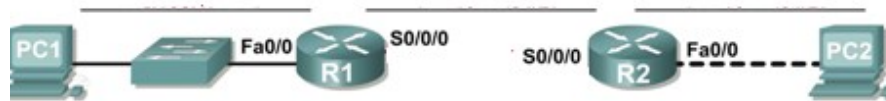


CEL 51, DCCN, Monsoon 2020

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 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 are required for this network. One subnet for the network connected to router R1, second subnet for the link between R1 and R2, third subnet for the network connected to router R2.

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

Given Network address:- 192.168.1.0/24

Last 8 bits can be used to identify host

Therefore number of usable hosts are: $2^n - 2 = 2^8 - 2 = 256 - 2 = 254$

We need 3 subnets in this network. So we can use 2 subnet bits to get $2^2 = 4$ subnets.

First 24 bits are required for network identification.

Next 2 bits will be subnet bits

Next 6 bits will be host bits. Therefore each subnet can have maximum $2^6 = 64$ addresses.

Therefore remaining 6 bits will be used as host bits.

Subnet mask in dotted binary notation is 11111111.11111111.11111111.11000000

Therefore subnet mask in dotted decimal notation is 255.255.255.192

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

Subnet mask in slash format is /26

How many usable hosts are there per subnet?

We have six bits for identifying the hosts. Therefore from 6 bits we can have $2^6 = 64$ addresses.

Therefore each subnet has 64 addresses.

The first address of the subnet is used as network identification and last one is the broadcast.

Each subnet has 64 addresses. Therefore the usable hosts are $64 - 2 = 62$ hosts

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

1. Assign subnet 1 to the network attached to R1 = 192.168.1.64/26
2. Assign subnet 2 to the link between R1 and R2 = 192.168.1.128/26
3. Assign subnet 3 to the network attached to R2 = 192.168.1.192/26

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.
Fa0/0 = 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.
S0/0/0 = 192.168.1.129

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

S0/0/0 = 192.168.1.190

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

Fa0/0 = 192.168.1.193

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

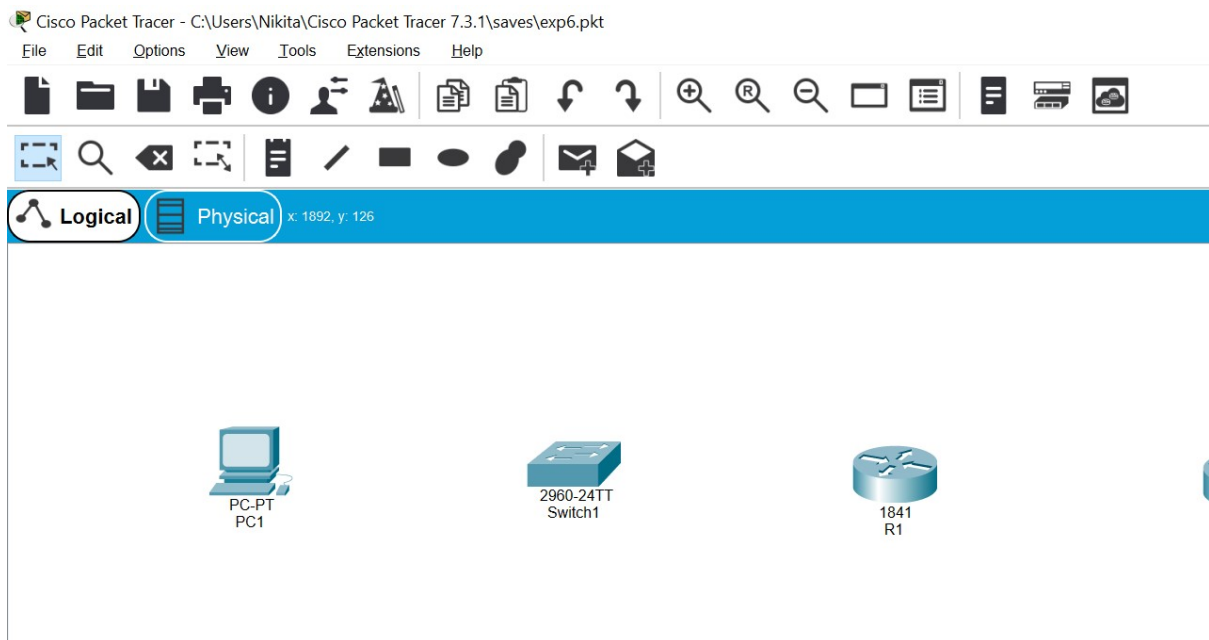
192.168.1.254

Network connected to router 1 requires 15 hosts. But subnet 1 can have 64 hosts. So in subnet 1 addresses from 192.168.1.65- 192.168.1.95 will be used.

Network connected to router 2 requires 30 hosts. But subnet 2 can have 64 hosts. So in subnet 2 addresses from 192.168.1.129 - 192.168.1.159 will be used.

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

Task 3: Configure the Serial and FastEthernet Addresses.



Cisco Packet Tracer - C:\Users\Nikita\Cisco Packet Tracer 7.3.1\saves\exp6.pkt

File Edit Options View Tools Extensions Help



Logical Physical x: 1526, y: 114



- RS 232
- USB0
- USB1
- FastEthernet0



Cisco Packet Tracer - C:\Users\Nikita\Cisco Packet Tracer 7.3.1\saves\exp6.pkt

File Edit Options View Tools Extensions Help



Logical Physical x: 1698, y: 118



- Console
- FastEthernet0/1
- FastEthernet0/2
- FastEthernet0/3
- FastEthernet0/4
- FastEthernet0/5
- FastEthernet0/6
- FastEthernet0/7
- FastEthernet0/8
- FastEthernet0/9
- FastEthernet0/10
- FastEthernet0/11
- FastEthernet0/12
- FastEthernet0/13
- FastEthernet0/14
- FastEthernet0/15
- FastEthernet0/16
- FastEthernet0/17
- FastEthernet0/18
- FastEthernet0/19
- FastEthernet0/20

Nikita\Cisco Pack

Tools Extens

al x: 1881, y: 115

PT 1

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

Zoom In

Phys

Customize

Nikita\Cisco Pack

Tools Extens

al x: 1881, y: 130

PT 1

Physical Config CLI Attributes

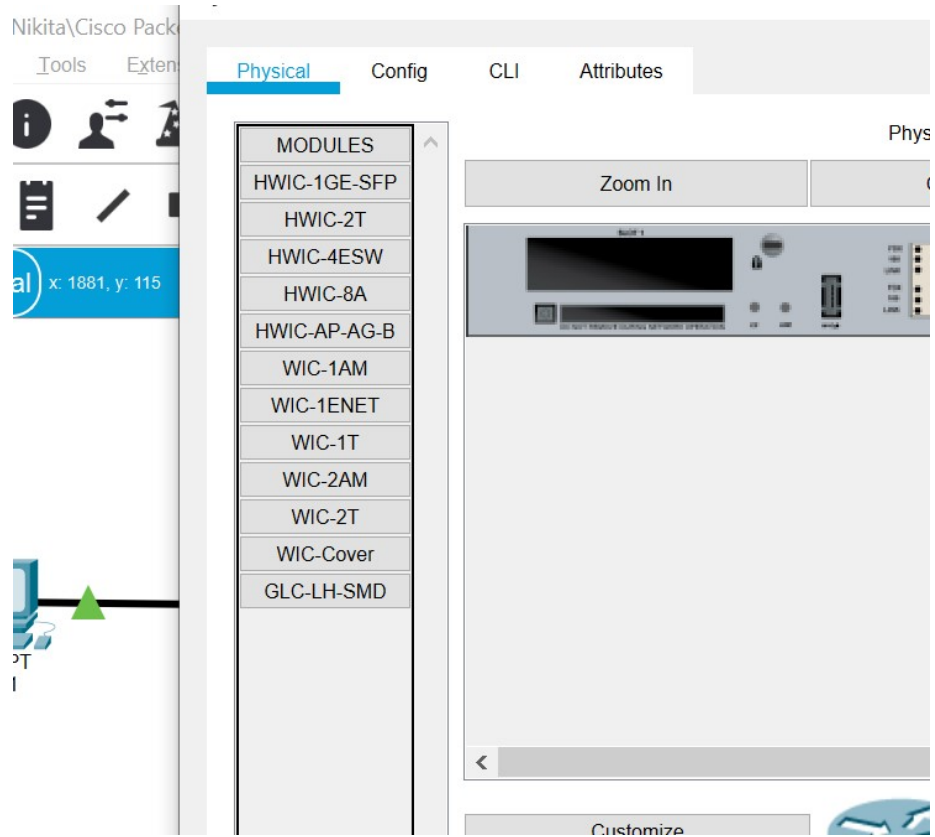
MODULES

- 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

Zoom In

Phys

Customize



R2

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



<

 R2

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

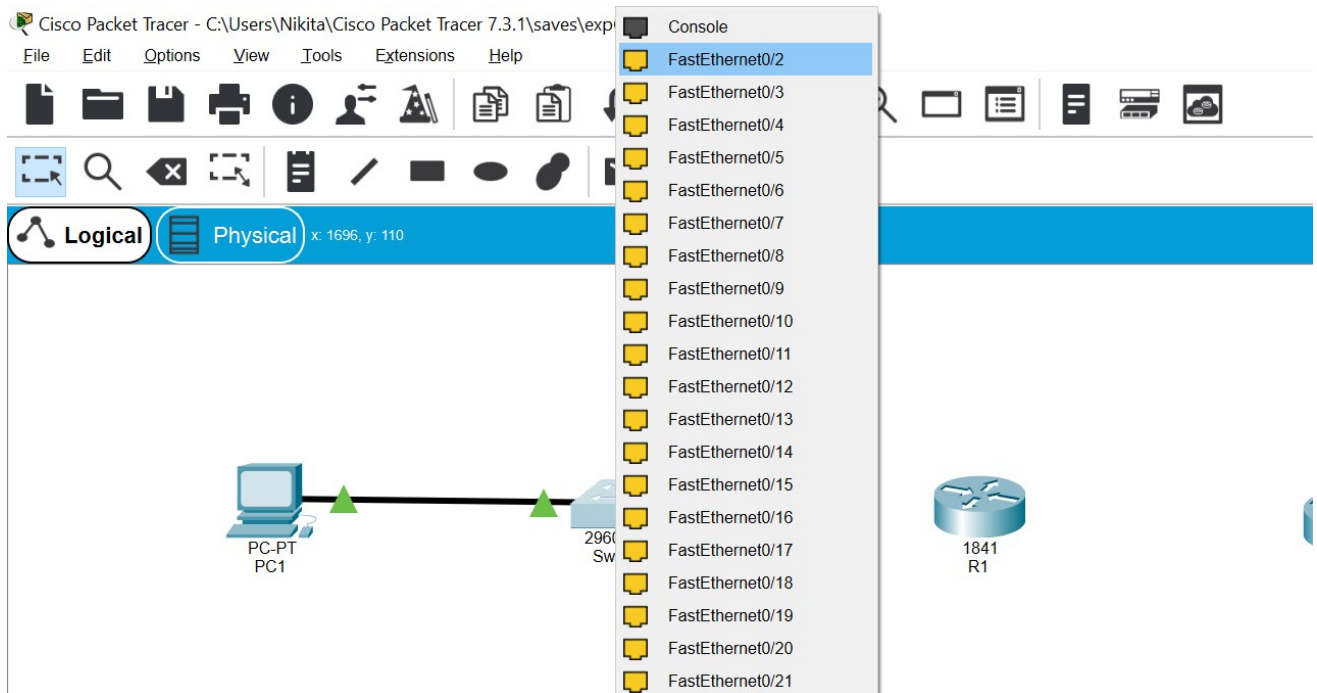
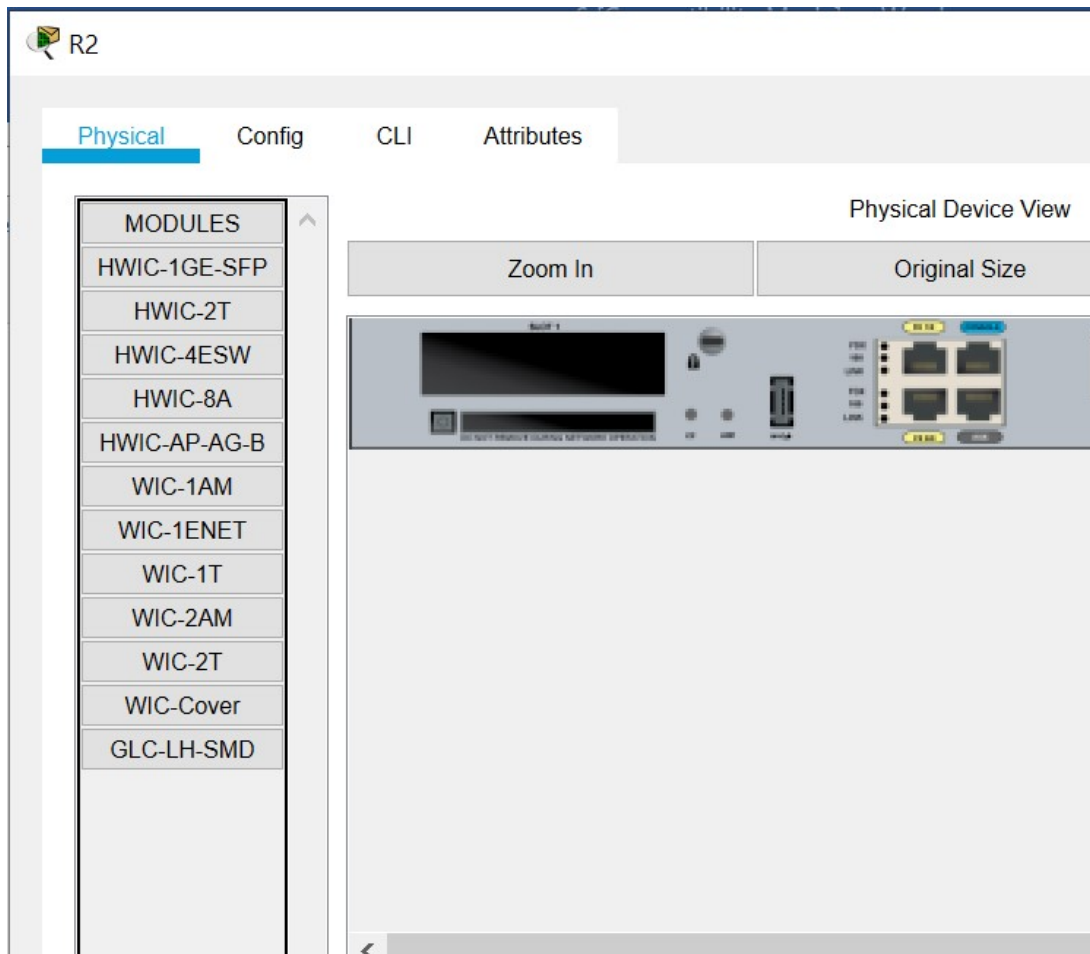
Physical Device View

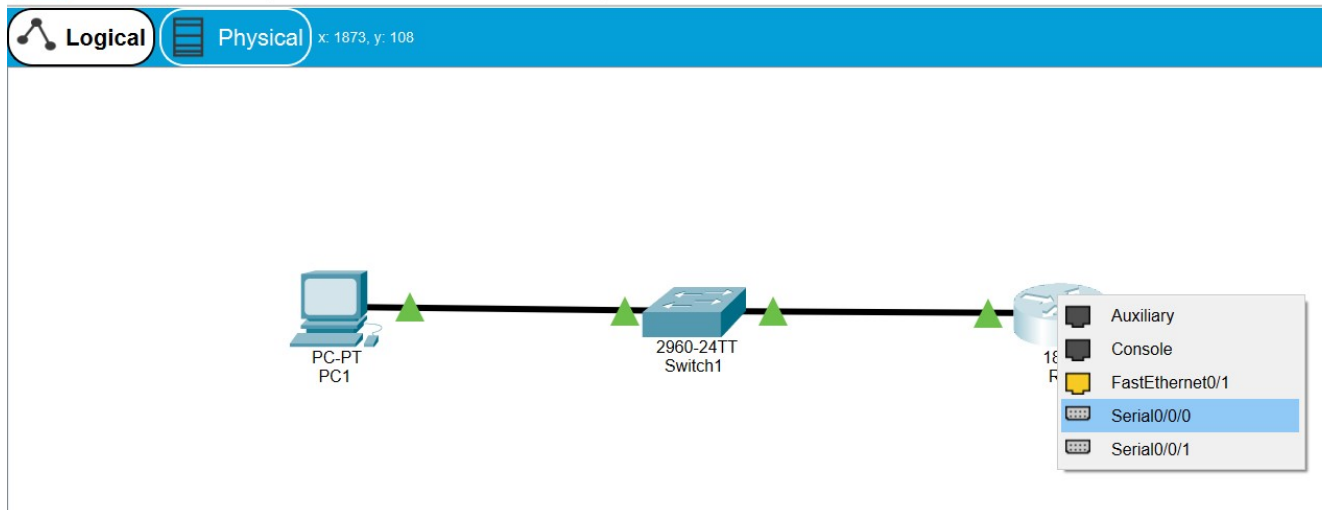
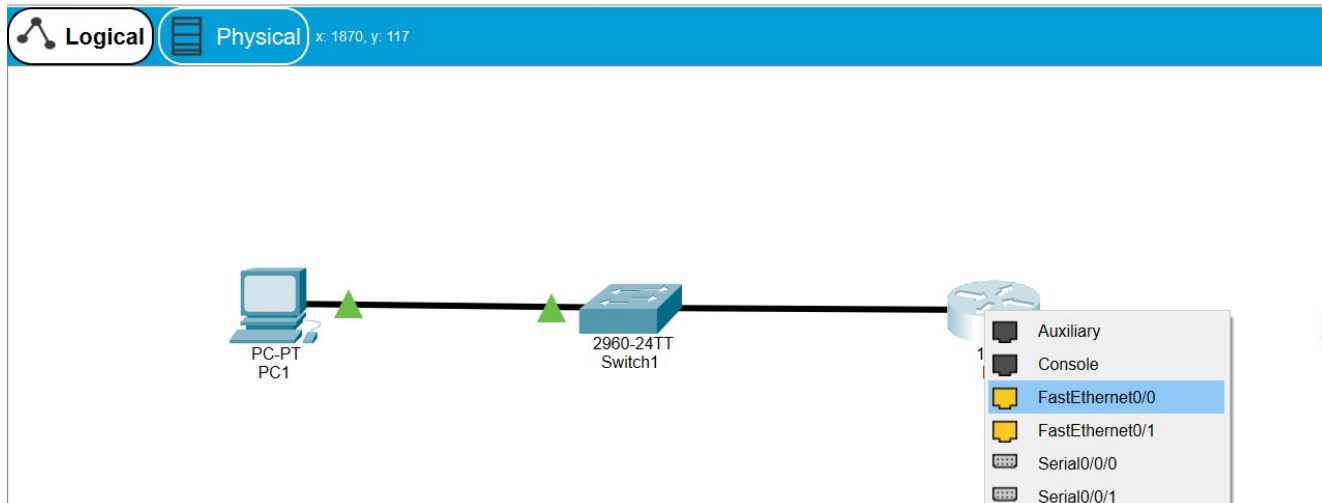
Zoom In

Original Size



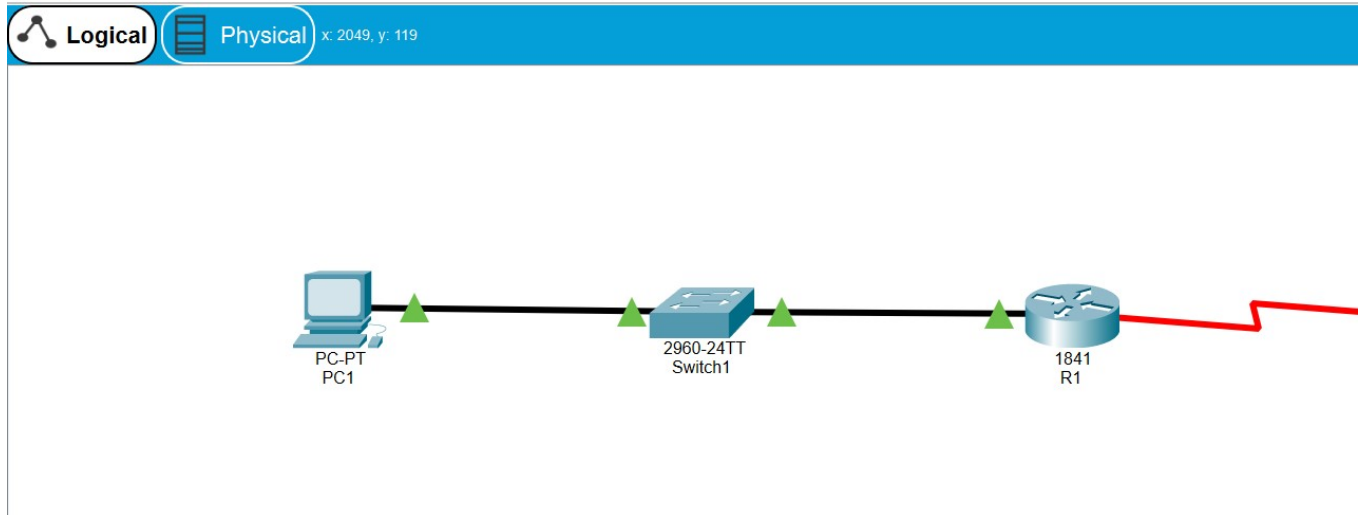
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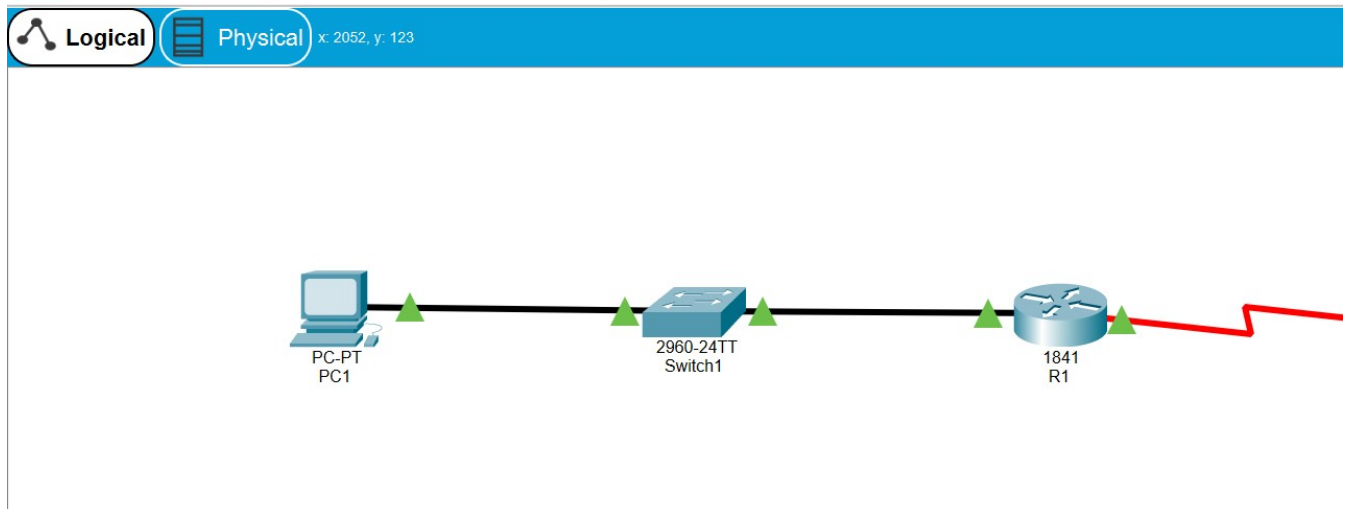
Cisco Packet Tracer - C:\Users\Nikita\Cisco Packet Tracer 7.3.1\saves\exp6.pkt

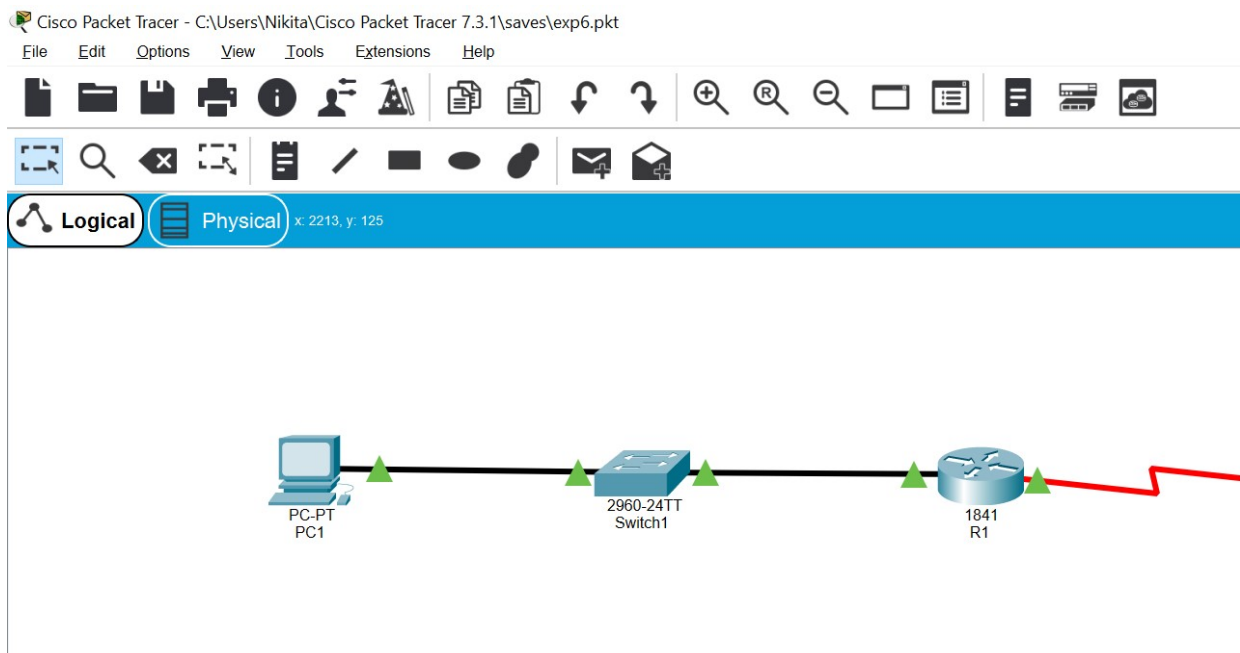
File Edit Options View Tools Extensions Help



Cisco Packet Tracer - C:\Users\Nikita\Cisco Packet Tracer 7.3.1\saves\exp6.pkt

File Edit Options View Tools Extensions Help





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.

R1

Physical **Config** CLI Attributes

GLOBAL	FastEthernet0/0
Settings	Port Status
Algorithm Settings	Bandwidth
ROUTING	Duplex
Static	MAC Address
RIP	0000.0C9
SWITCHING	IP Configuration
VLAN Database	IPv4 Address
INTERFACE	Subnet Mask
FastEthernet0/0	192.168.1
FastEthernet0/1	255.255.2
Serial0/0/0	
Serial0/0/1	
	Tx Ring Limit
	10

Equivalent IOS Commands

```

Router(config)#interface Serial0/0/0
Router(config-if)#ip address
% Incomplete command.
Router(config-if)#ip address
  
```

R1

Physical **Config** CLI Attributes

GLOBAL	Serial0/0/0
Settings	Port Status
Algorithm Settings	Duplex <input type="radio"/> Full D
ROUTING	Clock Rate 2000000
Static	IP Configuration
RIP	IPv4 Address 192.168.1
SWITCHING	Subnet Mask 255.255.2
VLAN Database	
INTERFACE	
FastEthernet0/0	Tx Ring Limit 10
FastEthernet0/1	
Serial0/0/0	
Serial0/0/1	

Equivalent IOS Commands


```
Router(config-if)#ip address
% Incomplete command.
Router(config-if)#ip address 192 168 1 65 255 255 255 0
```

R2

Physical **Config** CLI Attributes

GLOBAL	FastEthernet0/0
Settings	Port Status
Algorithm Settings	Bandwidth
ROUTING	Duplex
Static	MAC Address 0001.649
RIP	IP Configuration
SWITCHING	IPv4 Address 192.168.1
VLAN Database	Subnet Mask 255.255.2
INTERFACE	
FastEthernet0/0	Tx Ring Limit 10
FastEthernet0/1	
Serial0/0/0	
Serial0/0/1	

Equivalent IOS Commands

 R2

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
 IPv4 Address 192.168.1.193
 Subnet Mask 255.255.255.192
 Tx Ring Limit 10

Equivalent IOS Commands

```

Router(config-if)#ip address 192.168.1.193 255.255.255.192
Router(config-if)#ip address 192.168.1.193 255.255.255.192
Router(config-if)#ip address 192.168.1.193 255.255.255.192
  
```

 Switch1

Physical Config **CLI** Attributes

IOS Command Line Interface

```

CLEI Code Number          : COM3K00BRA
Hardware Board Revision Number : 0x01

Switch  Ports  Model          SW Version      SW Image
-----  ----  -
*    1    26    WS-C2960-24TT   12.2            C2960-LANBAS

Cisco IOS Software, C2960 Software (C2960-LANBASE-M), Version 12.2(25)F
Copyright (c) 1986-2005 by Cisco Systems, Inc.
Compiled Wed 12-Oct-05 22:05 by pt_team

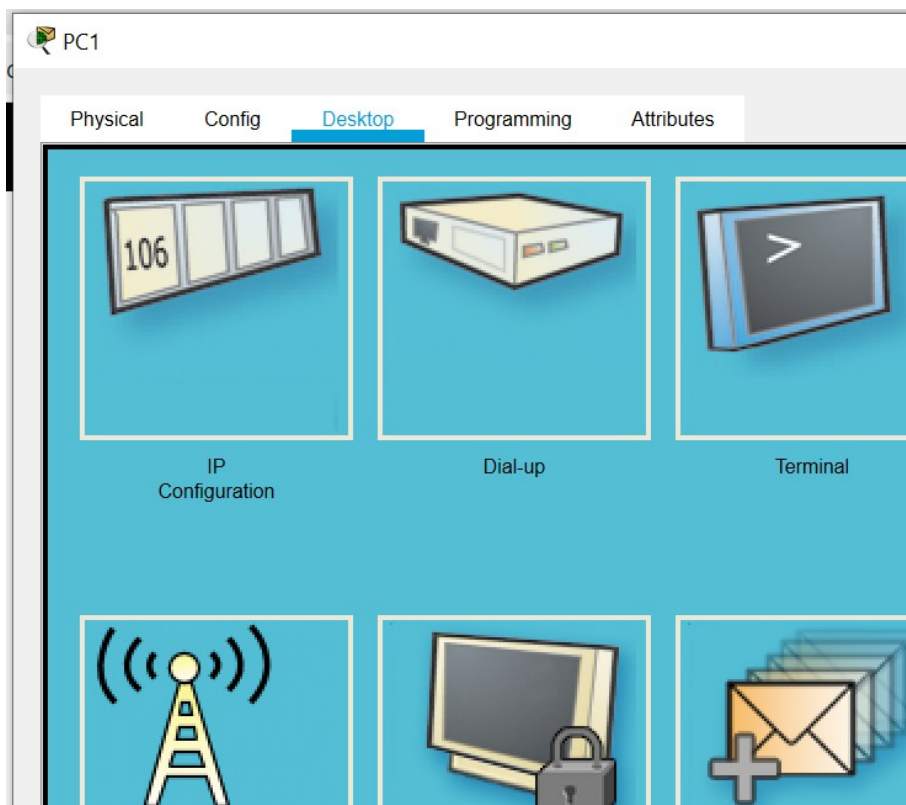
Press RETURN to get started!

%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, change
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to
%LINK-5-CHANGED: Interface FastEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2. change
  
```

```
Switch#en
Switch#conf t
Enter configuration commands, one per line
Switch(config)#ip default-gateway 192.168
```

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

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.168.1.126

Subnet Mask 255.255.255.192

Default Gateway 192.168.1.65

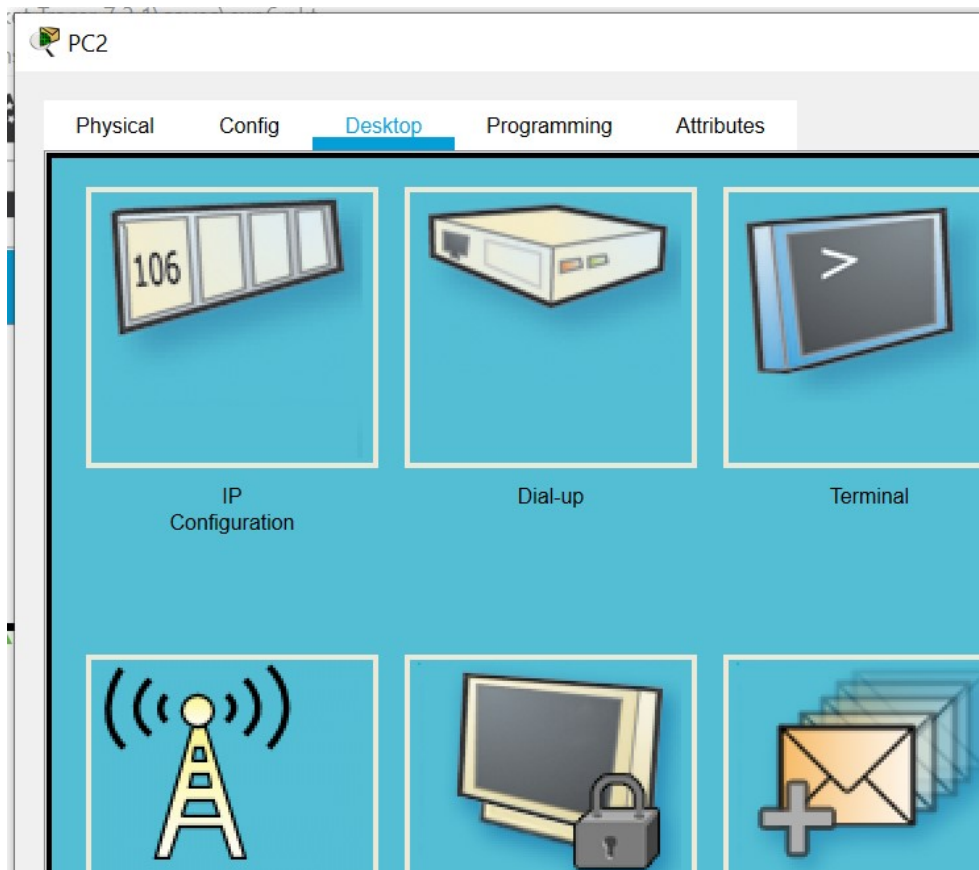
DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address

Link Local Address FE80::2E0:F9FF:FE1C:2839



PC2

Physical Config **Desktop** Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 192.168.1.254

Subnet Mask: 255.255.255.192

Default Gateway: 192.168.1.193

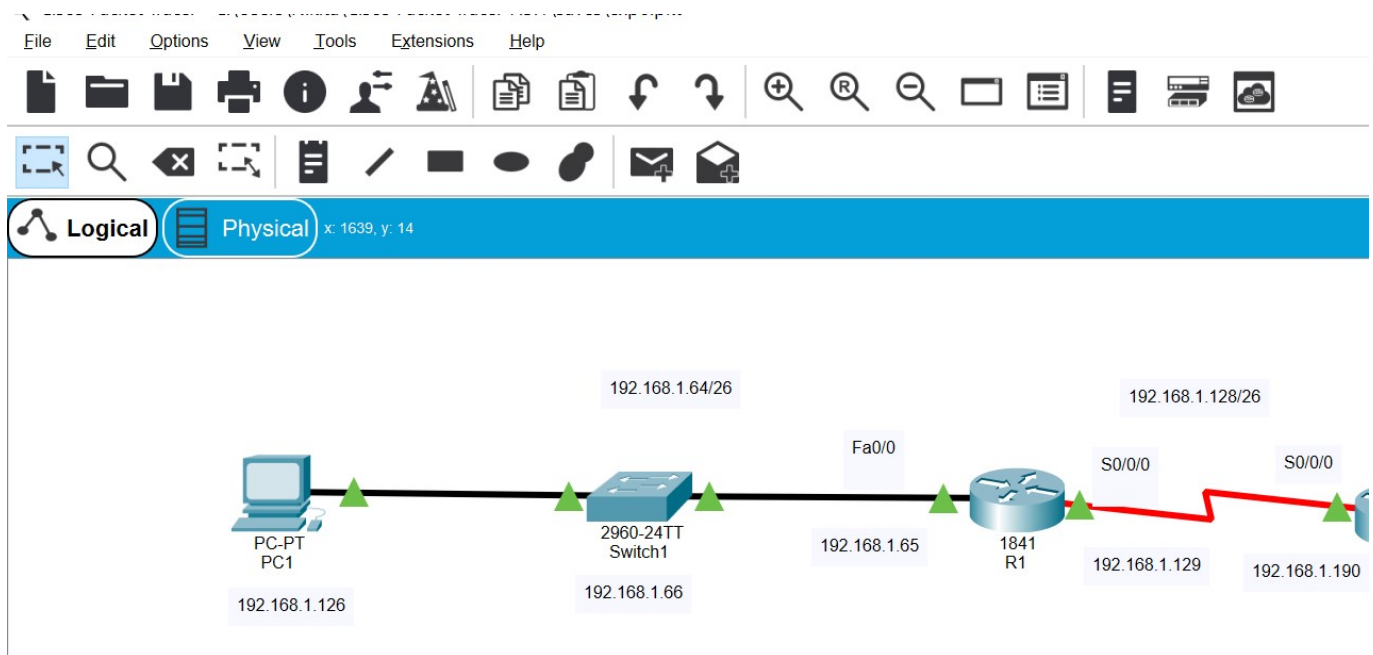
DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address:

Link Local Address: FE80::201:C7FF:FEC6:2CC7

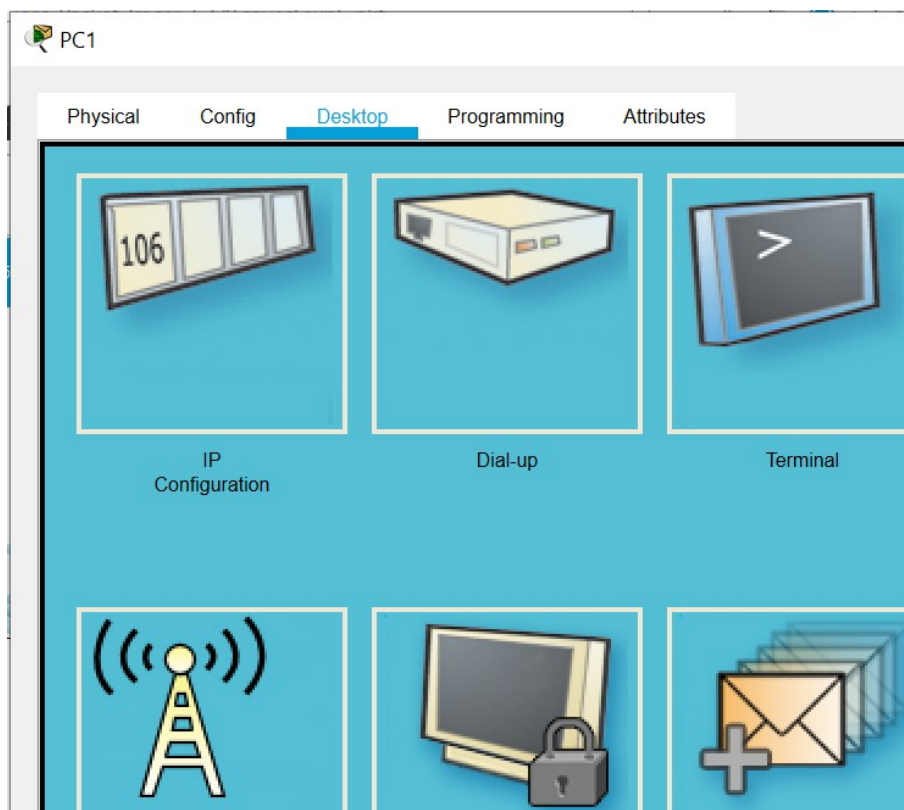


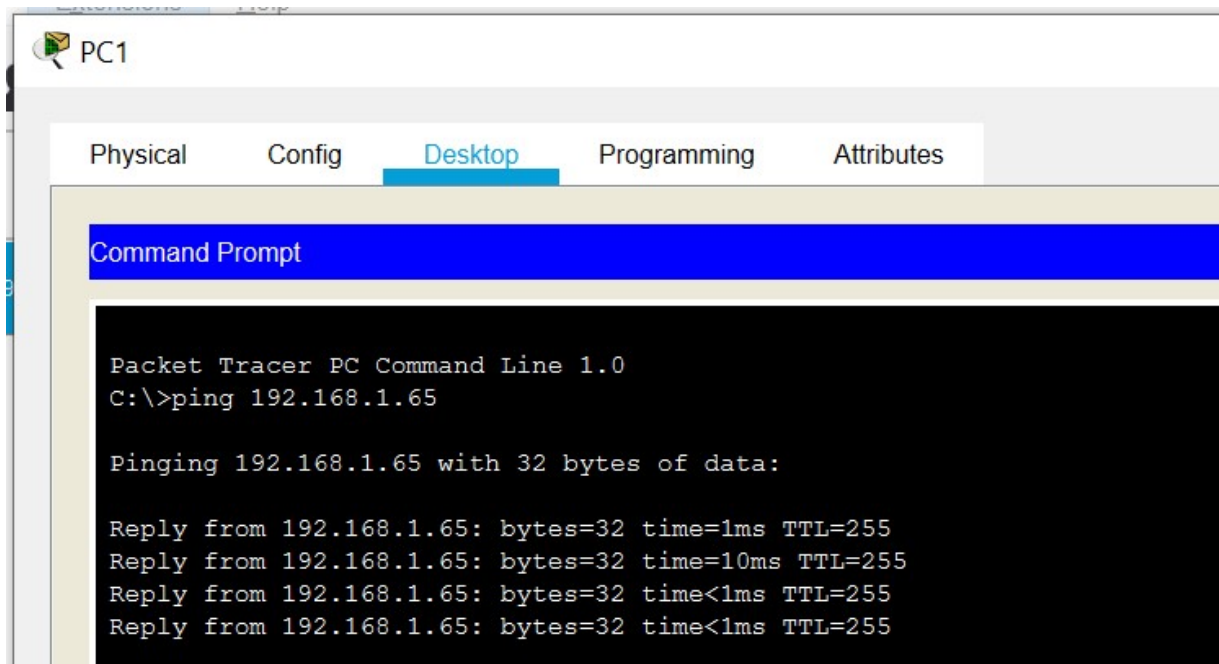
Task 4: Verify the Configurations.

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?

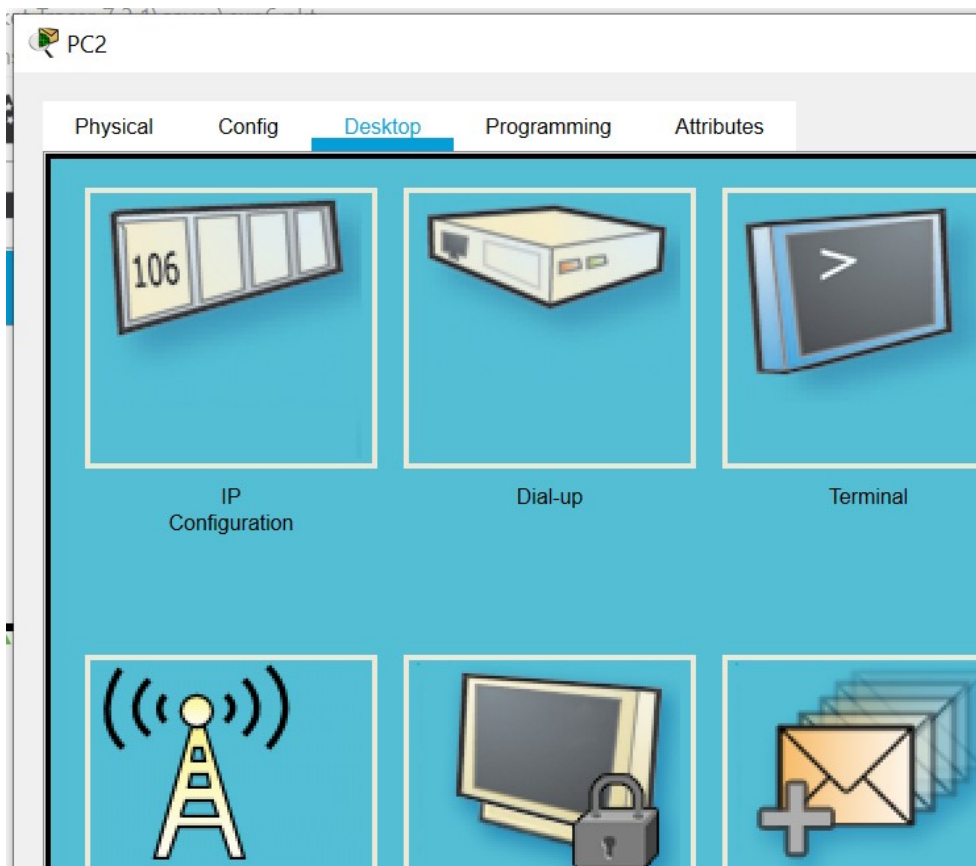
Yes, it is possible

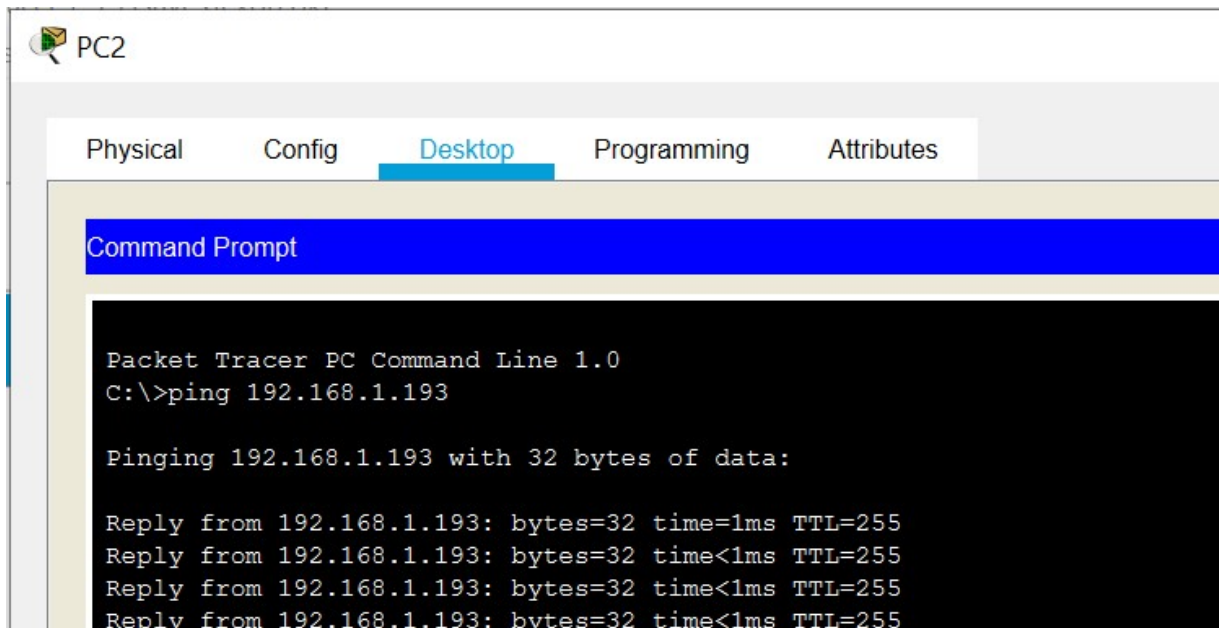




From the host attached to R2, is it possible to ping the default gateway?

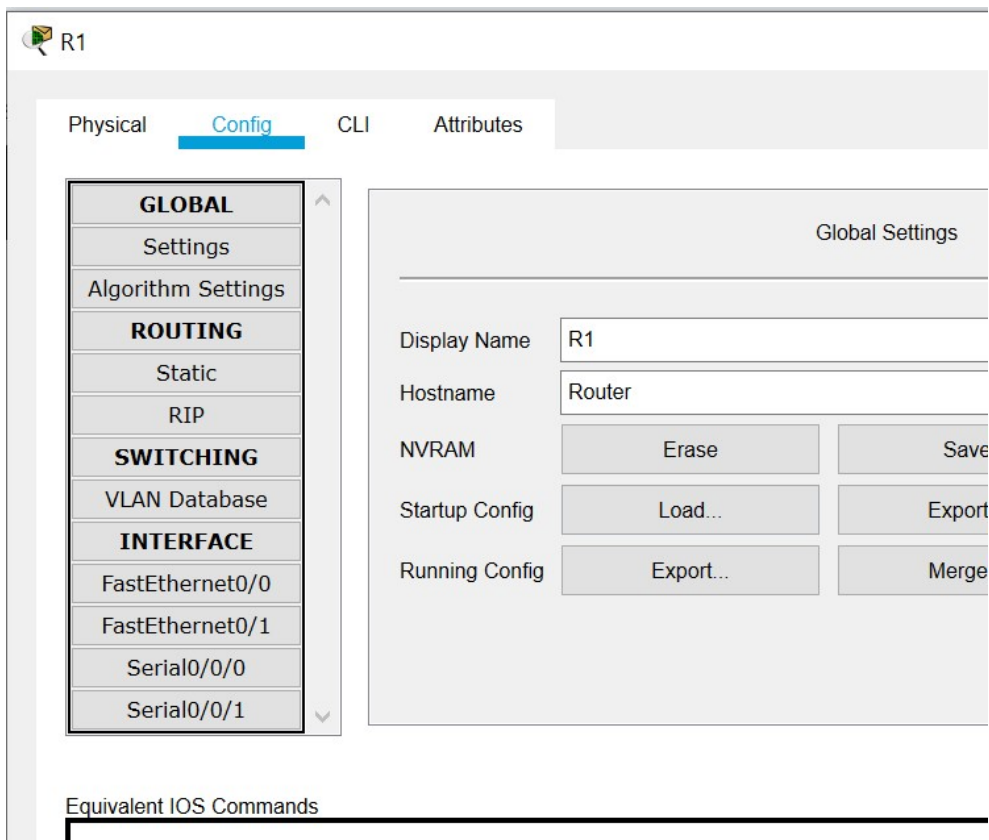
Yes, it is possible

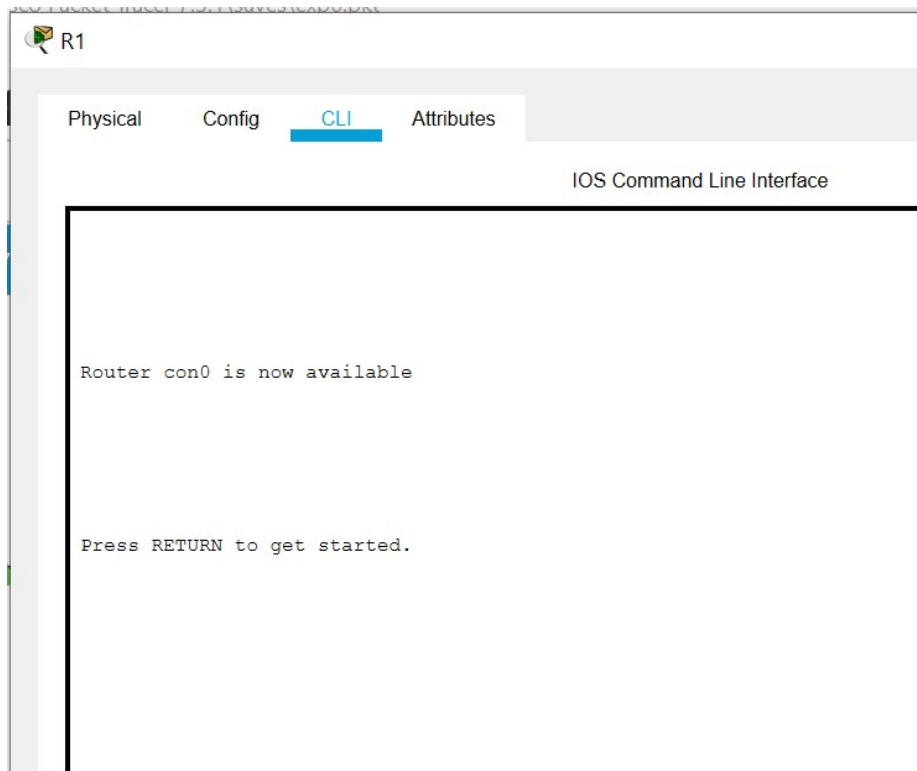




From the router R1, is it possible to ping the Serial 0/0/0 interface of R2?

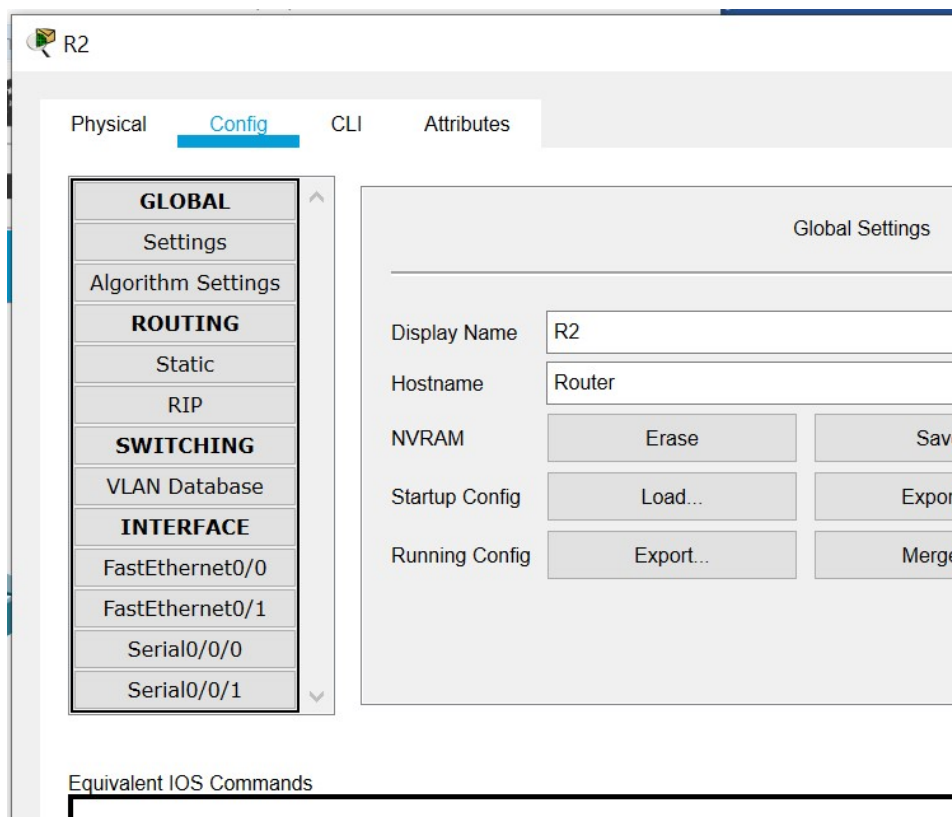
Yes, it is possible

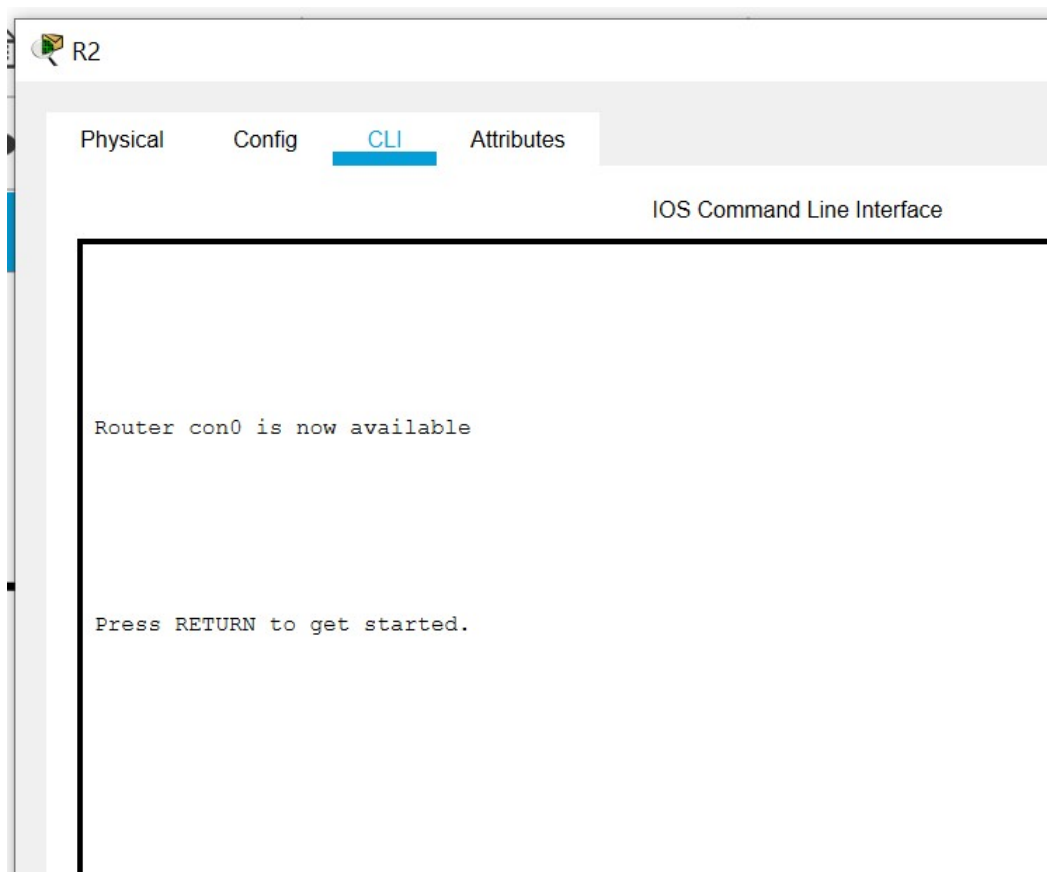




From the router R2, is it possible to ping the Serial 0/0/0 interface of R1?

Yes, it is possible



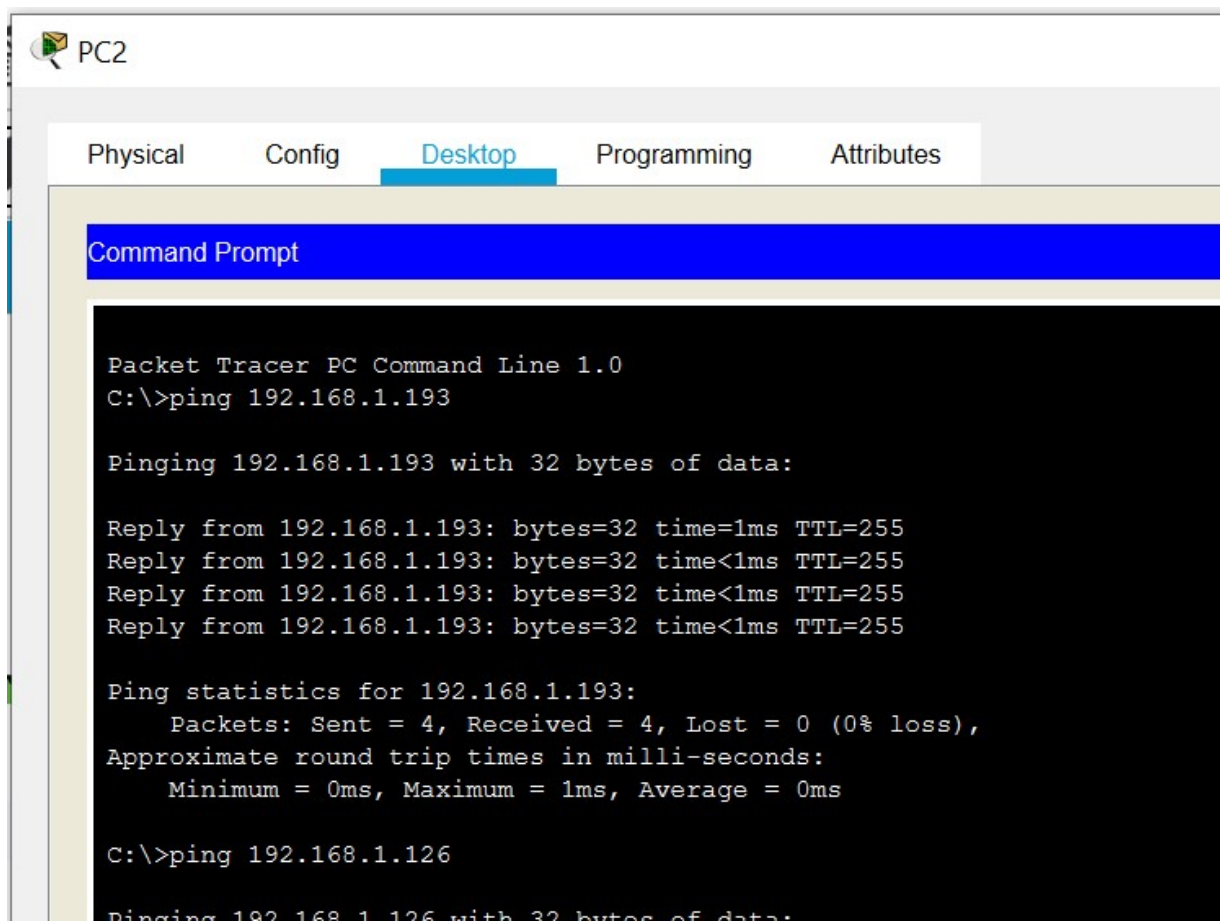


The answer to the above questions should be **yes**. If any of the above pings failed, check your physical connections and configurations.

Task 5: Reflection

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

Devices from different networks cannot ping each other.



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



```
Router>ping 192.168.1.190

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.190, timeout is 2 seconds:
!!!!|
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/7 ms

Router>show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
```

The above routing table only has addresses of devices which are directly connected to the router's interface

We cannot ping these devices because we have not configured routing.

The routing needs to have either static or dynamic routing to determine path to which the packet is to be forwarded.

Static Routing:- Routing table is not changed until network administrator changes it.

Dynamic Routing:- Routing table is changed once any changes to network occurs or network topology changes.