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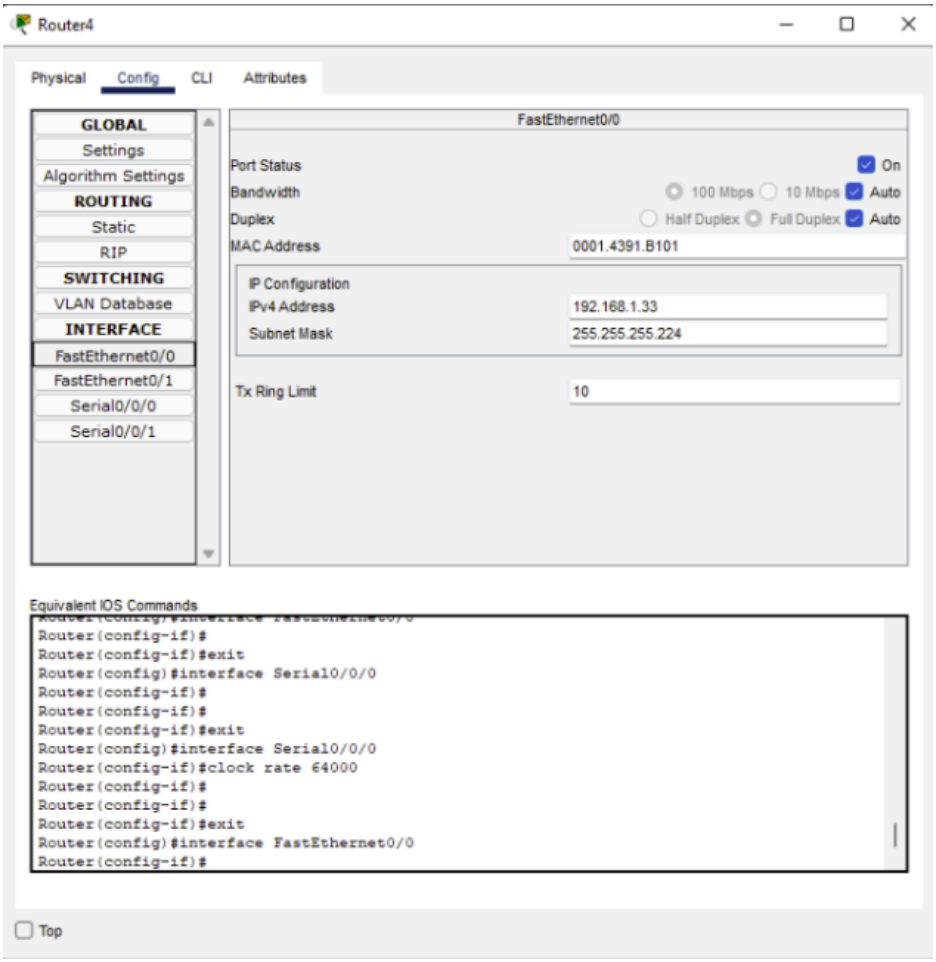
SUBJECT	CCN
EXPERIMENT	9
DATE OF PERFORMANCE	6/04/24
DATE OF SUBMISSION	11/04/24
AIM **THEORY**	Experiment using Cisco Packet Tracer Cisco Packet Tracer is Cisco's simulation software. It can be used to create complicated network typologies, as well as to test and simulate abstract networking concepts. It acts as a playground for you to explore networking and the experience is very close to what you see in computer networks. They also provide their service in languages such as Russian, German, Spanish and French. Packet Tracer enables students to create complicated and huge networks, which is frequently impossible with physical hardware due to cost considerations. Packet Tracer is available for Linux, Windows, MacOS, Android, and iOS. Packet Tracer allows users to drag and drop routers, switches, and other network devices to create simulated network topologies The best way to learn about networking, according to Cisco, is to do it. This programme cannot replace hardware routers or switches because the protocols are implemented solely in software. This tool, however, does not just contain Cisco hardware but also a wide range of other networking devices. Network topology is the arrangement of the elements of a communication network. Network topology can be used to define or describe the arrangement of various types of telecommunication networks, including command and control radio networks and computer networks.

	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. a. How many subnets are needed for this network? • 3 Subnets are required for this network b. What is the subnet mask for this network in dotted decimal format? • 255.255.255.224 is the subnet mask c. What is the subnet mask for the network in slash format? • /27 is the subnet mask in slash format for this address. d. How many usable hosts are there per subnet? • 30 usable hosts are there per subnet Step 3: Assign subnetwork addresses to the Topology Diagram. • Assign subnet 1 to the network attached to R1 − 192.168.1.32/27 • Assign subnet 2 to the link between R1 and R2 − 192.168.1.64/27 • Assign subnet 3 to the network attached to R2 − 192.168.1.96/27

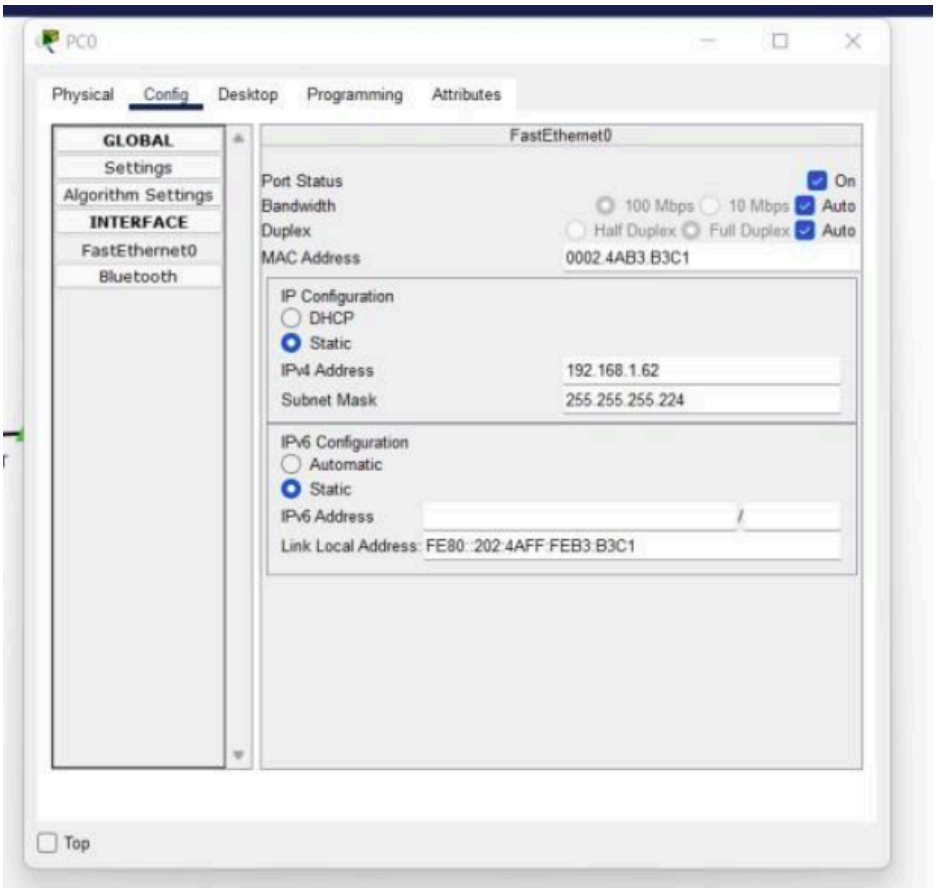
Task 2: Determine Interface Addresses.

Step 1: Assign appropriate addresses to the device interfaces

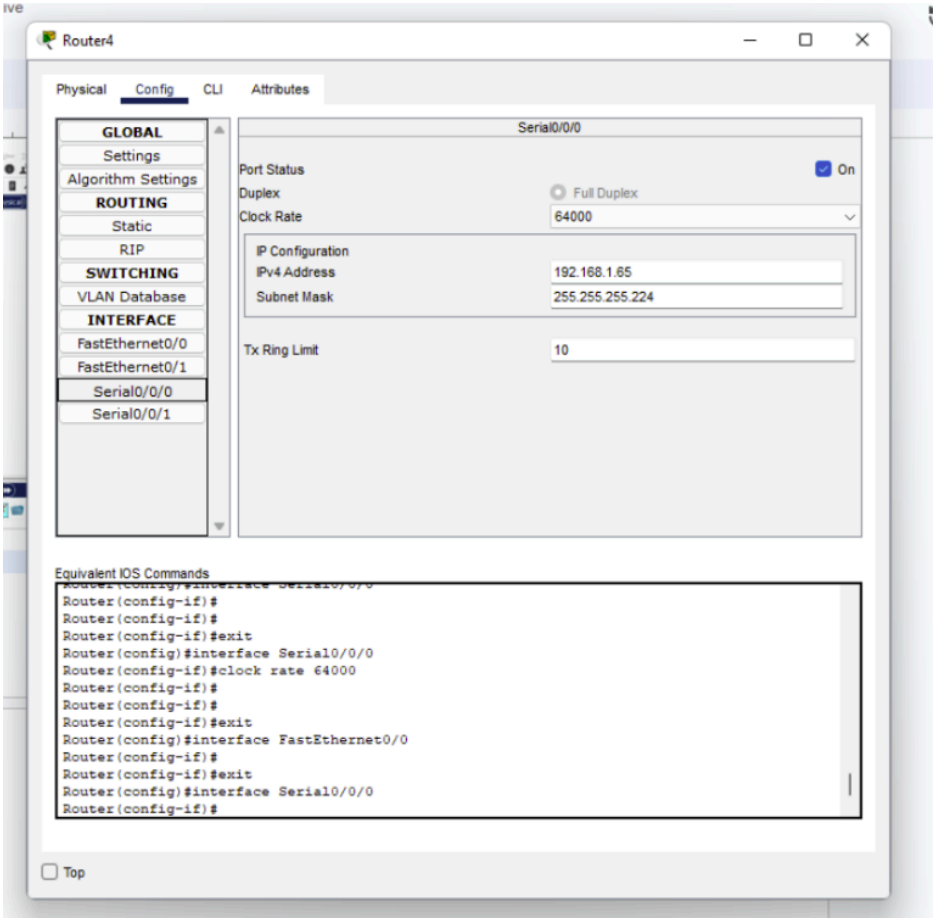
1. Assign the first valid host address in subnet 1 to the LAN interface on R1 i.e., 192.168.1.33



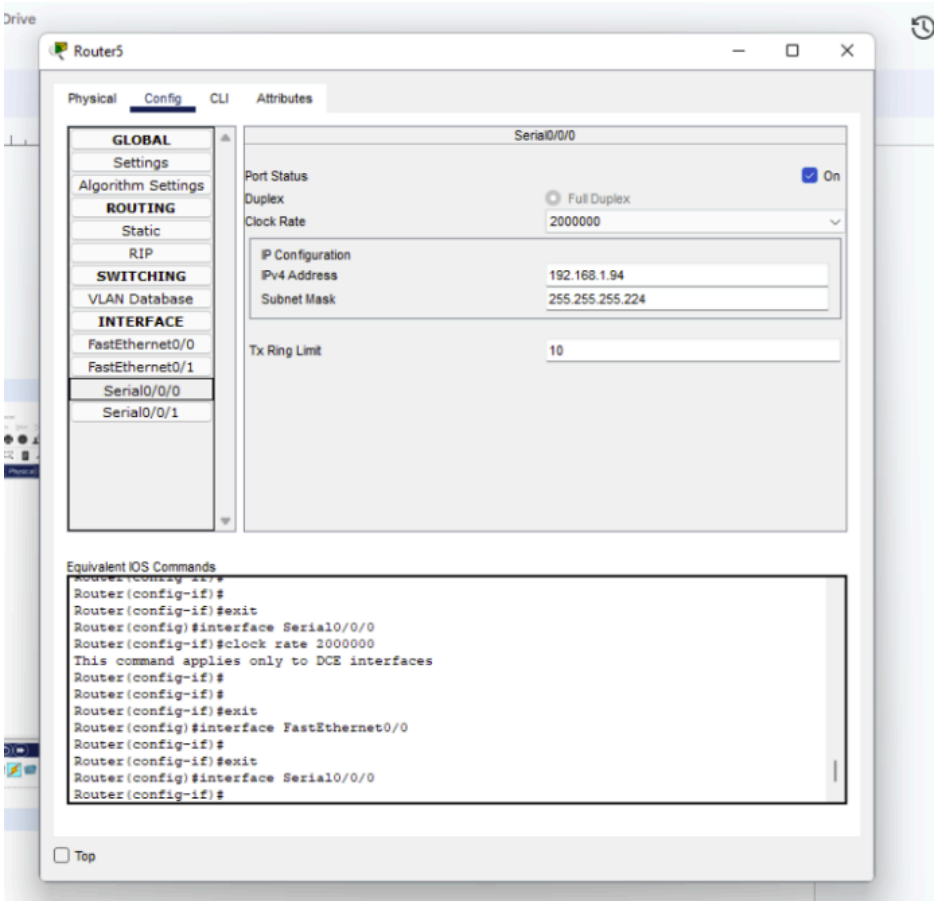
2. Assign the last valid host address in subnet 1 to PC1 i.e., 192.168.1.62



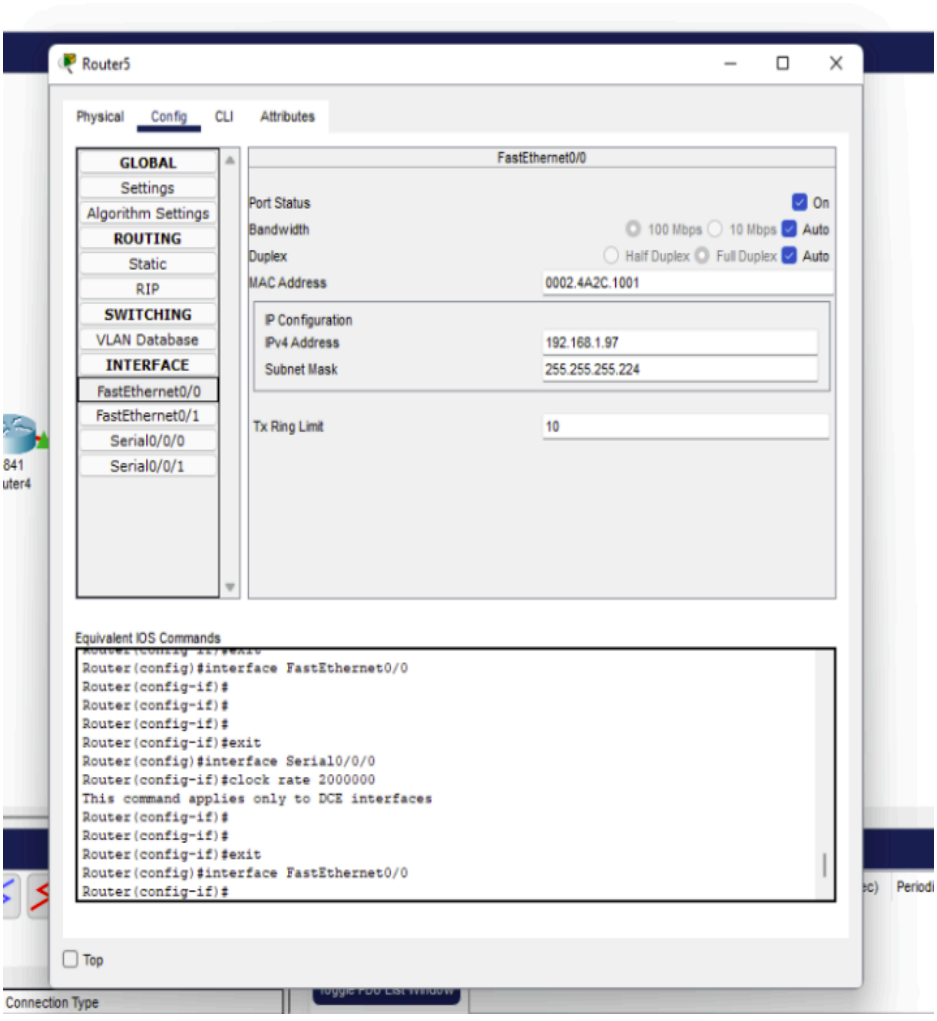
3. Assign the first valid host address in subnet 2 to the WAN interface on R1 i.e., 192.168.1.65



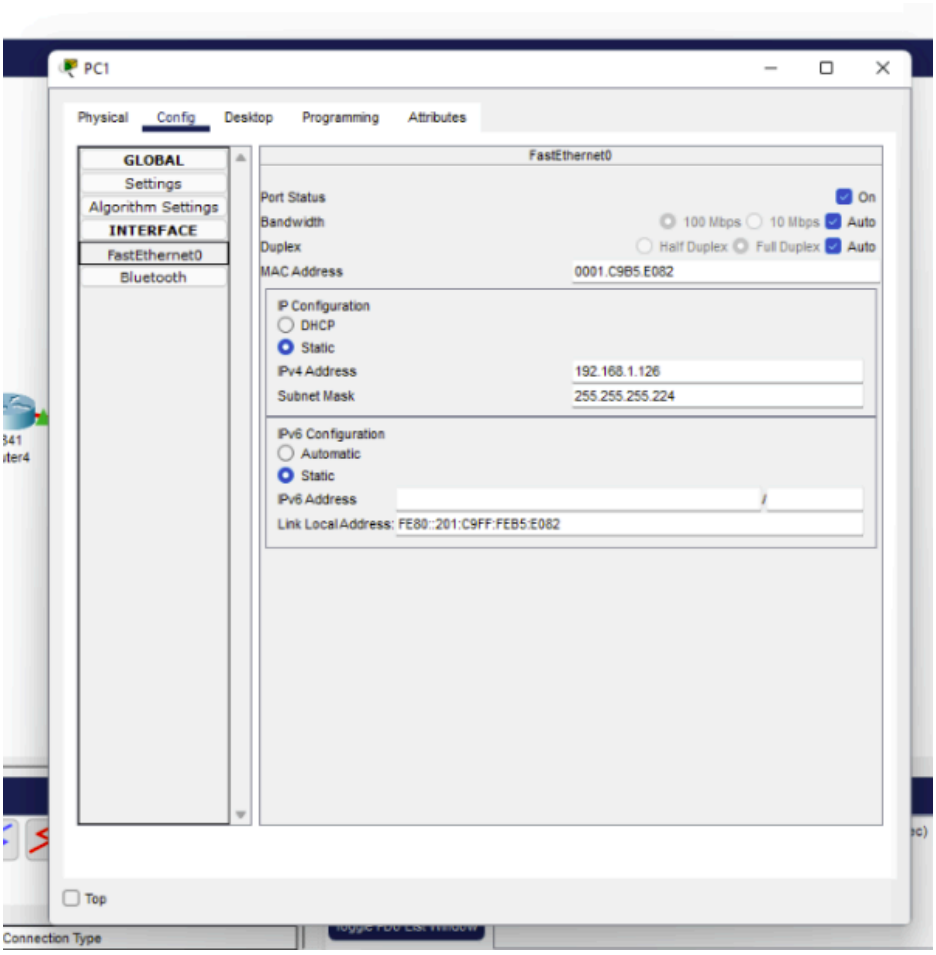
4. Assign the last valid host address in subnet 2 to the WAN interface on R2 i.e., 192.168.1.94



5. Assign the first valid host address in subnet 3 to the LAN interface of R2 i.e., 192.168.1.97



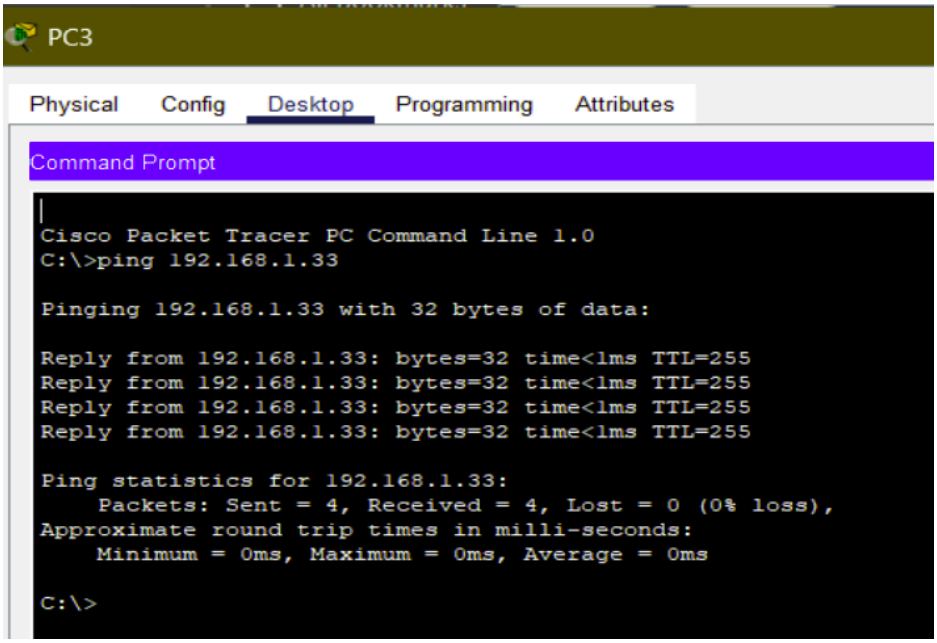
6. Assign the last valid host address in subnet 3 to PC2 i.e., 192.168.1.126



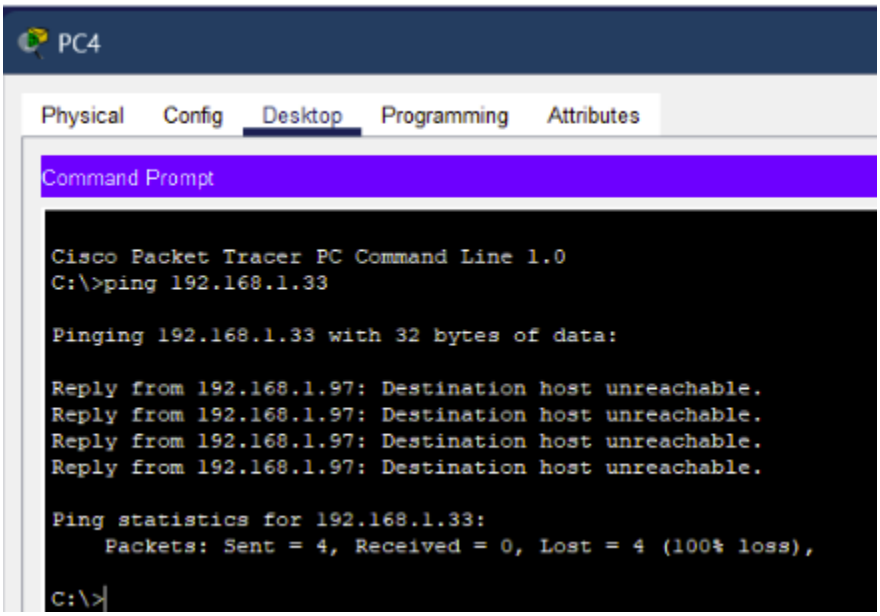
Task 3: Configure the Serial and FastEthernet Addresses.

Task 4: Verify the Configurations. Answer the following questions to verify that the network is operating as expected. Please attached screenshots to justify your answer.

1. From the host attached to R1, is it possible to ping the default gateway?
Yes it is possible from R1 to ping the default gateway (192.168.1.33).

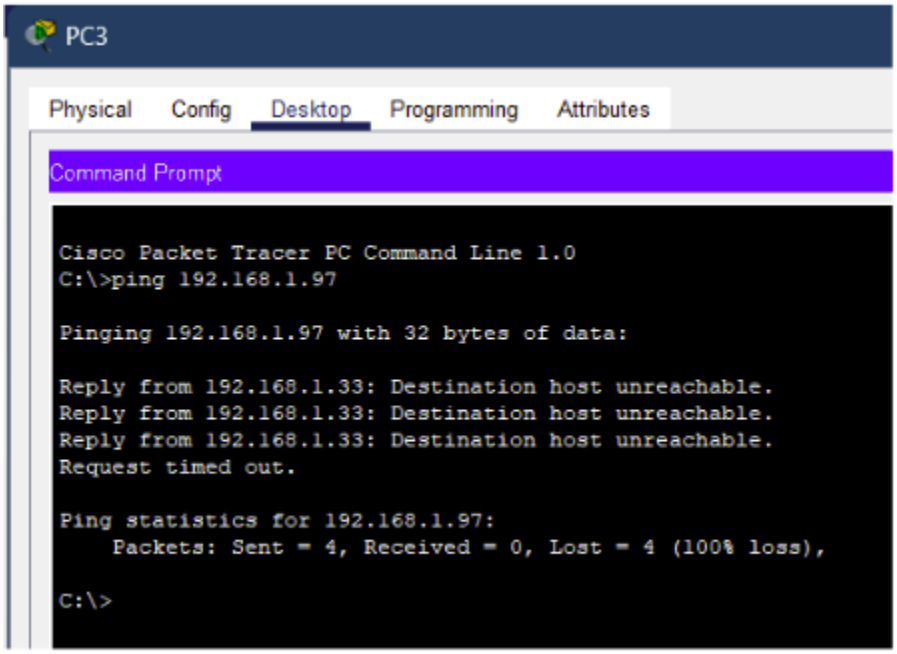


2. From the host attached to R2, is it possible to ping the default gateway?
No it is not possible from R2 to ping the default gateway (192.168.1.33)



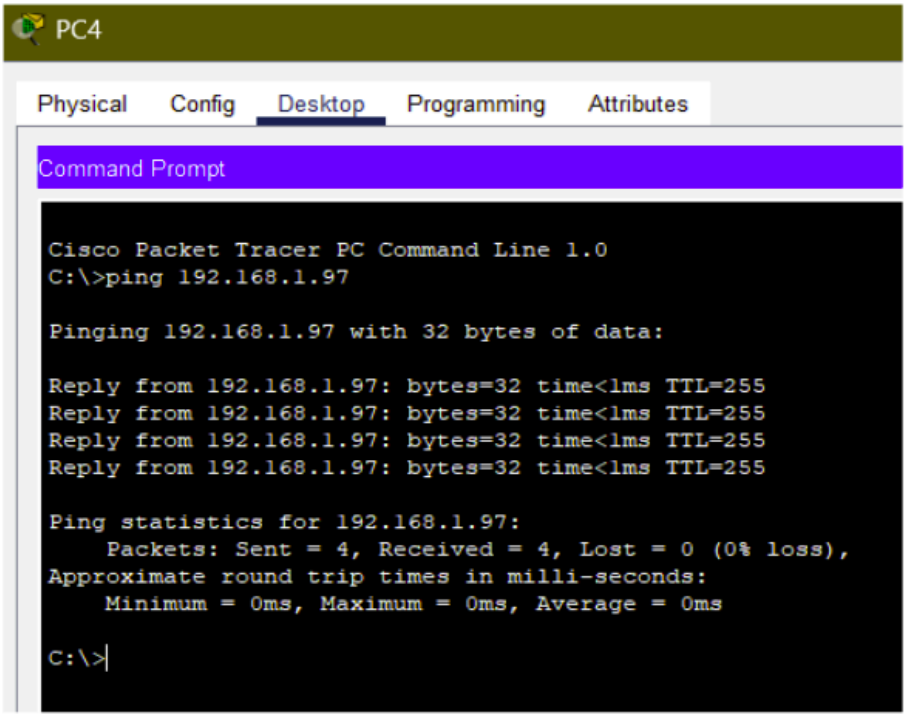
3. From the host attached to R1, is it possible to ping the default gateway?

No it is not possible from R1 to ping the default gateway (192.168.1.97)



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

Yes it is possible from R2 to ping the default gateway (192.168.1.97)



	Task 5: Reflection 1. Are there any devices on the network that cannot ping each other? Yes, based on the provided information, the devices on the network cannot ping each other. 2. What is missing from the network that is preventing communication between these devices? Based on the issue observed with the ping command output, it seems that the missing component in the network configuration that is preventing communication between the devices is a proper routing configuration.The network lacks a routing configuration that allows traffic to be forwarded between the two subnets connected to routers R1 and R2.

9.2

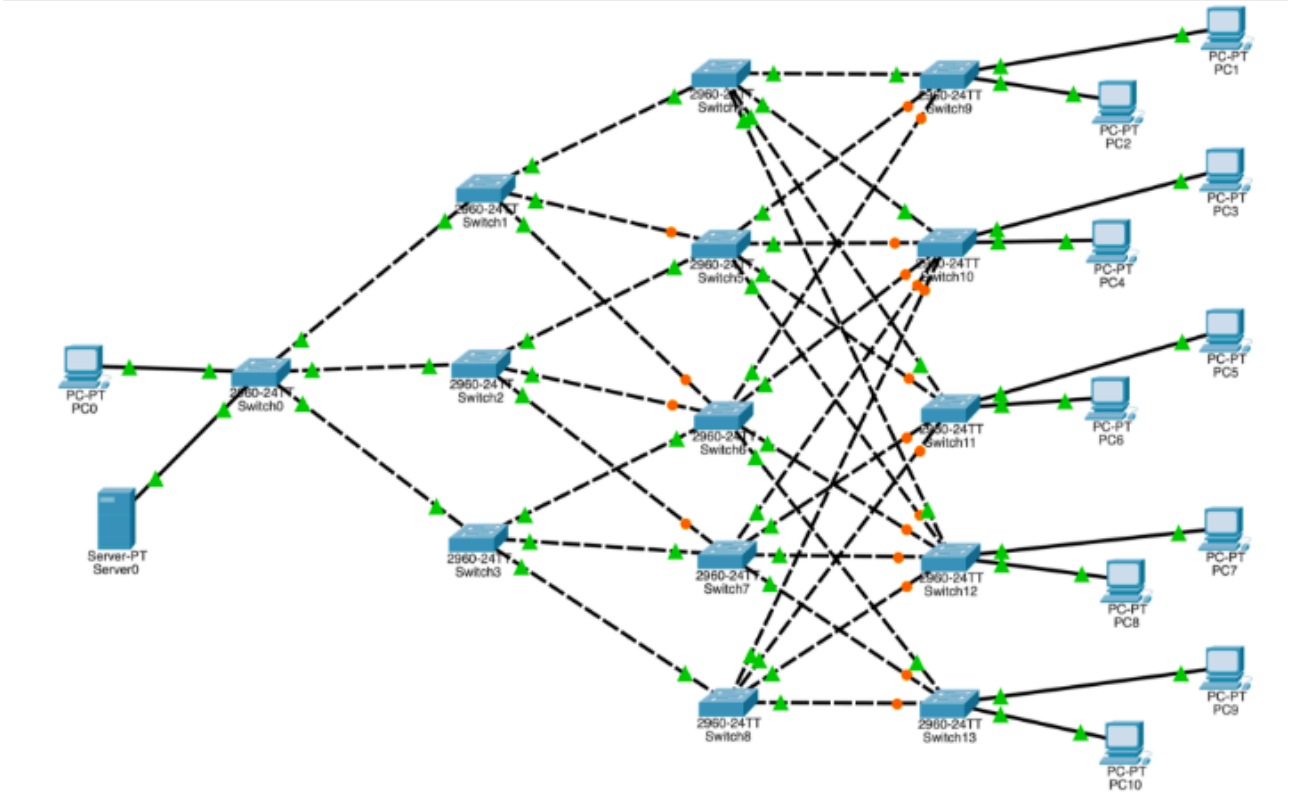
Challenge Lab – Find the Imposter – Layer 2

You have been informed that the following three MAC addresses are acting maliciously:
- 0006.2a55.34de
- 0000.0c07.be8e
- 0001.9666.3d1b

Starting from Switch0, use `show mac address-table` to trace the location of each MAC addresss above and shutdown their port.

1. 0006.2a55.34de

We start with seeing mac address table and use command show cdp neighbors and trace the route of the MAC address.



The following three MAC addresses might be malacious:
- 0006.2a55.34de
- 0000.0c07.be8e
- 0001.9666.3d1b

Starting at Switch0, let us trace the MAC address 0006.2a55.34de, it can be seen that this MAC address is at port Fa0/1

```
Switch0# show mac-address-table
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----

   1    0000.0c07.be8e    DYNAMIC     Fa0/1
   1    0001.9666.3d1b    DYNAMIC     Fa0/1
   1    0001.c92c.7351    DYNAMIC     Fa0/3
   1    0005.5ea7.bb7a    DYNAMIC     Fa0/1
   1    0006.2a4d.6e7a    DYNAMIC     Fa0/2
   1    0006.2a55.34de    DYNAMIC     Fa0/1
   1    0007.ec7a.b41a    DYNAMIC     Fa0/1
   1    000c.85a5.a401    DYNAMIC     Fa0/1
   1    0010.1154.7611    DYNAMIC     Fa0/5
   1    0030.a345.d1bb    DYNAMIC     Fa0/1
   1    0030.f2ed.c701    DYNAMIC     Fa0/4
   1    00d0.973b.d35c    DYNAMIC     Fa0/1
   1    00d0.baa9.9301    DYNAMIC     Fa0/5
   1    00d0.d372.7800    DYNAMIC     Fa0/1
   1    00e0.f92d.29a7    DYNAMIC     Fa0/5
```

- To figure out what exactly exists out Switch0 port Fa0/1, do the following:

```
Switch0# show cdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone
Device ID     Local Intrfce   Holdtme    Capability   Platform     Port ID
Switch2       Fas 0/4          124            S       2960         Fas 0/1
Switch3       Fas 0/5          124            S       2960         Fas 0/1
Switch1       Fas 0/1          124            S       2960         Fas 0/1
```

Which tells us that the next place to look for this particular MAC address is on Switch1. Thus from now on we repeat this process.

Finally on tracing the configuration further at Switch12, it can be seen that this MAC address is at port Fa0/7:

```
Switch12# show mac-address-table
          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----

   1    0006.2a4d.6e7a    DYNAMIC     Fa0/1
   1    0006.2a55.34de    DYNAMIC     Fa0/7
   1    0007.ec17.4b05    DYNAMIC     Fa0/1
   1    0030.a345.d1bb    DYNAMIC     Fa0/6
```

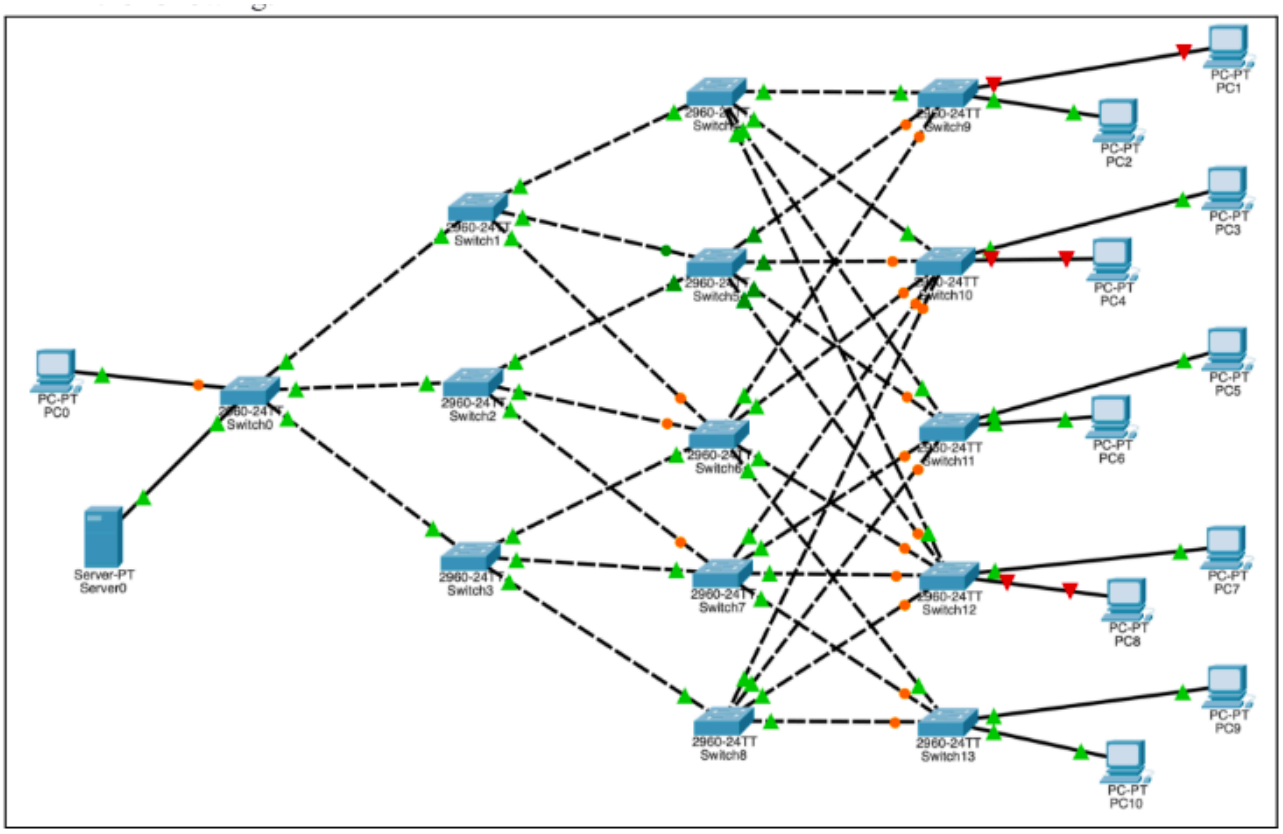
However, it is to be noted that in the following we are not seeing Fa0/7 as an interface option for our switches. Which tells that this is connected to something that isn't doing CDP (Cisco Discovery Protocol)

```
Switch12# show cdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone
Device ID     Local Intrfce   Holdtme    Capability   Platform    Port ID
Switch6       Fas 0/5          157            S       2960        Fas 0/6
Switch5       Fas 0/2          157            S       2960        Fas 0/6
Switch8       Fas 0/3          157            S       2960        Fas 0/3
Switch7       Fas 0/4          157            S       2960        Fas 0/4
Switch4       Fas 0/1          157            S       2960        Fas 0/5
```

From here we can simply accept that Fa0/7 must be the switch port that the offending host is plugged into. Thus we can confidently shut this port down in the interface configuration as follows

```
Switch12# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch12(config)# int fa0/7
Switch12(config-if)# shut

Switch12(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/7, changed state to administratively down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/7, changed state to down
```

Following the same steps for the other MAC addresses, the network configuration looks like the following:

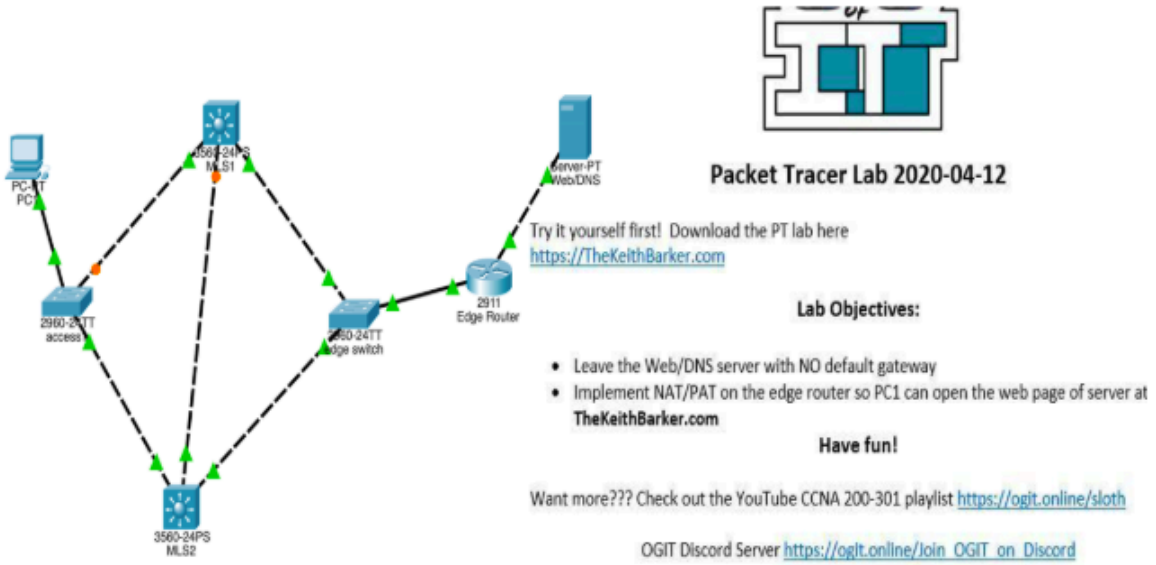


The following three MAC addresses:
- 0006.2a55.34de -> corresponds to host PC8
- 0000.0c07.be8e -> corresponds to host PC4
- 0001.9666.3d1b -> corresponds to host PC1

Thus we have successfully defended our network from the malicious hosts by shutting them down.

Part II (Static PAT & Dynamic PAT)

Static NAT (Network Address Translation):
• Theory: Static NAT maps private IP addresses to specific public IP addresses for one-to-one communication.
• How it works: Configured statically, doesn't change unless modified manually. Used for hosting services like servers accessible from the internet.
Dynamic PAT (Port Address Translation):
• Theory: Dynamic PAT shares a single public IP address among multiple devices using different source port numbers.
• How it works: Assigns unique port numbers to outgoing connections, maintains a translation table. Common in home/small office networks for internet access.
Router Troubleshooting:
• Theory: Router troubleshooting involves diagnosing and resolving network connectivity, configuration, routing, security, and performance issues on routers.
• Steps: Check physical connections, verify configurations, investigate routing problems, and address security or performance issues systematically

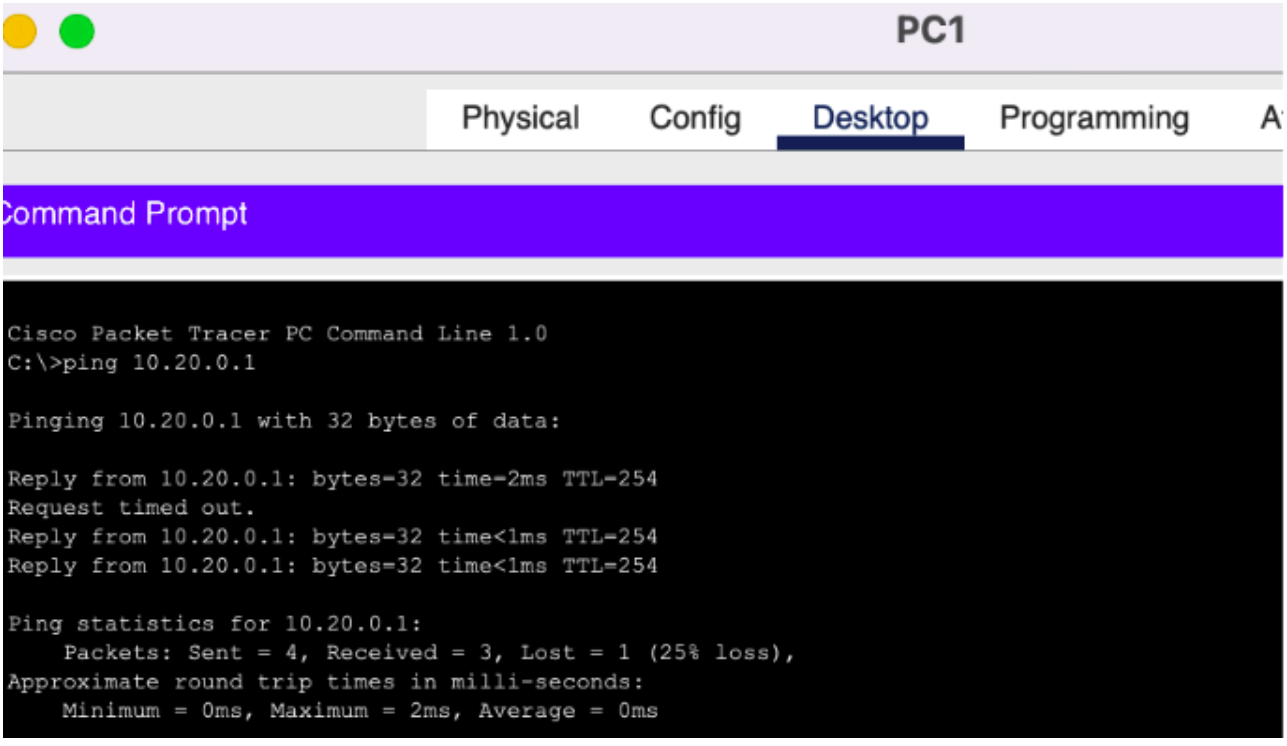


Objective :

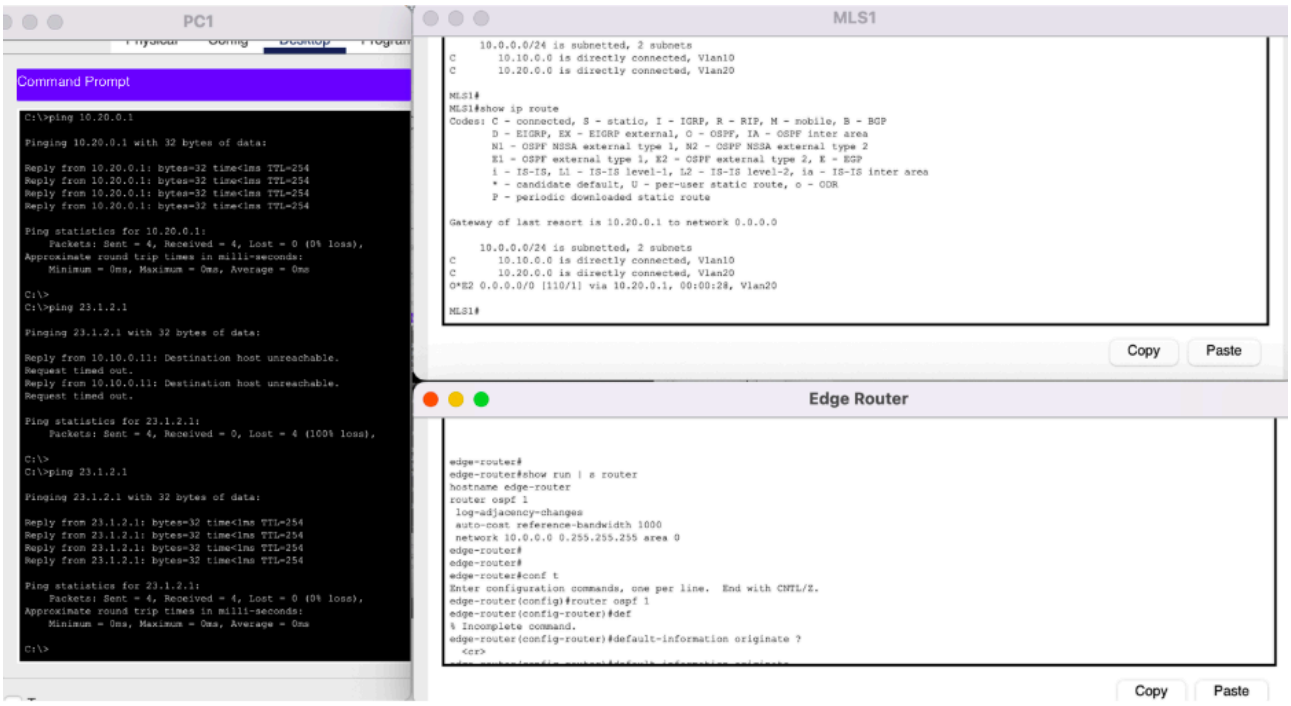
Leabe the Web/DNS server with NO default gateway

Implement NAT?PAT on n the edge router so pc1 can open the web page of server at TheKeithBarker.com

1. Checking if we have connectivity from pc to router by using ping



I sent a ping request to 23.1.2.1 that is the other interface and received a reply from 10.20.0.01 that the destination host is unreachable .

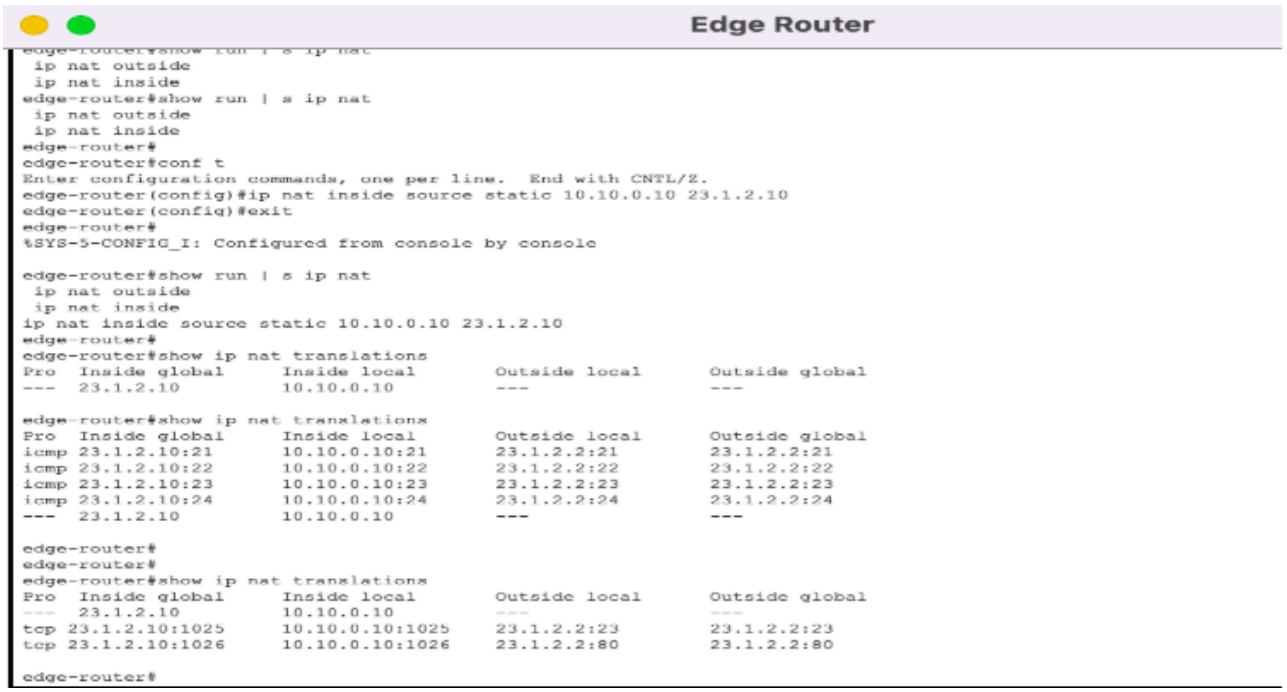


Using Static NAT:
Telling the router which interfaces are inside and which are on the outside:

Edge Router

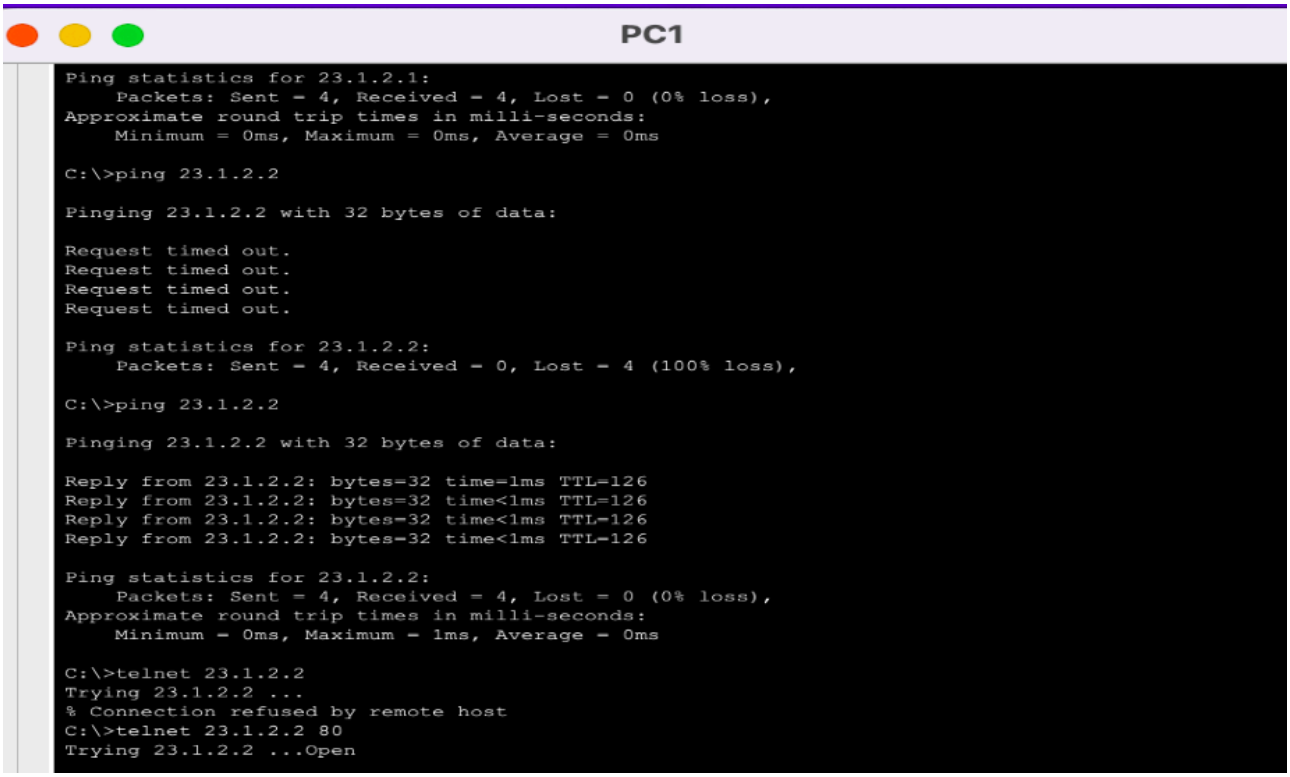
```
edge-router#show ip nat statistics
edge-router#
edge-router#
edge-router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
edge-router(config)#int  gig0/0
edge-router(config-if)#ip nat outside
edge-router(config-if)#exit
edge-router(config)#exit
edge-router#
%SYS-5-CONFIG_I: Configured from console by console

edge-router#show ip nat statistics
Total translations: 0 (0 static, 0 dynamic, 0 extended)
Outside Interfaces: GigabitEthernet0/0
Inside Interfaces:
Hits: 0  Misses: 0
Expired translations: 0
Dynamic mappings:
edge-router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
edge-router(config)#int gig0/1
edge-router(config-if)#ip nat inside
edge-router(config-if)#exit
edge-router(config)#exit
edge-router#
%SYS-5-CONFIG_I: Configured from console by console

edge-router#show ip nat statistics
Total translations: 0 (0 static, 0 dynamic, 0 extended)
Outside Interfaces: GigabitEthernet0/0
Inside Interfaces: GigabitEthernet0/1
Hits: 0  Misses: 0
Expired translations: 0
Dynamic mappings:
edge-router#show run | s ip nat
 ip nat outside
 ip nat inside
edge-router#
```

Using `show ip nat statistics`:



Configuring Static NAT on the router:

With the Static NAT configuration in place, we see that we are getting a response now:



Dynamic PAT :

1. Telling router what I am going to translate

Ip access-list standard (ACL Name) permit (Network id) (WildCard Mask)

```
edge-router#show ip nat translations
edge-router#show ip nat statistics
Total translations: 0 (0 static, 0 dynamic, 0 extended)
Outside Interfaces: GigabitEthernet0/0
Inside Interfaces: GigabitEthernet0/1
Hits: 11  Misses: 10
Expired translations: 5
Dynamic mappings:
edge-router#
edge-router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
edge-router(config)#ip access-list standard DPAT-source
edge-router(config-std-nacl)#permit 10.10.0.0 0.0.0.255
edge-router(config-std-nacl)#
edge-router(config-std-nacl)#exit
edge-router(config)#exit
edge-router#
%SYS-5-CONFIG_I: Configured from console by console

edge-router#show ip access-list
Standard IP access list DPAT-source
    10 permit 10.10.0.0 0.0.0.255

edge-router#
```

2. Defining what been translated to
Ip nat pool <Pool Name> <Start IP> <End IP> prefix length <CIDR>

```
edge-router# ip nat pool DPAT-pool 23.1.2.99 23.1.3.99 netmask 255.255.0.0
             ^
% Invalid input detected at '^' marker.

edge-router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
edge-router(config)#ip nat pool DPAT-pool 23.1.2.99 23.1.3.99 netmask 255.255.0.0
edge-router(config)#no ip nat pool DPAT-pool 23.1.2.99 23.1.3.99 netmask 255.255.0.0
edge-router(config)#ip nat pool DPAT-pool 23.1.2.99 23.1.2.99 netmask 255.255.255.0
edge-router(config)#exit
edge-router#
%SYS-5-CONFIG_I: Configured from console by console

edge-router#show run | s ip nat
 ip nat outside
 ip nat inside
ip nat pool DPAT-pool 23.1.2.99 23.1.2.99 netmask 255.255.255.0
edge-router#show run | s DRAT
edge-router#show run | s DPAT
ip nat pool DPAT-pool 23.1.2.99 23.1.2.99 netmask 255.255.255.0
ip access-list standard DPAT-source
 permit 10.10.0.0 0.0.0.255
edge-router#
```

3. Ip nat inside source list pool overload (tie them together)

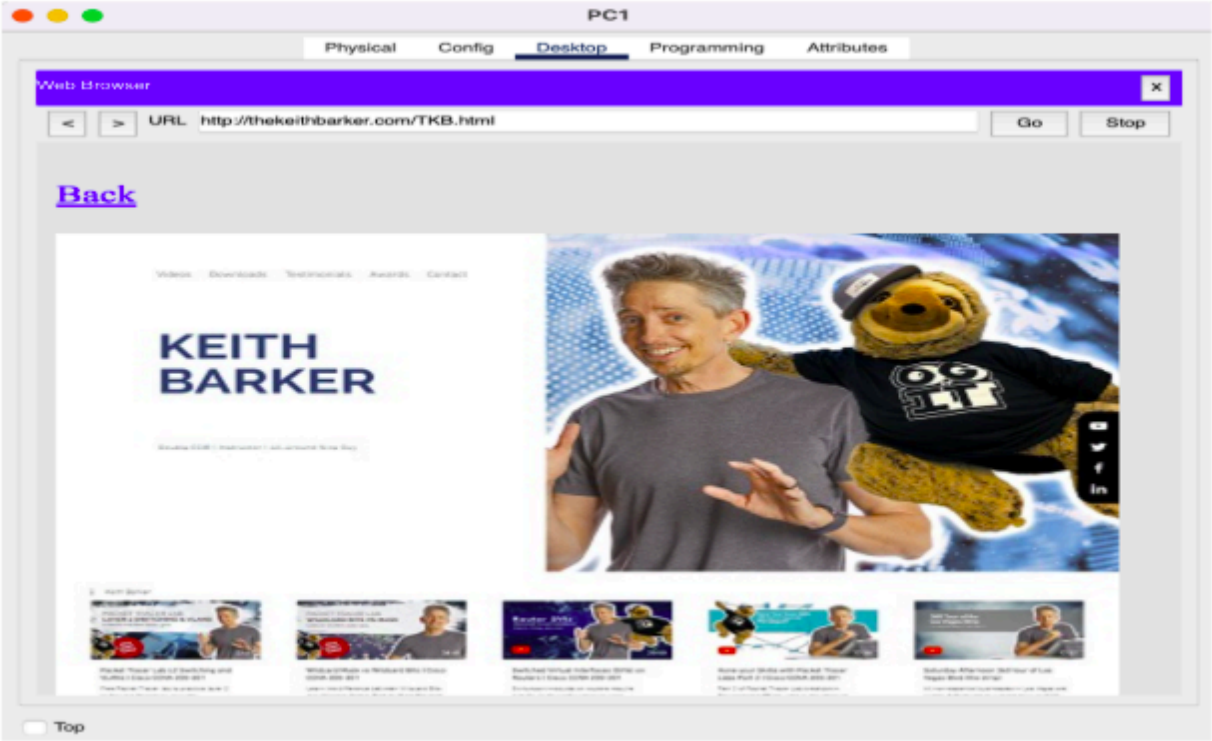
Edge Router

```
edge-router(config)#ip nat pool DPAT-pool 23.1.2.99 23.1.2.99 netmask 255.255.255.0
edge-router(config)#exit
edge-router#
%SYS-5-CONFIG_I: Configured from console by console

edge-router#show run | s ip nat
 ip nat outside
 ip nat inside
ip nat pool DPAT-pool 23.1.2.99 23.1.2.99 netmask 255.255.255.0
edge-router#show run | s DRAT
edge-router#show run | s DPAT
ip nat pool DPAT-pool 23.1.2.99 23.1.2.99 netmask 255.255.255.0
ip access-list standard DPAT-source
 permit 10.10.0.0 0.0.0.255
edge-router#
edge-router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
edge-router(config)#ip nat inside source list DPAT-source pool DPAT-pool overload
edge-router(config)#exit
edge-router#
%SYS-5-CONFIG_I: Configured from console by console

edge-router#show ip nat statistics
Total translations: 0 (0 static, 0 dynamic, 0 extended)
Outside Interfaces: GigabitEthernet0/0
Inside Interfaces: GigabitEthernet0/1
Hits: 11  Misses: 10
Expired translations: 5
Dynamic mappings:
-- Inside Source
access-list DPAT-source pool DPAT-pool refCount 0
 pool DPAT-pool: netmask 255.255.255.0
       start 23.1.2.99 end 23.1.2.99
       type generic, total addresses 1 , allocated 0 (0%), misses 0
edge-router#show ip nat translations
Pro  Inside global     Inside local       Outside local      Outside global
tcp 23.1.2.99:1027     10.10.0.10:1027    23.1.2.2:80        23.1.2.2:80

edge-router#
```

4. Successfully ping

PC1

```
% Connection refused by remote host
C:\>telnet 23.1.2.2 80
Trying 23.1.2.2 ...Open

[Connection to 23.1.2.2 closed by foreign host]
C:\>
C:\>
C:\>ping 23.1.2.2

Pinging 23.1.2.2 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 23.1.2.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
C:\>
C:\>ping 23.1.2.2

Pinging 23.1.2.2 with 32 bytes of data:

Reply from 23.1.2.2: bytes=32 time=11ms TTL=126
Reply from 23.1.2.2: bytes=32 time<1ms TTL=126
Reply from 23.1.2.2: bytes=32 time<1ms TTL=126
Reply from 23.1.2.2: bytes=32 time<1ms TTL=126

Ping statistics for 23.1.2.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 11ms, Average = 2ms

C:\>telnet 23.1.2.2 80
Trying 23.1.2.2 ...Open
```



CONCLUSION:I worked on tasks 9.1 and 9.2 in Cisco Packet Tracer. First, I built a network and checked if it could send packets in task 9.1. Then, in task 9.2, I fixed a problem with a MAC address and set up a connection from start to finish. This involved using Static Network Address Translation (NaT) and dynamic Port Address Translation (PAT) without directly setting a default gateway, like I did in task 5 of 9.1. These tasks helped me understand how packets move and how to create connections in different ways