AUBURN

UNIVERSITY

COMP 4320
Introduction to Computer Networks

Project #: Lab 3
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11/6/2025

Executive Summary

This report builds multiple networks using the Cisco Packet Manager and analyzes their properties.

Table of Contents

This section should begin on a new page. The table of contents below is generated using the "References" menu.

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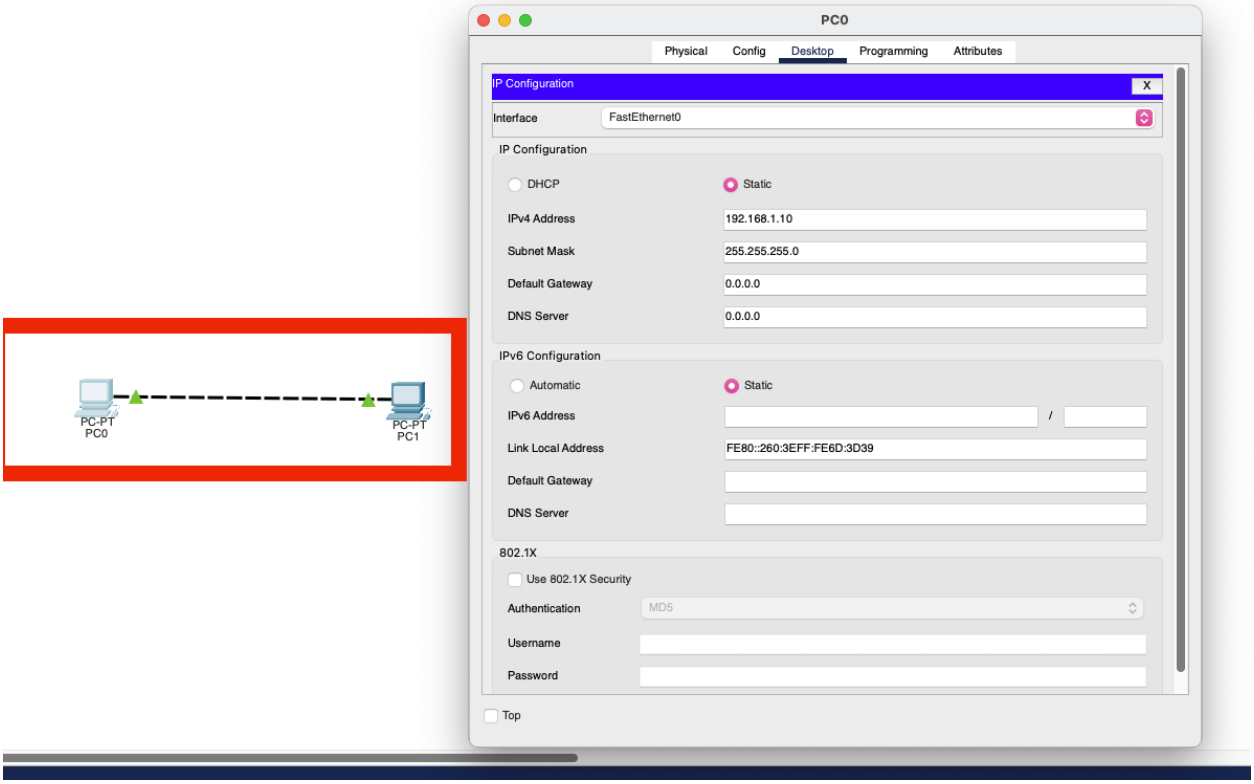
1 Direct Communication Between Two Devices

1. What type of cable did you use to connect the two PCs? Why is this specific cable type required for direct PC-to-PC communication?

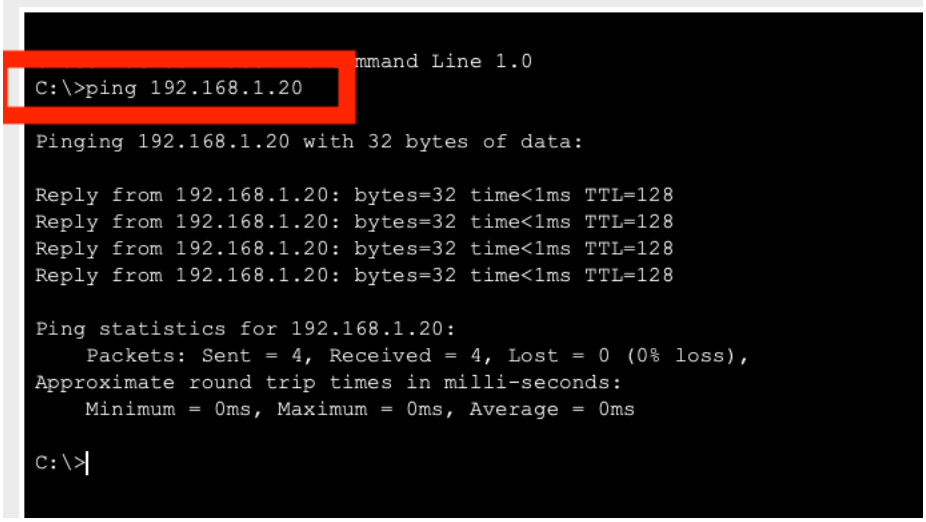
I used a crossover cable. This type of cable allows data to flow back and forth directly.

2. Include a screenshot showing your Packet Tracer workspace with both PCs connected and their IP configurations visible.



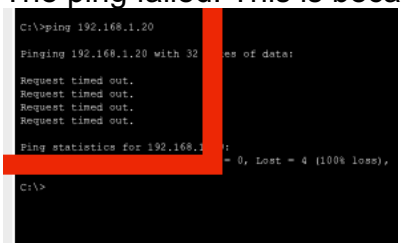
3. What was the result of your ping test? Include a screenshot showing the command prompt output from PC0 pinging PC1.

Both PCs were able to successfully communicate



4. Change PC1's IP address to 192.168.2.20 (different network). What happens when you try to ping now? Explain why.

The ping failed. This is because they are on different networks

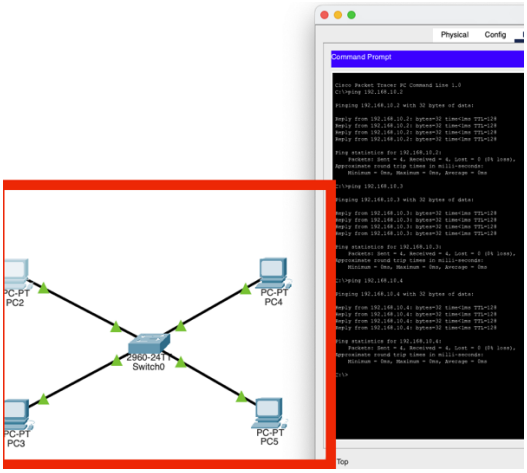


2 Communication Between Multiple Devices Through a Switch

1. Why do you use straight-through cables when connecting PCs to a switch unlike the crossover cable used in Part 1?

The crossover cable is only for similar types of devices. The straight through is designed for the PC to communicate with the switch.

2. Include a screenshot of your complete network topology showing all four PCs connected to the switch.



3. What would happen if you connect two switches using a straight-through cable versus a crossover cable? (You may test this in Packet Tracer if you wish.)

A straight through cable would not work while a crossover cable would.

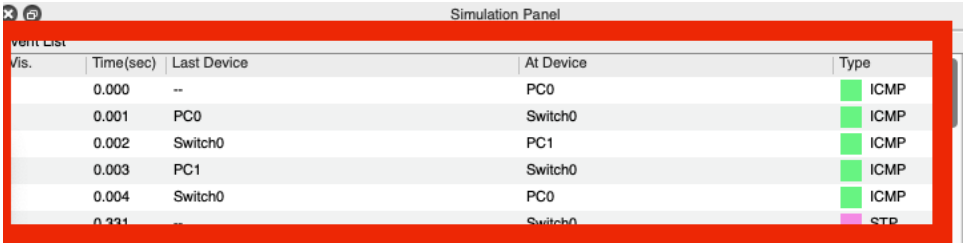
3 Real-Time vs Simulation Mode

1. Describe the key differences between Real-Time mode and Simulation mode in Cisco Packet Tracer. When would you use each mode?

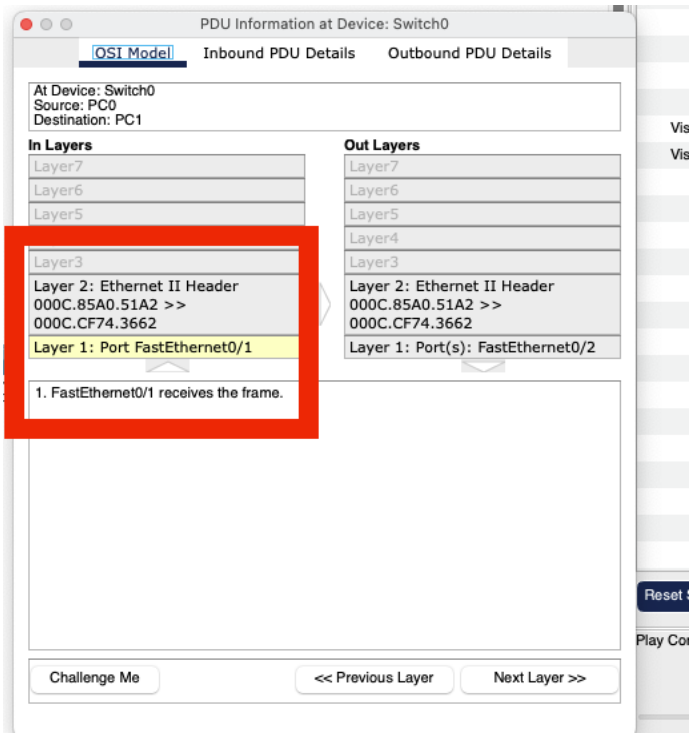
Real time mode has the messaging be near instant. Simulation mode allows everything to be slowed down so that trouble shooting can be done. Real-time mode is useful for simulating real world scenarios.

2. Send one ping (ICMP Echo Request) from PC0 to PC1 in Simulation mode. Trace the complete path of this packet as it travels to PC1 and returns with an ICMP Echo Reply. How many events are listed in the Simulation Panel in total? Include a screenshot of the Event List showing all ICMP events.

There are a total of 5 events for ICMP.

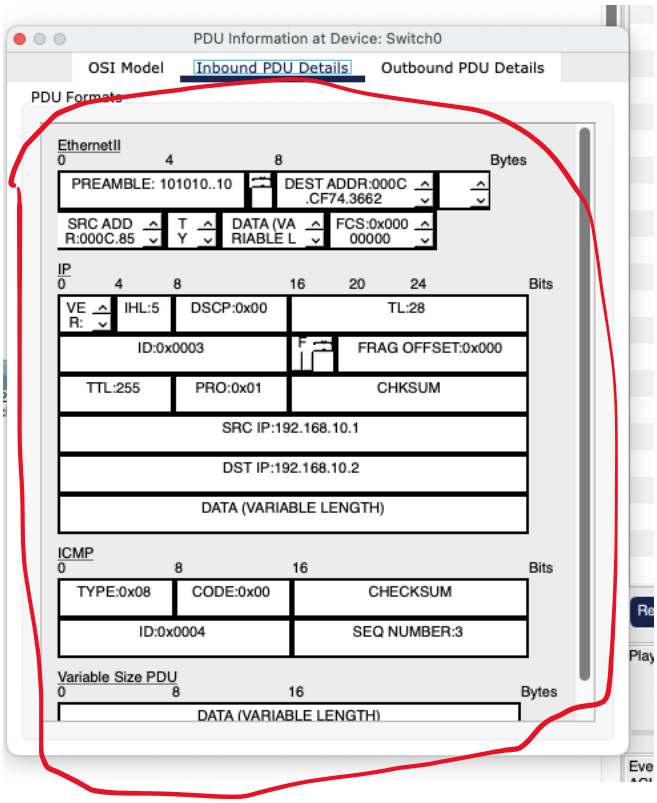


3. Click on the PDU when it reaches the switch. What OSI layers are involved at the switch? Include a screenshot showing the PDU information at this stage.



The layers involved were Layer 2 (Ethernet II header) and Layer 1 (FastEthernet ports).

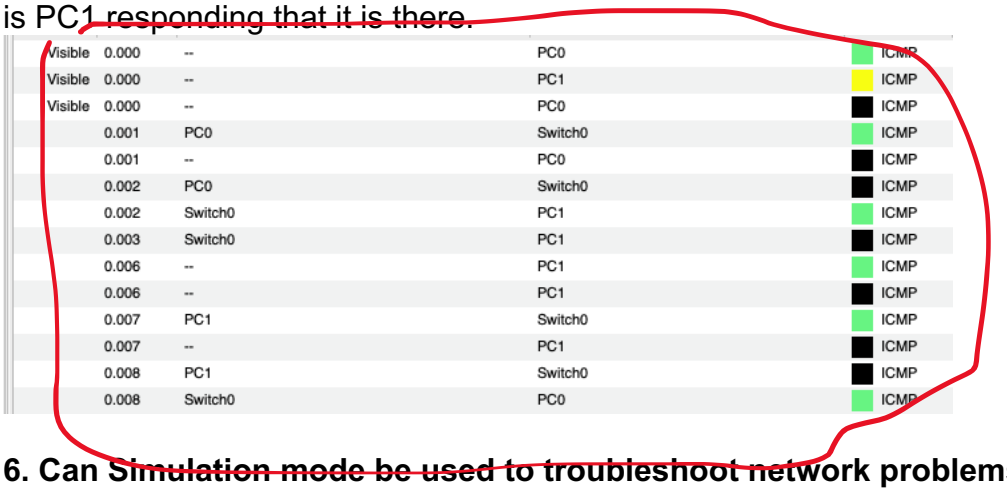
4. In the Simulation Panel, what is the difference between the "Inbound PDU Details" and "Outbound PDU Details"? Provide an example from your trace.



Inbound PDU details shows the packet as it arrived on the device. The outbound shows the packet information as it is leaving.

5. Filter the simulation to show only ICMP packets. Send a ping and observe the Echo Request and Echo Reply. Include screenshots showing both messages and explain the difference between them.

The first message is PC0 asking if the other device is there and the response message is PC1 responding that it is there.



Visible	0.000	--	PC0	ICMP
Visible	0.000	--	PC1	ICMP
Visible	0.000	--	PC0	ICMP
	0.001	PC0	Switch0	ICMP
	0.001	--	PC0	ICMP
	0.002	PC0	Switch0	ICMP
	0.002	Switch0	PC1	ICMP
	0.003	Switch0	PC1	ICMP
	0.006	--	PC1	ICMP
	0.006	--	PC1	ICMP
	0.007	PC1	Switch0	ICMP
	0.007	--	PC1	ICMP
	0.008	PC1	Switch0	ICMP
	0.008	Switch0	PC0	ICMP

6. Can Simulation mode be used to troubleshoot network problems? Give two specific exam- ples of issues you could identify using this mode.

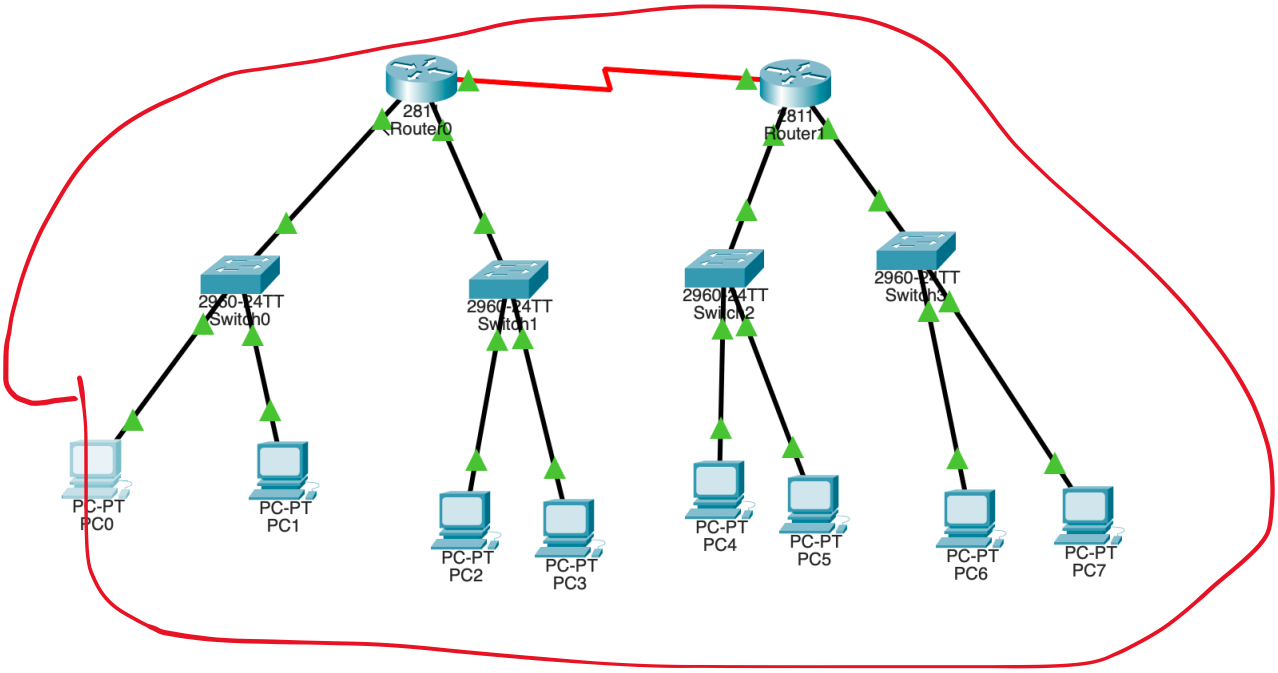
Yes, it could be used to spot ARP failures or it could be used to see when packets are dropped due to wrong IP settings.

4 IPv4 Subnetting and Network Configuration

1. Show your subnetting calculations. For the network 172.16.0.0/22, provide a table with the following information for all four subnets:

Subnet	Network Address	Subnet Mask	Usable Range	Broadcast
1	172.16.0.0/24	255.255.255.0	172.16.0.1 – 172.16.0.254	172.16.0.255
2	172.16.1.0/24	255.255.255.0	172.16.1.1 – 172.16.1.254	172.16.1.255
3	172.16.2.0/24	255.255.255.0	172.16.2.1 – 172.16.2.254	172.16.2.255
4	172.16.3.0/24	255.255.255.0	172.16.3.1 – 172.16.3.254	172.16.3.255

2. Include a screenshot of your complete network topology showing all routers, switches, and PCs with proper labeling.

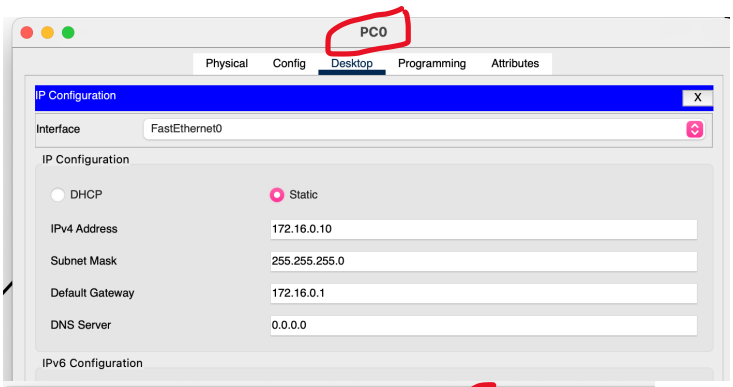


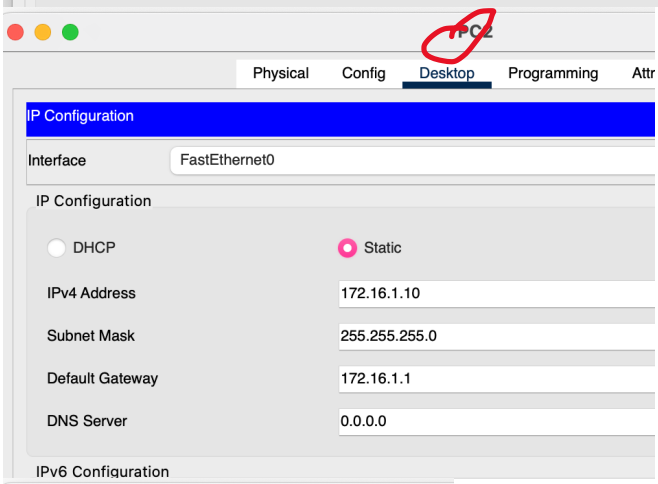
3. Provide the router configuration for all interfaces. Include a screenshot of the router's CLI showing the show ip interface brief command output.

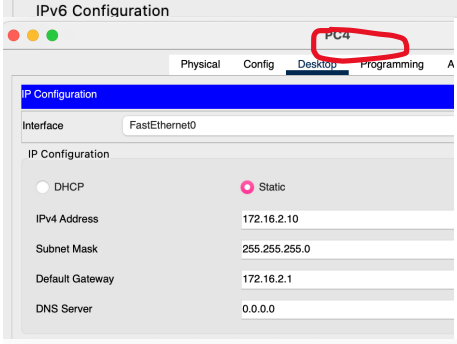
```
Router>
Router>show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        172.16.0.1      YES manual up                    up
FastEthernet0/1        172.16.1.1      YES manual up                    up
Serial0/3/0            10.0.0.1        YES manual up                    up
Serial0/3/1            unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
Router>
```

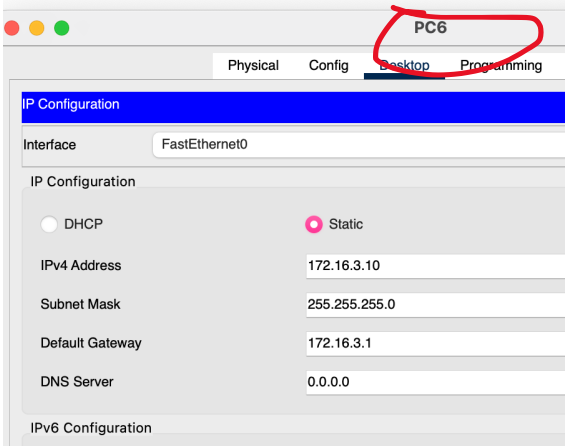
```
Router>show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
FastEthernet0/0        172.16.2.1      YES manual up                    up
FastEthernet0/1        172.16.3.1      YES manual up                    up
Serial0/3/0            10.0.0.2        YES manual up                    up
Serial0/3/1            unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
Router>
```

4. Document your PC configurations. For each subnet, show the IP configuration of at least one PC (screenshot of Desktop → IP Configuration). Include screenshots showing successful ping tests:

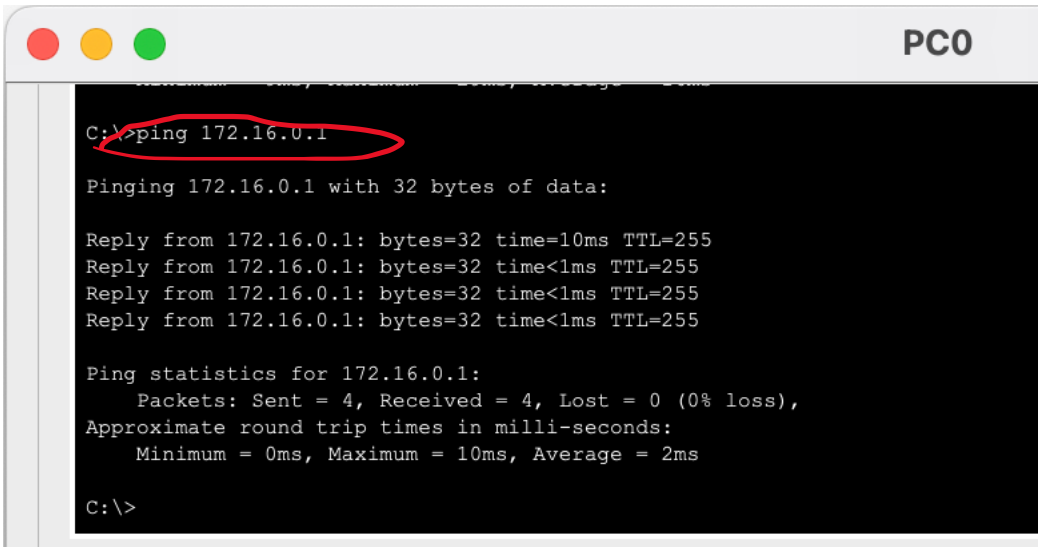




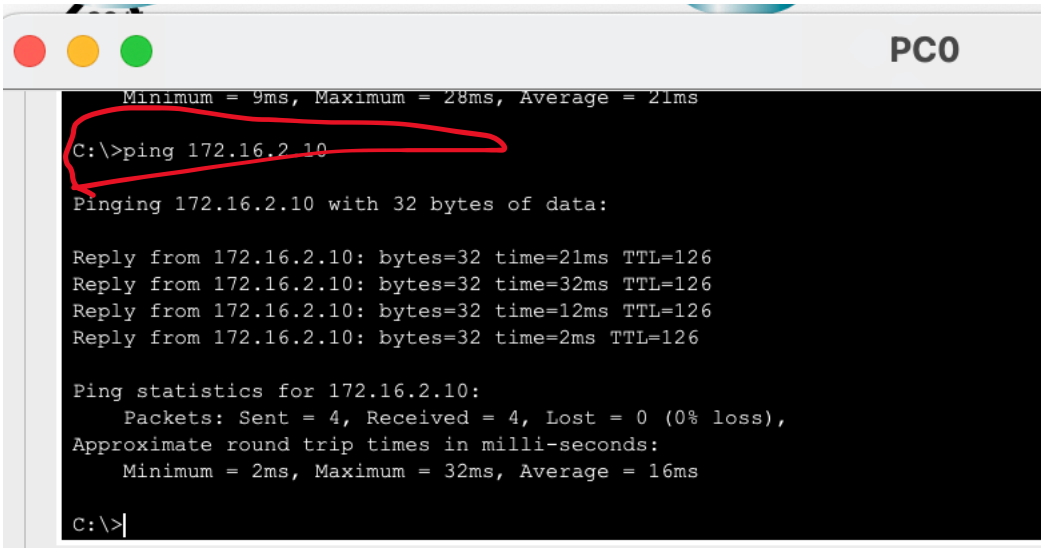




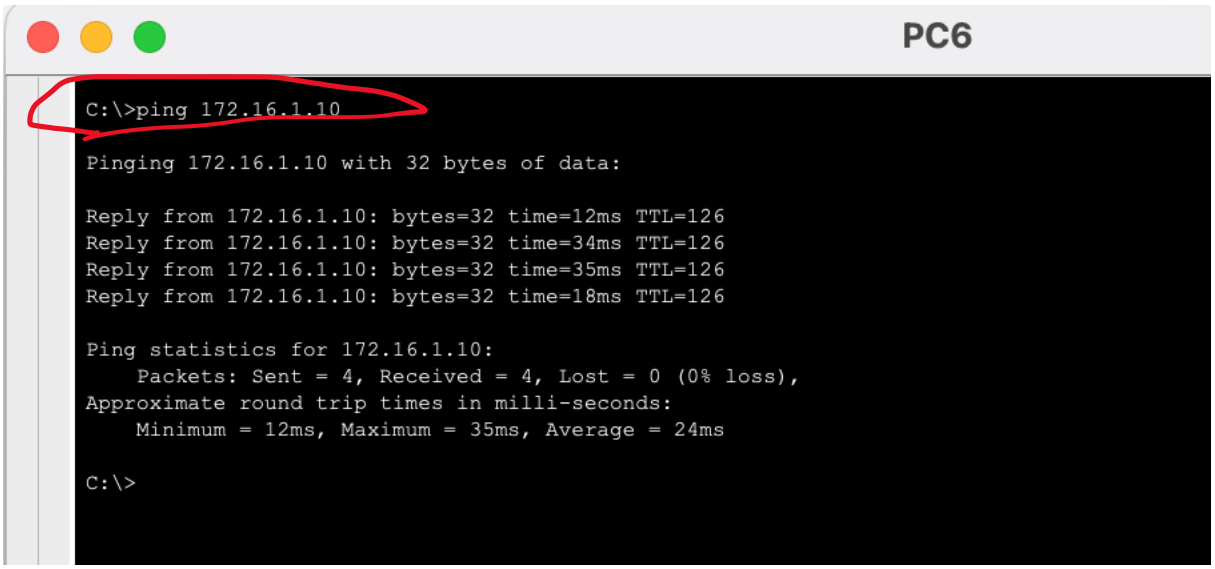
• From a PC in Subnet 1 to the gateway



• From a PC in Subnet 1 to a PC in Subnet 3

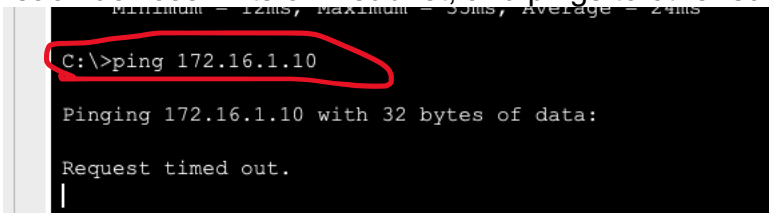


• From a PC in Subnet 4 to a PC in Subnet 2

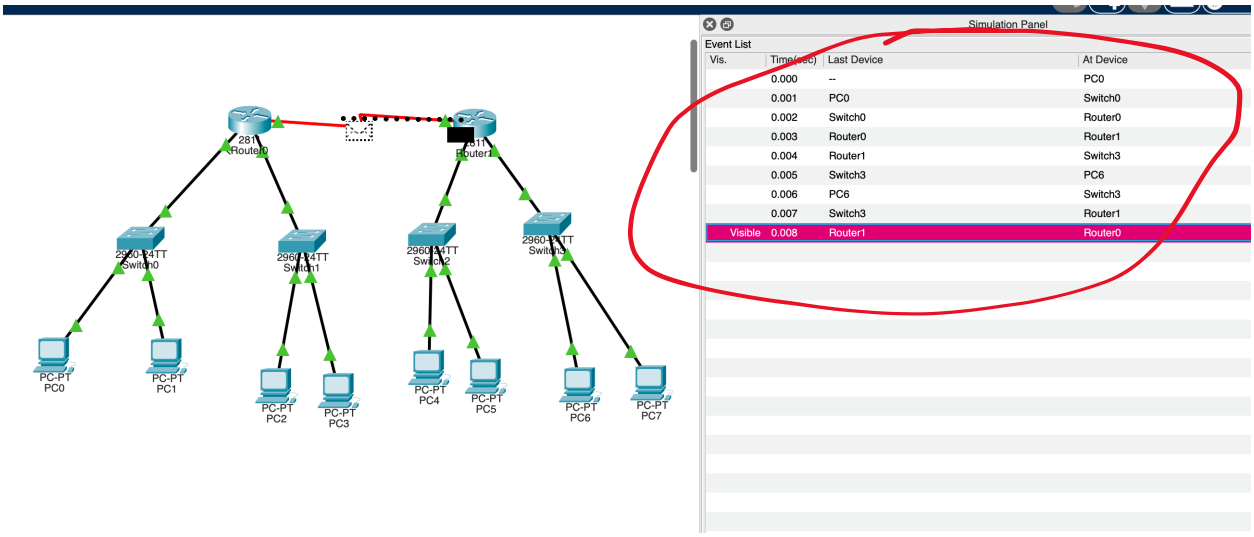


5. Explain the role of the default gateway in inter-subnet communication. What happens if you remove the default gateway from one of the PCs and try to ping a device in a different subnet?

The default gateway sends data to other networks. If it is removed, the PC can only reach devices in its own subnet, and pings to other subnets will fail.



6. Use Simulation mode to trace a packet from a PC in Subnet 1 to a PC in Subnet 4. Describe the path the packet takes and the routing decision made by the router. Include relevant screenshots.



The message goes from PC 0 to Switch 0, to Router 0 to Router 1, to Switch 3 to PC 6. Then it goes back in reverse order.

7. What is the maximum number of usable hosts in each of your subnets? Show your calculation.

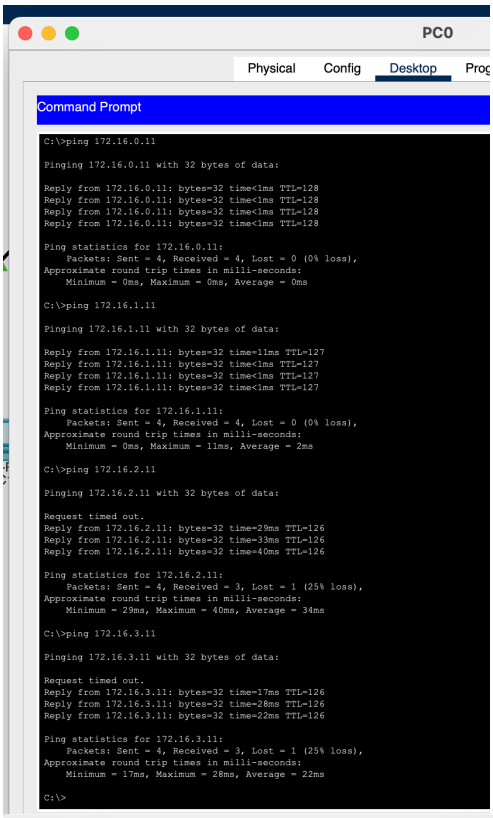
2^(32 − 24) = 2^8 = 256 total addresses
256 − 2 = 254 Usable hosts

So each subnet can have a maximum number of 254 hosts.

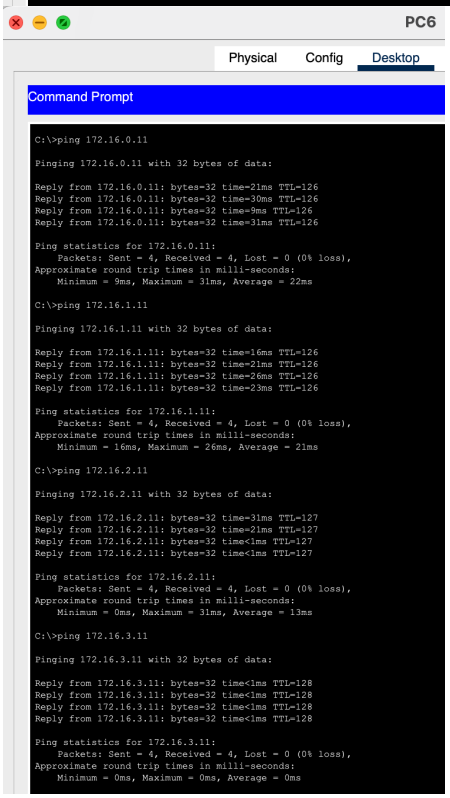
8. If you needed to create 8 subnets instead of 4 from the original 172.16.0.0/22 network, what would be the new subnet mask? How many usable hosts would each subnet have?

If the 172.16.0.0/22 network is split into eight subnets, the new subnet mask becomes 255.255.255.128 which gives each subnet 126 usable host addresses.

9. Collection of screenshots


PC0
Physical
Config
Desktop
Command Prompt
C:\>ping 172.16.0.11
Pinging 172.16.0.11 with 32 bytes of data:
Reply from 172.16.0.11: bytes=32 time<1ms TTL=128
Reply from 172.16.0.11: bytes=32 time<1ms TTL=128
Reply from 172.16.0.11: bytes=32 time<1ms TTL=128
Reply from 172.16.0.11: bytes=32 time<1ms TTL=128
Ping statistics for 172.16.0.11:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 172.16.1.11
Pinging 172.16.1.11 with 32 bytes of data:
Reply from 172.16.1.11: bytes=32 time=11ms TTL=127
Reply from 172.16.1.11: bytes=32 time<1ms TTL=127
Reply from 172.16.1.11: bytes=32 time<1ms TTL=127
Reply from 172.16.1.11: bytes=32 time<1ms TTL=127
Ping statistics for 172.16.1.11:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 11ms, Average = 2ms
C:\>ping 172.16.2.11
Pinging 172.16.2.11 with 32 bytes of data:
Request timed out.
Reply from 172.16.2.11: bytes=32 time=29ms TTL=126
Reply from 172.16.2.11: bytes=32 time=33ms TTL=126
Reply from 172.16.2.11: bytes=32 time=40ms TTL=126
Ping statistics for 172.16.2.11:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 29ms, Maximum = 40ms, Average = 34ms
C:\>ping 172.16.3.11
Pinging 172.16.3.11 with 32 bytes of data:
Request timed out.
Reply from 172.16.3.11: bytes=32 time=17ms TTL=126
Reply from 172.16.3.11: bytes=32 time=28ms TTL=126
Reply from 172.16.3.11: bytes=32 time=22ms TTL=126
Ping statistics for 172.16.3.11:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 17ms, Maximum = 28ms, Average = 22ms
C:\>


PC2
Physical
Config
Desktop
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.16.0.10
Pinging 172.16.0.10 with 32 bytes of data:
Reply from 172.16.0.10: bytes=32 time<1ms TTL=127
Reply from 172.16.0.10: bytes=32 time<1ms TTL=127
Reply from 172.16.0.10: bytes=32 time<1ms TTL=127
Reply from 172.16.0.10: bytes=32 time<1ms TTL=127
Ping statistics for 172.16.0.10:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 172.16.1.11
Pinging 172.16.1.11 with 32 bytes of data:
Reply from 172.16.1.11: bytes=32 time<1ms TTL=128
Reply from 172.16.1.11: bytes=32 time<1ms TTL=128
Reply from 172.16.1.11: bytes=32 time<1ms TTL=128
Reply from 172.16.1.11: bytes=32 time<1ms TTL=128
Ping statistics for 172.16.1.11:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 172.16.2.11
Pinging 172.16.2.11 with 32 bytes of data:
Reply from 172.16.2.11: bytes=32 time=14ms TTL=126
Reply from 172.16.2.11: bytes=32 time=38ms TTL=126
Reply from 172.16.2.11: bytes=32 time=27ms TTL=126
Reply from 172.16.2.11: bytes=32 time=23ms TTL=126
Ping statistics for 172.16.2.11:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 14ms, Maximum = 38ms, Average = 25ms
C:\>ping 172.16.3.11
Pinging 172.16.3.11 with 32 bytes of data:
Reply from 172.16.3.11: bytes=32 time=25ms TTL=126
Reply from 172.16.3.11: bytes=32 time=19ms TTL=126
Reply from 172.16.3.11: bytes=32 time=34ms TTL=126
Reply from 172.16.3.11: bytes=32 time=24ms TTL=126
Ping statistics for 172.16.3.11:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 19ms, Maximum = 34ms, Average = 25ms
C:\>



5 AI Use Reflation Statement

For this assignment, I used GPT-5 to assist me with understanding the Cisco packet manager and to debug the issues I was having. I wrote all parts of the final assignment. AI tools were helpful for me to debug why my network was not communicating.

By writing this reflection, I acknowledge that AI is a support tool, not a substitute for my own effort, and I take full responsibility for the final submission.