CSE307

Internet Networking Essentials

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GitHub Repository:

https://github.com/Kartik070704/Networking-Topology-.git

Overview

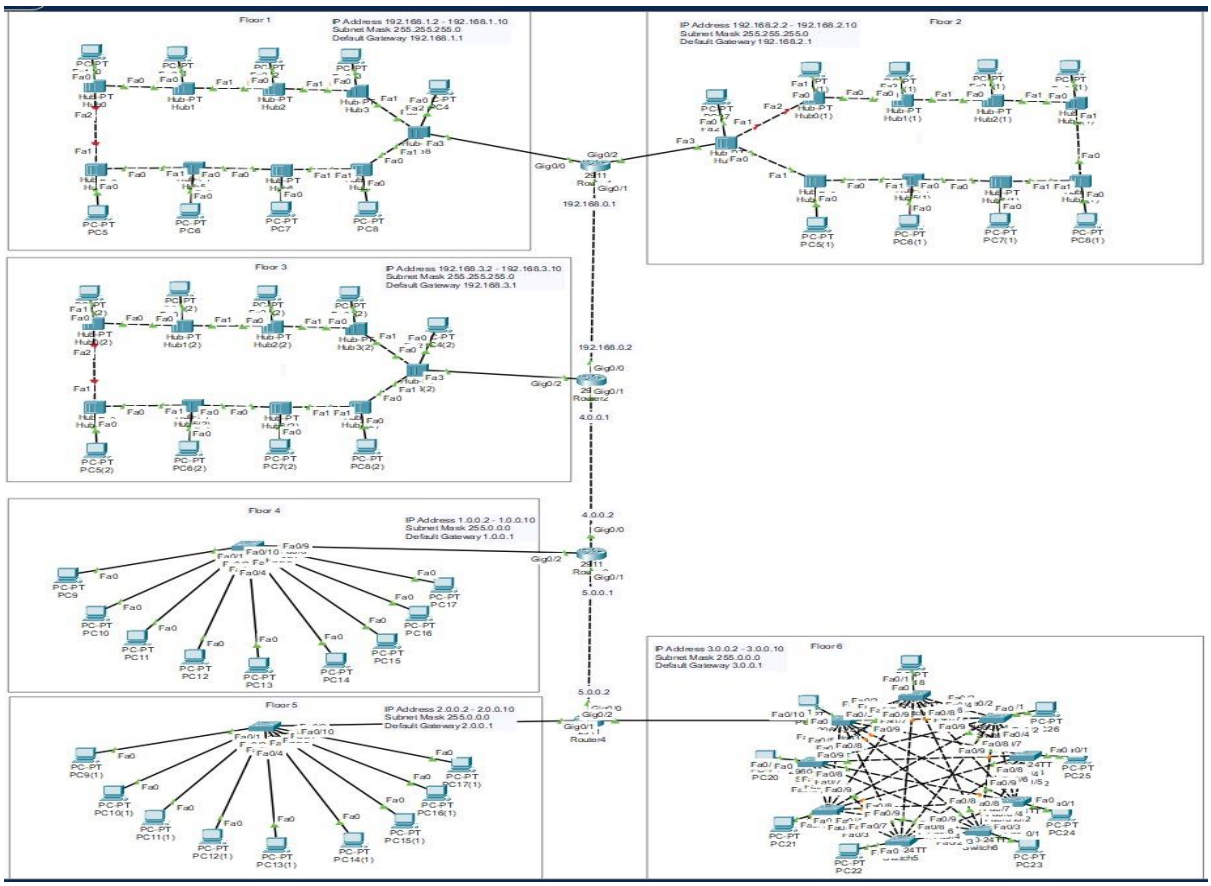
A six-floor office building implements a well-designed hybrid network that provides both efficient communication and scalable and tolerant network functionality. The nine computers on each of the first three floors use ring topology to connect to a centralized switch which enhances management capabilities. Data transmission through the ring topology design in the following two floors maintains continuous data flow as well as system redundancy. All devices on the final three floors benefit from mesh topology which ensures maximum tolerance through their straight device-to-device connections.

The first three floors receive Class B private IPv4 addresses but Class A public IPv4 addresses power the remaining floors to connect with external networks. Routers in this topology follow a bus arrangement to communicate using Class A public IP addresses as they connect between each other.

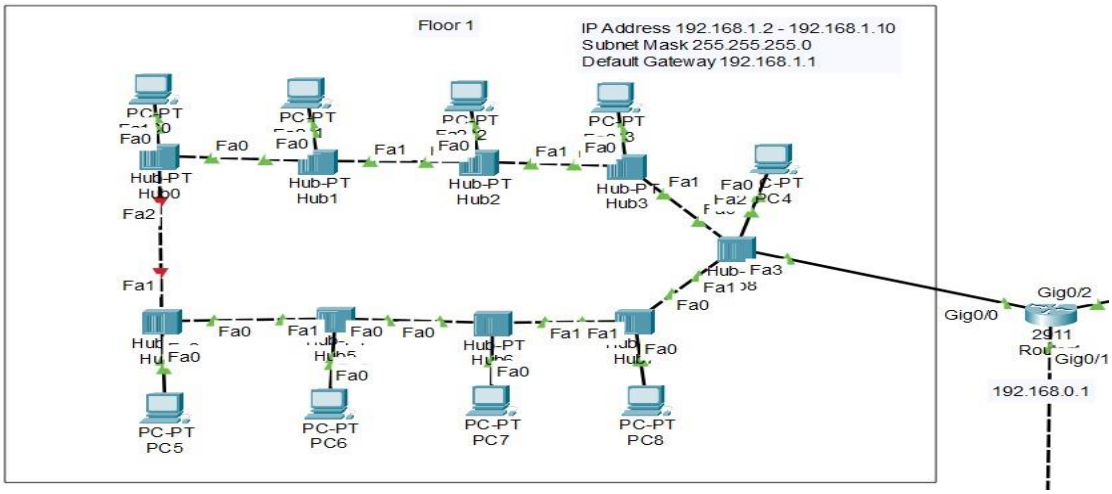
Inter-floor communication remains predictable in dynamic routing because it prevents useless route changes. All floors experience smooth connectivity according to ping tests that validate both the address scheme and routing design. An organized method provides an organization with secure operations along with scalable and high-performance networking services.

Physical Scenario

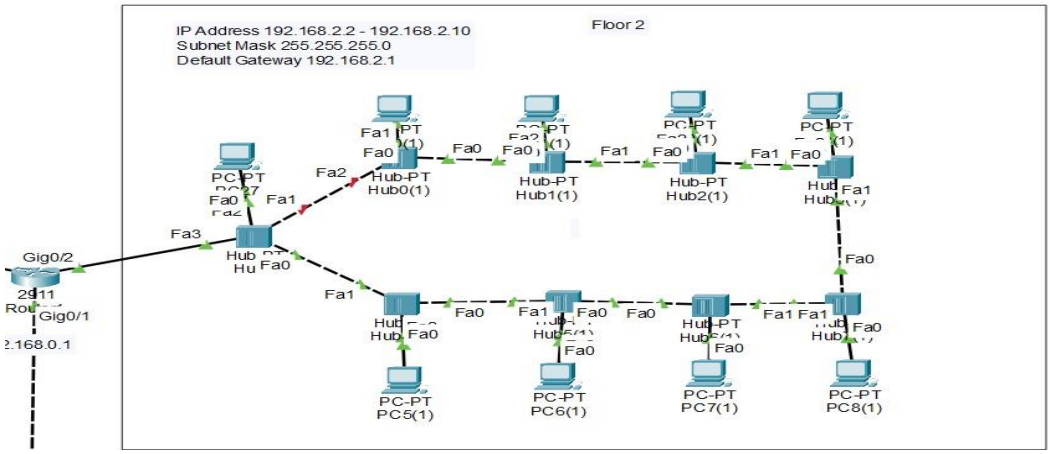
The six-storied office structure contains organizational networking elements which maximize operational connectivity and administrative expandability. Nine computers in each of the first three floors function under a star topology which connects to a central switch to make management simpler while accommodating growth needs. A star topology covers the following two floors through circular computer connections that maintain redundancy for improved data flow efficiency. The mesh topology connection devices throughout the last floor provide complete tolerance and high levels of reliability. The combination of topologies provides good performance as well as operational resiliency and extends scalability throughout the building's footprint.



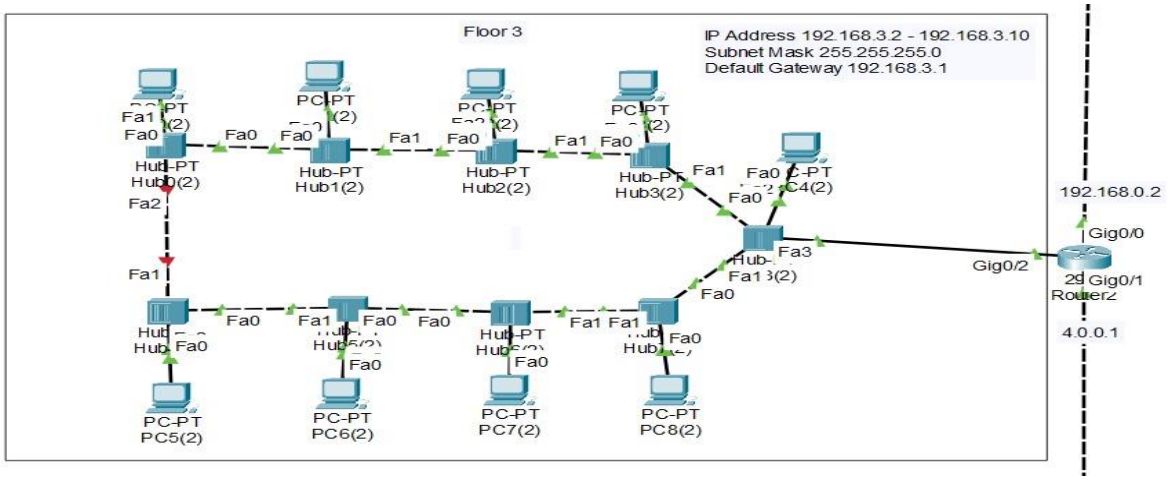
- Ground Floor (Lan 1)



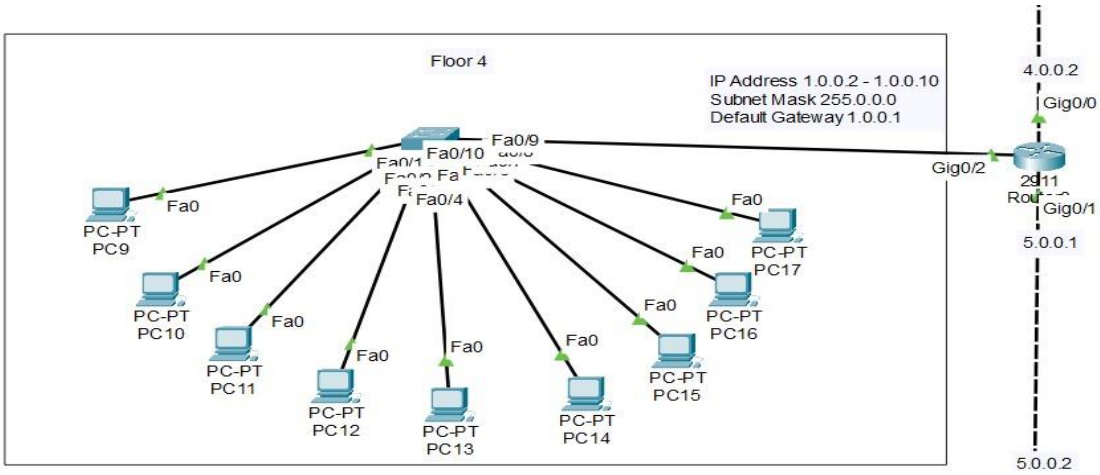
- 2nd Floor (Lan 2)



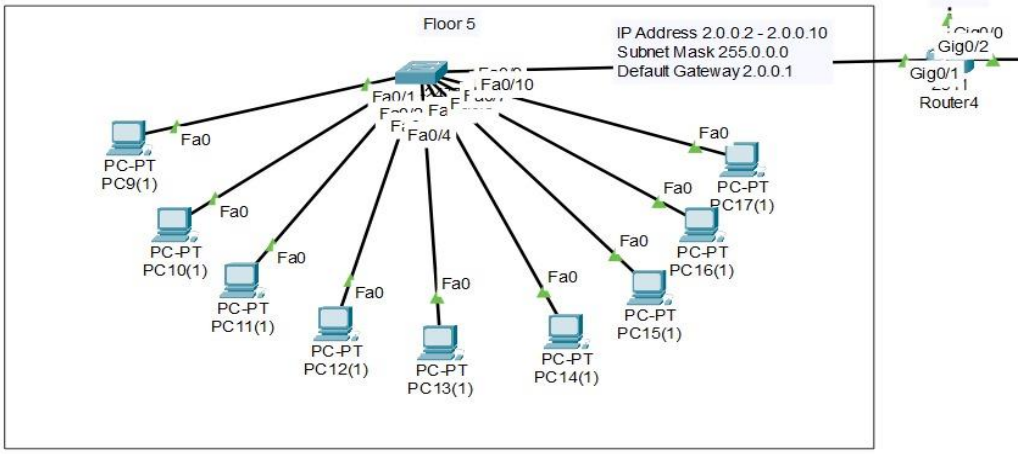
- 3rd Floor (Lan 3)



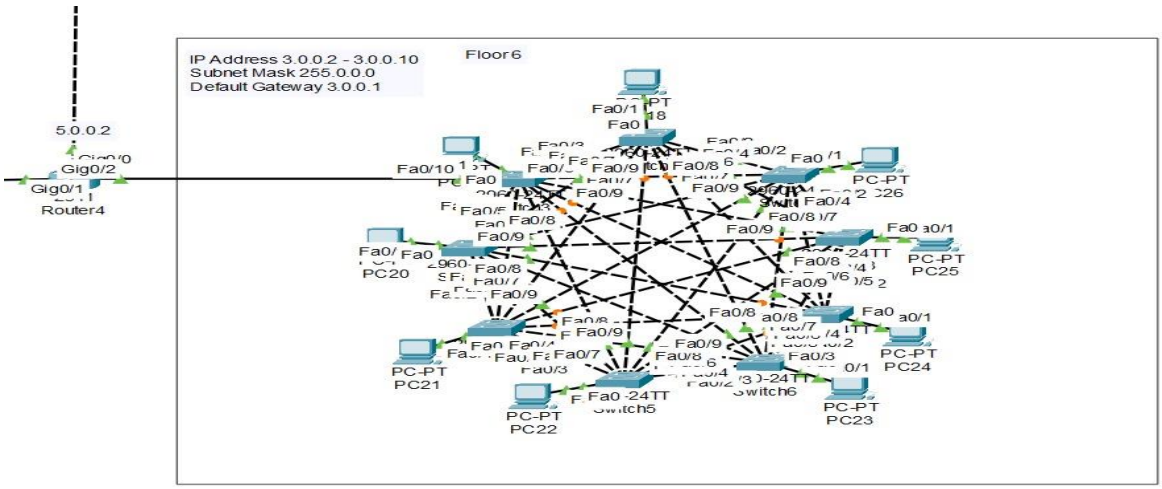
- 4th Floor (Lan 4)



- 5th Floor (Lan 5)



- 6th Floor (Lan 6)



Project Description: Multi-Floor Network Topology

1. Floor 1 - Ring Topology (9 Computers)
2. Floor 2 - Ring Topology (9 Computers)
3. Floor 3 - Ring Topology (9 Computers)
4. Floor 4 - Star Topology (9 Computers)
5. Floor 5 - Star Topology (9 Computers)
6. Floor 6 - Mesh Topology (9 Computers)

Routers used – 4

Floor 1 - Ring Topology

- IP Range: 192.168.1.2 – 192.168.1.10
- Gateway: 192.168.1.1

Floor 2 - Ring Topology

- IP Range: 192.168.2.2 - 192.168.2.10
- Gateway: 192.168.2.1

Floor 3 - Ring Topology

- IP Range: 192.168.3.2 - 192.168.3.10
- Gateway: 192.168.3.1

Floor 4 - Star Topology

- IP Range: 1.0.0.2 - 1.0.0.10
- Gateway: 1.0.0.1

Floor 5 - Star Topology

- IP Range: 2.0.0.2 - 2.0.0.10
- Gateway: 2.0.0.1

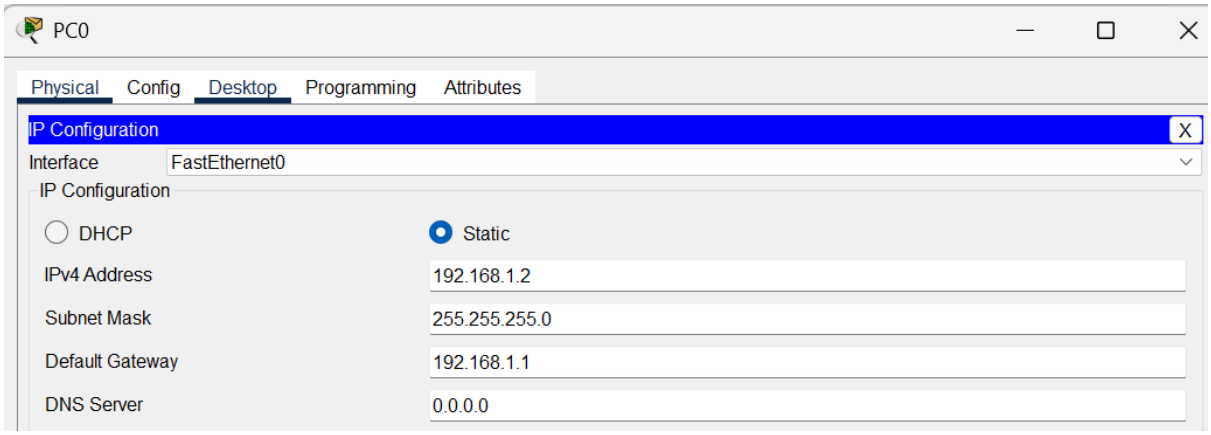
Floor 6 - Mesh Topology

- IP Range: 3.0.0.2 – 3.0.0.10
- Gateway: 3.0.0.1

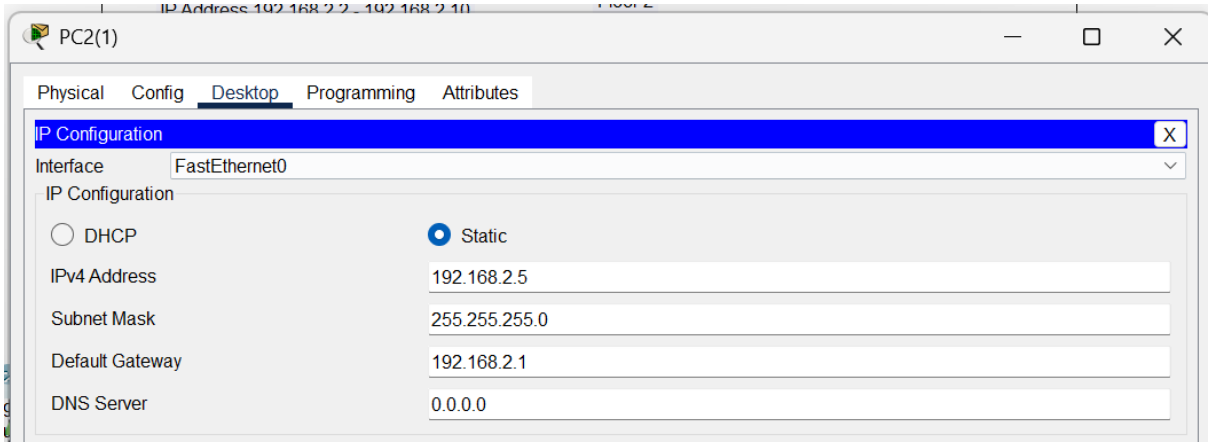
IP Address Allocation

The organization has established a planned IP addressing format to allow smooth network connectivity among the six-floor workplace. Each floor of the three initial sections will receive Class B private IPv4 addresses which provide exclusive addressing for nine computers each floor while maintaining network security. Class A public IPv4 addresses will be assigned to the remaining five floors which enables extensive external connections. The routers utilize a bus topology to link their network segments with each router using Class A public IPv4 addresses for router-to-router communication establishing effortless data transmission between network segments. Network performance shows maximum scalability alongside unique IP allocation while ensuring optimized network connections throughout all different floors of the building.

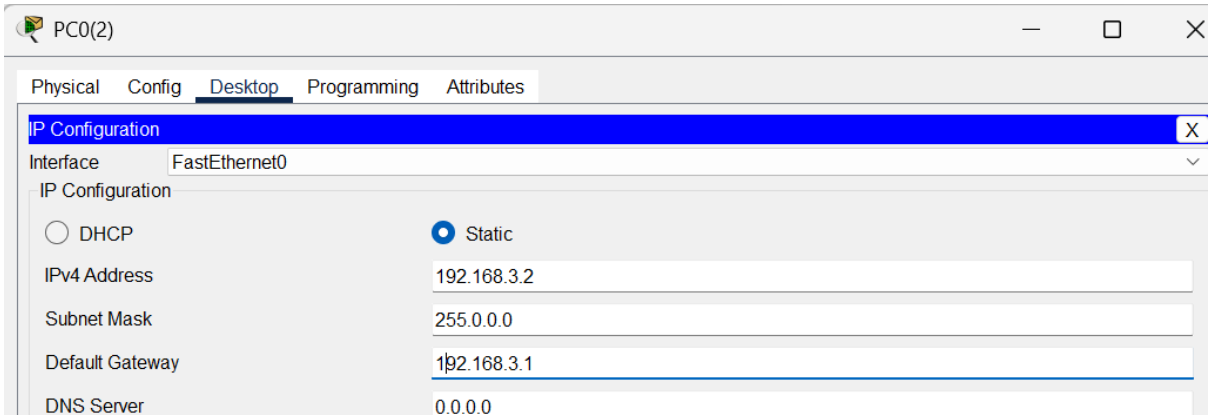
- LAN 1 (Network Address: 192.168.1.0)



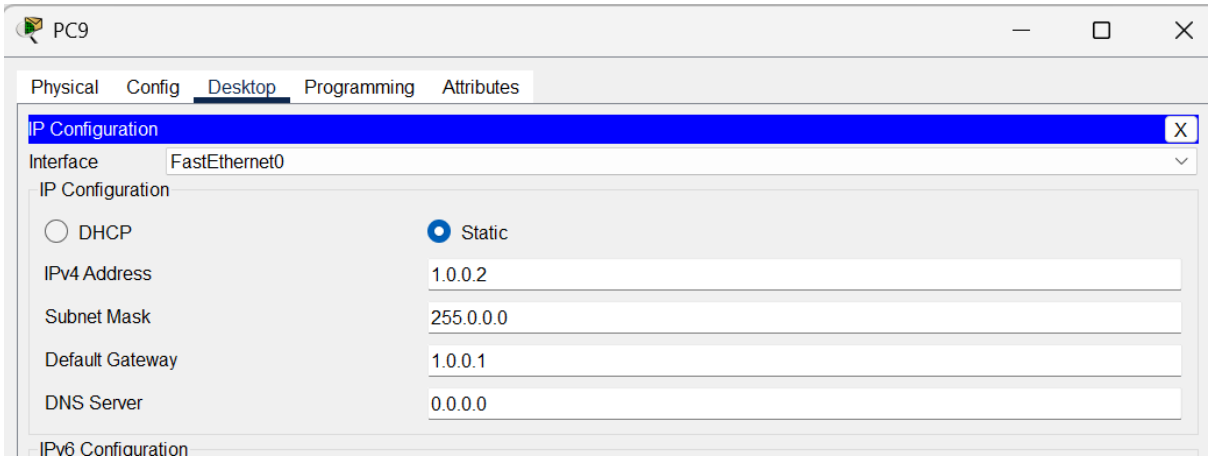
- LAN 2 (Network Address: 192.168.2.0)



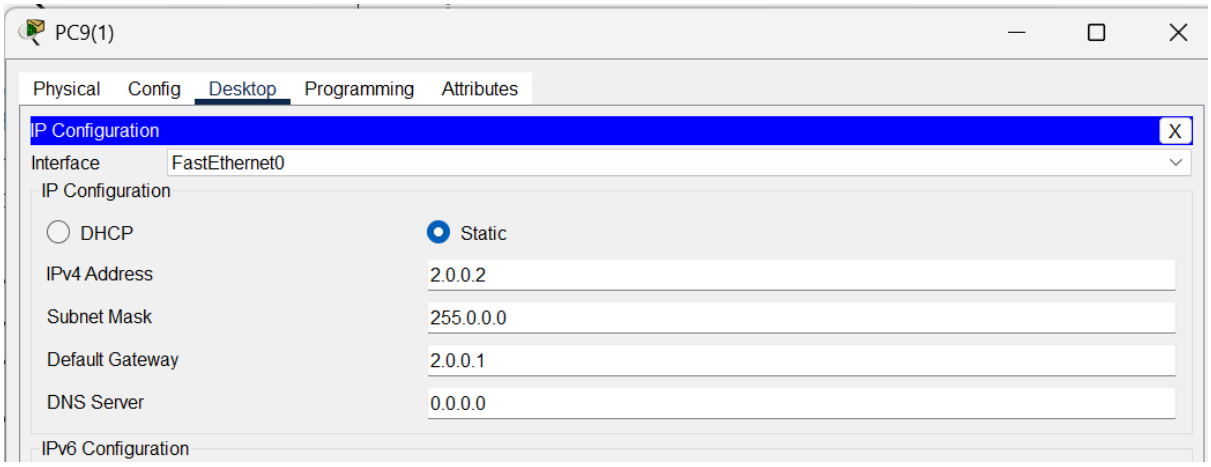
- LAN 3 (Network Address: 192.168.3.0)



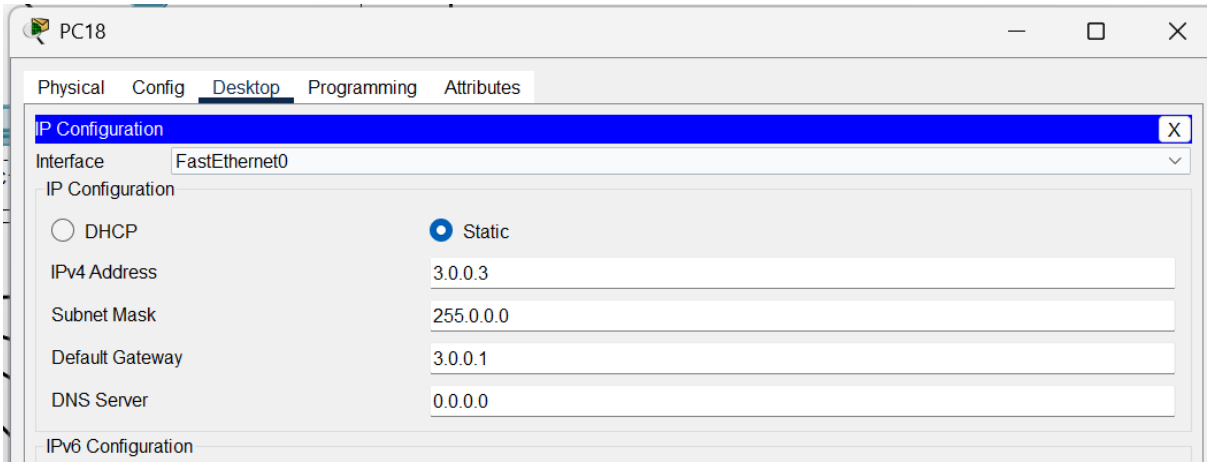
- LAN 4 (Network Address: 1.0.0.0)



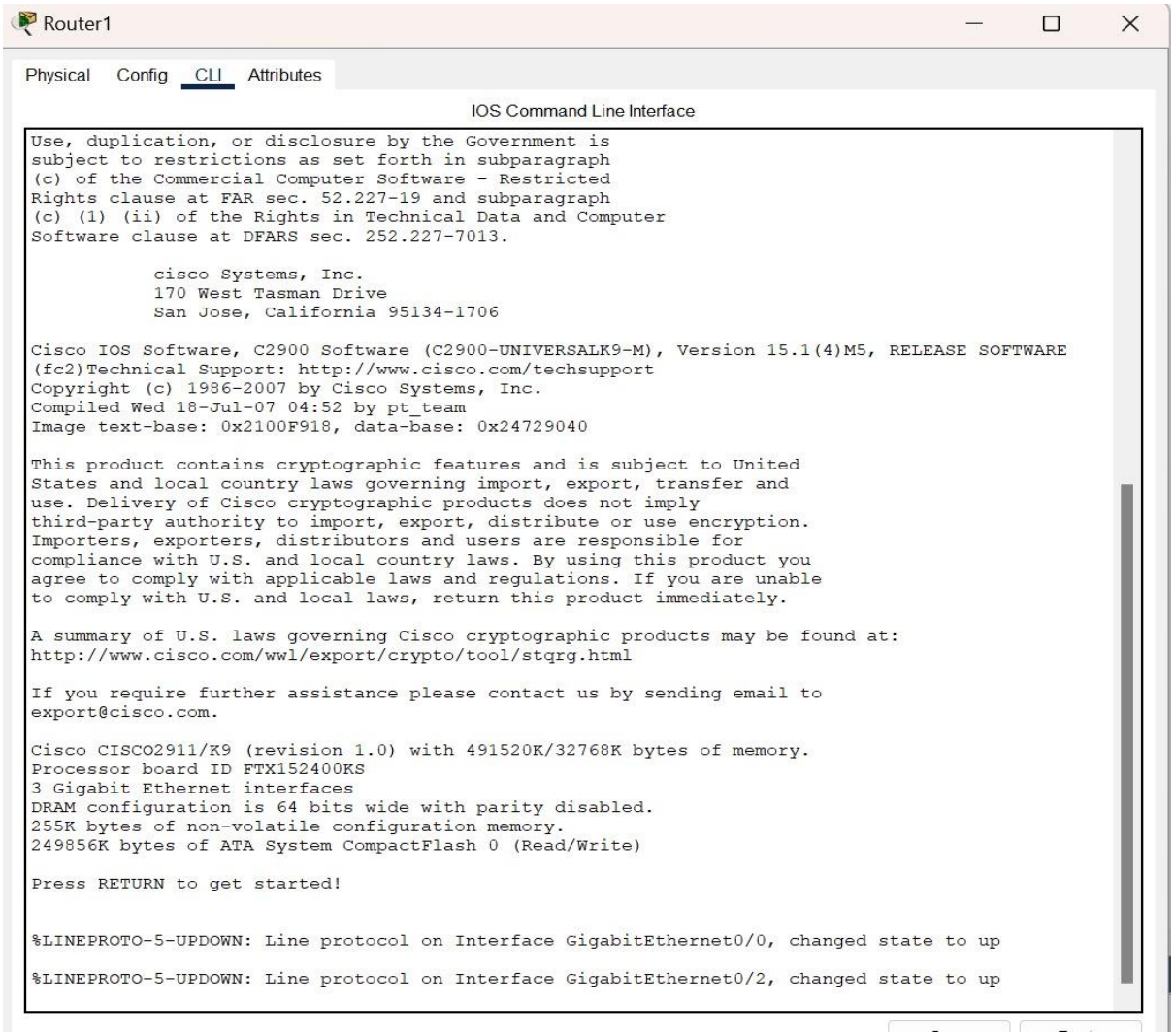
- LAN 5 (Network Address: 2.0.0.0)



- LAN 6 (Network Address: 3.0.0.0)



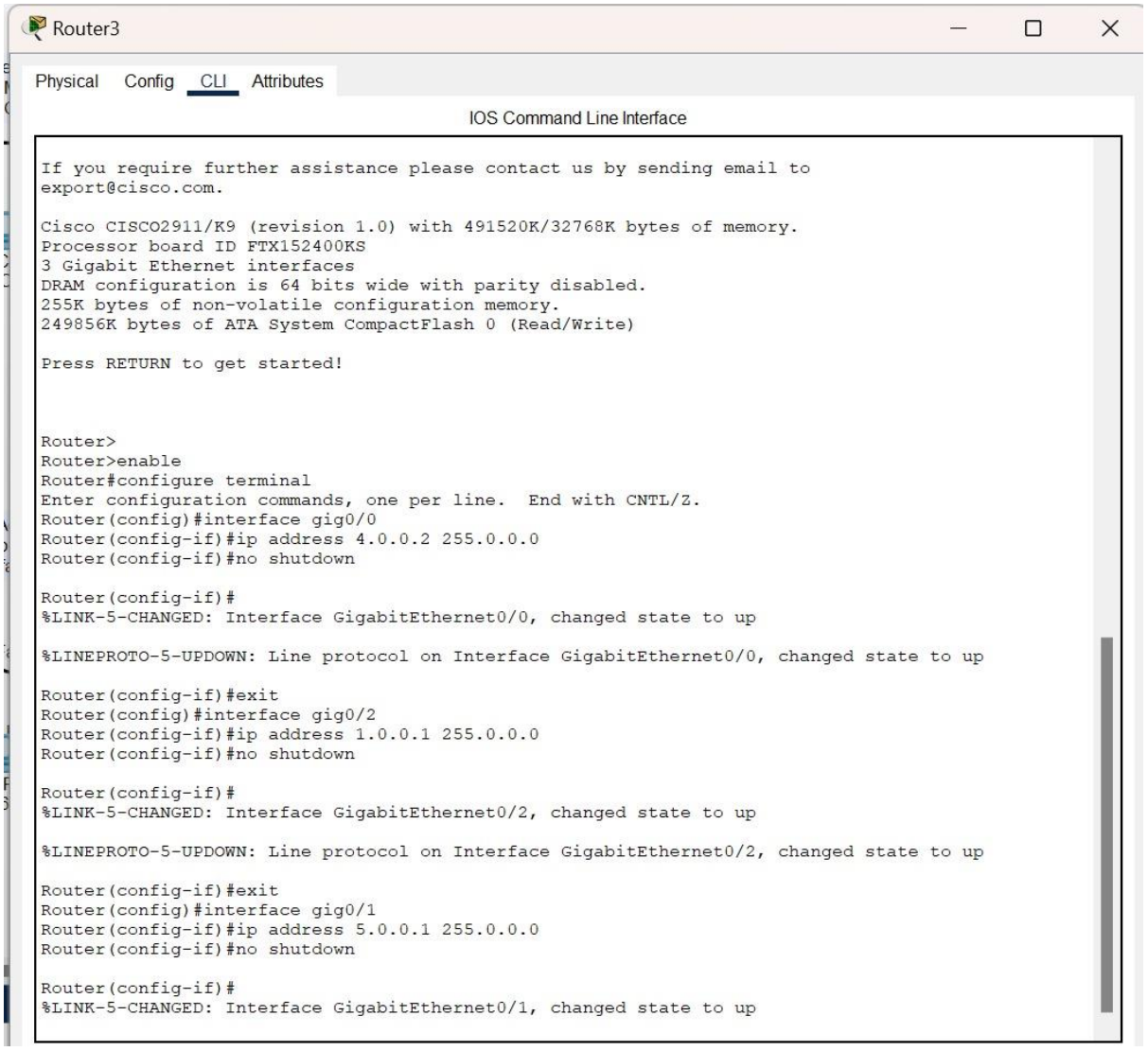
- Router 1



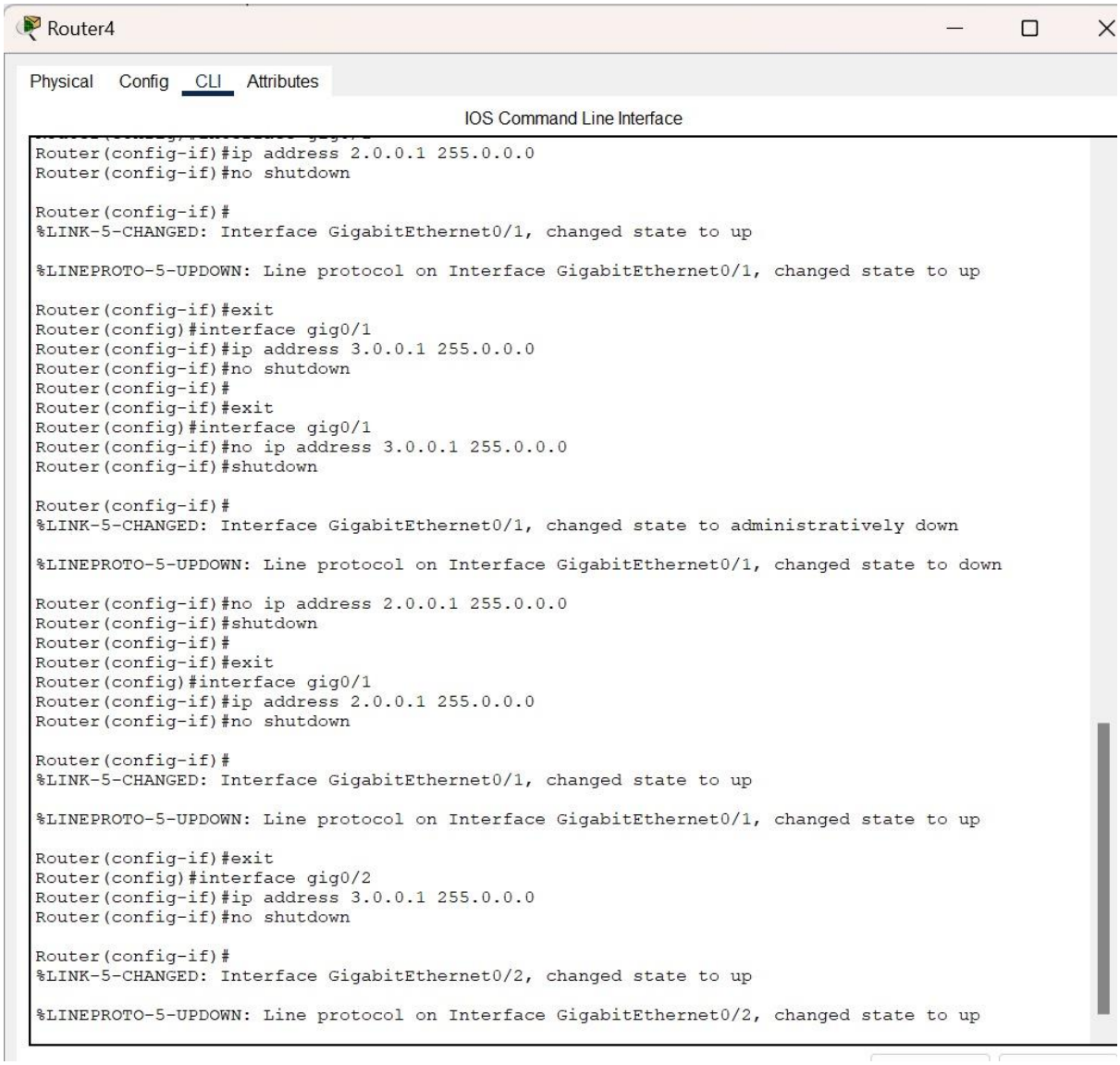
- Router 2

```
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)

Press RETURN to get started!



Router>
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface gig0/0
Router(config-if)#ip address 192.168.0.2 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
%IP-4-DUPADDR: Duplicate address 192.168.0.2 on GigabitEthernet0/0, sourced by 0060.47BE.D702
%IP-4-DUPADDR: Duplicate address 192.168.0.2 on GigabitEthernet0/0, sourced by 0060.47BE.D702

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up

Router(config-if)#
Router(config-if)#exit
Router(config)#interface gig0/2
Router(config-if)#ip address 192.168.3.1 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up

Router(config-if)#
Router(config-if)#exit
Router(config)#interface gig0/1
Router(config-if)#ip address 4.0.0.1 255.0.0.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
```

- Router 3

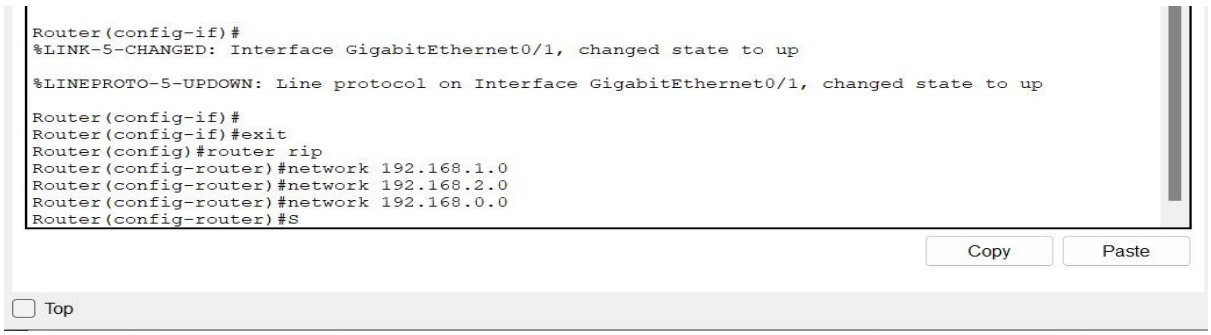

Router3
Physical
Config
CLI
Attributes
IOS Command Line Interface
If you require further assistance please contact us by sending email to
export@cisco.com.
Cisco CISCO2911/K9 (revision 1.0) with 491520K/32768K bytes of memory.
Processor board ID FTX152400KS
3 Gigabit Ethernet interfaces
DRAM configuration is 64 bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)
Press RETURN to get started!
Router>
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface gig0/0
Router(config-if)#ip address 4.0.0.2 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#interface gig0/2
Router(config-if)#ip address 1.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up
Router(config-if)#exit
Router(config)#interface gig0/1
Router(config-if)#ip address 5.0.0.1 255.0.0.0
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

- Router 4

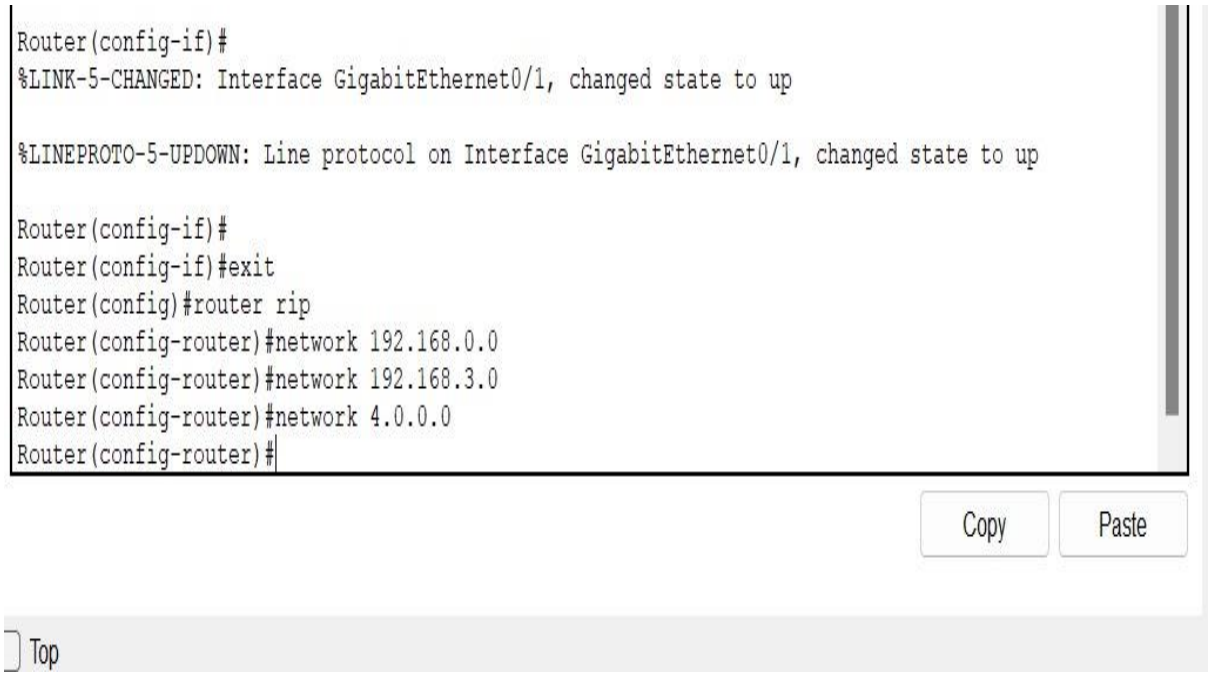


Dynamic Routing: -

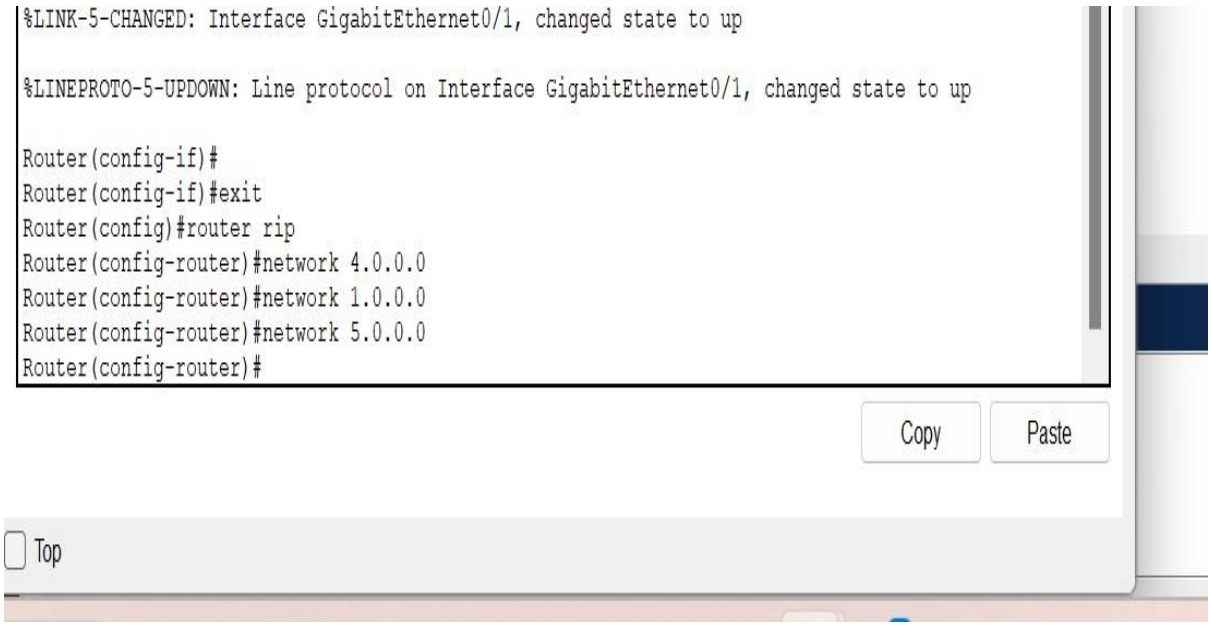
- Router 1



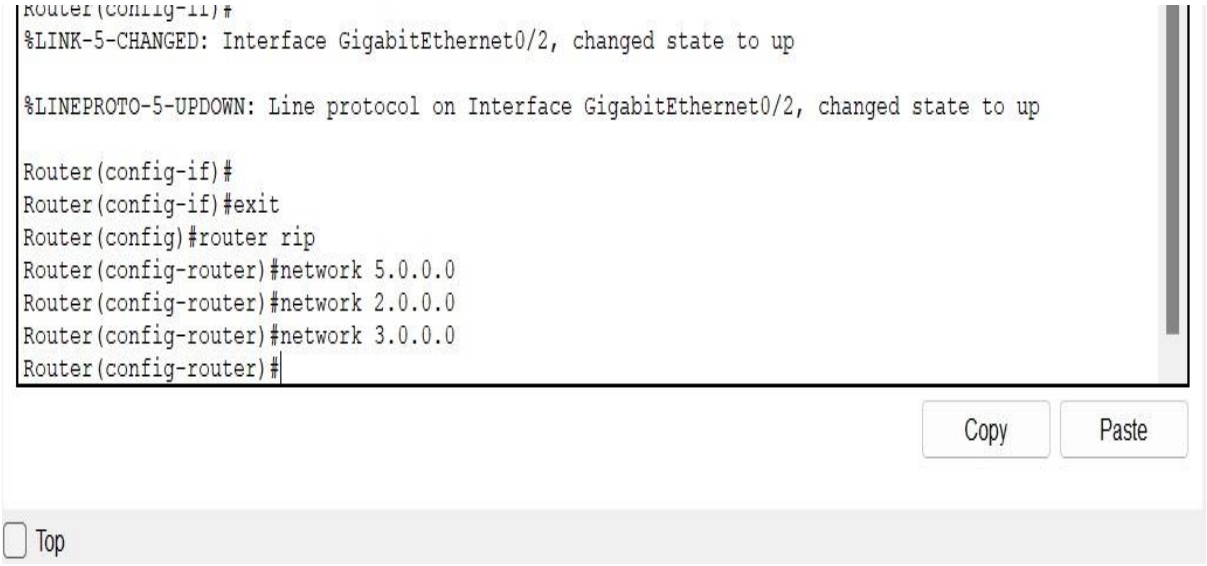
- Router 2



- Router 3



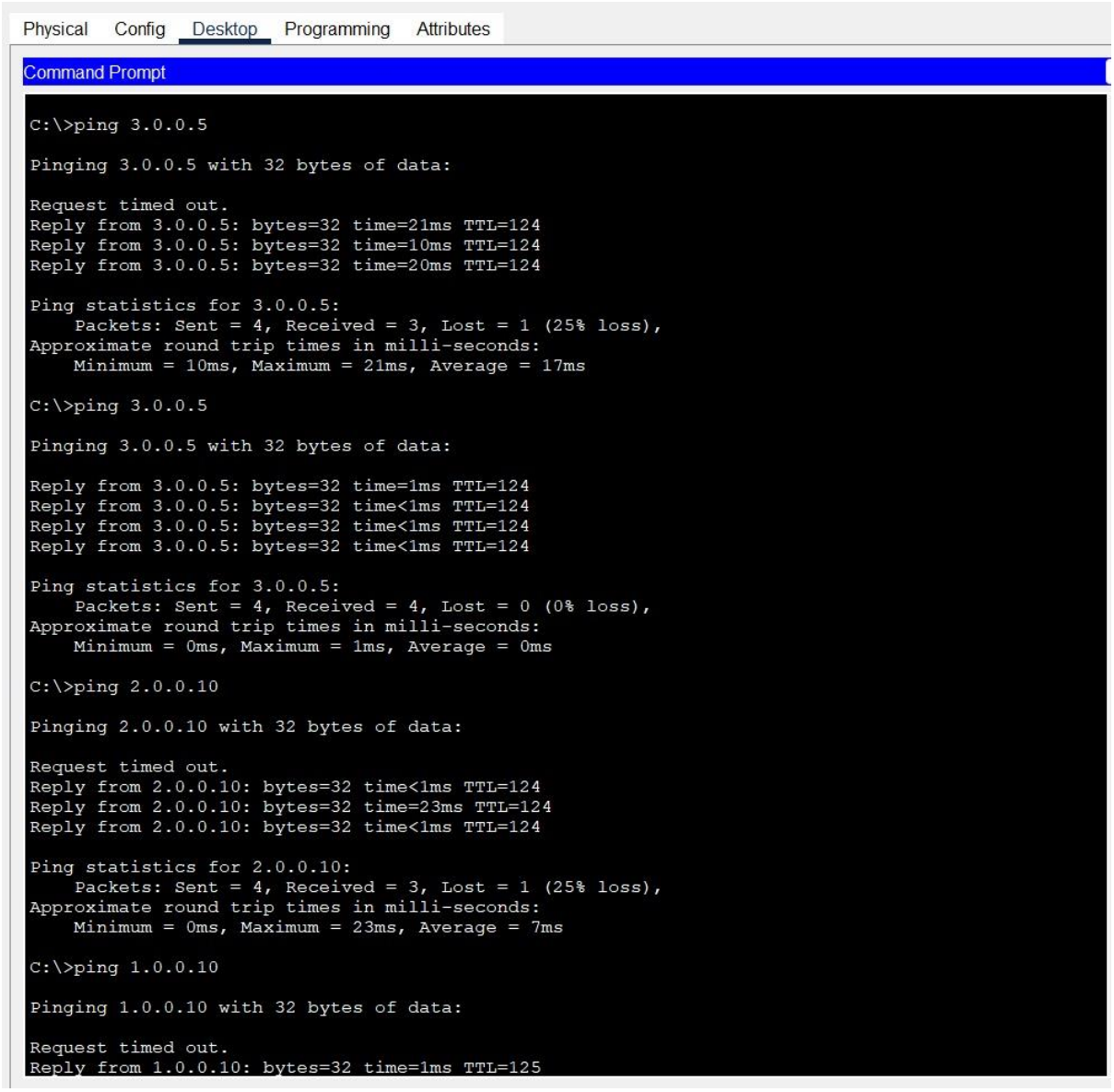
- Router 4

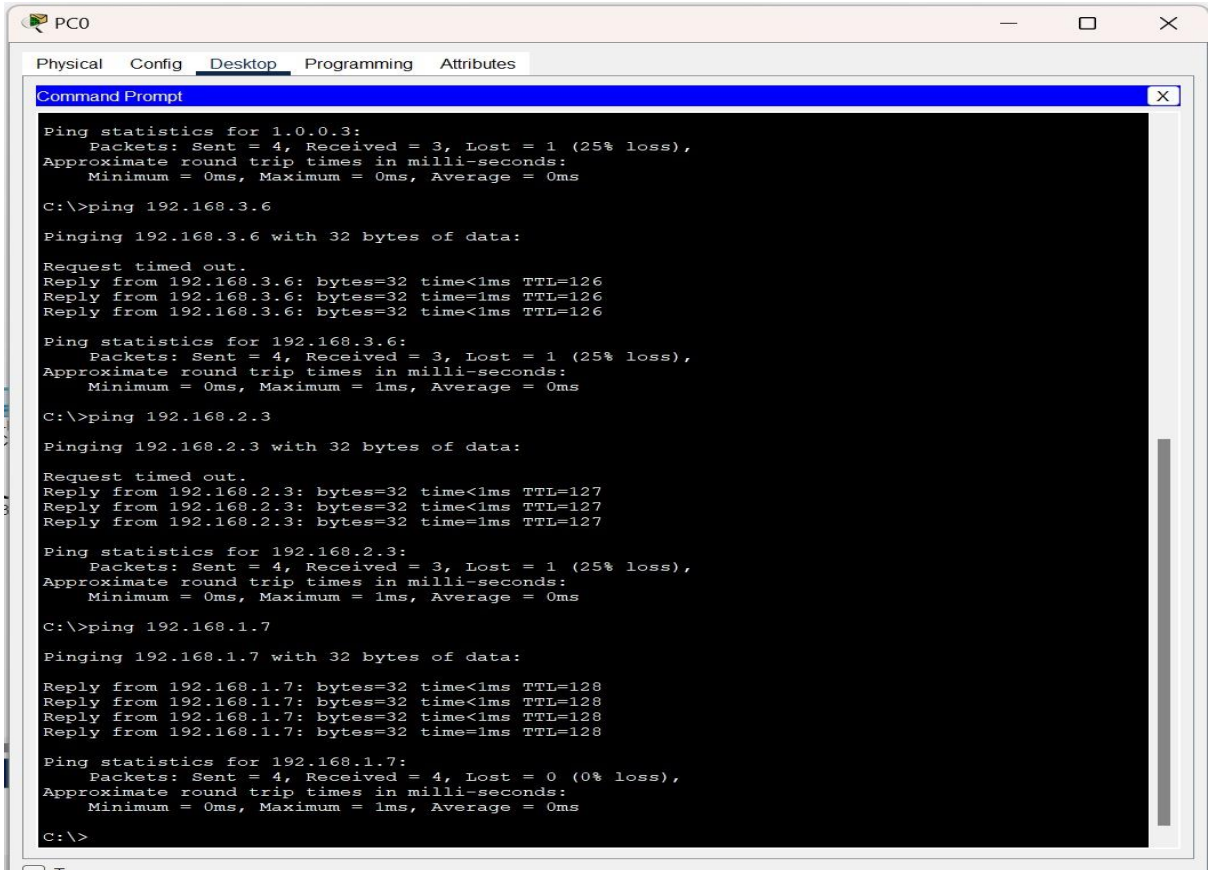


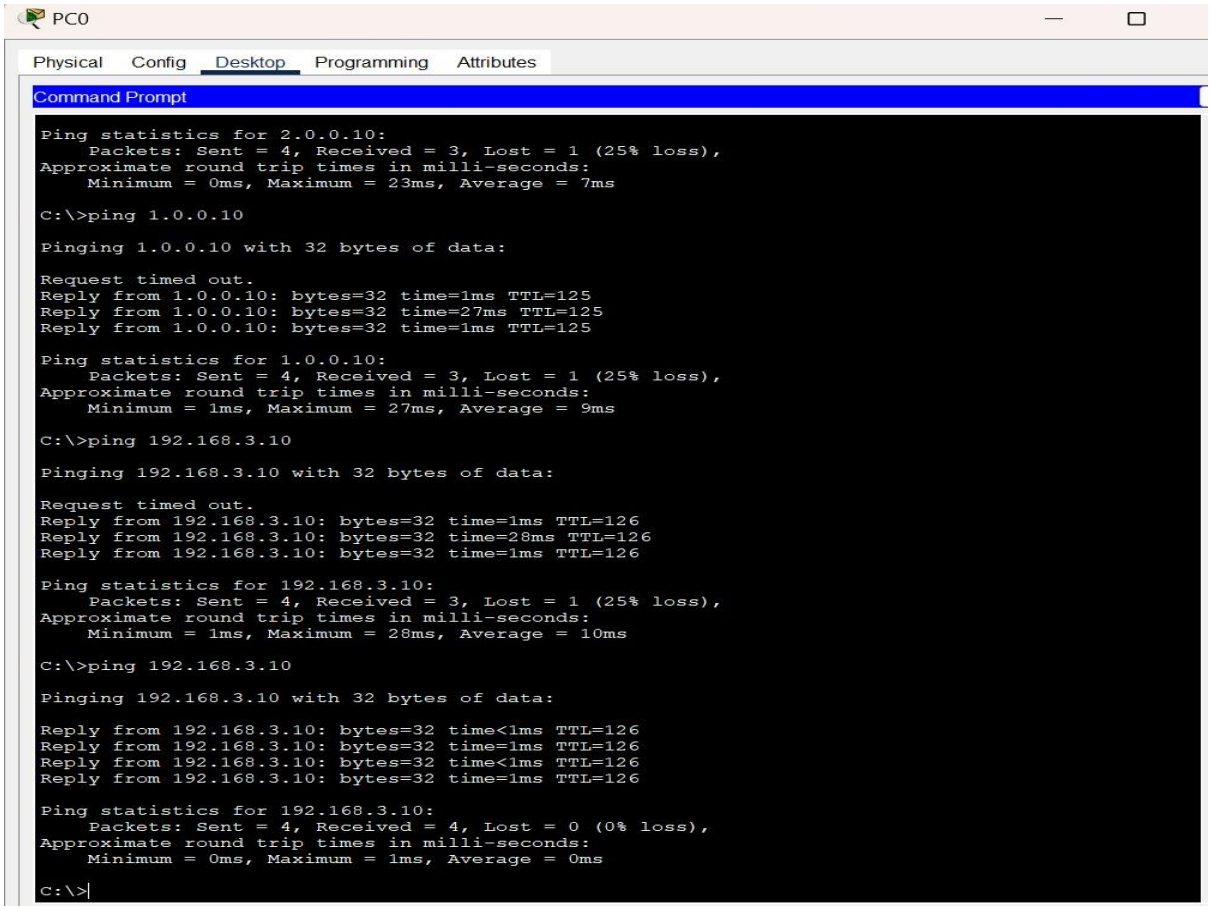
Communication Between LANs

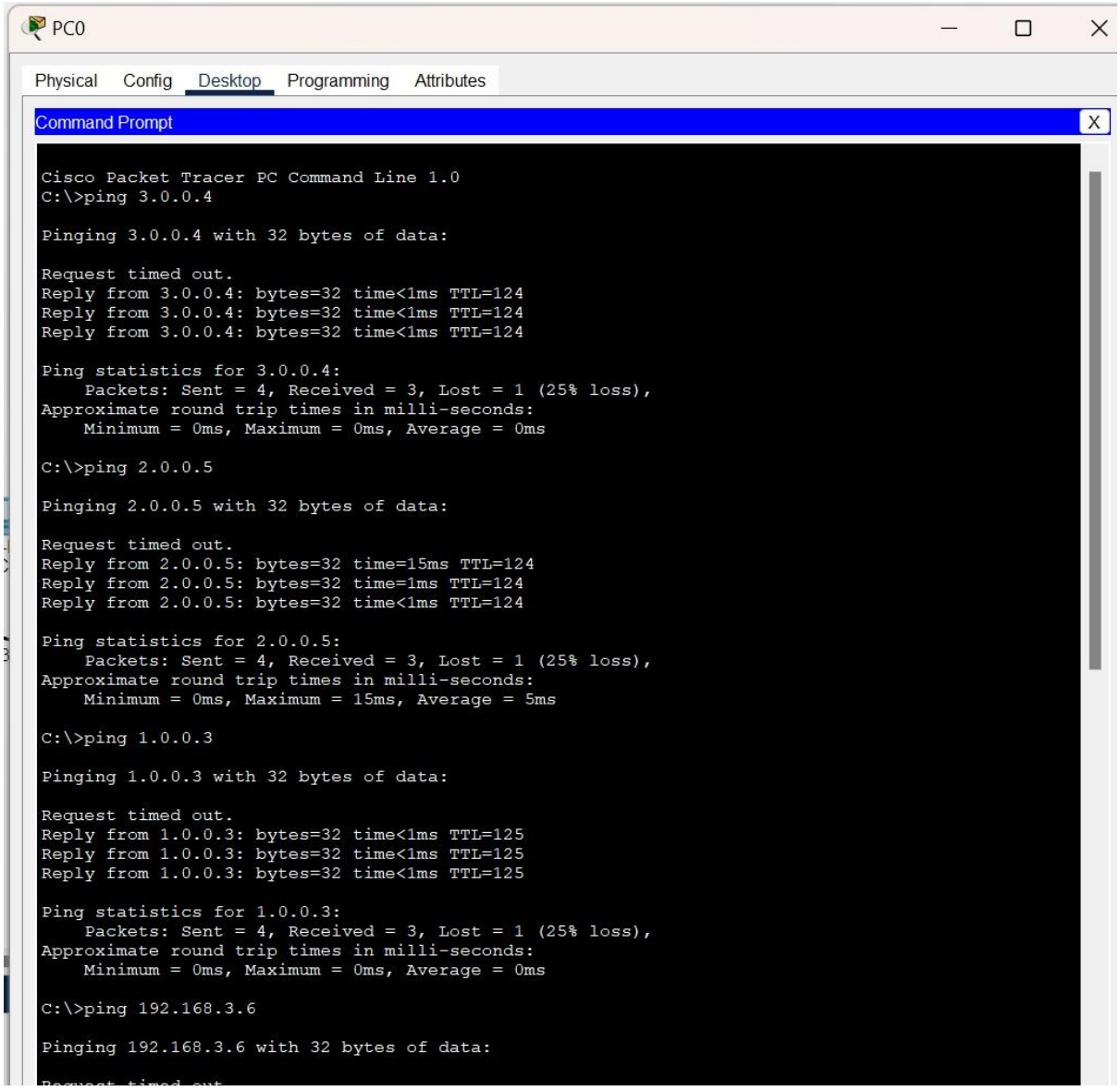
The successful ping test verifies that every Local Area Network (LAN) located across six floors communicates without problems. Every Local Area Network which has its designated classful IP range achieves successful ICMP echo communication with all other networks in the building. The established dynamic routing protocol maintains predetermined network routes to enable efficient floor-to-floor data connection. All devices on the Floors 1-3 Class B private network possess a dual capability for intra-network communication as well as external connectivity to the Class A public network devices that exist on Floors 4-6 through router configuration. The bus topology successfully links all routers to facilitate constant data transmission which provides swift and dependable network connections. Network design and routing effectiveness is verified when packets sent from various floors reach all intended destinations without suffering any losses according to ping test results.

Ping: -


Physical
Config
Desktop
Programming
Attributes
Command Prompt
C:\>ping 3.0.0.5
Pinging 3.0.0.5 with 32 bytes of data:
Request timed out.
Reply from 3.0.0.5: bytes=32 time=21ms TTL=124
Reply from 3.0.0.5: bytes=32 time=10ms TTL=124
Reply from 3.0.0.5: bytes=32 time=20ms TTL=124
Ping statistics for 3.0.0.5:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 10ms, Maximum = 21ms, Average = 17ms
C:\>ping 3.0.0.5
Pinging 3.0.0.5 with 32 bytes of data:
Reply from 3.0.0.5: bytes=32 time=1ms TTL=124
Reply from 3.0.0.5: bytes=32 time<1ms TTL=124
Reply from 3.0.0.5: bytes=32 time<1ms TTL=124
Reply from 3.0.0.5: bytes=32 time<1ms TTL=124
Ping statistics for 3.0.0.5:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms
C:\>ping 2.0.0.10
Pinging 2.0.0.10 with 32 bytes of data:
Request timed out.
Reply from 2.0.0.10: bytes=32 time<1ms TTL=124
Reply from 2.0.0.10: bytes=32 time=23ms TTL=124
Reply from 2.0.0.10: bytes=32 time<1ms TTL=124
Ping statistics for 2.0.0.10:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 23ms, Average = 7ms
C:\>ping 1.0.0.10
Pinging 1.0.0.10 with 32 bytes of data:
Request timed out.
Reply from 1.0.0.10: bytes=32 time=1ms TTL=125


PC0
Physical
Config
Desktop
Programming
Attributes
Command Prompt
Ping statistics for 1.0.0.3:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 192.168.3.6
Pinging 192.168.3.6 with 32 bytes of data:
Request timed out.
Reply from 192.168.3.6: bytes=32 time<1ms TTL=126
Reply from 192.168.3.6: bytes=32 time=1ms TTL=126
Reply from 192.168.3.6: bytes=32 time<1ms TTL=126
Ping statistics for 192.168.3.6:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms
C:\>ping 192.168.2.3
Pinging 192.168.2.3 with 32 bytes of data:
Request timed out.
Reply from 192.168.2.3: bytes=32 time<1ms TTL=127
Reply from 192.168.2.3: bytes=32 time<1ms TTL=127
Reply from 192.168.2.3: bytes=32 time=1ms TTL=127
Ping statistics for 192.168.2.3:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms
C:\>ping 192.168.1.7
Pinging 192.168.1.7 with 32 bytes of data:
Reply from 192.168.1.7: bytes=32 time<1ms TTL=128
Reply from 192.168.1.7: bytes=32 time<1ms TTL=128
Reply from 192.168.1.7: bytes=32 time<1ms TTL=128
Reply from 192.168.1.7: bytes=32 time=1ms TTL=128
Ping statistics for 192.168.1.7:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms
C:\>


PC0
Physical
Config
Desktop
Programming
Attributes
Command Prompt
Ping statistics for 2.0.0.10:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 23ms, Average = 7ms
C:\>ping 1.0.0.10
Pinging 1.0.0.10 with 32 bytes of data:
Request timed out.
Reply from 1.0.0.10: bytes=32 time=1ms TTL=125
Reply from 1.0.0.10: bytes=32 time=27ms TTL=125
Reply from 1.0.0.10: bytes=32 time=1ms TTL=125
Ping statistics for 1.0.0.10:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 27ms, Average = 9ms
C:\>ping 192.168.3.10
Pinging 192.168.3.10 with 32 bytes of data:
Request timed out.
Reply from 192.168.3.10: bytes=32 time=1ms TTL=126
Reply from 192.168.3.10: bytes=32 time=28ms TTL=126
Reply from 192.168.3.10: bytes=32 time=1ms TTL=126
Ping statistics for 192.168.3.10:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 28ms, Average = 10ms
C:\>ping 192.168.3.10
Pinging 192.168.3.10 with 32 bytes of data:
Reply from 192.168.3.10: bytes=32 time<1ms TTL=126
Reply from 192.168.3.10: bytes=32 time=1ms TTL=126
Reply from 192.168.3.10: bytes=32 time<1ms TTL=126
Reply from 192.168.3.10: bytes=32 time=1ms TTL=126
Ping statistics for 192.168.3.10:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms
C:\>


PC0
Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 3.0.0.4
Pinging 3.0.0.4 with 32 bytes of data:
Request timed out.
Reply from 3.0.0.4: bytes=32 time<1ms TTL=124
Reply from 3.0.0.4: bytes=32 time<1ms TTL=124
Reply from 3.0.0.4: bytes=32 time<1ms TTL=124
Ping statistics for 3.0.0.4:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 2.0.0.5
Pinging 2.0.0.5 with 32 bytes of data:
Request timed out.
Reply from 2.0.0.5: bytes=32 time=15ms TTL=124
Reply from 2.0.0.5: bytes=32 time=1ms TTL=124
Reply from 2.0.0.5: bytes=32 time<1ms TTL=124
Ping statistics for 2.0.0.5:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 15ms, Average = 5ms
C:\>ping 1.0.0.3
Pinging 1.0.0.3 with 32 bytes of data:
Request timed out.
Reply from 1.0.0.3: bytes=32 time<1ms TTL=125
Reply from 1.0.0.3: bytes=32 time<1ms TTL=125
Reply from 1.0.0.3: bytes=32 time<1ms TTL=125
Ping statistics for 1.0.0.3:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 192.168.3.6
Pinging 192.168.3.6 with 32 bytes of data: