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Network Training Programme

Module 5

Q5. Given an IP address range of 192.168.1.0/24, divide the network into 4 subnets.

Task: Manually calculate the new subnet mask and the range of valid IP addresses for each subnet.

Assign IP addresses from these subnets to devices in Cisco Packet Tracer and verify connectivity using ping between them.

Step 1: Calculate the Subnet Mask and Ranges

To divide a /24 network into 4 subnets, we need to borrow 2 additional bits ($2^2 = 4$).

- Original network: 192.168.1.0/24
- New subnets will be: /26
- New subnet mask: 255.255.255.192

Each subnet will have 64 addresses ($256 \div 4 = 64$).

Subnet 1:

- Network address: 192.168.1.0/26
- First usable IP: 192.168.1.1
- Last usable IP: 192.168.1.62
- Broadcast address: 192.168.1.63

Subnet 2:

- Network address: 192.168.1.64/26
- First usable IP: 192.168.1.65
- Last usable IP: 192.168.1.126
- Broadcast address: 192.168.1.127

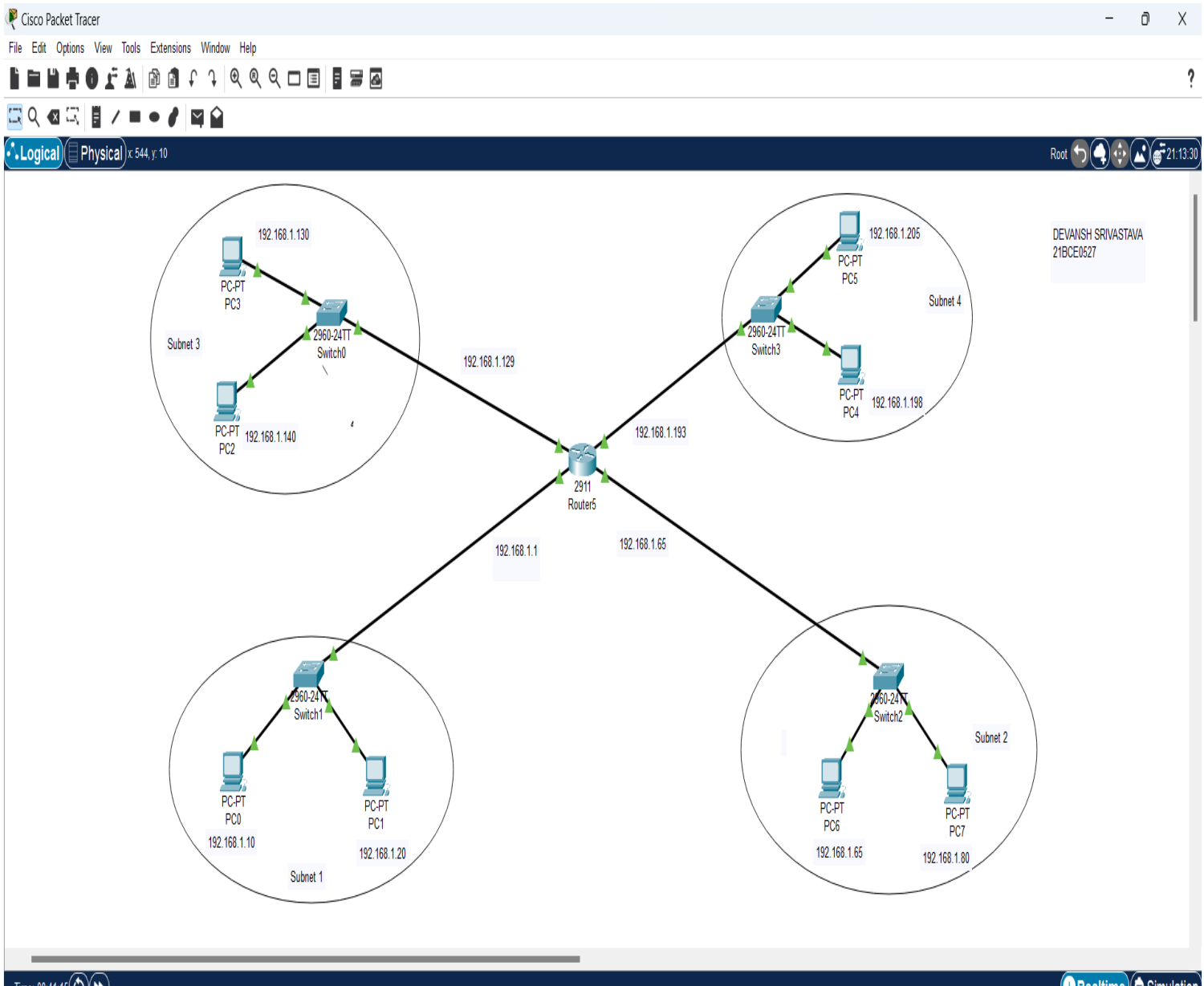
Subnet 3:

- Network address: 192.168.1.128/26
- First usable IP: 192.168.1.129
- Last usable IP: 192.168.1.190
- Broadcast address: 192.168.1.191

Subnet 4:

- Network address: 192.168.1.192/26
- First usable IP: 192.168.1.193
- Last usable IP: 192.168.1.254
- Broadcast address: 192.168.1.255

Network Diagram:



Configuration of IP address to the PCs of each subnet along with default gateway of that subnet respectively

Default Gateway of each Subnet:

Subnet 1- 192.168.1.1

Subnet 2- 192.168.1.65

Subnet 3- 192.168.1.129

Subnet 4- 192.168.1.193

Subnet 1

The screenshot shows the configuration window for PC0, specifically the 'Desktop' tab. The 'IP Configuration' section is active, showing settings for the 'FastEthernet0' interface. The 'Static' radio button is selected for both IPv4 and IPv6 configurations. The IPv4 configuration includes an IP address of 192.168.1.10, a subnet mask of 255.255.255.0, a default gateway of 192.168.1.1, and a DNS server of 0.0.0.0. The IPv6 configuration includes a static IP address, a link local address of FE80::201:C9FF:FEA7:20A8, and empty fields for default gateway and DNS server. The '802.1X' section is also visible, with 'Use 802.1X Security' unchecked, authentication set to MD5, and empty fields for username and password.

PC0

Physical Config **Desktop** Programming Attributes

IP Configuration [X]

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 192.168.1.10

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.1.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::201:C9FF:FEA7:20A8

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

☐ Top

PC1

Physical

Config

Desktop

Programming

Attributes

IP Configuration

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address192.168.1.20

Subnet Mask255.255.255.0

Default Gateway192.168.1.1

DNS Server0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

Link Local AddressFE80::201:C9FF:FE07:117A

Default Gateway

DNS Server

802.1X

Use 802.1X Security

AuthenticationMD5

Username

Password

Top

Subnet 2

PC6

Physical Config **Desktop** Programming Attributes

IP Configuration [X]

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 192.168.1.66

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.1.65

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::201:C9FF:FE39:D8D7

Default Gateway:

DNS Server:

802.1X

☐ Use 802.1X Security

Authentication: MD5

Username:

Password:

PC7

PhysicalConfigDesktopProgrammingAttributes

IP Configuration

X

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address192.168.1.80

Subnet Mask255.255.255.0

Default Gateway192.168.1.65

DNS Server0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

Link Local AddressFE80::201:96FF:FE16:8EB6

Default Gateway

DNS Server

802.1X

Use 802.1X Security

AuthenticationMD5

Username

Password

Top

Subnet 3

PC3

Physical Config Desktop Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 192.168.1.130

Subnet Mask 255.255.255.0

Default Gateway 192.168.1.129

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::2E0:B0FF:FE2B:D068

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

PC2

Physical

Config

Desktop

Programming

Attributes

IP Configuration

X

Interface

FastEthernet0

IP Configuration

DHCP

Static

IPv4 Address

192.168.1.140

Subnet Mask

255.255.255.0

Default Gateway

192.168.1.129

DNS Server

0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

/

Link Local Address

FE80::205:5EFF:FE90:BB1E

Default Gateway

DNS Server

802.1X

Use 802.1X Security

Authentication

MD5

Username

Password

Top

Subnet 4

PC4

Physical Config Desktop Programming Attributes

IP Configuration

InterfaceFastEthernet0

IP Configuration

☐ DHCP

☒ Static

IPv4 Address

192.168.1.198

Subnet Mask

255.255.255.0

Default Gateway

192.168.1.193

DNS Server

0.0.0.0

IPv6 Configuration

☐ Automatic

☒ Static

IPv6 Address

Link Local Address

FE80::2D0:BCFF:FEEE:61B8

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication

MD5

Username

Password

☐ Top

PC5

Physical

Config

Desktop

Programming

Attributes

IP Configuration

X

Interface

FastEthernet0

IP Configuration

DHCP

Static

IPv4 Address

192.168.1.205

Subnet Mask

255.255.255.0

Default Gateway

192.168.1.193

DNS Server

0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

/

Link Local Address

FE80::260:2FFF:FEED:E16A

Default Gateway

DNS Server

802.1X

Use 802.1X Security

Authentication

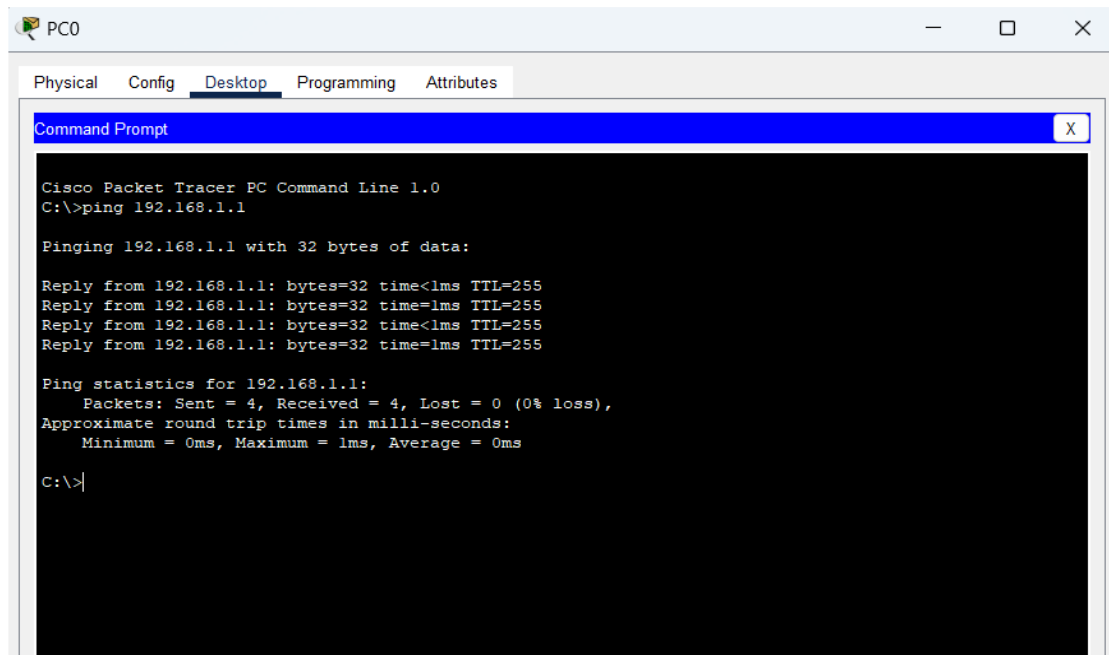
MD5

Username

Password

Checking connectivity using Ping command:

Subnet 1 PC



The screenshot shows a Cisco Packet Tracer window for PC0. The 'Desktop' tab is active, displaying a 'Command Prompt' window. The command prompt shows the execution of the 'ping 192.168.1.1' command. The output indicates that four packets were sent and received successfully with 0% loss. The round trip times are all 0ms.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.1

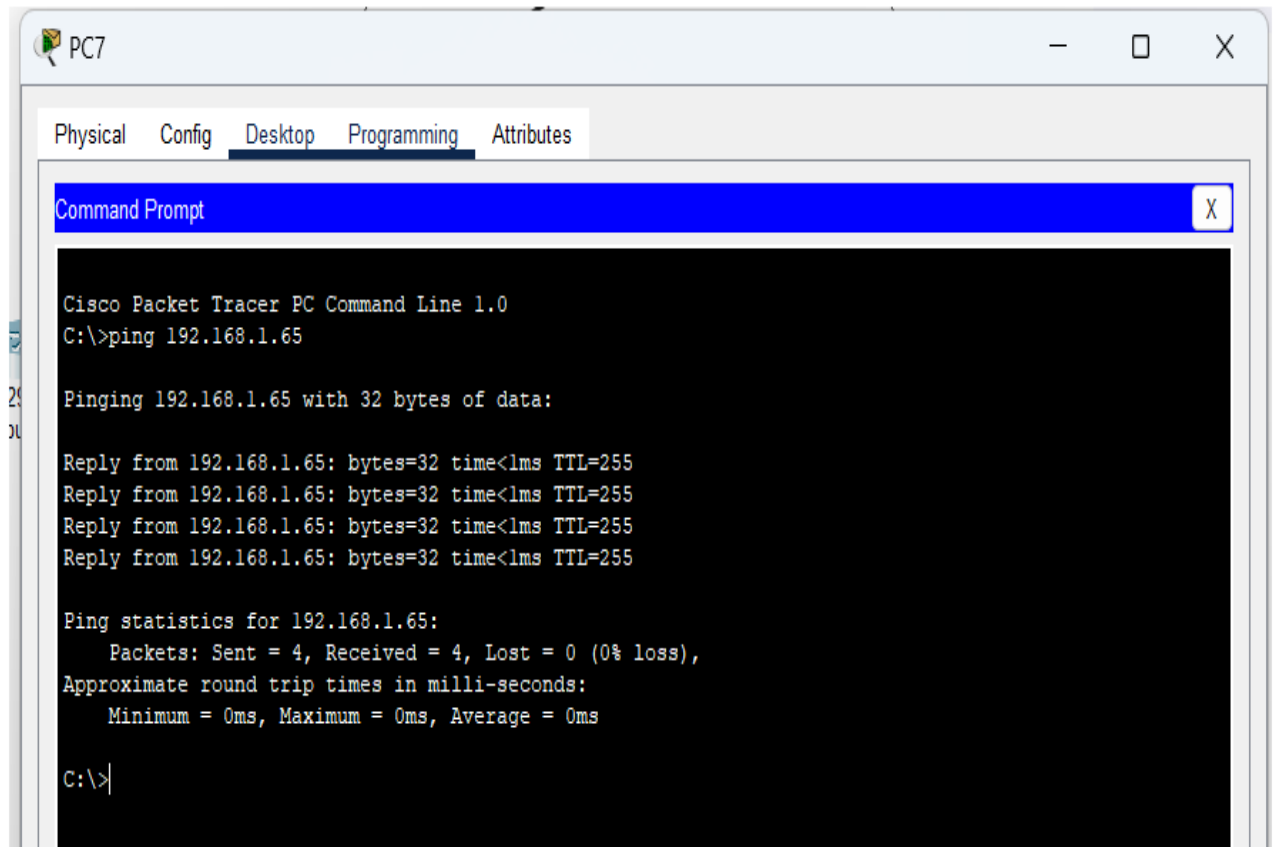
Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time<1ms TTL=255
Reply from 192.168.1.1: bytes=32 time<1ms TTL=255
Reply from 192.168.1.1: bytes=32 time<1ms TTL=255
Reply from 192.168.1.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

Subnet 2 PC



The screenshot shows a Cisco Packet Tracer window for PC7. The 'Desktop' tab is active, displaying a 'Command Prompt' window. The command prompt shows the execution of the 'ping 192.168.1.65' command. The output indicates that four packets were sent and received successfully with 0% loss. The round trip times are all 0ms.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.65

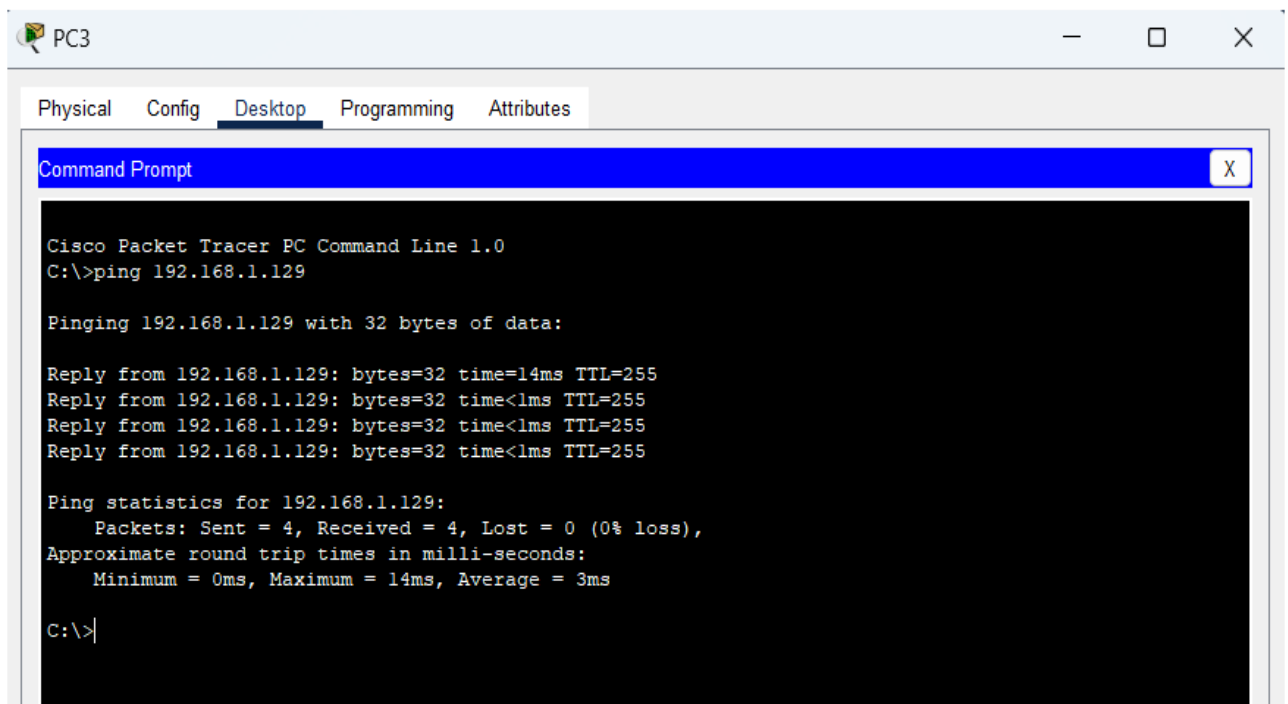
Pinging 192.168.1.65 with 32 bytes of data:

Reply from 192.168.1.65: bytes=32 time<1ms TTL=255
Reply from 192.168.1.65: bytes=32 time<1ms TTL=255
Reply from 192.168.1.65: bytes=32 time<1ms TTL=255
Reply from 192.168.1.65: bytes=32 time<1ms TTL=255

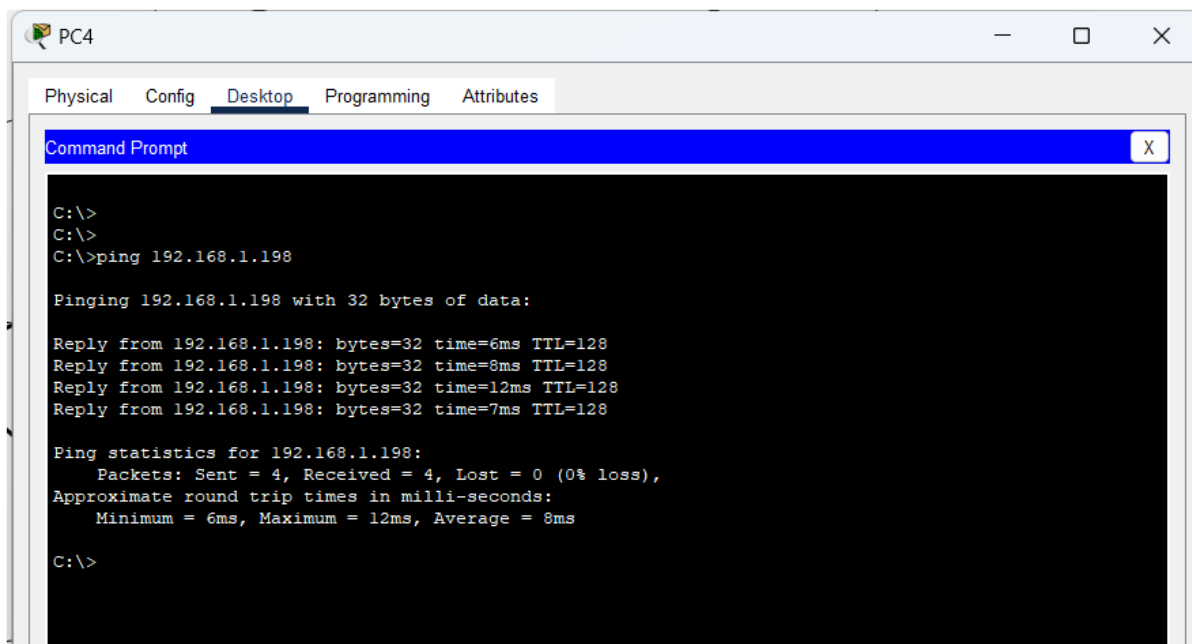
Ping statistics for 192.168.1.65:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Subnet 3 PC



Subnet 4 PC



Key Learning:

1. Subnetting allows efficient IP address management by dividing a large network into smaller segments.
2. Choosing the correct subnet mask depends on the required number of subnets (powers of 2).
3. A /26 mask divides a /24 network into 4 equal subnets.
4. Each subnet has 62 usable IPs (excluding network & broadcast addresses).