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Network Training Programme

Module 6

Q3. Given a network address of 10.0.0.0/24, divide it into 4 equal subnets. Calculate the new subnet mask. Determine the valid host range for each subnet. Assign IP addresses to devices in Packet Tracer and verify connectivity.

**Analyzing the original network:**

Network address: 10.0.0.0/24

Original subnet mask: 255.255.255.0

Number of host bits: 8

Number of available hosts:  $2^8 - 2 = 254$

Calculate new subnet mask for 4 equal subnets:

So, we require 2 additional subnet bits ( $2^2 = 4$  subnets)

New prefix length:  $24 + 2 = /26$

Number of host in each network:  $2^{32-26} = 2^6 = 64$  hosts

New subnet mask: 255.255.255.192

**Calculate the subnets:**

Subnet 0: 10.0.0.0/26

Network address: 10.0.0.0

Broadcast address: 10.0.0.63

Valid host range: 10.0.0.1 - 10.0.0.62

Subnet 1: 10.0.0.64/26

Network address: 10.0.0.64

Broadcast address: 10.0.0.127

Valid host range: 10.0.0.65 - 10.0.0.126

Subnet 2: 10.0.0.128/26

Network address: 10.0.0.128

Broadcast address: 10.0.0.191

Valid host range: 10.0.0.129 - 10.0.0.190

Subnet 3: 10.0.0.192/26

Network address: 10.0.0.192

Broadcast address: 10.0.0.255

Valid host range: 10.0.0.193 - 10.0.0.254

Configure devices in Packet Tracer:

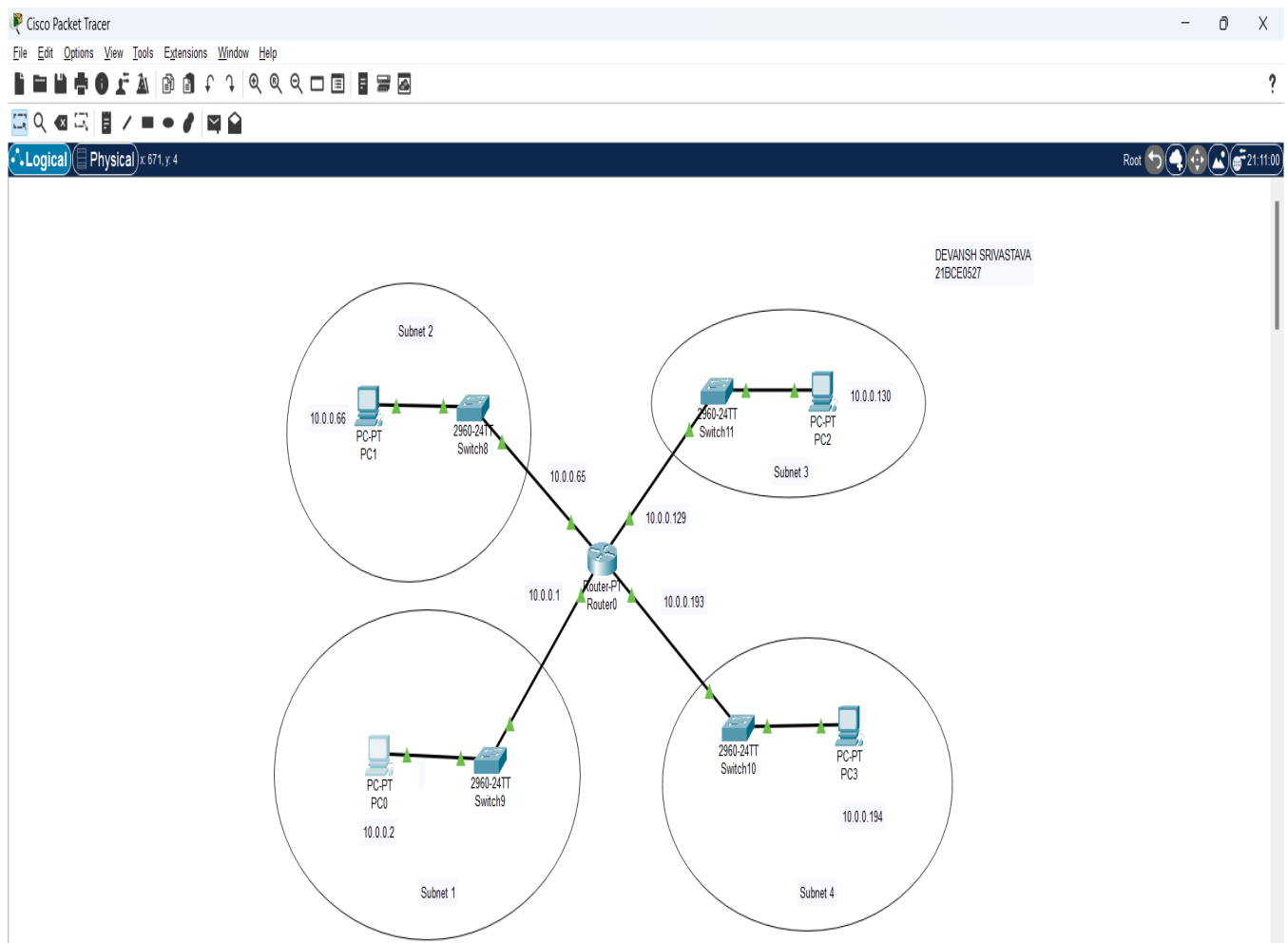
Assigning PC1: 10.0.0.2/26, Gateway: 10.0.0.1

Assigning PC2: 10.0.0.66/26, Gateway: 10.0.0.65

Assigning PC3: 10.0.0.130/26, Gateway: 10.0.0.129

Assigning PC4: 10.0.0.194/26, Gateway: 10.0.0.193

Network Diagram:



PC0

PC0

Physical

Config

Desktop

Programming

Attributes

IP Configuration

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address

10.0.0.2

Subnet Mask

255.0.0.0

Default Gateway

10.0.0.1

DNS Server

0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

/

Link Local Address

FE80::201:96FF:FEA4:8C06

Default Gateway

DNS Server

802.1X

Use 802.1X Security

Authentication

MD5

Username

Password

Top

## PC1

PC1

Physical

Config

Desktop

Programming

Attributes

IP Configuration

X

Interface

FastEthernet0

IP Configuration

☐ DHCP

☒ Static

IPv4 Address

10.0.0.66

Subnet Mask

255.0.0.0

Default Gateway

10.0.0.65

DNS Server

0.0.0.0

IPv6 Configuration

☐ Automatic

☒ Static

IPv6 Address

/

Link Local Address

FE80::2E0:F9FF:FE72:165B

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication

MD5

Username

Password

☐ Top

PC2

PC2

PhysicalConfigDesktopProgrammingAttributes

IP Configuration

X

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address10.0.0.130

Subnet Mask255.0.0.0

Default Gateway10.0.0.129

DNS Server0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

Link Local AddressFE80::230:A3FF:FE03:99C

Default Gateway

DNS Server

802.1X

Use 802.1X Security

AuthenticationMD5

Username

Password

Top

PC3

PC3

Physical

Config

Desktop

Programming

Attributes

IP Configuration

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address

10.0.0.194

Subnet Mask

255.0.0.0

Default Gateway

10.0.0.193

DNS Server

0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

/

Link Local Address

FE80::205:5EFF:FEAC:14B5

Default Gateway

DNS Server

802.1X

Use 802.1X Security

Authentication

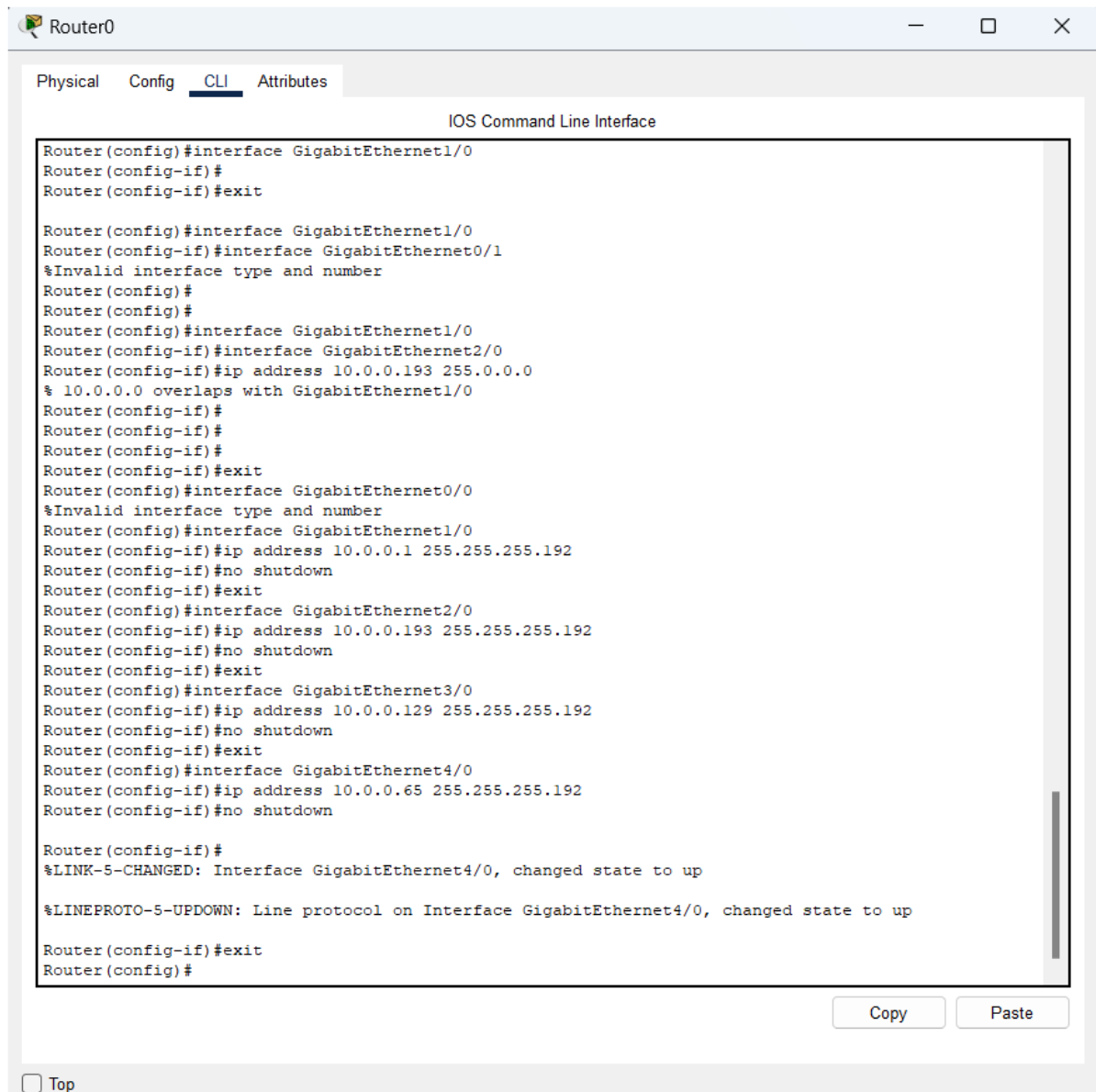
MD5

Username

Password

Top

## Router Configuration:



The screenshot shows a window titled "Router0" with tabs for "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is active, displaying the "IOS Command Line Interface". The terminal shows the following sequence of commands and outputs:

```
Router(config)#interface GigabitEthernet1/0
Router(config-if)#
Router(config-if)#exit

Router(config)#interface GigabitEthernet1/0
Router(config-if)#interface GigabitEthernet0/1
%Invalid interface type and number
Router(config)#
Router(config)#
Router(config)#interface GigabitEthernet1/0
Router(config-if)#interface GigabitEthernet2/0
Router(config-if)#ip address 10.0.0.193 255.0.0.0
% 10.0.0.0 overlaps with GigabitEthernet1/0
Router(config-if)#
Router(config-if)#
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0
%Invalid interface type and number
Router(config)#interface GigabitEthernet1/0
Router(config-if)#ip address 10.0.0.1 255.255.255.192
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface GigabitEthernet2/0
Router(config-if)#ip address 10.0.0.193 255.255.255.192
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface GigabitEthernet3/0
Router(config-if)#ip address 10.0.0.129 255.255.255.192
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface GigabitEthernet4/0
Router(config-if)#ip address 10.0.0.65 255.255.255.192
Router(config-if)#no shutdown

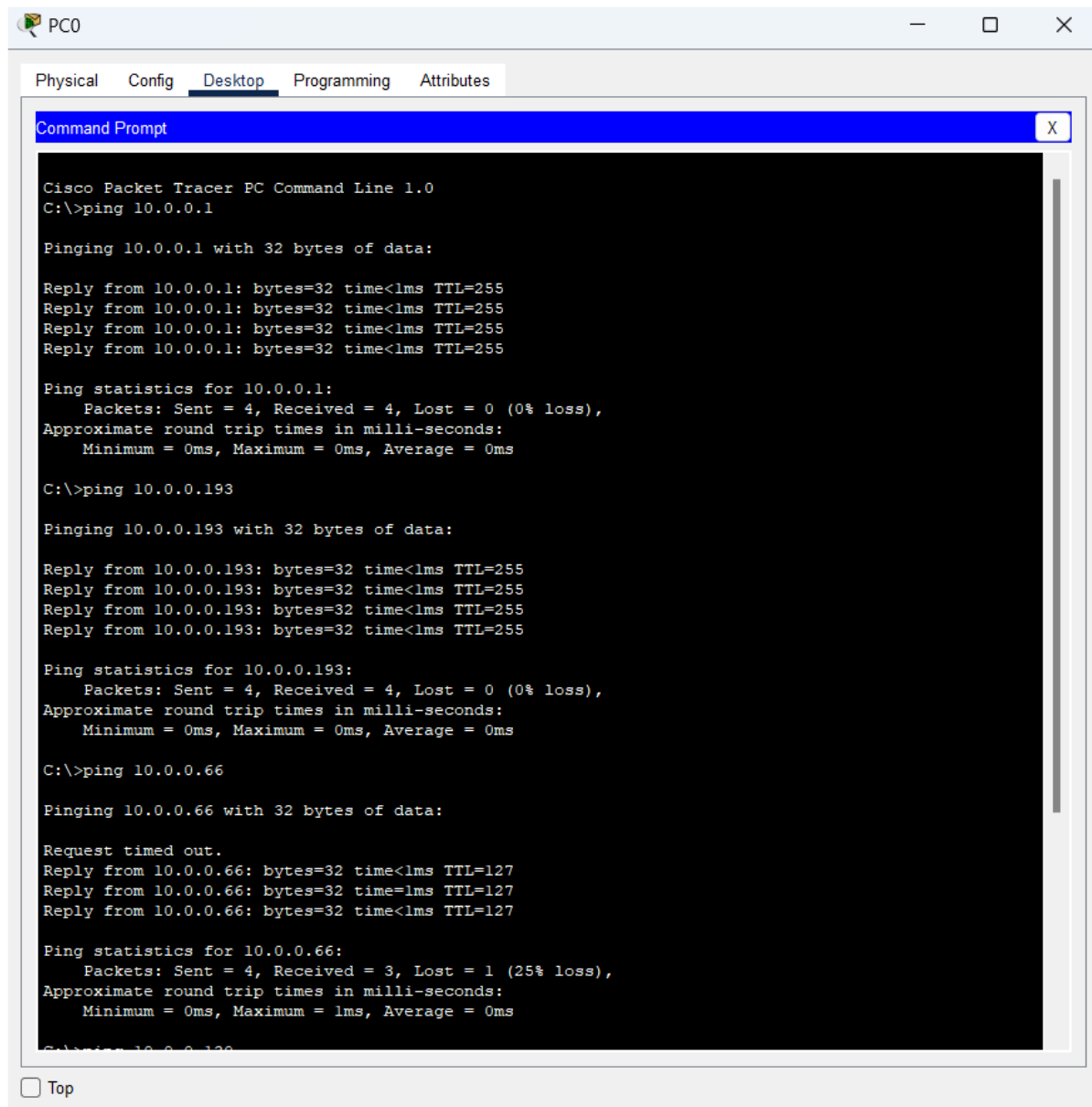
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet4/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet4/0, changed state to up

Router(config-if)#exit
Router(config)#
```

At the bottom right of the CLI window, there are "Copy" and "Paste" buttons. Below the CLI window, there is a "Top" button with a checkbox.

## Testing Connectivity:



The screenshot shows a Cisco Packet Tracer interface with the 'PC0' window open to the 'Desktop' tab. A 'Command Prompt' window is active, displaying the results of three ping tests performed from the PC's command line. The first two tests, to 10.0.0.1 and 10.0.0.193, are successful with 0% loss. The third test, to 10.0.0.66, shows a 25% loss (1 out of 4 packets received).

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time<1ms TTL=255
Reply from 10.0.0.1: bytes=32 time<1ms TTL=255
Reply from 10.0.0.1: bytes=32 time<1ms TTL=255
Reply from 10.0.0.1: bytes=32 time<1ms TTL=255

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 10.0.0.193

Pinging 10.0.0.193 with 32 bytes of data:

Reply from 10.0.0.193: bytes=32 time<1ms TTL=255
Reply from 10.0.0.193: bytes=32 time<1ms TTL=255
Reply from 10.0.0.193: bytes=32 time<1ms TTL=255
Reply from 10.0.0.193: bytes=32 time<1ms TTL=255

Ping statistics for 10.0.0.193:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 10.0.0.66

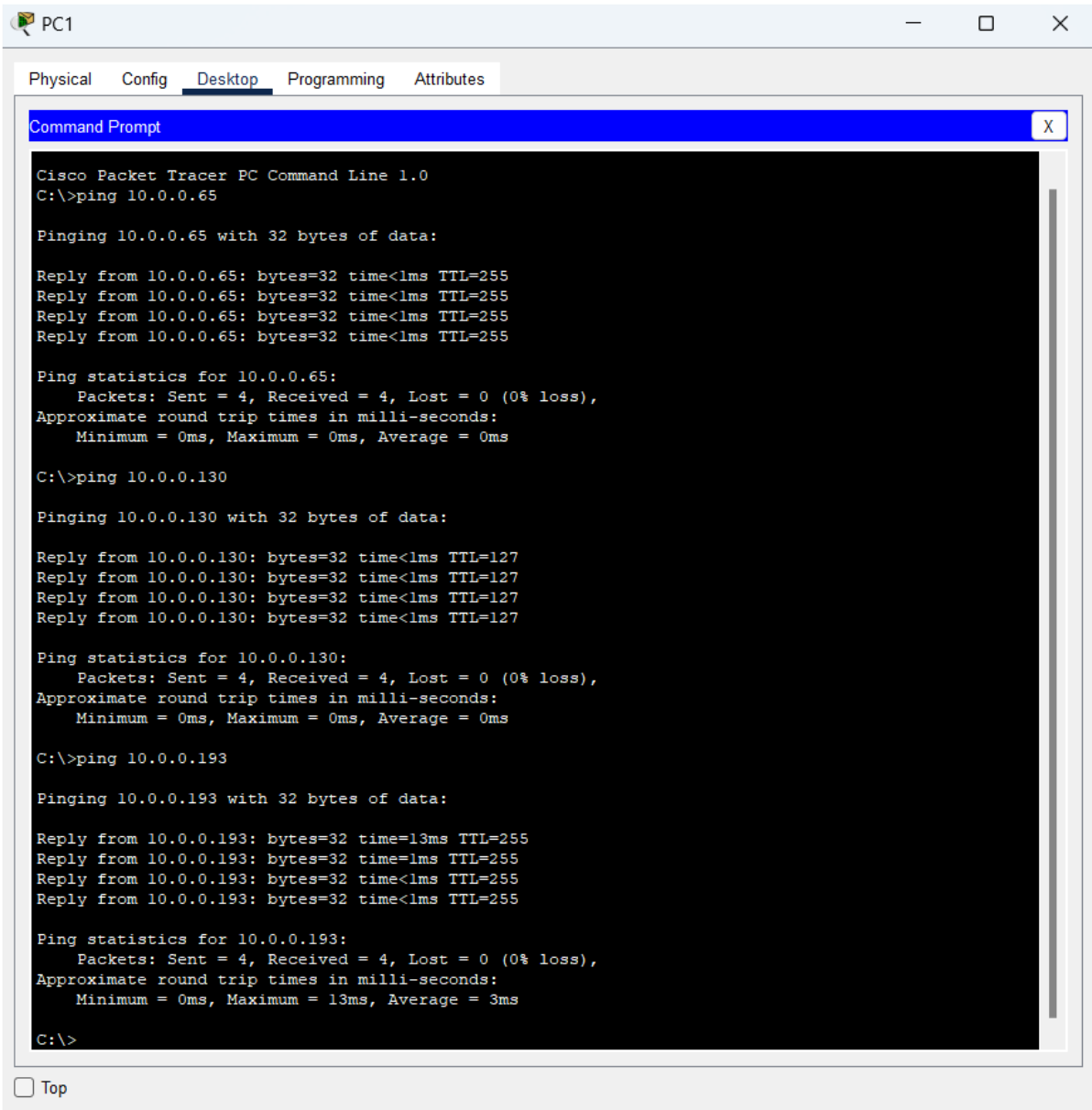
Pinging 10.0.0.66 with 32 bytes of data:

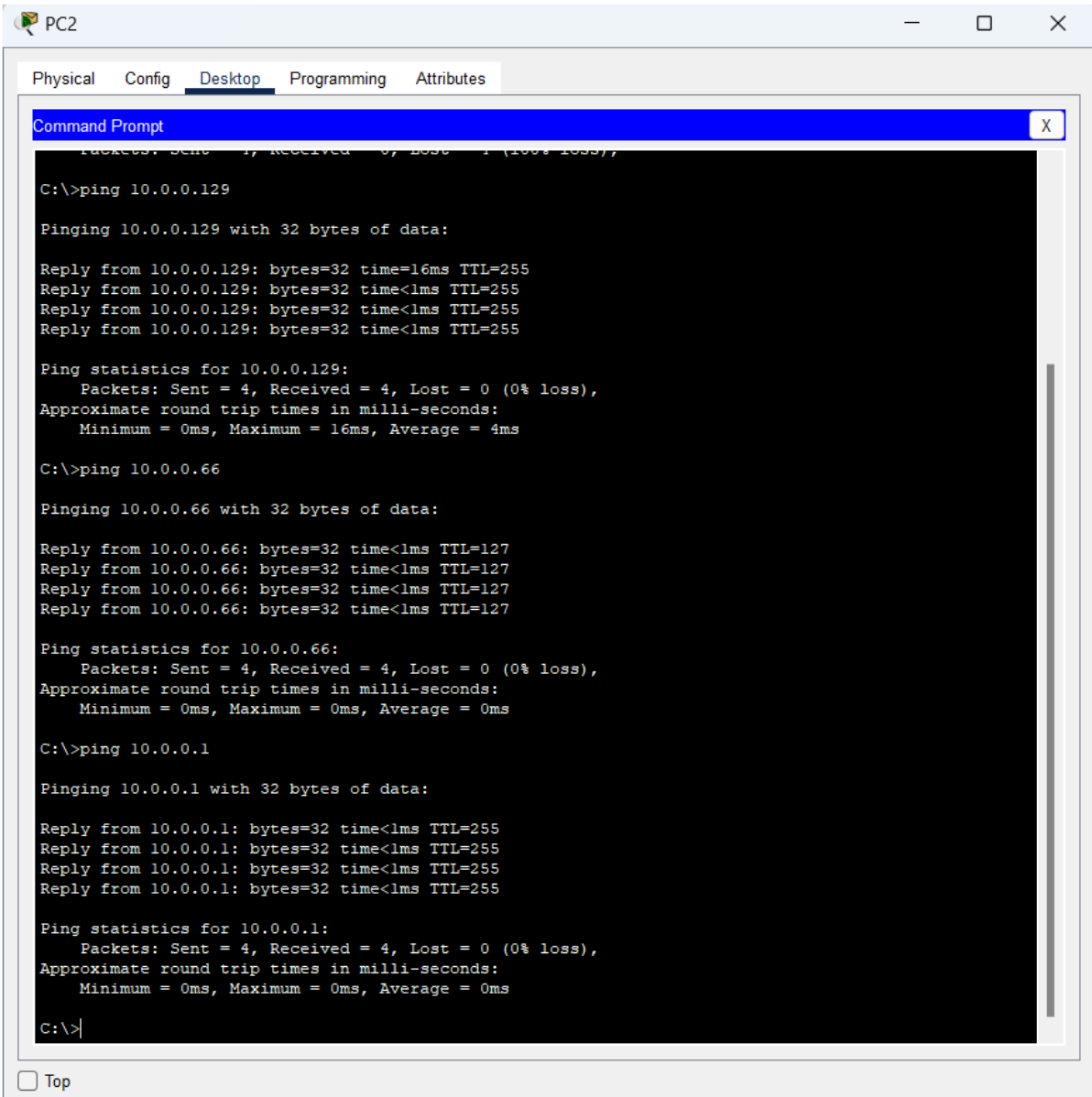
Request timed out.
Reply from 10.0.0.66: bytes=32 time<1ms TTL=127
Reply from 10.0.0.66: bytes=32 time=1ms TTL=127
Reply from 10.0.0.66: bytes=32 time<1ms TTL=127

Ping statistics for 10.0.0.66:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

☐ Top







```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.193

Pinging 10.0.0.193 with 32 bytes of data:

Reply from 10.0.0.193: bytes=32 time<1ms TTL=255
Reply from 10.0.0.193: bytes=32 time<1ms TTL=255
Reply from 10.0.0.193: bytes=32 time<1ms TTL=255
Reply from 10.0.0.193: bytes=32 time<1ms TTL=255

Ping statistics for 10.0.0.193:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time<1ms TTL=255
Reply from 10.0.0.1: bytes=32 time<1ms TTL=255
Reply from 10.0.0.1: bytes=32 time<1ms TTL=255
Reply from 10.0.0.1: bytes=32 time<1ms TTL=255

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 10.0.0.66

Pinging 10.0.0.66 with 32 bytes of data:

Reply from 10.0.0.66: bytes=32 time<1ms TTL=127
Reply from 10.0.0.66: bytes=32 time<1ms TTL=127
Reply from 10.0.0.66: bytes=32 time<1ms TTL=127
Reply from 10.0.0.66: bytes=32 time<1ms TTL=127

Ping statistics for 10.0.0.66:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>|
```

☐ Top

### Key Learning:

- 1.Subnet Mask Precision: The correct subnet mask (255.255.255.192) must be used consistently across all interfaces to prevent overlap errors - using a different mask like 255.0.0.0 causes the router to interpret networks incorrectly.
- 2.Interface Independence: Each subnet needs its own dedicated physical interface on the router with the appropriate gateway address (10.0.0.1, 10.0.0.65, etc.) to maintain proper network segmentation.
- 3.Connected Route Creation: A router automatically creates routing table entries for directly connected subnets, enabling communication between devices on different subnets without additional configuration.
- 4.Verification Through Connectivity: Successful pings between devices on different subnets confirms proper subnet implementation, interface configuration, and router functionality.