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Final Project

Autumn 2024

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Abstract

This project delves into the implementation of static routing in a simulated network environment. The network topology consists of interconnected devices such as routers, switches, and bridges, configured to ensure seamless packet delivery across different subnets. Manual static routing configurations are utilized to establish connectivity, and network performance is tested using ping and traceroute commands. This document explores the outcomes of these tests, analyzing the reasons for successful or unsuccessful communications, and demonstrates how static routing protocols enable effective data forwarding between distinct networks. Key findings highlight the intricacies of manual routing table setup and its impact on network functionality.

Introduction

The growing complexity of network infrastructures in various industries requires robust and precise configurations to ensure connectivity. Static routing, though simple in implementation, plays a fundamental role in network operations by explicitly defining the paths for data transmission between devices. This project explores a network topology designed for static routing, providing a hands-on approach to understanding how routing tables influence IP forwarding.

The simulation replicates a multi-network scenario using Packet Tracer, a versatile tool for designing and testing network configurations. Through this process, the relationship between network prefixes and IP forwarding is examined, emphasizing the critical role of manual configurations in network reliability and performance.

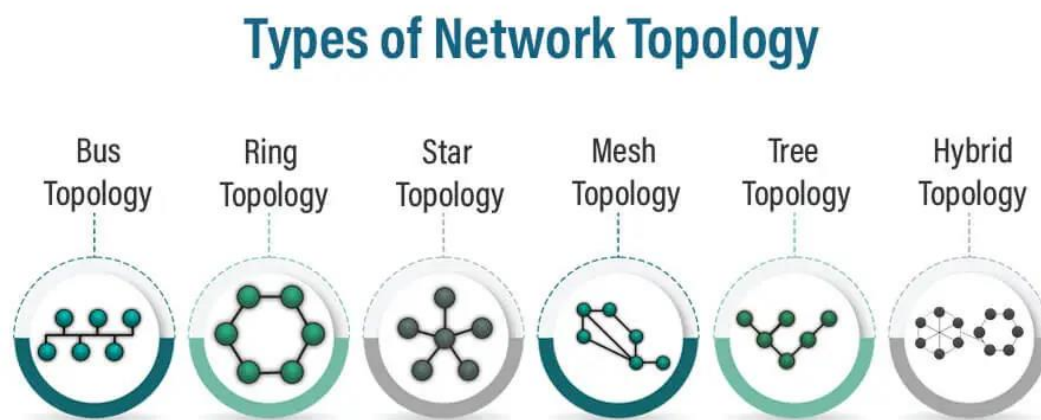


Figure 1 educba types-of-network-topology (August 3, 2023)



Figure 2: CISCO switch (CISCO, n.d.)

A network switch connects devices within a local area network (LAN) and facilitates communication between them by forwarding data to the appropriate device. It operates at Layer 2 of the OSI model, focusing on the transmission of data frames within the same network. Switches are a core component of modern networking, commonly used to manage connections in environments like homes, businesses, and data centers.



Figure 3 Cisco SPA122 Router (n.d)

Routers perform a different function by linking separate networks and managing the flow of data between them. Operating at Layer 3 of the OSI model, routers determine the best path for data to travel across networks, including connecting local networks to the internet. In many households, routers often include built-in wireless features, enabling both wired and wireless connections.

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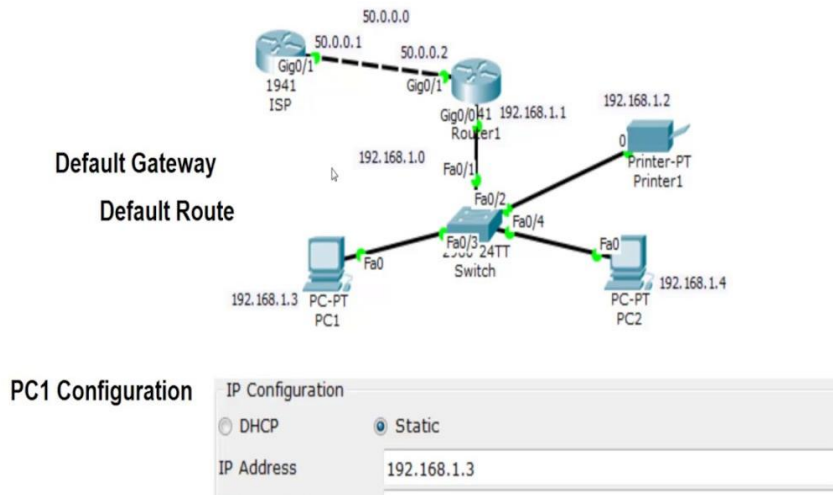


Figure 4 Cisco Router Basics - Default Gateway (2017)

The default gateway is the designated IP address used to direct traffic from a local network to other networks, such as the internet. When a device within the network needs to communicate with one outside its own subnet, it sends the data to the default gateway, which forwards it to its final destination.

Methodology:

We will start by configuring the interfaces on Router 1.

This is how the 10.0.1.0/24 and 10.0.4.0/24 interfaces were configured for the gigabit0/0 port on Router 1:

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface gigabit0/0
Router(config-if)#ip address 10.0.1.1 255.255.255.0
Router(config-if)#ip address 10.0.4.1 255.255.255.0
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

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

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The screenshot shows the configuration window for Router1. The 'Config' tab is active, and the 'INTERFACE' section is expanded, showing the configuration for GigabitEthernet0/0. The settings are as follows:

GigabitEthernet0/0	
Port Status	<input checked="" type="checkbox"/> On
Bandwidth	<input type="radio"/> 1000 Mbps <input checked="" type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto
Duplex	<input type="radio"/> Half Duplex <input checked="" type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto
MAC Address	00E0.A3D8.B601
IP Configuration	
IPv4 Address	10.0.4.1
Subnet Mask	255.255.255.0
Tx Ring Limit	10

Figure 5 (Router1)

This is how the 10.0.3.0/24 interface was configured for the gigabit0/1 port on Router 1:

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface gigabit0/1
Router(config-if)#ip address 10.0.3.1 255.255.255.0
Router(config-if)#no shutdown

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

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up

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

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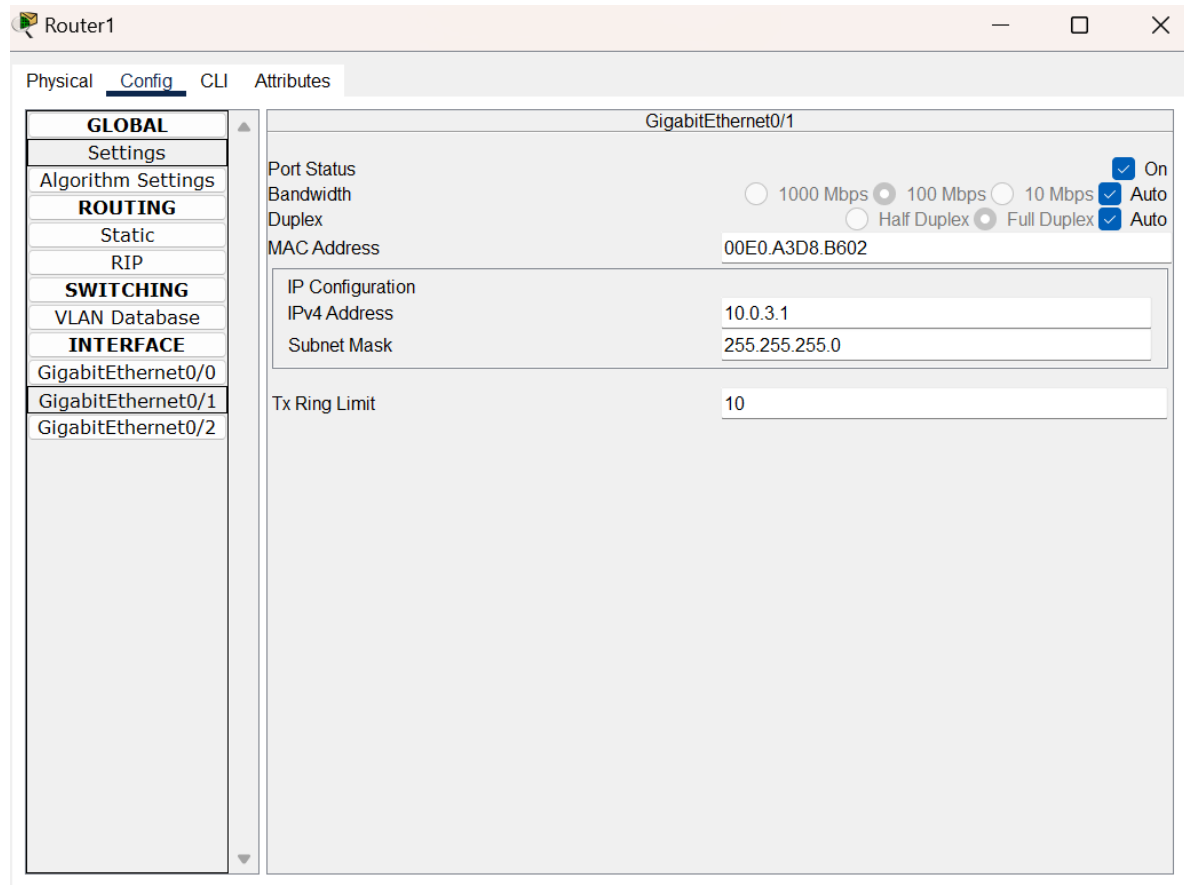


Figure 6 (Router0)

For Router 0,

the following procedure was performed to configure the 10.0.3.0/24 and 10.0.4.0/24 interfaces on Router 0:

For the gigabit0/0 port:

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface gigabit0/0
Router(config-if)#ip address 10.0.4.2/24 255.255.255.0
      ^
% Invalid input detected at '^' marker.

Router(config-if)#ip address 10.0.4.2 255.255.255.0
Router(config-if)#no shutdown
```

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The screenshot shows a web-based configuration interface for a router named 'Router0'. The interface has four tabs: 'Physical', 'Config' (selected), 'CLI', and 'Attributes'. On the left side, there is a navigation tree with the following categories: 'GLOBAL' (containing 'Settings'), 'ROUTING' (containing 'Algorithm Settings', 'Static', and 'RIP'), 'SWITCHING' (containing 'VLAN Database'), and 'INTERFACE' (containing 'GigabitEthernet0/0', 'GigabitEthernet0/1', and 'GigabitEthernet0/2'). The 'GigabitEthernet0/0' interface is selected, and its configuration is displayed in the main area. The configuration includes: 'Port Status' set to 'On' (checked), 'Bandwidth' set to '100 Mbps' (selected), 'Duplex' set to 'Full Duplex' (selected), 'MAC Address' set to '0090.0C3A.9301', 'IP Configuration' section with 'IPv4 Address' set to '10.0.4.2' and 'Subnet Mask' set to '255.255.255.0', and 'Tx Ring Limit' set to '10'.

Figure 7 (gigabit0)

For the gigabit0/1 of router 0:

```
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface gigabit0/1
Router(config-if)#ip address 10.0.3.2
% Incomplete command.
Router(config-if)#ip address 10.0.3.2 255.255.255.0
Router(config-if)#no shutdown
```

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The screenshot shows the configuration window for Router0. The 'Config' tab is active, and the 'INTERFACE' section is expanded, showing 'GigabitEthernet0/1'. The configuration for this interface is as follows:

GigabitEthernet0/1	
Port Status	<input checked="" type="checkbox"/> On
Bandwidth	<input type="radio"/> 1000 Mbps <input checked="" type="radio"/> 100 Mbps <input type="radio"/> 10 Mbps <input checked="" type="checkbox"/> Auto
Duplex	<input type="radio"/> Half Duplex <input checked="" type="radio"/> Full Duplex <input checked="" type="checkbox"/> Auto
MAC Address	0090.0C3A.9302
IP Configuration	
IPv4 Address	10.0.3.2
Subnet Mask	255.255.255.0
Tx Ring Limit	10

We configured the PCs as follows:

PC 2:

The screenshot shows the configuration window for PC2. The 'Config' tab is active, and the 'Global Settings' section is expanded. The configuration for this PC is as follows:

Global Settings	
Display Name	PC2
Interfaces	FastEthernet0
Gateway/DNS IPv4	
<input type="radio"/> DHCP <input checked="" type="radio"/> Static	
Default Gateway	10.0.3.1
DNS Server	
Gateway/DNS IPv6	
<input type="radio"/> Automatic <input checked="" type="radio"/> Static	
Default Gateway	
DNS Server	

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PC2

Physical Config Desktop Programming Attributes

GLOBAL

Settings

Algorithm Settings

INTERFACE

FastEthernet0

Bluetooth

FastEthernet0

Port Status ☒ On

Bandwidth ☐ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 00D0.FF29.46E6

IP Configuration

☐ DHCP

☒ Static

IPv4 Address 10.0.3.30

Subnet Mask 255.255.255.0

IPv6 Configuration

☐ Automatic

☒ Static

IPv6 Address

Link Local Address: FE80:2D0:FFFF:FE29:46E6

PC0:

PC0

Physical Config Desktop Programming Attributes

GLOBAL

Settings

Algorithm Settings

INTERFACE

FastEthernet0

Bluetooth

Global Settings

Display Name PC0

Interfaces FastEthernet0

Gateway/DNS IPv4

☐ DHCP

☒ Static

Default Gateway 10.0.4.2

DNS Server

Gateway/DNS IPv6

☐ Automatic

☒ Static

Default Gateway

DNS Server

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PC0

Physical **Config** Desktop Programming Attributes

GLOBAL

Settings

Algorithm Settings

INTERFACE

FastEthernet0

Bluetooth

FastEthernet0

Port Status ☒ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 000A.41B1.0AED

IP Configuration

☐ DHCP

☒ Static

IPv4 Address 10.0.4.40

Subnet Mask 255.255.255.0

IPv6 Configuration

☐ Automatic

☒ Static

IPv6 Address

Link Local Address: FE80::20A:41FF:FEB1:AED

PC1:

PC1

Physical **Config** Desktop Programming Attributes

GLOBAL

Settings

Algorithm Settings

INTERFACE

FastEthernet0

Bluetooth

Global Settings

Display Name PC1

Interfaces FastEthernet0

Gateway/DNS IPv4

☐ DHCP

☒ Static

Default Gateway 10.0.4.2

DNS Server

Gateway/DNS IPv6

☐ Automatic

☒ Static

Default Gateway

DNS Server

PC1

Physical **Config** Desktop Programming Attributes

GLOBAL

Settings

Algorithm Settings

INTERFACE

FastEthernet0

Bluetooth

FastEthernet0

Port Status ☒ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

MAC Address 0001.425D.3D73

IP Configuration

☐ DHCP

☒ Static

IPv4 Address 10.0.4.41

Subnet Mask 255.255.255.0

IPv6 Configuration

☐ Automatic

☒ Static

IPv6 Address

Link Local Address: FE80::201:42FF:FE5D:3D73

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To enable routing functionality, we configured the routers as follows:

We configured Router 1 (the one in the middle) as follows:

The screenshot shows the configuration interface for Router1. The 'Config' tab is active, and the 'Static Routes' section is selected. The configuration fields are as follows:

Field	Value
Network	10.0.4.0
Mask	255.255.255.0
Next Hop	10.0.3.2

Below the configuration fields is a list of configured static routes:

Network Address
10.0.4.0/24 via 10.0.3.2

Buttons for 'Add' and 'Remove' are located at the bottom right of the configuration area.

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We configured Router 0 (the one on the left) as follows:

The screenshot shows the configuration window for Router0. The window has a title bar with a router icon and the text "Router0". Below the title bar are four tabs: "Physical", "Config", "CLI", and "Attributes". The "Config" tab is selected. On the left side of the "Config" tab is a vertical sidebar with a tree view. The tree view has four main categories: "GLOBAL", "ROUTING", "SWITCHING", and "INTERFACE". Under "GLOBAL", there are "Settings" and "Algorithm Settings". Under "ROUTING", there are "Static" (which is highlighted with a blue background), "RIP", and "SWITCHING". Under "SWITCHING", there is "VLAN Database". Under "INTERFACE", there are "GigabitEthernet0/0", "GigabitEthernet0/1", and "GigabitEthernet0/2". The main area of the window is titled "Static Routes". It contains three input fields: "Network" with the value "10.0.1.0", "Mask" with the value "255.255.255.0", and "Next Hop" with the value "10.0.3.1". To the right of these fields is a blue "Add" button. Below these fields is a large white box with a thin border. Inside this box, the text "Network Address" is at the top left, and below it, the text "10.0.1.0/24 via 10.0.3.1" is displayed. At the bottom right of the window is a "Remove" button.

Router0

Physical Config CLI Attributes

GLOBAL

- Settings
- Algorithm Settings

ROUTING

- Static
- RIP

SWITCHING

- VLAN Database

INTERFACE

- GigabitEthernet0/0
- GigabitEthernet0/1
- GigabitEthernet0/2

Static Routes

Network 10.0.1.0

Mask 255.255.255.0

Next Hop 10.0.3.1

Add

Network Address

10.0.1.0/24 via 10.0.3.1

Remove

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Ping

PC0:

```
C:\>ping 10.0.1.10

Pinging 10.0.1.10 with 32 bytes of data:

Reply from 10.0.1.10: bytes=32 time=1ms TTL=126
Reply from 10.0.1.10: bytes=32 time=2ms TTL=126
Reply from 10.0.1.10: bytes=32 time<1ms TTL=126
Reply from 10.0.1.10: bytes=32 time=1ms TTL=126

Ping statistics for 10.0.1.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 1ms

C:\>ping 10.0.3.30

Pinging 10.0.3.30 with 32 bytes of data:

Reply from 10.0.3.30: bytes=32 time<1ms TTL=126
Reply from 10.0.3.30: bytes=32 time=9ms TTL=126
Reply from 10.0.3.30: bytes=32 time<1ms TTL=126
Reply from 10.0.3.30: bytes=32 time<1ms TTL=126

Ping statistics for 10.0.3.30:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 9ms, Average = 2ms

C:\>ping 10.0.4.41

Pinging 10.0.4.41 with 32 bytes of data:

Reply from 10.0.4.41: bytes=32 time=1ms TTL=128
Reply from 10.0.4.41: bytes=32 time=23ms TTL=128
Reply from 10.0.4.41: bytes=32 time=1ms TTL=128
Reply from 10.0.4.41: bytes=32 time=10ms TTL=128

Ping statistics for 10.0.4.41:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 23ms, Average = 8ms
```

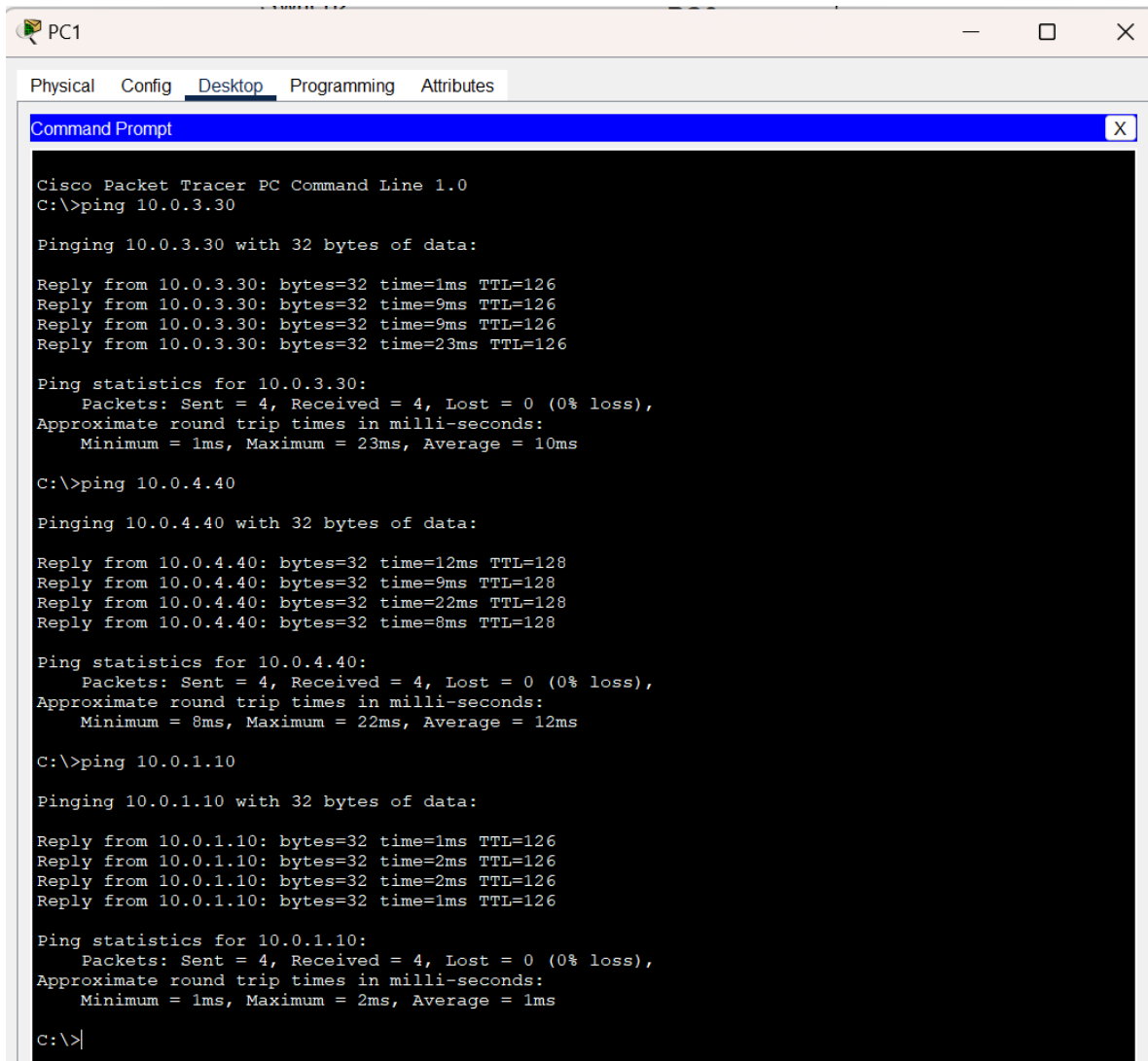
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PC1:



```
PC1
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.3.30

Pinging 10.0.3.30 with 32 bytes of data:

Reply from 10.0.3.30: bytes=32 time=1ms TTL=126
Reply from 10.0.3.30: bytes=32 time=9ms TTL=126
Reply from 10.0.3.30: bytes=32 time=9ms TTL=126
Reply from 10.0.3.30: bytes=32 time=23ms TTL=126

Ping statistics for 10.0.3.30:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 23ms, Average = 10ms

C:\>ping 10.0.4.40

Pinging 10.0.4.40 with 32 bytes of data:

Reply from 10.0.4.40: bytes=32 time=12ms TTL=128
Reply from 10.0.4.40: bytes=32 time=9ms TTL=128
Reply from 10.0.4.40: bytes=32 time=22ms TTL=128
Reply from 10.0.4.40: bytes=32 time=8ms TTL=128

Ping statistics for 10.0.4.40:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 8ms, Maximum = 22ms, Average = 12ms

C:\>ping 10.0.1.10

Pinging 10.0.1.10 with 32 bytes of data:

Reply from 10.0.1.10: bytes=32 time=1ms TTL=126
Reply from 10.0.1.10: bytes=32 time=2ms TTL=126
Reply from 10.0.1.10: bytes=32 time=2ms TTL=126
Reply from 10.0.1.10: bytes=32 time=1ms TTL=126

Ping statistics for 10.0.1.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>|
```

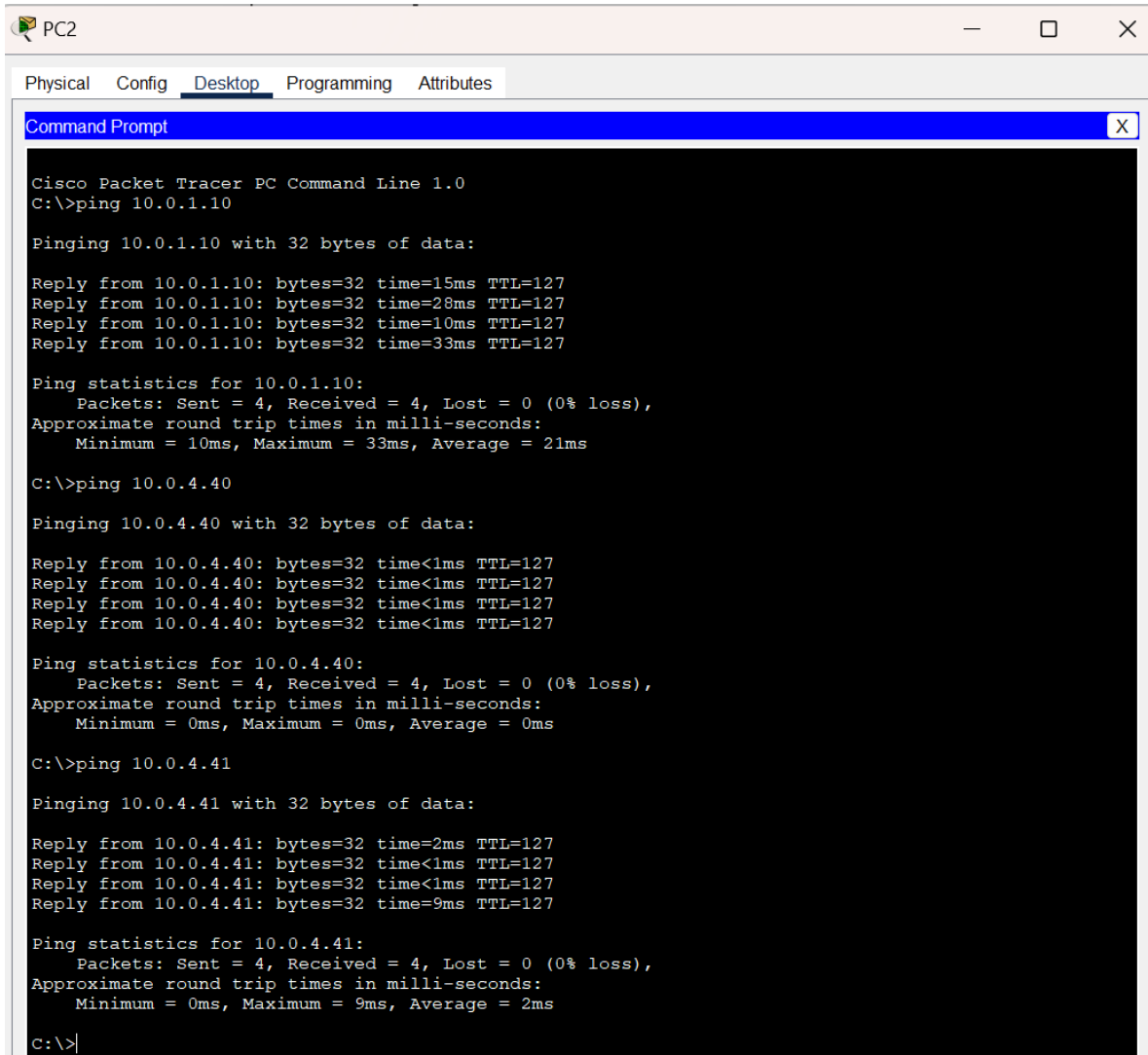
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PC2:



The screenshot shows a Cisco Packet Tracer PC Command Prompt window for PC2. The window has tabs for Physical, Config, Desktop, Programming, and Attributes, with Desktop selected. The Command Prompt displays the output of three ping commands: ping 10.0.1.10, ping 10.0.4.40, and ping 10.0.4.41. Each command shows four replies with varying times and TTL values, followed by ping statistics indicating 0% loss.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.1.10

Pinging 10.0.1.10 with 32 bytes of data:

Reply from 10.0.1.10: bytes=32 time=15ms TTL=127
Reply from 10.0.1.10: bytes=32 time=28ms TTL=127
Reply from 10.0.1.10: bytes=32 time=10ms TTL=127
Reply from 10.0.1.10: bytes=32 time=33ms TTL=127

Ping statistics for 10.0.1.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 10ms, Maximum = 33ms, Average = 21ms

C:\>ping 10.0.4.40

Pinging 10.0.4.40 with 32 bytes of data:

Reply from 10.0.4.40: bytes=32 time<1ms TTL=127
Reply from 10.0.4.40: bytes=32 time<1ms TTL=127
Reply from 10.0.4.40: bytes=32 time<1ms TTL=127
Reply from 10.0.4.40: bytes=32 time<1ms TTL=127

Ping statistics for 10.0.4.40:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 10.0.4.41

Pinging 10.0.4.41 with 32 bytes of data:

Reply from 10.0.4.41: bytes=32 time=2ms TTL=127
Reply from 10.0.4.41: bytes=32 time<1ms TTL=127
Reply from 10.0.4.41: bytes=32 time<1ms TTL=127
Reply from 10.0.4.41: bytes=32 time=9ms TTL=127

Ping statistics for 10.0.4.41:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 9ms, Average = 2ms

C:\>|
```

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PC3:

```
PC3
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.3.30

Pinging 10.0.3.30 with 32 bytes of data:

Reply from 10.0.3.30: bytes=32 time=25ms TTL=127
Reply from 10.0.3.30: bytes=32 time<1ms TTL=127
Reply from 10.0.3.30: bytes=32 time=20ms TTL=127
Reply from 10.0.3.30: bytes=32 time=1ms TTL=127

Ping statistics for 10.0.3.30:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 25ms, Average = 11ms

C:\>ping 10.0.4.40

Pinging 10.0.4.40 with 32 bytes of data:

Reply from 10.0.4.40: bytes=32 time<1ms TTL=126
Reply from 10.0.4.40: bytes=32 time=2ms TTL=126
Reply from 10.0.4.40: bytes=32 time=23ms TTL=126
Reply from 10.0.4.40: bytes=32 time=9ms TTL=126

Ping statistics for 10.0.4.40:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 23ms, Average = 8ms

C:\>ping 10.0.4.41

Pinging 10.0.4.41 with 32 bytes of data:

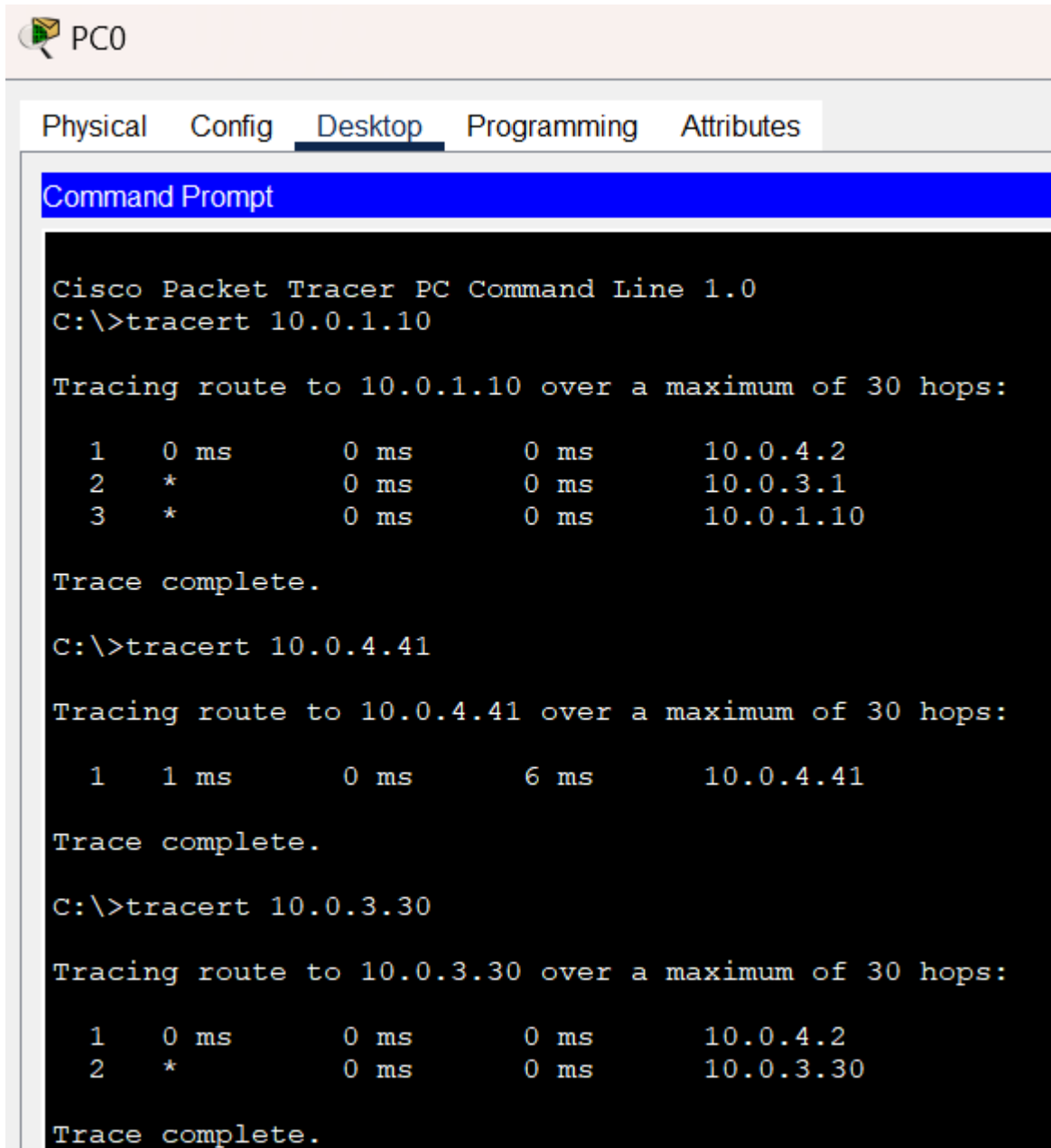
Reply from 10.0.4.41: bytes=32 time=1ms TTL=126
Reply from 10.0.4.41: bytes=32 time=21ms TTL=126
Reply from 10.0.4.41: bytes=32 time=9ms TTL=126
Reply from 10.0.4.41: bytes=32 time=24ms TTL=126

Ping statistics for 10.0.4.41:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 24ms, Average = 13ms
```


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TRACERT

PC0:



The screenshot shows the PC0 interface in Cisco Packet Tracer. The 'Desktop' tab is selected, displaying a 'Command Prompt' window. The window title is 'Cisco Packet Tracer PC Command Line 1.0'. The command prompt shows three traceroute commands and their results:

```
C:\>tracert 10.0.1.10

Tracing route to 10.0.1.10 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      10.0.4.2
  2    *         0 ms      0 ms      10.0.3.1
  3    *         0 ms      0 ms      10.0.1.10

Trace complete.

C:\>tracert 10.0.4.41

Tracing route to 10.0.4.41 over a maximum of 30 hops:

  1    1 ms      0 ms      6 ms      10.0.4.41

Trace complete.

C:\>tracert 10.0.3.30

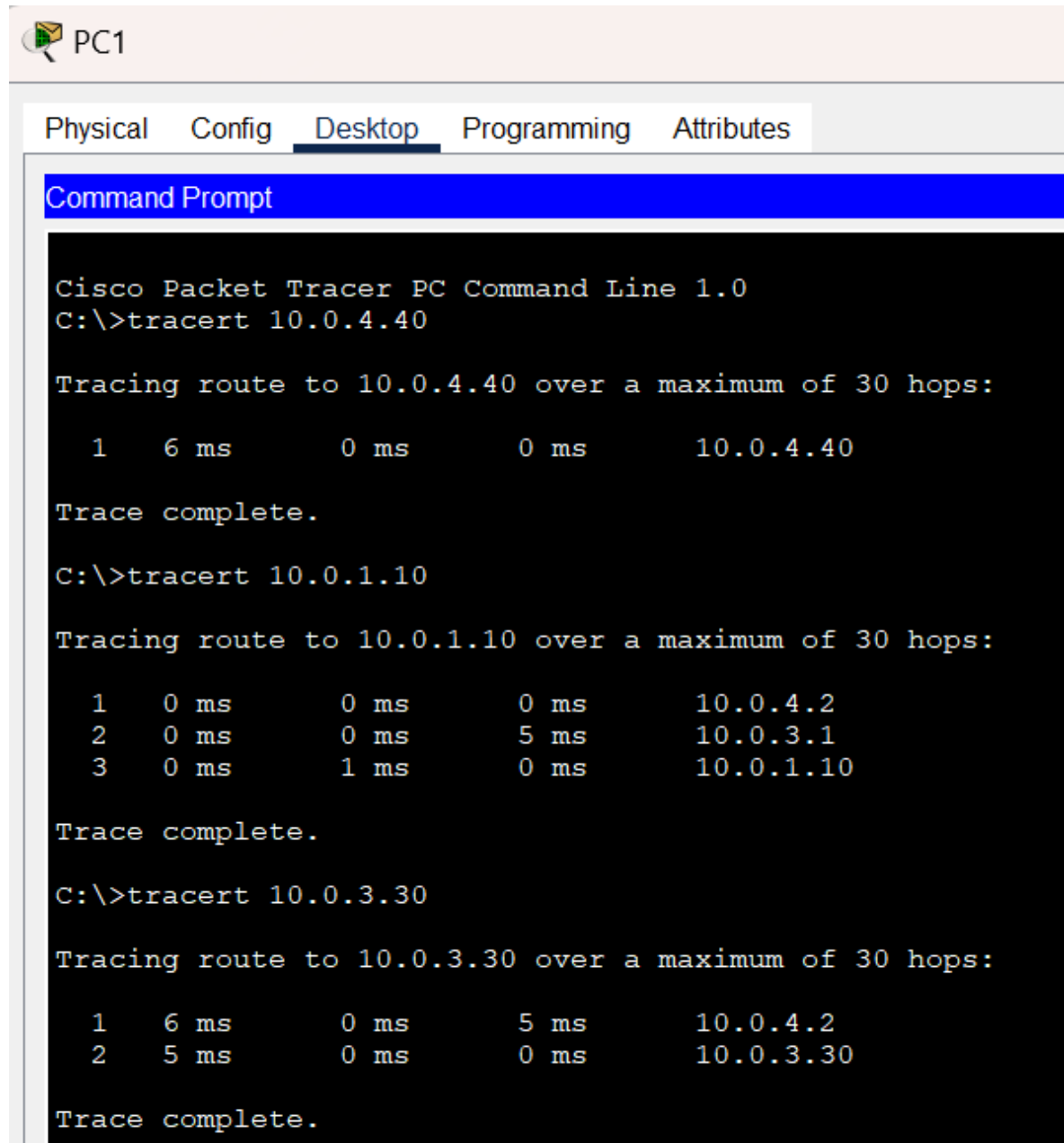
Tracing route to 10.0.3.30 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      10.0.4.2
  2    *         0 ms      0 ms      10.0.3.30

Trace complete.
```

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PC1:



The screenshot shows the 'PC1' window with the 'Desktop' tab selected. A 'Command Prompt' window is open, displaying the following text:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>tracert 10.0.4.40

Tracing route to 10.0.4.40 over a maximum of 30 hops:

  1    6 ms    0 ms    0 ms    10.0.4.40

Trace complete.

C:\>tracert 10.0.1.10

Tracing route to 10.0.1.10 over a maximum of 30 hops:

  1    0 ms    0 ms    0 ms    10.0.4.2
  2    0 ms    0 ms    5 ms    10.0.3.1
  3    0 ms    1 ms    0 ms    10.0.1.10

Trace complete.

C:\>tracert 10.0.3.30

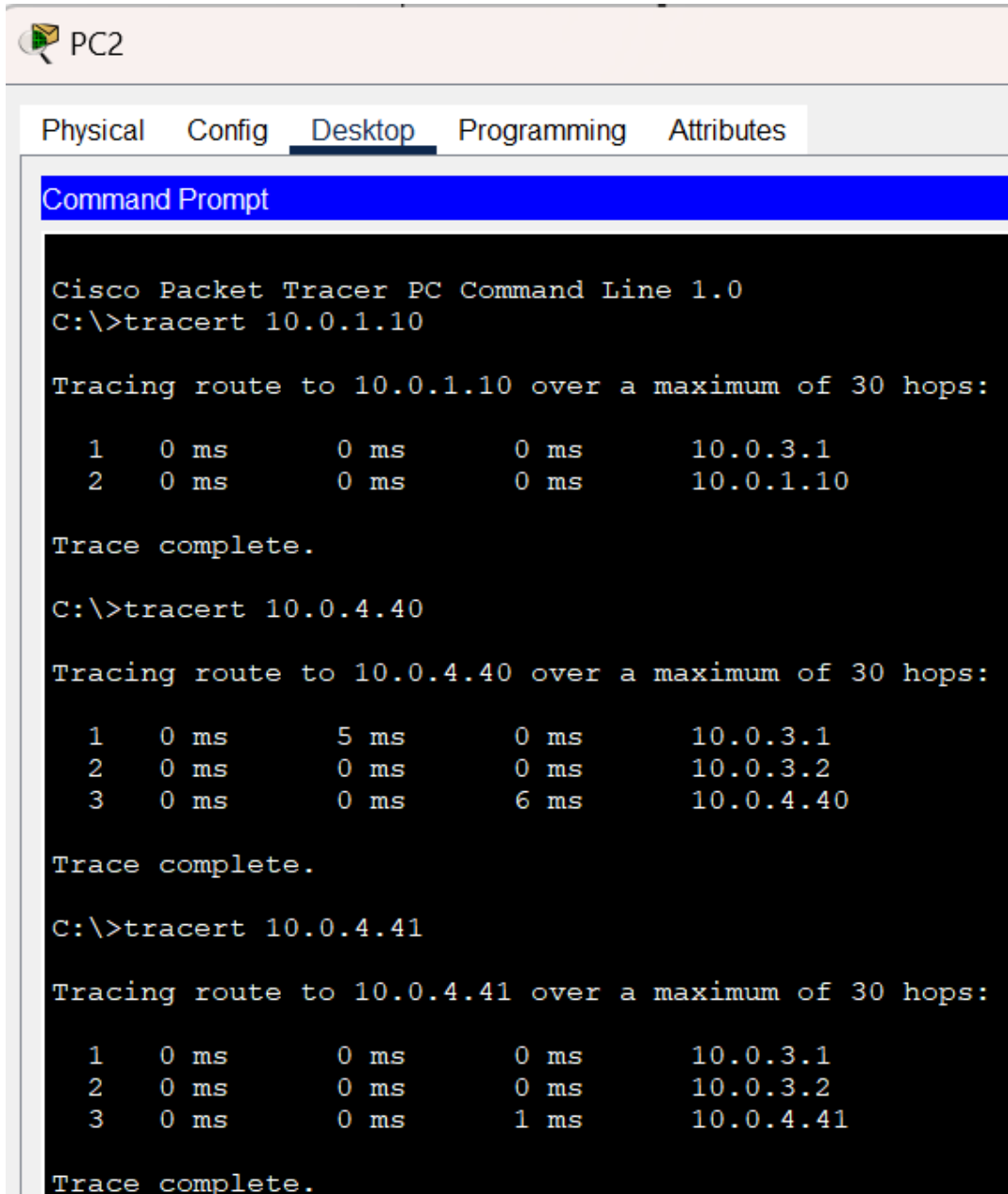
Tracing route to 10.0.3.30 over a maximum of 30 hops:

  1    6 ms    0 ms    5 ms    10.0.4.2
  2    5 ms    0 ms    0 ms    10.0.3.30

Trace complete.
```

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PC2:



The screenshot shows the 'PC2' window with the 'Desktop' tab selected. A 'Command Prompt' window is open, displaying the output of three traceroute commands. The first command is 'tracert 10.0.1.10', which shows a two-hop path from 10.0.3.1 to 10.0.1.10. The second command is 'tracert 10.0.4.40', which shows a three-hop path from 10.0.3.1 to 10.0.3.2 to 10.0.4.40. The third command is 'tracert 10.0.4.41', which shows a three-hop path from 10.0.3.1 to 10.0.3.2 to 10.0.4.41. All paths show 0 ms latency for the first two hops and 1 ms for the third hop.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>tracert 10.0.1.10

Tracing route to 10.0.1.10 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      10.0.3.1
  2    0 ms      0 ms      0 ms      10.0.1.10

Trace complete.

C:\>tracert 10.0.4.40

Tracing route to 10.0.4.40 over a maximum of 30 hops:

  1    0 ms      5 ms      0 ms      10.0.3.1
  2    0 ms      0 ms      0 ms      10.0.3.2
  3    0 ms      0 ms      6 ms      10.0.4.40

Trace complete.

C:\>tracert 10.0.4.41

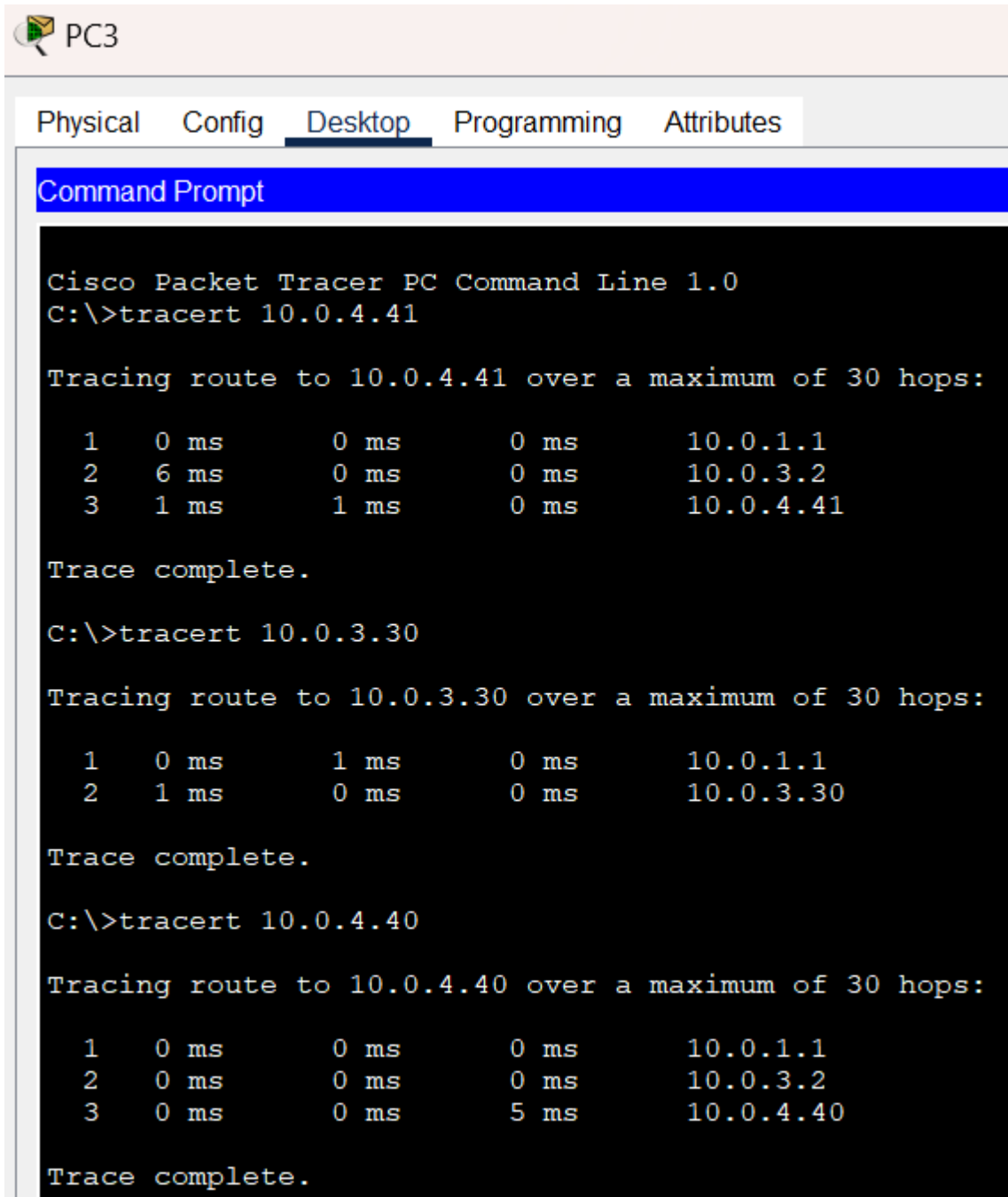
Tracing route to 10.0.4.41 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      10.0.3.1
  2    0 ms      0 ms      0 ms      10.0.3.2
  3    0 ms      0 ms      1 ms      10.0.4.41

Trace complete.
```

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PC3:



The screenshot shows the PC3 interface in Cisco Packet Tracer. The 'Desktop' tab is selected, displaying a Command Prompt window. The window title is 'PC3'. The Command Prompt shows three traceroute commands and their results.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>tracert 10.0.4.41

Tracing route to 10.0.4.41 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      10.0.1.1
  2    6 ms      0 ms      0 ms      10.0.3.2
  3    1 ms      1 ms      0 ms      10.0.4.41

Trace complete.

C:\>tracert 10.0.3.30

Tracing route to 10.0.3.30 over a maximum of 30 hops:

  1    0 ms      1 ms      0 ms      10.0.1.1
  2    1 ms      0 ms      0 ms      10.0.3.30

Trace complete.

C:\>tracert 10.0.4.40

Tracing route to 10.0.4.40 over a maximum of 30 hops:

  1    0 ms      0 ms      0 ms      10.0.1.1
  2    0 ms      0 ms      0 ms      10.0.3.2
  3    0 ms      0 ms      5 ms      10.0.4.40

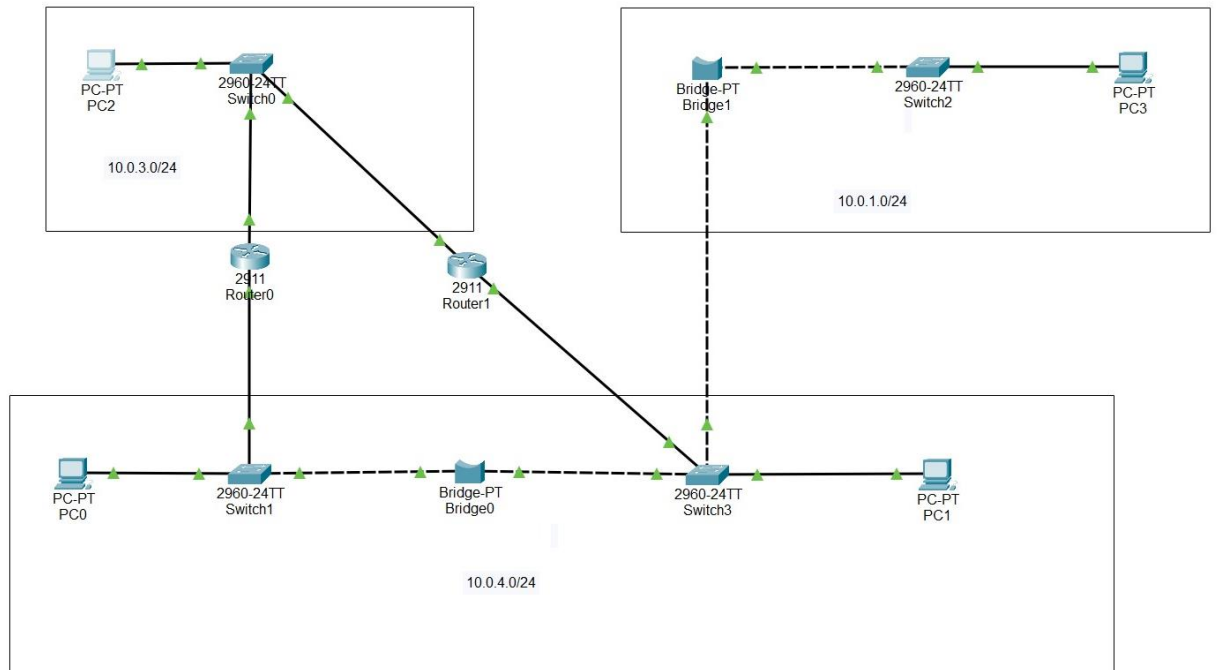
Trace complete.
```

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Results and Discussion

This network diagram showcases a segmented topology where we have implemented a structured communication system using routers, switches, bridges, and PCs. Here's how we configured and designed the network:

1. PC2 Network (Top Left):

- We connected PC2 to Switch0, assigning it to the 10.0.3.0/24 network.
- Switch0 routes traffic through Router0, facilitating communication with other network segments.

2. Router0 (Middle Left):

- We configured Router0 to connect the 10.0.3.0/24 network (via Switch0) and the 10.0.4.0/24 network.
- Router0 serves as a gateway between PC2 and the central Router1.

3. Central Router1:

- We set up Router1 as the core connection point, linking three main networks:
 - 10.0.3.0/24 (connecting via Router0).
 - 10.0.4.0/24 (linking through Bridge0 and Switch3).
 - 10.0.1.0/24 (connected via Switch2 and PC3).

4. PC0 Network (Bottom Left):

- We included PC0 in the 10.0.4.0/24 network by connecting it through Switch1 and Bridge0.
- This setup ensures that PC0 can communicate across the entire topology via Router1.

5. PC3 Network (Top Right):

- We added PC3 to the 10.0.1.0/24 network, linking it to Switch2.
- Router1 manages PC3's communication with other network segments.

6. PC1 Network (Bottom Right):

- We placed PC1 in the 10.0.4.0/24 network, connecting it through Switch3 and Bridge0 to Router1.

Overall Functionality:

We designed this topology to ensure seamless communication between networks while maintaining a clear segmentation for efficient routing. The combination of routers and switches allows for scalability, and we leveraged bridges to enhance network connectivity. This approach ensures that every device can reach its intended destination while minimizing broadcast traffic and maintaining network organization.

Conclusions:

This project effectively demonstrates the role of static routing in network design. By manually configuring routing tables, devices were able to communicate across subnets with minimal latency. The use of Packet Tracer provided a practical understanding of network topology, IP addressing, and routing protocols. The project highlights the importance of meticulous planning and configuration in ensuring network reliability.

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Video Link:

<https://www.youtube.com/watch?v=KjA2eNrty-M>