



Department of Computer Science and Engineering
Islamic University of Technology (IUT)
A subsidiary organ of OIC

Lab Report 04

CSE 4412: Data Communication and Networking Lab

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Section: B(Even)

Semester: 4th(Summer)

Academic Year: 2022-2023

Date of Submission: 17th February 2024

Title: Understanding the basics of Inter-VLAN communication using Router, L3 Switch along with basics of Static Routing

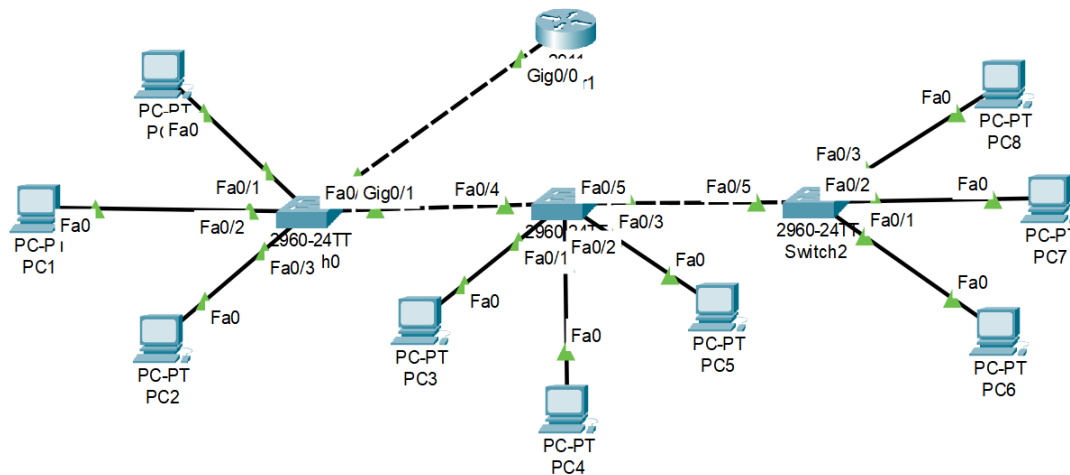
Objectives:

1. Design and implement Inter-VLAN routing using Router on a stick
2. Design and implement Inter-VLAN routing using Multilayer Switch
3. Understand and implement Static Routing

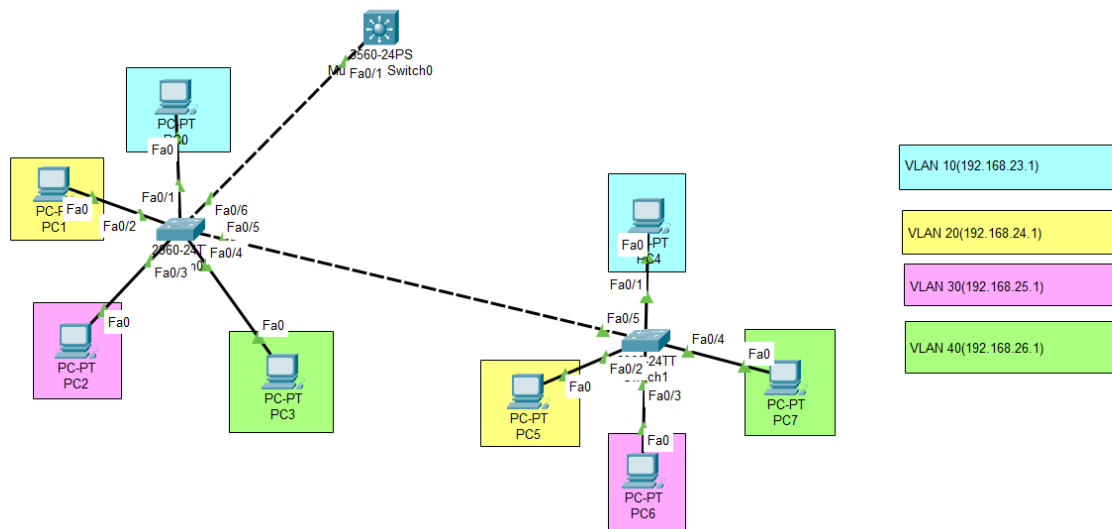
Diagram of the experiment:

(Provide screenshot of the final network topology. Make sure to label the network components.)

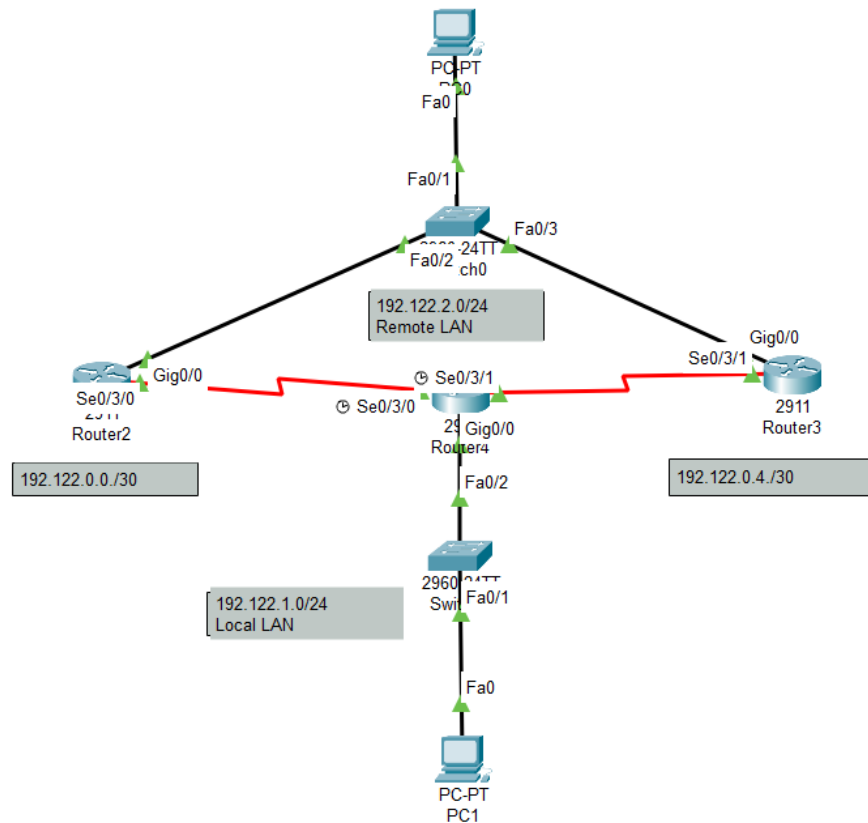
TASK 1:



TASK 2:



TASK 3:



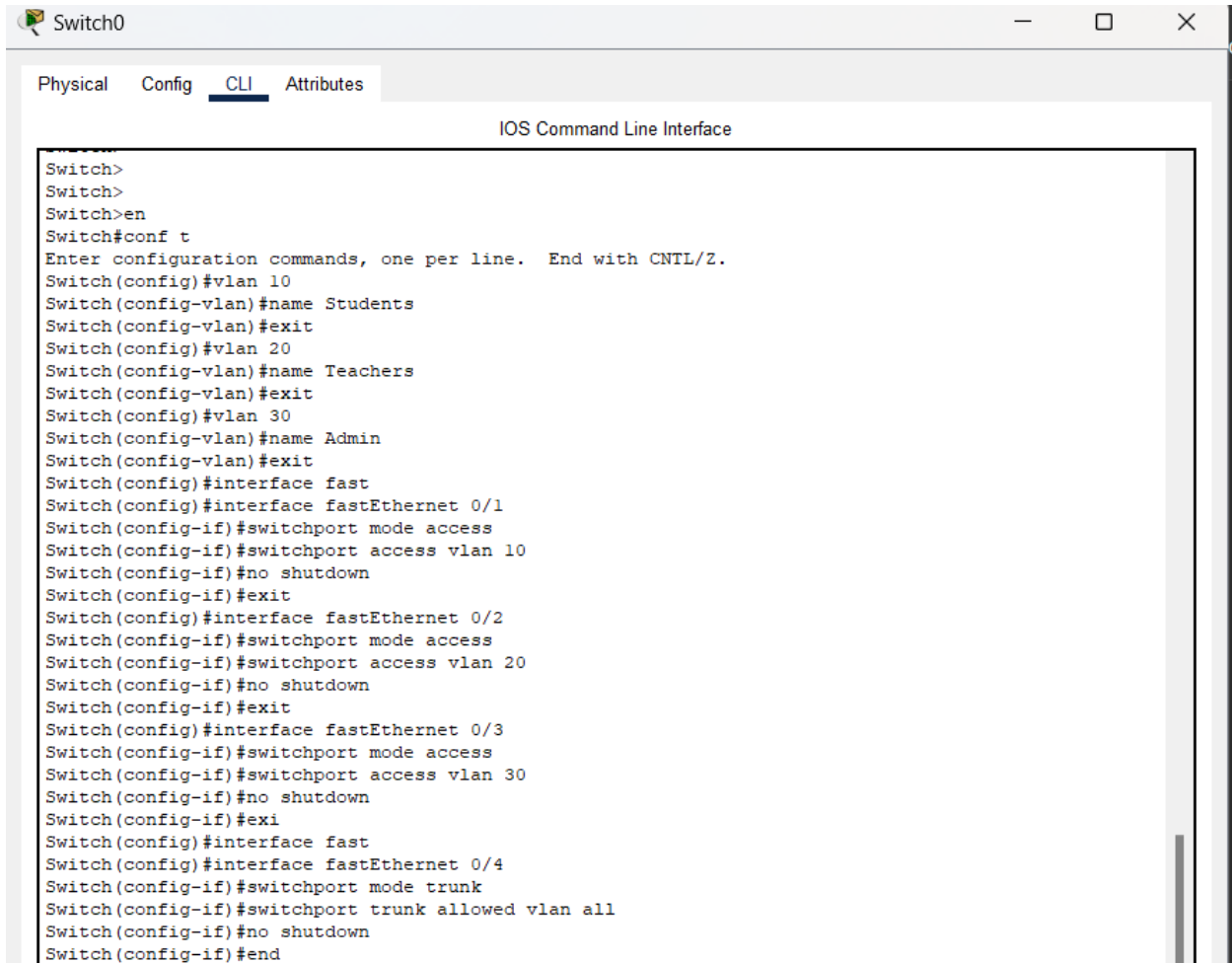
Working Procedure:

(Explain in brief how you completed the tasks. Provide necessary screenshots of used commands for each task.)

TASK 1:

For the switch configurations:

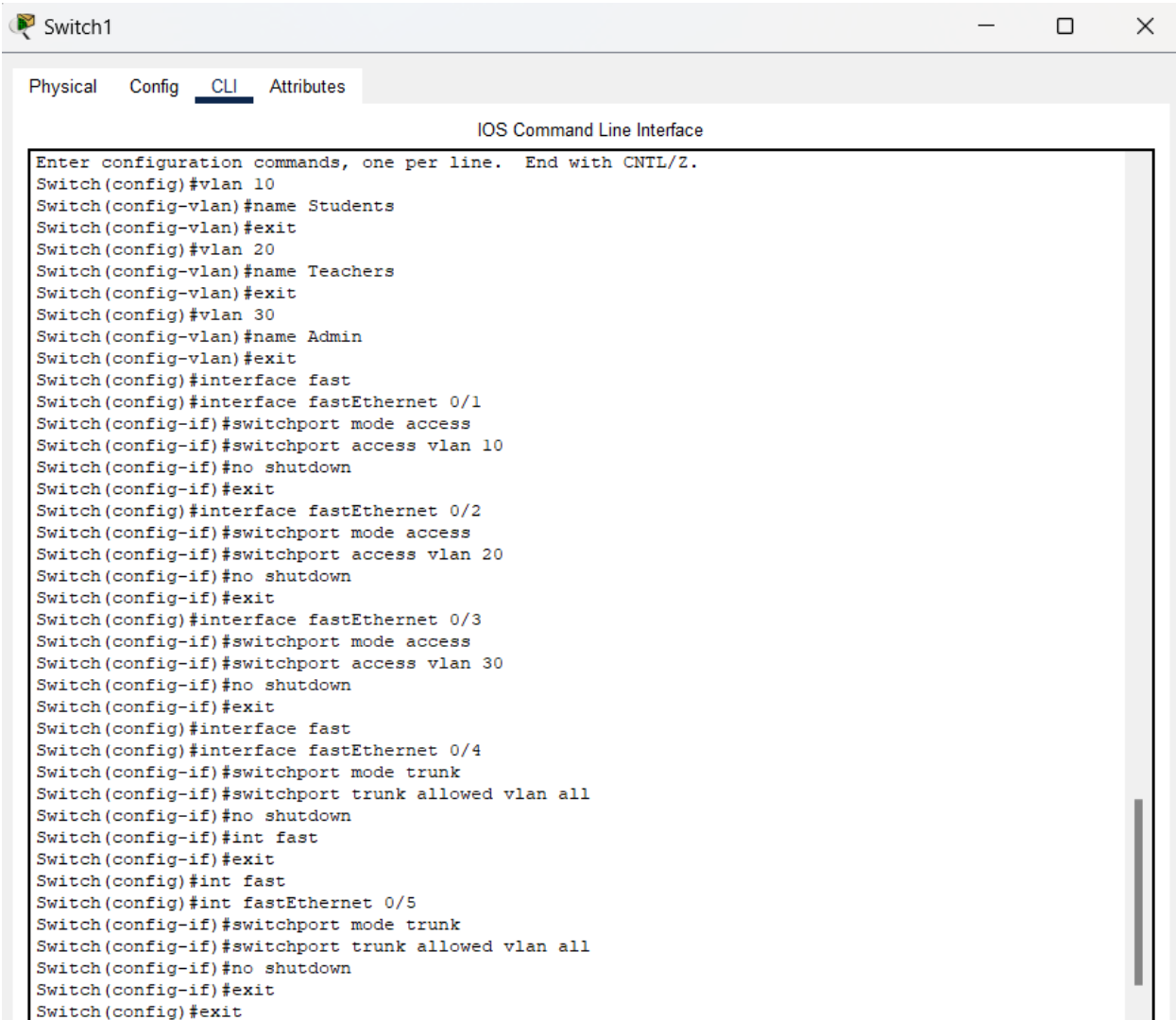
SWITCH0:



```
Switch0
Physical Config CLI Attributes
IOS Command Line Interface

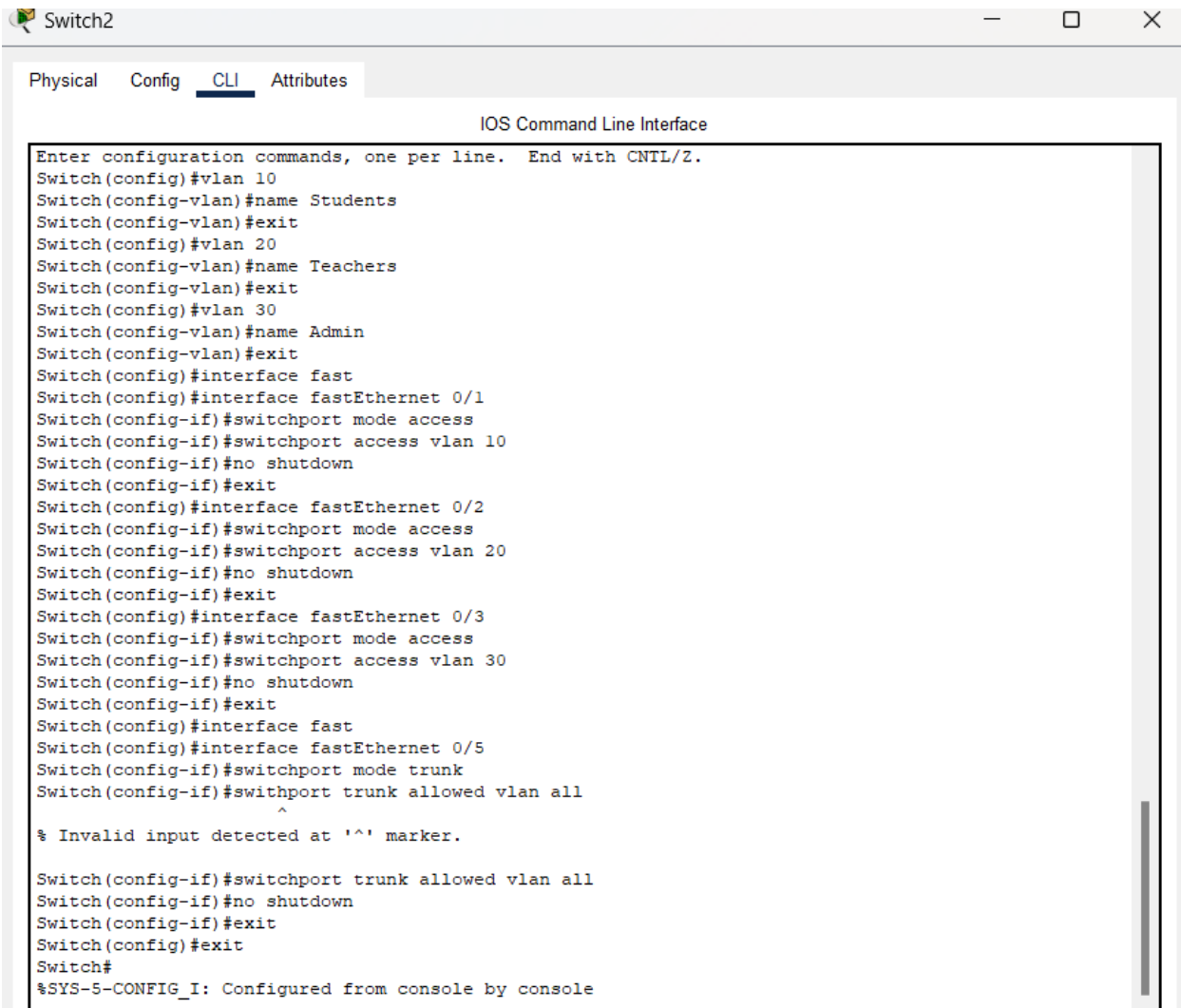
Switch>
Switch>
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name Students
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name Teachers
Switch(config-vlan)#exit
Switch(config)#vlan 30
Switch(config-vlan)#name Admin
Switch(config-vlan)#exit
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 30
Switch(config-if)#no shutdown
Switch(config-if)#exi
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/4
Switch(config-if)#switchport mode trunk
Switch(config-if)#switchport trunk allowed vlan all
Switch(config-if)#no shutdown
Switch(config-if)#end
```

SWITCH1:



```
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name Students
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name Teachers
Switch(config-vlan)#exit
Switch(config)#vlan 30
Switch(config-vlan)#name Admin
Switch(config-vlan)#exit
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 30
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/4
Switch(config-if)#switchport mode trunk
Switch(config-if)#switchport trunk allowed vlan all
Switch(config-if)#no shutdown
Switch(config-if)#int fast
Switch(config-if)#exit
Switch(config)#int fast
Switch(config)#int fastEthernet 0/5
Switch(config-if)#switchport mode trunk
Switch(config-if)#switchport trunk allowed vlan all
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#exit
```

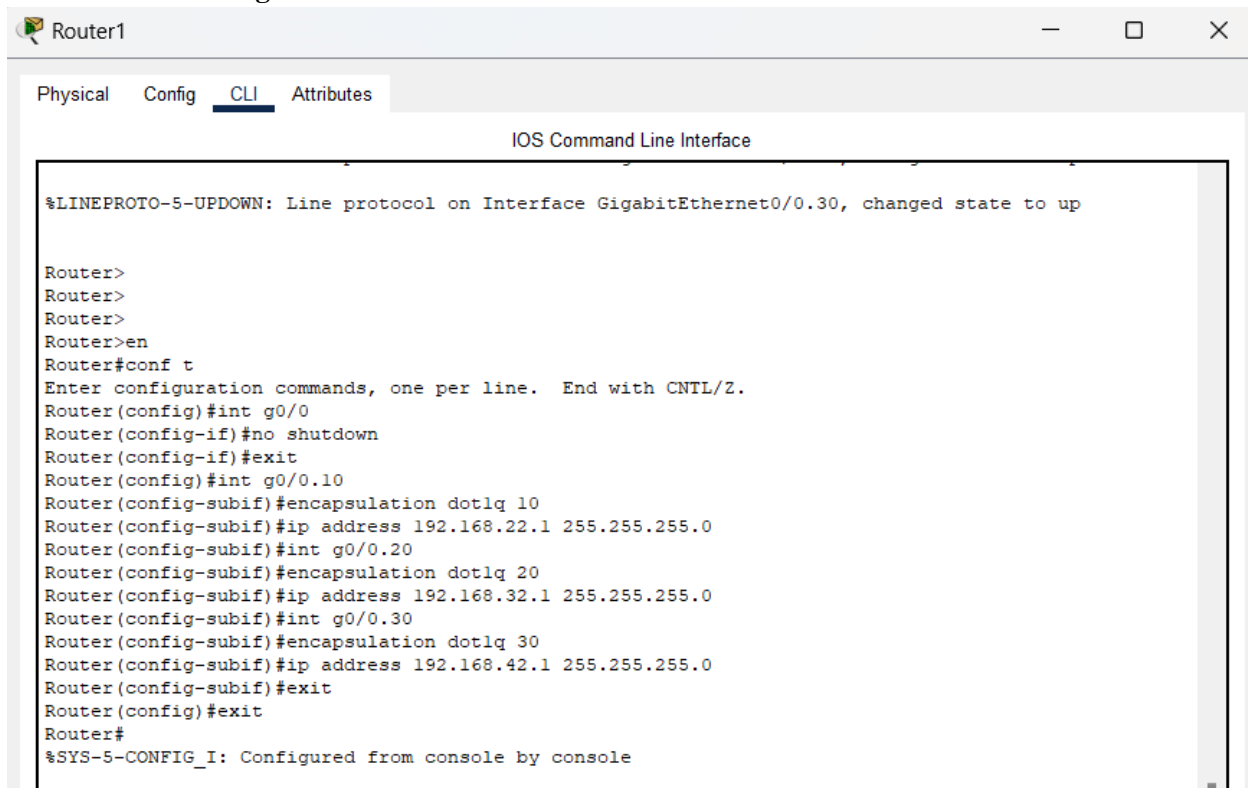
SWITCH2:



```
Switch2
Physical Config CLI Attributes
IOS Command Line Interface
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name Students
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name Teachers
Switch(config-vlan)#exit
Switch(config)#vlan 30
Switch(config-vlan)#name Admin
Switch(config-vlan)#exit
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 30
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/5
Switch(config-if)#switchport mode trunk
Switch(config-if)#switchport trunk allowed vlan all
^
% Invalid input detected at '^' marker.

Switch(config-if)#switchport trunk allowed vlan all
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console
```

For the router configuration:

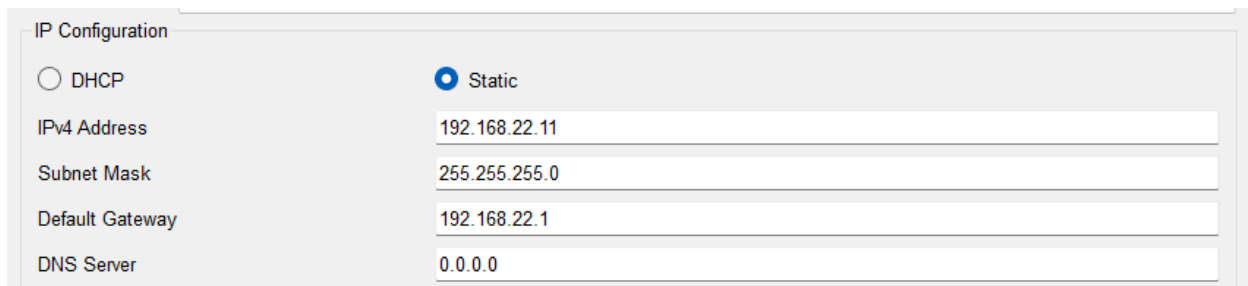


The screenshot shows the Router1 CLI interface with the following commands and output:

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.30, changed state to up

Router>
Router>
Router>
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int g0/0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#int g0/0.10
Router(config-subif)#encapsulation dot1q 10
Router(config-subif)#ip address 192.168.22.1 255.255.255.0
Router(config-subif)#int g0/0.20
Router(config-subif)#encapsulation dot1q 20
Router(config-subif)#ip address 192.168.32.1 255.255.255.0
Router(config-subif)#int g0/0.30
Router(config-subif)#encapsulation dot1q 30
Router(config-subif)#ip address 192.168.42.1 255.255.255.0
Router(config-subif)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

The PCs for VLAN 10:

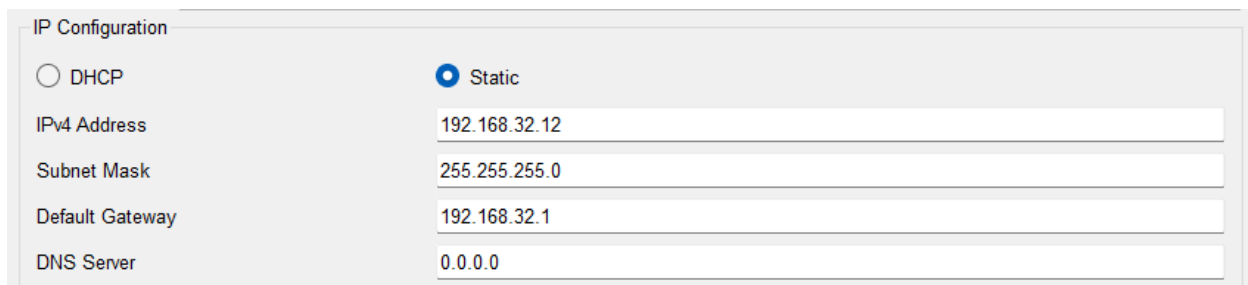


The screenshot shows the IP Configuration form for a PC in VLAN 10. The configuration is as follows:

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	192.168.22.11
Subnet Mask	255.255.255.0
Default Gateway	192.168.22.1
DNS Server	0.0.0.0

(The rest of the pcs of vlan 10 are configured like this as well.)

The PCs for VLAN 20:



The screenshot shows the IP Configuration form for a PC in VLAN 20. The configuration is as follows:

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	192.168.32.12
Subnet Mask	255.255.255.0
Default Gateway	192.168.32.1
DNS Server	0.0.0.0

(The rest of the pcs of vlan 20 are configured like this as well.)

The PCs for VLAN 30:

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	192.168.42.13
Subnet Mask	255.255.255.0
Default Gateway	192.168.42.1
DNS Server	0.0.0.0

(The rest of the pcs of vlan 30 are configured like this as well.)

Pinging PC from the VLAN 10 to other PC in VLAN 10 and to the PCs of the other VLANs:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.22.14

Pinging 192.168.22.14 with 32 bytes of data:

Reply from 192.168.22.14: bytes=32 time<1ms TTL=128
Reply from 192.168.22.14: bytes=32 time<1ms TTL=128
Reply from 192.168.22.14: bytes=32 time<1ms TTL=128
Reply from 192.168.22.14: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.22.14:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.32.12

Pinging 192.168.32.12 with 32 bytes of data:

Reply from 192.168.32.12: bytes=32 time<1ms TTL=127
Reply from 192.168.32.12: bytes=32 time<1ms TTL=127
Reply from 192.168.32.12: bytes=32 time<1ms TTL=127
Reply from 192.168.32.12: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.32.12:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.42.19

Pinging 192.168.42.19 with 32 bytes of data:

Request timed out.
Reply from 192.168.42.19: bytes=32 time<1ms TTL=127
Reply from 192.168.42.19: bytes=32 time<1ms TTL=127
Reply from 192.168.42.19: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.42.19:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Pinging PC from the VLAN 20 to other PC in VLAN 20 and to the PCs of the other VLANs:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.32.15

Pinging 192.168.32.15 with 32 bytes of data:

Reply from 192.168.32.15: bytes=32 time=10ms TTL=128
Reply from 192.168.32.15: bytes=32 time=10ms TTL=128
Reply from 192.168.32.15: bytes=32 time=8ms TTL=128
Reply from 192.168.32.15: bytes=32 time=9ms TTL=128

Ping statistics for 192.168.32.15:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 8ms, Maximum = 10ms, Average = 9ms

C:\>ping 192.168.22.17

Pinging 192.168.22.17 with 32 bytes of data:

Request timed out.
Reply from 192.168.22.17: bytes=32 time<1ms TTL=127
Reply from 192.168.22.17: bytes=32 time=1ms TTL=127
Reply from 192.168.22.17: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.22.17:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.42.16

Pinging 192.168.42.16 with 32 bytes of data:

Request timed out.
Reply from 192.168.42.16: bytes=32 time=1ms TTL=127
Reply from 192.168.42.16: bytes=32 time<1ms TTL=127
Reply from 192.168.42.16: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.42.16:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Pinging PC from the VLAN 30 to other PC in VLAN 30 and to the PCs of the other VLANs:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.42.13

Pinging 192.168.42.13 with 32 bytes of data:

Reply from 192.168.42.13: bytes=32 time<1ms TTL=128
Reply from 192.168.42.13: bytes=32 time<1ms TTL=128
Reply from 192.168.42.13: bytes=32 time<1ms TTL=128
Reply from 192.168.42.13: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.42.13:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.22.17

Pinging 192.168.22.17 with 32 bytes of data:

Reply from 192.168.22.17: bytes=32 time<1ms TTL=127
Reply from 192.168.22.17: bytes=32 time<1ms TTL=127
Reply from 192.168.22.17: bytes=32 time<1ms TTL=127
Reply from 192.168.22.17: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.22.17:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.32.18

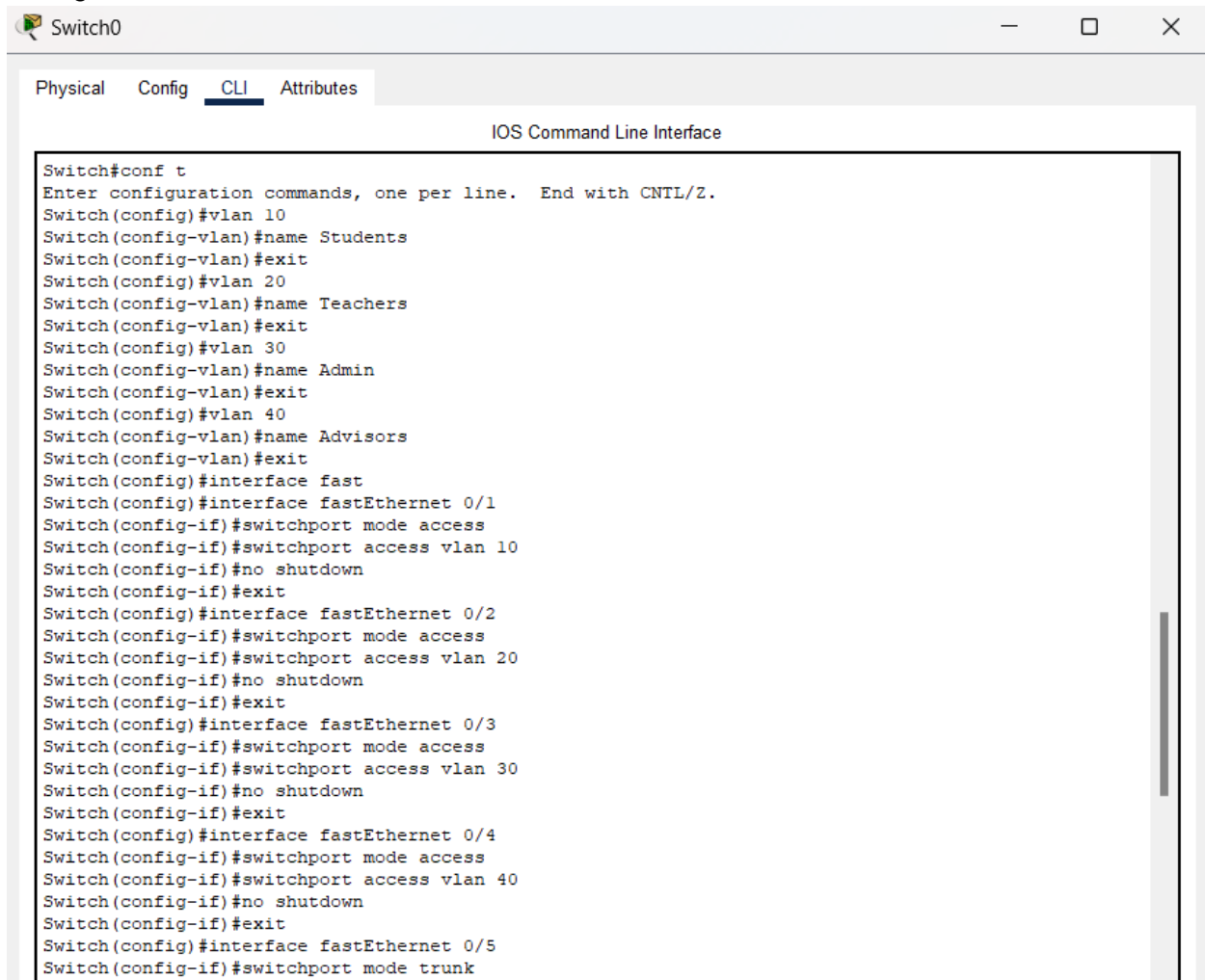
Pinging 192.168.32.18 with 32 bytes of data:

Request timed out.
Reply from 192.168.32.18: bytes=32 time<1ms TTL=127
Reply from 192.168.32.18: bytes=32 time<1ms TTL=127
Reply from 192.168.32.18: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.32.18:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

TASK 2:

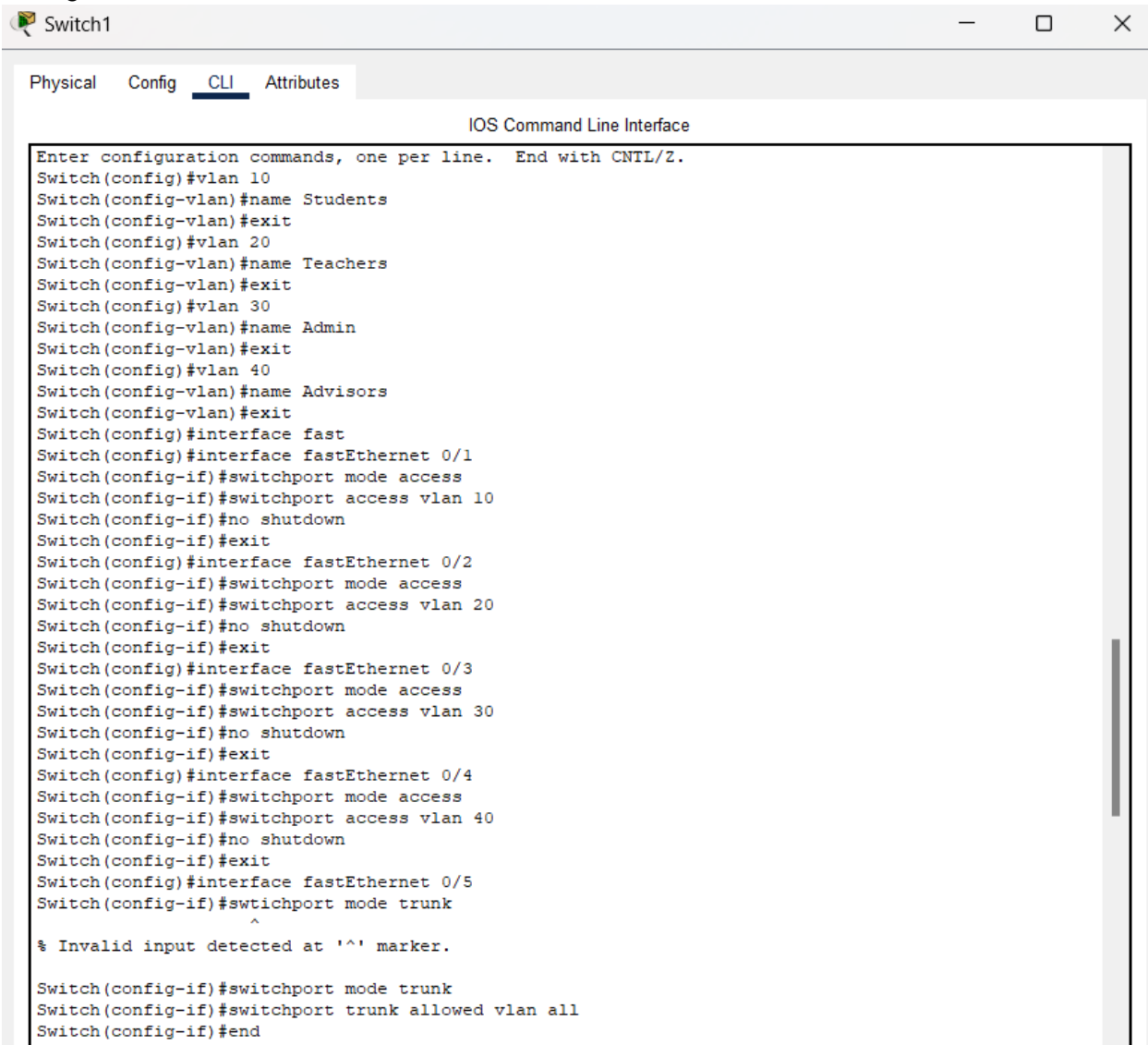
Configure Switch0:



```
Switch0
Physical Config CLI Attributes
IOS Command Line Interface

Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name Students
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name Teachers
Switch(config-vlan)#exit
Switch(config)#vlan 30
Switch(config-vlan)#name Admin
Switch(config-vlan)#exit
Switch(config)#vlan 40
Switch(config-vlan)#name Advisors
Switch(config-vlan)#exit
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 30
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/4
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 40
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/5
Switch(config-if)#switchport mode trunk
```

Configure Switch1:

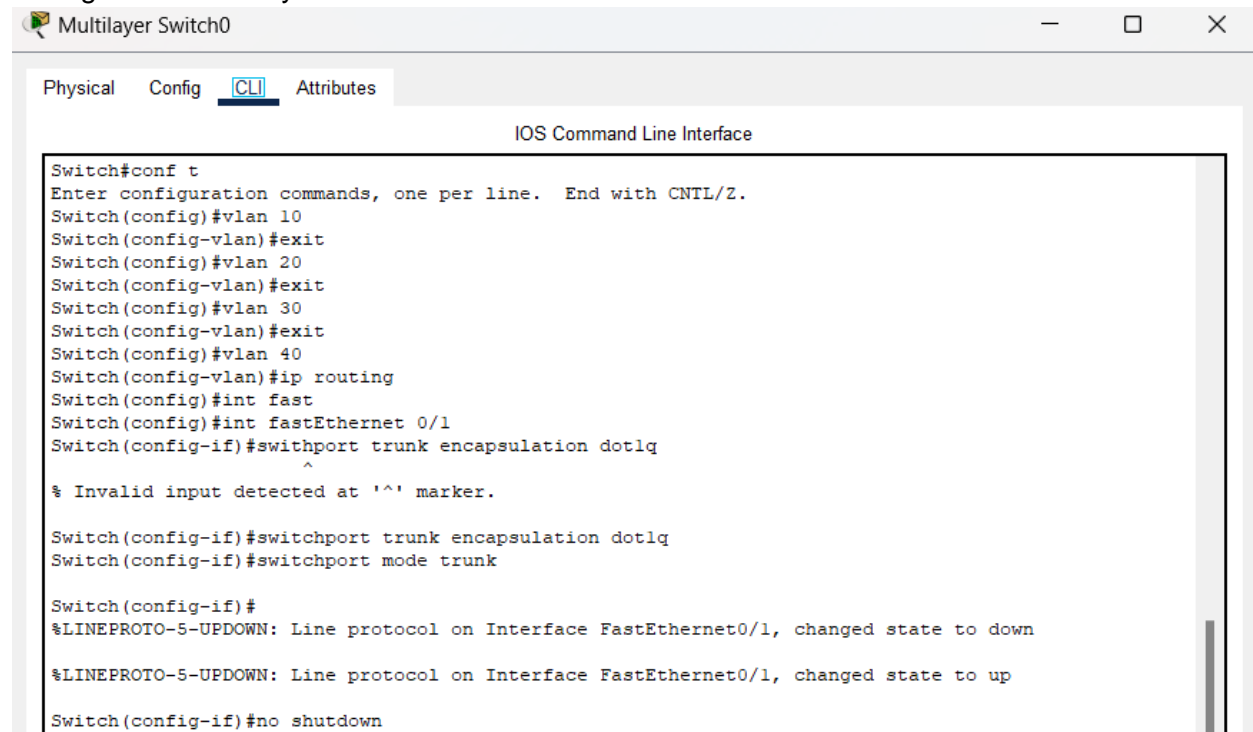


The screenshot shows a window titled "Switch1" with a tabbed interface. The "CLI" tab is selected, displaying the "IOS Command Line Interface". The interface contains a series of configuration commands for a switch, including VLAN creation and interface setup. A message indicates an invalid input was detected at a specific point in the configuration.

```
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name Students
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name Teachers
Switch(config-vlan)#exit
Switch(config)#vlan 30
Switch(config-vlan)#name Admin
Switch(config-vlan)#exit
Switch(config)#vlan 40
Switch(config-vlan)#name Advisors
Switch(config-vlan)#exit
Switch(config)#interface fast
Switch(config)#interface fastEthernet 0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 30
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/4
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 40
Switch(config-if)#no shutdown
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/5
Switch(config-if)#switchport mode trunk
Switch(config-if)#switchport mode trunk
Switch(config-if)#switchport trunk allowed vlan all
Switch(config-if)#end
```

% Invalid input detected at '^' marker.

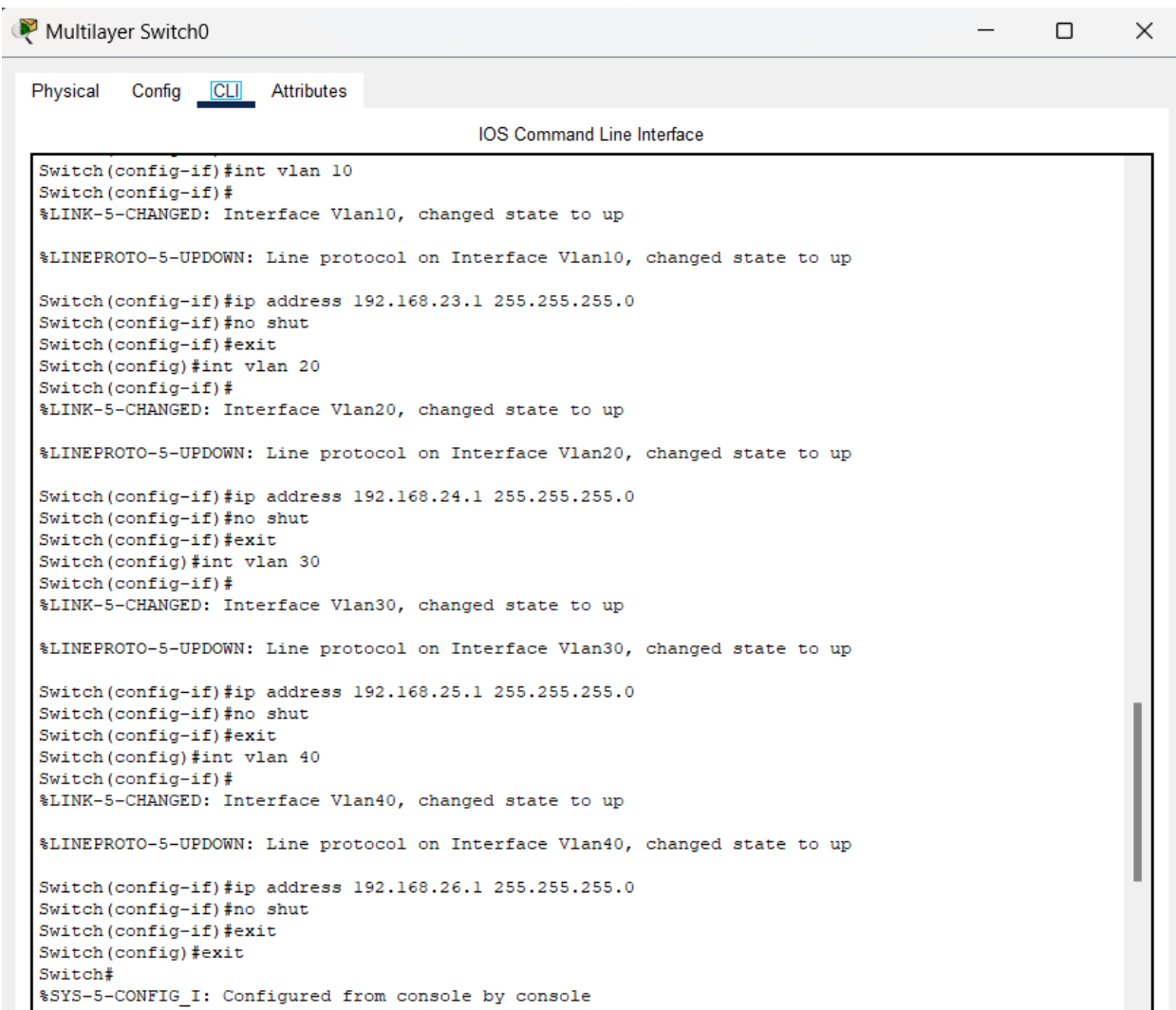
Configure the Multilayer Switch0:



The screenshot shows a window titled "Multilayer Switch0" with a tabbed interface. The "CLI" tab is selected, displaying the "IOS Command Line Interface". The interface shows a series of configuration commands being entered into a terminal window. The commands configure VLANs 10, 20, 30, and 40, enable IP routing, and configure interface FastEthernet0/1 as a trunk port with dot1q encapsulation. A message indicates that the line protocol on FastEthernet0/1 changed state to down and then to up.

```
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#exit
Switch(config)#vlan 30
Switch(config-vlan)#exit
Switch(config)#vlan 40
Switch(config-vlan)#ip routing
Switch(config)#int fast
Switch(config)#int fastEthernet 0/1
Switch(config-if)#switchport trunk encapsulation dot1q
Switch(config-if)#switchport trunk encapsulation dot1q
Switch(config-if)#switchport mode trunk

Switch(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
Switch(config-if)#no shutdown
```



Configure the PCs:

VLAN 10:

The image displays two screenshots of a network configuration interface, likely from a Cisco Packet Tracer environment, showing the configuration for two PCs, PC0 and PC4. Both PCs are configured with static IP addresses on the FastEthernet0 interface.

PC0 Configuration:

- Interface: FastEthernet0
- IP Configuration: Static (selected)
- IPv4 Address: 192.168.23.11
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.23.1
- DNS Server: 0.0.0.0

PC4 Configuration:

- Interface: FastEthernet0
- IP Configuration: Static (selected)
- IPv4 Address: 192.168.23.15
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.23.1
- DNS Server: 0.0.0.0

VLAN 20:

PC1

PhysicalConfigDesktopProgrammingAttributes

IP Configuration

X

InterfaceFastEthernet0

IP Configuration

☐ DHCP

☒ Static

IPv4 Address192.168.24.12

Subnet Mask255.255.255.0

Default Gateway192.168.24.1

DNS Server0.0.0.0

PC5

PhysicalConfigDesktopProgrammingAttributes

IP Configuration

X

InterfaceFastEthernet0

IP Configuration

☐ DHCP

☒ Static

IPv4 Address192.168.24.16

Subnet Mask255.255.255.0

Default Gateway192.168.24.1

DNS Server0.0.0.0

VLAN 30:

The image shows two network configuration windows, one for PC2 and one for PC6. Both windows have tabs for Physical, Config, Desktop, Programming, and Attributes. The 'Desktop' tab is active, showing the 'IP Configuration' section. In both windows, the 'Interface' is 'FastEthernet0'. The 'IP Configuration' section has two radio buttons: 'DHCP' and 'Static'. The 'Static' option is selected in both. The configuration fields are as follows:

Field	PC2 Value	PC6 Value
IPv4 Address	192.168.25.13	192.168.25.17
Subnet Mask	255.255.255.0	255.255.255.0
Default Gateway	192.168.25.1	192.168.25.1
DNS Server	0.0.0.0	0.0.0.0

VLAN 40:

PC3

Physical Config Desktop Programming Attributes

IP Configuration X

InterfaceFastEthernet0

IP Configuration

☐ DHCP

☒ Static

IPv4 Address192.168.26.14

Subnet Mask255.255.255.0

Default Gateway192.168.26.1

DNS Server0.0.0.0

PC7

Physical Config Desktop Programming Attributes

IP Configuration X

InterfaceFastEthernet0

IP Configuration

☐ DHCP

☒ Static

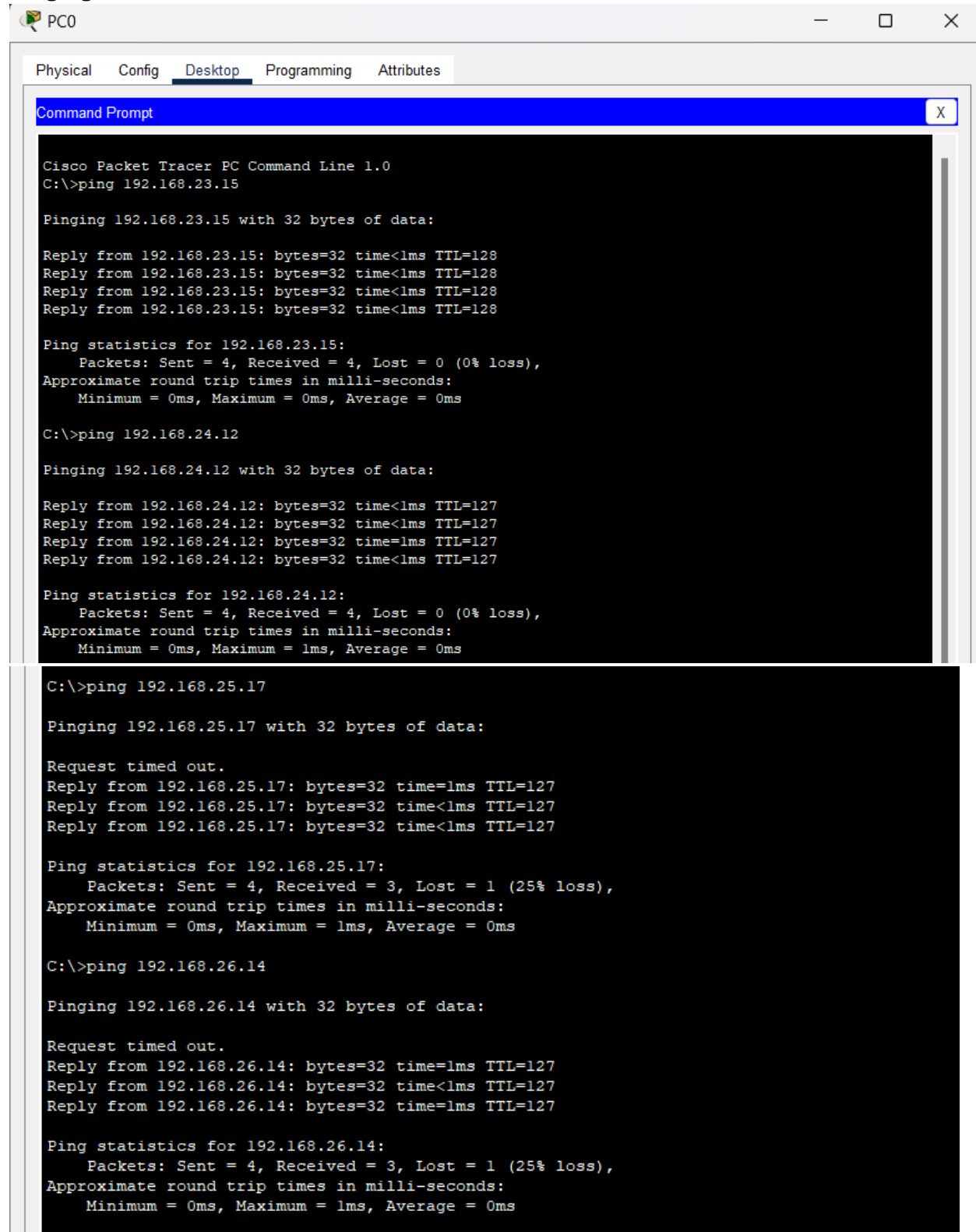
IPv4 Address192.168.26.18

Subnet Mask255.255.255.0

Default Gateway192.168.26.1

DNS Server0.0.0.0

Pinging from a VLAN 10 PC to another VLAN 10 PC and other VLAN PCs:



The screenshot shows a Cisco Packet Tracer PC Command Prompt window for PC0. The window has tabs for Physical, Config, Desktop, Programming, and Attributes. The Desktop tab is active, showing a Command Prompt window. The Command Prompt displays the results of three ping commands executed from PC0.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.23.15

Pinging 192.168.23.15 with 32 bytes of data:

Reply from 192.168.23.15: bytes=32 time<1ms TTL=128
Reply from 192.168.23.15: bytes=32 time<1ms TTL=128
Reply from 192.168.23.15: bytes=32 time<1ms TTL=128
Reply from 192.168.23.15: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.23.15:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.24.12

Pinging 192.168.24.12 with 32 bytes of data:

Reply from 192.168.24.12: bytes=32 time<1ms TTL=127
Reply from 192.168.24.12: bytes=32 time<1ms TTL=127
Reply from 192.168.24.12: bytes=32 time=1ms TTL=127
Reply from 192.168.24.12: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.24.12:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.25.17

Pinging 192.168.25.17 with 32 bytes of data:

Request timed out.
Reply from 192.168.25.17: bytes=32 time=1ms TTL=127
Reply from 192.168.25.17: bytes=32 time<1ms TTL=127
Reply from 192.168.25.17: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.25.17:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

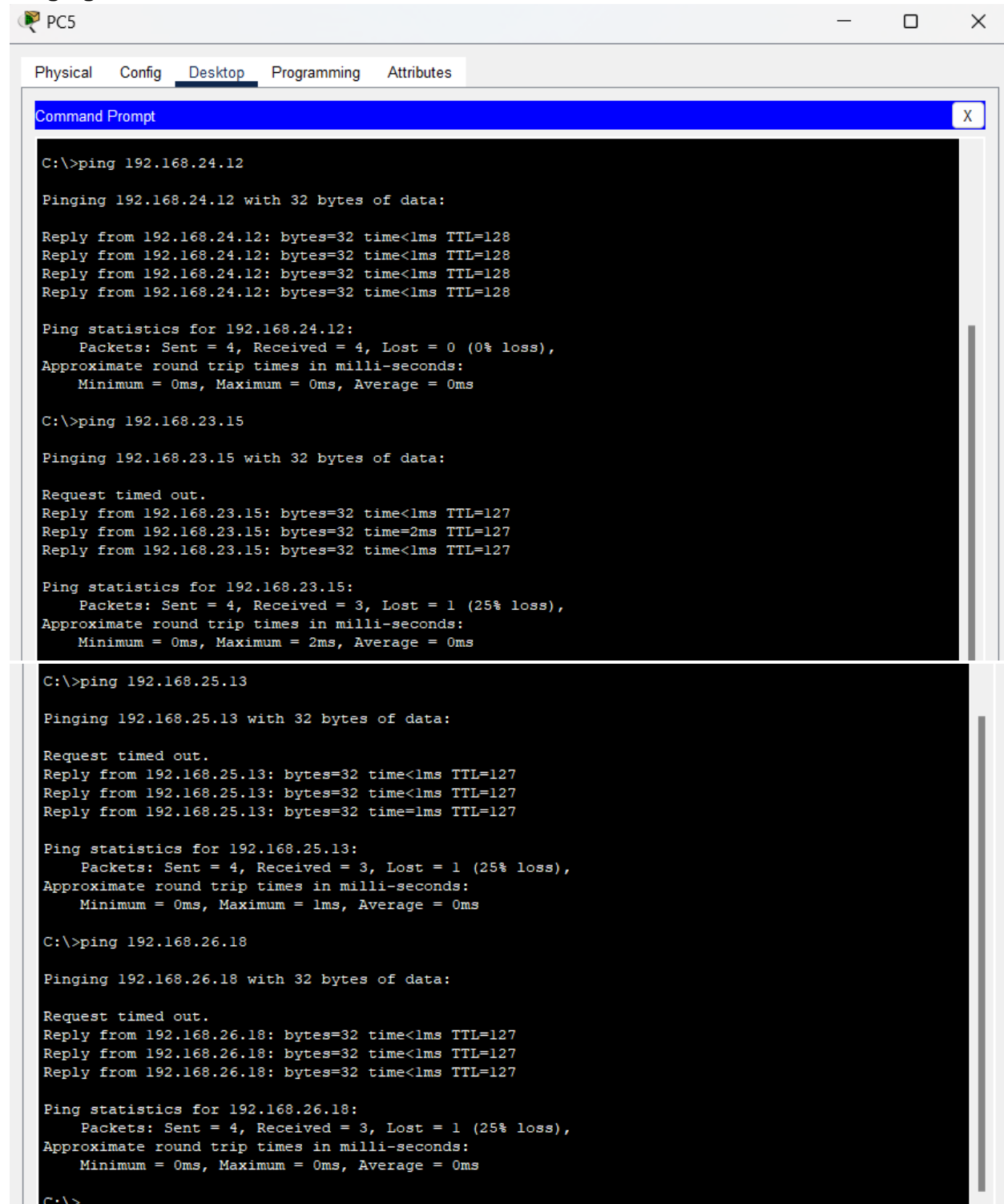
C:\>ping 192.168.26.14

Pinging 192.168.26.14 with 32 bytes of data:

Request timed out.
Reply from 192.168.26.14: bytes=32 time=1ms TTL=127
Reply from 192.168.26.14: bytes=32 time<1ms TTL=127
Reply from 192.168.26.14: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.26.14:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Pinging from a VLAN 20 PC to another VLAN 20 PC and other VLAN PCs:



The screenshot shows a Packet Tracer configuration window for a PC named PC5. The 'Desktop' tab is selected, displaying a Command Prompt window. The Command Prompt shows the results of three ping commands executed from the PC's command line. The first command is a successful ping to 192.168.24.12. The second and third commands are pings to 192.168.23.15 and 192.168.25.13, both of which show a 25% packet loss (1 out of 4 packets received).

```
C:\>ping 192.168.24.12

Pinging 192.168.24.12 with 32 bytes of data:

Reply from 192.168.24.12: bytes=32 time<1ms TTL=128
Reply from 192.168.24.12: bytes=32 time<1ms TTL=128
Reply from 192.168.24.12: bytes=32 time<1ms TTL=128
Reply from 192.168.24.12: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.24.12:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.23.15

Pinging 192.168.23.15 with 32 bytes of data:

Request timed out.
Reply from 192.168.23.15: bytes=32 time<1ms TTL=127
Reply from 192.168.23.15: bytes=32 time=2ms TTL=127
Reply from 192.168.23.15: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.23.15:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\>ping 192.168.25.13

Pinging 192.168.25.13 with 32 bytes of data:

Request timed out.
Reply from 192.168.25.13: bytes=32 time<1ms TTL=127
Reply from 192.168.25.13: bytes=32 time<1ms TTL=127
Reply from 192.168.25.13: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.25.13:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.26.18

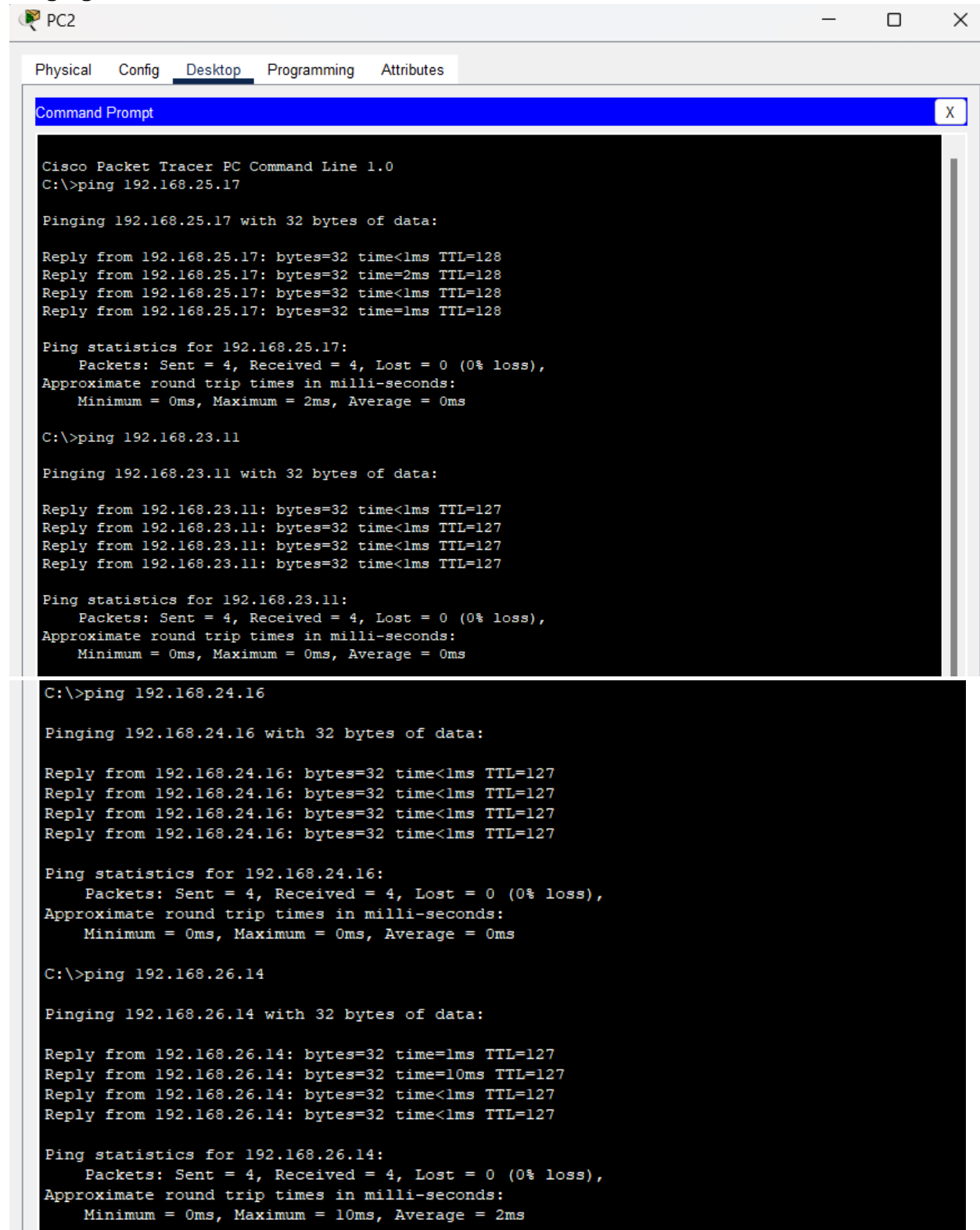
Pinging 192.168.26.18 with 32 bytes of data:

Request timed out.
Reply from 192.168.26.18: bytes=32 time<1ms TTL=127
Reply from 192.168.26.18: bytes=32 time<1ms TTL=127
Reply from 192.168.26.18: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.26.18:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Pinging from a VLAN 30 PC to another VLAN 30 PC and other VLAN PCs:



The screenshot shows a Cisco Packet Tracer PC Command Prompt window for a PC named PC2. The window has tabs for Physical, Config, Desktop, Programming, and Attributes, with Desktop selected. The Command Prompt displays the results of three ping commands executed from the PC's command line.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.25.17

Pinging 192.168.25.17 with 32 bytes of data:

Reply from 192.168.25.17: bytes=32 time<1ms TTL=128
Reply from 192.168.25.17: bytes=32 time=2ms TTL=128
Reply from 192.168.25.17: bytes=32 time<1ms TTL=128
Reply from 192.168.25.17: bytes=32 time=1ms TTL=128

Ping statistics for 192.168.25.17:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\>ping 192.168.23.11

Pinging 192.168.23.11 with 32 bytes of data:

Reply from 192.168.23.11: bytes=32 time<1ms TTL=127
Reply from 192.168.23.11: bytes=32 time<1ms TTL=127
Reply from 192.168.23.11: bytes=32 time<1ms TTL=127
Reply from 192.168.23.11: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.23.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.24.16

Pinging 192.168.24.16 with 32 bytes of data:

Reply from 192.168.24.16: bytes=32 time<1ms TTL=127
Reply from 192.168.24.16: bytes=32 time<1ms TTL=127
Reply from 192.168.24.16: bytes=32 time<1ms TTL=127
Reply from 192.168.24.16: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.24.16:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

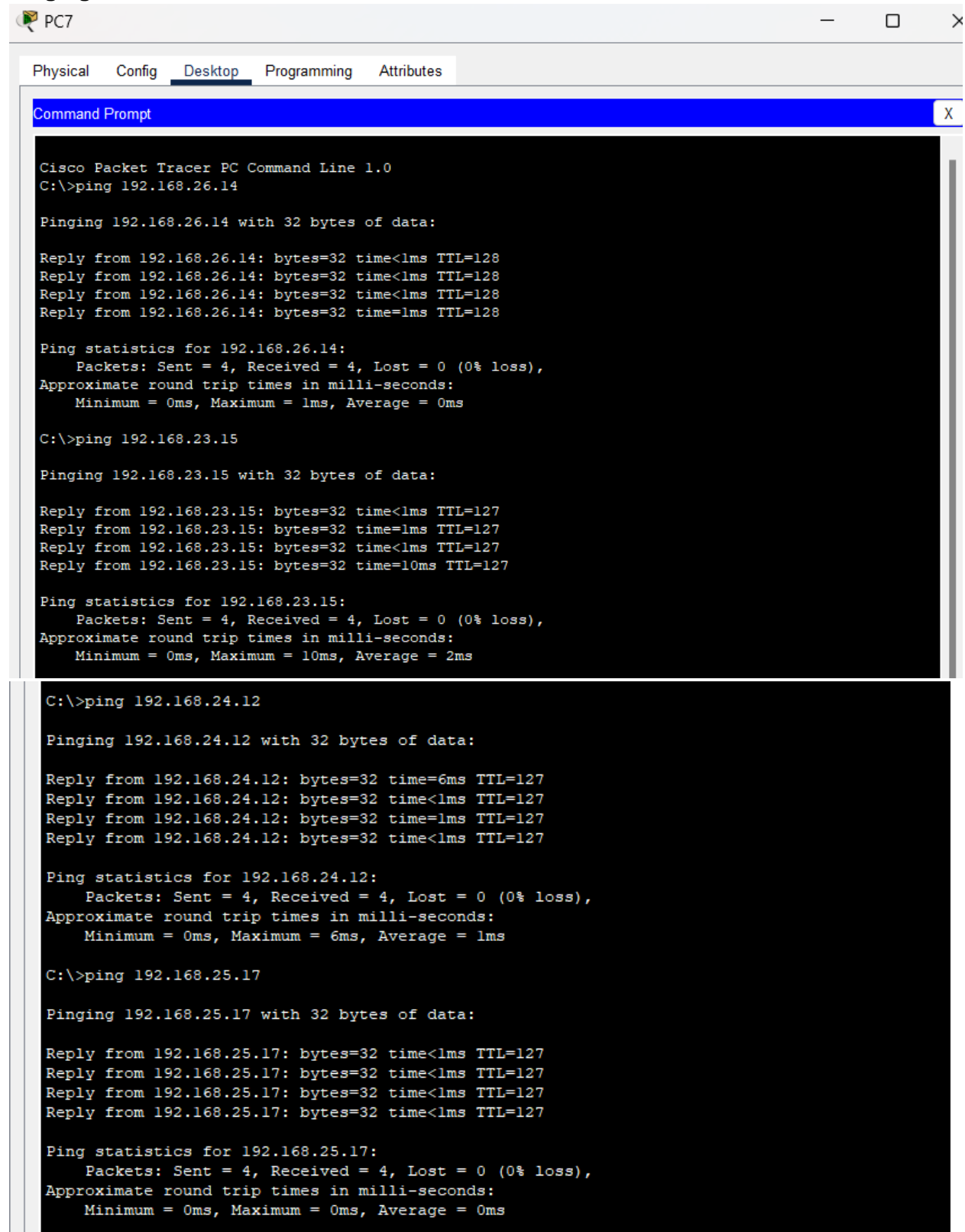
C:\>ping 192.168.26.14

Pinging 192.168.26.14 with 32 bytes of data:

Reply from 192.168.26.14: bytes=32 time=1ms TTL=127
Reply from 192.168.26.14: bytes=32 time=10ms TTL=127
Reply from 192.168.26.14: bytes=32 time<1ms TTL=127
Reply from 192.168.26.14: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.26.14:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 10ms, Average = 2ms
```

Pinging from a VLAN 40 PC to another VLAN 40 PC and other VLAN PCs:



The screenshot shows a Cisco Packet Tracer PC Command Line window for PC7. The window has tabs for Physical, Config, Desktop, Programming, and Attributes, with Desktop selected. The Command Prompt shows the following output:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.26.14

Pinging 192.168.26.14 with 32 bytes of data:

Reply from 192.168.26.14: bytes=32 time<1ms TTL=128
Reply from 192.168.26.14: bytes=32 time<1ms TTL=128
Reply from 192.168.26.14: bytes=32 time<1ms TTL=128
Reply from 192.168.26.14: bytes=32 time=1ms TTL=128

Ping statistics for 192.168.26.14:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.23.15

Pinging 192.168.23.15 with 32 bytes of data:

Reply from 192.168.23.15: bytes=32 time<1ms TTL=127
Reply from 192.168.23.15: bytes=32 time=1ms TTL=127
Reply from 192.168.23.15: bytes=32 time<1ms TTL=127
Reply from 192.168.23.15: bytes=32 time=10ms TTL=127

Ping statistics for 192.168.23.15:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 10ms, Average = 2ms

C:\>ping 192.168.24.12

Pinging 192.168.24.12 with 32 bytes of data:

Reply from 192.168.24.12: bytes=32 time=6ms TTL=127
Reply from 192.168.24.12: bytes=32 time<1ms TTL=127
Reply from 192.168.24.12: bytes=32 time=1ms TTL=127
Reply from 192.168.24.12: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.24.12:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 6ms, Average = 1ms

C:\>ping 192.168.25.17

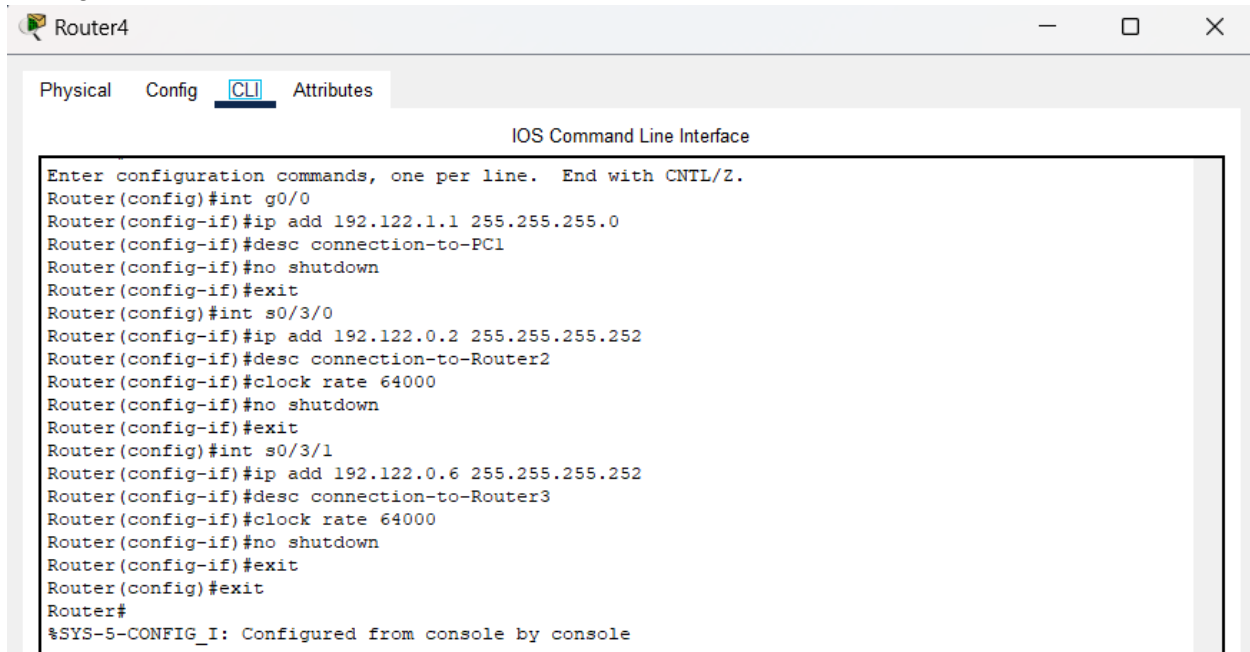
Pinging 192.168.25.17 with 32 bytes of data:

Reply from 192.168.25.17: bytes=32 time<1ms TTL=127
Reply from 192.168.25.17: bytes=32 time<1ms TTL=127
Reply from 192.168.25.17: bytes=32 time<1ms TTL=127
Reply from 192.168.25.17: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.25.17:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

TASK 3:

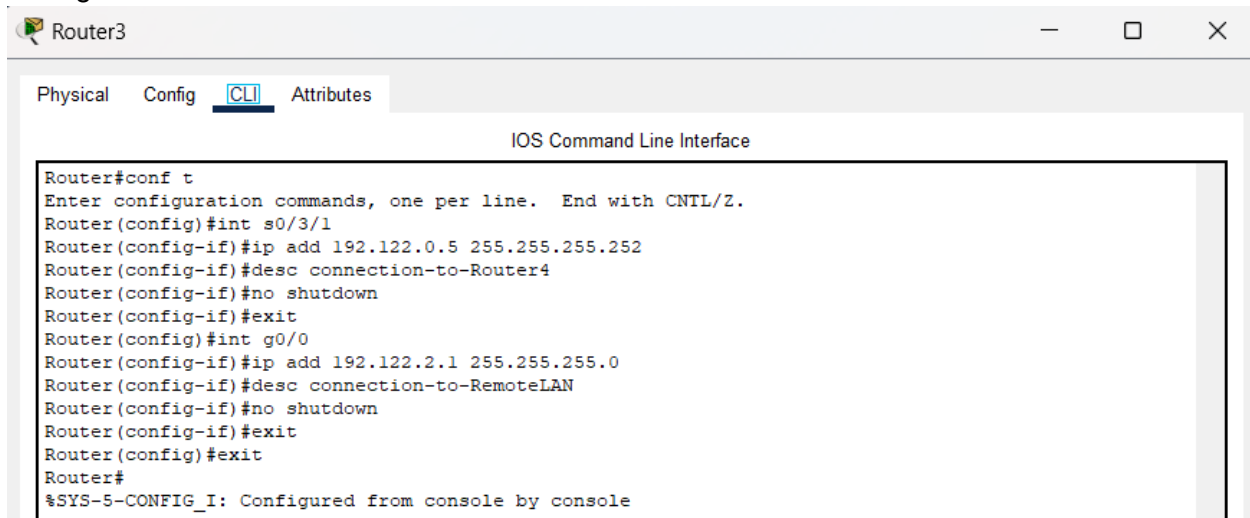
Configure Router4 Interfaces:



The screenshot shows a window titled "Router4" with a tabbed interface. The "CLI" tab is selected, showing the "IOS Command Line Interface". The text in the terminal area is as follows:

```
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int g0/0
Router(config-if)#ip add 192.122.1.1 255.255.255.0
Router(config-if)#desc connection-to-PC1
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#int s0/3/0
Router(config-if)#ip add 192.122.0.2 255.255.255.252
Router(config-if)#desc connection-to-Router2
Router(config-if)#clock rate 64000
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#int s0/3/1
Router(config-if)#ip add 192.122.0.6 255.255.255.252
Router(config-if)#desc connection-to-Router3
Router(config-if)#clock rate 64000
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

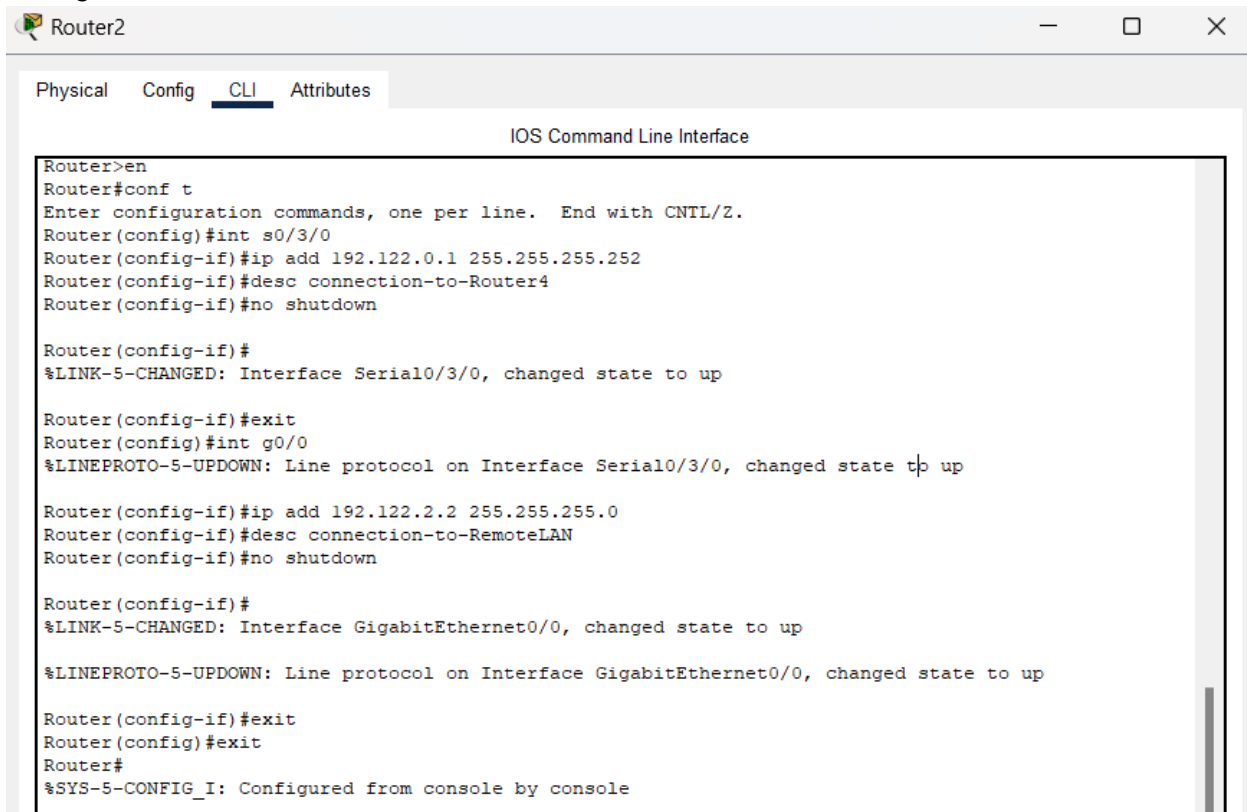
Configure Router3 Interfaces:



The screenshot shows a window titled "Router3" with a tabbed interface. The "CLI" tab is selected, showing the "IOS Command Line Interface". The text in the terminal area is as follows:

```
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int s0/3/1
Router(config-if)#ip add 192.122.0.5 255.255.255.252
Router(config-if)#desc connection-to-Router4
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#int g0/0
Router(config-if)#ip add 192.122.2.1 255.255.255.0
Router(config-if)#desc connection-to-RemoteLAN
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```


Configure Router2 Interfaces:



The image shows a window titled "Router2" with tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, displaying the "IOS Command Line Interface". The terminal shows the following commands and output:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int s0/3/0
Router(config-if)#ip add 192.122.0.1 255.255.255.252
Router(config-if)#desc connection-to-Router4
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/3/0, changed state to up

Router(config-if)#exit
Router(config)#int g0/0
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/3/0, changed state to up

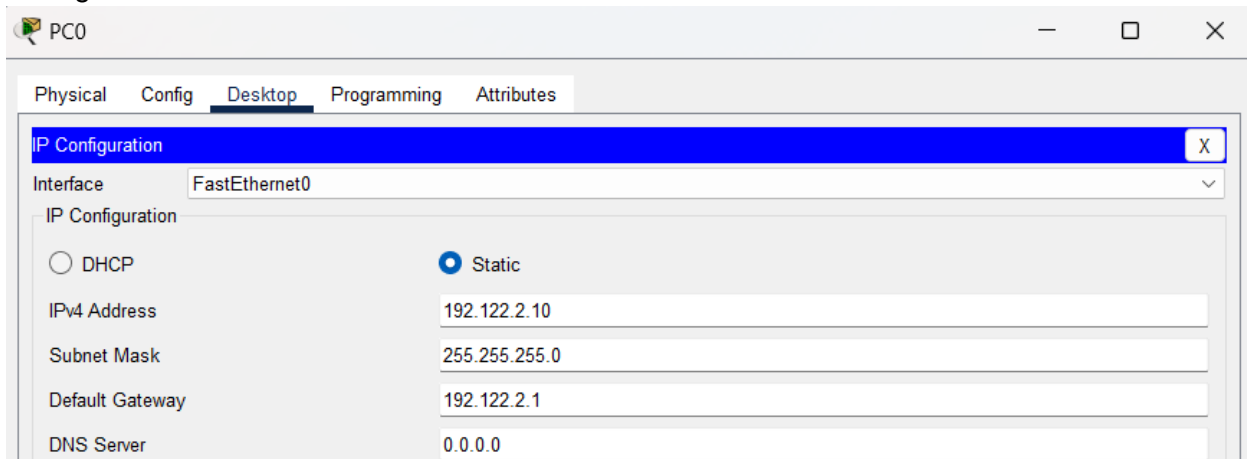
Router(config-if)#ip add 192.122.2.2 255.255.255.0
Router(config-if)#desc connection-to-RemoteLAN
Router(config-if)#no shutdown

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)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

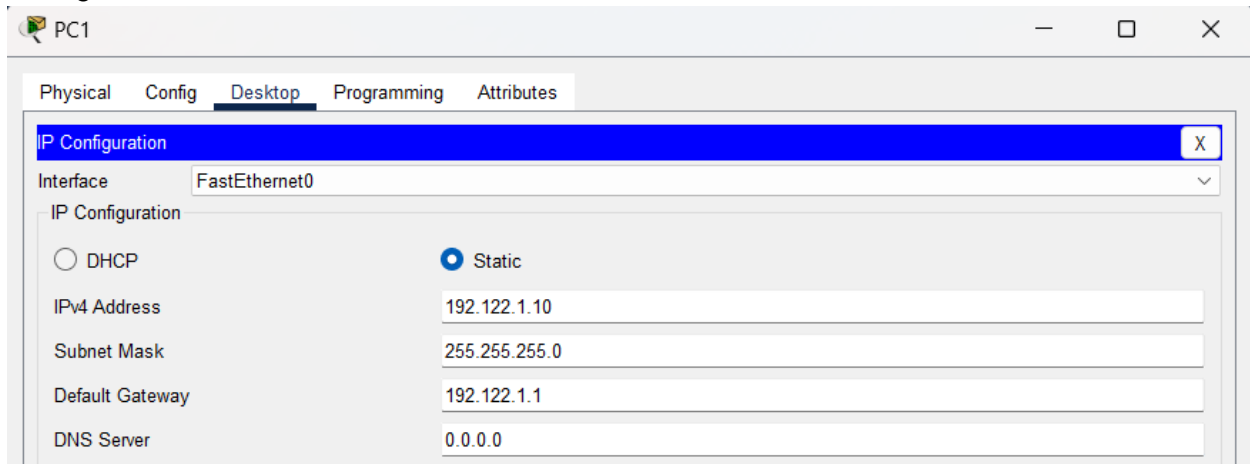
Configure PC0:



The image shows a window titled "PC0" with tabs for Physical, Config, Desktop, Programming, and Attributes. The Desktop tab is active, displaying the "IP Configuration" window. The "Interface" dropdown is set to "FastEthernet0". The "IP Configuration" section shows the "Static" radio button selected. The fields for IPv4 Address, Subnet Mask, Default Gateway, and DNS Server are filled with the following values:

Field	Value
IPv4 Address	192.122.2.10
Subnet Mask	255.255.255.0
Default Gateway	192.122.2.1
DNS Server	0.0.0.0

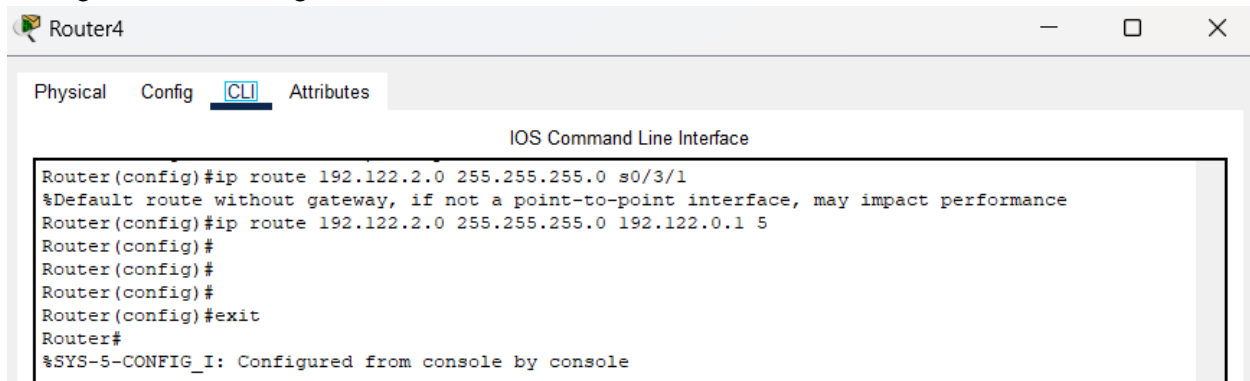
Configure PC1:



The screenshot shows the 'PC1' configuration window with the 'Desktop' tab selected. The 'IP Configuration' section is expanded, showing the 'FastEthernet0' interface. The 'Static' radio button is selected for IP configuration. The fields are filled with the following values:

Field	Value
Interface	FastEthernet0
IP Configuration	Static
IPv4 Address	192.122.1.10
Subnet Mask	255.255.255.0
Default Gateway	192.122.1.1
DNS Server	0.0.0.0

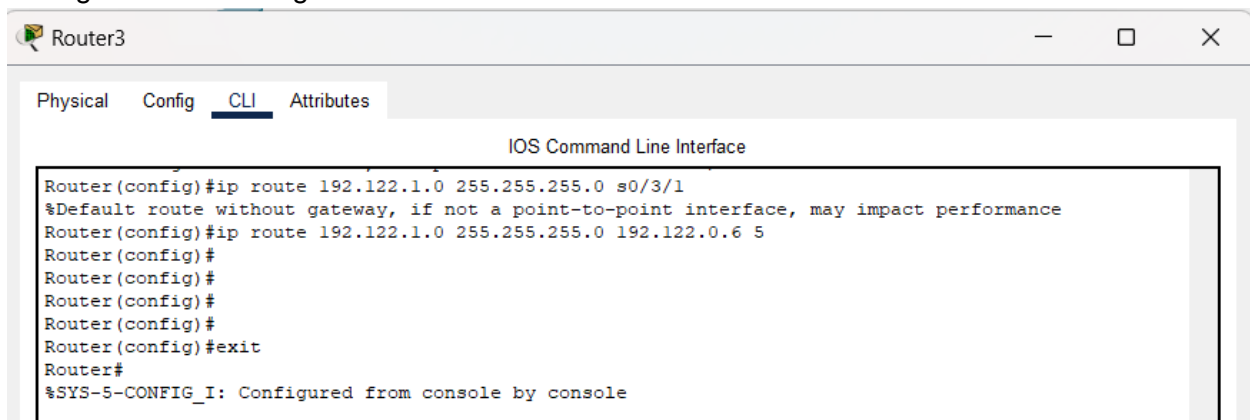
Configure static routing to Remote LAN in Router4:



The screenshot shows the 'Router4' configuration window with the 'CLI' tab selected. The 'IOS Command Line Interface' section displays the following commands and output:

```
Router(config)#ip route 192.122.2.0 255.255.255.0 s0/3/1
%Default route without gateway, if not a point-to-point interface, may impact performance
Router(config)#ip route 192.122.2.0 255.255.255.0 192.122.0.1 5
Router(config)#
Router(config)#
Router(config)#
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

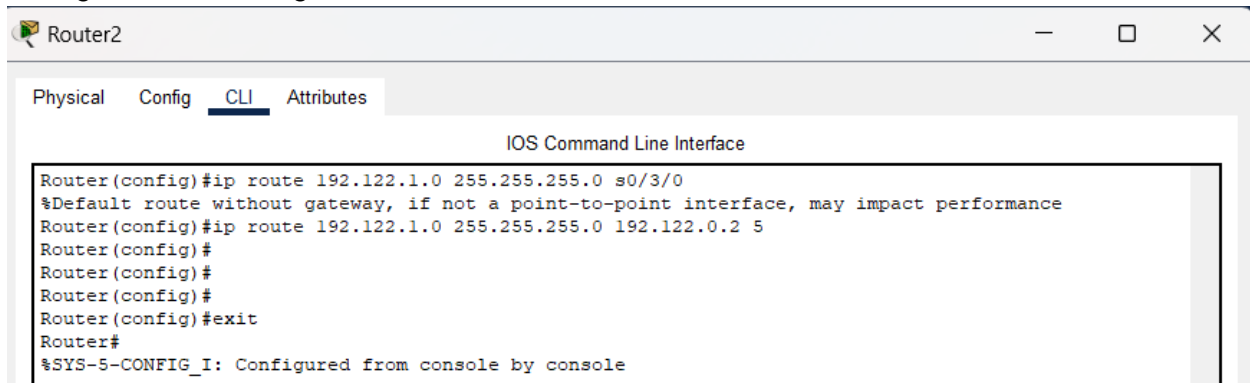
Configure static routing to Remote LAN in Router3:



The screenshot shows the 'Router3' configuration window with the 'CLI' tab selected. The 'IOS Command Line Interface' section displays the following commands and output:

```
Router(config)#ip route 192.122.1.0 255.255.255.0 s0/3/1
%Default route without gateway, if not a point-to-point interface, may impact performance
Router(config)#ip route 192.122.1.0 255.255.255.0 192.122.0.6 5
Router(config)#
Router(config)#
Router(config)#
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

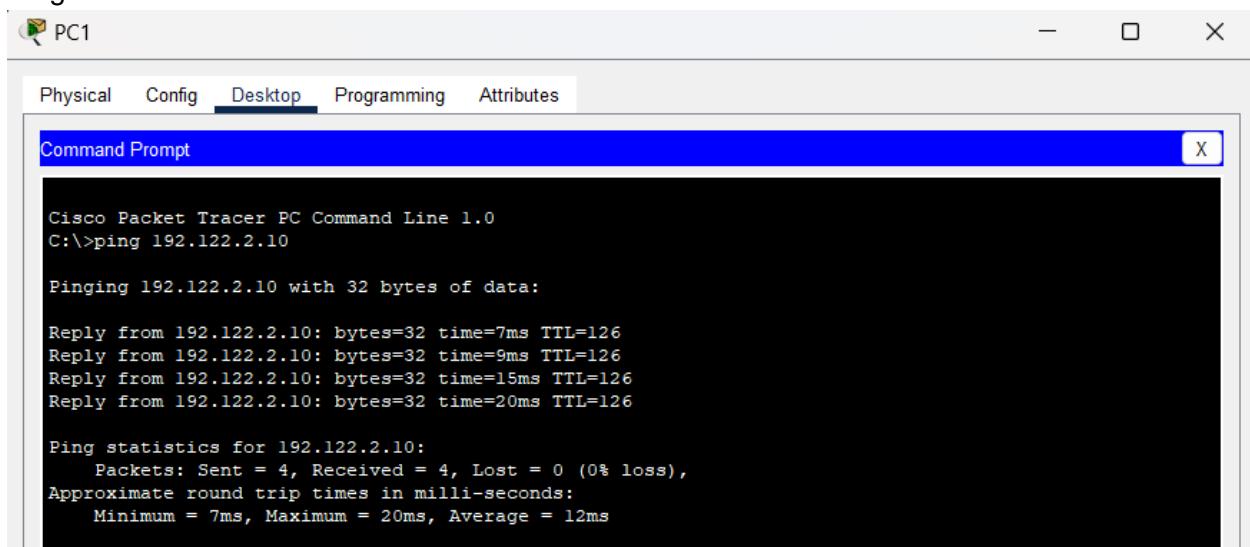
Configure static routing to Remote LAN in Router2:



The screenshot shows the Router2 CLI interface with the following commands and output:

```
Router(config)#ip route 192.122.1.0 255.255.255.0 s0/3/0
%Default route without gateway, if not a point-to-point interface, may impact performance
Router(config)#ip route 192.122.1.0 255.255.255.0 192.122.0.2 5
Router(config)#
Router(config)#
Router(config)#
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

Ping PC0 from PC1:



The screenshot shows the PC1 Command Prompt with the following output:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.122.2.10

Pinging 192.122.2.10 with 32 bytes of data:

Reply from 192.122.2.10: bytes=32 time=7ms TTL=126
Reply from 192.122.2.10: bytes=32 time=9ms TTL=126
Reply from 192.122.2.10: bytes=32 time=15ms TTL=126
Reply from 192.122.2.10: bytes=32 time=20ms TTL=126

Ping statistics for 192.122.2.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 7ms, Maximum = 20ms, Average = 12ms
```

Questions (Answer to the point):

1. Why do we need L3 Switches?

Ans: L3 switches are needed for efficient Inter-VLAN routing. They can route traffic between VLANs at high speeds, reducing the load on external routers.

2. What is the use router in Inter-Vlan Routing?

Ans: Routers are used in inter-VLAN routing to allow hosts in different VLANs to communicate with each other.

3. What changes are needed while configuring VLANs using L3 switches instead of Router-on-a-stick approach?

Ans: When using L3 switches, there is no need for a separate router. The switch itself can perform routing between VLANs, simplifying the network architecture.

4. What is next-hop floating address?

Ans: The next-hop floating address is an alternate route specified in static routing with higher metric. It is used as a backup route if the primary route fails.

5. What is the disadvantage of static routing?

Ans: One of the drawbacks is that static routing is not flexible or resilient to changes in the network topology, as it requires manual updates and modifications. Static routing also does not support load balancing or redundancy, which can affect the performance and availability of the network.

Challenges (if any):

For the Router-on-a-stick method it was kind of hard to notice that I had to trunk the router as well as it wasn't working for the inter-VLAN.