

Network Structure and Design

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Contents

Task 01 - Network Design and Plan

Use **simulation** mode to send a message between PC0 and PC7. Disable the link between Router A and Router B. Again, use simulation mode to send a message between PC0 and PC7. Describe the changes in behaviour of your model.

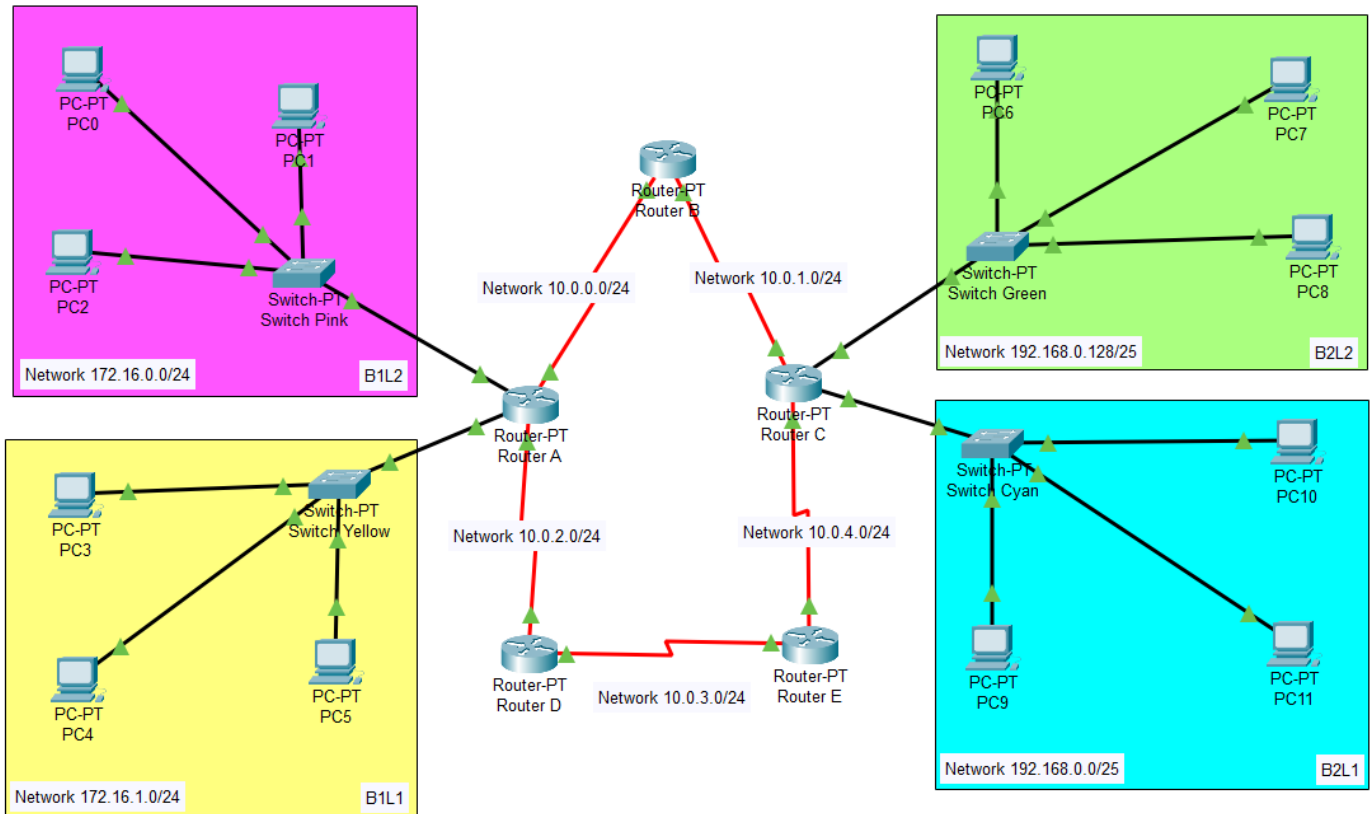
Task 02 - Layer 2 Implementation and Analysis

Check connectivity within the same and different VLANs. Use **Simulation** mode in Packet Tracer to show the connectivity with 'pinging' using GUI with the router interfaces being enabled and disabled. Analyze the results and explain why it was a 'success' or 'failure'.

Task 03 - Layer 3 Evaluation

our report should evaluate and analyse how Layer 2 and Layer 3 addresses (source and destination) are allocated in each network's incoming and outgoing (router) interfaces. For example, what address is changed at the router interfaces on the Pink subnet and the Green subnet.? Explain why.

Task 1 – Network Design and Plan



Explanation

Four Networks are represented in this diagram by networks, B1L1, B1L2, B2L1, B2L2. Each network has Different IP addresses and has 3 PCs for each network. I initially selected the proper IP range and Subnet mask based on the number of devices on each network. When using Networks without subnetting, it wastes the IP addresses, therefore I chose DHCP pools to establish subnets and add the required IP range for each Network.

The IP configuration for each network is as follows:

IP configuration of Network B1L2

IP address Range: 172.16.0.1 to 172.16.0.254

Subnet Mask: 255.255.255.0

Default Gateway: 172.16.0.1

Router Configuration for Network B1L2

Router>en

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#int fa1/0

Router(config-if)#ip address 172.16.0.1 255.255.255.0

Router(config-if)#no shutdown

Router(config-if)#

%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on interface FastEthernet1/0, changed state to up

Configuring DHCP pool for Network B1L2

Router(config)#ip dhcp pool B1L2

Router(dhcp-config)#network 172.16.0.0 255.255.255.0

Router(dhcp-config)#default-router 172.16.0.1

Router(dhcp-config)#exit

Router(config)#exit

Router#

%SYS-5-CONFIG_I: Configured from console by console

Router#write memory

Building configuration...

[OK]

Router#

PC0 in Network B1L2 has the IP address of 172.16.0.3 with a Subnet Mask of 255.255.255.0. The IP address of each PC in the Network B1L2 can be found in a similar way. You can see the IP configuration of the PC0 in Network B1L2 below.

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 'DHCP' option is selected, and a message indicates 'DHCP request successful.' The IPv4 Address is 172.16.0.2, Subnet Mask is 255.255.255.0, Default Gateway is 172.16.0.1, and DNS Server is 0.0.0.0. The 'IPv6 Configuration' section shows 'Static' selected, with a Link Local Address of FE80::203:E4FF:FE10:4BA. The '802.1X' section shows 'Use 802.1X Security' unchecked, with Authentication set to MD5. A 'Top' button is at the bottom left.

PC0

Physical Config Desktop Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☒ DHCP ☐ Static DHCP request successful.

IPv4 Address 172.16.0.2

Subnet Mask 255.255.255.0

Default Gateway 172.16.0.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::203:E4FF:FE10:4BA

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

☐ Top

IP configuration of Network B1L1

IP address Range: 172.16.1.1 to 172.16.1.254

Subnet Mask: 255.255.255.0

Default Gateway: 172.16.1.1

Router Configuration for Network B1L1

Router>en

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#int fa0/0

Router(config-if)#ip address 172.16.1.1 255.255.255.0

Router(config-if)#no shutdown

Router(config-if)#

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on interface FastEthernet0/0, changed state to up

Configuring DHCP pool for Network B1L1

Router(config)#ip dhcp pool B1L1

Router(dhcp-config)#network 172.16.1.0 255.255.255.0

Router(dhcp-config)#default-router 172.16.1.1

Router(dhcp-config)#exit

Router(config)#exit

Router#

%SYS-5-CONFIG_I: Configured from console by console

Router#write memory

Building configuration...

[OK]

Router#

PC3 in Network B1L1 has the IP address of 172.16.1.2 with a Subnet Mask of 255.255.255.0. The IP address of each PC in the Network B1L1 can be found in a similar way. You can see the IP configuration of the PC3 in Network B1L1 below.

The screenshot shows a window titled "PC3" with a green header bar. Below the header are tabs: "Physical", "Config", "Desktop" (selected), "Programming", and "Attributes". The "IP Configuration" section is highlighted in blue. It shows the "Interface" as "FastEthernet0". Under "IP Configuration", the "DHCP" radio button is selected, and the "Static" radio button is unselected. A message "DHCP request successful." is displayed. The "IPv4 Address" is "172.16.1.2", the "Subnet Mask" is "255.255.255.0", the "Default Gateway" is "172.16.1.1", and the "DNS Server" is "0.0.0.0". Under "IPv6 Configuration", the "Automatic" radio button is unselected and the "Static" radio button is selected. The "IPv6 Address" is empty, the "Link Local Address" is "FE80::201:42FF:FE66:7224", and the "Default Gateway" and "DNS Server" are empty. Under "802.1X", the "Use 802.1X Security" checkbox is unselected, the "Authentication" dropdown is set to "MD5", and the "Username" and "Password" fields are empty. A "Top" button is at the bottom left.

PC3

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☒ DHCP ☐ Static DHCP request successful.

IPv4 Address 172.16.1.2

Subnet Mask 255.255.255.0

Default Gateway 172.16.1.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::201:42FF:FE66:7224

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

☐ Top

IP configuration of Network B2L2

IP address Range: 192.168.0.129 to 192.168.0.254

Subnet Mask: 255.255.255.128

Default- Gateway: 192.168.0.129

Router Configuration for Network B2L2

Router>en

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#int fa1/0

Router(config-if)#ip address 192.168.0.129 255.255.255.128

Router(config-if)#no shutdown

Router(config-if)#

%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on interface FastEthernet1/0, changed state to up

Configuring DHCP pool for Network B2L2

Router(config)#ip dhcp pool B2L2

Router(dhcp-config)#network 192.168.0.128 255.255.255.128

Router(dhcp-config)#default-router 192.168.0.129

Router(dhcp-config)#exit

Router(config)#exit

Router#

%SYS-5-CONFIG_I: Configured from console by console

Router#write memory

Building configuration...

[OK]

Router#

PC6 in Network B2L2 has the IP address of 192.168.0.131 with a Subnet Mask of 255.255.255.128. The IP address of each PC in the Network B2L2 can be found in a similar way. You can see the IP configuration of the PC3 in Network B2L2 below.

The screenshot shows the configuration window for PC6, specifically the 'Desktop' tab. The 'IP Configuration' section is active, showing settings for the 'FastEthernet0' interface. The 'DHCP' option is selected, and a message indicates 'DHCP request successful.' The IPv4 Address is 192.168.0.131, Subnet Mask is 255.255.255.128, Default Gateway is 192.168.0.129, and DNS Server is 0.0.0.0. The IPv6 Configuration section shows 'Static' selected, with a Link Local Address of FE80::20B:BEFF:FEEA:7D90. The 802.1X section shows 'Use 802.1X Security' unchecked, with Authentication set to MD5, and empty fields for Username and Password. A 'Top' button is at the bottom left.

PC6

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☒ DHCP ☐ Static DHCP request successful.

IPv4 Address 192.168.0.131

Subnet Mask 255.255.255.128

Default Gateway 192.168.0.129

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::20B:BEFF:FEEA:7D90

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

☐ Top

IP configuration of Network B2L1

IP address Range: 192.168.0.1 to 192.168.0.254

Subnet Mask: 255.255.255.128

Default-Gateway: 192.168.0.1

Router Configuration for Network B2L1

Router>en

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#int fa0/0

Router(config-if)#ip address 192.168.0.1 255.255.255.128

Router(config-if)#no shutdown

Router(config-if)#

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on interface FastEthernet0/0, changed state to up

Configuring DHCP pool for Network B2L1

Router(config)#ip dhcp pool B2L1

Router(dhcp-config)#network 192.168.0.0 255.255.255.128

Router(dhcp-config)#default-router 192.168.0.1

Router(dhcp-config)#exit

Router(config)#exit

Router#

%SYS-5-CONFIG_I: Configured from console by console

Router#write memory

Building configuration...

[OK]

Router#

PC9 in Network B2L1 has the IP address of 192.168.0.3 with a Subnet Mask of 255.255.255.128. The IP address of each PC in the Network B2L1 can be found in a similar way. You can see the IP configuration of the PC9 in Network B2L1 below.

The screenshot shows the configuration window for PC9, specifically the 'Desktop' tab. The 'IP Configuration' section is active, showing settings for the 'FastEthernet0' interface. The 'DHCP' option is selected, and a message indicates 'DHCP request successful.' The IPv4 Address is 192.168.0.3, Subnet Mask is 255.255.255.128, Default Gateway is 192.168.0.1, and DNS Server is 0.0.0.0. The 'IPv6 Configuration' section shows 'Static' selected, with fields for IPv6 Address, Link Local Address (FE80::260:47FF:FE33:1042), Default Gateway, and DNS Server. The '802.1X' section has 'Use 802.1X Security' unchecked, and 'Authentication' set to 'MD5'.

PC9

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☒ DHCP ☐ Static DHCP request successful.

IPv4 Address 192.168.0.3

Subnet Mask 255.255.255.128

Default Gateway 192.168.0.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::260:47FF:FE33:1042

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

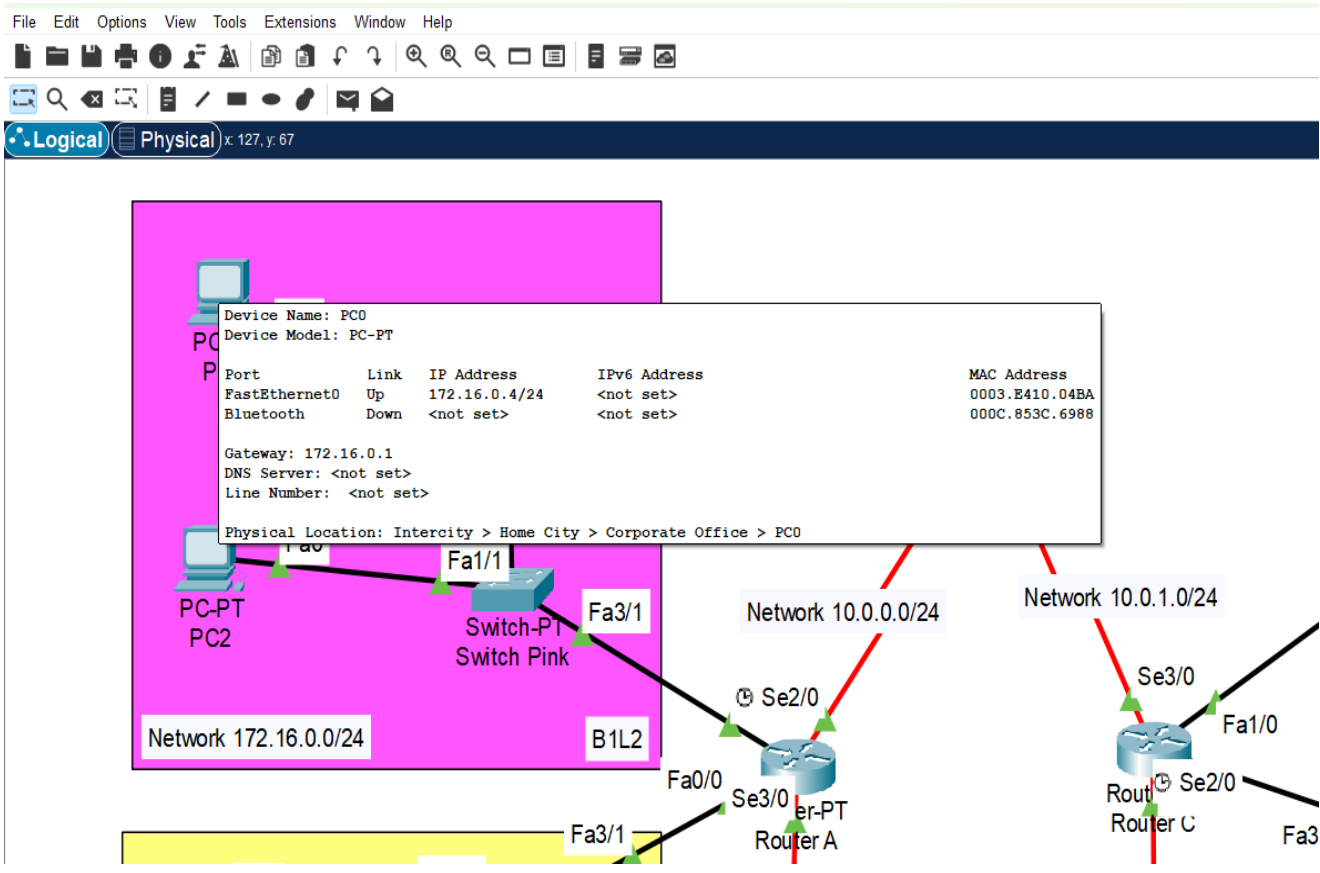
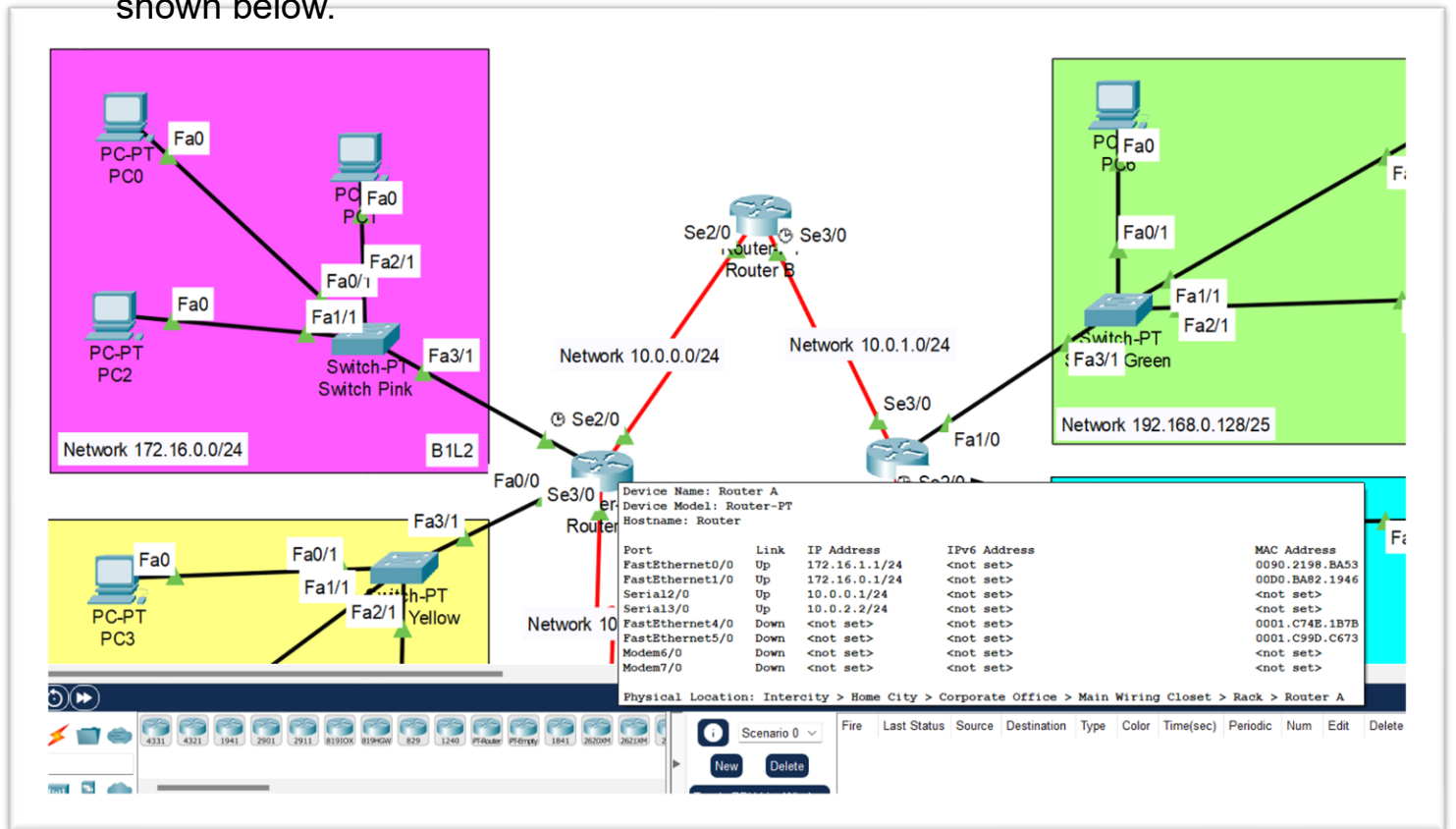
Authentication MD5

Username

Password

☐ Top

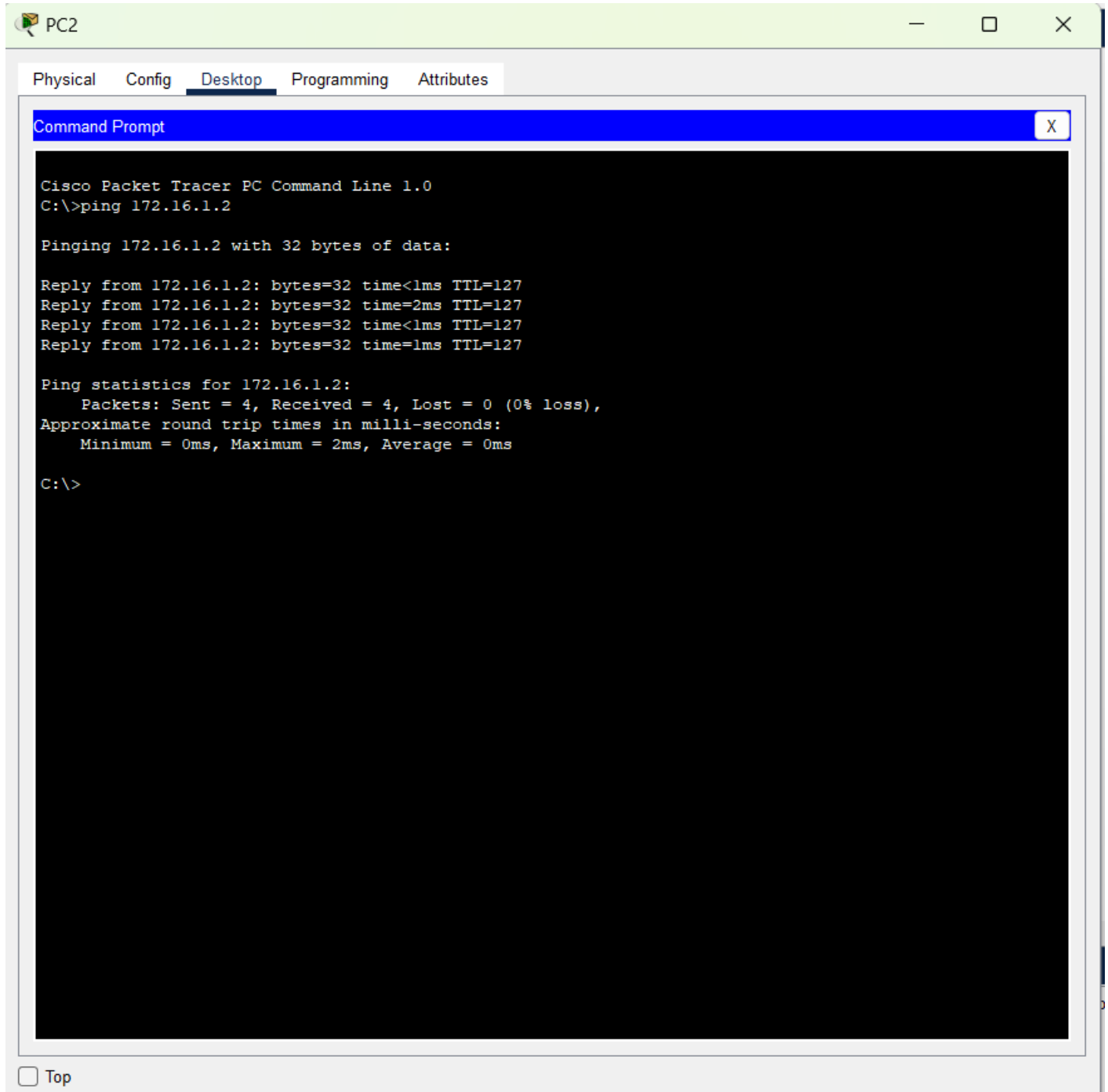
If you want to See the details of each PC or Router (IP address etc.), you can move the cursor near the device, and it will display all the details as shown below.



We can test the connection by sending packets from Same network and across different networks.

Ping Process across same network

First, I'll send packets from PC2 in Network B1L2 to PC3 in Network B1L1



The screenshot shows a PC2 window in Cisco Packet Tracer. The 'Desktop' tab is selected, displaying a 'Command Prompt' window. The command prompt shows the execution of a ping command to 172.16.1.2, resulting in four successful replies with 0% loss.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.16.1.2

Pinging 172.16.1.2 with 32 bytes of data:

Reply from 172.16.1.2: bytes=32 time<1ms TTL=127
Reply from 172.16.1.2: bytes=32 time=2ms TTL=127
Reply from 172.16.1.2: bytes=32 time<1ms TTL=127
Reply from 172.16.1.2: bytes=32 time=1ms TTL=127

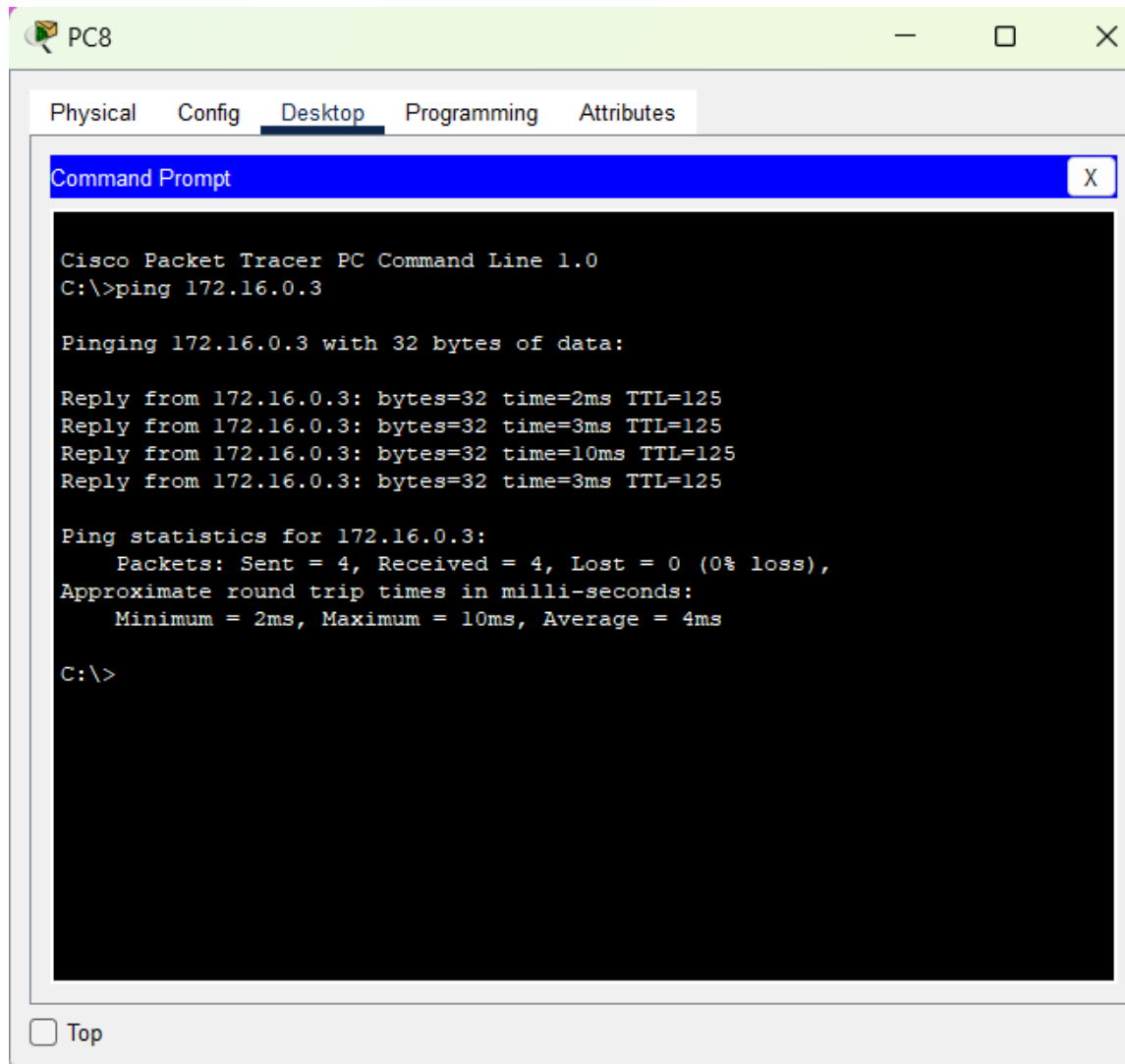
Ping statistics for 172.16.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\>
```

At the bottom left of the PC2 window, there is a checkbox labeled 'Top' which is currently unchecked.

Ping Process across different Networks

Now I'll Send a packet from PC8 in Network B2L2 to PC0 in Network B1L2 and these PC's are in two Different Networks.



Routing Solutions

We have decided to use OSPF (Open Shortest Path First), a dynamic routing protocol, for routing between the subnets. A link-state routing protocol called OSPF modifies routing tables dynamically in response to changes in the network topology. Here's why OSPF was selected for this network:

Scalability: Because OSPF is scalable, it may be used on networks of different sizes, including the multi-subnet network in our instance.

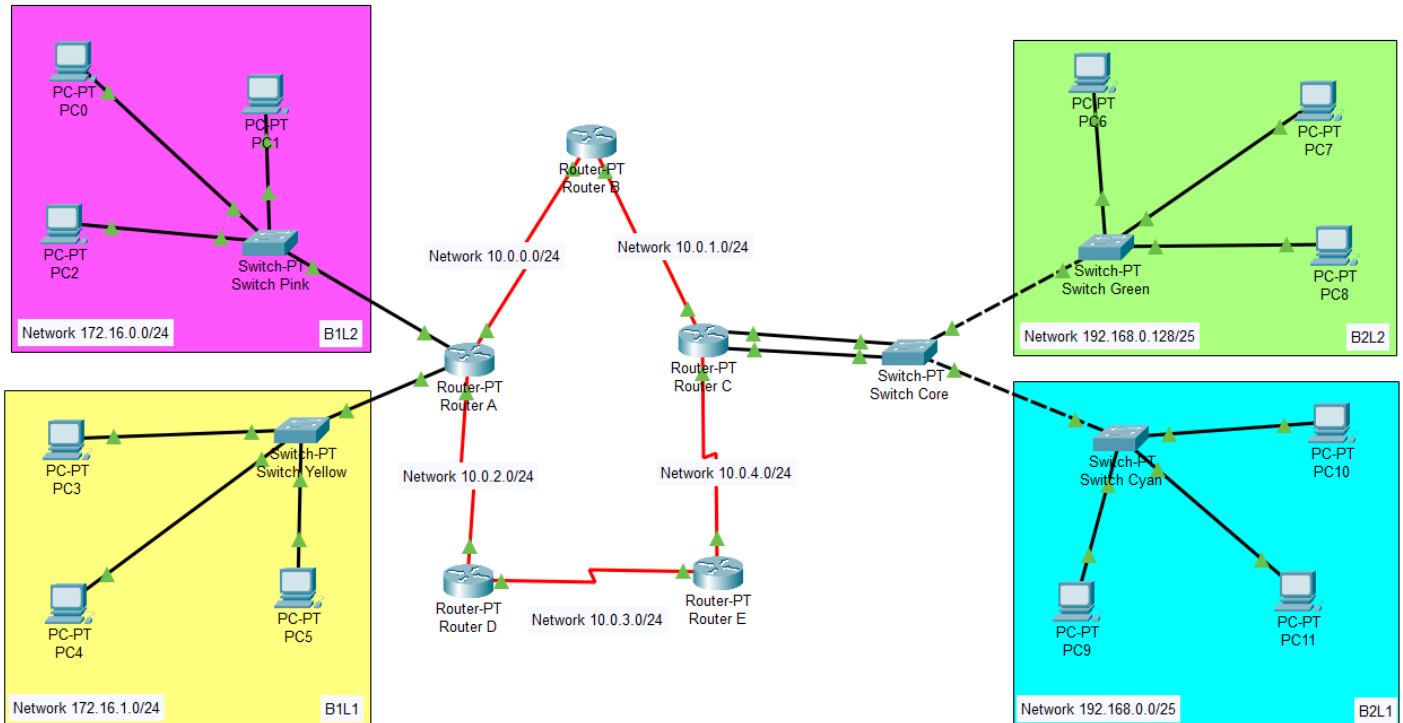
Fast Convergence: OSPF can swiftly adjust to changes in the network topology, such as new routes or failed links, because of its fast convergence times.

OSPF facilitates load balancing, which can enhance network performance by dividing traffic among several paths.

Robustness: OSPF is a robust protocol that can reliably route traffic and manage intricate network topologies.

We provide effective and dependable routing between the subnets by installing OSPF on our network's routers. This enables devices in different subnets to communicate with each other without interruption and allows the network to adapt as conditions change.

Task 2: Layer 2 Implementation and Analysis



The router must be configured with VLANs (Virtual Local Area Networks) by identifying the VLANs. In this assignment, Two VLANs are available. VLAN 100 and VLAN 200. All the even numbered PCs are members of VLAN 100, and all the Odd numbered PCs are members of VLAN 200.

VLAN 100 PCs. – PC06, PC08, PC10

VLAN 200 PCs. – PC07, PC09, PC11

The Network ID assigned for VLAN 100 is 192.168.128.0/25 and Network id assigned for VLAN 200 is 192.168.0.0/25.

Typically, switches are configured with VLANs by assigning certain interfaces to a broadcast domain and others to a different one. An Ethernet LAN's switch ports function as a subset of every VLAN. Network managers can easily restrict access to a specific user. Grouped by dividing workstations into multiple distinct LAN segments using VLANs.

Switch Configurations for Make VLANs

Switch Green VLAN Creation

The screenshot shows a web-based configuration interface for a switch named 'Switch Green'. The interface has tabs for 'Physical', 'Config', 'CLI', and 'Attributes'. The 'Config' tab is active, and the 'VLAN Database' is selected in the left-hand menu. The main area displays the 'VLAN Configuration' section with input fields for 'VLAN Number' and 'VLAN Name', and 'Add' and 'Remove' buttons. Below this is a table listing existing VLANs. The table has two columns: 'VLAN No' and 'VLAN Name'. The entries are: 1 (default), 100 (Green-VLAN), 200 (Blue-VLAN), 1002 (fddi-default), 1003 (token-ring-default), 1004 (fddinet-default), and 1005 (trnet-default). At the bottom, there is a section titled 'Equivalent IOS Commands' containing a terminal window with the following text: %SPANTREE-2-RECV_PVID_ERR: Received 802.1Q BPDU on non trunk FastEthernet3/1 VLAN1. %SPANTREE-2-BLOCK_PVID_LOCAL: Blocking FastEthernet3/1 on VLAN0001. Inconsistent port type. Switch>enable Switch# Switch#configure terminal Enter configuration commands, one per line. End with CNTL/Z. Switch(config)# Switch(config)#. A 'Top' button is located at the bottom left of the window.

Switch Green

Physical **Config** CLI Attributes

GLOBAL

- Settings
- Algorithm Settings

SWITCHING

- VLAN Database**

INTERFACE

- FastEthernet0/1
- FastEthernet1/1
- FastEthernet2/1
- FastEthernet3/1
- FastEthernet4/1
- FastEthernet5/1

VLAN Configuration

VLAN Number

VLAN Name

Add Remove

VLAN No	VLAN Name
1	default
100	Green-VLAN
200	Blue-VLAN
1002	fddi-default
1003	token-ring-default
1004	fddinet-default
1005	trnet-default

Equivalent IOS Commands

```
%SPANTREE-2-RECV_PVID_ERR: Received 802.1Q BPDU on non trunk FastEthernet3/1 VLAN1.  
  
%SPANTREE-2-BLOCK_PVID_LOCAL: Blocking FastEthernet3/1 on VLAN0001. Inconsistent port type.  
  
Switch>enable  
Switch#  
Switch#configure terminal  
Enter configuration commands, one per line. End with CNTL/Z.  
Switch(config)#  
Switch(config)#
```

☐ Top

In Switch Green Fastethernet should be always access.

The screenshot displays the 'Switch Green' configuration window. The 'Config' tab is active, showing the configuration for 'FastEthernet0/1'. The left sidebar contains a tree view with 'GLOBAL' (Settings, Algorithm Settings), 'SWITCHING' (VLAN Database), and 'INTERFACE' (FastEthernet0/1, FastEthernet1/1, FastEthernet2/1, FastEthernet3/1, FastEthernet4/1, FastEthernet5/1). The main area shows the configuration for 'FastEthernet0/1' with the following settings:

- Port Status: ☒ On
- Bandwidth: ☒ 100 Mbps, ☐ 10 Mbps
- Duplex: ☐ Half Duplex, ☒ Full Duplex
- Access: ☐ Access, ☒ VLAN
- VLAN: 100
- Tx Ring Limit: 10

Below the configuration area, the 'Equivalent IOS Commands' section shows the following commands:

```
Switch>enable
Switch#
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#
Switch(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to up
Switch(config)#interface FastEthernet0/1
Switch(config-if)#
```

At the bottom left, there is a 'Top' button.

Switch Cyan VLAN Creation

Switch Cyan

Physical

Config

CLI

Attributes

GLOBAL

Settings

Algorithm Settings

SWITCHING

VLAN Database

INTERFACE

FastEthernet0/1

FastEthernet1/1

FastEthernet2/1

FastEthernet3/1

FastEthernet4/1

FastEthernet5/1

VLAN Configuration

VLAN Number

VLAN Name

Add

Remove

VLAN No	VLAN Name
1	default
100	Green-VLAN
200	Blue-VLAN
1002	fddi-default
1003	token-ring-default
1004	fddinet-default
1005	trnet-default

Equivalent IOS Commands

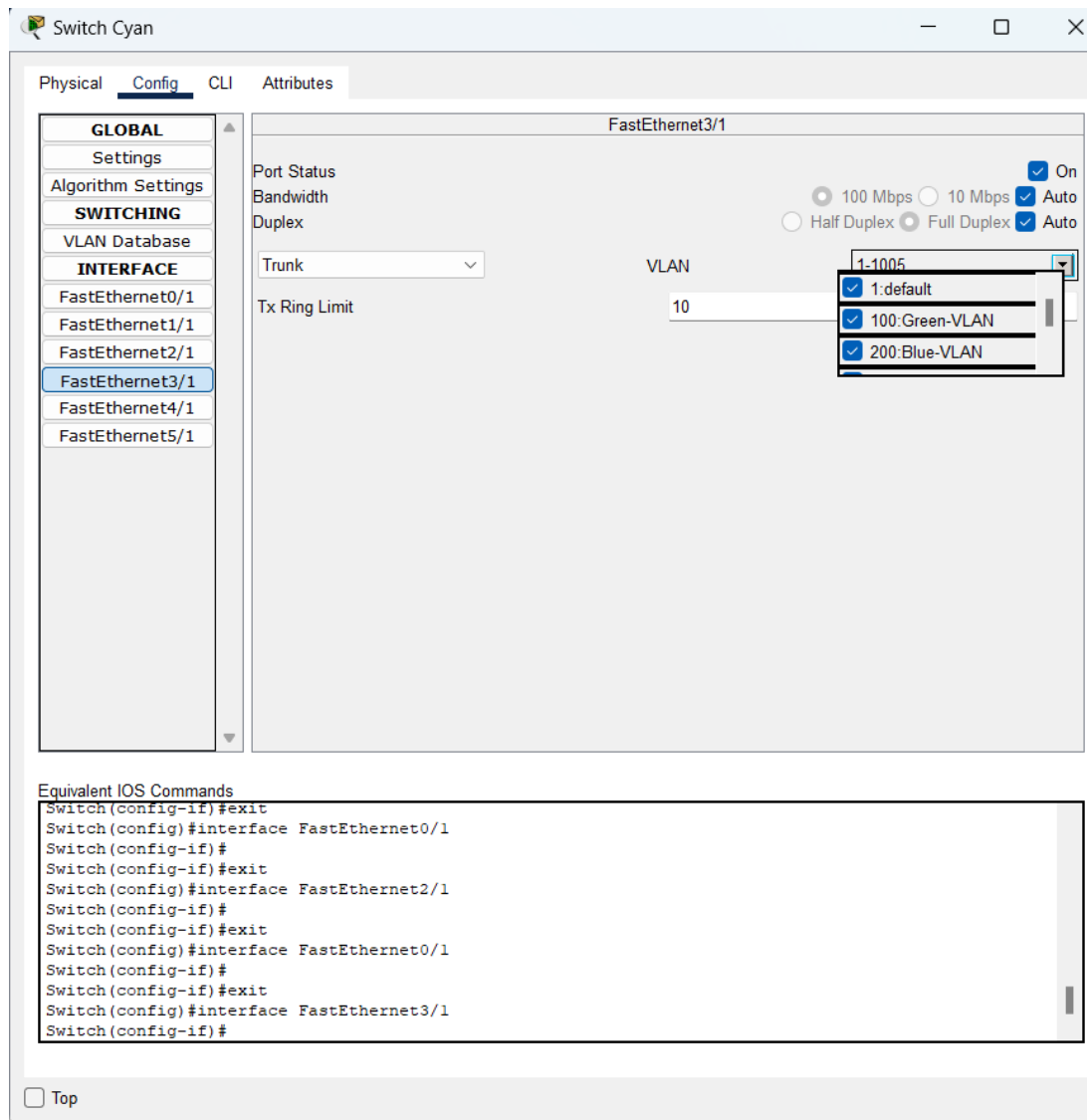
```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to up

Switch>enable
Switch#
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#
Switch(config)#
```

☐ Top

In Switch Cyan fa 0/1, fa 0/2 are access
Fa0/3 is Trunk due to two types of VLANs.



The screenshot displays the configuration page for FastEthernet3/1 on a switch named 'Switch Cyan'. The interface includes tabs for Physical, Config, CLI, and Attributes. The left sidebar shows a tree view with categories: GLOBAL (Settings, Algorithm Settings), SWITCHING (VLAN Database), and INTERFACE (FastEthernet0/1, FastEthernet1/1, FastEthernet2/1, FastEthernet3/1, FastEthernet4/1, FastEthernet5/1). The main configuration area for FastEthernet3/1 shows: Port Status (On), Bandwidth (100 Mbps), Duplex (Full Duplex), and a Trunk mode dropdown set to 'Trunk'. A VLAN list dropdown is open, showing '1-1005' with a search filter '10' and a list of selected VLANs: '1:default', '100:Green-VLAN', and '200:Blue-VLAN'. Below the configuration area, a section titled 'Equivalent IOS Commands' contains a list of commands:

```
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/1
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#interface FastEthernet2/1
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#interface FastEthernet0/1
Switch(config-if)#
Switch(config-if)#exit
Switch(config)#interface FastEthernet3/1
Switch(config-if)#
```

 At the bottom left, there is a 'Top' link.

Switch Core VLAN creation

Switch Core

Physical

Config

CLI

Attributes

GLOBAL

Settings

Algorithm Settings

SWITCHING

VLAN Database

INTERFACE

FastEthernet0/1

FastEthernet1/1

FastEthernet2/1

FastEthernet3/1

FastEthernet4/1

FastEthernet5/1

VLAN Configuration

VLAN Number

VLAN Name

Add

Remove

VLAN No	VLAN Name
1	default
100	Green-VLAN
200	Blue-VLAN
1002	fdi-default
1003	token-ring-default
1004	fdinet-default
1005	trnet-default

Equivalent IOS Commands

```
%LINK-5-CHANGED: Interface FastEthernet3/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to up

Switch>enable
Switch#
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#
Switch(config)#
```

☐ Top

In switch Core f0/1, fa1/1 are Trunk because of two VLANs.

Switch Core

Physical **Config** CLI Attributes

GLOBAL

- Settings
- Algorithm Settings

SWITCHING

- VLAN Database

INTERFACE

- FastEthernet0/1**
- FastEthernet1/1
- FastEthernet2/1
- FastEthernet3/1
- FastEthernet4/1
- FastEthernet5/1

FastEthernet0/1

Port Status ☒ On

Bandwidth ☒ 100 Mbps ☐ 10 Mbps ☒ Auto

Duplex ☐ Half Duplex ☒ Full Duplex ☒ Auto

Trunk VLAN

Tx Ring Limit

Equivalent IOS Commands

```
Switch(config-if)#  
Switch(config-if)#exit  
Switch(config)#interface FastEthernet0/1  
Switch(config-if)#  
Switch(config-if)#exit  
Switch(config)#interface FastEthernet0/1  
Switch(config-if)#  
Switch(config-if)#exit  
Switch(config)#  
Switch(config)#  
Switch(config)#interface FastEthernet0/1  
Switch(config-if)#
```

☐ Top

Shown below are the VLANs of the Switches. It shows the access cables but not the trunk cables.

Switch Core

Switch Core

Physical Config CLI Attributes

IOS Command Line Interface

```
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
%LINK-5-CHANGED: Interface FastEthernet1/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/1, changed state to up
%LINK-5-CHANGED: Interface FastEthernet2/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/1, changed state to up
%LINK-5-CHANGED: Interface FastEthernet3/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to up

Switch>show vlan

VLAN Name                Status    Ports
-----
1    default                active    Fa4/1, Fa5/1
100  Green-VLAN              active    Fa2/1
200  Blue-VLAN               active    Fa3/1
1002 fddi-default           active
1003 token-ring-default   active
1004 fddinet-default      active
1005 trnet-default         active

VLAN Type  SAID      MTU    Parent RingNo BridgeNo Stp    BrdgMode Trans1 Trans2
-----
1    enet     1000001  1500   -       -       -       -     -         0       0
100  enet     100100  1500   -       -       -       -     -         0       0
200  enet     100200  1500   -       -       -       -     -         0       0
1002 fddi     101002  1500   -       -       -       -     -         0       0
1003 tr      101003  1500   -       -       -       -     -         0       0
1004 fdnet   101004  1500   -       -       -       -     ieee      0       0
1005 trnet   101005  1500   -       -       -       -     ibm       0       0

VLAN Type  SAID      MTU    Parent RingNo BridgeNo Stp    BrdgMode Trans1 Trans2
--More--
```

Copy Paste

☐ Top

Switch Cyan

Switch Cyan

PhysicalConfigCLIAttributes

IOS Command Line Interface

```
%LINK-5-CHANGED: Interface FastEthernet2/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/1, changed state to up
%LINK-5-CHANGED: Interface FastEthernet3/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to up
%SPANTRIE-2-RECV_FVID_ERR: Received 802.1Q BPDU on non trunk FastEthernet3/1 VLAN1.
%SPANTRIE-2-BLOCK_FVID_LOCAL: Blocking FastEthernet3/1 on VLAN0001. Inconsistent port type.

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to up

Switch>show vlan
```

VLAN	Name	Status	Ports
1	default	active	Fa4/1, Fa5/1
100	Green-VLAN	active	Fa2/1
200	Blue-VLAN	active	Fa0/1, Fa1/1
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	0	0
100	enet	100100	1500	-	-	-	-	-	0	0
200	enet	100200	1500	-	-	-	-	-	0	0
1002	fddi	101002	1500	-	-	-	-	-	0	0
1003	tr	101003	1500	-	-	-	-	-	0	0
1004	fdnet	101004	1500	-	-	-	ieee	-	0	0
1005	trnet	101005	1500	-	-	-	ibm	-	0	0

VLAN Type SAID MTU Parent RingNo BridgeNo Stp BrdgMode Trans1 Trans2

--More--

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Switch Green

Switch Green

Physical Config **CLI** Attributes

IOS Command Line Interface

```
%LINK-5-CHANGED: Interface FastEthernet2/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/1, changed state to up
%LINK-5-CHANGED: Interface FastEthernet3/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to up
%SPANTREE-2-RECV_PVID_ERR: Received 802.1Q BPDU on non trunk FastEthernet3/1 VLAN1.
%SPANTREE-2-BLOCK_PVID_LOCAL: Blocking FastEthernet3/1 on VLAN0001. Inconsistent port type.

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to up

Switch>show vlan
```

VLAN	Name	Status	Ports
1	default	active	Fa4/1, Fa5/1
100	Green-VLAN	active	Fa0/1, Fa2/1
200	Blue-VLAN	active	Fa1/1
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	0	0
100	enet	100100	1500	-	-	-	-	-	0	0
200	enet	100200	1500	-	-	-	-	-	0	0
1002	fddi	101002	1500	-	-	-	-	-	0	0
1003	tr	101003	1500	-	-	-	-	-	0	0
1004	fdnet	101004	1500	-	-	-	ieee	-	0	0
1005	trnet	101005	1500	-	-	-	ibm	-	0	0

VLAN Type SAID MTU Parent RingNo BridgeNo Stp BrdgMode Trans1 Trans2

--More--

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Then we can make DHCP pools for subnetworks and set default routers. In network 1 and 2

Router Configuration for Network 1

Router>en

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#int fa0/0

Router(config-if)#ip address 192.168.128.1 255.255.255.128

Router(config-if)#no shutdown

Router(config-if)#

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on interface FastEthernet0/0, changed state to up

DHCP Pool Configuration for Network 1

Router(config)#ip dhcp pool network1

Router(dhcp-config)#network 192.168.128.0 255.255.255.128

Router(dhcp-config)#default-router 192.168.128.1

Router(dhcp-config)#exit

Router(config)#exit

Router#

%SYS-5-CONFIG_I: Configured from console by console

Router#write memory

Building configuration...

[OK]

Router#

Router Configuration for Network 2

Router>en

Router#conf t

Enter configuration commands, one per line. End with CNTL/Z.

Router(config)#int fa1/0

Router(config-if)#ip address 192.168.0.1 255.255.255.128

Router(config-if)#no shutdown

Router(config-if)#

%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on interface FastEthernet1/0, changed state to up

DHCP Pool Configuration for Network 2

Router(config)#ip dhcp pool network1

Router(dhcp-config)#network 192.168.0.0 255.255.255.128

Router(dhcp-config)#default-router 192.168.0.1

Router(dhcp-config)#exit

Router(config)#exit

Router#

%SYS-5-CONFIG_I: Configured from console by console

Router#write memory

Building configuration...

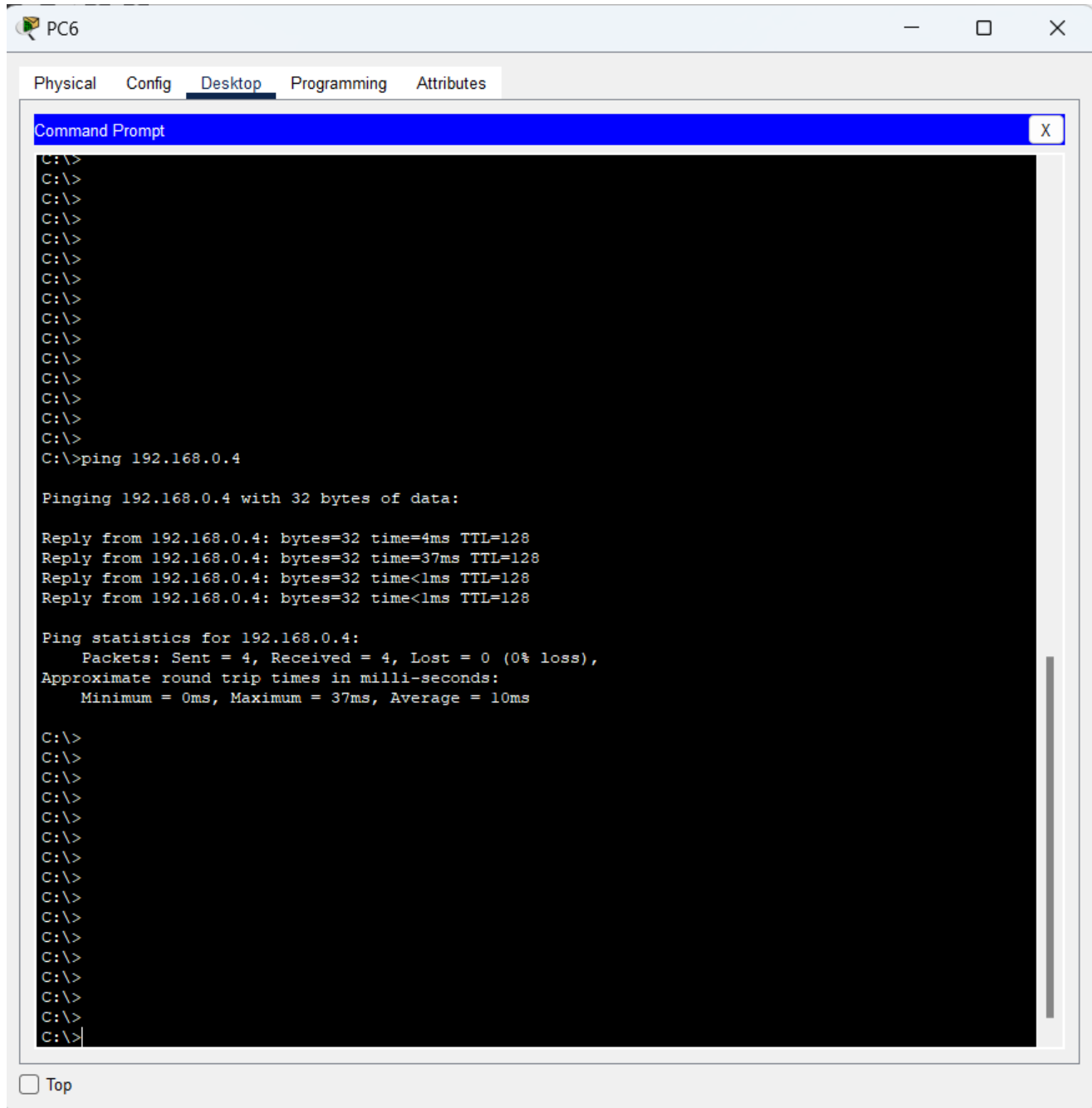
[OK]

Router#

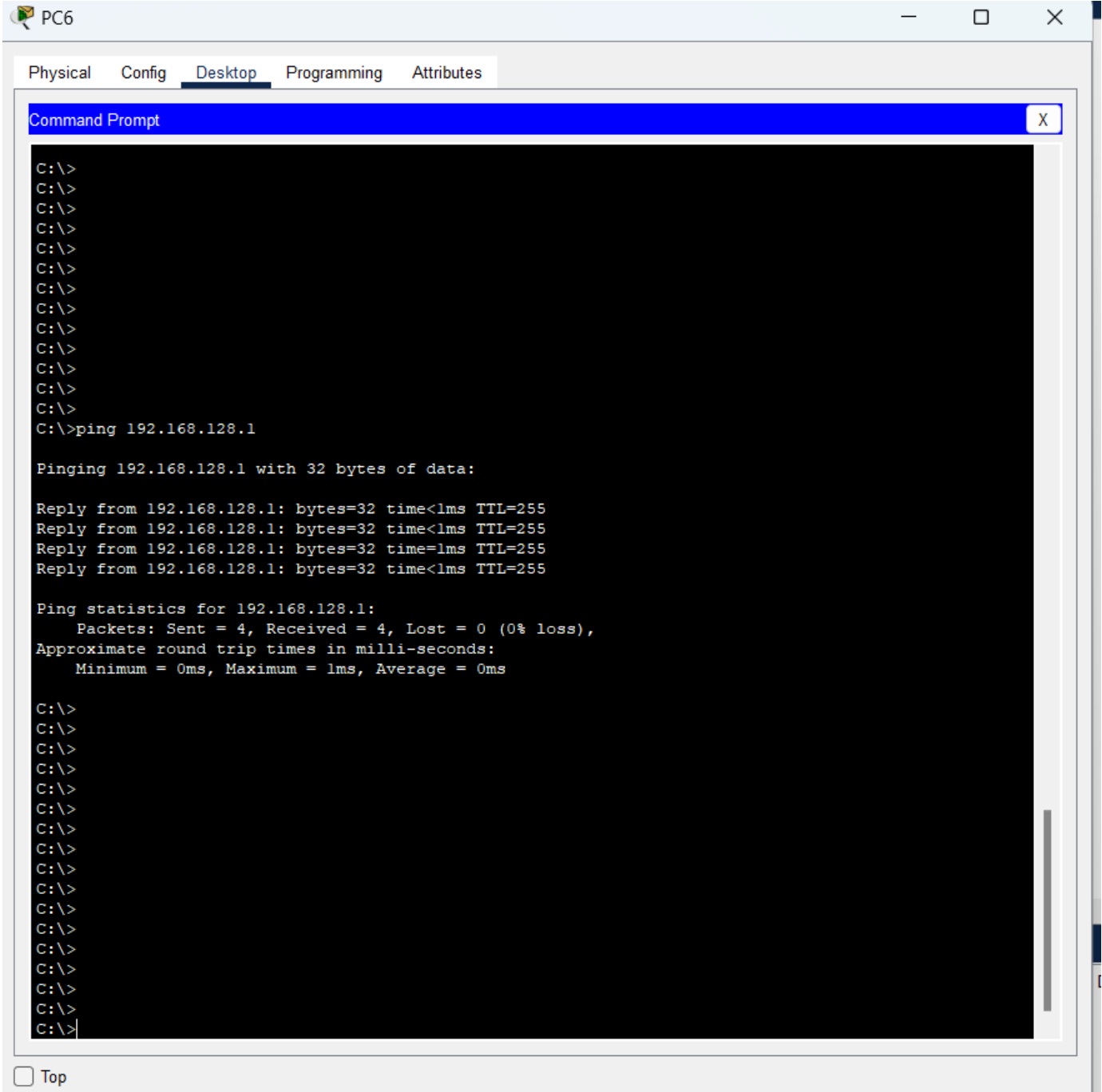
We can get IP addresses for PCs as the same way we have done in task 1.

Now, We are able to use ping command and use ping command to verify the connectivity over VLANs.

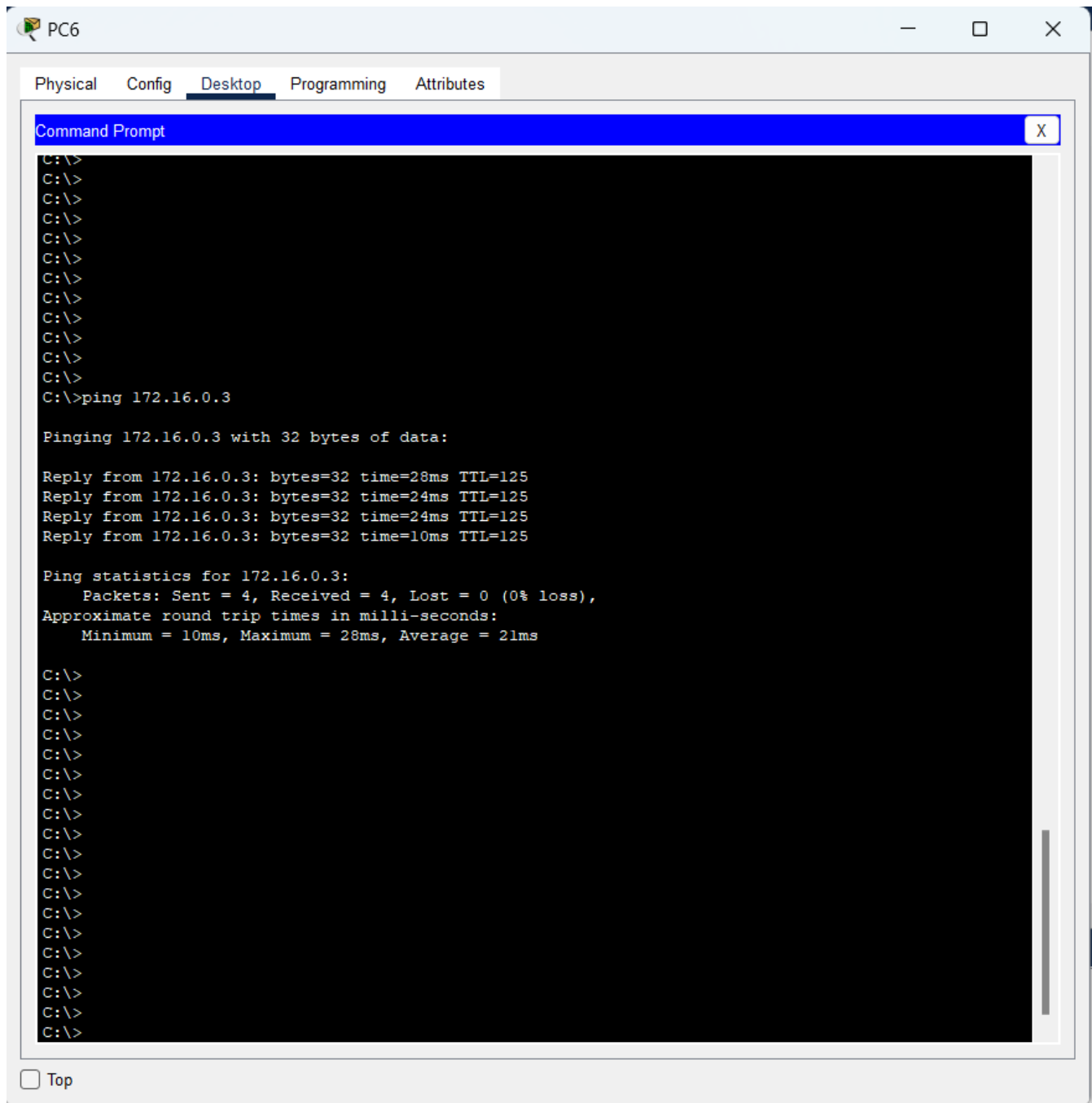
Checking Connectivity in same VLAN (PC6 to PC8)



Checking connectivity from Different Network (PC6 to PC9)



Checking Connectivity from Two Different Networks (PC6 to PC0)



Method for Setting Up VLANs and Routing Information Across Subnets:

Setting Up a VLAN:

On a Layer 2 switch, create VLAN 100 and VLAN 200.

Assign the appropriate ports to every VLAN.

Set up the switch's VLAN interfaces (SVIs) for VLANs 100 and 200.

192.168.128.1 - 192.168.128.126 should be the range for switch interfaces connected to devices in VLAN 100, and 192.168.0.1 - 192.168.0.126 should be the range for switch interfaces connected to devices in VLAN 200.

Inter-Subnet Routing:

Use a trunk port to link the router and switch it together.

Set up subinterfaces on the router using the IP addresses 192.168.128.1/25 and 192.168.0.1/25 for VLAN 100 and VLAN 200, respectively.

On the router, enable routing.

Set the switch's default gateways to point to the subinterfaces of the router.

Dissimilarities with Task 1: IP Addressing System

The IP ranges and masks for the VLANs in this scenario differ from those in Task 1. Whereas VLAN 200 uses 192.168.0.0/25, VLAN 100 utilizes the range 192.168.128.0/25.

Routing Configuration: Because VLAN 100 and VLAN 200 have different network requirements, the precise IP addresses and subnet configurations on the router's sub interfaces are different in this situation, even though the fundamental idea of routing between VLANs is still the same.

Network Segmentation: VLAN-achieved network segmentation remains the main focus, although the particular network IDs and subnetting information differ between the two tasks according to the demands of each network configuration.

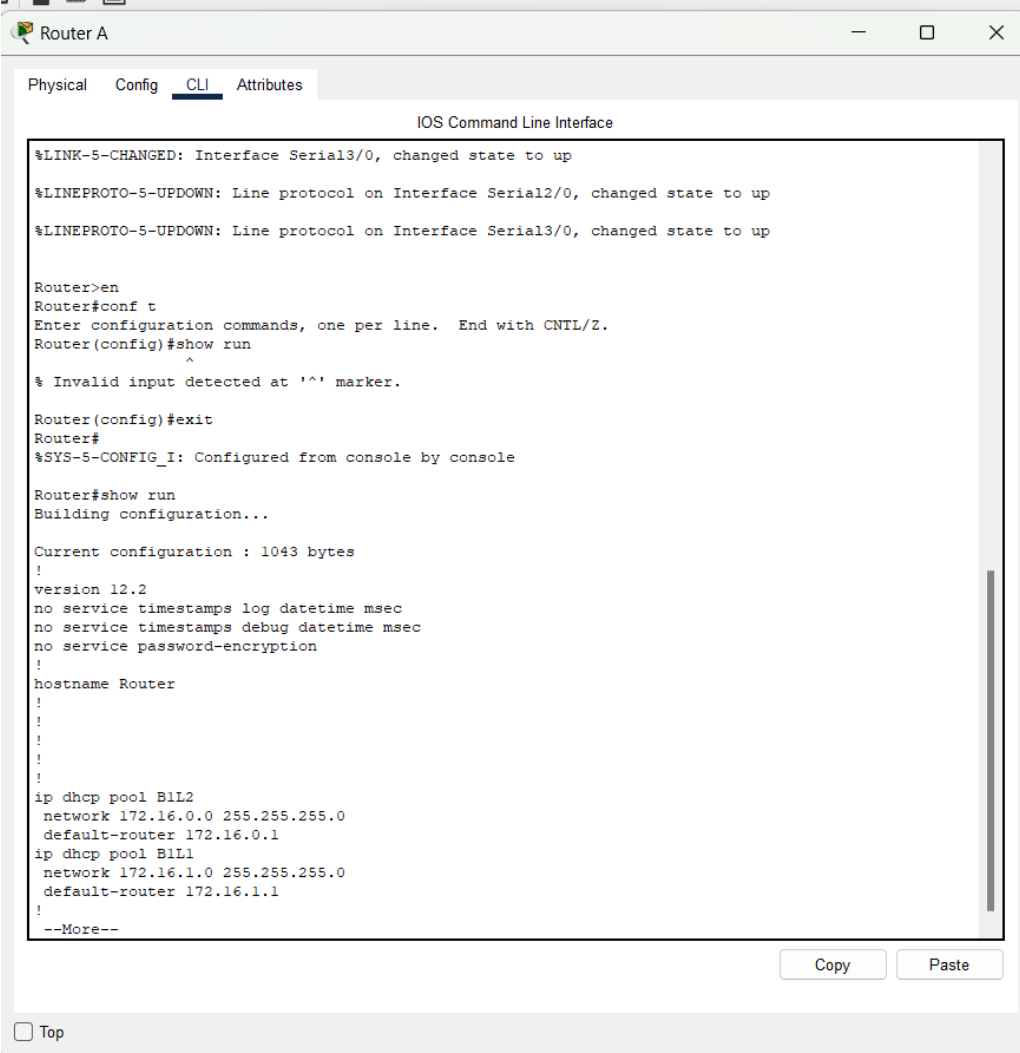
In conclusion, the basic ideas behind configuring VLANs and routing data between subnets are still the same.

Task 03 - Layer 3 Evaluation

In Task 3, we focus on evaluating Layer 3 performance in the Task 1 network that has already been constructed. We start a ping operation from a host in Network B to a host in Network A with a specific focus on Network B. Our objective is to look into how Layer 2 (Data Link Layer) and Layer 3 (Network Layer) addresses are assigned and managed at the entry and exit points of each network.

First, I will use Show run command to examine the running configuration of all routers and switches.

Router A



The screenshot shows the Router A CLI interface with the following text:

```
Router A
Physical Config CLI Attributes
IOS Command Line Interface

%LINK-5-CHANGED: Interface Serial3/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#show run
^
% Invalid input detected at '^' marker.


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

Router#show run
Building configuration...

Current configuration : 1043 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
!
ip dhcp pool B1L2
network 172.16.0.0 255.255.255.0
default-router 172.16.0.1
ip dhcp pool B1L1
network 172.16.1.0 255.255.255.0
default-router 172.16.1.1
!
--More--
```

At the bottom of the window, there are "Copy" and "Paste" buttons, and a "Top" link.

Router B

 Router B

Physical Config CLI Attributes

IOS Command Line Interface

```
4 FastEthernet/IEEE 802.3 interface(s)
2 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)

Press RETURN to get started!

%LINK-5-CHANGED: Interface Serial2/0, changed state to up
%LINK-5-CHANGED: Interface Serial3/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up


Router>en
Router#show run
Building configuration...

Current configuration : 766 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
!
!
!
!
ip cef
no ipv6 cef
!
!
--More-- |
```

Copy Paste

☐ Top

Router C

 Router C

Physical Config CLI Attributes

IOS Command Line Interface

```
Press RETURN to get started!

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
%LINK-5-CHANGED: Interface Serial3/0, changed state to up
%LINK-5-CHANGED: Interface Serial2/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up


Router>en
Router#show run
Building configuration...

Current configuration : 989 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
!
ip dhcp pool B2L2
 network 192.168.0.128 255.255.255.128
 default-router 192.168.0.129
ip dhcp pool B2L1
 network 192.168.0.0 255.255.255.128
 default-router 192.168.0.1
!
--More--
```

Copy Paste

☐ Top

Router D

 Router D — □ ×

Physical Config CLI Attributes

IOS Command Line Interface

```
4 FastEthernet/IEEE 802.3 interface(s)
2 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)

Press RETURN to get started!

%LINK-5-CHANGED: Interface Serial2/0, changed state to up
%LINK-5-CHANGED: Interface Serial3/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up


Router>en
Router#show run
Building configuration...

Current configuration : 786 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
!
!
!
!
ip cef
no ipv6 cef
!
!
--More--
```

Copy Paste

☐ Top

Router E

 Router E

Physical Config CLI Attributes

IOS Command Line Interface

```
4 FastEthernet/IEEE 802.3 interface(s)
2 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)

Press RETURN to get started!

%LINK-5-CHANGED: Interface Serial2/0, changed state to up
%LINK-5-CHANGED: Interface Serial3/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up


Router>en
Router#show run
Building configuration...

Current configuration : 748 bytes
!
version 12.2
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
!
!
!
!
ip cef
no ipv6 cef
!
!
--More--
```

Copy Paste

☐ Top

Switch Pink

 Switch Pink

Physical Config CLI Attributes

IOS Command Line Interface

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to up

Switch>en
Switch#show run
Building configuration...

Current configuration : 499 bytes
!
version 12.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Switch
!
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet1/1
!
interface FastEthernet2/1
!
interface FastEthernet3/1
!
interface FastEthernet4/1
!
interface FastEthernet5/1
!
interface Vlan1
  no ip address
  shutdown
!
!
--More--
```

Copy Paste

☐ Top

Switch Yellow

Switch Yellow

Physical Config CLI Attributes

IOS Command Line Interface

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to up

Switch>en
Switch#show run
Building configuration...


Current configuration : 499 bytes
!
version 12.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Switch
!
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet1/1
!
interface FastEthernet2/1
!
interface FastEthernet3/1
!
interface FastEthernet4/1
!
interface FastEthernet5/1
!
interface Vlan1
  no ip address
  shutdown
!
!
--More--
```

Copy

Paste

☐ Top

Switch Green

 Switch Green

Physical Config CLI Attributes

IOS Command Line Interface

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1, changed state to up

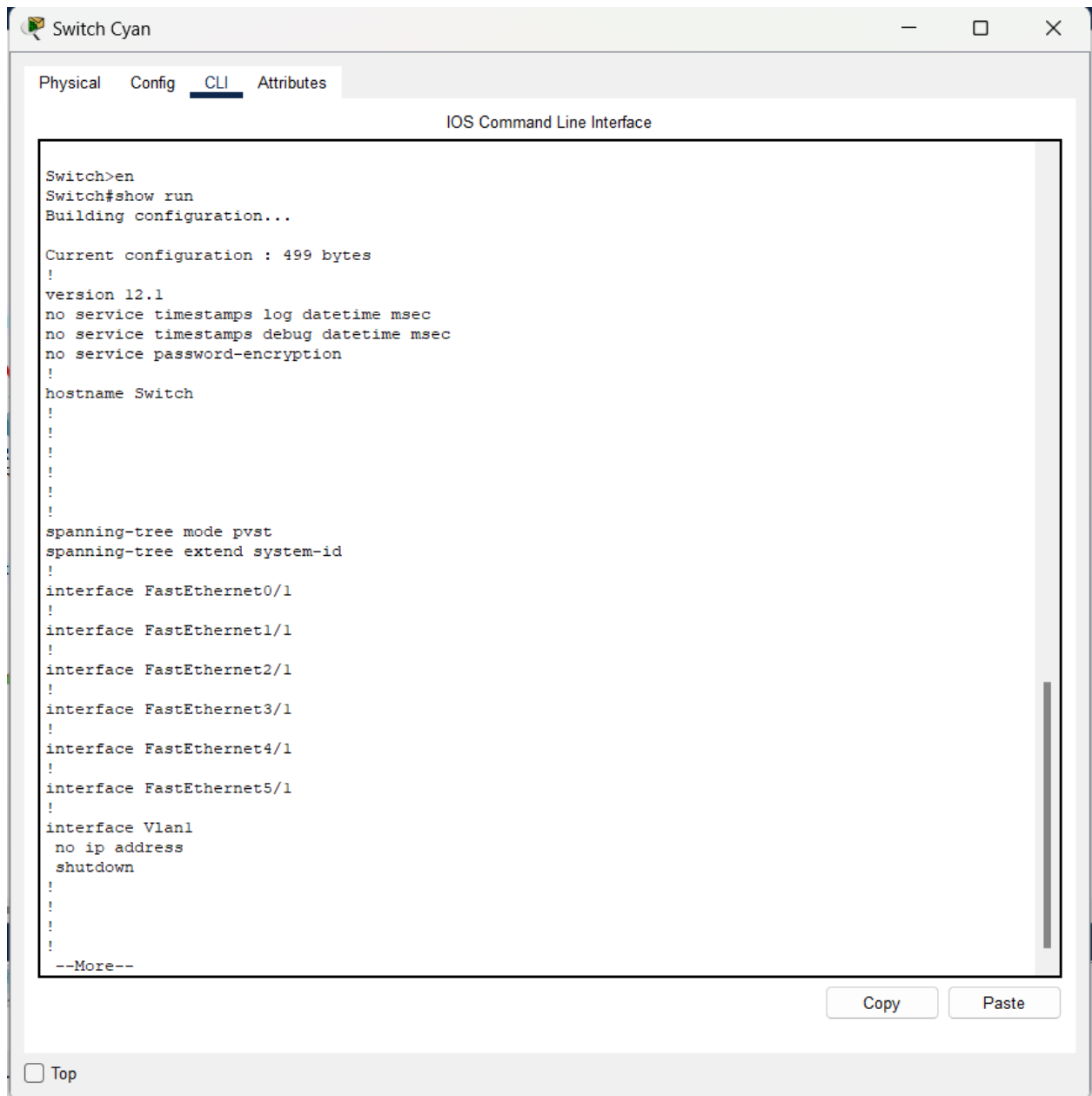
Switch>en
Switch#show run
Building configuration...

Current configuration : 499 bytes
!
version 12.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Switch
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet1/1
!
interface FastEthernet2/1
!
interface FastEthernet3/1
!
interface FastEthernet4/1
!
interface FastEthernet5/1
!
interface Vlan1
no ip address
shutdown
!
!
--More-- |
```

Copy Paste

☐ Top

Switch Cyan



The screenshot shows a web-based interface for a device named "Switch Cyan". The interface has four tabs: "Physical", "Config", "CLI", and "Attributes". The "CLI" tab is selected, and the title "IOS Command Line Interface" is displayed above the main text area. The text area contains the output of the "show run" command, which shows the current configuration of the switch. The configuration includes the version (12.1), service timestamps, hostname (Switch), spanning-tree mode (pvst), and several interfaces (FastEthernet0/1 through FastEthernet5/1 and Vlan1). The output is truncated with "--More--" at the bottom. Below the text area, there are "Copy" and "Paste" buttons. At the bottom left of the interface, there is a "Top" link.

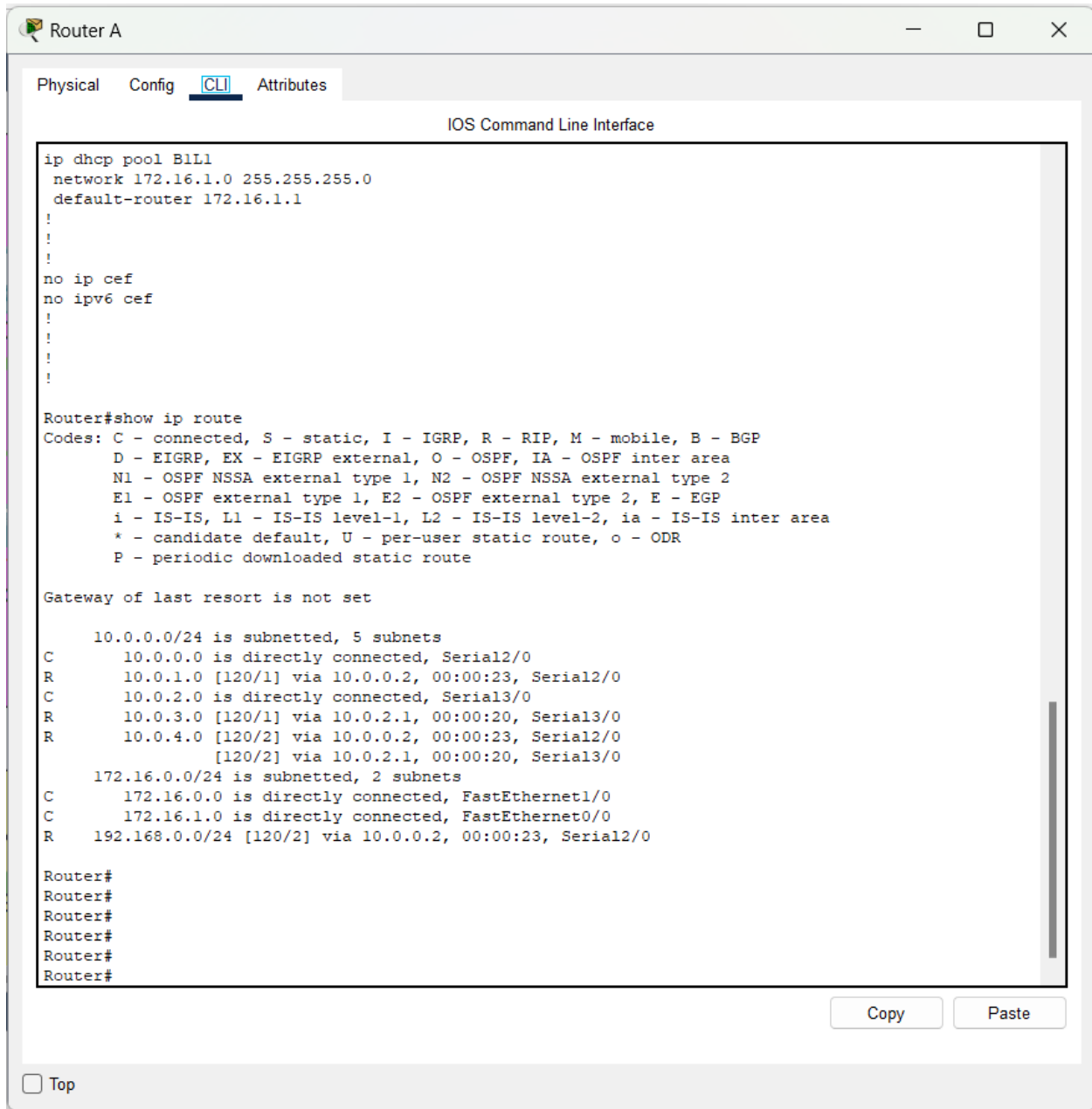
```
Switch>en
Switch#show run
Building configuration...

Current configuration : 499 bytes
!
version 12.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Switch
!
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet1/1
!
interface FastEthernet2/1
!
interface FastEthernet3/1
!
interface FastEthernet4/1
!
interface FastEthernet5/1
!
interface Vlan1
  no ip address
  shutdown
!
!
!
!
--More--
```

☐ Top

Now I will use show IP route command for all routers.

Router A



The screenshot shows the CLI interface of Router A. The 'CLI' tab is selected. The command history shows the configuration of a DHCP pool named 'B1L1' with network 172.16.1.0/24 and default-router 172.16.1.1. Below this, the 'show ip route' command is executed, displaying the routing table. The output shows the gateway of last resort is not set, and lists the subnets for 10.0.0.0/24 and 172.16.0.0/24. The routing table shows that 10.0.0.0/24 is subnetted into 5 subnets, and 172.16.0.0/24 is subnetted into 2 subnets. The routing table also shows that 172.16.1.0 is directly connected to FastEthernet0/0. The routing table is as follows:

```
Router A
Physical Config CLI Attributes
IOS Command Line Interface

ip dhcp pool B1L1
network 172.16.1.0 255.255.255.0
default-router 172.16.1.1
!
!
!
no ip cef
no ipv6 cef
!
!
!

Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

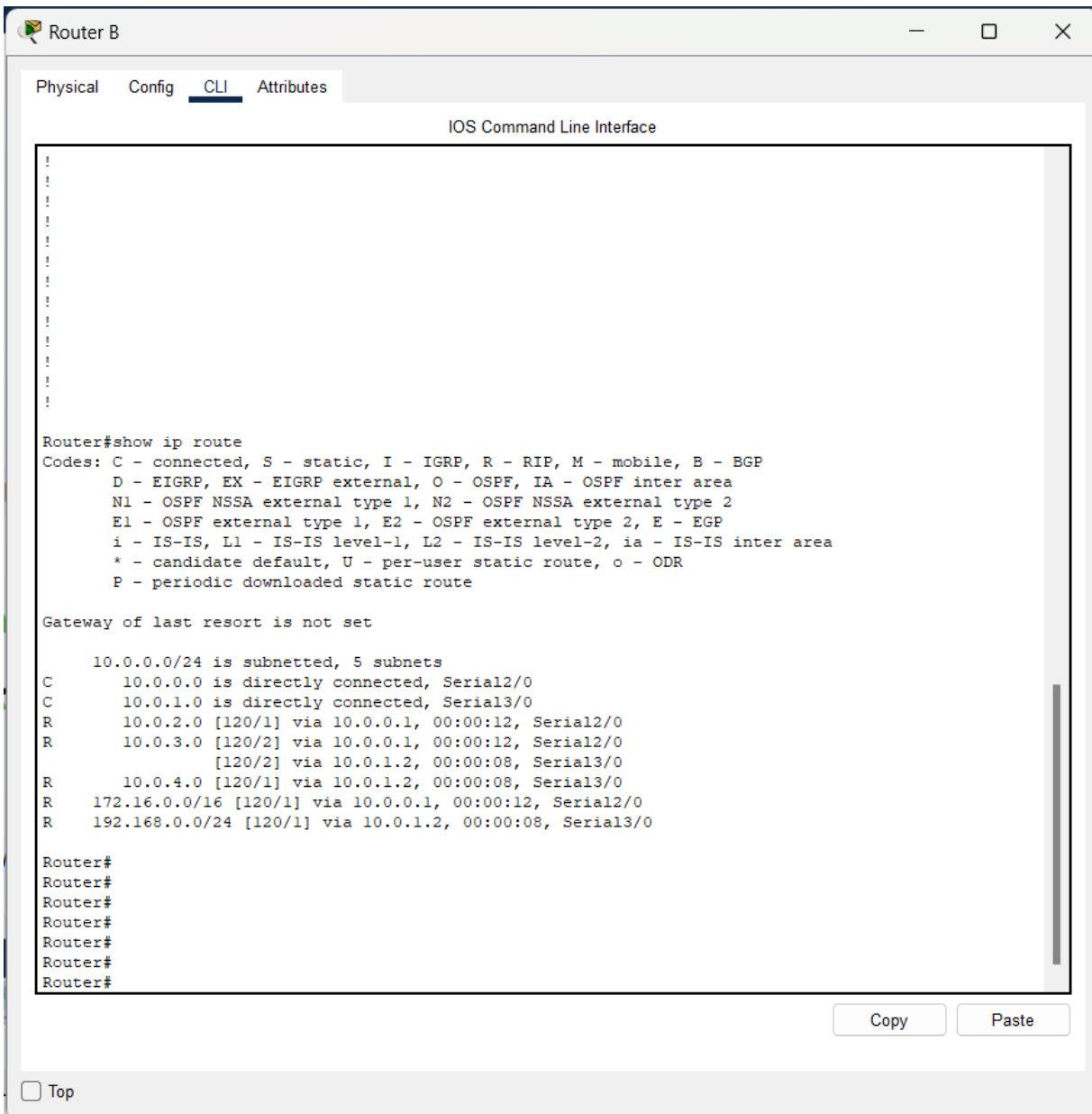
  10.0.0.0/24 is subnetted, 5 subnets
C      10.0.0.0 is directly connected, Serial2/0
R      10.0.1.0 [120/1] via 10.0.0.2, 00:00:23, Serial2/0
C      10.0.2.0 is directly connected, Serial3/0
R      10.0.3.0 [120/1] via 10.0.2.1, 00:00:20, Serial3/0
R      10.0.4.0 [120/2] via 10.0.0.2, 00:00:23, Serial2/0
        [120/2] via 10.0.2.1, 00:00:20, Serial3/0
  172.16.0.0/24 is subnetted, 2 subnets
C      172.16.0.0 is directly connected, FastEthernet1/0
C      172.16.1.0 is directly connected, FastEthernet0/0
R      192.168.0.0/24 [120/2] via 10.0.0.2, 00:00:23, Serial2/0

Router#
Router#
Router#
Router#
Router#
Router#
```


Copy Paste

☐ Top

Router B



Router C

 Router C

Physical Config CLI Attributes

IOS Command Line Interface

```
Router>en
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

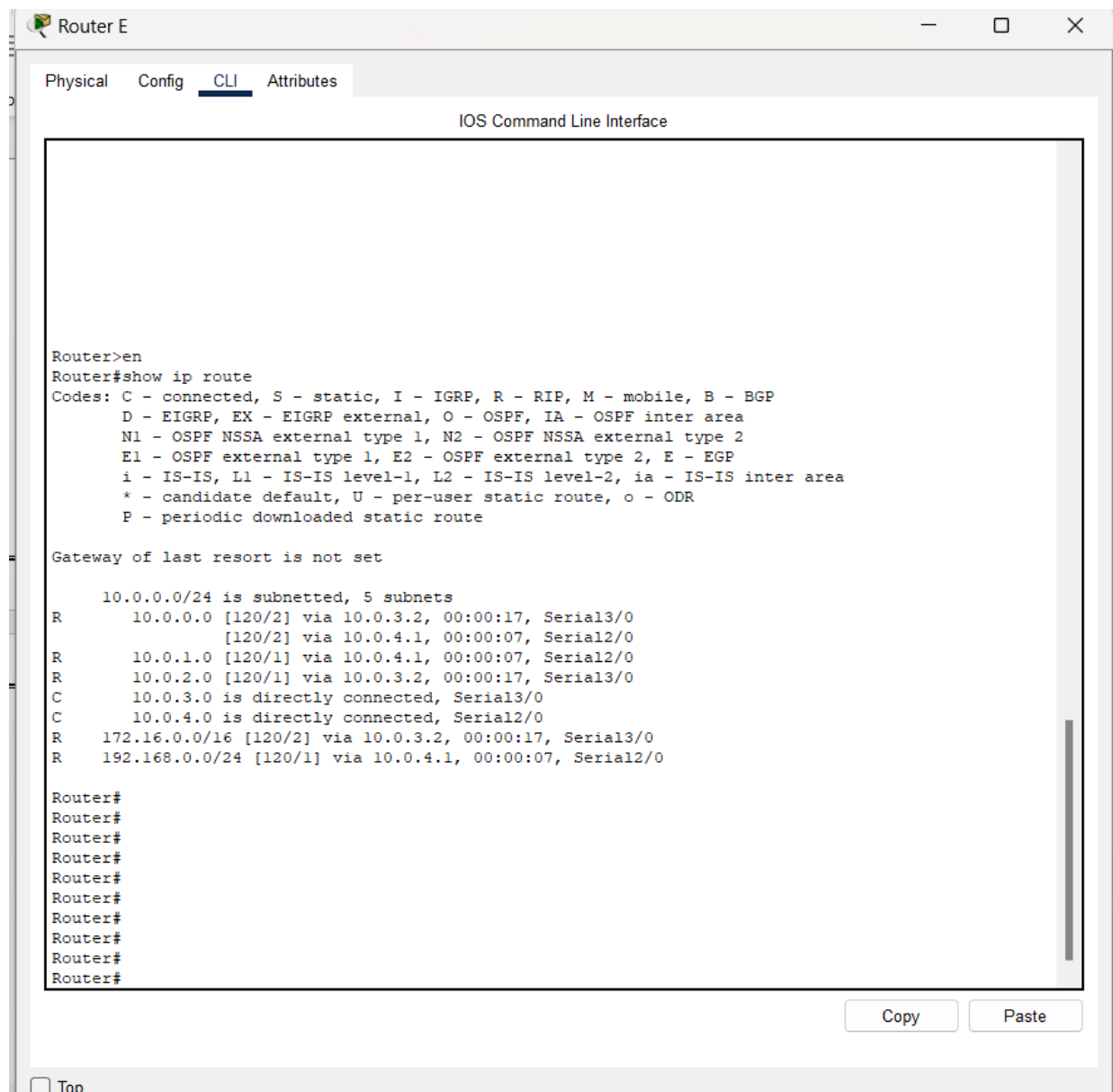
  10.0.0.0/24 is subnetted, 5 subnets
R    10.0.0.0 [120/1] via 10.0.1.1, 00:00:02, Serial3/0
C    10.0.1.0 is directly connected, Serial3/0
R    10.0.2.0 [120/2] via 10.0.1.1, 00:00:02, Serial3/0
     [120/2] via 10.0.4.2, 00:00:22, Serial2/0
R    10.0.3.0 [120/1] via 10.0.4.2, 00:00:22, Serial2/0
C    10.0.4.0 is directly connected, Serial2/0
R    172.16.0.0/16 [120/2] via 10.0.1.1, 00:00:02, Serial3/0
  192.168.0.0/25 is subnetted, 2 subnets
C    192.168.0.0 is directly connected, FastEthernet0/0
C    192.168.0.128 is directly connected, FastEthernet1/0

Router#
Router#
Router#
Router#
Router#
Router#
Router#
Router#
```

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Router E



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

```
Router>en
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route


Gateway of last resort is not set

    10.0.0.0/24 is subnetted, 5 subnets
R       10.0.0.0 [120/2] via 10.0.3.2, 00:00:17, Serial3/0
         [120/2] via 10.0.4.1, 00:00:07, Serial2/0
R       10.0.1.0 [120/1] via 10.0.4.1, 00:00:07, Serial2/0
R       10.0.2.0 [120/1] via 10.0.3.2, 00:00:17, Serial3/0
C       10.0.3.0 is directly connected, Serial3/0
C       10.0.4.0 is directly connected, Serial2/0
R       172.16.0.0/16 [120/2] via 10.0.3.2, 00:00:17, Serial3/0
R       192.168.0.0/24 [120/1] via 10.0.4.1, 00:00:07, Serial2/0

Router#
Router#
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At the bottom right of the CLI window, there are "Copy" and "Paste" buttons. At the bottom left, there is a "Top" button.

Router D

 Router D

Physical Config **CLI** Attributes

IOS Command Line Interface

```
Router>en
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

    10.0.0.0/24 is subnetted, 5 subnets
R       10.0.0.0 [120/1] via 10.0.2.2, 00:00:20, Serial2/0
R       10.0.1.0 [120/2] via 10.0.2.2, 00:00:20, Serial2/0
        [120/2] via 10.0.3.1, 00:00:19, Serial3/0
C       10.0.2.0 is directly connected, Serial2/0
C       10.0.3.0 is directly connected, Serial3/0
R       10.0.4.0 [120/1] via 10.0.3.1, 00:00:19, Serial3/0
R       172.16.0.0/16 [120/1] via 10.0.2.2, 00:00:20, Serial2/0
R       192.168.0.0/24 [120/2] via 10.0.3.1, 00:00:19, Serial3/0

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Copy Paste

☐ Top

So now let's examine what addresses would change in the networks.

I'll use Green Subnet and Pink Subnet as examples.

Pink Subnet

MAC Address Change: The router must forward a data packet to the WAN after receiving it from a device in the Pink subnet. The router accomplishes this by replacing the MAC address of the device connected to the Pink subnet, which is the source MAC address of the inbound packet, with its own MAC address for the outgoing interface that links to the WAN. This is so because the WAN functions as a distinct network segment with its own set of MAC addresses, and MAC addresses are used for communication inside a local network segment.

IP Address Unchanged: Throughout this operation, the data packet's IP address doesn't change. When a packet is forwarded to the WAN, the router does not change its source IP address. The device in the Pink subnet that sent the packet initially is still listed as the source IP address.

Green Subnet

MAC Address Change: The router, like the Pink subnet, modifies the source MAC address of a data packet arriving from a device in the Green subnet to its own MAC address for the outgoing interface that is connected to the WAN. This guarantees that the packet can traverse various network segments accurately routed.

IP Address Unchanged: The data packet's IP address stays the same, just like it does with the Pink subnet. When a packet is forwarded to the WAN, the router does not change its source IP address. The device in the Green subnet that sent the packet initially is still listed as the source IP address.

In conclusion, for the outgoing interface that connects to the WAN, the router modifies the source MAC address of incoming packets from the Pink and Green subnets to its own MAC address. Given that MAC addresses are unique to each network segment, this is required to guarantee that the packets may be routed correctly across various network segments. However, because IP addresses are used for end-to-end communication and are not updated by the router during the routing process, they do not change.

Reference

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