

CSCI 5010 – Fundamentals of Data Communications

Lab 2 – Introduction to Cisco IOS and Switching Spanning Tree Protocol (STP)

Student Name: Srivaishnavi Gone
Student ID: 110378712

University of Colorado Boulder
Department of Computer Science
Network Engineering

Professor Levi Perigo, Ph.D.

Summary

This lab will provide an introduction to Cisco IOS, and how to use the Command Line Interface (CLI). For Cisco devices, the CLI is the primary way to configure and troubleshoot. It is important that you understand the basic CLI commands to navigate a Cisco device. Several videos have been linked for additional assistance and clarification, but you are also encouraged to search for other videos that may be of assistance to you.

The foundational layer to any network revolves around switching. This lab is intended to be an overview of Cisco IOS, and switching technology - STP.

The questions in the lab are intentionally vague. The purpose of this is for you not only to research, investigate, and learn the technologies, but also become proficient at interpreting both non-technical and technical questions. Being able to research and discover answers on your own will be critical as you progress in your career.

- Learn how to perform basic switch configuration & troubleshooting including:
 - Switch password assignment and IOS navigation
 - How to activate/deactivate a port
 - How to change the speed and duplex of a port
 - How to verify the MAC addresses of computers connected to a specific port
- Review the usage of Spanning Tree Protocol (STP) including how switching environments behave regarding:
 - network failure
 - network loops

Part 1

Objective 1: Connect PC to Cisco Switch in Cisco Packet Tracer

This objective will provide instructions for how to connect a PC to a Cisco device for configuration purposes.



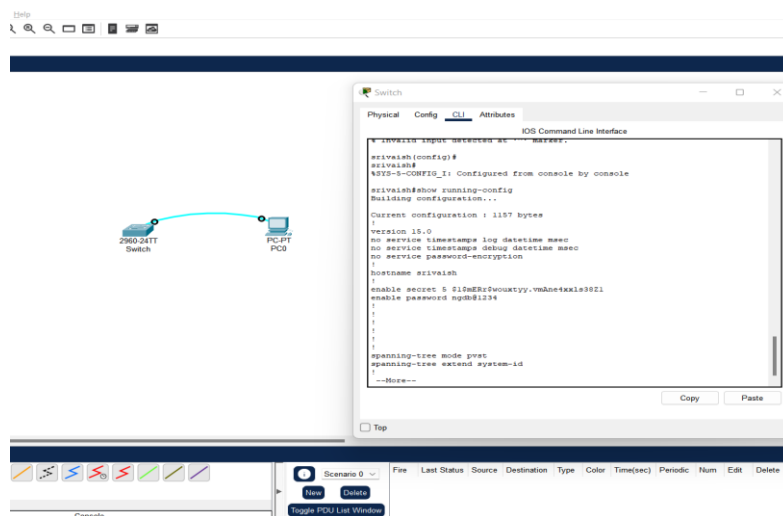
1. Use a Cisco console cable to connect PC1 to the switch “Switch1”

Objective 2: Cisco IOS User Levels & Command Line Interface (CLI)

This objective will provide an introduction to Cisco IOS network device user levels. Cisco user levels are important to understand how to navigate the prompts of a Cisco device and determine how to configure and troubleshoot the device.



1. Follow the Cisco documentation [Using the CLI](#).
2. Configure the hostname on the switch to be “your name.”



3. Create an enable password of "cisco"

```
$ Invalid input detected at '^' marker.

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

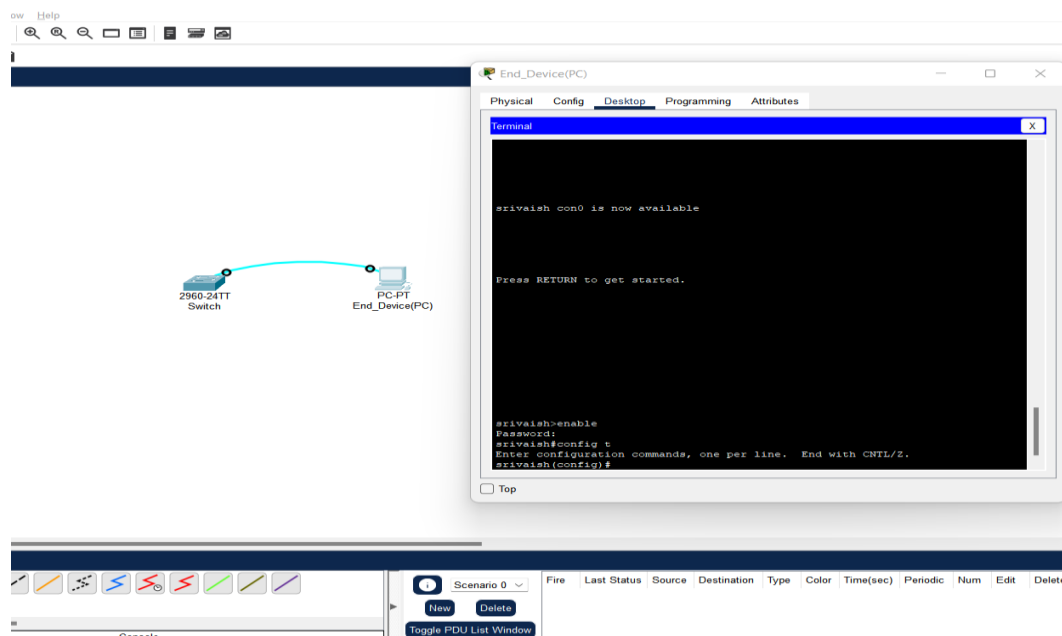
srivaish#show running-config
Building configuration...

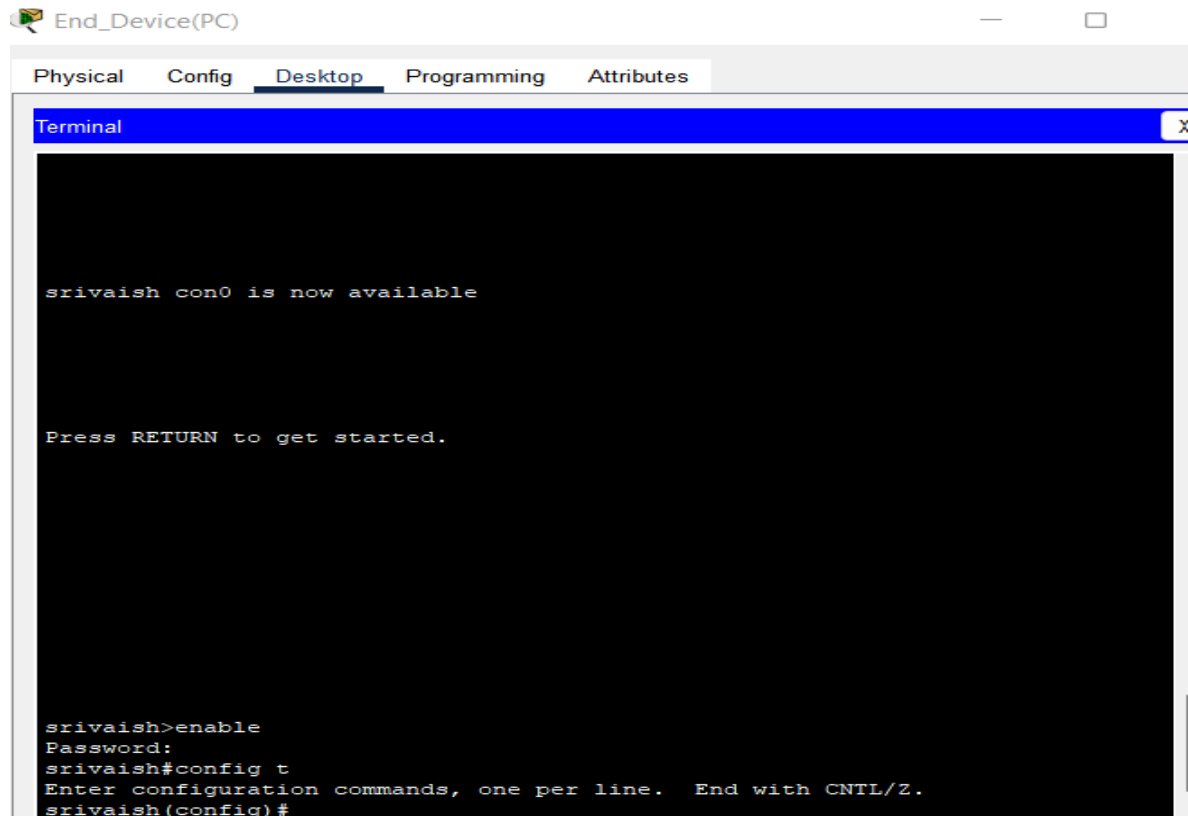
Current configuration : 1157 bytes
!
version 15.0
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname srivaish
!
enable secret 5 $1$mERr$wouxtyy.vmAne4xxls38Zl
enable password ngdb@1234
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
--More--
```

4. Create a console password of "lab".

5. Logout from the switch and console again using the PC (PC>>Desktop>>Terminal).

- a. Make sure to remember which password is for which level
- b. Verify the spelling and case sensitivity. Paste the screenshot of successful login. **[10 points]**

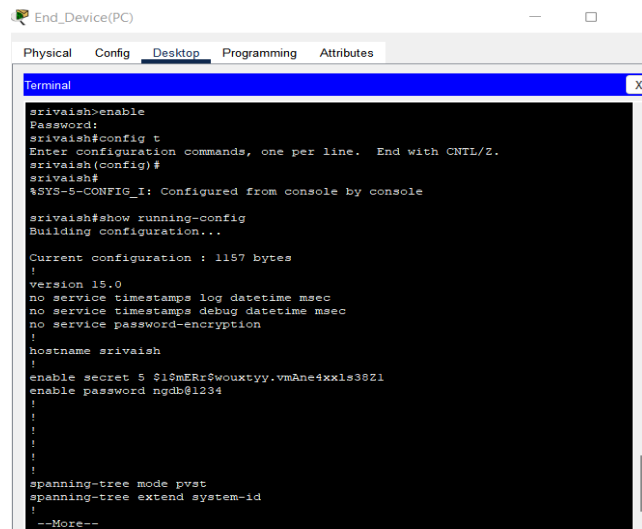




6. Paste the switch's running configuration [5 points]

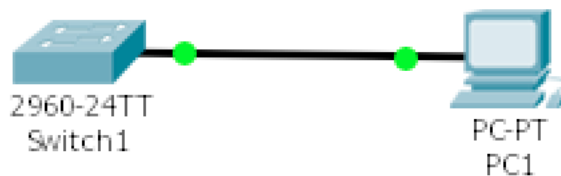
a. Do you see the settings you configured?

- i. Hostname
- ii. Enable password
- iii. Console password



Objective 3: Creating Remote Access to Cisco Networking Device (Telnet)

This objective will allow you to connect remotely to the Cisco device via the network, without using a console cable in Cisco Packet Tracer. Use this [“Enable Telnet”](#) video for assistance.



1. Configure and connect the PC and switch according to the diagram. Which cable did you use this time? [2 points]

Ans : Straight-through cable

The screenshot displays the Cisco Packet Tracer interface. The main workspace shows a 2960-24TT Switch0 connected to a PC-PT PC0. The switch configuration window is open, showing the following commands:

```
Switch>en
Switch#conf
Configuring from terminal, memory, or
Enter configuration commands, one per
Switch(config)#hostname srivaish
srivaish(config)#enable password ngdb
srivaish(config)#interface vlan 1
srivaish(config-if)#ip add 10.0.0.1
srivaish(config-if)#no shutdown

srivaish(config-if)#
%LINK-5-CHANGED: Interface Vlan1, cha
%LINEPROTO-5-UPDOWN: Line protocol on

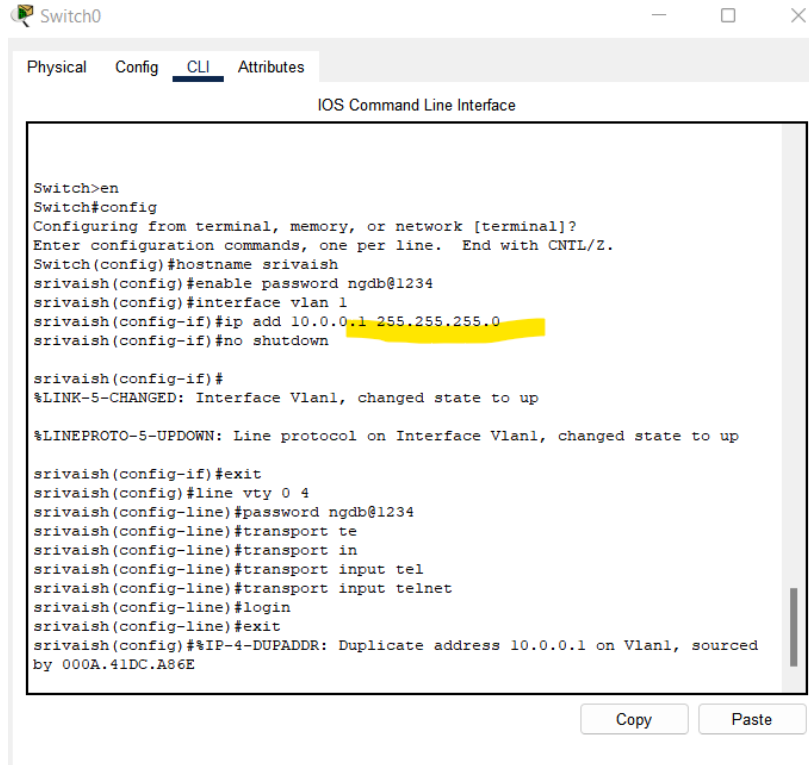
srivaish(config-if)#exit
srivaish(config)#line vty 0 4
srivaish(config-line)#password ngdb
srivaish(config-line)#transport te
srivaish(config-line)#transport in
srivaish(config-line)#transport input
srivaish(config-line)#login
srivaish(config-line)#exit
srivaish(config)#%IP-4-DUPADDR: Dupl
by 000A.41DC.A86E
```

The PC configuration window is also open, showing the IP address 10.0.0.1 and the default gateway 10.0.0.1. The Command Prompt window is open, showing the Telnet command being entered:

```
Cisco Packet Tracer
C:\>telnet 10.0.0.1
Trying 10.0.0.1 ...O
User Access Verification
Password:
srivaish>en
Password:
srivaish#
```

- a. Make sure the PC has an IP address (10.0.0.1) and subnet mask (255.255.255.0) in the same subnet as the switch (VLAN 1 IP - 10.0.0.2/255.255.255.0)

Ans : Switch Config:



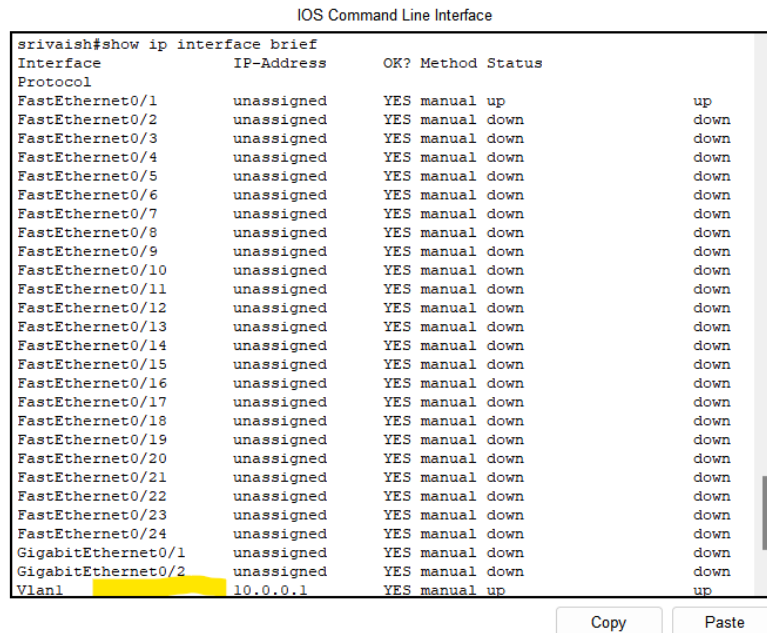
```
Switch0
Physical Config CLI Attributes
IOS Command Line Interface

Switch>en
Switch#config
Configuring from terminal, memory, or network [terminal]?
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname srivaish
srivaish(config)#enable password ngdb@1234
srivaish(config)#interface vlan 1
srivaish(config-if)#ip add 10.0.0.1 255.255.255.0
srivaish(config-if)#no shutdown

srivaish(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

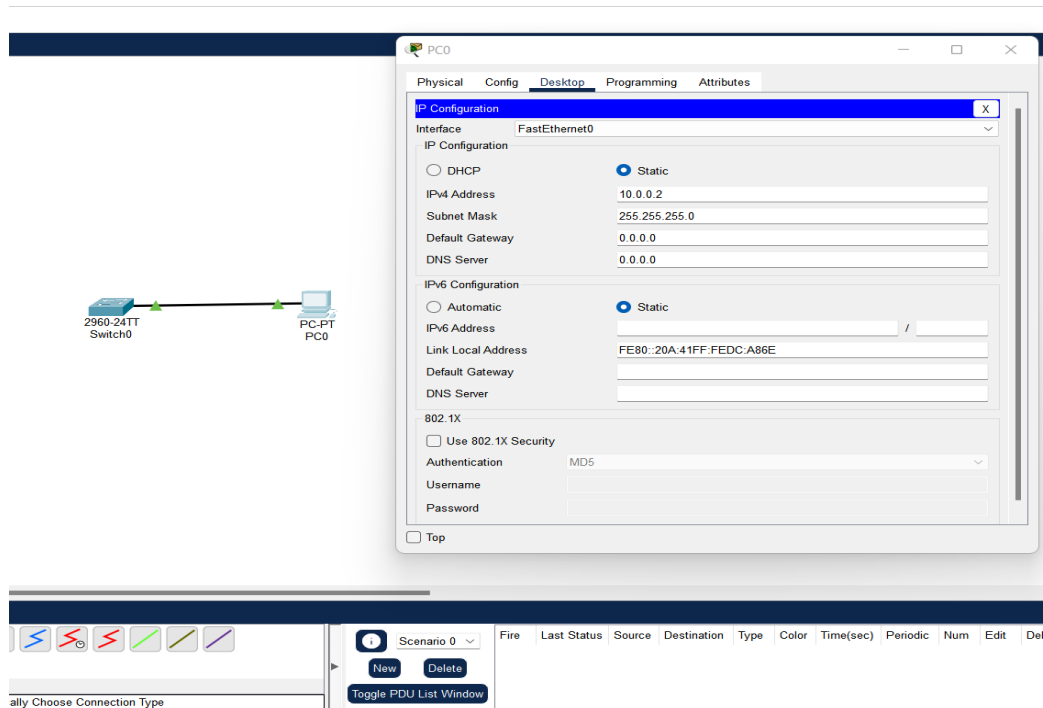
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

srivaish(config-if)#exit
srivaish(config)#line vty 0 4
srivaish(config-line)#password ngdb@1234
srivaish(config-line)#transport te
srivaish(config-line)#transport in
srivaish(config-line)#transport input tel
srivaish(config-line)#transport input telnet
srivaish(config-line)#login
srivaish(config-line)#exit
srivaish(config)#%IP-4-DUPADDR: Duplicate address 10.0.0.1 on Vlan1, sourced
by 000A.41DC.A86E
```



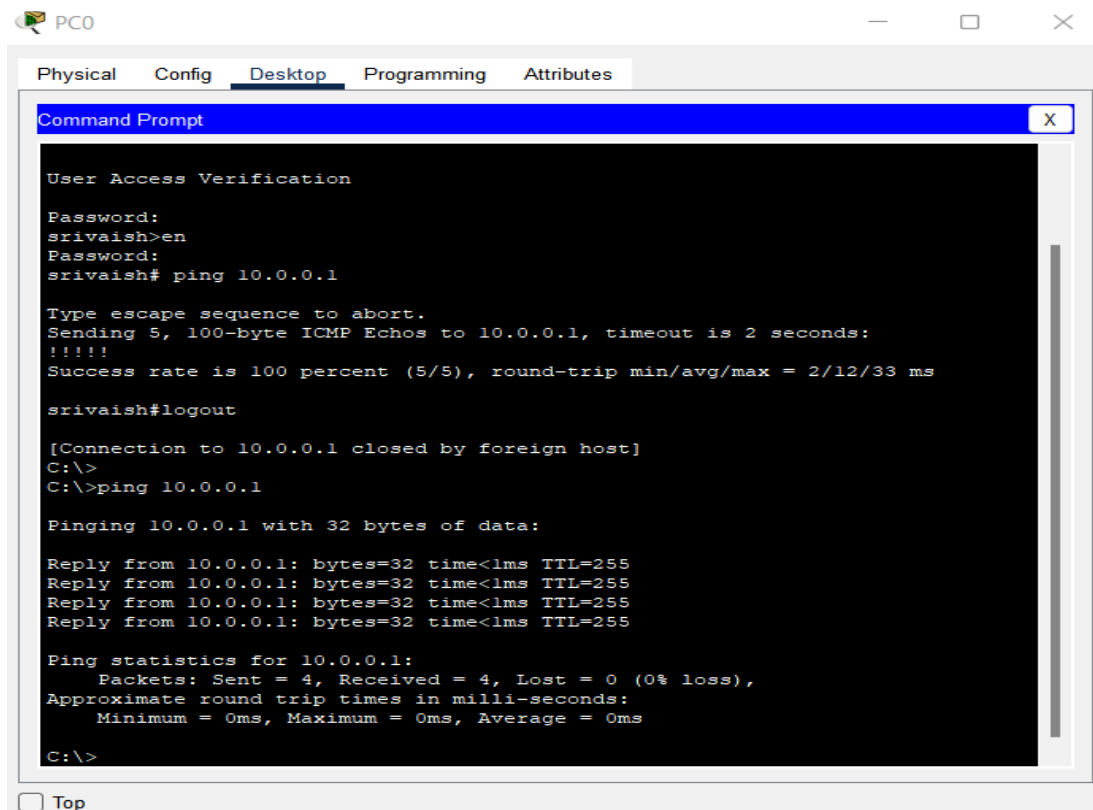
```
srivaish#show ip interface brief
Interface          IP-Address      OK? Method Status
Protocol
FastEthernet0/1    unassigned      YES manual up
FastEthernet0/2    unassigned      YES manual down
FastEthernet0/3    unassigned      YES manual down
FastEthernet0/4    unassigned      YES manual down
FastEthernet0/5    unassigned      YES manual down
FastEthernet0/6    unassigned      YES manual down
FastEthernet0/7    unassigned      YES manual down
FastEthernet0/8    unassigned      YES manual down
FastEthernet0/9    unassigned      YES manual down
FastEthernet0/10   unassigned      YES manual down
FastEthernet0/11   unassigned      YES manual down
FastEthernet0/12   unassigned      YES manual down
FastEthernet0/13   unassigned      YES manual down
FastEthernet0/14   unassigned      YES manual down
FastEthernet0/15   unassigned      YES manual down
FastEthernet0/16   unassigned      YES manual down
FastEthernet0/17   unassigned      YES manual down
FastEthernet0/18   unassigned      YES manual down
FastEthernet0/19   unassigned      YES manual down
FastEthernet0/20   unassigned      YES manual down
FastEthernet0/21   unassigned      YES manual down
FastEthernet0/22   unassigned      YES manual down
FastEthernet0/23   unassigned      YES manual down
FastEthernet0/24   unassigned      YES manual down
GigabitEthernet0/1 unassigned      YES manual down
GigabitEthernet0/2 unassigned      YES manual down
Vlan1              10.0.0.1        YES manual up
```

PC Config :



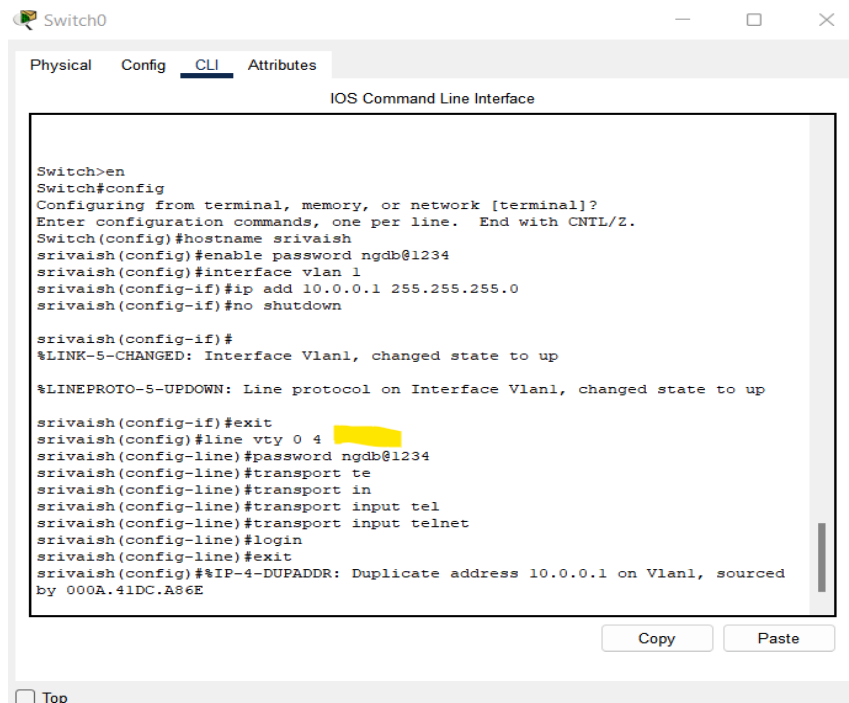
2. Verify the PC can ping the IP address of the switch. Paste the screenshot of the command output. **[5 points]**

Ans : PC Ping Switch (10.0.0.2 to 10.0.0.1)

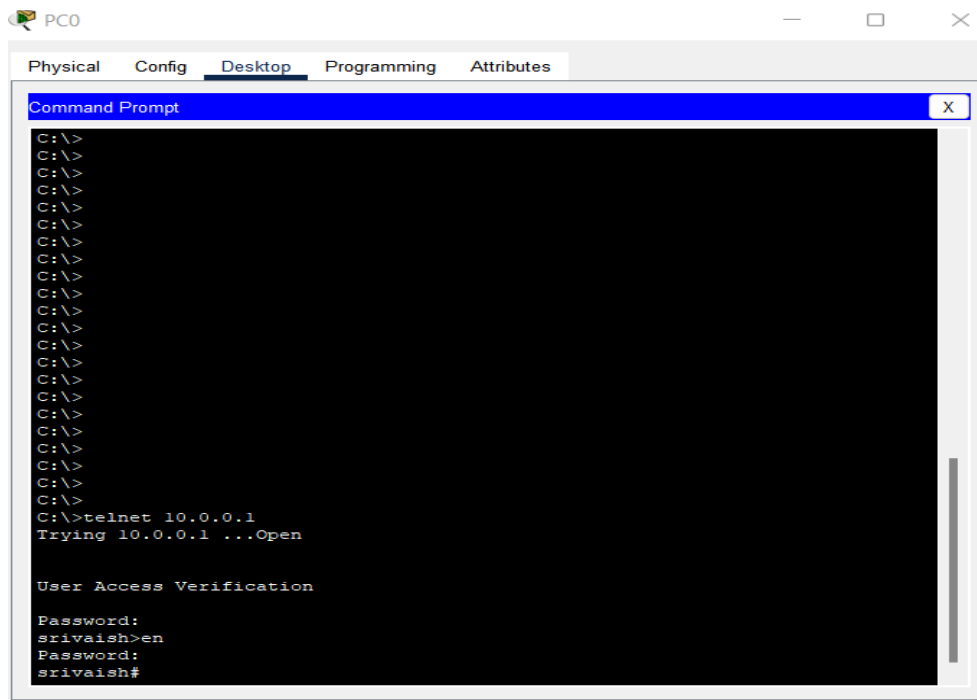


3. Configure Telnet on the switch

- Use all the vty lines
- Create a password of "telnet" as "cisco"



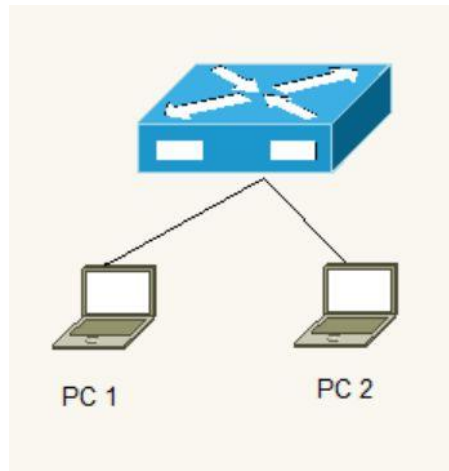
- c. Use Terminal (PC>>Desktop>>Command Prompt) of the PC to Telnet to the switch. Paste the screenshot of telnet output. **[10 point]**



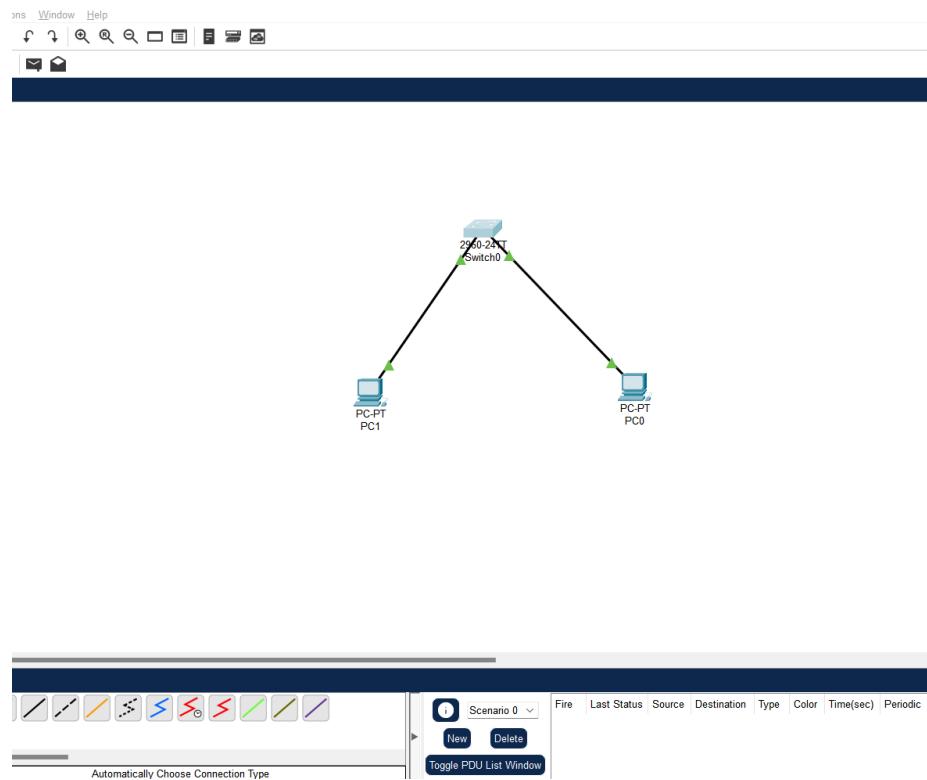
Part 2

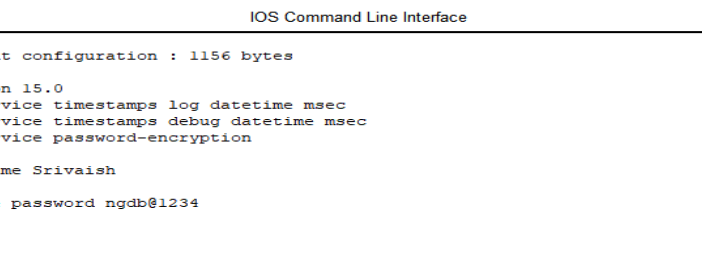
Objective 1: Cisco IOS Switch Port Configuration

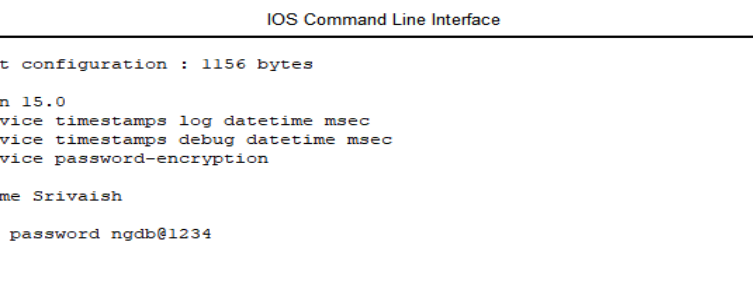
This objective will allow you to configure port settings on the industry standard Cisco switches.



2. Connect PC1 and PC2 to a switch



- 
- The screenshot shows a network switch interface with tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, displaying the 'IOS Command Line Interface'. The current configuration is shown as follows:
- ```
Current configuration : 1156 bytes
!
version 15.0
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Srivaish
!
enable password ngdb@1234
!
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
 description Computer1
!
interface FastEthernet0/2
 description Computer2
!
interface FastEthernet0/3
!
interface FastEthernet0/4
--More--
```
- At the bottom of the CLI window, there are 'Copy' and 'Paste' buttons. Below the CLI window, there is a 'Top' button with a checkbox next to it.

- 
- Switch0
- Physical Config CLI Attributes
- IOS Command Line Interface
- ```
Current configuration : 1156 bytes
!
version 15.0
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Srivaish
!
enable password ngdb@1234
!
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
 description Computer1
!
interface FastEthernet0/2
 description Computer2
!
interface FastEthernet0/3
!
interface FastEthernet0/4
--More--
```
- Copy Paste
- ☐ Top

4. Configure the necessary steps to ping from PC1 to PC2 (*hint: you will have to configure settings on the switch (use the default VLAN), but you will also have to configure both PCs*)

Switch0

Physical Config **CLI** Attributes

IOS Command Line Interface

Interface	IP-Address	OK?	Method	Status
Protocol				
FastEthernet0/1	unassigned	YES	manual	up
FastEthernet0/2	unassigned	YES	manual	up
FastEthernet0/3	unassigned	YES	manual	down
FastEthernet0/4	unassigned	YES	manual	down
FastEthernet0/5	unassigned	YES	manual	down
FastEthernet0/6	unassigned	YES	manual	down
FastEthernet0/7	unassigned	YES	manual	down
FastEthernet0/8	unassigned	YES	manual	down
FastEthernet0/9	unassigned	YES	manual	down
FastEthernet0/10	unassigned	YES	manual	down
FastEthernet0/11	unassigned	YES	manual	down
FastEthernet0/12	unassigned	YES	manual	down
FastEthernet0/13	unassigned	YES	manual	down
FastEthernet0/14	unassigned	YES	manual	down
FastEthernet0/15	unassigned	YES	manual	down
FastEthernet0/16	unassigned	YES	manual	down
FastEthernet0/17	unassigned	YES	manual	down
FastEthernet0/18	unassigned	YES	manual	down
FastEthernet0/19	unassigned	YES	manual	down
FastEthernet0/20	unassigned	YES	manual	down
FastEthernet0/21	unassigned	YES	manual	down
FastEthernet0/22	unassigned	YES	manual	down
FastEthernet0/23	unassigned	YES	manual	down
FastEthernet0/24	unassigned	YES	manual	down
GigabitEthernet0/1	unassigned	YES	manual	down
GigabitEthernet0/2	unassigned	YES	manual	down
Vlan1	192.10.0.3	YES	manual	up

SriVaish#

Copy Paste

☐ Top

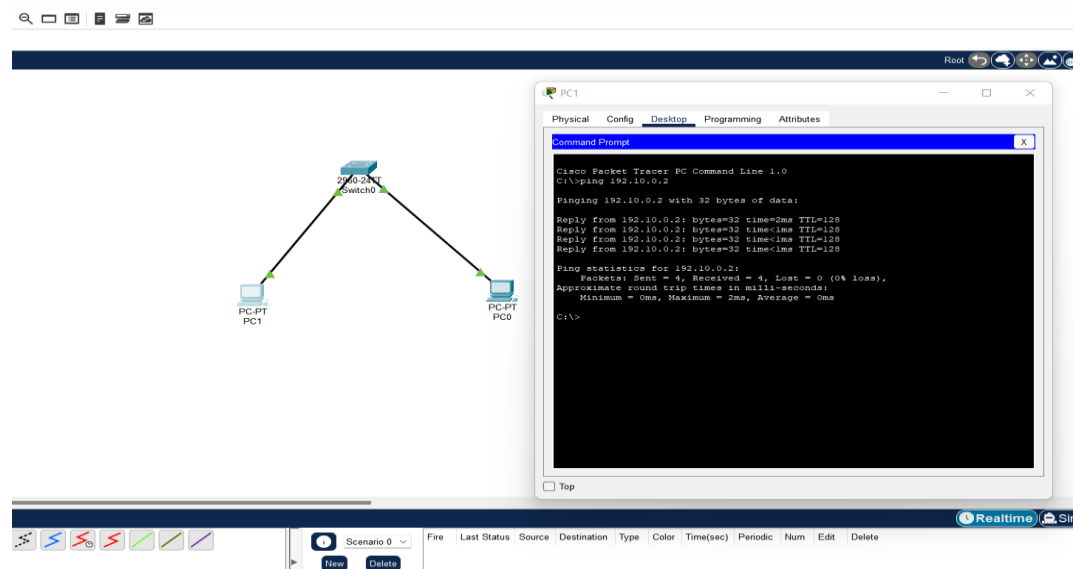
- a. List the steps you had to perform to get the PCs to ping each other [20 points]

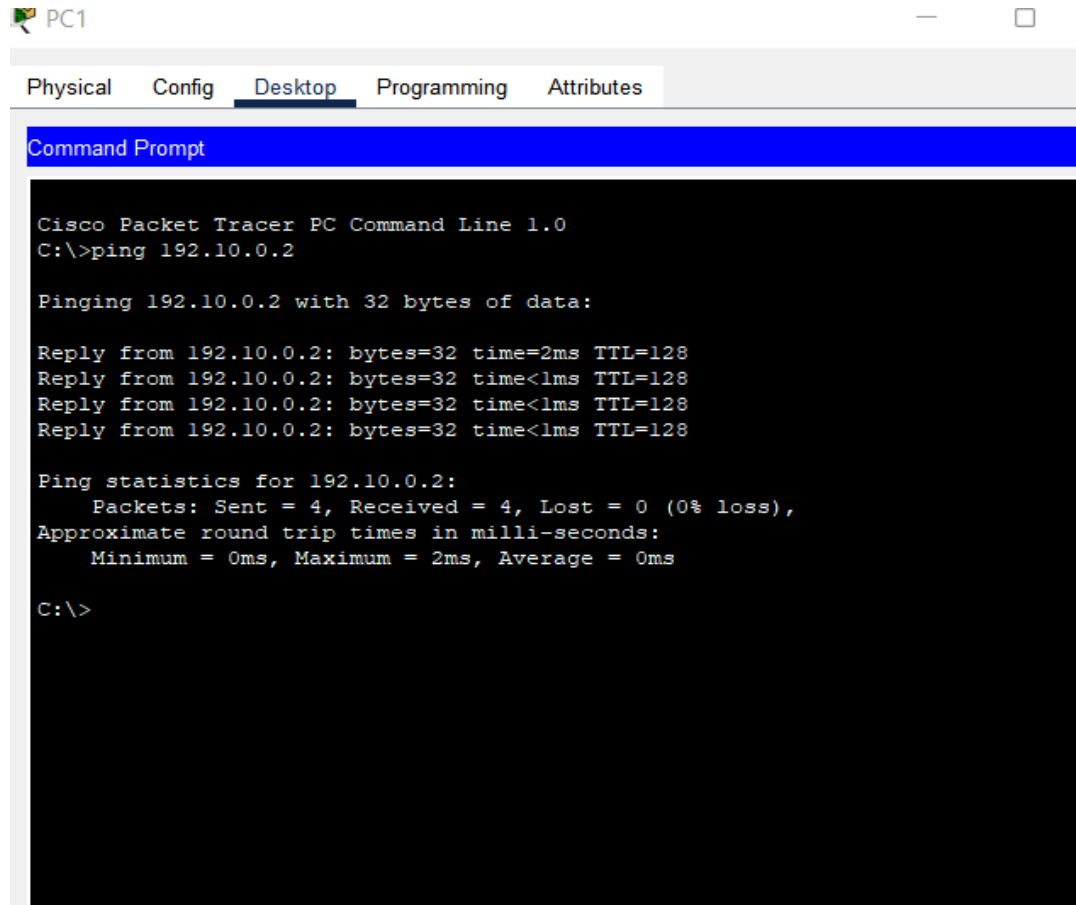
```
File Edit View

"#Lab2 CISCO IOS AND STP by Srivaishnavi"

STEPS:
1. Configure the static IPV4 address with 192.168.0.1 on PC1
2. Configure the 255.255.255.0 subnet mask
3. Configure the Static IPV4 address with 192.168.0.2 on PC2
4. Configure the 255.255.255.0 subnet mask
5. Interconnect both PC1, and PC2 using a Network Device - Switch.
6. Login into Switch CLI
7. Switch > : Type enable to switch from user mode to privileged mode
8. Configure the hostname and enable password in global config mode
9. Once configured, use interface Vlan 1 command
10. And then in the (config-line) mode configure the ip address using - Ip address 0.0.0.0 255.255.255.0 subnet mask
11. type no-shutdown
12. eexit()
13. run show ip interface brief command to check whether the status of interface is up/down
14. open the Desktop > Command Prompt on PC1 > Do Ping <Ip Address> and the ping should happen confirming the connection establishment.
```

Pinging from PC 1 to PC2 (192.10.0.1 to 192.10.0.2)





The screenshot shows a Cisco Packet Tracer interface for PC1. The 'Desktop' tab is selected, displaying a 'Command Prompt' window. The window title is 'Command Prompt'. The text inside the window shows the execution of a ping command to 192.10.0.2. The output indicates successful connectivity with 0% loss and a maximum round trip time of 2ms.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.10.0.2

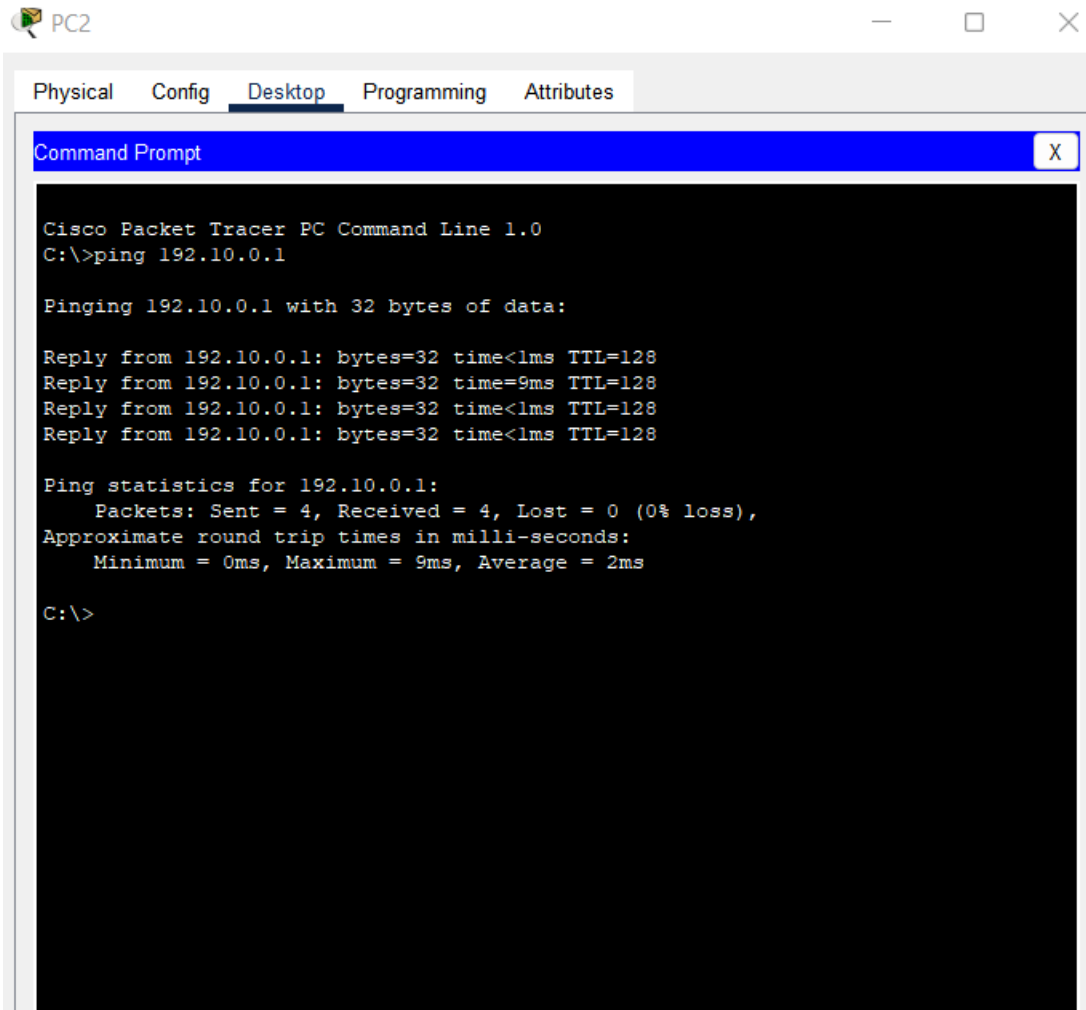
Pinging 192.10.0.2 with 32 bytes of data:

Reply from 192.10.0.2: bytes=32 time=2ms TTL=128
Reply from 192.10.0.2: bytes=32 time<1ms TTL=128
Reply from 192.10.0.2: bytes=32 time<1ms TTL=128
Reply from 192.10.0.2: bytes=32 time<1ms TTL=128

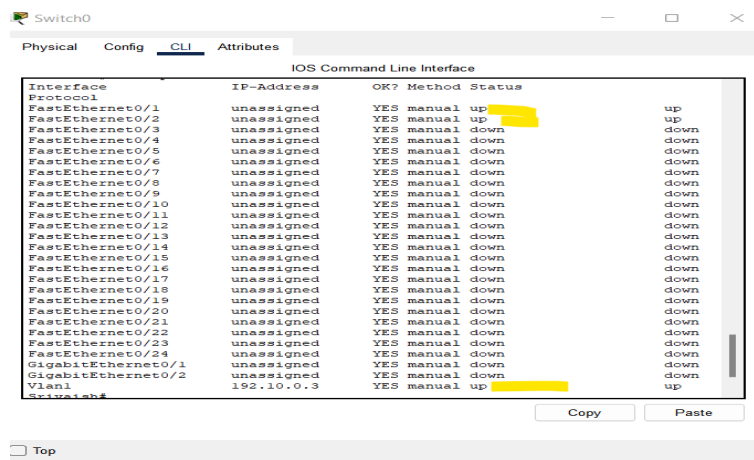
Ping statistics for 192.10.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\>
```

Ping from PC2 to PC1 :



5. Check the status of the switch port connected to PC1
 - a. Provide a screenshot of the status of the port [2 points]



- i. Indicate that the port is up [2 points]

Switch0

Physical Config CLI Attributes

IOS Command Line Interface

```
GigabitEthernet0/2    unassigned    YES manual down    down
Vlan1                192.10.0.3    YES manual up      up
Srivaish#
Srivaish#
Srivaish#
Srivaish#
Srivaish#show interface FastEthernet0/1
FastEthernet0/1 is up, line protocol is up (connected)
  Hardware is Lance, address is 00e0.f926.a301 (bia 00e0.f926.a301)
  Description: Computer1
  BW 100000 Kbit, DLY 1000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s
  input flow-control is off, output flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:08, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue :0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    956 packets input, 193351 bytes, 0 no buffer
    Received 956 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 watchdog, 0 multicast, 0 pause input
    0 input packets with dribble condition detected
--More--
```

ii. Indicate the speed and duplex of the port [2 points]

Switch0

Physical Config CLI Attributes

IOS Command Line Interface

```
GigabitEthernet0/2    unassigned    YES manual down    down
Vlan1                192.10.0.3    YES manual up      up
Srivaish#
Srivaish#
Srivaish#
Srivaish#
Srivaish#show interface FastEthernet0/1
FastEthernet0/1 is up, line protocol is up (connected)
  Hardware is Lance, address is 00e0.f926.a301 (bia 00e0.f926.a301)
  Description: Computer1
  BW 100000 Kbit, DLY 1000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s
  input flow-control is off, output flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:08, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue :0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    956 packets input, 193351 bytes, 0 no buffer
    Received 956 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 watchdog, 0 multicast, 0 pause input
    0 input packets with dribble condition detected
--More--
```

iii. Make sure it has the proper description (above)

Switch0

Physical Config CLI Attributes

IOS Command Line Interface

```

GigabitEthernet0/2    unassigned    YES manual down    down
Vlan1                 192.10.0.3    YES manual up      up
Srivaish#
Srivaish#
Srivaish#
Srivaish#
Srivaish#show interface FastEthernet0/1
FastEthernet0/1 is up, line protocol is up (connected)
  Hardware is Lance, address is 00e0.f926.a301 (bia 00e0.f926.a301)
  Description: Computer1
  BW 100000 Kbit, DLY 1000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s
  input flow-control is off, output flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:08, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue :0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    956 packets input, 193351 bytes, 0 no buffer
    Received 956 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 watchdog, 0 multicast, 0 pause input
    0 input packets with dribble condition detected
--More--

```

Switch port connected to PC2

Physical Config CLI Attributes

IOS Command Line Interface

```

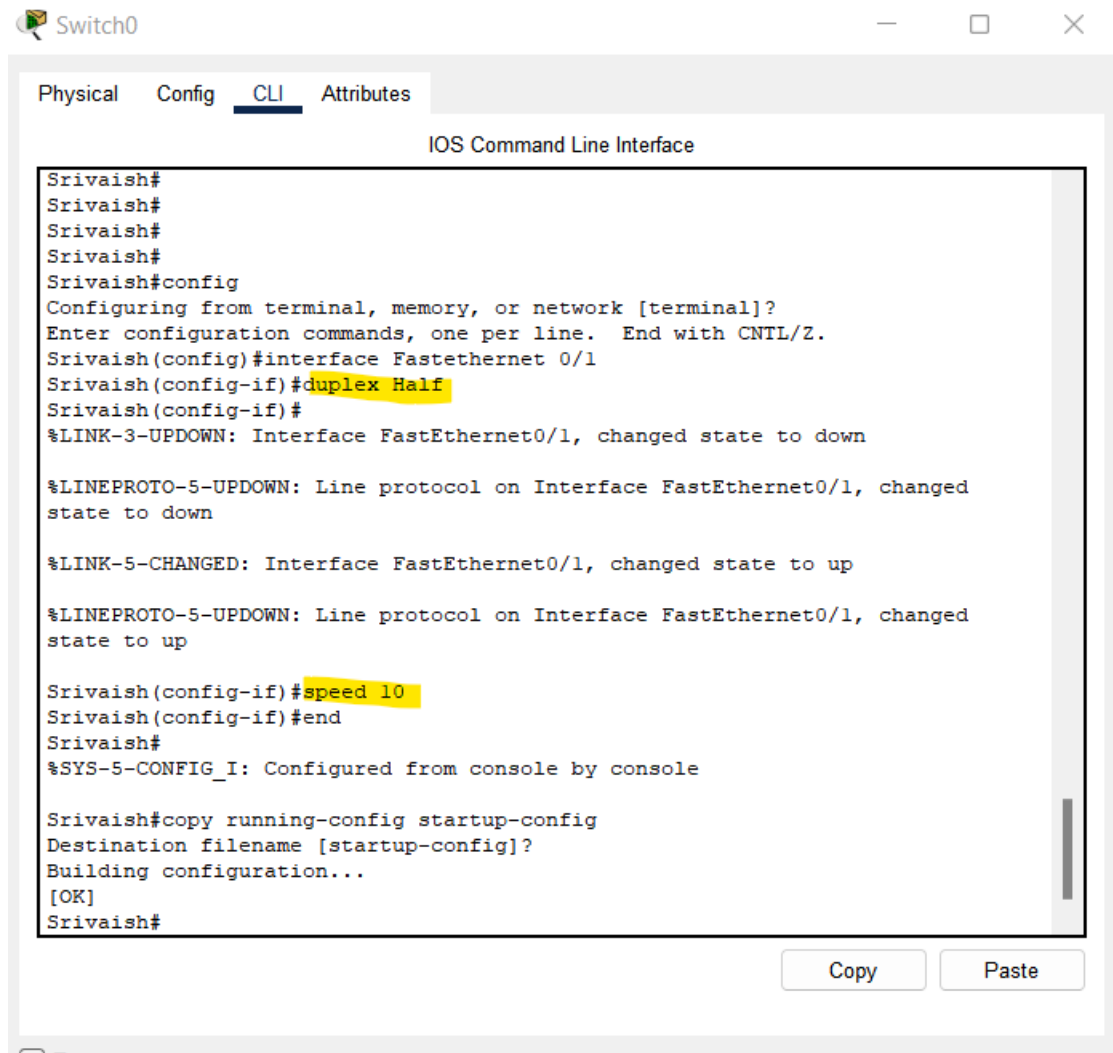
%SYS-5-CONFIG_I: Configured from console by console
Srivaish#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Srivaish#show interface FastEthernet0/2
FastEthernet0/2 is up, line protocol is up (connected)
  Hardware is Lance, address is 00e0.f926.a302 (bia 00e0.f926.a302)
  Description: Computer2
  BW 100000 Kbit, DLY 1000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s
  input flow-control is off, output flow-control is off
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:08, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue :0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    956 packets input, 193351 bytes, 0 no buffer
    Received 956 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 watchdog, 0 multicast, 0 pause input
    0 input packets with dribble condition detected
--More--

```

Copy Paste

6. Configure the switch port that connects to PC1

- a. Hard set the port to 10Mbps and Half Duplex



The screenshot shows a Cisco IOS Command Line Interface (CLI) window titled "Switch0". The "CLI" tab is selected. The interface shows the following commands and output:

```
Srivaish#
Srivaish#
Srivaish#
Srivaish#
Srivaish#config
Configuring from terminal, memory, or network [terminal]?
Enter configuration commands, one per line. End with CNTL/Z.
Srivaish(config)#interface FastEthernet 0/1
Srivaish(config-if)#duplex Half
Srivaish(config-if)#
%LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed
state to down

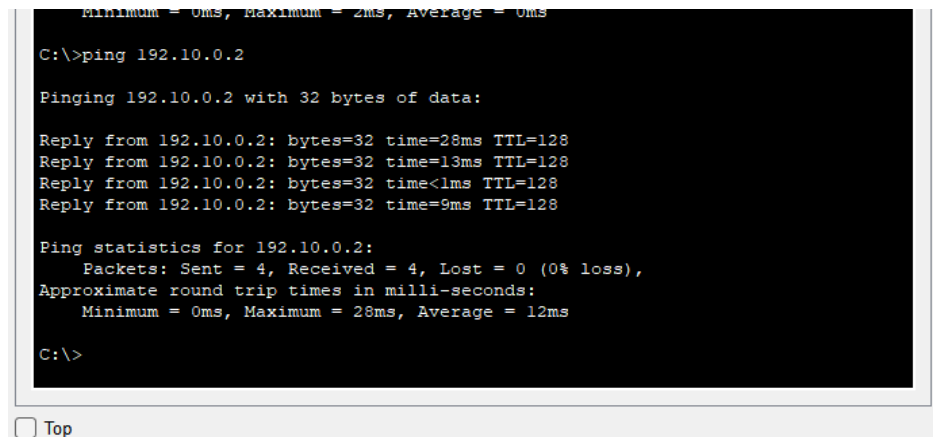
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed
state to up

Srivaish(config-if)#speed 10
Srivaish(config-if)#end
Srivaish#
%SYS-5-CONFIG_I: Configured from console by console

Srivaish#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Srivaish#
```

- b. Can PC1 still reach PC2? Why or why not? [2 points]



The screenshot shows a Windows command prompt window with the following output:

```
Minimum = 0ms, Maximum = 28ms, Average = 12ms

C:\>ping 192.10.0.2

Pinging 192.10.0.2 with 32 bytes of data:

Reply from 192.10.0.2: bytes=32 time=28ms TTL=128
Reply from 192.10.0.2: bytes=32 time=13ms TTL=128
Reply from 192.10.0.2: bytes=32 time<1ms TTL=128
Reply from 192.10.0.2: bytes=32 time=9ms TTL=128

Ping statistics for 192.10.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 28ms, Average = 12ms

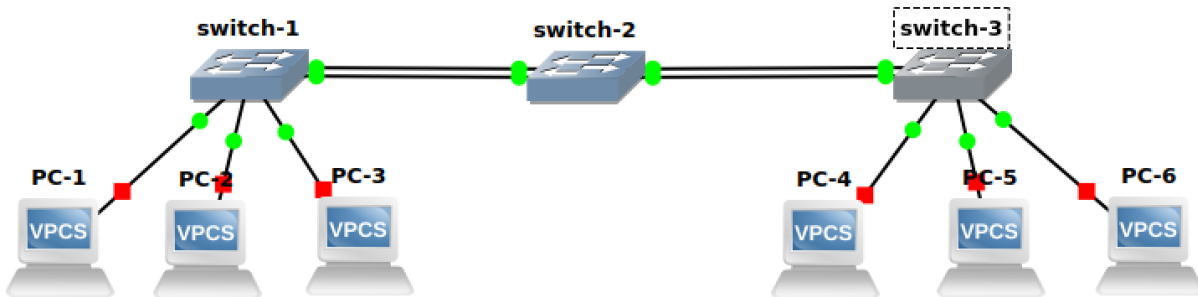
C:\>
```

Ans : Yes. PC1 can still reach PC2 in Half-duplex mode. Because, half-

duplex devices can only transmit in one direction at one time. So the data can move in two directions b/w Tx and Rx but not at the same time.

X`

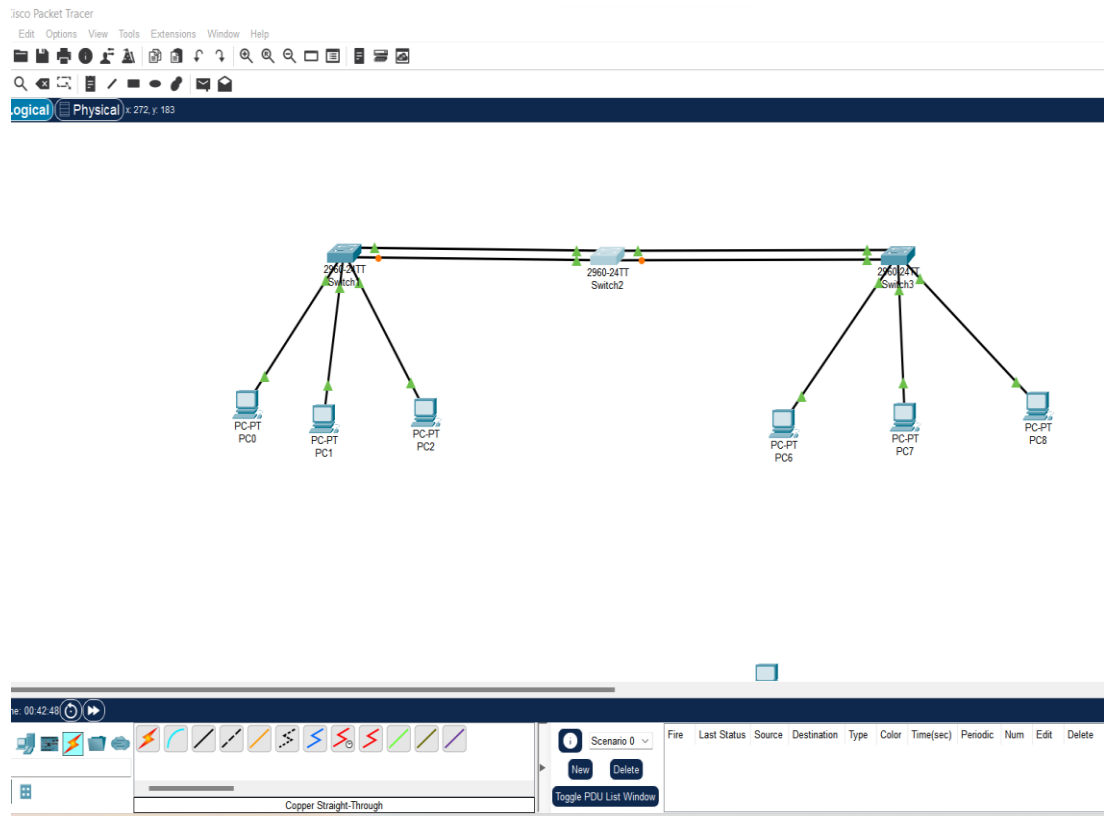
7. Now create a following topology in Cisco Packet Tracer



a. Provide the screenshot of the created topology in Cisco Packet Tracer.

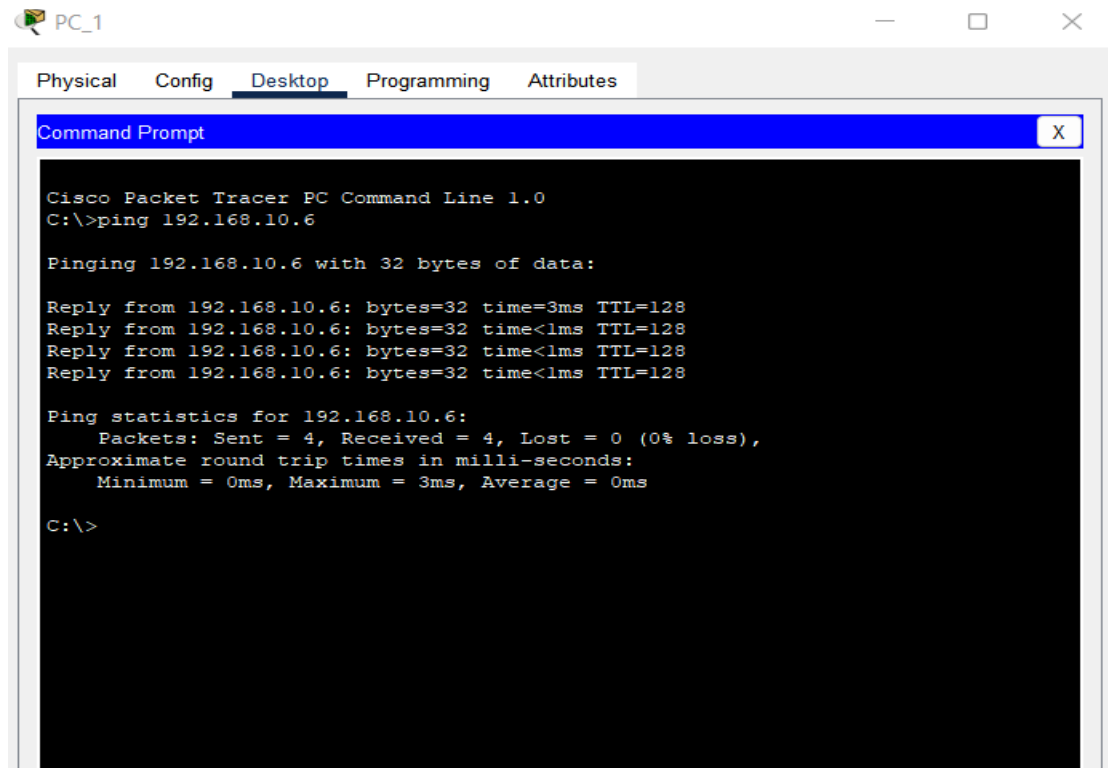
Assign IPs to all the hosts. **[5 points]**

Ans :: IP Address of all hosts :: 192.168.10.1, 10.2,10.3,10.4,10.5,10.6



- b. Ping PC-6 from PC-1. What command would you use to look at the mac-table on switch-2? Paste the screenshot showing its output. [5 points]

Ping : From PC_1 to PC_6 (192.168.10.1 to 192.168.10.6)



```
PC_1
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.10.6

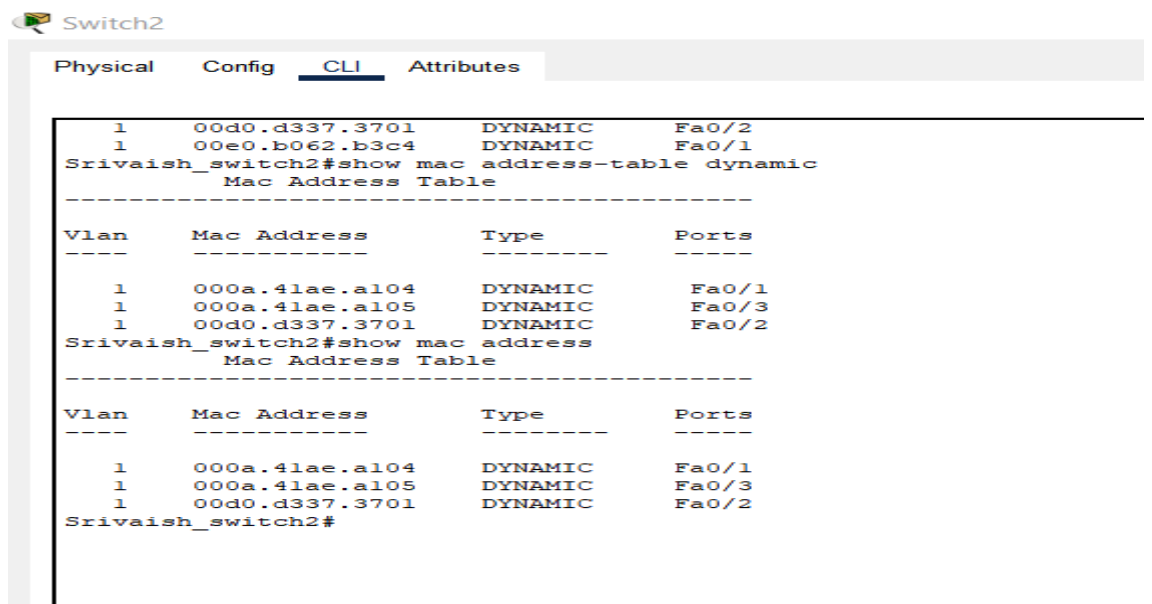
Pinging 192.168.10.6 with 32 bytes of data:

Reply from 192.168.10.6: bytes=32 time=3ms TTL=128
Reply from 192.168.10.6: bytes=32 time<1ms TTL=128
Reply from 192.168.10.6: bytes=32 time<1ms TTL=128
Reply from 192.168.10.6: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.10.6:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 0ms

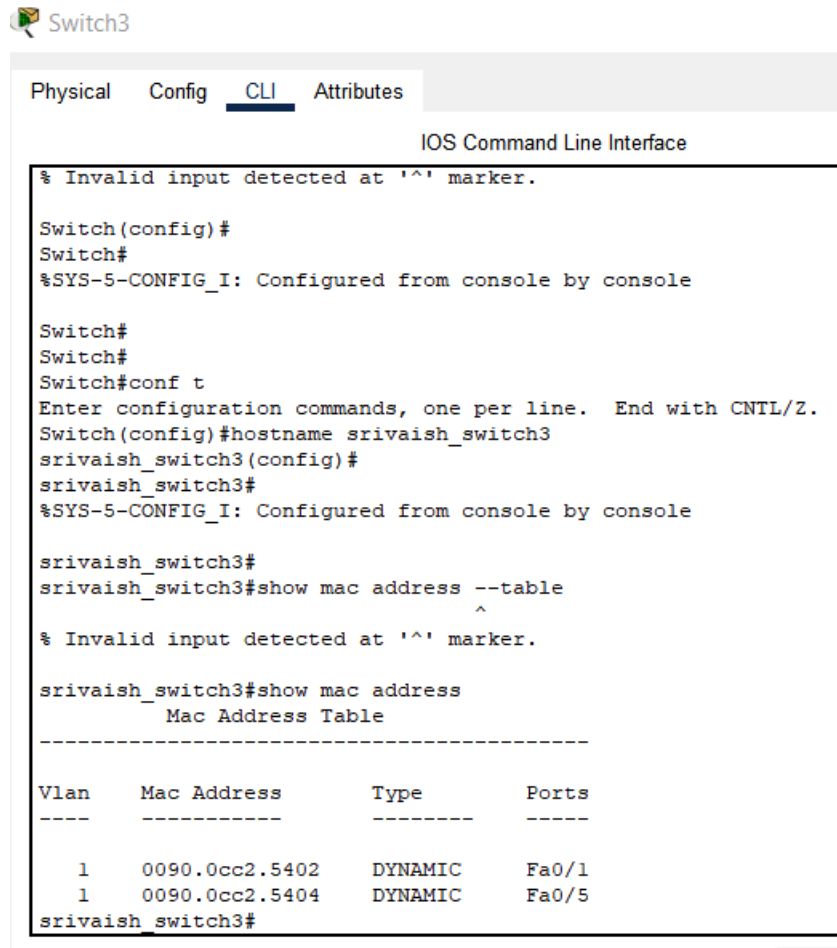
C:\>
```

Command to see the Mac_Table : **SHOW MAC ADDRESS—TAB**



```
Switch2
Physical Config CLI Attributes
SriVaish_switch2#show mac address-table dynamic
Mac Address Table
-----
Vlan    Mac Address      Type        Ports
----    -
1       00d0.d337.3701   DYNAMIC     Fa0/2
1       00e0.b062.b3c4   DYNAMIC     Fa0/1
SriVaish_switch2#show mac address
Mac Address Table
-----
Vlan    Mac Address      Type        Ports
----    -
1       000a.41ae.a104   DYNAMIC     Fa0/1
1       000a.41ae.a105   DYNAMIC     Fa0/3
1       00d0.d337.3701   DYNAMIC     Fa0/2
SriVaish_switch2#
```

- c. Interpret the mac-table of switch-3 and briefly explain it. [5 points]



```
Switch3
Physical Config CLI Attributes
IOS Command Line Interface
% Invalid input detected at '^' marker.
Switch(config)#
Switch#
%SYS-5-CONFIG_I: Configured from console by console
Switch#
Switch#
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname srivaish_switch3
srivaish_switch3(config)#
srivaish_switch3#
%SYS-5-CONFIG_I: Configured from console by console
srivaish_switch3#
srivaish_switch3#show mac address --table
^
% Invalid input detected at '^' marker.
srivaish_switch3#show mac address
Mac Address Table
-----
Vlan    Mac Address      Type      Ports
----    -
1       0090.0cc2.5402   DYNAMIC   Fa0/1
1       0090.0cc2.5404   DYNAMIC   Fa0/5
srivaish_switch3#
```

SWITCH_3 Mac address table constitutes the Mac Addresses shows the no. of Vlan connection per port. And the type of ports/interfaces used in the connection and the type of the connection. Fa0/1, Fa0/5 are connecting ports b/w Switch2 and Switc3.

8. Now disconnect PC-6 from switch-3 and connect it to switch-1. Did you notice any change in the mac-table of switch-2? Yes or No? Why so? Paste the screenshot of the output. **[10 points]**

Window Help

2960-24TT Switch1 2960-24TT Switch2 2960-24TT Switch3

PC-PT PC_1 PC-PT PC_2 PC-PT PC_3 PC-PT PC_6 PC-PT PC_4 PC-PT PC_5

Scenario 0 Fire Last Status Source Destination Type Color Time(sec) Period

```
Srivaish_switch2>
Srivaish_switch2>en
Password:
Srivaish_switch2#show mac address
Mac Address Table
-----
Vlan    Mac Address      Type      Ports
-----
1       000a.41ae.a104    DYNAMIC   Fa0/1
1       000a.41ae.a105    DYNAMIC   Fa0/3
1       00d0.d337.3701    DYNAMIC   Fa0/2
Srivaish_switch2#show mac address-table dynamic
Mac Address Table
-----
Vlan    Mac Address      Type      Ports
-----
1       00d0.d337.3701    DYNAMIC   Fa0/2
Srivaish_switch2#
```

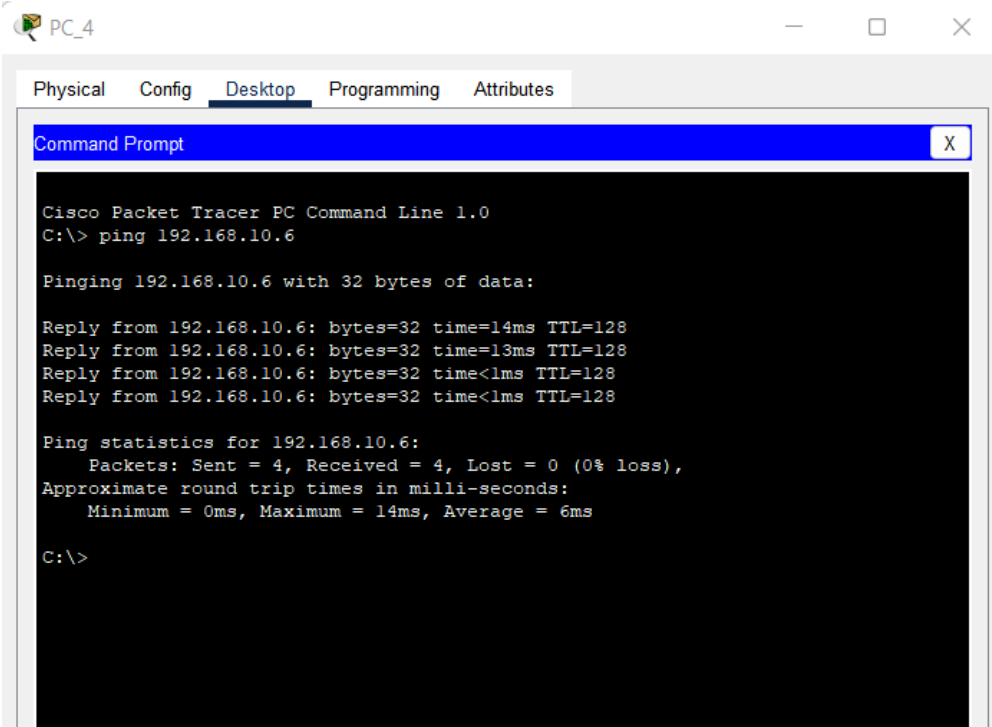
Copy Paste

☐ Top

YES. There is a change in the dynamic mac address table. Because of change in the port connection, the interface mac address is changed.

- a. Now ping PC-6 from PC-4. Check the mac-table once again on switch-2. Did you notice any change in the mac-table of switch-2? Yes or No? Why so? Paste the screenshot of the output. [10 points]

Ping from PC4 to PC6 (192.168.10.4 to 192.168.10.6)



The screenshot shows a Cisco Packet Tracer PC Command Line window for PC_4. The 'Desktop' tab is selected. The command prompt shows the execution of a ping command to 192.168.10.6. The output indicates that the ping was successful with 4 packets sent and received, 0% loss, and an average round trip time of 6ms.

```
Cisco Packet Tracer PC Command Line 1.0
C:\> ping 192.168.10.6

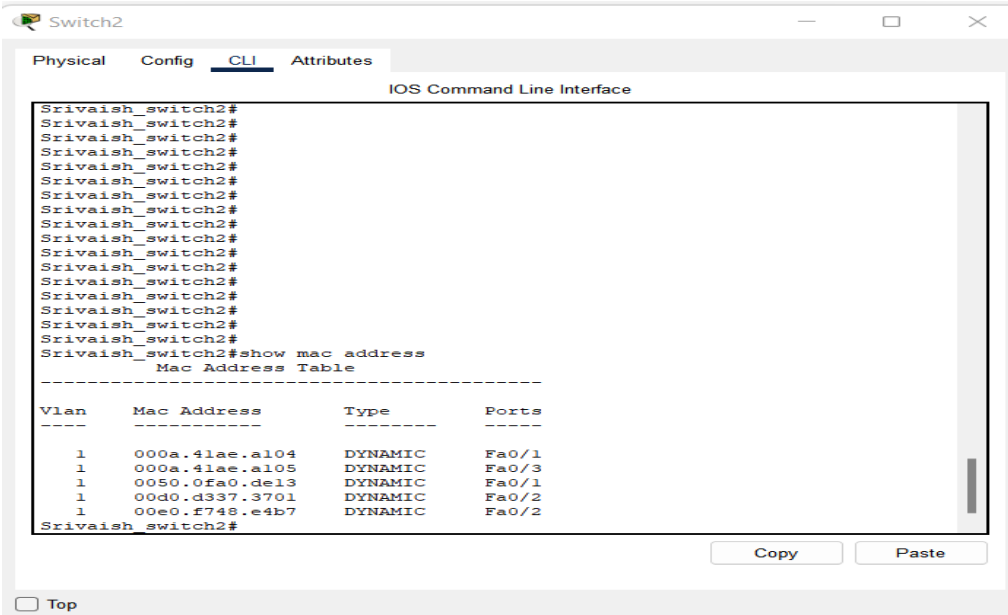
Pinging 192.168.10.6 with 32 bytes of data:

Reply from 192.168.10.6: bytes=32 time=14ms TTL=128
Reply from 192.168.10.6: bytes=32 time=13ms TTL=128
Reply from 192.168.10.6: bytes=32 time<1ms TTL=128
Reply from 192.168.10.6: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.10.6:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 14ms, Average = 6ms

C:\>
```

YES. The MAC Address table is updated with the dynamic address of new interface/port connections

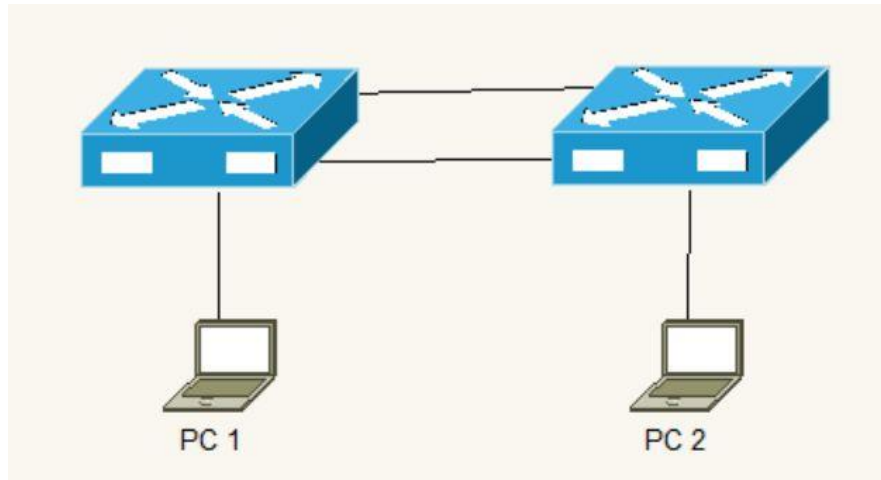


The screenshot shows the CLI of Switch2. The user has entered the command 'show mac address', which displays the MAC Address Table. The table lists five entries, all of which are dynamic and associated with VLAN 1. The ports are Fa0/1, Fa0/3, Fa0/1, Fa0/2, and Fa0/2.

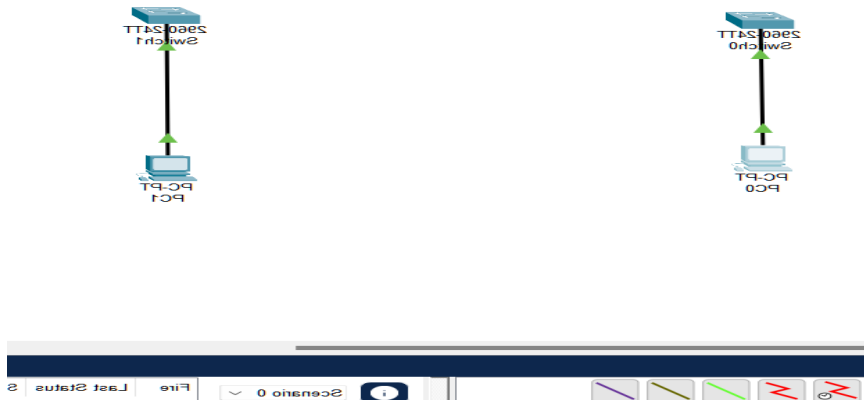
```
Srivaish_switch2#
Srivaish_switch2#
Srivaish_switch2#
Srivaish_switch2#
Srivaish_switch2#
Srivaish_switch2#
Srivaish_switch2#
Srivaish_switch2#
Srivaish_switch2#
Srivaish_switch2#
Srivaish_switch2#
Srivaish_switch2#
Srivaish_switch2#
Srivaish_switch2#
Srivaish_switch2#
Srivaish_switch2#show mac address
Mac Address Table
-----
Vlan    Mac Address      Type        Ports
----
1       000a.41ae.a104   DYNAMIC     Fa0/1
1       000a.41ae.a105   DYNAMIC     Fa0/3
1       0050.0fa0.de13   DYNAMIC     Fa0/1
1       00d0.d337.3701   DYNAMIC     Fa0/2
1       00e0.f748.e4b7   DYNAMIC     Fa0/2
Srivaish_switch2#
```

Objective 2: Spanning Tree Protocol (STP)

This objective will indicate how STP prevents loops and provides redundancy.



7. Connect PC1 to Switch1 and PC2 to Switch 2



a. Verify PCs can Ping each other

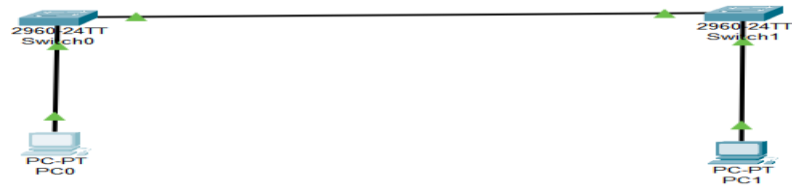
```
Physical  Config  Desktop  Programming  Attributes
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.0.2

Pinging 192.168.0.2 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.0.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
```


8. Interconnect the switches



a. Verify PCs can Ping each other

```
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>
C:\>ping 192.168.0.2

Pinging 192.168.0.2 with 32 bytes of data:

Reply from 192.168.0.2: bytes=32 time=12ms TTL=128
Reply from 192.168.0.2: bytes=32 time=15ms TTL=128
Reply from 192.168.0.2: bytes=32 time<1ms TTL=128
Reply from 192.168.0.2: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 15ms, Average = 6ms

C:\>
```

9. Use the appropriate IOS command to verify which ports on the switch map to the MAC addresses from PC1 and PC2

a. Explain your findings [2 points]

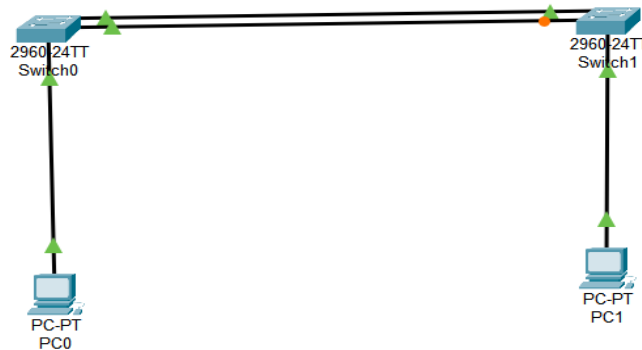
```
Switch1#show mac address-table dynamic
Mac Address Table
-----
Vlan    Mac Address      Type    Ports
----    -
1       0030.f225.c002   DYNAMIC Fa0/2
Switch1#show
```

```
Switch>en
Switch#show mac address-table dynamic
Mac Address Table
-----
Vlan    Mac Address      Type    Ports
----    -
1       000a.f3b8.8302   DYNAMIC Fa0/2
Switch#
```

Port FastEthernet 02 on both switch1 and switch2 mapping the mac address from end devices.

10. Add an additional link between Switch1 and Switch2

a. Explain what should happen in this case **[5 points]**



b. Verify the switches resolved the problem above, indicate how you can determine this in the Cisco switch (*hint: Spanning-tree blocked*) **[5 points]**

11. Issue a continuous ping from PC1 to PC2

- Unplug one of the cables interconnecting the switches
- Did the pings fail? If so, for how long? If they didn't fail, why not? **[5 points]**

Report Questions

1. What is the length of the MAC address? How is it divided? **[2 points]**

A MAC Address is a 12 digit, hexadecimal number consists of 48 bits. A Mac address is divided into two parts. The first six digits represented the OUI (Organisational unique identifier) and the last six digitas represent the NIC(Network Interface Controller).

2. Why are switches faster than routers? **[2 points]**

Switches are slightly faster in the LAN Network because they are wired connections which helps in eliminating the Network Congestion as faced by Router/Modem.

3. Explain how ARP works. [5 points]

Address Resolution protocol working in the Network Layer of the OSI Model helps in finding the MAC address of the device given the IP address

How it works :

In the network layer when the source wants to find out the MAC address of the destination device it first looks for the MAC address in the ARP table. If present there then it will use the MAC address from there for communication. If the MAC address is not found in the ARP table then the source device will generate an ARP Request message. In the request message the source puts its own MAC address, its IP address, destination IP address and the destination MAC address is left blank.

When the source receives the ARP reply it comes to know about the destination MAC address and it also updates its ARP cache. Now the packets can be sent as the source knows destination MAC address.

The ARP Source message is "Broadcast" whereas ARP Reply message is "Unicast"

Total Score = _____/121