

Labsheet- 4

OBJECTIVES:

1. To configure Switch and End devices.
2. To implement basic Switch Commands.

Configuration of Switch and End devices in a network.

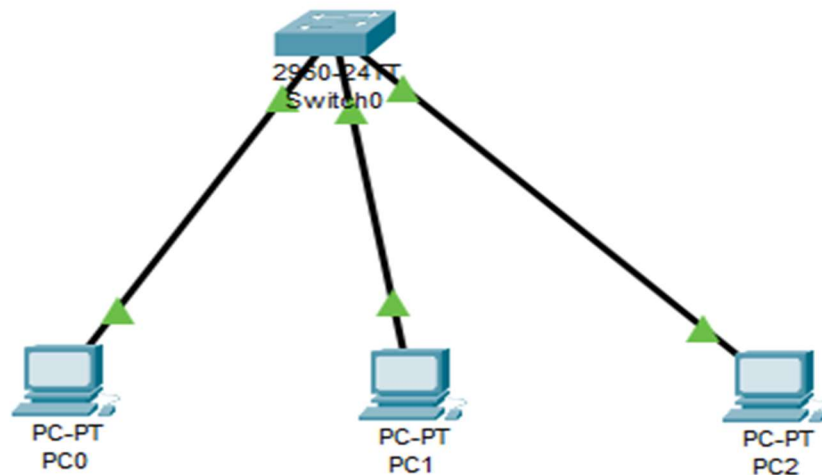


Fig: Network architecture of a Switch connecting 3 PCs

Theory

• IOS

IOS is an operating system developed by Cisco for the configuration of several DCE devices and servers. It provides a standard way of configuring these devices. It is stored in the ROM of the DCE devices and Cisco servers. The startup configuration of any DCE device is stored in NVRAM and running configuration is stored in flash memory.

• Different configuration modes in IOS

✓ User Exec Mode

The very initial mode of any IOS device is called user exec mode. This mode is mainly used to view statistics and run commands like ping and telnet. It is represented as:
hostname>

✓ Privileged exec mode or Enable mode

This mode is accessed by typing in the command “enable” in user exec mode. It is represented as: hostname#.

✓ Global Configuration mode or Terminal mode

This mode is accessed by typing in the command “config t” in the enable mode. It is used to make the global changes to the IOS devices and change its configuration. It is represented by :Hostname(config)#.

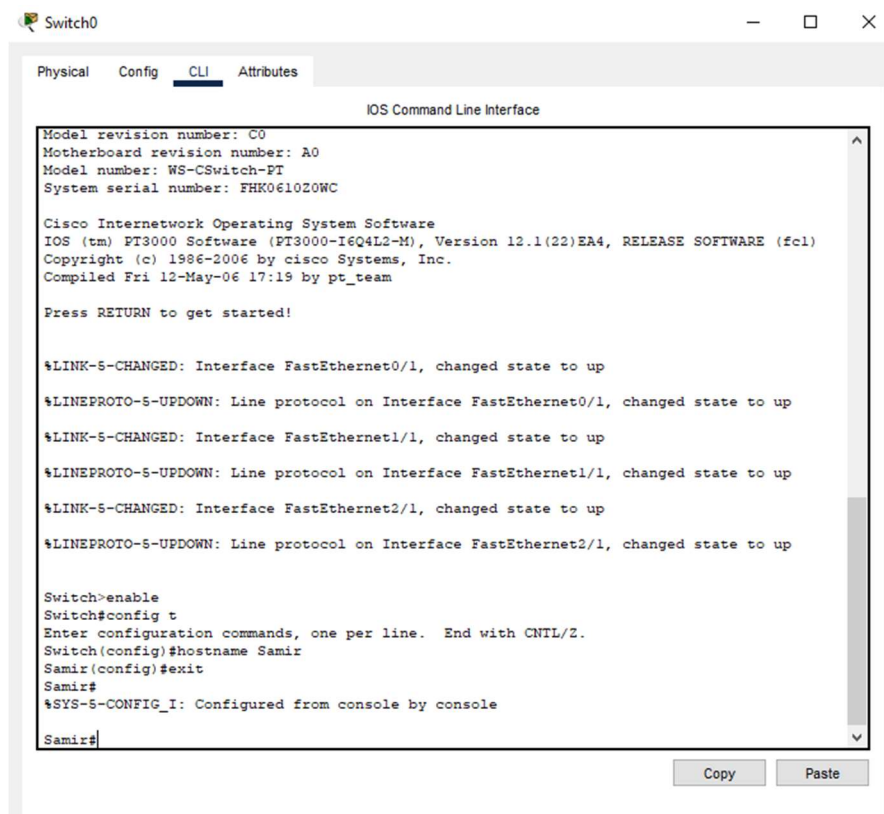
Procedure

1. Open Cisco Packet Tracer.
2. Select a Switch and 3 PCs and establish a connection between them using a straight through cable in Fa Interface.
3. Open the CLI terminal of the switch and perform several switch commands.
4. Perform Ping command operation as well to ensure connectivity.

Basic Switch Commands

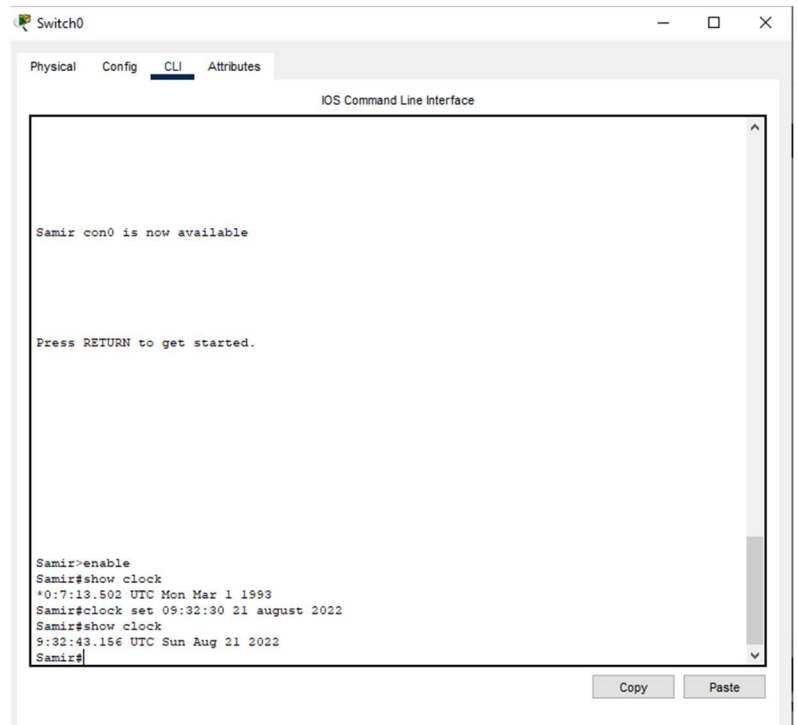
1. Changing the Hostname

```
Switch>enable
Switch#config t
Switch(config)#hostname Samir
Samir(config)#exit
Samir#exit
```



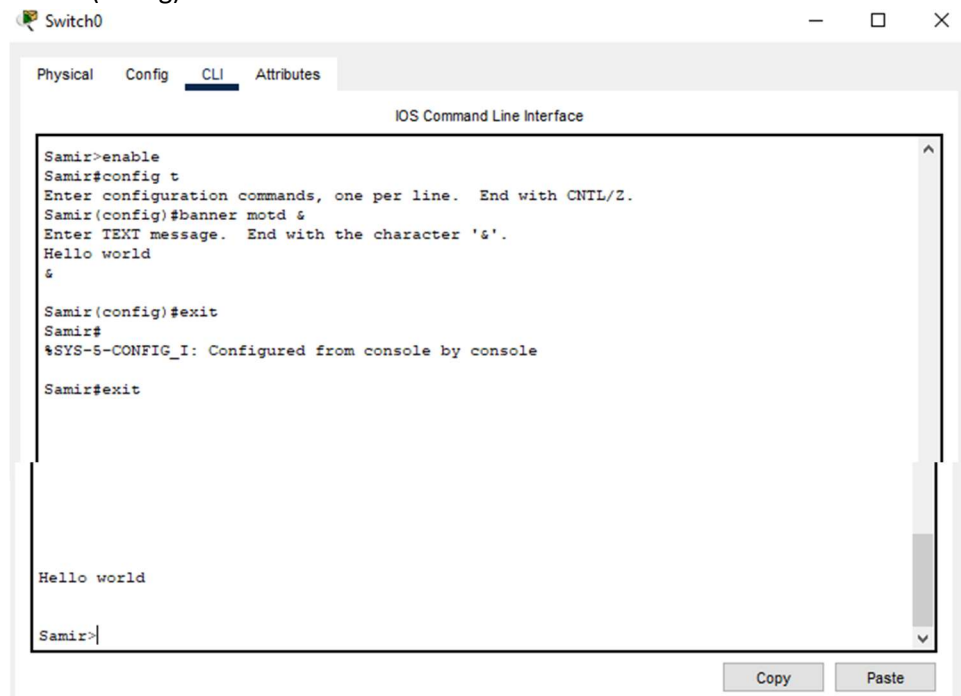
2. Viewing and Editing time and date

```
Samir >enable
Samir #show clock
Samir#clock set 11:30:30 30 may 2022
Samir #show clock
```



3. Set Banner

```
Samir >enable
Samir #config t
Samir (config)#banner motd &
Enter TEXT message. End with the character '&'.
Hello World &
Samir (config)#exit
```

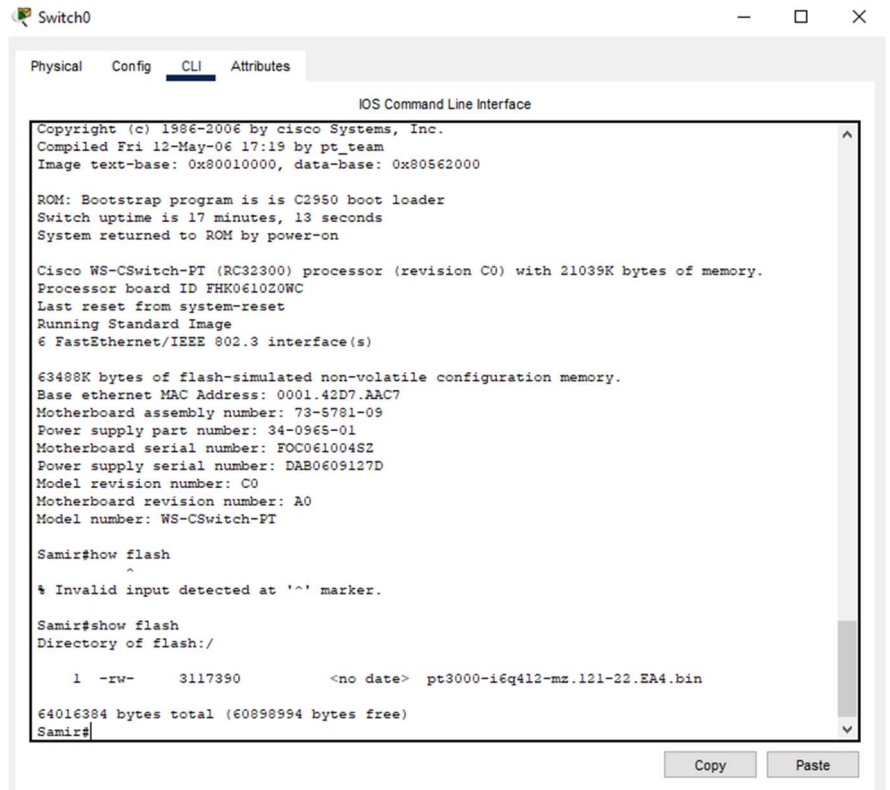


4. Show Version and Flash

Samir>enable

Samir# show version

Samir# show flash



The screenshot shows the Cisco IOS Command Line Interface for a switch named 'Switch0'. The 'CLI' tab is selected. The output of the 'show version' command is displayed, showing system information such as the processor (Cisco WS-CSwitch-PT), memory (21039K bytes), and uptime (17 minutes, 13 seconds). The output of the 'show flash' command is also shown, displaying the directory of flash memory with a single file 'pt3000-i6q4l2-mz.121-22.EA4.bin' and a total of 64016384 bytes.

```
Copyright (c) 1986-2006 by cisco Systems, Inc.
Compiled Fri 12-May-06 17:19 by pt_team
Image text-base: 0x80010000, data-base: 0x80562000

ROM: Bootstrap program is is C2950 boot loader
Switch uptime is 17 minutes, 13 seconds
System returned to ROM by power-on

Cisco WS-CSwitch-PT (RC32300) processor (revision C0) with 21039K bytes of memory.
Processor board ID FHK0610Z0WC
Last reset from system-reset
Running Standard Image
6 FastEthernet/IEEE 802.3 interface(s)

63488K bytes of flash-simulated non-volatile configuration memory.
Base ethernet MAC Address: 0001.42D7.AAC7
Motherboard assembly number: 73-5781-09
Power supply part number: 34-0965-01
Motherboard serial number: FOC061004S2
Power supply serial number: DAB0609127D
Model revision number: C0
Motherboard revision number: A0
Model number: WS-CSwitch-PT

Samir#show flash
^
% Invalid input detected at '^' marker.

Samir#show flash
Directory of flash:/

 1  -rw-      3117390      <no date>  pt3000-i6q4l2-mz.121-22.EA4.bin

64016384 bytes total (60898994 bytes free)
Samir#
```

5. Set Password

Samir>enable

Samir#config t

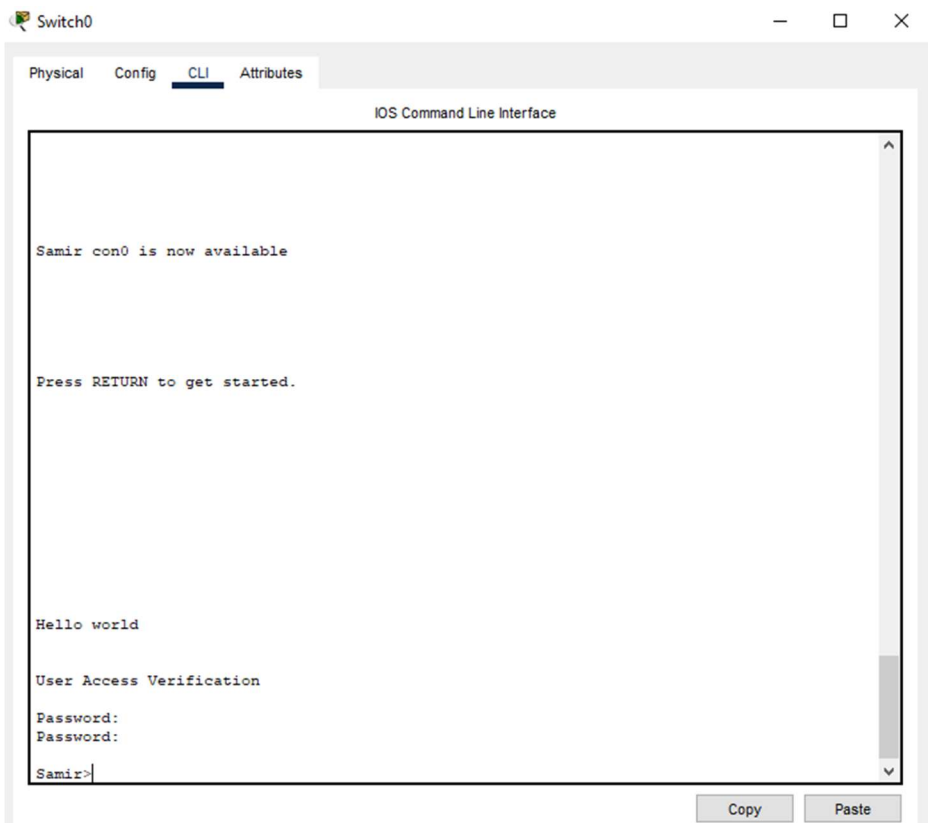
Samir(config)#line console 0

Samir(config-line)#password hello

Samir(config-line)#login

Samir(config-line)#exit

Samir(config)#exit



The screenshot shows the Cisco IOS Command Line Interface for a switch named 'Switch0'. The 'CLI' tab is selected. The output of the 'login' command is displayed, showing the message 'Samir con0 is now available' and 'Press RETURN to get started.' The prompt 'Hello world' is shown. The 'User Access Verification' section is displayed, showing the password prompt 'Password:' and the user input 'Samir#'. The prompt 'Samir#>' is shown at the bottom.

```
Samir con0 is now available

Press RETURN to get started.

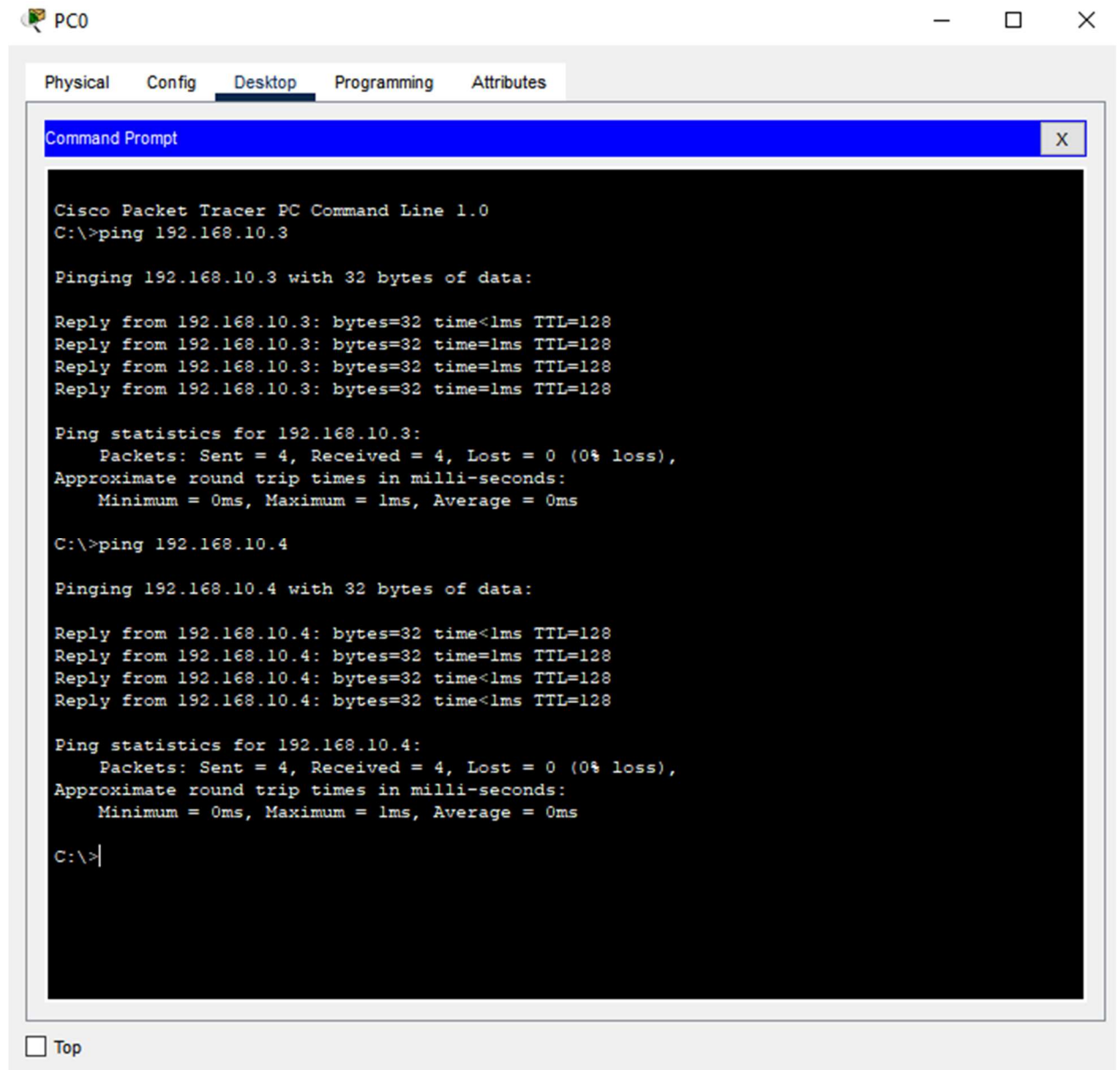
Hello world

User Access Verification

Password:
Password:
Samir#>
```

Ping Test

Pinging PC2 from PC0 and pinging PC1 from PC0 to ensure connectivity :



PC0

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.10.3

Pinging 192.168.10.3 with 32 bytes of data:

Reply from 192.168.10.3: bytes=32 time<1ms TTL=128
Reply from 192.168.10.3: bytes=32 time=1ms TTL=128
Reply from 192.168.10.3: bytes=32 time=1ms TTL=128
Reply from 192.168.10.3: bytes=32 time=1ms TTL=128

Ping statistics for 192.168.10.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.10.4

Pinging 192.168.10.4 with 32 bytes of data:

Reply from 192.168.10.4: bytes=32 time<1ms TTL=128
Reply from 192.168.10.4: bytes=32 time=1ms TTL=128
Reply from 192.168.10.4: bytes=32 time<1ms TTL=128
Reply from 192.168.10.4: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.10.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>|
```

☐ Top

Labsheet- 5

OBJECTIVES:

1. To configure Switch and End devices.
2. To implement basic Switch Commands.

Configuration of Router, Switch and End devices in a network.

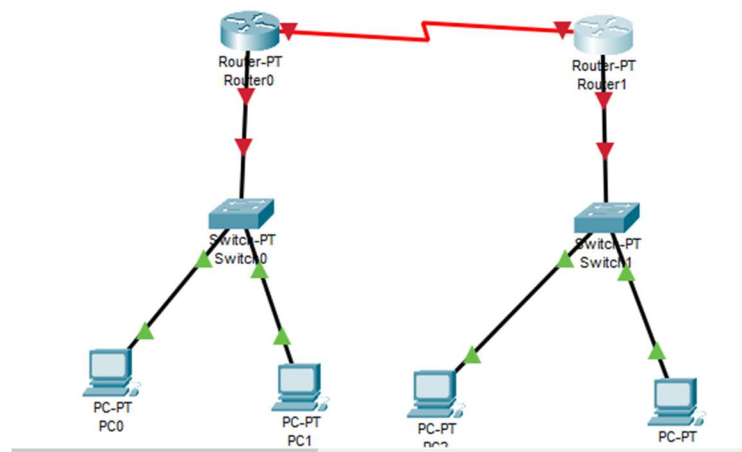


Fig: Network architecture of 2 routers ,2 switches connecting 4 PCs

Theory

• IOS

IOS is an operating system developed by Cisco for the configuration of several DCE devices and servers. It provides a standard way of configuring these devices. It is stored in the ROM of the DCE devices and Cisco servers. The startup configuration of any DCE device is stored in NVRAM and running configuration is stored in flash memory.

• Different configuration modes in IOS

✓ User Exec Mode

The very initial mode of any IOS device is called user exec mode. This mode is mainly used to view statistics and run commands like ping and telnet. It is represented as:
hostname>

✓ **Privileged exec mode or Enable mode**

This mode is accessed by typing in the command “enable” in user exec mode. It is represented as: hostname#.

✓ **Global Configuration mode or Terminal mode**

This mode is accessed by typing in the command “config t” in the enable mode. It is used to make the global changes to the IOS devices and change its configuration. It is represented by :Hostname(config)#.

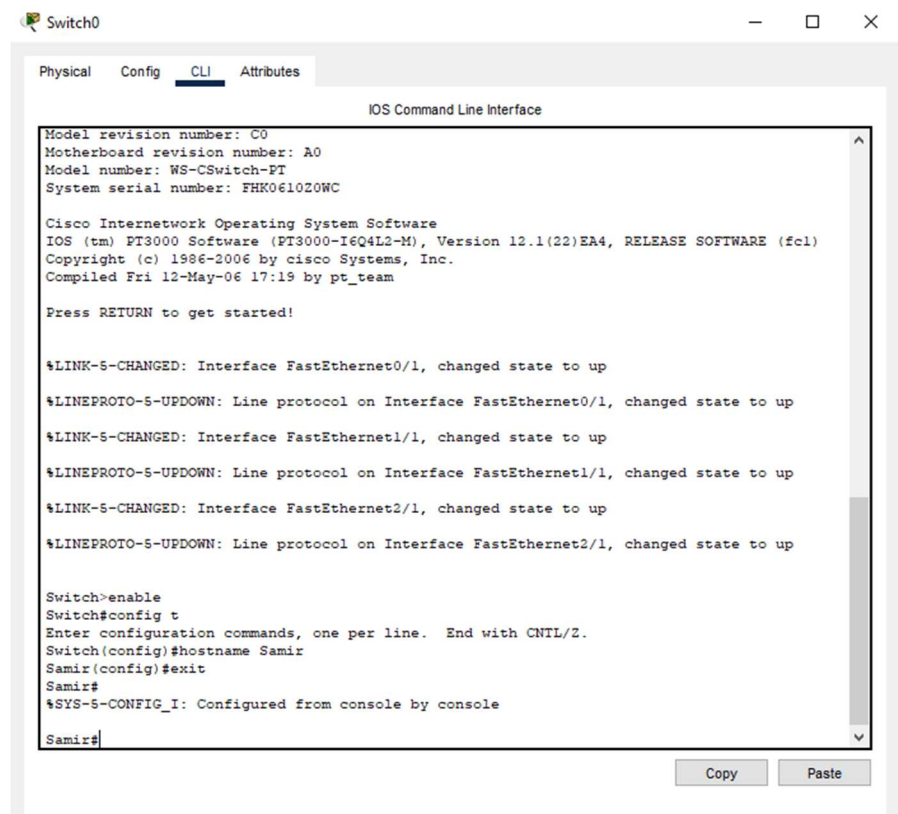
Procedure

- a. Open Cisco Packet Tracer.
- b. Select a Router and 3 PCs and establish a connection between them using Cables.
 - i. Router-Router: Serial DCE cable
 - ii. Router-Switch: Straight through cable
 - iii. Switch-Computer: Straight through cable
- c. 3.Open the CLI terminal of the Router and perform several Router commands.

Basic Switch Commands

1. Changing the Hostname

```
Switch>enable
Switch#config t
Switch(config)#hostname Samir
Samir(config)#exit
Samir#exit
```



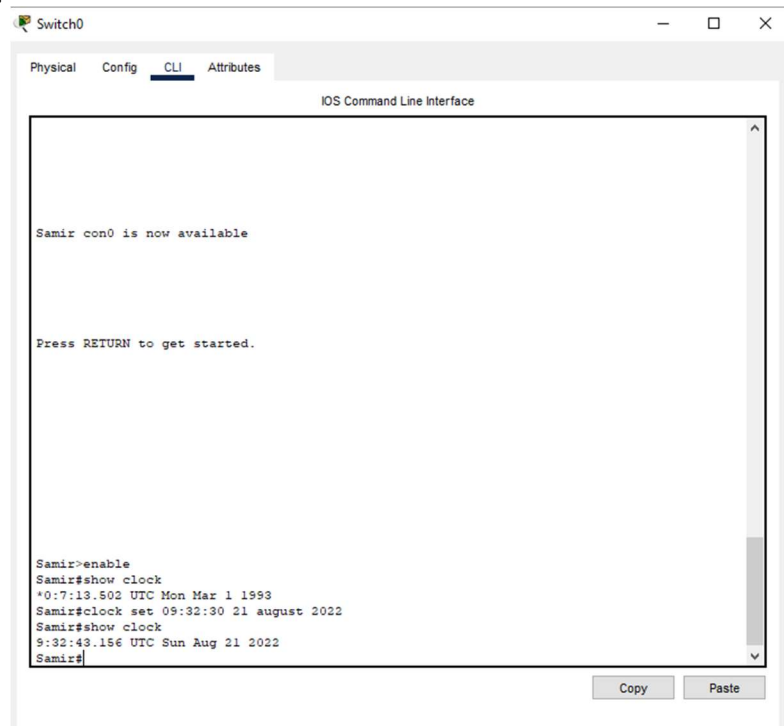
2. Viewing and Editing time and date

Samir >enable

Samir #show clock

Samir #clock set 11:30:30 30 may 2022

Samir #show clock



3. Set Banner

Samir >enable

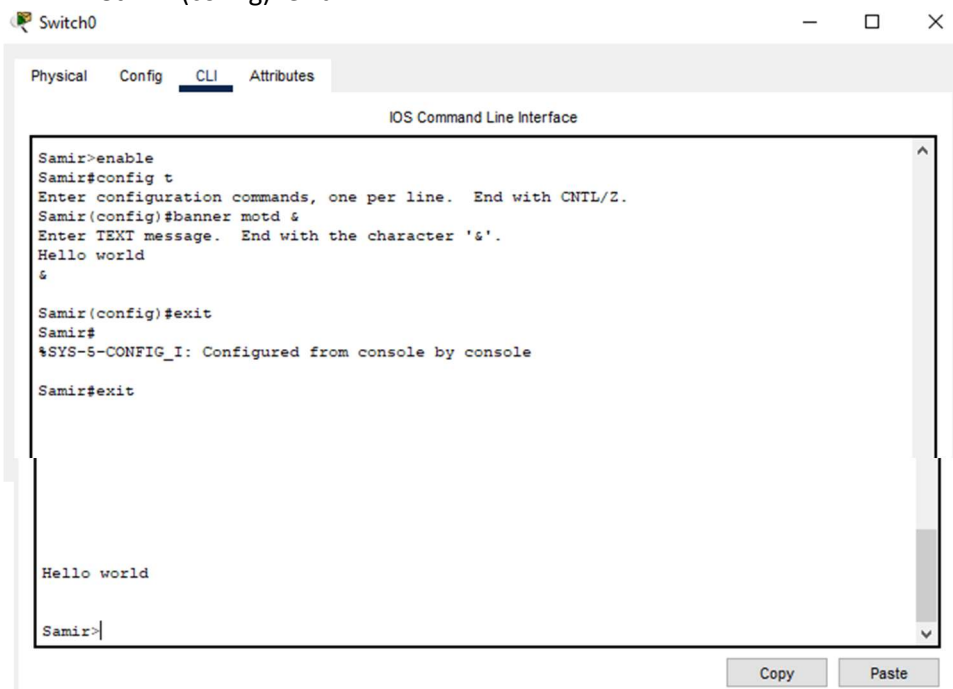
Samir #config t

Samir (config)#banner motd &

Enter TEXT message. End with the character '&'.

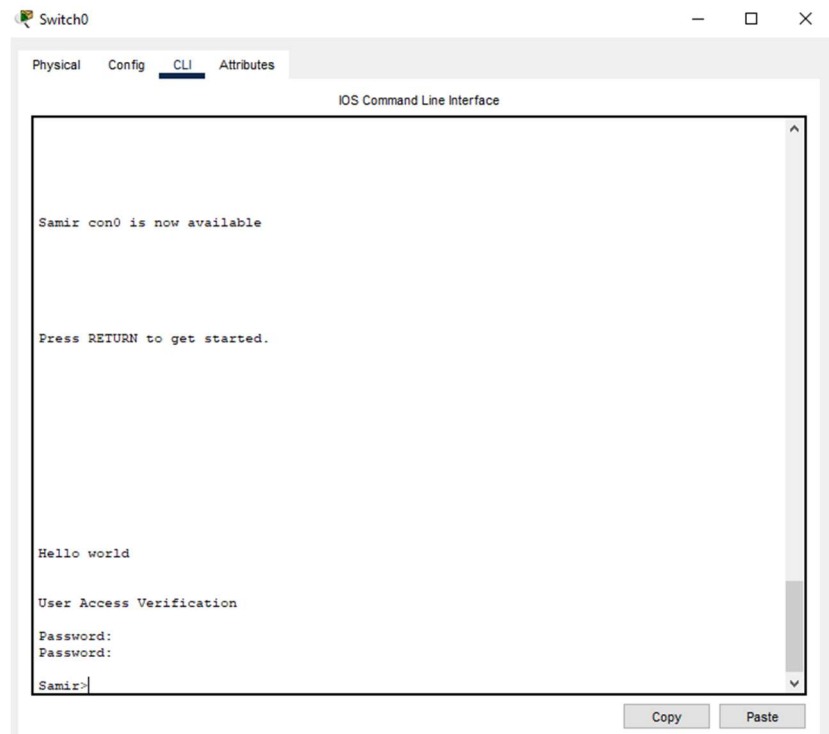
Hello World &

Samir (config)#exit



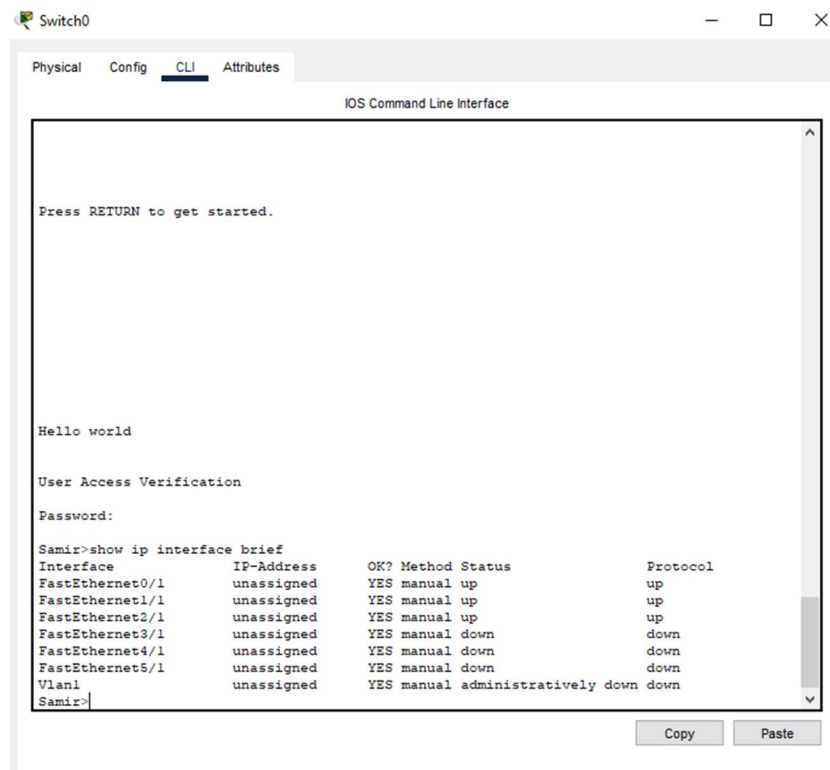
4. Set Password

```
Samir>enable
Samir#config t
Samir (config)#line console 0
Samir (config-line)#password hello
Samir (config-line)#login
Samir (config-line)#exit
Samir (config)#exit
```



5. Show ip interface brief

```
Samir>enable
Samir# show ip interface brief
```



6. Show running configuration

Samir>enable

Samir#show running-config

7. Show startup configuration

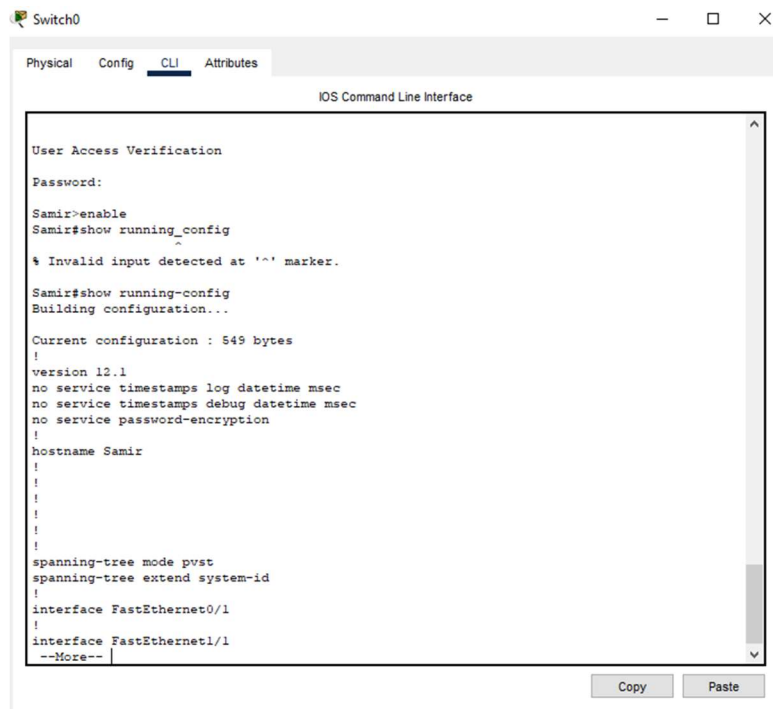
Samir>enable

Samir#show startup-config

8. Copy Running configuration to startup configuration

Samir>enable

Samir#show runnig#copy running-config startup-config

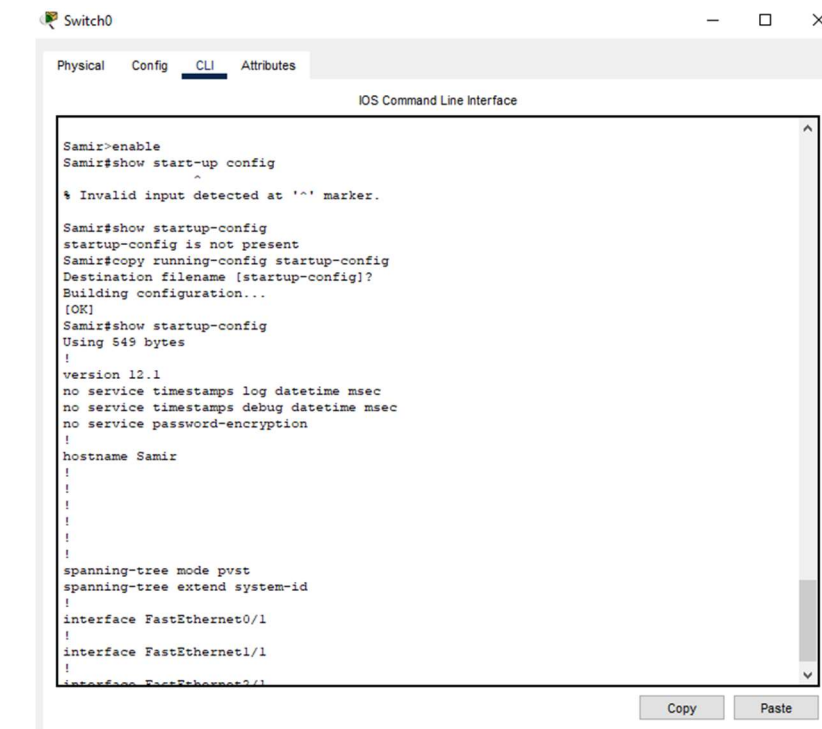


The screenshot shows a terminal window titled "Switch0" with tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, displaying the "IOS Command Line Interface". The user has entered the command "show running-config", and the output shows the current configuration, including version 12.1, hostname Samir, and various interface configurations. The output is truncated with "--More--" at the bottom.

```
User Access Verification
Password:
Samir>enable
Samir#show running-config
^
% Invalid input detected at '^' marker.

Samir#show running-config
Building configuration...

Current configuration : 549 bytes
!
version 12.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Samir
!
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet1/1
!
--More--
```



The screenshot shows the same terminal window as above, but now showing the output of the "show startup-config" command, which indicates that the startup configuration is not present. The user then enters the command "copy running-config startup-config", and the output shows the configuration being copied to the startup configuration. The output is truncated with "--More--" at the bottom.

```
Samir>enable
Samir#show start-up config
^
% Invalid input detected at '^' marker.

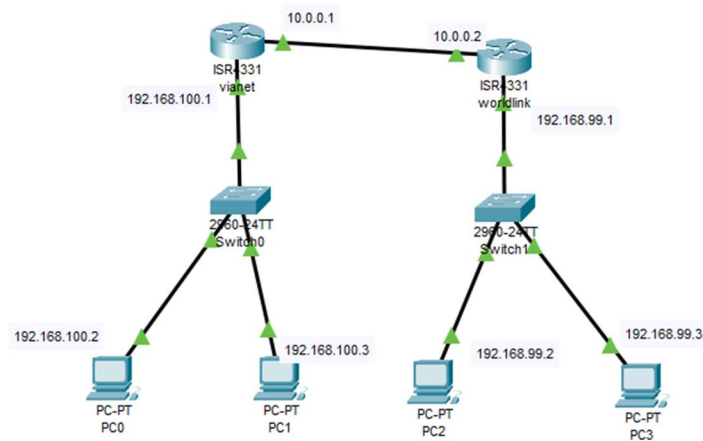
Samir#show startup-config
startup-config is not present
Samir#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Samir#show startup-config
Using 549 bytes
!
version 12.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Samir
!
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet1/1
!
--More--
```

Labsheet- 6

OBJECTIVES:

- To implement Static Routing and RIP (Routing Information Protocol) to establish communication between two different networks

Configuration of Router Switch and End devices in a network.



Theory

Routing is the process of selecting path along which the data can be transferred from source to the destination. And for this purpose of forwarding the data packets, routing tables are used. Routing Table is a set of rules, often viewed in table format, that is used to determine where data packets traveling over an Internet Protocol (IP) network will be directed. The routing table consists of following entries:

1. Network ID
2. Subnet Mask
3. Next Hop
4. Outgoing Interface
5. Metric

There are 3 types of routing:

1. Static Routing
2. Dynamic Routing
3. Default Routing

Static Routing

It is also known as non-adaptive routing technique. In this technique ,administrator has to manually add the routes into the routing table. It is a better approach for the smaller networks but are impractical for the larger networks.

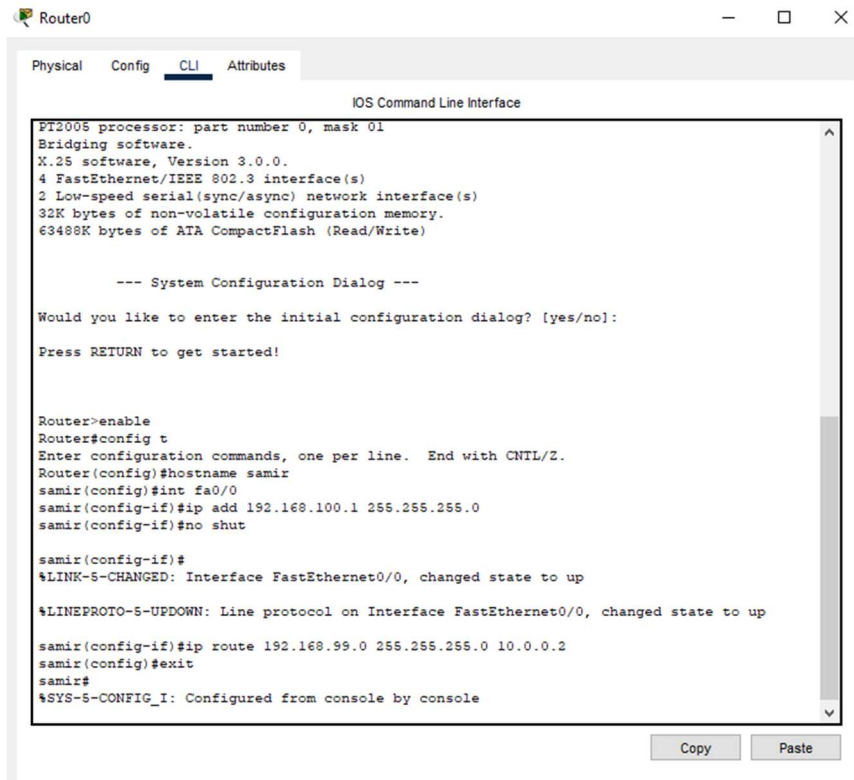
Dynamic Routing

It is also known as adaptive routing technique. In this technique, router itself adds the route in the routing table using some protocols like RIP, EIGRP and OSPF. If any route goes down, then the automatic adjustment will be made to reach the destination.

Procedure

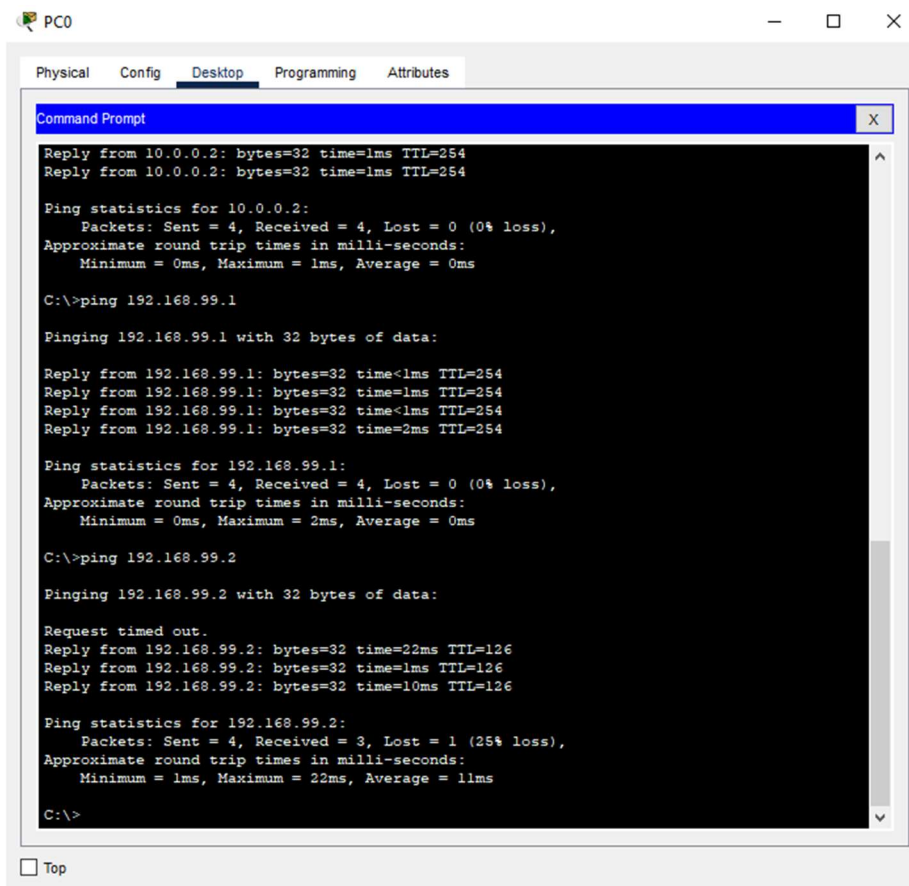
Static Routing:

1. Open Cisco Packet tracer
2. Select 2 routers , 2 switches and 4 PCs and connect them with appropriate cables.
3. Assign IP and Gateway to the computers such that two PCs from 1 switch remains in same network and the other two from next switch remains in another network.
4. Use CLI of router to assign IP to every interface to which the cable connects in router.
And enable the interface.
Command:
Router(config)#int [interface]
Router(config-if)#ip add [ip address] [subnet mask]
Router(config-if)#no shut
5. Manually add the routes in each of the routers.
Command:
Router(config)# ip route [Network ID] [Mask] [Next hop]
6. The connection is now established between two different network which can be verified with ping test.



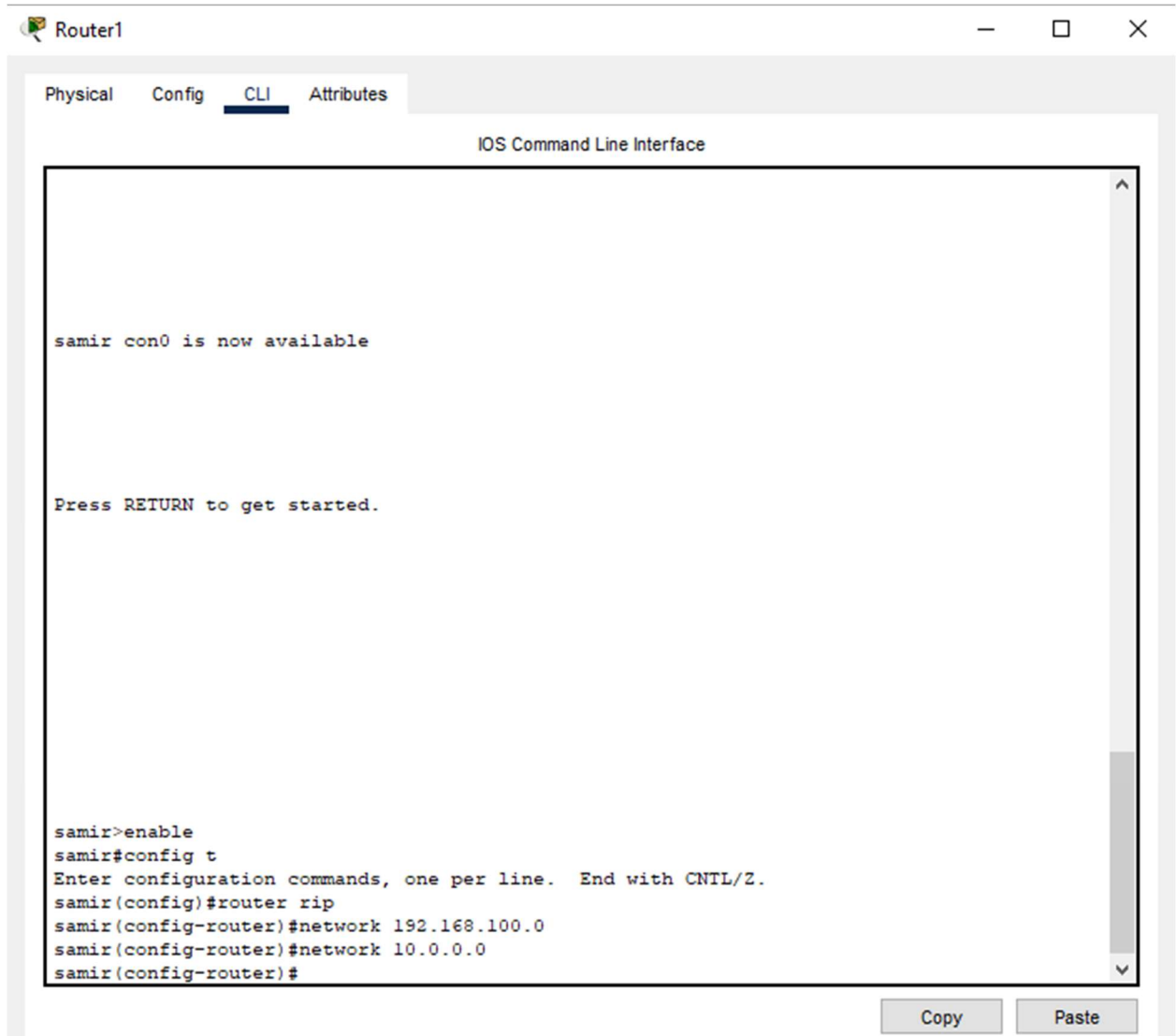
Ping test

Pinging from PC0(192.168.100.2) to PC2(192.168.99.2)



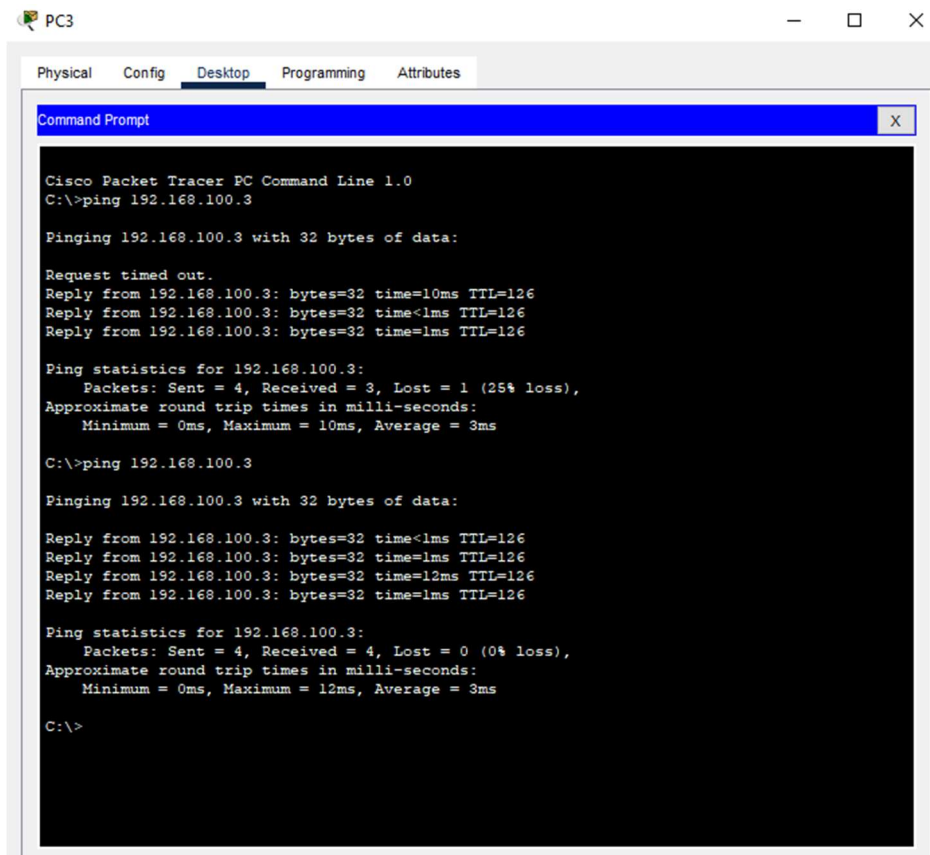
Dynamic Routing with RIP

1. Perform steps(1-4) of static routing
2. Apply RIP to the routers and add the network ID of the all the interfaces.
Command:
Router(config)#router rip
Router(config-router)# network [Network ID]
3. Connection is now established, Perform ping test for the verification.



Ping test

Pinging from PC3(192.168.99.3) to PC1(192.168.100.3)



```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.100.3

Pinging 192.168.100.3 with 32 bytes of data:

Request timed out.
Reply from 192.168.100.3: bytes=32 time=10ms TTL=126
Reply from 192.168.100.3: bytes=32 time<1ms TTL=126
Reply from 192.168.100.3: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.100.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 10ms, Average = 3ms

C:\>ping 192.168.100.3

Pinging 192.168.100.3 with 32 bytes of data:

Reply from 192.168.100.3: bytes=32 time<1ms TTL=126
Reply from 192.168.100.3: bytes=32 time=1ms TTL=126
Reply from 192.168.100.3: bytes=32 time=12ms TTL=126
Reply from 192.168.100.3: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.100.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 12ms, Average = 3ms

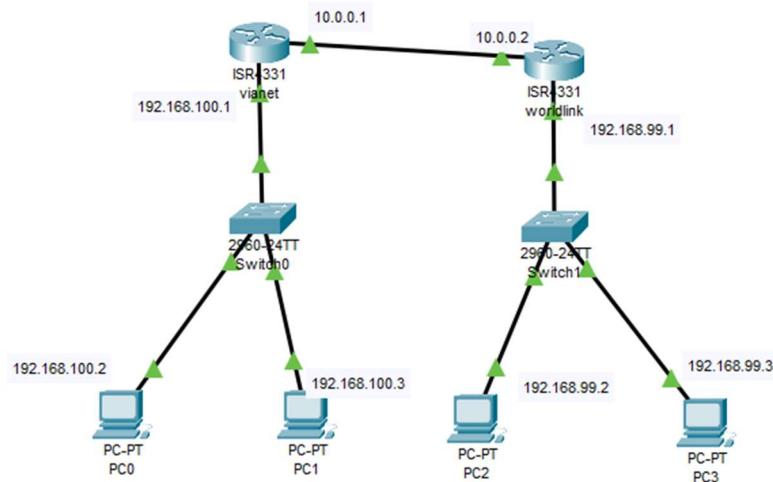
C:\>
```

Labsheet- 6.2

OBJECTIVES:

- To implement EIGRP(Enhanced Interior Gateway Routing Protocol) and OSPF(Open Shortest Path First) to establish communication between two different networks.

Configuration of Router Switch and End devices in a network.



Theory

Autonomous system is a collection of routers that has a same protocol. Hence two different types of routing protocol are used to make connection between autonomous systems:

- Internal Gateway Protocol
 - Used for Intra Autonomous System
 - Its types are Distance vector protocol and Link state protocol (RIP,EIGRP,OSPF)
- External Gateway Protocol
 - Used for Extra Autonomous System

EIGRP and OSPF are two Link state protocols. EIGRP uses bandwidth and delay as a metric whereas OSPF uses only the bandwidth.

The OSPF has largely replaced the older RIP or Routing Information Protocol in corporate networks. RIP requires routers to send every 30 seconds of the entire routing table to neighbors. But OSPF sends only the changed part and only when a change occurs.

EIGRP determines the most efficient routes to destinations that are reachable in a network of links and routers. It is the distance-based decision and whether there is a loop-free destination path. With faster convergences, it increases availability.

Procedure

1. Open Cisco Packet tracer
2. Select 2 routers , 2 switches and 4 PCs and connect them with appropriate cables.
3. Assign IP and Gateway to the computers such that two PCs from 1 switch remains in same network and the other two from next switch remains in another network.
4. Use CLI of router to assign IP to every interface to which the cable connects in router. And enable the interface.

Command:

```
Router(config)#int [interface]
```

```
Router(config-if)#ip add [ip address] [subnet mask]
```

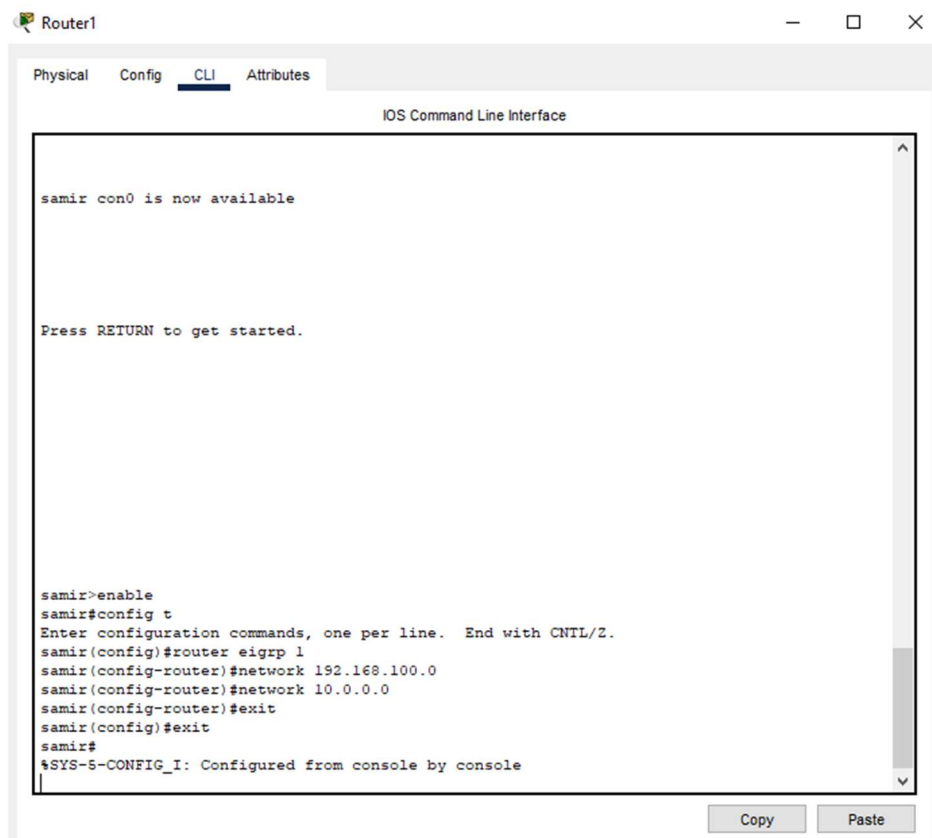
```
Router(config-if)#no shut
```

5. For setting up EIGRP, type the command in both the routers's CLI.

Command:

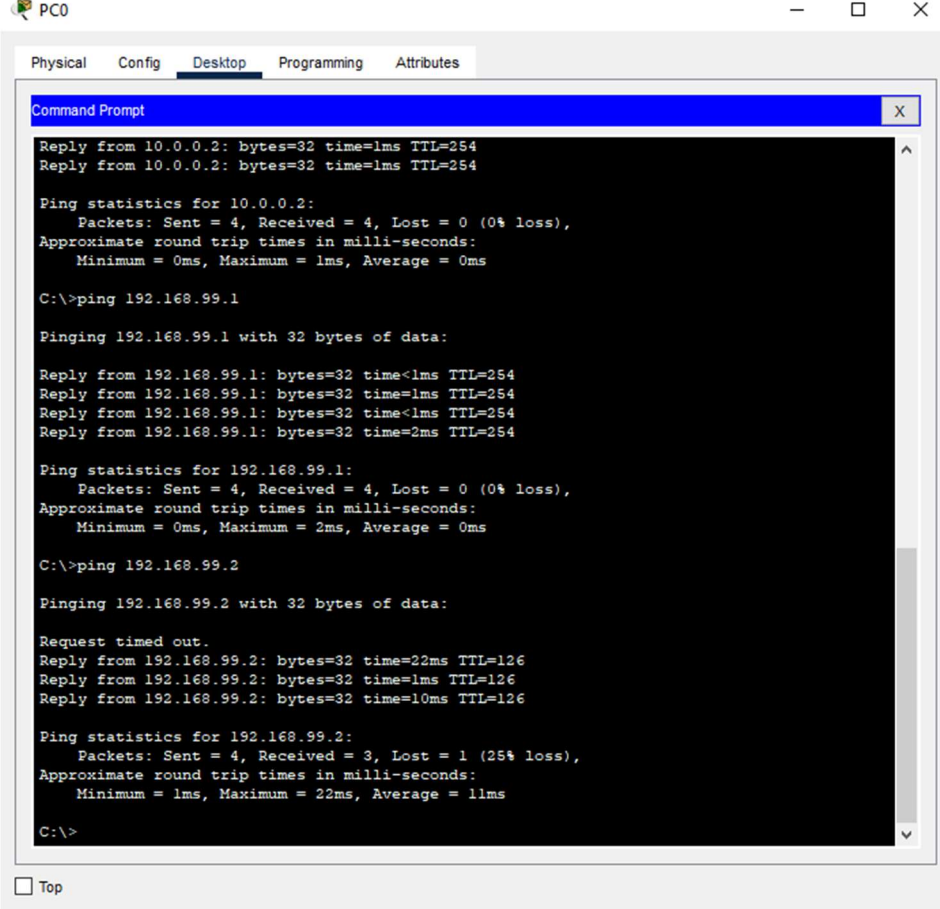
```
Router(config)#router eigrp [Autonomous system number]
```

```
Router(config-router)#network [Network ID]
```



Ping test

Pinging PC2(192.168.99.2) from PC0(192.168.100.2)



The screenshot shows a PC0 desktop environment with a window titled 'PC0'. The window has tabs for 'Physical', 'Config', 'Desktop', 'Programming', and 'Attributes'. The 'Desktop' tab is active, displaying a 'Command Prompt' window. The Command Prompt shows the results of a ping test from PC0 to PC2. The test is performed in two steps: first, a ping to 192.168.99.1, which succeeds, and then a ping to 192.168.99.2, which fails with a 25% loss. The Command Prompt text is as follows:

```
Command Prompt
Reply from 10.0.0.2: bytes=32 time=1ms TTL=254
Reply from 10.0.0.2: bytes=32 time=1ms TTL=254

Ping statistics for 10.0.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.99.1

Pinging 192.168.99.1 with 32 bytes of data:

Reply from 192.168.99.1: bytes=32 time<1ms TTL=254
Reply from 192.168.99.1: bytes=32 time=1ms TTL=254
Reply from 192.168.99.1: bytes=32 time<1ms TTL=254
Reply from 192.168.99.1: bytes=32 time=2ms TTL=254

Ping statistics for 192.168.99.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\>ping 192.168.99.2

Pinging 192.168.99.2 with 32 bytes of data:

Request timed out.
Reply from 192.168.99.2: bytes=32 time=22ms TTL=126
Reply from 192.168.99.2: bytes=32 time=1ms TTL=126
Reply from 192.168.99.2: bytes=32 time=10ms TTL=126

Ping statistics for 192.168.99.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 22ms, Average = 11ms

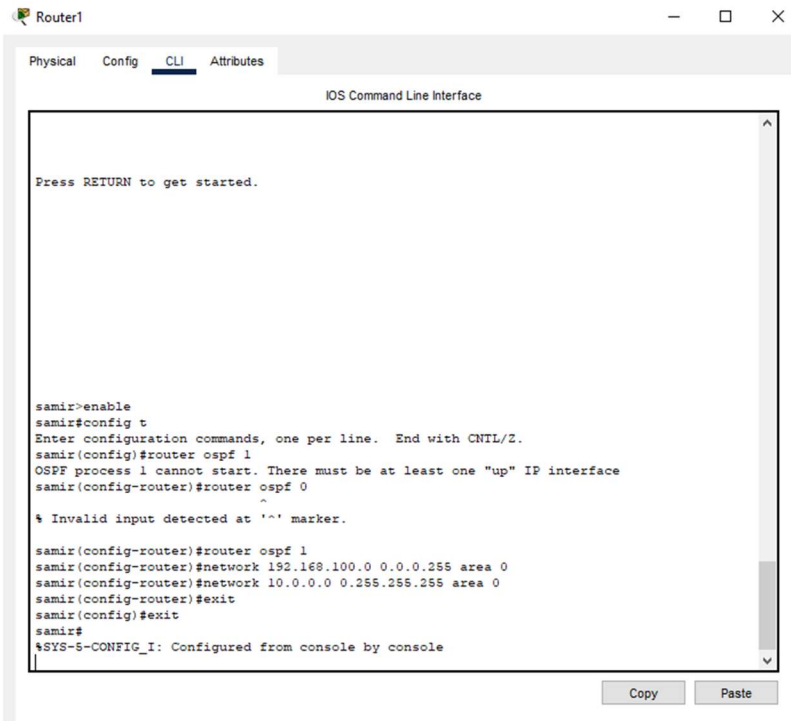
C:\>
```

6. For setting up OSPF, type the command in both the routers's CLI.

Command:

Router(config)#router ospf [Process ID]

Router(config-router)#network [Network ID] [Wildcard] area [area number]



Ping test

Pinging PC1(192.168.100.3) from PC3(192.168.99.3)

