DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
AMRITA SCHOOL OF COMPUTING
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23CSE302 – COMPUTER NETWORKS

EXPERIMENT 8
INITIAL ROUTER CONFIGURATION

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Roll No.:CH.SC.U4CSE23224	Section:C	
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Criteria	Weightage	Score (1–4)	Weighted Score
Understanding of Concepts	15%		
Execution of Experiment	20%		
Use of Commands/Tools	10%		
Problem Solving & Debugging	10%		
Viva Performance	15%		
Online Documentation/Observation Book	10%		
Teamwork & Participation	10%		
Timeliness	10%		
Total	**100%**		**/100**

OBJECTIVES:

1. **Students will understand how and what initial configuration needs to be applied to a Network Router**
2. **Students will gain knowledge about the importance of the initial router configuration**

AIM

To configure a network using switches and routers, where static routing is set up on two routers, and basic router configurations are applied. The setup ensures communication between two distinct networks through routing and proper router configuration using Cisco Packet Tracer.

SYSTEM AND SOFTWARE REQUIREMENTS

Software – Cisco Packet Tracer
Components used:
1) End Devices
   - 2 PC-PT
   - 2 Server-PTs
2) Network Devices
   - 2 Switch 2960-24TT
   - 2 Routers 1841
3) Connections
   - Copper Straight-Through
   - Serial DTE
   - Console cable

PROCEDURE

To configure a network with basic router configurations using Cisco Packet Tracer, follow the given steps:

Step 1: Open Cisco Packet Tracer

1) Launch Cisco Packet Tracer on your computer.

Step 2: Add Devices to the Workspace

1) Add two PCs:
   - Click on the "End Devices" icon in the bottom left corner.
   - Select "PC" and drag two PCs into the workspace.
2) Add two Servers:
   - Click on the "End Devices" icon in the bottom left corner.
   - Select "Server" and drag two PCs into the workspace.

3) Add two Switches:
   - Click on the "Switches" icon under Network devices in the bottom left corner.
   - Select a switch (2960-24TT) and drag 2 switches into the workspace.
   - Open the Physical tab, Select Modules: Turn off the switch's power, Drag The HWIC-2T (a Cisco 2-Port Serial High-Speed WAN Interface Card, providing 2 serial ports), and Turn on the Switch again.
4) Add two Routers:
   - Click on "Routers" icon under Network devices in the bottom left corner.
   - Select a router (1841) and drag 2 routers into the workspace.

Step 3: Connect the Devices

1) Select the Connection Tool:
   - Click on the "Connections" icon (lightning bolt) in bottom left corner.
2) Connect the PCs to the Switch:
   - Click on a PC and then click on the switch to connect them with a copper straight-through cable, follow the same for another PC.
   - Connect the remaining two PCs with the other switch using the same method.
3) Connect the Switch to the Router:
   - Click on the switch and then click on the Router to connect them with a copper straight-through cable (connect Switch0 to Router0's GigabitEthernet0/0 interface).
   - Repeat for the other switch and router (connect Switch1 to Router1's GigabitEthernet0/1 interface).
4) Connect the two Routers:
   - Click on a router and then click on the other router to connect them with a serial DTE cable (connect Router0's Serial0/1/0 interface to Router1's Serial0/1/0interface).
5) Connect Router and PC within same network:
   - Click on a PC and then click on the router to connect them with a console cable (connect PC's RS-232 interface to Router1's Console interface).

Step 4: Configure IP Addresses

LAN Network-1 with network address 192.168.1.0/24

1) Configure the Customer PC:
   - Open the PC, navigate to Desktop, enter IP configuration
   - Choose Static to manually enter the following,

   IPv4 Address: 192.168.1.2`

   Subnet Mask: 255.255.255.0

   Default Gateway: 192.168.1.1

2) Configure the Customer Server:
   - Open the Server, navigate to Desktop, enter IP configuration
   - Choose Static to manually enter the following,

   IPv4 Address: 192.168.1.3

   Subnet Mask: 255.255.255.0

   Default Gateway: 192.168.1.1

3) Configure the Customer Router:
   - Click on the router and navigate to the Config tab.
   - Select the interface connected to the switch (FastEthernet0/0).
   - Set the IP address and subnet mask:

   IP Address: 192.168.1.1

   Subnet Mask: 255.255.255.0

   - Check the box for "Port Status" to bring the interface up.

LAN Network-2 with network address 192.168.2.0/24

1) Configure the ISP Workstation:
   - Open the PC, navigate to Desktop, enter IP configuration
   - Choose Static to manually enter the following,

   IPv4 Address: 192.168.2.2

   Subnet Mask: 255.255.255.0

   Default Gateway: 192.168.2.1

2) Configure the ISP Server:

- Open the Server, navigate to Desktop, enter IP configuration Choose Static to manually enter the following,

  IPv4 Address: 192.168.2.3

  Subnet Mask: 255.255.255.0

  Default Gateway: 192.168.2.1

3) Configure the ISP Router:
   - Click on the router and navigate to the Config tab.
   - Select the interface connected to the PC (GigabitEthernet0/1).
   - Set the IP address and subnet mask:

   IP Address: 192.168.2.1

   Subnet Mask: 255.255.255.0

   - Check the box for "Port Status" to bring the interface up.

WAN Network with network address 10.0.0.0/24

1) Configure Customer Router:
   - Click on the router and navigate to the Config tab.
   - Select the interface connected to the ISP Router (Serial0/1/0).
   - Set the IP address and subnet mask:

   IP Address: 10.0.0.1

   Subnet Mask: 255.0.0.0

   - Check the box for "Port Status" to bring the interface up.
2) Configure the ISP Router:
   - Click on the router and navigate to the Config tab.
   - Select the interface connected to the Customer Router (Serial0/1/0).
   - Set the IP address and subnet mask:

   IP Address: 10.0.0.2

   Subnet Mask: 255.0.0.0

   - Check the box for "Port Status" to bring the interface up.

Step 5: Configure the Static Routes using either of the 2 methods:

Through Command Line Interface:

(1) Router0
    1) Select the router, navigate to CLI
    2) Enter privileged EXEC mode by typing:
        enable
    3) Enter global configuration mode by typing:
        configure terminal
    4) Configure IP route of the network:
        ip route 192.168.2.0 255.255.255.0 10.0.0.2
    5) Exit configuration mode
        End

(2) Router1
    1) Select the router, navigate to CLI
    2) Enter privileged EXEC mode by typing:
        enable
    3) Enter global configuration mode by typing:
        configure terminal
    4) Configure IP route of the network:
        ip route 192.168.1.0 255.255.255.0 10.0.0.1
    5) Exit configuration mode
        End

Through Graphical User Interface:

(1) Router0
    1) Select the router, navigate to Config tab.
    2) Select Static under Routing and enter the following:
        Network: 192.168.2.0
        Mask: 255.255.255.0
        Next Hop: 10.0.0.2
    3) Click on add.

(2) Router1
    1) Select the router, navigate to Config tab.
    2) Select Static under Routing and enter the following:
        Network: 192.168.1.0
        Mask: 255.255.255.0
        Next Hop: 10.0.0.1
    3) Click on add.

Step 6: Router Configuration on Customer Router:

1) Select the PC connected to Router via console cable, navigate to desktop and enter Terminal

2) Configure switch hostname:

   enable
   configure terminal
   hostname CCE22010CustomerRouter

3) Configure privileged mode password and secret:

   enable password cisco
   enable secret cisco123

4) Configure console password:

   line console 0
   password cisco123
   login
   exit

5) Configure virtual teletype (vty) pw:
   line vty 0 4
   password cisco123
   login
   exit

6) Enable Password Encryption:
   service password-encryption
   show running-config

7) Configure banner MOTD:
   banner motd $ Farhath - Authorised Access Only$

8) Disable IP Domain Lookup:
   no ip domain-lookup
   end

9) Save the Configuration:
   copy run start

Step 7: Router Configuration on ISP Router:

1) Select the PC connected to Router via console cable, navigate to desktop and enter Terminal

2) Configure switch hostname:
   enable

configure terminal
hostname CCE22010ISProuter

3) Configure privileged mode password and secret:

   enable password cisco
   enable secret cisco123

4) Configure console password:

   line console 0
   password cisco123
   login
   exit

5) Configure virtual teletype (vty) pw:

   line vty 0 4
   password cisco123
   login
   exit

6) Enable Password Encryption:
   service password-encryption
   show running-config

7) Configure banner MOTD:
   banner motd $ Farhath - Authorised Access Only$

8) Disable IP Domain Lookup:
   no ip domain-lookup
   end

9) Save the Configuration:
   copy run start
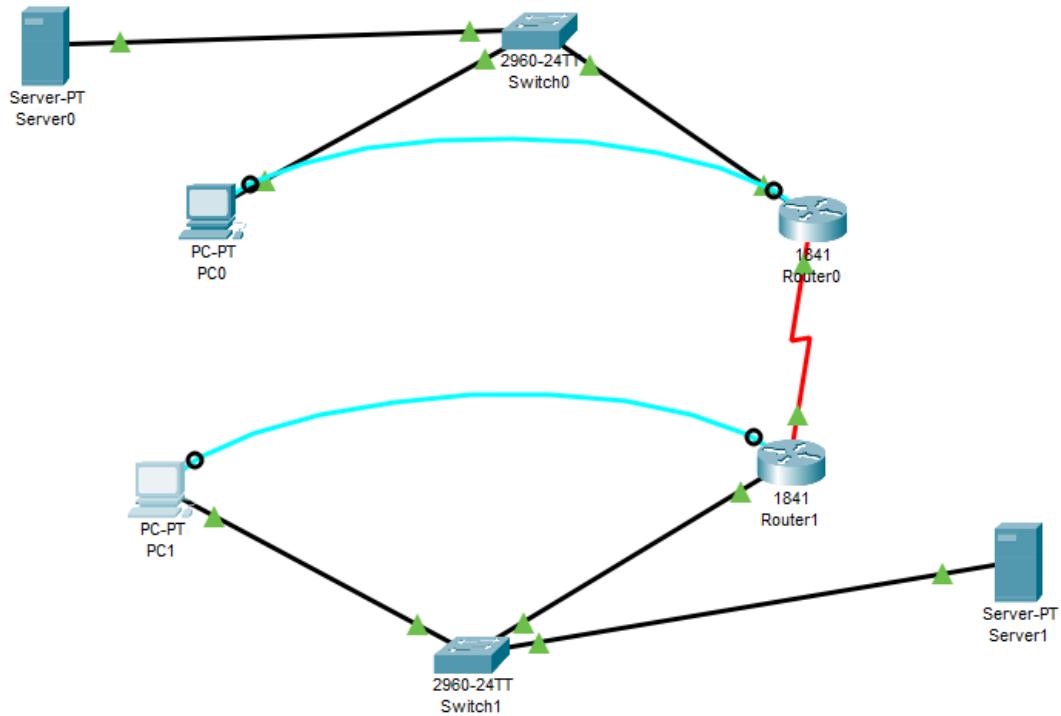
Step 9: Verify the implementation of Router Configuration:

1) Select the PC connected to Router via console cable, navigate to desktop and enter Terminal
2) Enter privileged mode, console access, and virtual teletype (vty) access, and verify that the switch is protected from unauthorized access.
3) Ensure the MOTD banner provides a **message** that is displayed to users when they attempt to access the switch.
4) Ensure all passwords are encrypted in the running configuration to protect against unauthorized viewing.
5) Ensure no ip domain-lookup prevents the router from trying to resolve mistyped commands into domain names.

Step 8: Verify the connectivity between the two LAN Networks:
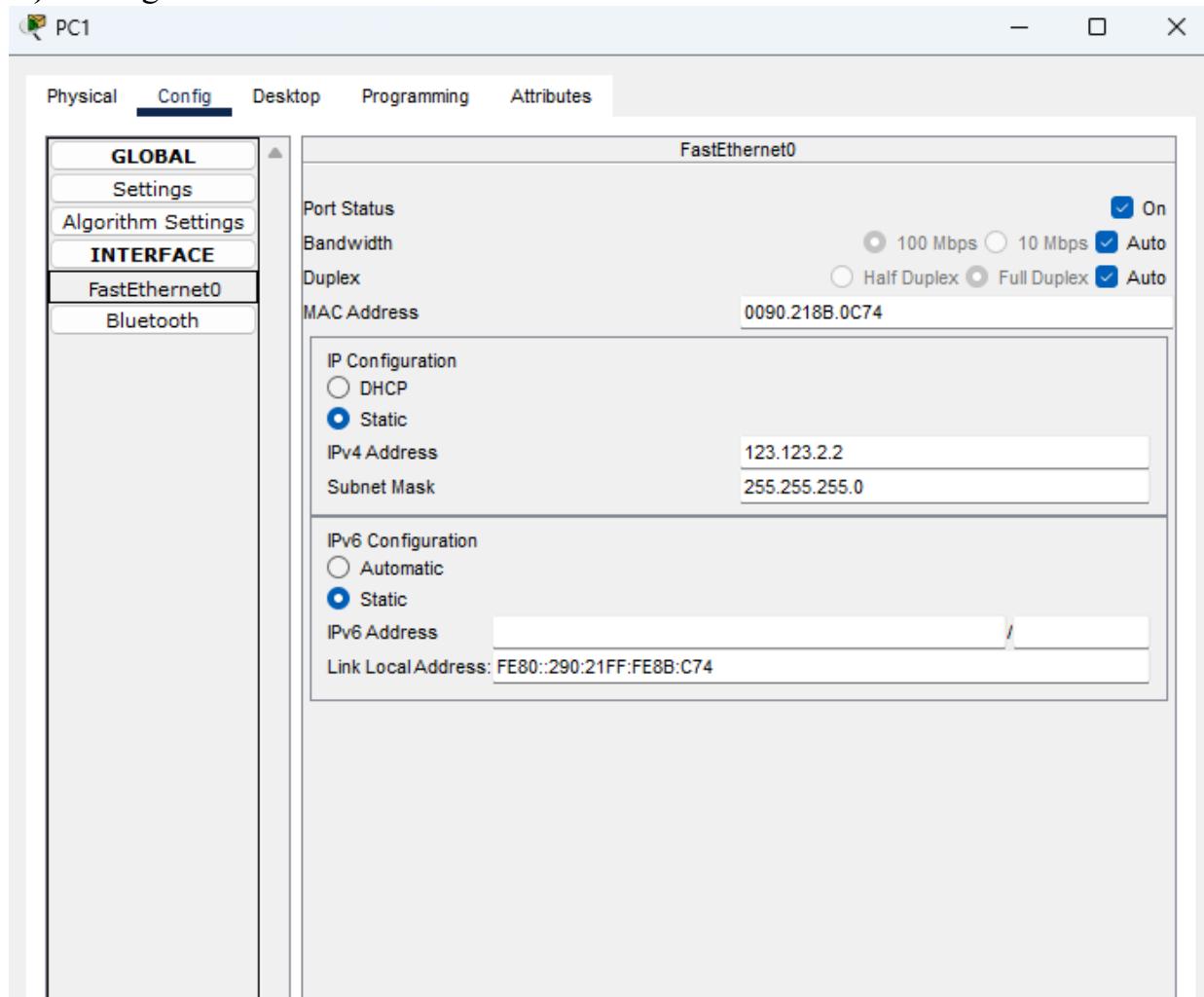
1) Ping Test from customer PC to ISP Server:
   - On customer PC, navigate to the Desktop tab and open the Command Prompt.
   - Enter the command **ping 192.168.2.3** and observe the responses.
2) Ping Test from ISP Workstation PC to Customer Server:
   - On customer PC, navigate to the Desktop tab and open the Command Prompt.
   - Enter the command **ping 192.168.1.3** and observe the responses.

NETWORK TOPOLOGY DIAGRAM

OUTPUT

1) Configure IP Address of the PCs and servers:

2) Configure IP Address of Customer Router

3) Configure IP Address of ISP Router

Physical   Config   CLI   Attributes

FastEthernet0/0

Port Status   ☑ On
Bandwidth   ⦿ 100 Mbps ◯ 10 Mbps ☑ Auto
Duplex   ◯ Half Duplex ⦿ Full Duplex ☑ Auto
MAC Address   0001.C963.A901
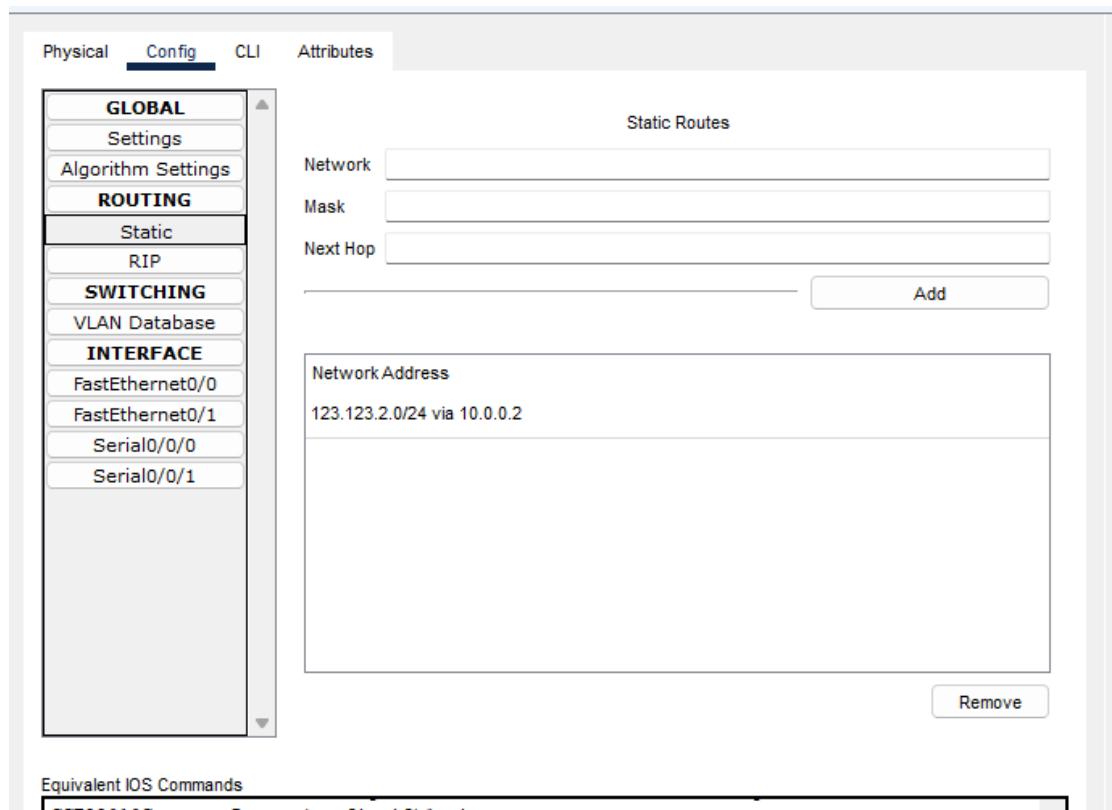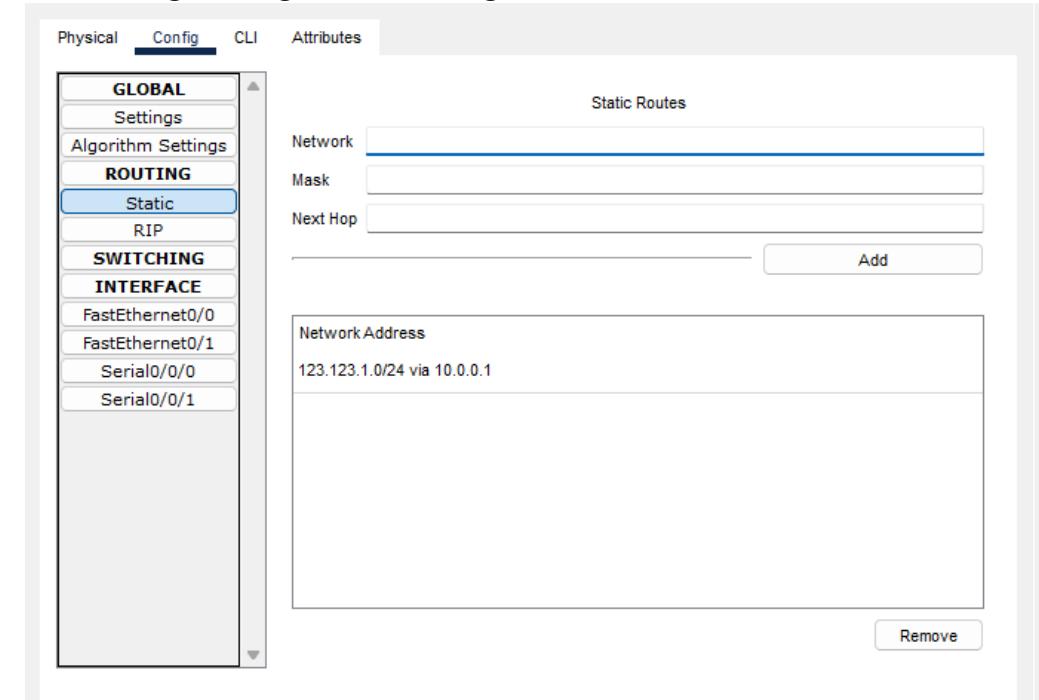
IP Configuration
IPv4 Address   123.123.2.1
Subnet Mask   255.255.255.0

Tx Ring Limit   10
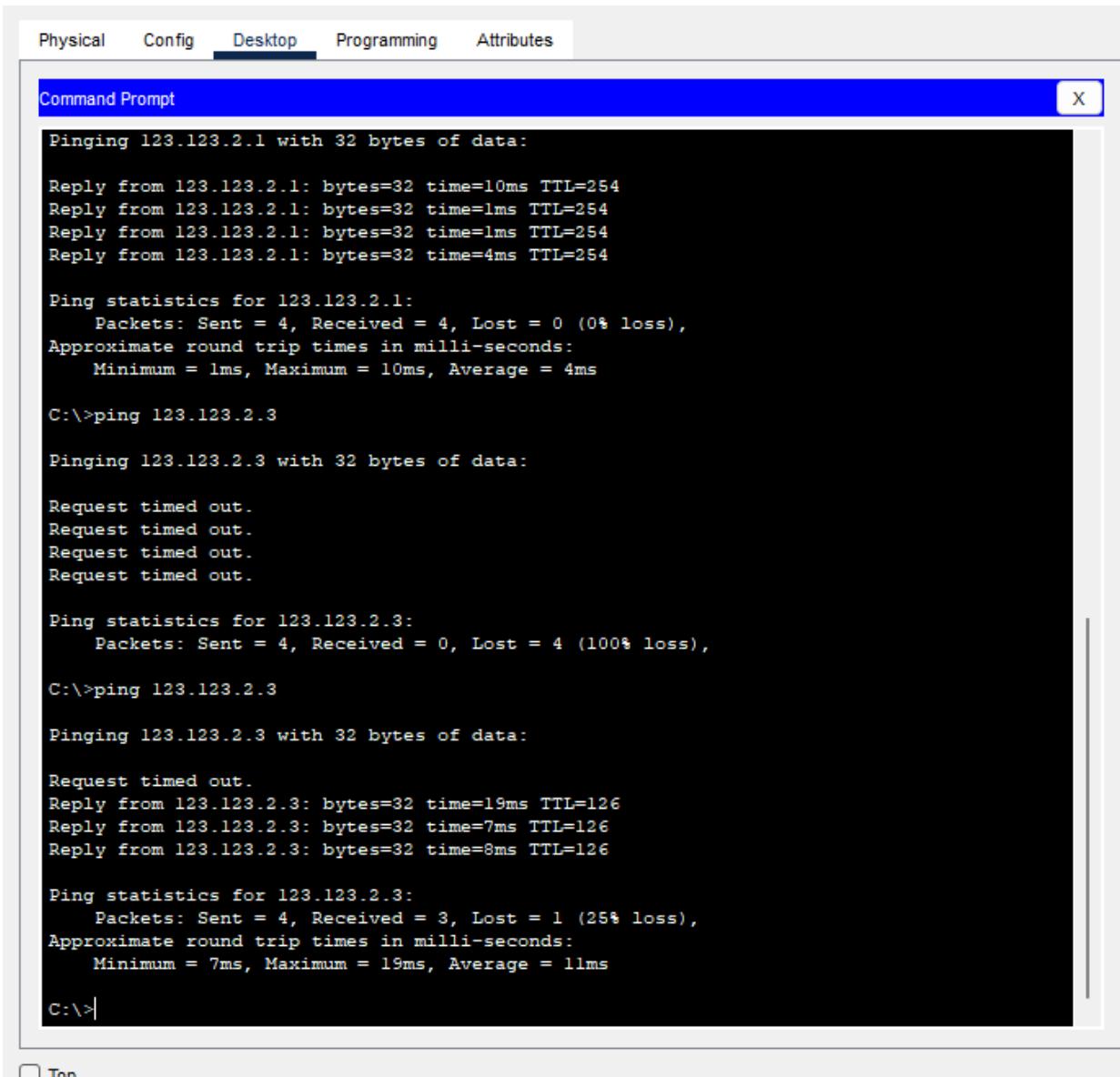
Equivalent IOS Commands

```
  Farhath - Authorised Access Only

User Access Verification

Password:
```

4) Static Routing Configuration through GUI

| Physical | Config | CLI | Attributes |

| **GLOBAL** |
| Settings |
| Algorithm Settings |
| **ROUTING** |
| Static |
| RIP |
| **SWITCHING** |
| **INTERFACE** |
| FastEthernet0/0 |
| FastEthernet0/1 |
| Serial0/0/0 |
| Serial0/0/1 |

Static Routes

Network

Mask

Next Hop

Add

Network Address

123.123.1.0/24 via 10.0.0.1

Remove

| Physical | Config | CLI | Attributes |

| **GLOBAL** |
| Settings |
| Algorithm Settings |
| **ROUTING** |
| Static |
| RIP |
| **SWITCHING** |
| VLAN Database |
| **INTERFACE** |
| FastEthernet0/0 |
| FastEthernet0/1 |
| Serial0/0/0 |
| Serial0/0/1 |

Static Routes

Network

Mask

Next Hop

Add

Network Address

123.123.2.0/24 via 10.0.0.2

Remove

Equivalent IOS Commands

5) Verify the connectivity between the two LAN Networks by sending packets:

Physical   Config   Desktop   Programming   Attributes

Command Prompt   X

```
Pinging 123.123.2.1 with 32 bytes of data:

Reply from 123.123.2.1: bytes=32 time=10ms TTL=254
Reply from 123.123.2.1: bytes=32 time=1ms TTL=254
Reply from 123.123.2.1: bytes=32 time=1ms TTL=254
Reply from 123.123.2.1: bytes=32 time=4ms TTL=254

Ping statistics for 123.123.2.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 10ms, Average = 4ms

C:\>ping 123.123.2.3

Pinging 123.123.2.3 with 32 bytes of data:

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

Ping statistics for 123.123.2.3:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 123.123.2.3

Pinging 123.123.2.3 with 32 bytes of data:

Request timed out.
Reply from 123.123.2.3: bytes=32 time=19ms TTL=126
Reply from 123.123.2.3: bytes=32 time=7ms TTL=126
Reply from 123.123.2.3: bytes=32 time=8ms TTL=126

Ping statistics for 123.123.2.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 7ms, Maximum = 19ms, Average = 11ms

C:\>
```

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6) Customer Router Configuration through Customer PC:

```
Terminal                                                                    X

                                    ^
% Invalid input detected at '^' marker.

CCE22010ISProuter>banner motd $ Farhath-Authorised Access Only$
                              ^
% Invalid input detected at '^' marker.

CCE22010ISProuter>enab;e
Translating "enab;e"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find computer address

CCE22010ISProuter>enable
Password:
Password:
CCE22010ISProuter#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
CCE22010ISProuter(config)#banner motd $ Farhath - Authorised Access Only$
CCE22010ISProuter(config)#no ip domain-lookup
CCE22010ISProuter(config)#end
CCE22010ISProuter#
%SYS-5-CONFIG_I: Configured from console by console
copy run start
Destination filename [startup-config]?
Building configuration...
 [OK]
CCE22010ISProuter#
?Bad filename
%Error parsing filename (Bad file number)
CCE22010ISProuter#
CCE22010ISProuter#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
CCE22010ISProuter(config)#interface FastEthernet0/0
CCE22010ISProuter(config-if)#
```

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7) ISP Router Configuration through ISP Workstation PC:

Physical   Config   Desktop   Programming   Attributes

Terminal   X

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

CCE22010ISProuter>banner motd $ Farhath-Authorised Access Only$
                              ^
% Invalid input detected at '^' marker.

CCE22010ISProuter>enab;e
Translating "enab;e"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find computer address

CCE22010ISProuter>enable
Password:
Password:
CCE22010ISProuter#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
CCE22010ISProuter(config)#banner motd $ Farhath - Authorised Access Only$
CCE22010ISProuter(config)#no ip domain-lookup
CCE22010ISProuter(config)#end
CCE22010ISProuter#
%SYS-5-CONFIG_I: Configured from console by console
copy run start
Destination filename [startup-config]?
Building configuration...
 [OK]
CCE22010ISProuter#
?Bad filename
%Error parsing filename (Bad file number)
CCE22010ISProuter#
CCE22010ISProuter#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
CCE22010ISProuter(config)#interface FastEthernet0/0
CCE22010ISProuter(config-if)#
```

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8) Verify no ip domain-lookup configuration:

After Configuration:

```
CCE22010CustomerRouter#show running-config | include enable secret
enable secret 5 $1$mERr$5.a6P4JqbNiMX0lusIfka/
CCE22010CustomerRouter#show running-config | include banner
banner motd ^C Farhath - Authorised Access Only^C
CCE22010CustomerRouter#show running-config | include service password-encryption
service password-encryption
CCE22010CustomerRouter#show running-config | include no ip domain-lookup
no ip domain-lookup
CCE22010CustomerRouter#
```

9) Verify that the router is protected from unauthorized access and Verify the MOTD banner provides a message that is displayed to users when they attempt to access the switch:

```
CCE22010CustomerRouter#show running-config | section line con
line con 0
 password 7 0822455D0A16544541
 login
CCE22010CustomerRouter#show running-config | include enable secret
enable secret 5 $1$mERr$5.a6P4JqbNiMX0lusIfka/
CCE22010CustomerRouter#show running-config | include banner
banner motd ^C Farhath - Authorised Access Only^C
CCE22010CustomerRouter#show running-config | include service password-encryption
service password-encryption
CCE22010CustomerRouter#show running-config | include no ip domain-lookup
no ip domain-lookup
CCE22010CustomerRouter#
```

RESULT

1. Basic Router Configuration:

- Hostnames were set for each router for easy identification.

- Passwords were configured to secure console, VTY, and privileged EXEC access.

- MOTD banners were successfully applied to display warning messages on login.

- Password encryption was enabled to protect sensitive password information.

- IP domain lookup was disabled to prevent delays caused by incorrect commands.

2. Static Routing Setup:

- Static routes were manually configured on both routers, pointing to the opposite network.

- The routers correctly forwarded packets between their respective connected networks.

- Routing tables on both routers reflected the static routes configured.

3. Network Communication:

- PCs connected to different networks were able to successfully ping each other.

- Packet tracer simulation confirmed that data was correctly routed via the static routes.

- No packet loss occurred, indicating successful configuration and communication.

4. Verification:

- show ip routeconfirmed static routes were present on both routers.

- `Show running-config` verified that all basic configurations and passwords were properly applied.

Ping tests between hosts in different networks verified end-to-end connectivity.

INFERENCE

From this experiment, it can be inferred that static routing is an effective and straightforward method to enable communication between two distinct networks through routers. By manually defining routes, routers can successfully forward data packets to the correct destination network without relying on dynamic routing protocols.