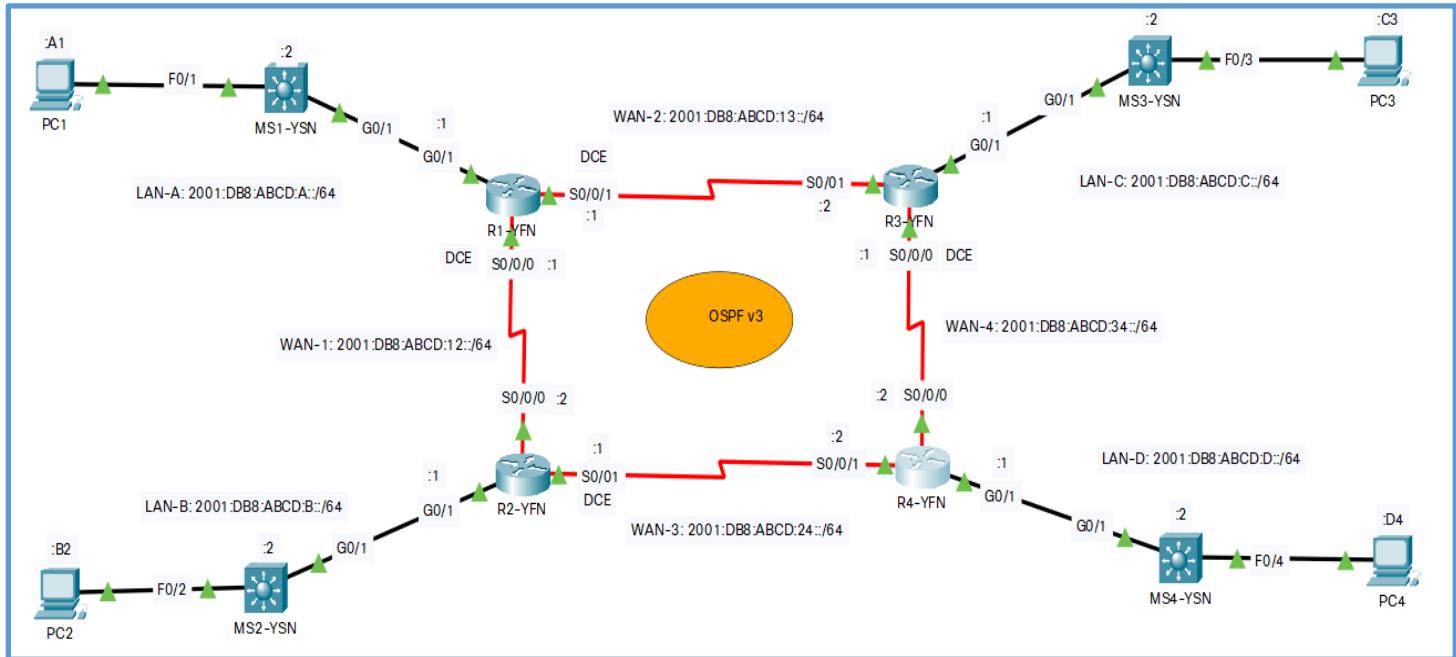


Lab Activity – OSPFv3 Routing (Dynamic):

- a. There are four LANs and four WANs in the topology below. Please simulate the following topology in any simulator, preferably Packet Tracer.

YFN → Your First Name

YSN → Your Last/Family Name



Required Resources:

- Four Multilayer Switches (Cisco 3560 with Cisco IOS Release 15+ image)
- Four Routers (Cisco 1941 with Cisco IOS Release 15+ image)
- Four PCs (Windows with Terminal Emulation Program)
- Cables:
 - Console cables to configure the Cisco IOS devices through the console port.
 - Ethernet cables as shown in the topology.

Addressing Table:

Device	Interface	IP Address	Default Gateway
MS1-YSN	VLAN1	2001:DB8:ABCD:A::2/64 FE80::1 (Link Local)	2001:DB8:ABCD:A::1/64
MS2-YSN	VLAN1	2001:DB8:ABCD:B::2/64 FE80::2 (Link Local)	2001:DB8:ABCD:B::1/64
MS3-YSN	VLAN1	2001:DB8:ABCD:C::2/64 FE80::3 (Link Local)	2001:DB8:ABCD:C::1/64
MS4-YSN	VLAN1	2001:DB8:ABCD:D::2/64 FE80::4 (Link Local)	2001:DB8:ABCD:D::1/64
R1-YFN	G0/1	2001:DB8:ABCD:A::1/64 FE80::1 (Link Local)	N/A
	S0/0/0	2001:DB8:ABCD:12::1/64 FE80::1 (Link Local)	N/A
	S0/0/1	2001:DB8:ABCD:13::1/64 FE80::1 (Link Local)	N/A
R2-YFN	G0/1	2001:DB8:ABCD:B::1/64 FE80::2 (Link Local)	N/A
	S0/0/0	2001:DB8:ABCD:12::2/64 FE80::2 (Link Local)	N/A
	S0/0/1	2001:DB8:ABCD:24::1/64 FE80::2 (Link Local)	N/A
R3-YFN	G0/1	2001:DB8:ABCD:C::1/64 FE80::3 (Link Local)	N/A
	S0/0/0	2001:DB8:ABCD:34::1/64 FE80::3 (Link Local)	N/A
	S0/0/1	2001:DB8:ABCD:13::2/64 FE80::3 (Link Local)	N/A
R4-YFN	G0/1	2001:DB8:ABCD:D::1/64 FE80::4 (Link Local)	N/A
	S0/0/0	2001:DB8:ABCD:34::2/64 FE80::4 (Link Local)	N/A
	S0/0/1	2001:DB8:ABCD:24::2/64 FE80::4 (Link Local)	N/A
PC1	NIC	2001:DB8:ABCD:A::A1/64	FE80::1
PC2	NIC	2001:DB8:ABCD:B::B2/64	FE80::2
PC3	NIC	2001:DB8:ABCD:C::C3/64	FE80::3
PC4	NIC	2001:DB8:ABCD:D::D4/64	FE80::4

Lab Description:

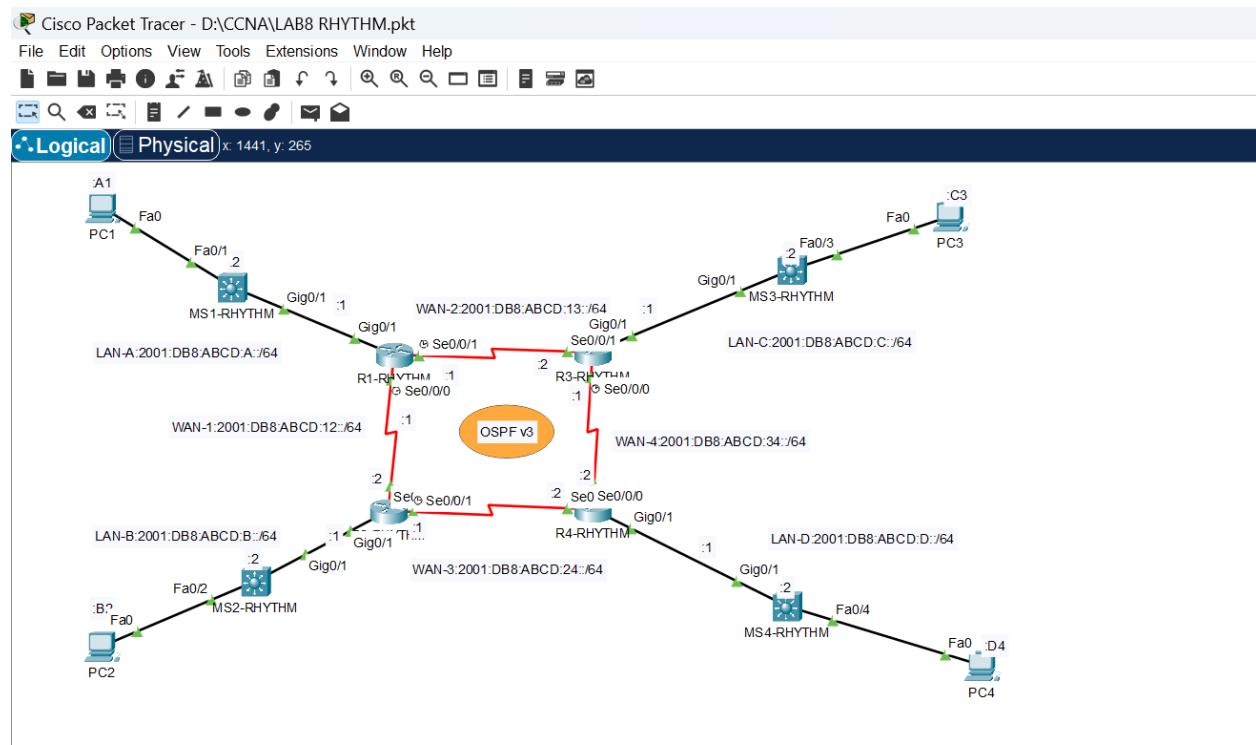
- b. In this lab, please build a LAN and WAN based simple network.

- LAN-A with one switch and one host.
 - LAN-B with one switch and one host.
 - LAN-C with one switch and one host.
 - LAN-D with one switch and one host.
 - Four WANs (WAN-1, WAN-2, WAN-3, and WAN-4) with four routers.
- c. You are also required to do the basic configuration on the following devices:
- Switches: Hostnames, SVI, default gateway, DNS lookup (disable), and so on.
 - Routers: Hostnames, IP addressing, DNS lookup (disable), and so on.

SOLUTION:

Step 1: Set up the network topology.

- Simulate the topology by using all the devices mentioned above and then cable them all together:
 - Turn on the devices.
 - Connect the switch with the default gateway.
 - Connect the PCs and server with their respective switch.
 - Make sure all the lights between switches, PCs, laptops and server are green.



Step 2: Configure and verify basic switch settings on all switches.

MS1-SHARMA

Cisco Packet Tracer - D:\CCNA\LAB8 RHYTHM.pkt

MS1-RHYTHM

Physical Config CLI Attributes

IOS Command Line Interface

```

Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname S1-SHARMA
S1-SHARMA(config)#no ip domain-lookup
S1-SHARMA(config)#sdm prefer dual-ipv4-and-ipv6 default
Changes to the running SDM preferences have been stored, but cannot take effect until the next reload.
Switch#show sdm prefer to see what SDM preference is currently active.
S1-SHARMA(config)#exit
S1-SHARMA#copy running-config startup-config
Destination filename [startup-config]? reload
Error: for copying nvram:reload (invalid argument)
S1-SHARMA#
%SYS-5-CONFIG_I: Configured from console by console
reload
System configuration has been modified. Save? [yes/no]:y
Building configuration...
[OK]
Proceed with reload? [confirm]y
C3560 Boot Loader (C3560-HBOOT-M) Version 12.2(25r)SEC, RELEASE SOFTWARE (fc4)
cisco WS-C3560-24PS (PowerPC405) processor (revision P0) with 122880K/8184K bytes of memory.
3560-24PS starting...
Base ethernet MAC Address: 0060.5C90.27C9
Xmodem file system is available.
Initializing Flash...
flashfs[0]: 0 files, 0 directories
flashfs[0]: 0 orphaned files, 0 orphaned directories
flashfs[0]: Total bytes: 64016384
flashfs[0]: Bytes used: 6918011
flashfs[0]: Bytes available: 55098373
flashfs[0]: flashfs fsck took 1 seconds.
...done Initializing Flash.

Boot Sector Filesystem (bs:) installed, fsid: 3
Parameter Block Filesystem (pb:) installed, fsid: 4

Loading "flash:/c3560-advisorservicesk9-mz.122-37.SE1.bin"...
#####

```

Copy Paste

Cisco Packet Tracer - D:\CCNA\LAB8 RHYTHM.pkt

MS1-RHYTHM

Physical Config CLI Attributes

IOS Command Line Interface

```

S1-SHARMA(config)#
Enter configuration commands, one per line. End with CNTL/Z.
S1-SHARMA(config)#banner motd "Warning! Authorized User only"
S1-SHARMA(config)#enable secret cisco
S1-SHARMA(config)#line console 0
S1-SHARMA(config-line)#password trios
S1-SHARMA(config-line)#login
S1-SHARMA(config-line)#exit
S1-SHARMA(config)#line vty 0 15
S1-SHARMA(config-line)#password trios
S1-SHARMA(config-line)#login local
S1-SHARMA(config-line)#exit
S1-SHARMA(config)#ip domain-name trios.com
S1-SHARMA(config)#username Admin privilege 15 password cisco123
S1-SHARMA(config)#crypto key generate rsa
The name for the keys will be: S1-SHARMA.trios.com
Choose the size of the key modulus in the range of 360 to 2048 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.

How many bits in the modulus [512]: 1024
* Generating 1024 bit RSA keys, keys will be non-exportable...[OK]

S1-SHARMA(config)#ip ssh version 2
*Mar 1 0:0:45.912: %SSH-5-ENABLED: SSH 1.99 has been enabled
S1-SHARMA(config)#line vty 0 15
S1-SHARMA(config-line)#transport input ssh
S1-SHARMA(config-line)#exit
S1-SHARMA(config)#service password-encryption
S1-SHARMA(config)#interface vlan 1
S1-SHARMA(config-if)#ipv6 address 2001:DB8:ABCD:A::2/64
S1-SHARMA(config-if)#ipv6 address fe80::1 link-local
S1-SHARMA(config-if)#no shut

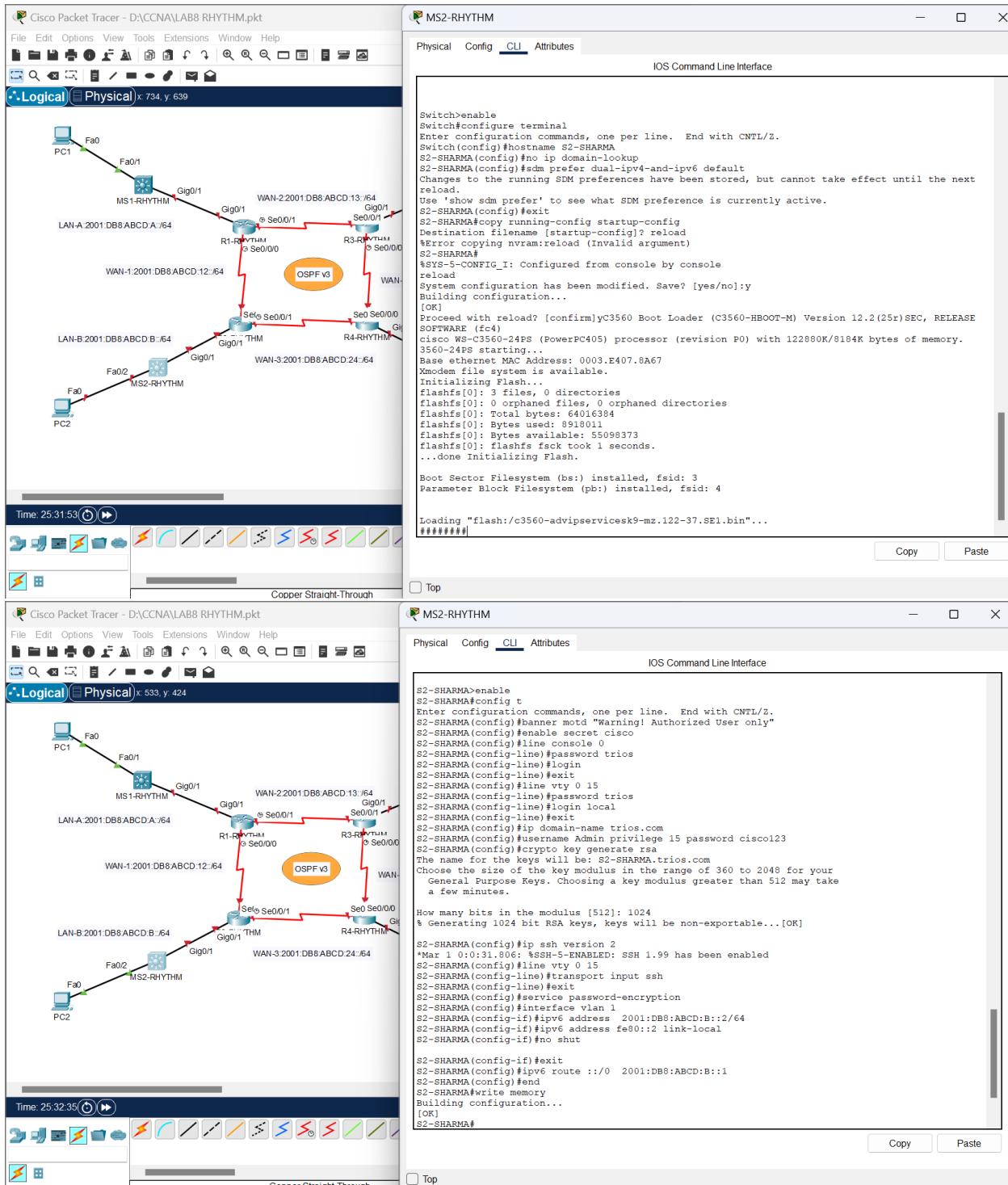
S1-SHARMA(config-if)#exit
S1-SHARMA(config)#Configure default gateway according to the addressing table.
^
* Invalid input detected at '^' marker.

S1-SHARMA(config)#ipv6 route ::/0 2001:DB8:ABCD:A::1
S1-SHARMA(config)#end
S1-SHARMA#write memory
Building configuration...

```

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MS2-SHARMA



MS3-SHARMA

Cisco Packet Tracer - D:\CCNA\LAB8 RHYTHM.pkt

File Edit Options View Tools Extensions Window Help

Logical Physical x: 489, y: 344

Time: 25:38:45

Conner Straight-Through

MS3-RHYTHM

Physical Config CLI Attributes

IOS Command Line Interface

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to up
% Please answer 'yes' or 'no'.
Would you like to enter the initial configuration dialog? [yes/no]: no

Press RETURN to get started!

Switch#enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname S3-SHARMA
S3-SHARMA(config)#no ip domain-lookup
S3-SHARMA(config)#sdm prefer dual-ipv4-and-ipv6 default
S3-SHARMA(config)#exit
S3-SHARMA(config)#copy running-config startup-config
Destination filename [startup-config]??
Building configuration...
[OK]
S3-SHARMA#reload
Proceed with reload? [confirm]y
C3560 Boot Loader (C3560-HBOOT-M) Version 12.2(25r)SEC, RELEASE SOFTWARE (fc4)
cisco WS-C3560-24PS (PowerPC405) processor (revision P0) with 122880K/8194K bytes of memory.
3560-24PS starting...
Base ethernet MAC Address: 00C.CF70.37AA
Xmodem file system is available.
Initializing Flash...
flashfs[0]: 3 files, 0 directories
flashfs[0]: 0 orphaned files, 0 orphaned directories
flashfs[0]: Total bytes: 64016384
flashfs[0]: Bytes used: 8918011
flashfs[0]: Bytes available: 55098373
flashfs[0]: flashfs fack took 1 seconds.
...done Initializing Flash.

Boot Sector Filesystem (bs): installed, fsid: 3
Parameter Block Filesystem (pb): installed, fsid: 4

Loading "flash:/c3560-adviservicesk9-mz.122-37.SE1.bin"...
#####

```

Copy Paste

MS3-RHYTHM

Physical Config CLI Attributes

IOS Command Line Interface

```
S3-SHARMA>enable
S3-SHARMA>config t
Enter configuration commands, one per line. End with CNTL/Z.
S3-SHARMA(config)#banner motd "Warning! Authorized User only"
S3-SHARMA(config)#enable secret cisco
S3-SHARMA(config)#line console 0
S3-SHARMA(config-line)#password trios
S3-SHARMA(config-line)#login
S3-SHARMA(config-line)#exit
S3-SHARMA(config)#line vty 0 15
S3-SHARMA(config-line)#password trios
S3-SHARMA(config-line)#login local
S3-SHARMA(config-line)#exit
S3-SHARMA(config)#ip domain-name trios.com
S3-SHARMA(config)#username Admin privilege 15 password cisco123
S3-SHARMA(config)#crypto key generate rsa
% You already have RSA keys defined named S3-SHARMA.trios.com .
% Do you really want to replace them? [yes/no]: yes
The name for the keys will be: S3-SHARMA.trios.com
Choose the size of the key modulus in the range of 360 to 2048 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.

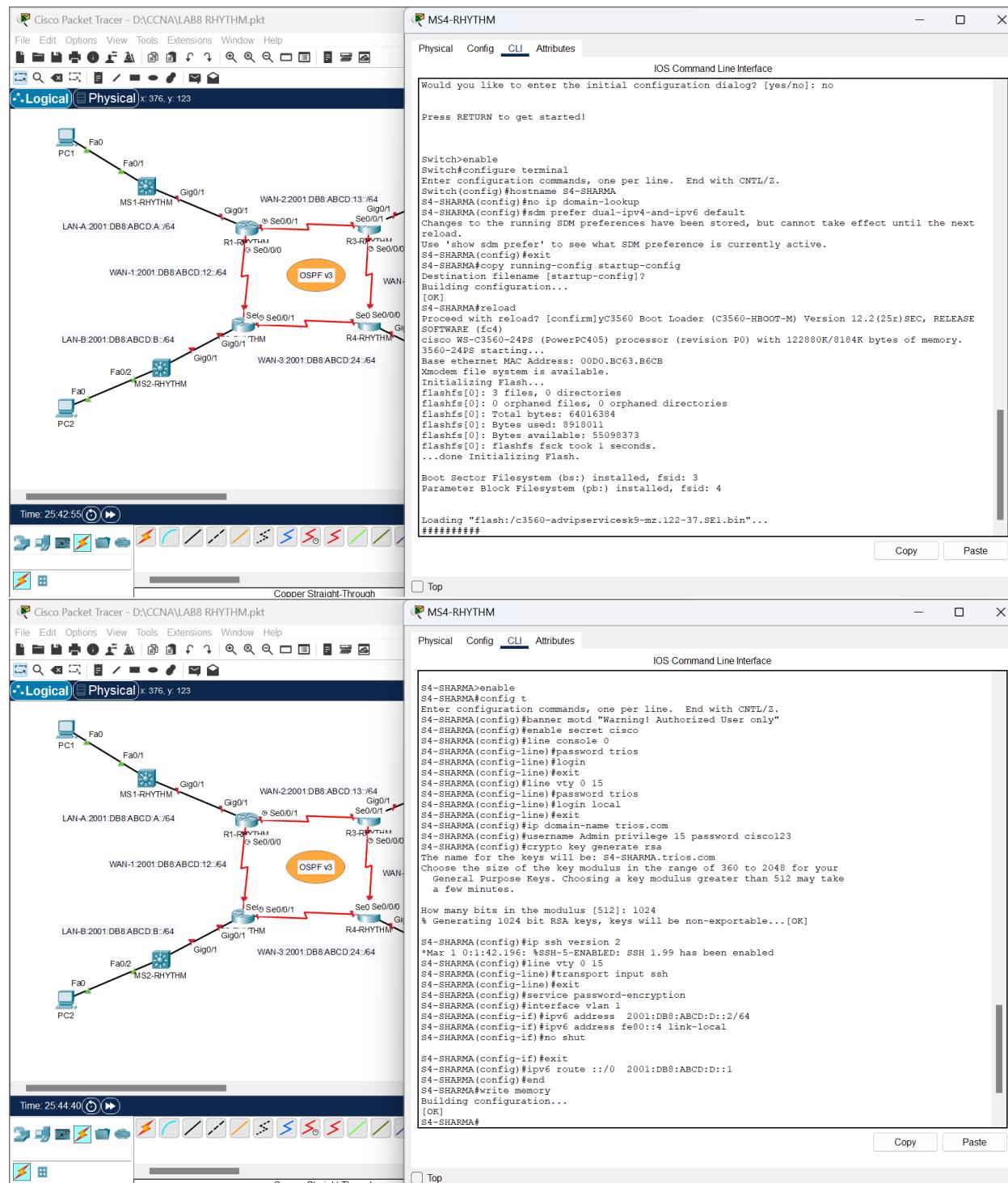
How many bits in the modulus [512]: 1024
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]

S3-SHARMA(config)#ip ssh version 2
*Mar 10 0:29.678: %SSH-5-ENABLED: SSH 1.99 has been enabled
S3-SHARMA(config)#line vty 0 15
S3-SHARMA(config-line)#transport input ssh
S3-SHARMA(config-line)#exit
S3-SHARMA(config)#service password-encryption
S3-SHARMA(config-if)#interface vlan 1
S3-SHARMA(config-if)#ip v6 address 2001:DB8:ABCD:C::2/64
S3-SHARMA(config-if)#ip v6 address fe80::3 link-local
S3-SHARMA(config-if)#no shut

S3-SHARMA(config-if)#exit
S3-SHARMA(config)#ip v6 route ::/0 2001:DB8:ABCD:C::1
S3-SHARMA(config)#end
S3-SHARMA#write memory
Building configuration...
[OK]
```

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MS4-SHARMA

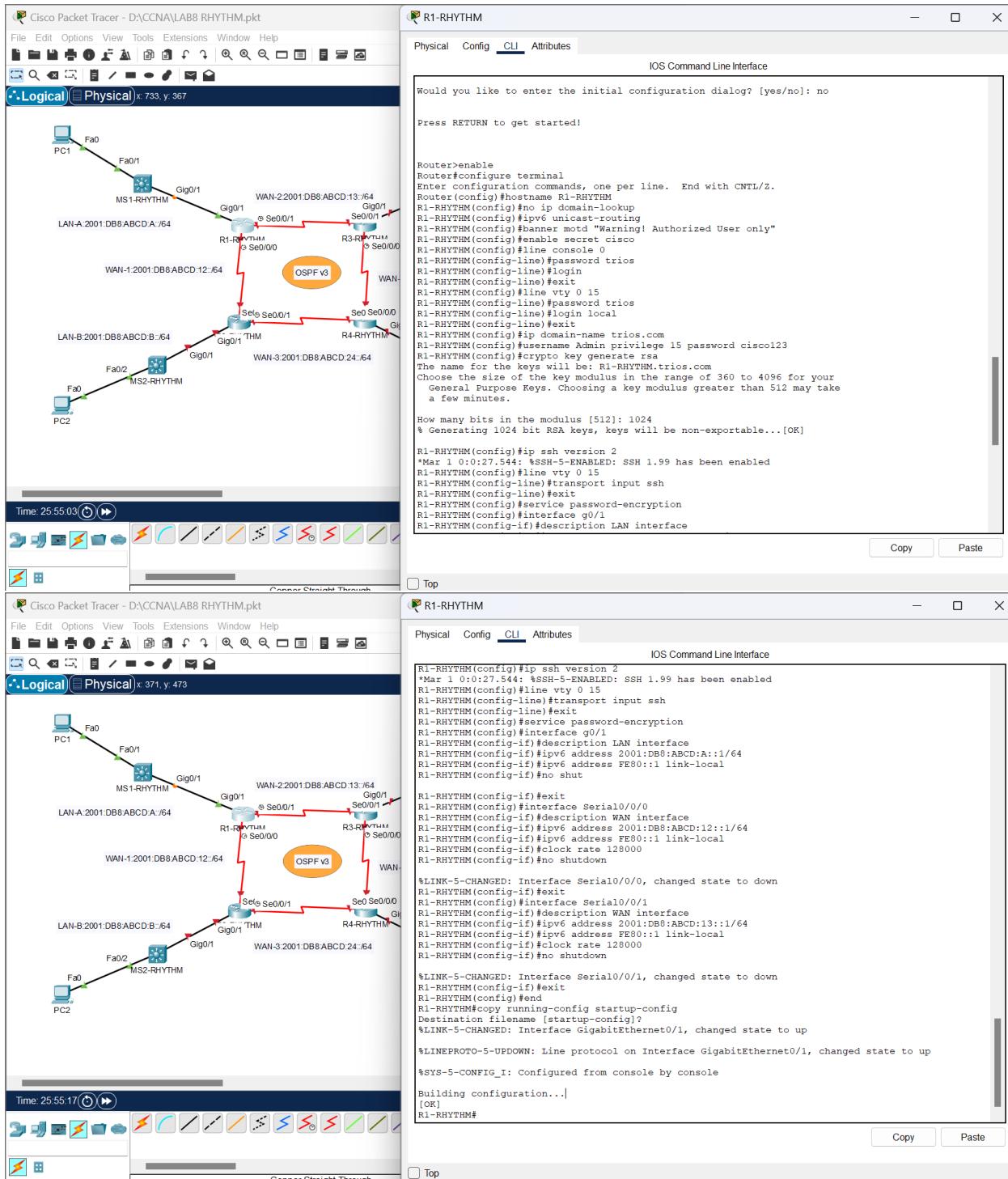


- Console into the switch and enter the global configuration mode:
 - Assign the switch with a host name according to the addressing table.
 - Disable unwanted DNS lookup.
 - Enable IPv6 configuration on switch: Perform the following commands on global configuration mode.

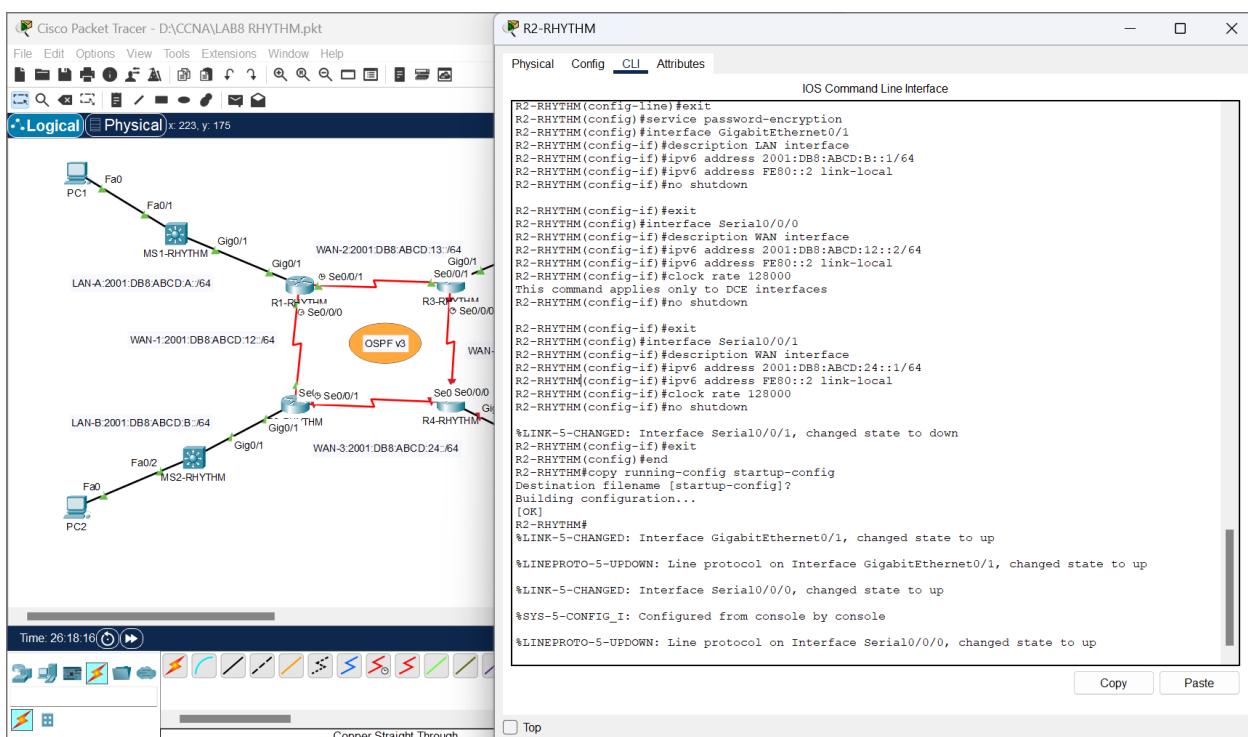
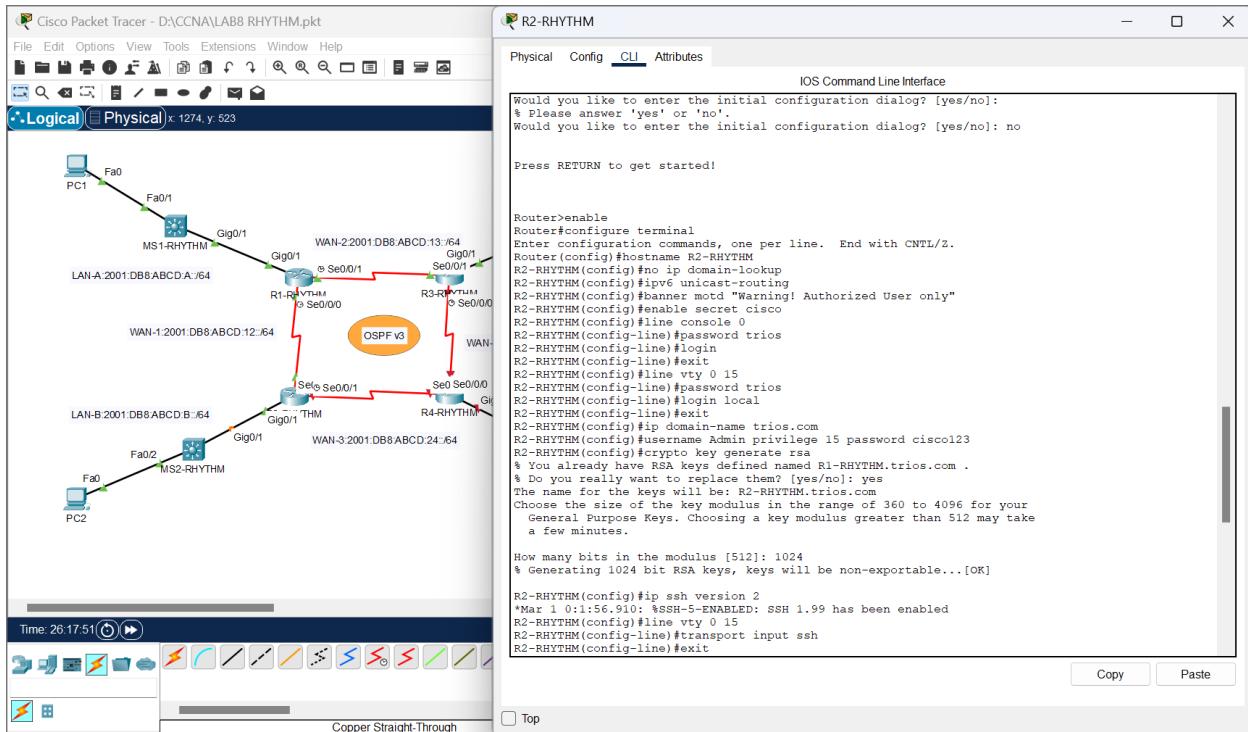
- *sdm prefer dual-ipv4-and-ipv6 default*
- *exit*
- *copy running-config startup-config*
- *reload*
- Configure a login MOTD banner to warn about illegal access.
- Assign the encrypted password cisco to privilege exec mode (#)
- Protect the physical and virtual lines from having console access using the password trios and configure **logging synchronous** for the console line.
- Configure the domain name as trios.com (both the hostname and domain name are required for the encryption keys to be generated)
- Configure username, to access SSH client access, as Admin and password as cisco123
- Generate the encryption keys (1024) for securing the session.
- Enable SSH version 2.
- Allow switch to be accessed remotely using only SSH.
- Encrypt all current and future passwords by enabling the required service.
- Configure and activate SVI according to the addressing table.
 - *interface vlan 1*
 - *ipv6 address 2001:DB8:ABCD:A::2/64*
 - *ipv6 address fe80::1 link-local*
 - *no shut*
 - *exit*
- Configure default gateway according to the addressing table.
 - *ipv6 route ::/0 2001:DB8:ABCD:A::1*
 - *exit*
- Save the configuration.

Step 3: Configure and verify basic router settings on all routers.

R1-RHYTHM



R2-RHYTHM



R3-RHYTHM

Top Window:

Cisco Packet Tracer - D:\CCNA\LAB8 RHYTHM.pkt

Physical Config CLI Attributes

IOS Command Line Interface

```

Would you like to enter the initial configuration dialog? [yes/no]:
% Please answer 'yes' or 'no'.
Would you like to enter the initial configuration dialog? [yes/no]: no

Press RETURN to get started!

Router>enable
Router>configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R3-RHYTHM
R3-RHYTHM(config)#no ip domain-lookup
R3-RHYTHM(config)#ip v6 unicast-routing
R3-RHYTHM(config)#banner motd "Warning! Authorized User only"
R3-RHYTHM(config)#enable secret cisco
R3-RHYTHM(config)#line console 0
R3-RHYTHM(config-line)#password trios
R3-RHYTHM(config-line)#login
R3-RHYTHM(config-line)#exit
R3-RHYTHM(config)#line vty 0 15
R3-RHYTHM(config-line)#password trios
R3-RHYTHM(config-line)#login local
R3-RHYTHM(config-line)#exit
R3-RHYTHM(config)#ip domain-name trios.com
R3-RHYTHM(config)#username Admin privilege 15 password cisco123
R3-RHYTHM(config)#crypto key generate rsa
% You already have RSA keys defined named R1-RHYTHM.trios.com
% Do you really want to replace them? [yes/no]: yes
The name for the keys will be: R3-RHYTHM.trios.com
Choose the size of the key modulus in the range of 360 to 4096 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.

How many bits in the modulus [512]: 1024
% Generating 1024 bit RSA keys, keys will be non-exportable...[OK]

R3-RHYTHM(config)#ip ssh version 2
*Mar 1 0:42:7.513: %SSH-5-ENABLED: SSH 1.99 has been enabled
R3-RHYTHM(config)#line vty 0 15
R3-RHYTHM(config-line)#transport input ssh
R3-RHYTHM(config-line)#exit

```

Copy Paste

Time: 26:16:37

Bottom Window:

Cisco Packet Tracer - D:\CCNA\LAB8 RHYTHM.pkt

Physical Config CLI Attributes

IOS Command Line Interface

```

R3-RHYTHM(config-line)#exit
R3-RHYTHM(config)#service password-encryption
R3-RHYTHM(config)#interface GigabitEthernet0/1
R3-RHYTHM(config-if)#description LAN interface
R3-RHYTHM(config-if)#ipv6 address 2001:DB8:ABCD:C::1/64
R3-RHYTHM(config-if)#ipv6 address FE80::3 link-local
R3-RHYTHM(config-if)#no shutdown

R3-RHYTHM(config-if)#exit
R3-RHYTHM(config)#interface Serial0/0/0
R3-RHYTHM(config-if)#description WAN interface
R3-RHYTHM(config-if)#ipv6 address 2001:DB8:ABCD:13::1/64
R3-RHYTHM(config-if)#ipv6 address FE80::3 link-local
R3-RHYTHM(config-if)#clock rate 128000
R3-RHYTHM(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
R3-RHYTHM(config-if)#exit
R3-RHYTHM(config)#interface Serial0/0/1
R3-RHYTHM(config-if)#description WAN interface
R3-RHYTHM(config-if)#ipv6 address 2001:DB8:ABCD:13::2/64
R3-RHYTHM(config-if)#ipv6 address FE80::3 link-local
R3-RHYTHM(config-if)#clock rate 128000
This command applies only to DCE interfaces
R3-RHYTHM(config-if)#no shutdown

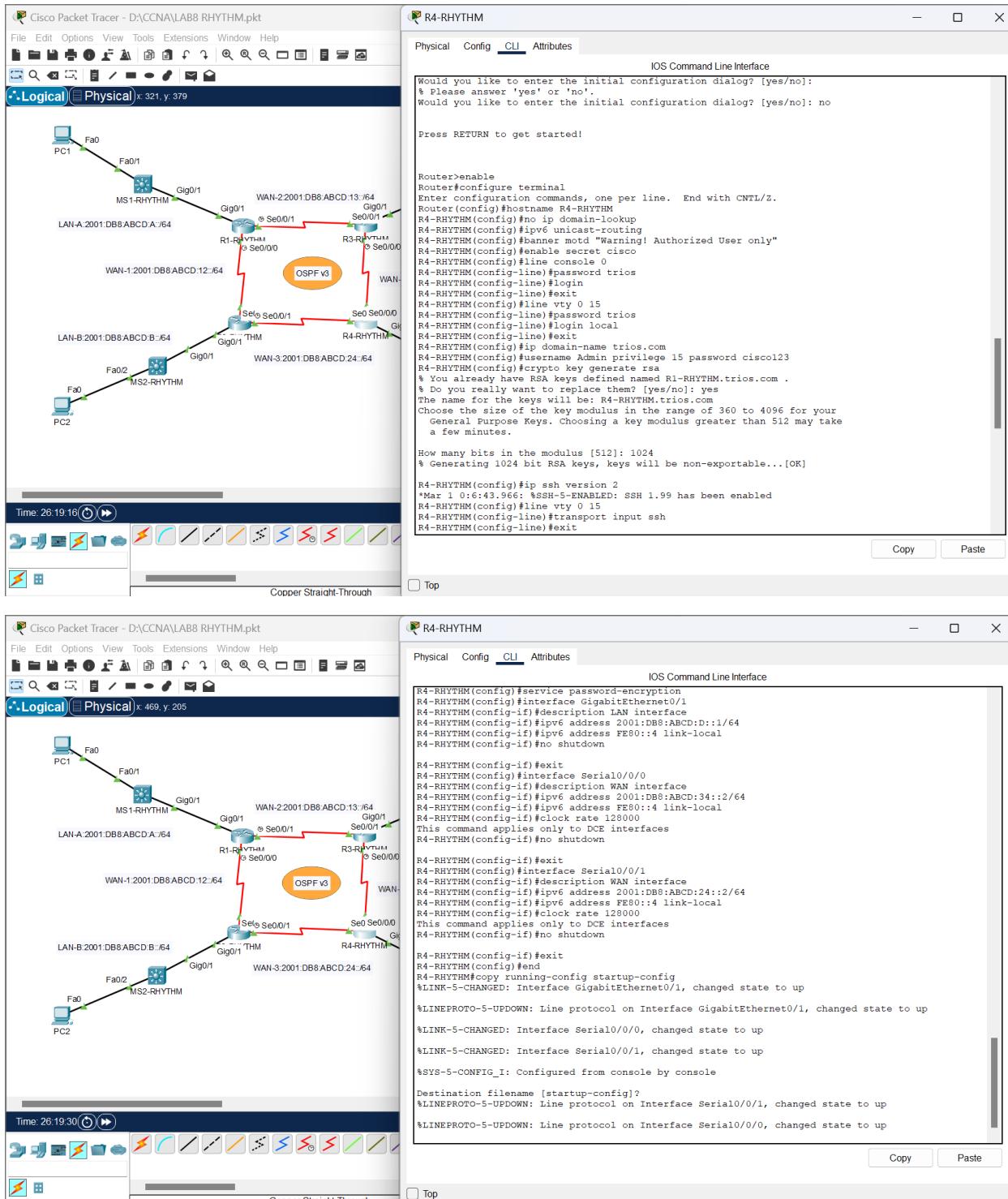
R3-RHYTHM(config-if)#exit
R3-RHYTHM(config)#end
R3-RHYTHM#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3-RHYTHM#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up
%SYS-5-CONFIG_I: Configured from console by console
R3-RHYTHM#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/1, changed state to up

```

Copy Paste

Time: 26:17:00

R4-RHYTHM



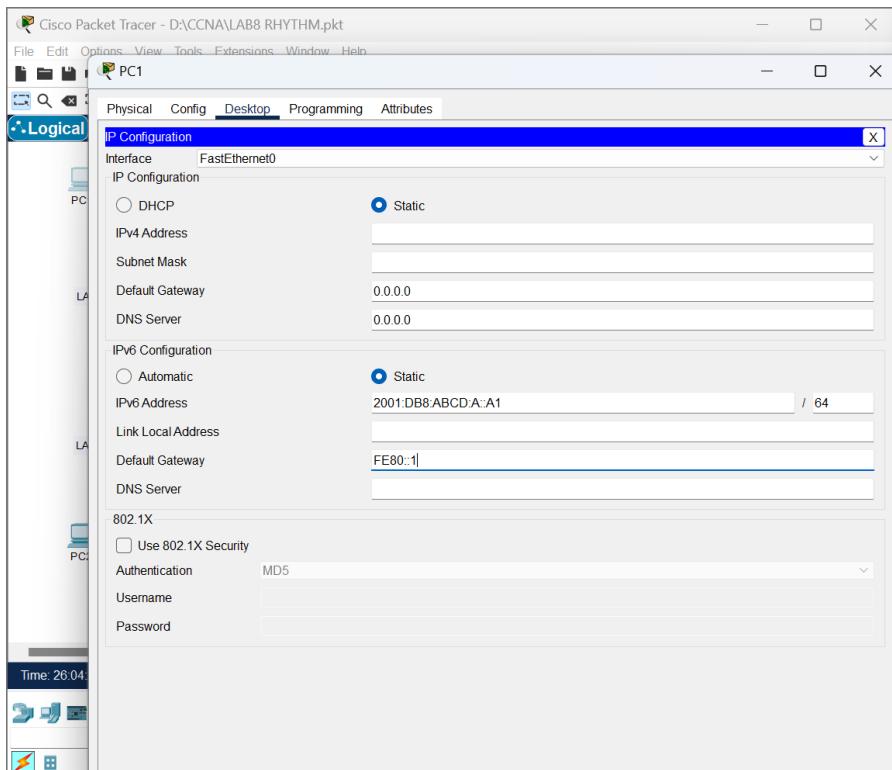
- Console into the router and enter the global configuration mode:
 - Assign the routers with host names according to the addressing table.
 - Disable unwanted DNS lookup.
 - Enable IPv6 configuration (***ipv6 unicast-routing***).
 - Configure a login MOTD banner to warn about illegal access.
 - Assign the encrypted password cisco to privilege exec mode (#)
 - Protect the physical and virtual lines from having console access using the password trios and configure ***logging synchronous*** for the console line.
 - Configure domain name as trios.com (both the hostname and domain name are required for the encryption keys to be generated)
 - Configure username, to access SSH client access, as Admin and password as cisco123
 - Generate the encryption keys (1024 bits) for securing the session.
 - Enable SSH version 2.
 - Allow router to be accessed remotely using only SSH.
 - Encrypt all current and future passwords by enabling the required service.
 - Configure and activate all the interfaces according to the addressing table.
 - *interface g0/1*
 - *ipv6 address 2001:DB8:ABCD:A::1/64*
 - *ipv6 address FE80::1 link-local*
 - *no shut*
 - *exit*

Note: (continue to similarly configure the other interfaces)

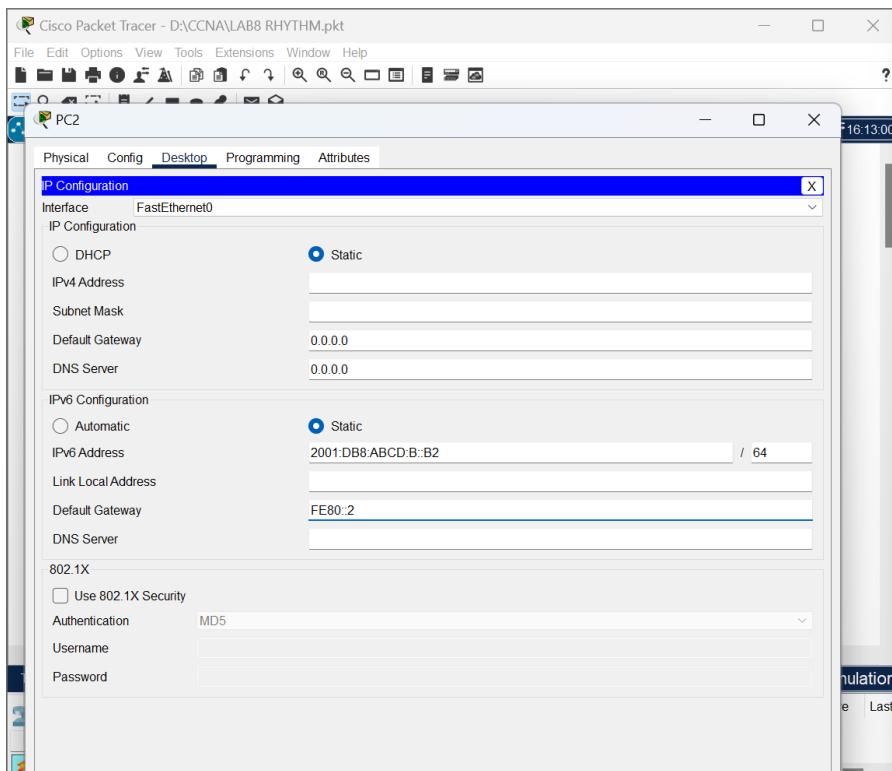
- Set the clock rate for serial (DCE) interface at 128000.
- Provide appropriate description on all the active interfaces.
- Save the configuration.

Step 4: Configure all host devices.

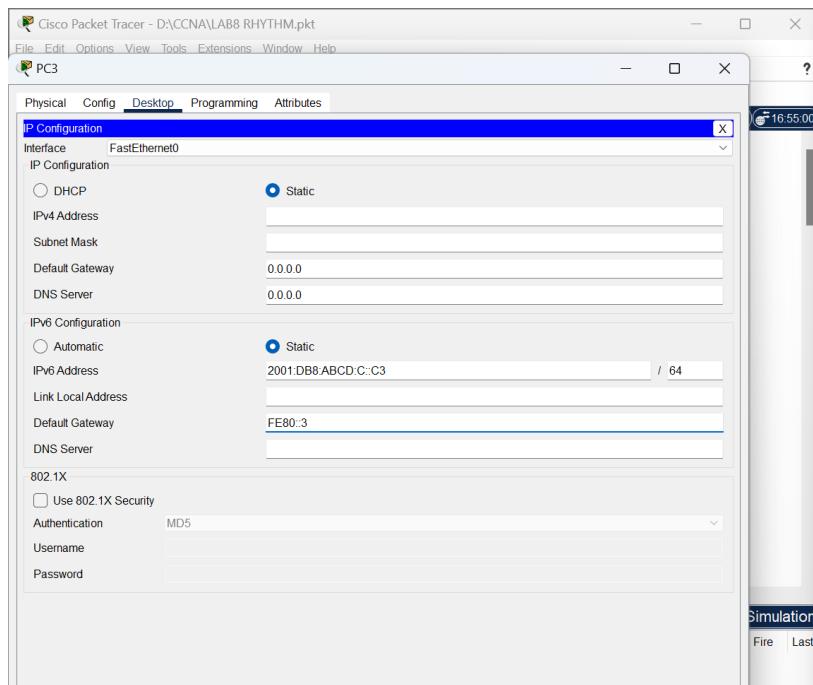
PC1



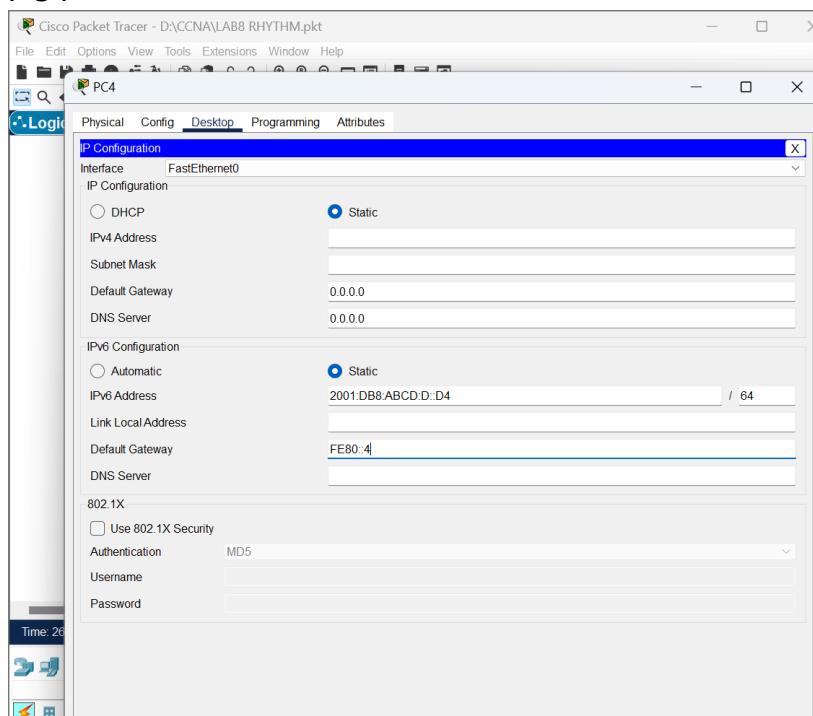
PC2



PC3



PC4



- a. Click to explore PC1.
- b. Select IP configuration under Desktop tab.
- c. Enter the IPv6 address, subnet mask, and default gateway from the addressing table above.
- d. Repeat the above steps from a to c for all host devices.

Step 5: Verify connections.

- Every router should be able to ping its directly connected neighbour router.

The image shows four Cisco Packet Tracer windows for routers R1-RHYTHM, R2-RHYTHM, R3-RHYTHM, and R4-RHYTHM. Each window displays the output of a 'ping' command to its directly connected neighbor. The logs show successful pings with 100% success rates and round-trip times ranging from 2 ms to 16 ms.

```

R1-RHYTHM
User Access Verification
Password:
R1-RHYTHM>ping 2001:DB8:ABCD:12::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ABCD:12::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/16/30 ms
R1-RHYTHM>ping 2001:DB8:ABCD:13::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ABCD:13::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 15/22/36 ms
R1-RHYTHM#
R2-RHYTHM
Password:
R2-RHYTHM>ping 2001:DB8:ABCD:12::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ABCD:12::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 14/26/36 ms
R2-RHYTHM>ping 2001:DB8:ABCD:24::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ABCD:24::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 19/25/35 ms
R2-RHYTHM#
R3-RHYTHM
User Access Verification
Password:
R3-RHYTHM>ping 2001:DB8:ABCD:34::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ABCD:34::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 10/18/26 ms
R3-RHYTHM>ping 2001:DB8:ABCD:13::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ABCD:13::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/25/41 ms
R3-RHYTHM#
R4-RHYTHM
User Access Verification
Password:
R4-RHYTHM>ping 2001:DB8:ABCD:34::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ABCD:34::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/21/36 ms
R4-RHYTHM>ping 2001:DB8:ABCD:24::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ABCD:24::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 11/24/48 ms
R4-RHYTHM#

```

- Every host device should be able to ping its switch SVI and default gateway.

PC1

The image shows a Cisco Packet Tracer network diagram and a Command Prompt window. The network includes two hosts (PC1 and PC2), two switches (MS1-RHYTHM and MS2-RHYTHM), and a central router (R1-RHYTHM). PC1 is connected to MS1-RHYTHM via Fa0 and Fa0/1. PC2 is connected to MS2-RHYTHM via Fa0 and Fa0/2. Both switches are connected to R1-RHYTHM via Gigabit ports. R1-RHYTHM has two WAN interfaces (WAN-1 and WAN-2) and two LAN interfaces (LAN-A and LAN-B). An OSPFv3 process is running on R1-RHYTHM. The Command Prompt window shows the results of pings from PC1 to R1-RHYTHM's IP address (2001:DB8:ABCD:A::1) and to its link-local address (FE80::1).

```

Cisco Packet Tracer PC Command Line 1.0
C:>ping 2001:DB8:ABCD:A::1
Pinging 2001:DB8:ABCD:A::1 with 32 bytes of data:
Reply from 2001:DB8:ABCD:A::2: bytes=32 time<1ms TTL=255
Reply from 2001:DB8:ABCD:A::2: bytes=32 time<1ms TTL=255
Reply from 2001:DB8:ABCD:A::2: bytes=32 time<1ms TTL=255
Reply from 2001:DB8:ABCD:A::2: bytes=32 time=7ms TTL=255

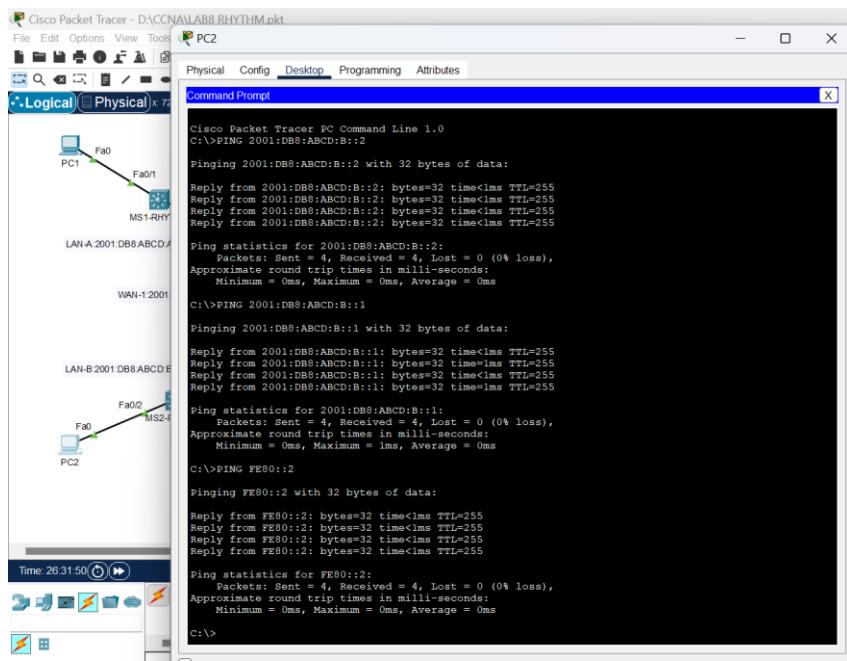
Ping statistics for 2001:DB8:ABCD:A::1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 7ms, Average = 1ms

C:>ping FE80::1
Pinging FE80::1 with 32 bytes of data:
Reply from FE80::1: bytes=32 time<1ms TTL=255

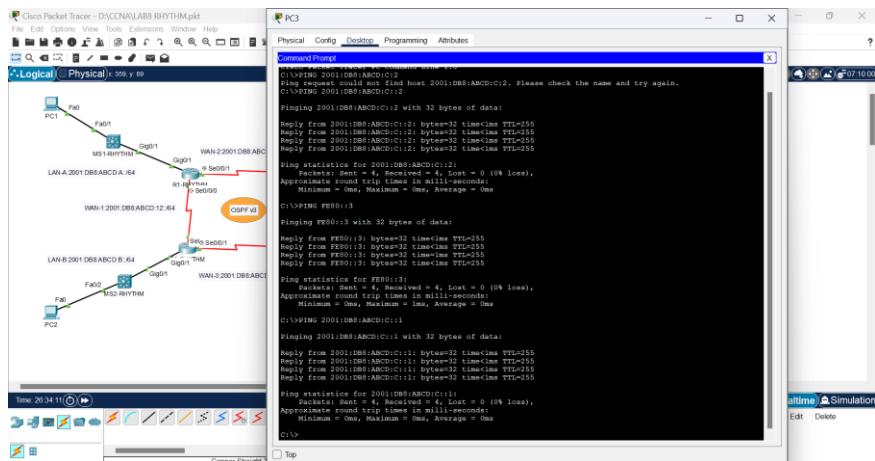
Ping statistics for FE80::1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:>

```

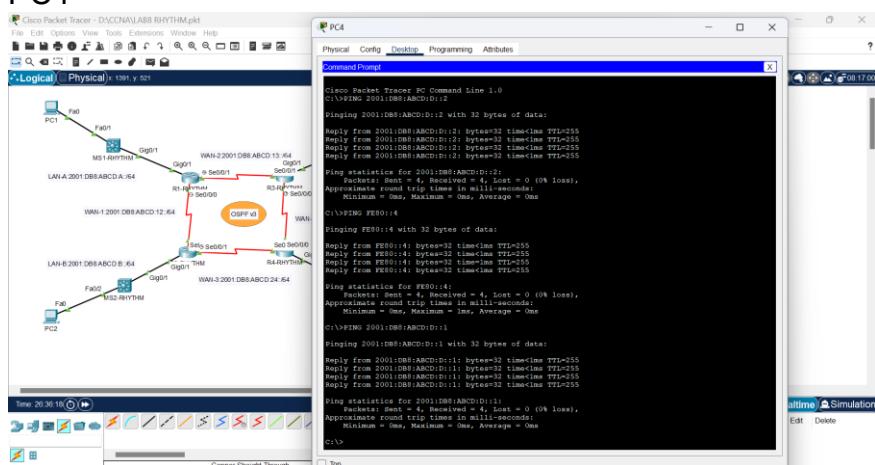
PC2



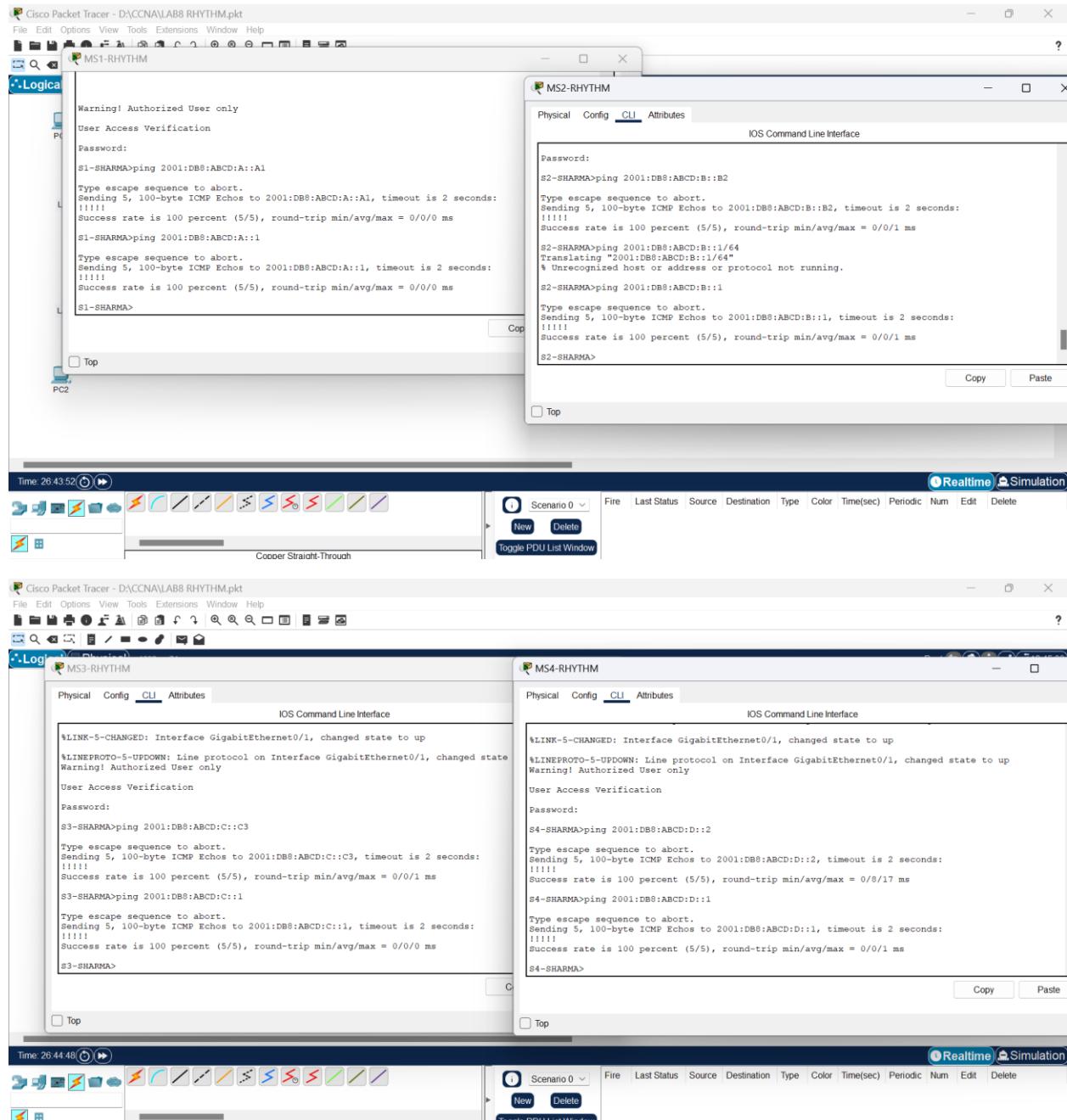
PC3



PC4

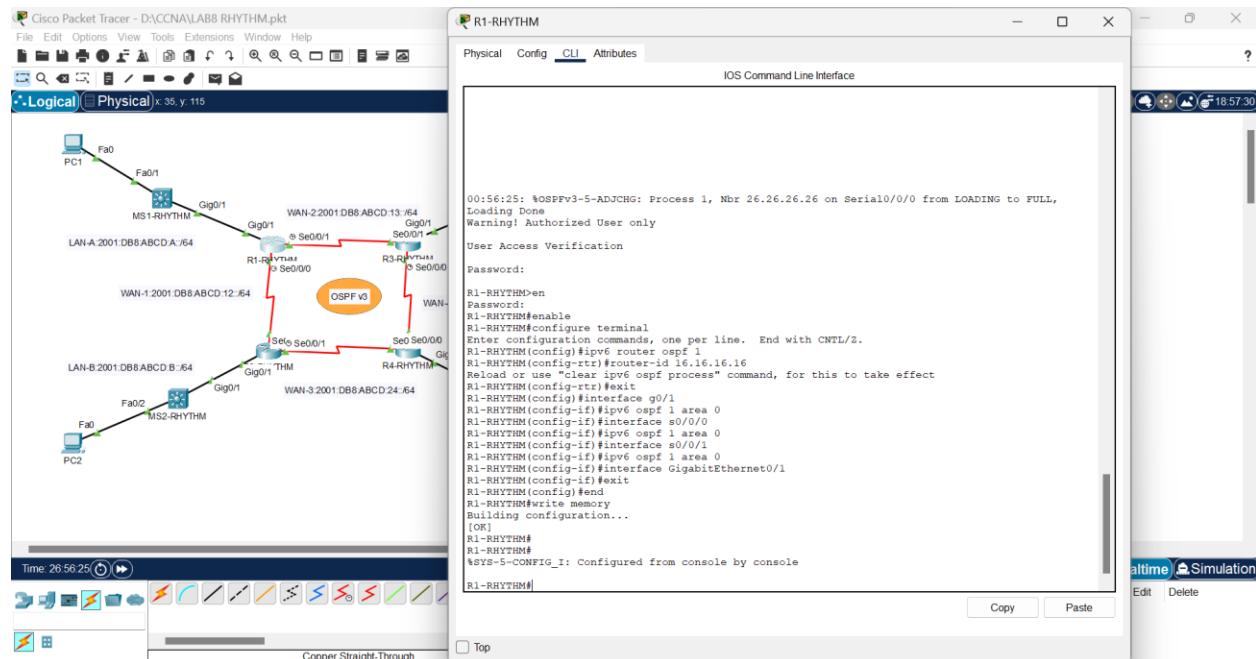


- c. Every switch should be able to ping its directly connected host device and default gateway.

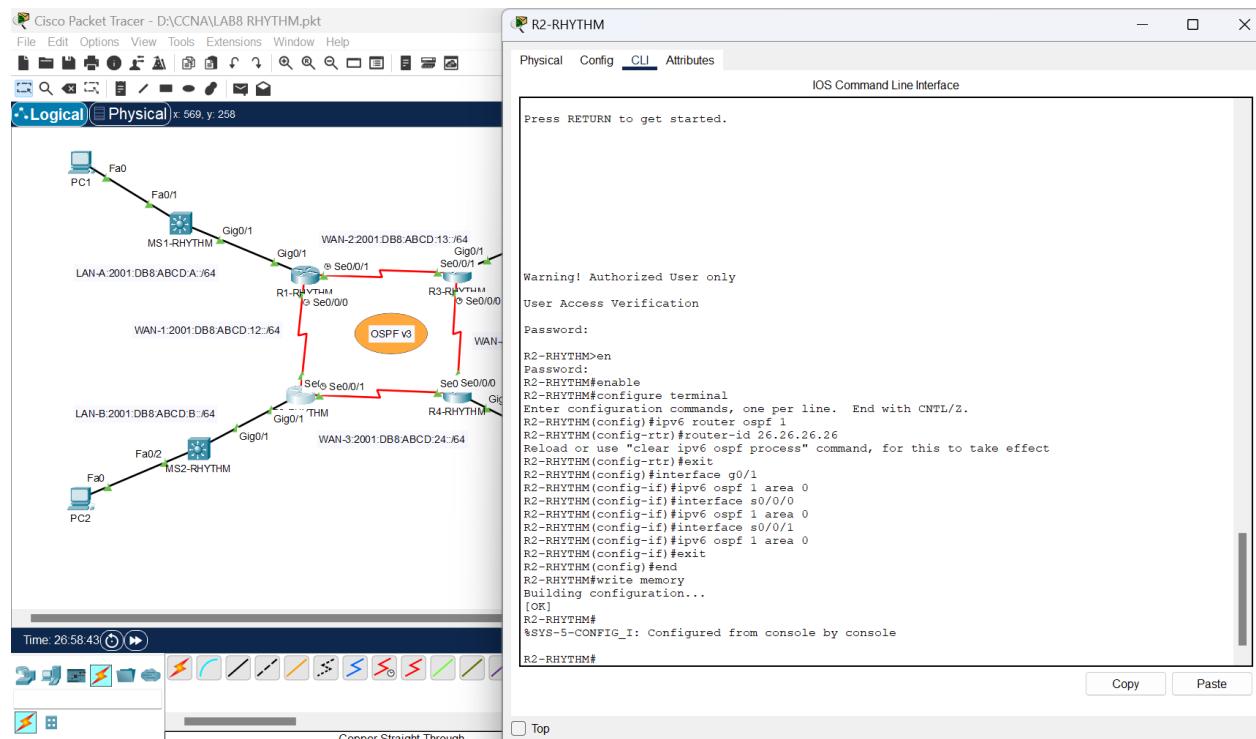


Step 6: Configure OSPF routing on all routers so that all hosts can communicate with every host in all LANs and WANs. The below configuration is for R1-YFN.

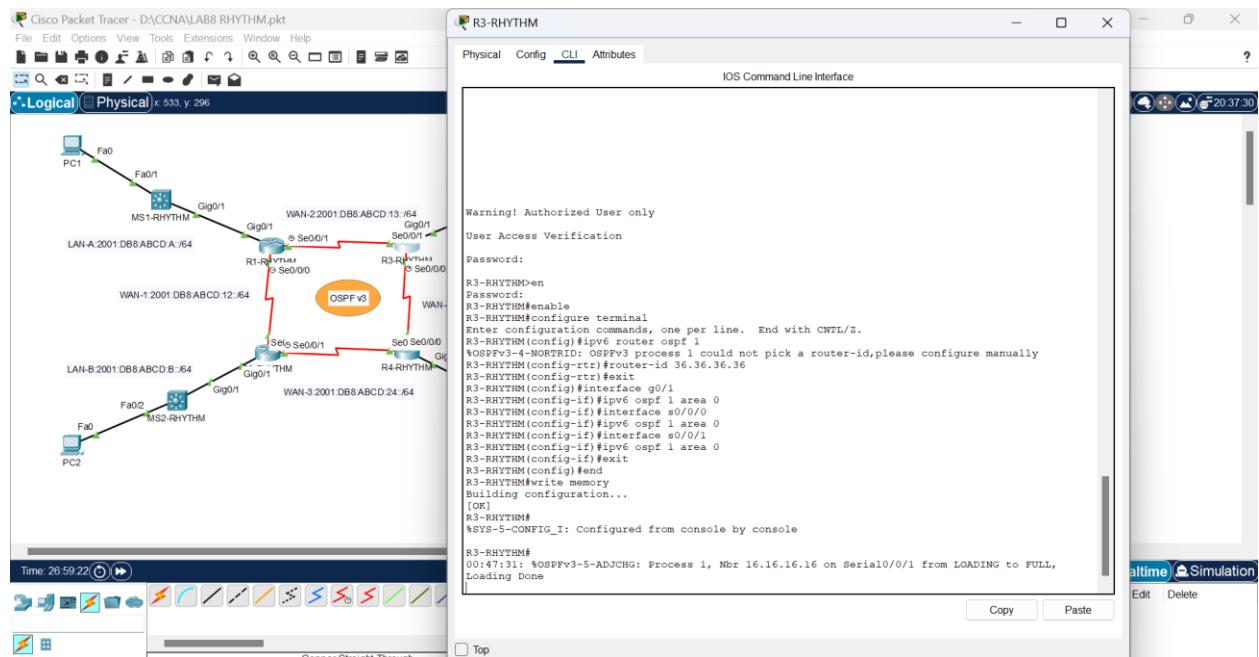
R1



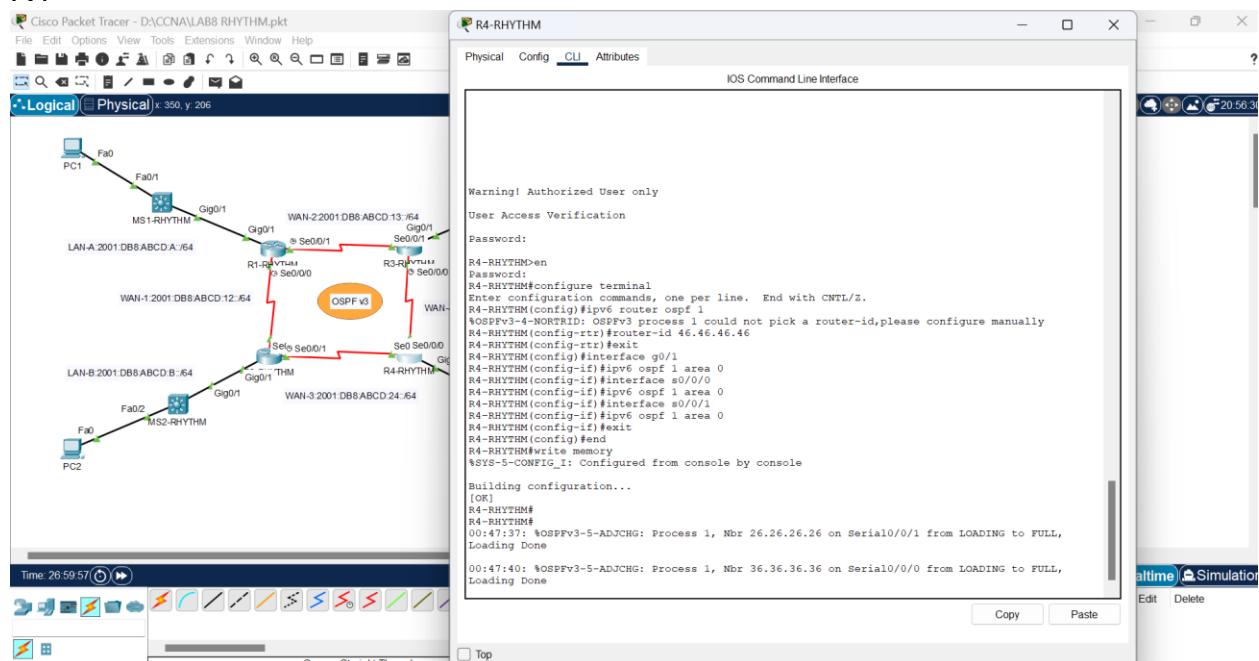
R2



R3



R4



- a. Enter into OSPF routing configuration mode.
 - *ipv6 router ospf 1* (1 is the local process id)

- b. Configure the router ID
 - *router-id 16.16.16.16* (For R1-YFN)
 - *exit*

(Note: 26.26.26.26 for R2-YFN, 36.36.36.36 for R3-YFN, 46.46.46.46 for R4-YFN)

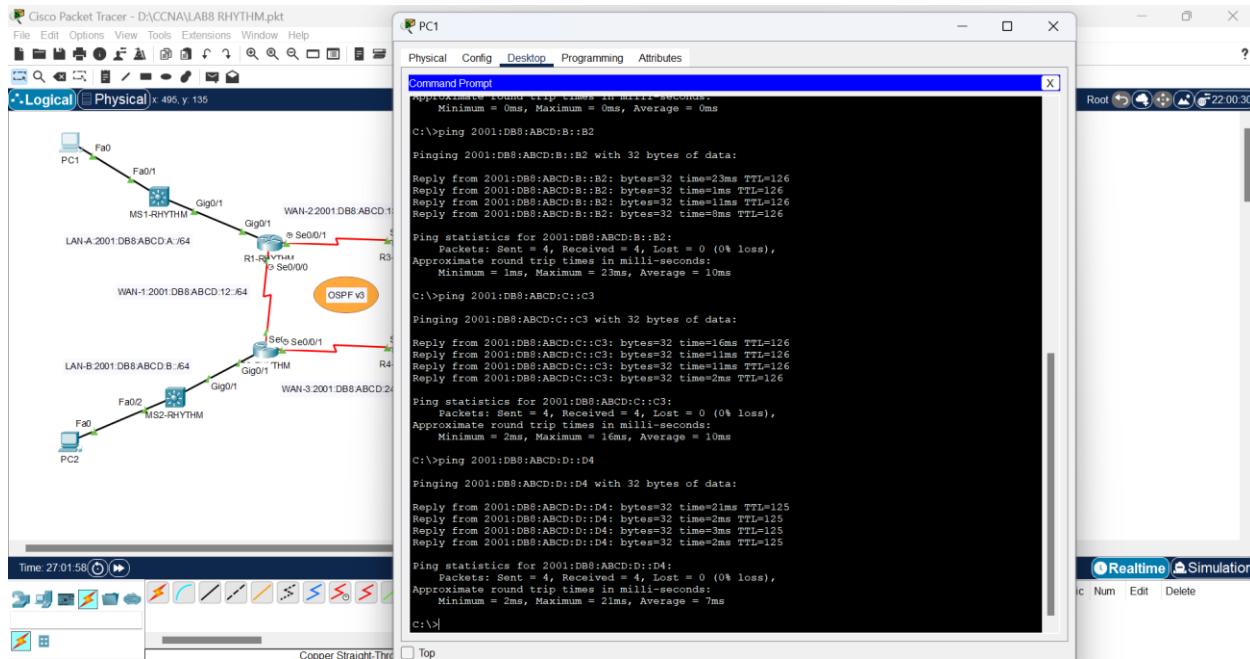
- c. Configure to OSPFv3 on all routers.

- *interface g0/1*
- *ipv6 ospf 1 area 0*
- *interface s0/0/0*
- *ipv6 ospf 1 area 0*
- *interface s0/0/1*
- *ipv6 ospf 1 area 0*

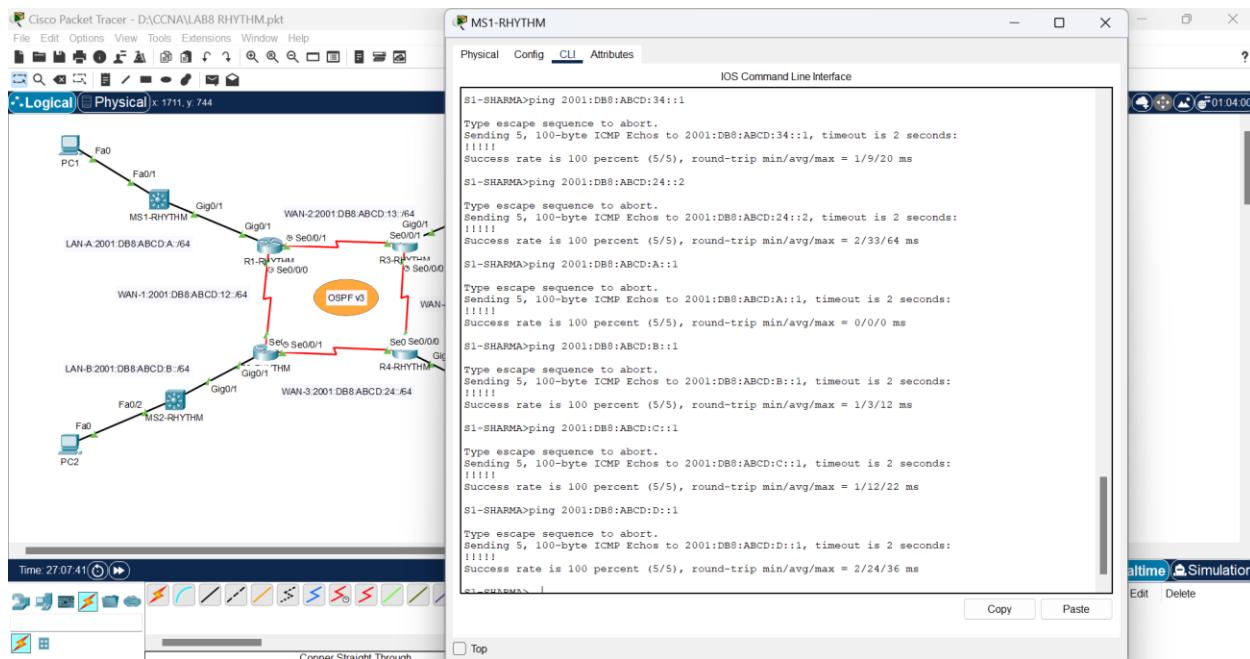
- d. Disable routing updates towards LANs using passive interface command.
- e. Save the configuration.
- f. Repeat the above steps from a to e for every router while changing router-id and interfaces in regard to the relevant router.

Step 7: Verify the connectivity.

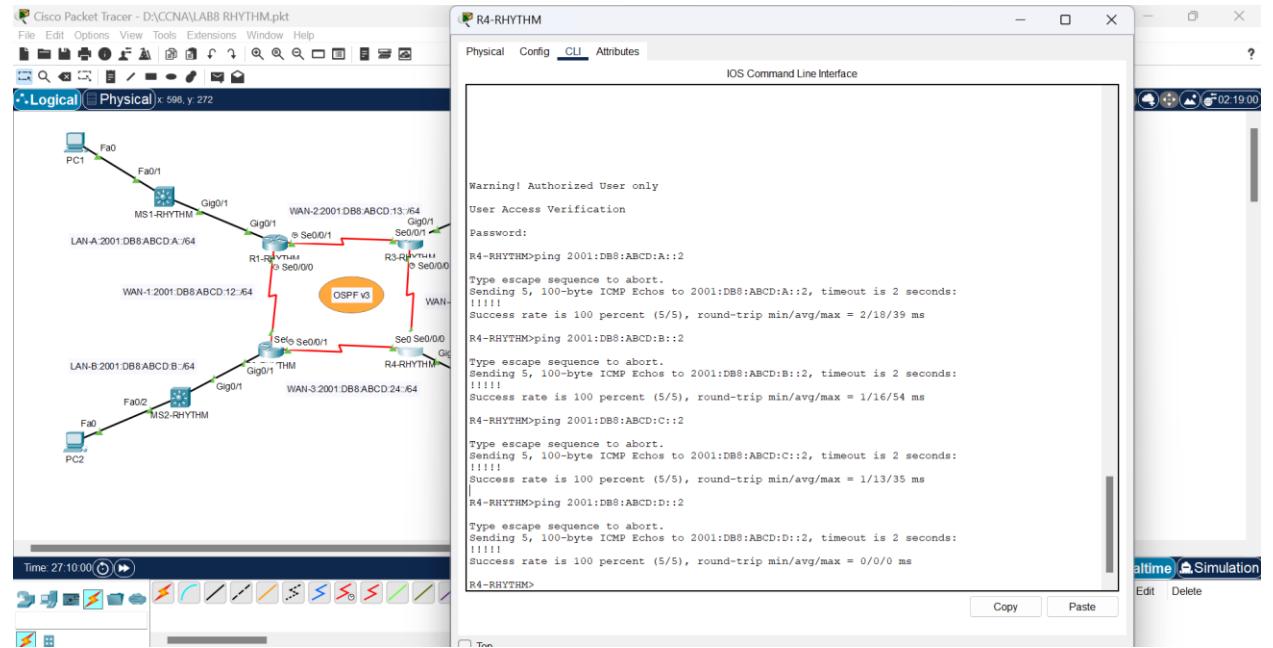
- Using the command line at PC1, ping the IP address of:
 - PC2, PC3, and PC4



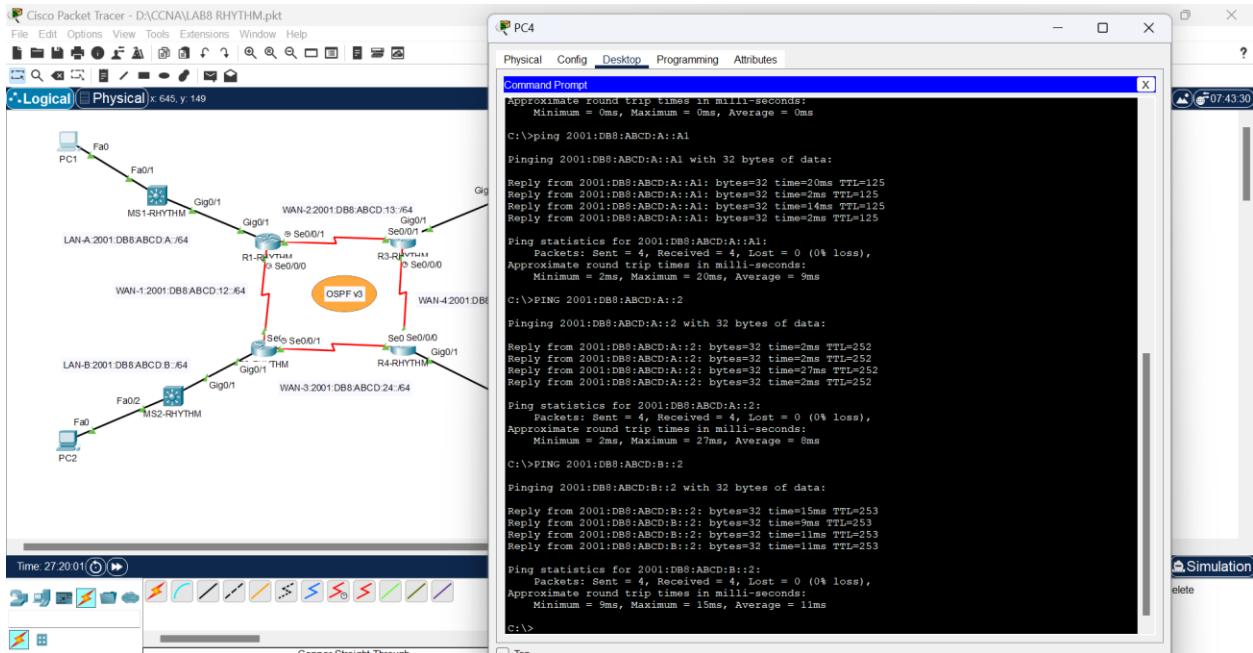
- Using the switch MS1-YSN, ping the IP address of:
 - S0/0/0 interface of router R3-YFN
 - S0/0/1 interface of router R4-YFN
 - G0/1 interfaces of R1-YFN, R2-YFN, R3-YFN, and R4-YFN

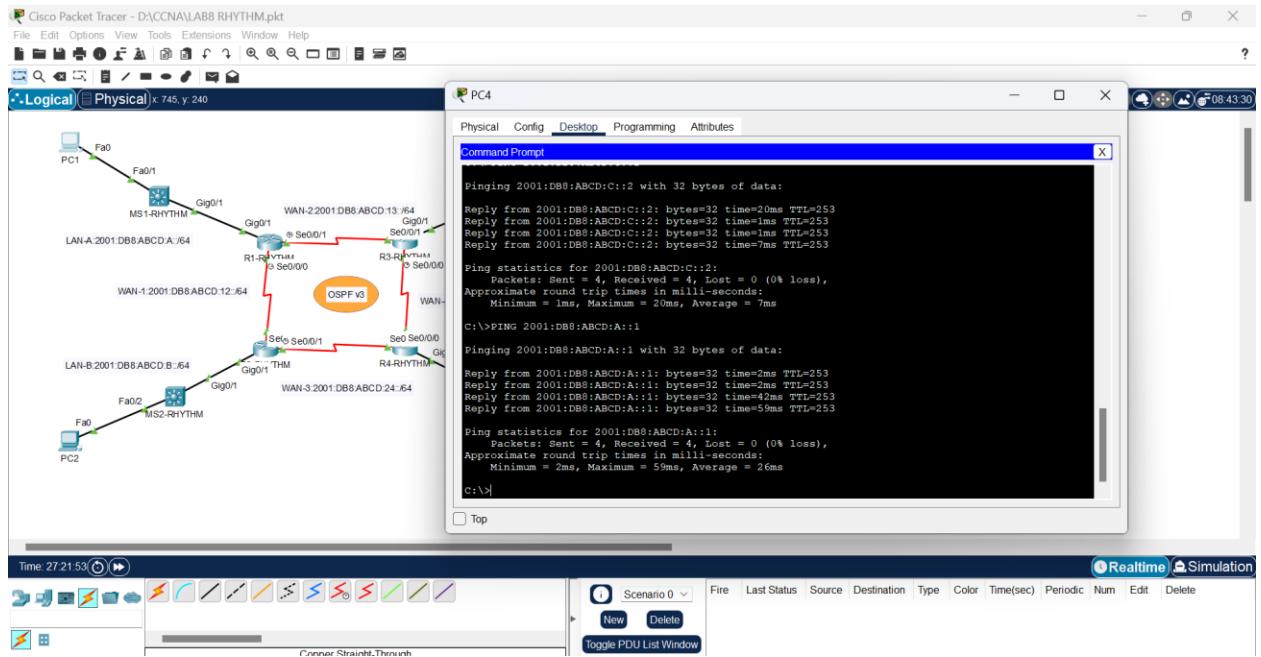


- Using the router R4-YFN, ping the SVI of MS1-YSN, MS2-YSN, MS3-YSN, and MS4-YSN



- Using the command line at PC4, ping the IP address of:
 - PC1
 - SVI of MS1-YSN, MS2-YSN, and MS3-YSN
 - G0/1 of R1-YFN
 - S0/0/0 of R2-YFN





NOTE: All the above-mentioned pings must work, otherwise troubleshoot the network.

Step 8: OSPF Verification. Sample output is provided for all the steps below. Please submit similar output for each router while highlighting the important information in the output, as displayed below.

a. OSPF routing verification

- o Execute the following command on all routers and check that all eight routes (four LANs, four WANs) are available from the entire network on every router.
 - show ipv6 route.

Sample Output for Router R2

```
R1-Muhammad#show ipv6 route
IPv6 Routing Table - 12 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
U - Per-user Static route, M - MIPv6
I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
ND - ND Default, NDp - ND Prefix, DCE - Destination, NDr - Redirect
O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
D - EIGRP, EX - EIGRP external

O 2001:DB8:ABCD:A::/64 [110/65]
via FE80::1, Serial0/0/0
C 2001:DB8:ABCD:B::/64 [0/0]
via GigabitEthernet0/1, directly connected
L 2001:DB8:ABCD:B::1/128 [0/0]
via GigabitEthernet0/1, receive
O 2001:DB8:ABCD:C::/64 [110/129]
via FE80::1, Serial0/0/0
via FE80::4, Serial0/0/1
O 2001:DB8:ABCD:D::/64 [110/65]
via FE80::4, Serial0/0/1
C 2001:DB8:ABCD:12::/64 [0/0]
via Serial0/0/0, directly connected
L 2001:DB8:ABCD:12::2/128 [0/0]
via Serial0/0/0, receive
O 2001:DB8:ABCD:13::/64 [110/128]
via FE80::1, Serial0/0/0
C 2001:DB8:ABCD:24::/64 [0/0]
via Serial0/0/1, directly connected
L 2001:DB8:ABCD:24::1/128 [0/0]
via Serial0/0/1, receive
O 2001:DB8:ABCD:34::/64 [110/128]
via FE80::4, Serial0/0/1
```

It can be clearly noticed from the above output that there are **three directly connected routes** and **five OSPF routes**, so this router R1-YFN can reach all eight networks (four LANs and four WANs) in the mentioned topology.

R1 and R2

Cisco Packet Tracer - D:\CCNA\LAB8 RHYTHM.pkt

File Edit Options View Tools Extensions Window Help

R1-RHYTHM Physical Config CLI Attributes

IOS Command Line Interface

```

Loading Done
00:00:20: %OSPFv3-5-ADJCHG: Process 1, Nbr 36.36.36.36 on Serial0/0/1 from LOADING
Loading Done

Password:
R1-RHYTHM>en
R1-RHYTHM#show ipv6 route
IPv6 Routing Table - 12 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
        U - Per-interface, M - Multicast
        I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
        ND - ND Default, NDP - ND Prefix, DCE - Destination, NDR - Redirect
        O - OSPF intra, OI - OSPF inter, OEL - OSPF ext 1, OE2 - OSPF ext 2
        ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
        D - EIGRP, EX - EIGRP external
        L - Loopback, EX - EIGRP external
        via GigabitEthernet0/1, directly connected
L 2001:DB8:ABCD::1:/128 [0/0]
    via GigabitEthernet0/1, receive
O 2001:DB8:ABCD:::/64 [110/193]
    via FE80::3, Serial0/0/1
O 2001:DB8:ABCD::1:/65 [110/195]
    via FE80::3, Serial0/0/1
C 2001:DB8:ABCD:::/64 [110/129]
    via FE80::3, Serial0/0/1
C 2001:DB8:ABCD::12::/64 [0/0]
    via Serial0/0/0, directly connected
L 2001:DB8:ABCD::13::/64 [110/192]
    via Serial0/0/0, receive
C 2001:DB8:ABCD::13::/64 [0/0]
    via Serial0/0/1, directly connected
L 2001:DB8:ABCD::13::/128 [0/0]
    via Serial0/0/1, receive
O 2001:DB8:ABCD::34::/64 [110/192]
    via FE80::3, Serial0/0/1
O 2001:DB8:ABCD::34::/64 [110/128]
    via FE80::3, Serial0/0/1
L FF00:::/8 [0/0]
    via Null0, receive
R1-RHYTHM#

```

R2-RHYTHM Physical Config CLI Attributes

IOS Command Line Interface

```

R2-RHYTHM>en
R2-RHYTHM#show ipv6 route
IPv6 Routing Table - 12 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
        U - Per-interface, M - Multicast
        I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
        ND - ND Default, NDP - ND Prefix, DCE - Destination, NDR - Redirect
        O - OSPF intra, OI - OSPF inter, OEL - OSPF ext 1, OE2 - OSPF ext 2
        ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
        D - EIGRP, EX - EIGRP external
        L - Loopback, EX - EIGRP external
        via GigabitEthernet0/1, directly connected
L 2001:DB8:ABCD::1:/128 [0/0]
    via GigabitEthernet0/1, receive
O 2001:DB8:ABCD::1:/129 [0/0]
    via FE80::1, Serial0/0/1
O 2001:DB8:ABCD::1:/64 [110/65]
    via FE80::1, Serial0/0/1
C 2001:DB8:ABCD::1:/64 [110/129]
    via FE80::1, Serial0/0/1
C 2001:DB8:ABCD::13::/64 [0/0]
    via Serial0/0/0, directly connected
L 2001:DB8:ABCD::13::/128 [0/0]
    via Serial0/0/0, receive
C 2001:DB8:ABCD::13::/64 [0/0]
    via Serial0/0/1, directly connected
L 2001:DB8:ABCD::13::/128 [0/0]
    via Serial0/0/1, receive
O 2001:DB8:ABCD::34::/64 [110/128]
    via FE80::4, Serial0/0/1
L FF00:::/8 [0/0]
    via Null0, receive
R2-RHYTHM#
R2-RHYTHM#

```

R3 and R4

Cisco Packet Tracer - D:\CCNA\LAB8 RHYTHM.pkt

File Edit Options View Tools Extensions Window Help

R3-RHYTHM Physical Config CLI Attributes

IOS Command Line Interface

```

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

R3-RHYTHM#show ipv6 route
IPv6 Routing Table - 12 entries
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
        U - Per-interface, M - Multicast
        I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
        ND - ND Default, NDP - ND Prefix, DCE - Destination, NDR - Redirect
        O - OSPF intra, OI - OSPF inter, OEL - OSPF ext 1, OE2 - OSPF ext 2
        ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
        D - EIGRP, EX - EIGRP external
        L - Loopback, EX - EIGRP external
        via GigabitEthernet0/1, directly connected
L 2001:DB8:ABCD::1:/128 [0/0]
    via FE80::1, Serial0/0/0
O 2001:DB8:ABCD::1:/129
    via FE80::4, Serial0/0/0
    via FE80::1, Serial0/0/1
C 2001:DB8:ABCD::1:/64 [110/65]
    via FE80::1, Serial0/0/1
    via GigabitEthernet0/1, directly connected
L 2001:DB8:ABCD::1:/128 [0/0]
    via GigabitEthernet0/1, receive
O 2001:DB8:ABCD::1:/64 [110/65]
    via FE80::1, Serial0/0/0
    via FE80::4, Serial0/0/0
    via FE80::1, Serial0/0/1
C 2001:DB8:ABCD::12::/64 [0/0]
    via FE80::1, Serial0/0/1
    via Serial0/0/0, directly connected
L 2001:DB8:ABCD::12::/128 [0/0]
    via Serial0/0/0, receive
C 2001:DB8:ABCD::12::/64 [0/0]
    via Serial0/0/1, directly connected
L 2001:DB8:ABCD::12::/128 [0/0]
    via Serial0/0/1, receive
O 2001:DB8:ABCD::24::/64 [110/128]
    via FE80::1, Serial0/0/0
    via FE80::4, Serial0/0/0
    via FE80::1, Serial0/0/1
C 2001:DB8:ABCD::34::/64 [0/0]
    via FE80::1, Serial0/0/1
    via Serial0/0/0, directly connected
L 2001:DB8:ABCD::34::/128 [0/0]
    via Serial0/0/0, receive
L FF00:::/8 [0/0]
    via Null0, receive
R3-RHYTHM#
R3-RHYTHM#

```

R4-RHYTHM Physical Config CLI Attributes

IOS Command Line Interface

```

via FE80::2, Serial0/0/1
2001:DB8:ABCD::13::/64 [110/128]
via FE80::3, Serial0/0/0
C 2001:DB8:ABCD::24::/64 [0/0]
    via Serial0/0/1, directly connected
L 2001:DB8:ABCD::24::/128 [0/0]
    via FE80::1, Serial0/0/1
C 2001:DB8:ABCD::34::/64 [110/65]
    via Serial0/0/0, directly connected
L 2001:DB8:ABCD::34::/128 [0/0]
    via Serial0/0/0, receive
C 2001:DB8:ABCD::34::/64 [0/0]
    via Serial0/0/1, directly connected
L 2001:DB8:ABCD::34::/128 [0/0]
    via Serial0/0/1, receive
L FF00:::/8 [0/0]
    via Null0, receive
R4-RHYTHM#
R4-RHYTHM#
$LINK-3-UPDOWN: Interface Serial0/0/0, changed state to down
$LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to down
01:32:30: %OSPFv3-5-ADJCHG: Process 1, Nbr 36.36.36.36 on Serial0/0/0 from FULL to DOWN, Neighbor Down: Interface down or detached
$LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
$LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
01:32:51: %OSPFv3-5-ADJCHG: Process 1, Nbr 36.36.36.36 on Serial0/0/0 from LOADING to FULL, Loading Done
$LINK-3-UPDOWN: Interface Serial0/0/0, changed state to down
$LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to down
01:33:09: %OSPFv3-5-ADJCHG: Process 1, Nbr 36.36.36.36 on Serial0/0/0 from FULL to DOWN, Neighbor Down: Interface down or detached
$LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
$LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
01:33:30: %OSPFv3-5-ADJCHG: Process 1, Nbr 36.36.36.36 on Serial0/0/0 from LOADING to FULL, Loading Done

```

b. OSPF neighbour verification

- o Execute the following command on all routers to check and verify that all the routers have two neighbours each.
 - *show ipv6 ospf neighbor*

Sample Output for all Routers

R1-Muhammad#*show ipv6 ospf neighbor*

Neighbor ID	Pri	State	Dead Time	Interface ID	Interface
36.36.36.36	0	FULL/-	00:00:38	4	Serial0/0/1
26.26.26.26	0	FULL/-	00:00:37	3	Serial0/0/0

R2-Muhammad#*show ipv6 ospf neighbor*

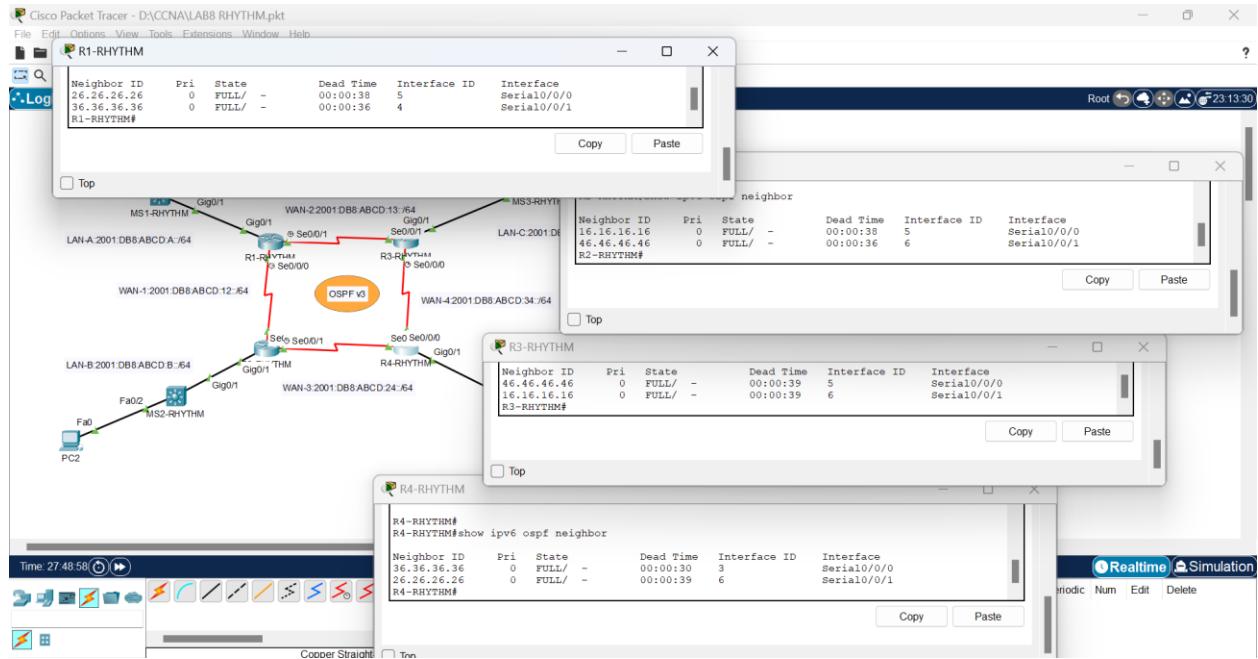
Neighbor ID	Pri	State	Dead Time	Interface ID	Interface
46.46.46.46	0	FULL/-	00:00:36	4	Serial0/0/1
16.16.16.16	0	FULL/-	00:00:39	3	Serial0/0/0

R3-Muhammad#*show ipv6 ospf neighbor*

Neighbor ID	Pri	State	Dead Time	Interface ID	Interface
46.46.46.46	0	FULL/-	00:00:38	3	Serial0/0/0
16.16.16.16	0	FULL/-	00:00:35	4	Serial0/0/1

R4-Muhammad#*show ipv6 ospf neighbor*

Neighbor ID	Pri	State	Dead Time	Interface ID	Interface
36.36.36.36	0	FULL/-	00:00:32	3	Serial0/0/0
26.26.26.26	0	FULL/-	00:00:31	4	Serial0/0/1

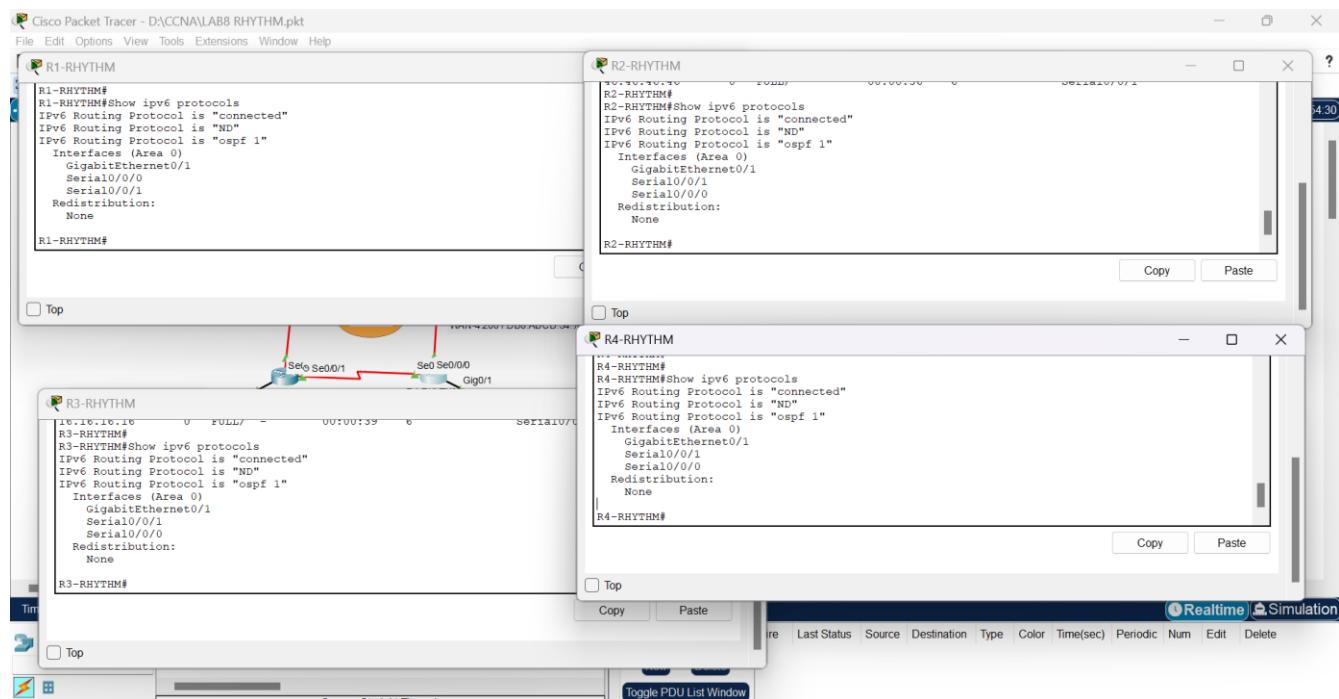


c. OSPF process information verification

- o Execute the following command on all routers to check and verify the process ID list of interfaces taking part in OSPFv3 (IPv6).
 - *Show ipv6 protocols*

Sample Output for Router R3

```
R3-Muhammad#show ipv6 protocols
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "ND"
IPv6 Routing Protocol is "ospf 1"
Interfaces (Area 0)
GigabitEthernet0/1
Serial0/0/1
Serial0/0/0
Redistribution:
None
```



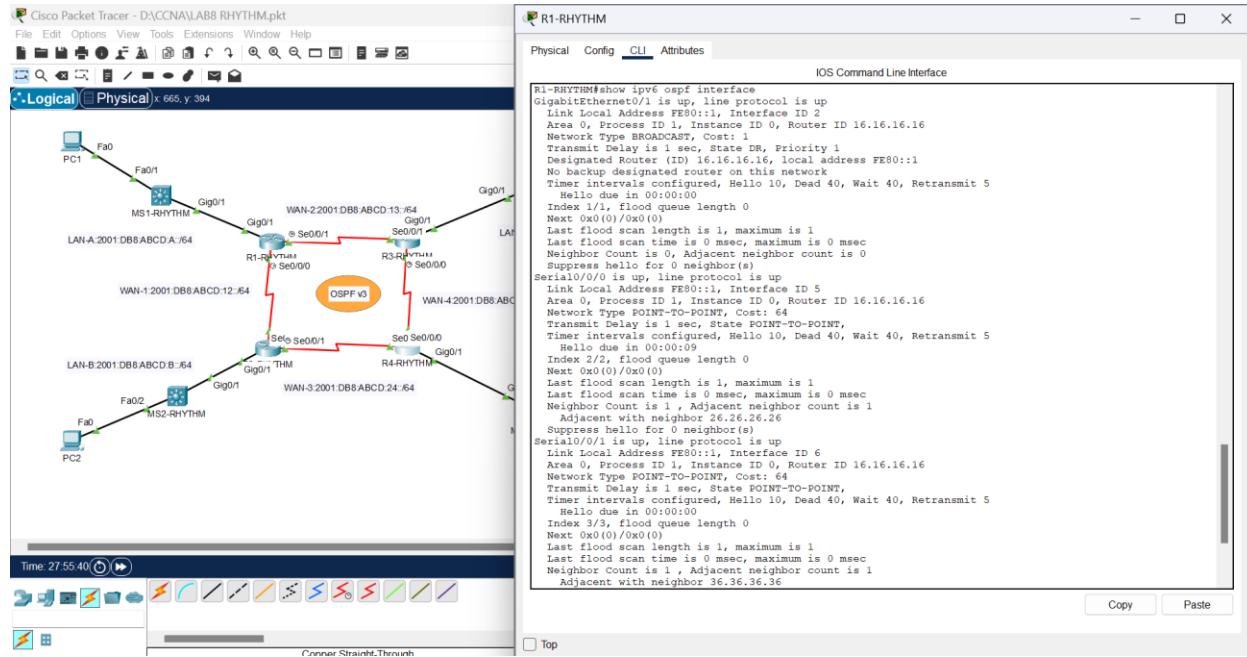
d. OSPFv3 interface verification

- o Execute the following command on all routers to check and verify interface status, its link local address, Process ID, and Router ID.
 - *show ipv6 ospf interface*

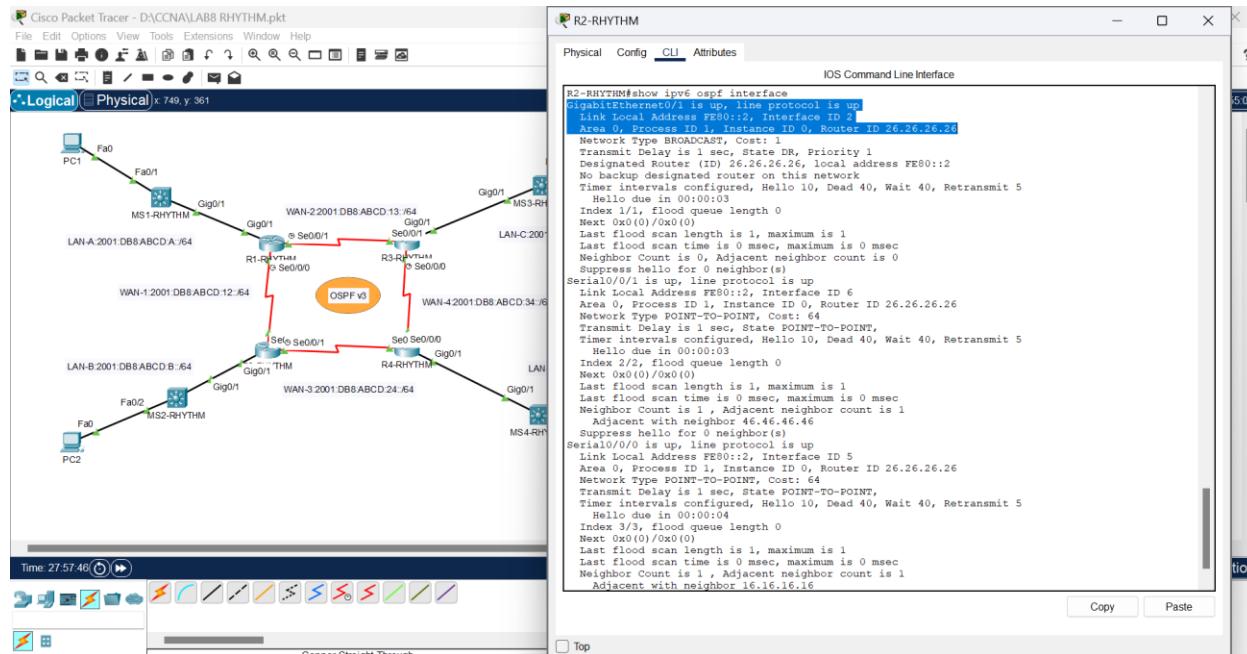
Sample Output for Router R2

```
R2-Muhammad#show ipv6 ospf interface
GigabitEthernet0/1 is up, line protocol is up
Link Local Address FE80::2, Interface ID 2
Area 0, Process ID 1, Instance ID 0, Router ID 26.26.26.26
Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State WAITING, Priority 1
No designated router on this network
No backup designated router on this network
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
No Hellos (Passive interface)
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 0, Adjacent neighbor count is 0
Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
Link Local Address FE80::2, Interface ID 3
Area 0, Process ID 1, Instance ID 0, Router ID 26.26.26.26
Network Type POINT-TO-POINT, Cost: 64
Transmit Delay is 1 sec, State POINT-TO-POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:04
Index 2/2, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
Adjacent with neighbor 16.16.16.16
Suppress hello for 0 neighbor(s)
Serial0/0/1 is up, line protocol is up
Link Local Address FE80::2, Interface ID 4
Area 0, Process ID 1, Instance ID 0, Router ID 26.26.26.26
Network Type POINT-TO-POINT, Cost: 64
Transmit Delay is 1 sec, State POINT-TO-POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:05
Index 3/3, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
Adjacent with neighbor 46.46.46.46
Suppress hello for 0 neighbor(s)
```

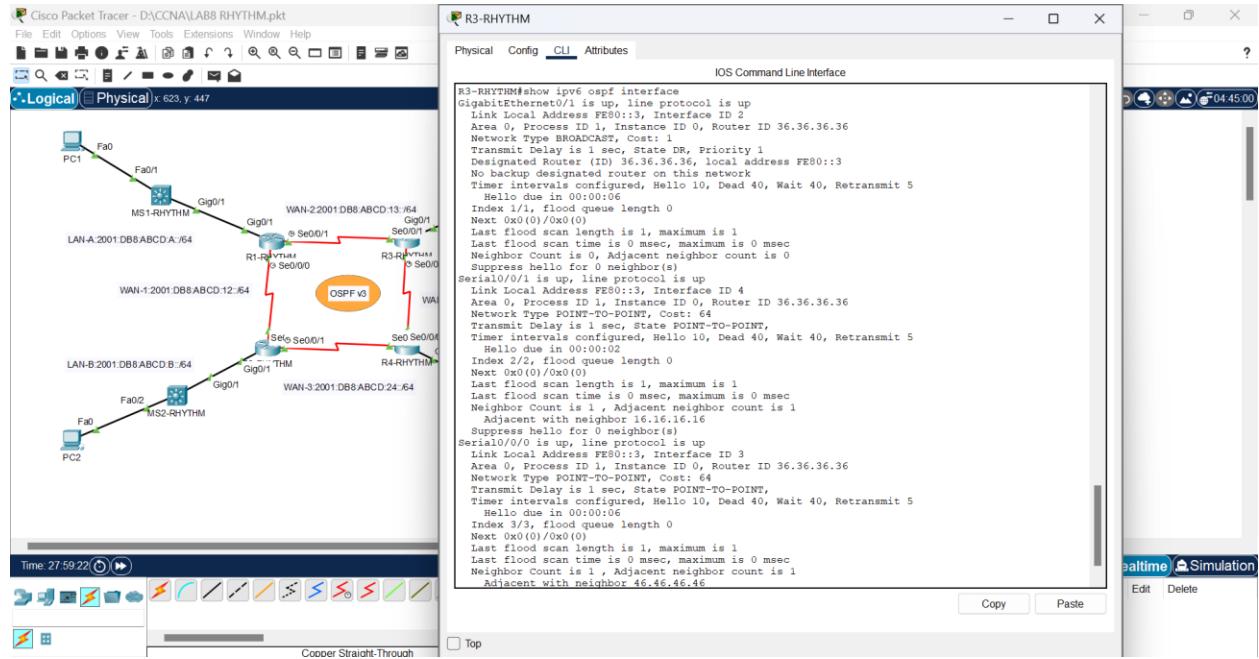
R1



R2



R3



R4

