Ex No: 2

Date:

CONFIGURE AND ANALYZE IPV4 AND IPV6 ADDRESSING SCHEMES AND SUBNETTING

AIM:

To build simple LANs, perform basic configurations for routers and switches, and implement IPv4 and IPv6 addressing schemes and Subnetting.

THEORY:

IPv4 (Internet Protocol version 4) is the most widely used version of the IP protocol, providing 32-bit addresses and supporting approximately 4.3 billion unique IP addresses. It uses a hierarchical addressing scheme consisting of a network address and a host address, separated by subnet masks to define network boundaries.

IPv6 (Internet Protocol version 6), on the other hand, was introduced to address the limitations of IPv4, offering a 128-bit address space, which provides a virtually limitless number of unique addresses. IPv6 also introduces improvements such as simplified header structures, improved security features, and better support for mobile networks. In this experiment, both addressing schemes are configured in a simple LAN, demonstrating how devices can communicate within the network and how these protocols coexist. IPv4 addresses are usually assigned using DHCP, while IPv6 uses **stateless address autoconfiguration (SLAAC)** or DHCPv6 for automatic address assignment. The setup allows for understanding how both protocols function, highlighting the importance of transitioning from IPv4 to IPv6 due to the growing demand for IP addresses in modern networks.

IPv4 (Internet Protocol Version 4)

- Format: IPv4 addresses are 32-bit numeric values, typically written in dotted-decimal notation (e.g., 192.168.1.1).
- Structure: It consists of four octets (8 bits each) separated by periods, with each octet ranging from 0 to 255.
- Address Space: IPv4 supports approximately 4.3 billion unique addresses.
- Example: 192.0.2.1
- Limitations: Due to rapid internet growth, IPv4 faces address exhaustion despite techniques like NAT (Network Address Translation).

IPv6 (Internet Protocol Version 6)

- Format: IPv6 addresses are 128-bit values, typically written in hexadecimal notation, separated by colons (e.g., 2001:0db8:85a3:0000:0000:8a2e:0370:7334).

- Structure: It consists of eight groups of four hexadecimal digits, with leading zeros in groups often omitted for simplicity.
- Address Space: IPv6 provides a vast address space (approximately 340 undecillion addresses), effectively solving the exhaustion problem.
- Example: 2001:db8::ff00:42:8329 (using :: to compress consecutive zeros).
- Enhancements: IPv6 offers improved security, multicast addressing, simplified header structure, and better support for mobile devices.
- An IPv6 (normal) address has the format y:y:y:y:y:y:y:y, where *y* is called a *segment* and can be any hexadecimal value between 0 and FFFF. The segments are separated by colons, not periods. An IPv6 normal address must have eight segments; however, a short form notation can be used in the TS4500 management GUI for segments that are zero, or those that have leading zeros.
- The following are examples of valid IPv6 (normal) addresses:2001:db8:3333:4444:5555:6666:7777:8888
- 2001:db8:3333:4444:CCCC:DDDD:EEEE:FFFF
- :: (implies all 8 segments are zero)
- 2001:db8:: (implies that the last six segments are zero)
- ::1234:5678 (implies that the first six segments are zero)
- 2001:db8::1234:5678 (implies that the middle four segments are zero)
- 2001:0db8:0001:0000:0000:0ab9:C0A8:0102 (This can be compressed to eliminate leading zeros, as follows: 2001:db8:1::ab9:C0A8:102)

PROCEDURE:

WIRED LAN

1. First, we will download Cisco Packet Tracer from netacad.com (latest version).
2. After downloading we will open it and now in this window, we see there are multiplesmall windows where we can select component and create our own particular computer network.
3. Select the components that are listed on the left bottom corner.
4. Select the 2950T switch and 2 routers from the components and place it on the white screen.
5. Place the PC's and laptops from the components and place it on the white screen.
6. Now select the wire from the connections and select copper straight through wire andconnect fastethernet from PC to the switch.
7. Select serial connecter for router to router connection.

CONFIGURING THE NETWORK

- Now assign ip address to each of the PC and laptops based on IPv4 or IPv6 formats.

- Under fastethernet tab when you double click on the PC you will able to see fastethernet and under that set IPv4 or IPv6 Address.

TESTING THE NETWORK

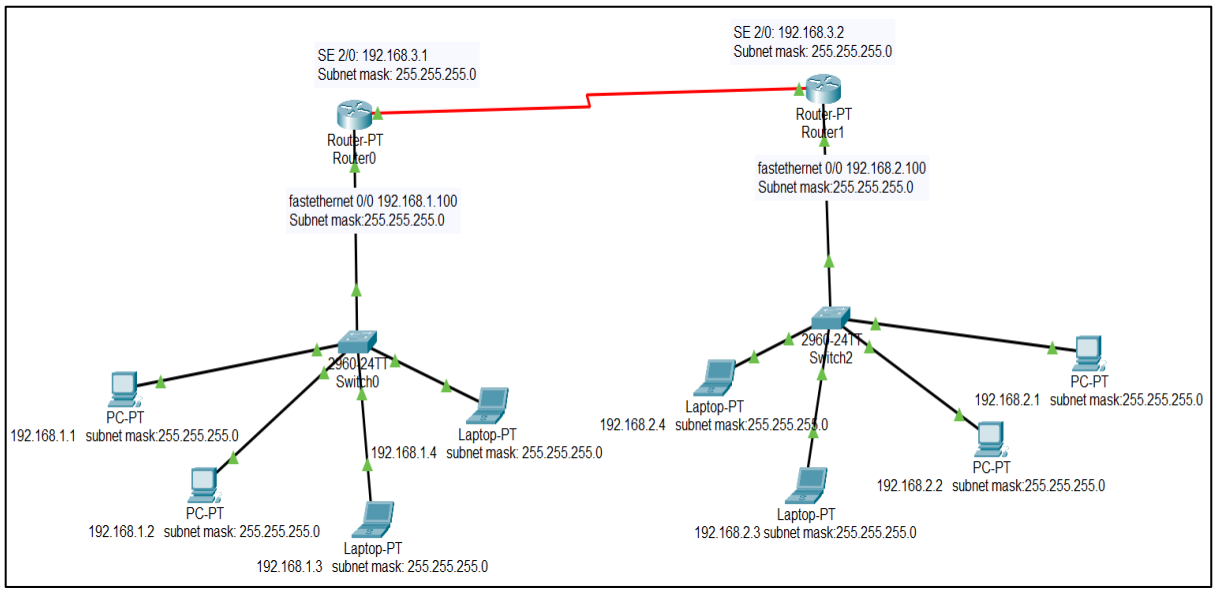
- Choose the device you want to test and double click on that and under desktop youwill see the command prompt option

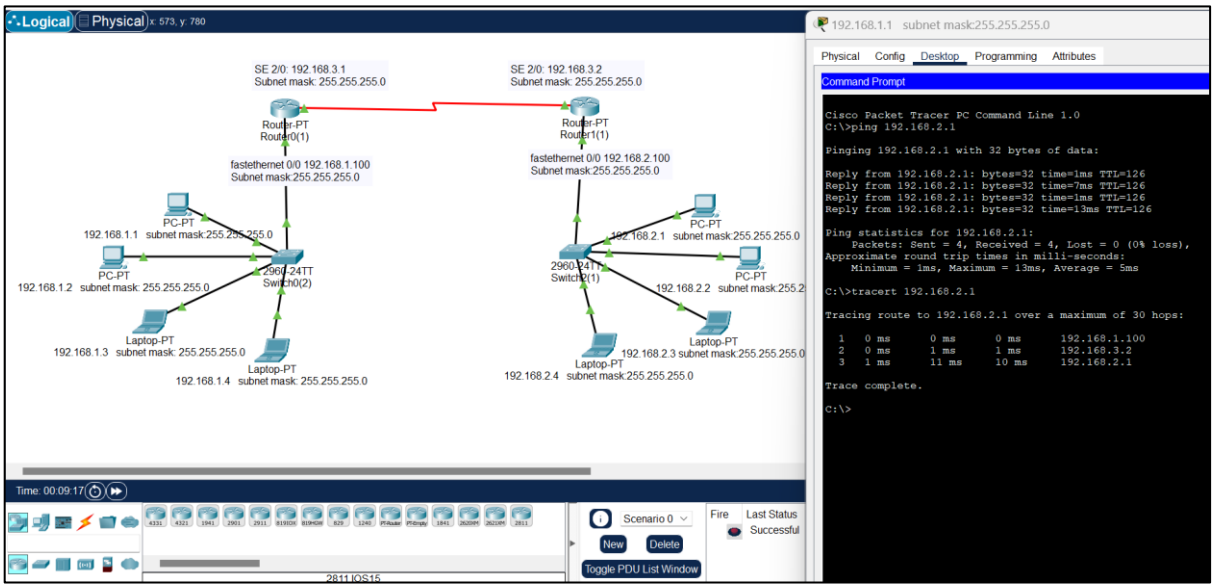
- Click on that and type the command ping “host ip”(the ip of any other device in thenetwork).

- The data packets are successfully sent from the source to destination.

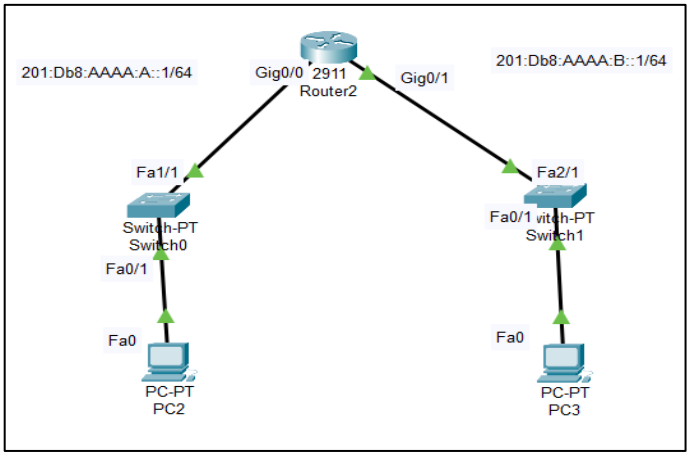
MODEL OUTPUT:

IPv4:





IPv6:



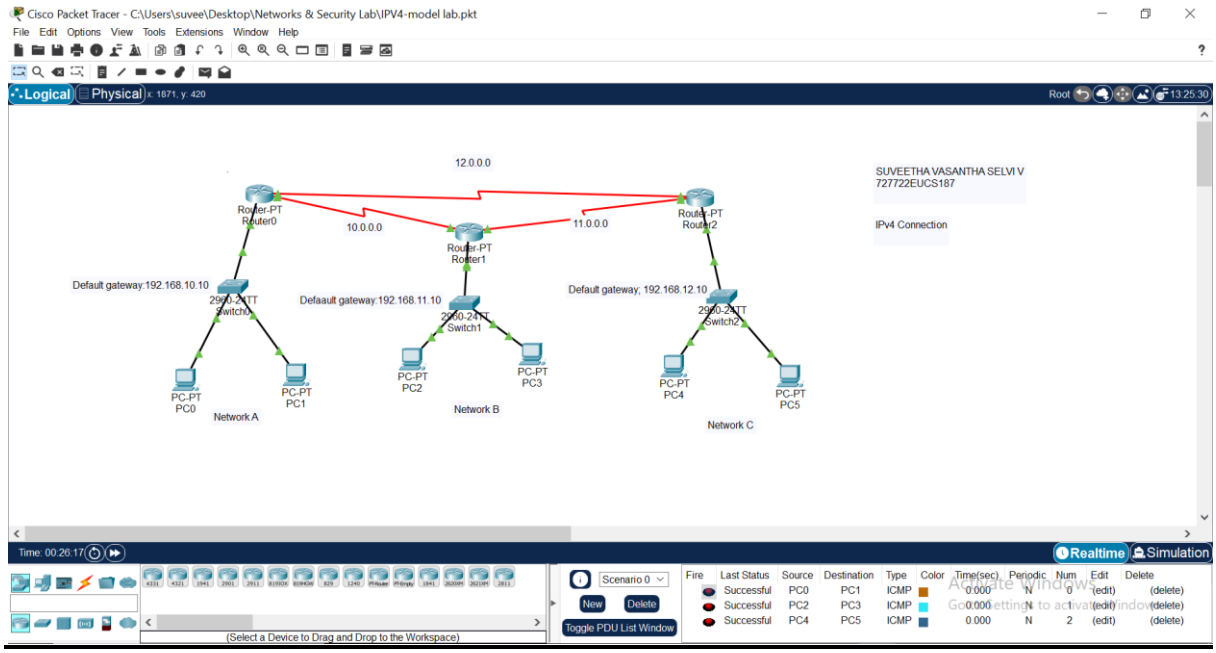

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ipv6 unicast-routing
Router(config)#int Gig0/0
Router(config-if)#ipv6 address FE80::1 link
Router(config-if)#ipv6 address FE80::1 link-local
Router(config-if)#no shut

Router(config-if)#int Gig0/1
Router(config-if)#ipv6 address FE80::1 link-local
Router(config-if)#no shut
```

```
Router#en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int Gig0/0
Router(config-if)#ipv6 address 2001:DB8:AAAA:A::1/64
Router(config-if)#no shut
Router(config-if)#int Gig0/1
Router(config-if)#ipv6 address 2001:DB8:AAAA:B::1/64
Router(config-if)#no shut
```

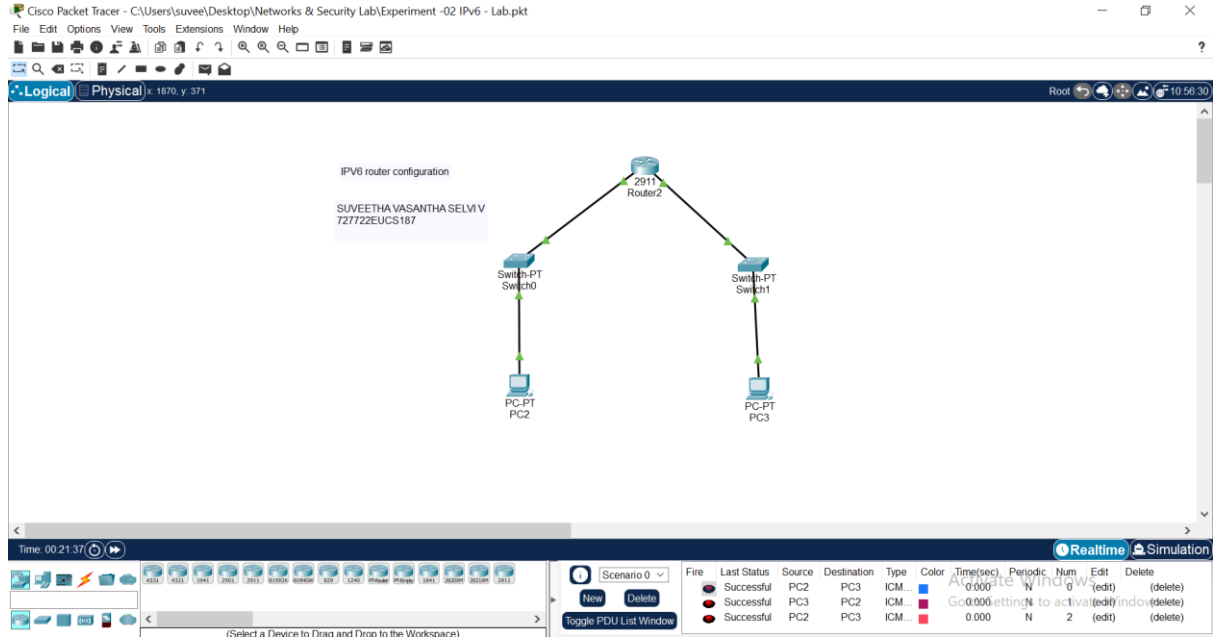
We have configured the router now change the settings of hosts in IPv6 configuration:
First, click on PC0 and go to desktop then IP configuration.
Now find the IPv6 configuration.
Change the settings from static to automatic and then after a few seconds. the IPv6 address and default

SIMULATION OUTPUT:

IPv4:



IPv6:



RESULT:

Thus, simple LAN networks, were implemented, where all the nodes were configured with both IPv4 and IPv6 addressing and communication between nodes was tested, in the Cisco Packet Tracer Simulation environment.