UNIVERSITY OF CHAKWAL
DEPARTMENT OF COMPUTER SCIENCE
(Computer Communication Networks CS-324)(LAB)

Lab 03

Network Topologies

Objective of the Experiment:

After completing this Lab student should able to:
- Have that much knowledge, to make topologies and further working on this easily.
- Make and construct Mesh topology on cisco packet tracer.
- Make and construct Star topology on cisco packet tracer.
- Make and construct Bus topology on cisco packet tracer.
- Make and construct Ring topology on cisco packet tracer.
- Make and construct Tree topology on cisco packet tracer.

Tools required:

- CISCO Packet tracer

Network Topology:

Network topology is the arrangement of the elements (links, nodes, etc.) of a communication network. Network topology is the topological structure of a network and may be depicted physically or logically.

Types of network topologies:

There are five common topologies in networks:

1- Mesh topology
2- Star topology
3- Bus topology
4- Ring topology
5- Tree topology

1.Mesh topology:

A network setup where each computer and network device are interconnected with one another, allowing for most transmissions to be distributed, even if one of the connections go down. It is a topology commonly used for wireless networks. Below is a visual example of a simple computer setup on a network using a mesh topology.
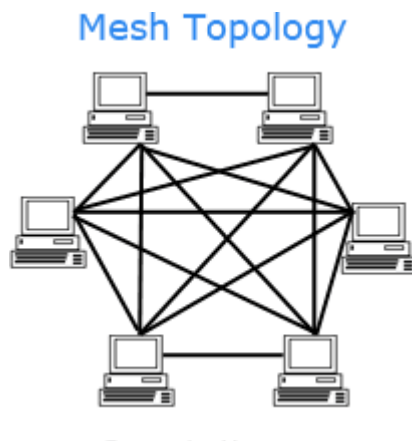

Figure 1: Mesh topology

2.Star topology:

A Star network is one of the most common computer network topologies. In its simplest form, a star network consists of one central hub which acts as a conduit to transmit messages. In star topology, every host is connected to a central hub. A star network is an implementation of a spoke–hub distribution paradigm in computer networks.
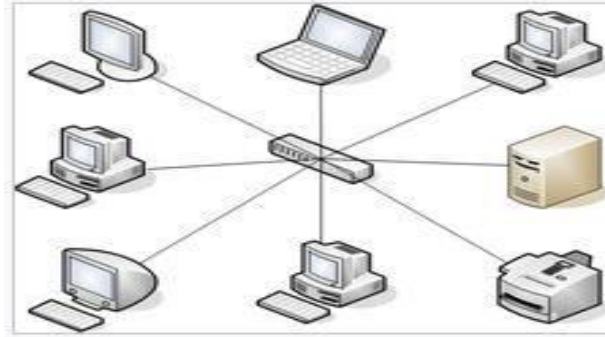
Figure 2: Star topology

3. Bus topology:

A bus network is a network topology in which nodes are directly connected to a common linear (or branched) half-duplex link called a bus.
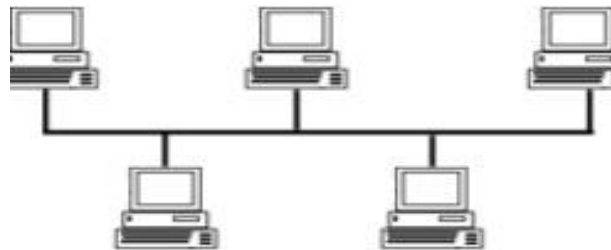

Figure 3: Bus topology

4. Ring topology:

A ring topology is a network configuration in which device connections create a circular data path. Each networked device is connected to two others, like points on a circle. Together, devices in a ring topology are referred to as a ring network.
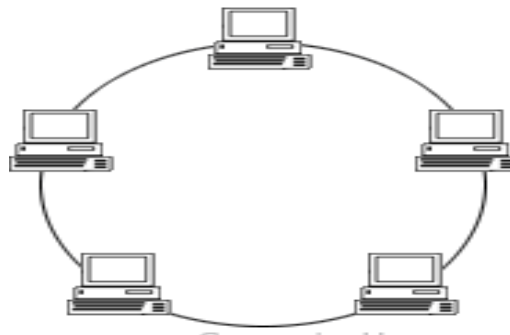

Figure 4: Ring topology

5. Tree topology:

A tree topology is a special type of structure in which many connected elements are arranged

like the branches of a tree. For example, tree topologies are frequently used to organize the computers in a corporate network, or the information in a database.
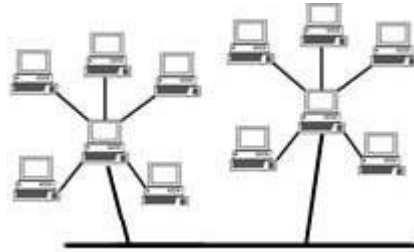

Figure 5: Tree topology

Implementation of Mesh Topology

In the mesh topology of networking, each and every device sends its own signal to the other devices that are present in the arrangement of the network.

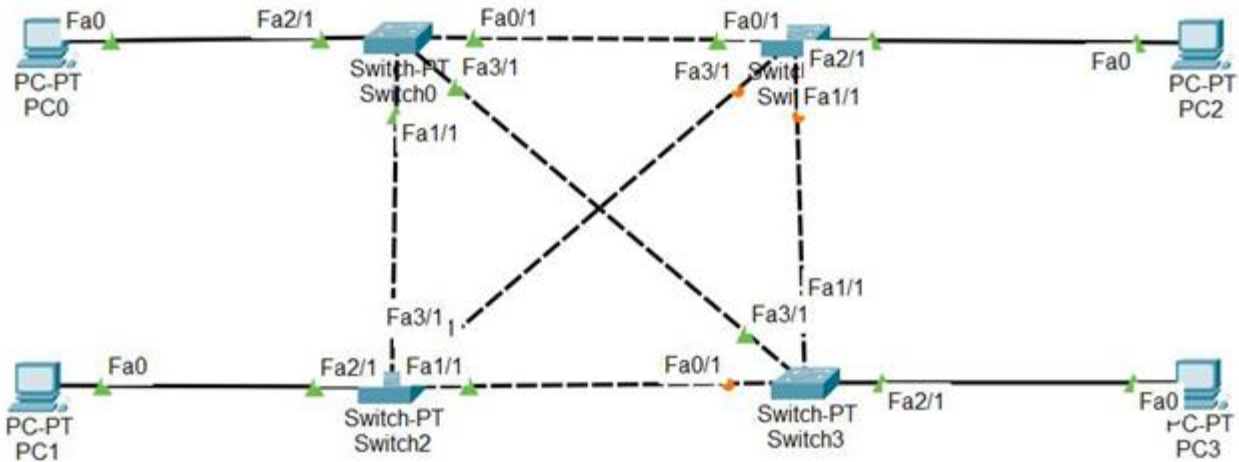## Steps to Configure and Setup Ring Topology in Cisco Packet Tracer:

Step 1: First, open the Cisco packet tracer desktop and select the devices given below:

S.NO	Device	Model name
1.	PC	PC
2.	Switch	PT-switch

IP Addressing Table:

S.NO	Device	IPv4 Address	Subnet Mask
1.	pc0	192.168.0.1	255.255.255.0
2.	pc1	192.168.0.2	255.255.255.0
3.	pc2	192.168.0.3	255.255.255.0
4.	pc3	192.168.0.4	255.255.255.0

- Then, create a network topology as shown below the image.
- Use an Automatic connecting cable to connect the devices with others.

Step 2: Configure the PCs (hosts) with IPv4 address and Subnet Mask according to the IP addressing table given above.

- To assign an IP address in PC0, click on PC0.
- Then, go to desktop and then IP configuration and there you will IPv4 configuration.
- Fill IPv4 address and subnet mask.

- Assigning IP address using the ipconfig command.
- Also, we can also assign an IP address with the help of a command.
- Go to the command terminal of the PC.
- Then, type ipconfig <IPv4 address><subnet mask><default gateway>(if needed)

Example: ipconfig 192.168.0.1 255.255.255.0
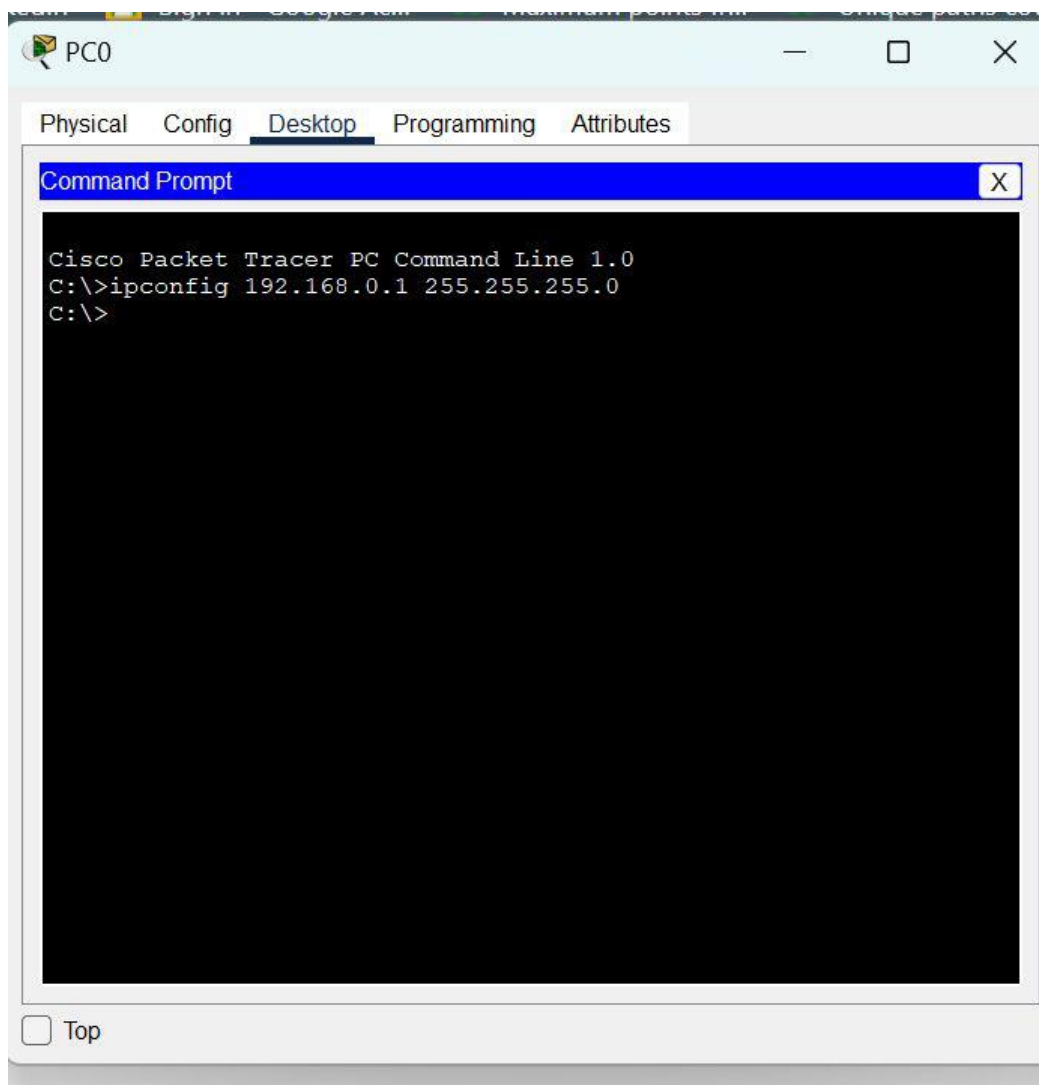
- Repeat the same procedure with other PCs to configure them thoroughly.

Step 3: Verify the connection by pinging the IP address of any host in PC0.
- Use the ping command to verify the connection.
- We will check if we are getting any replies or not.
- Here we get replies from a targeted node on both PCs.
- Hence the connection is verified.
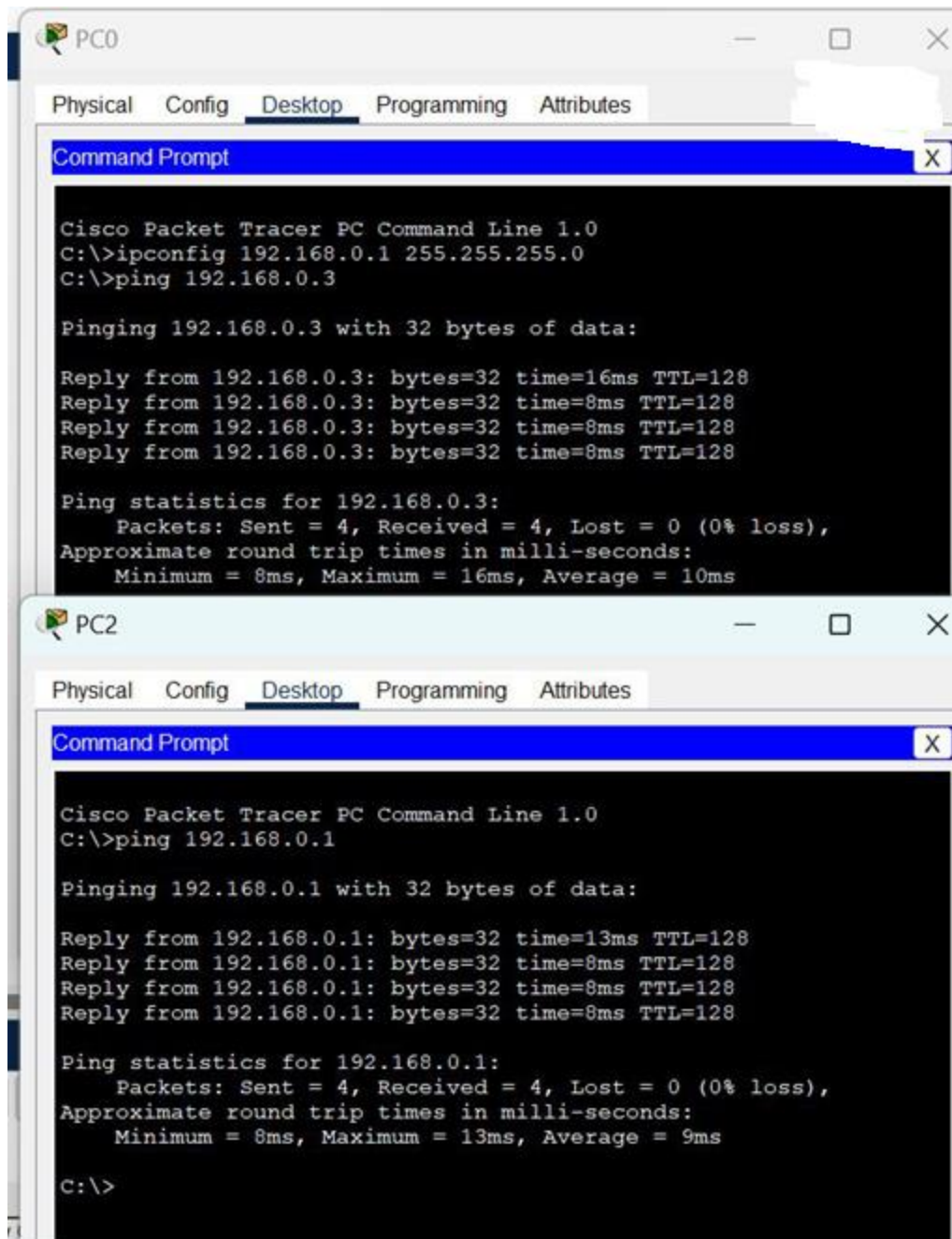
- A simulation of the experiment is given below we have sent two PDU packets one targeted from PC0 to PC3 and another targeted from PC1 to PC2.
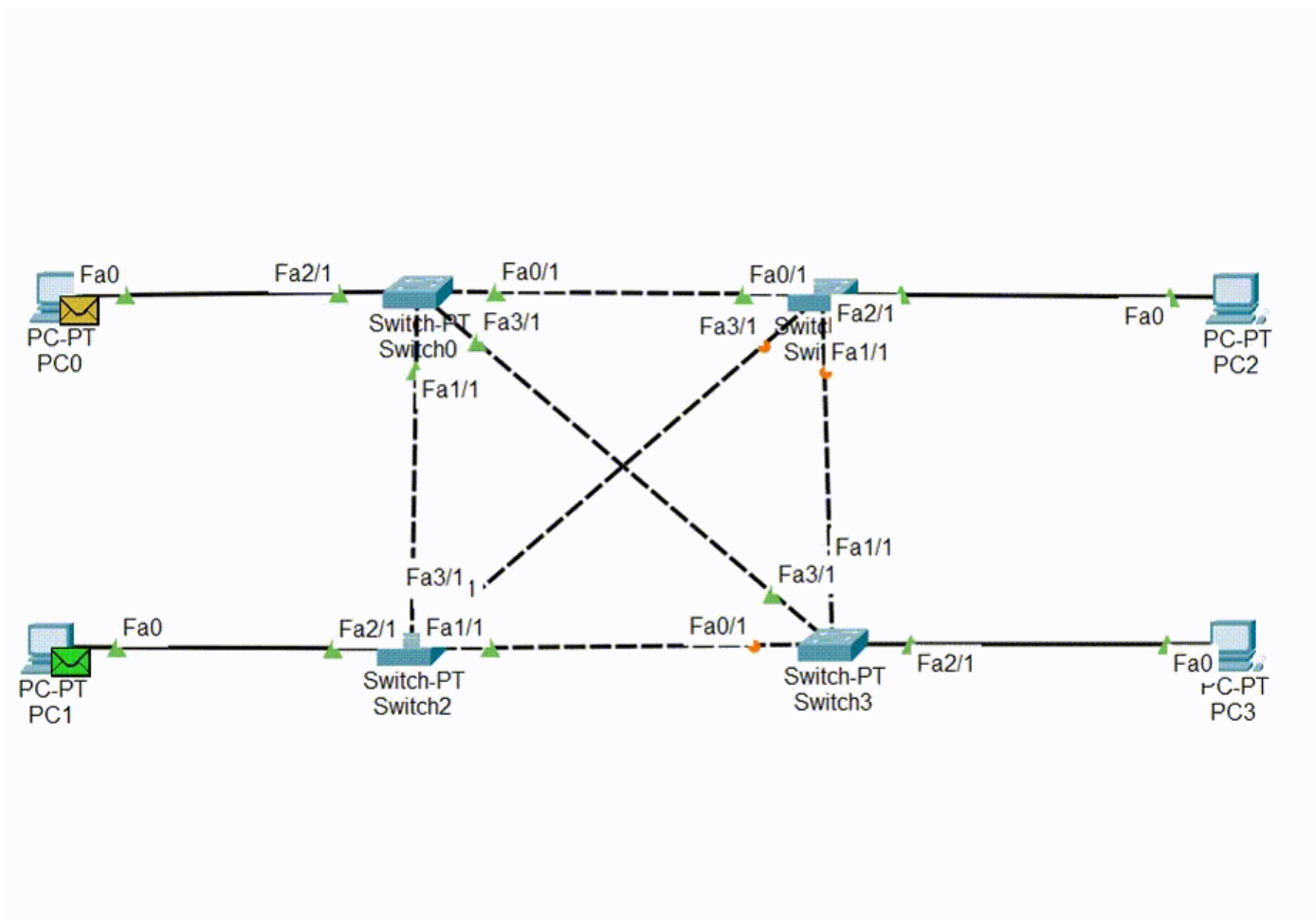
Implementation of Bus Topology

A bus topology is a network in which nodes are directly linked with a common half-duplex link. A host on a bus topology is called a station. In a bus network, every station will accept all network packets, and these packets generated by each station have equal information priority. A bus network includes a single network segment and collision domain.

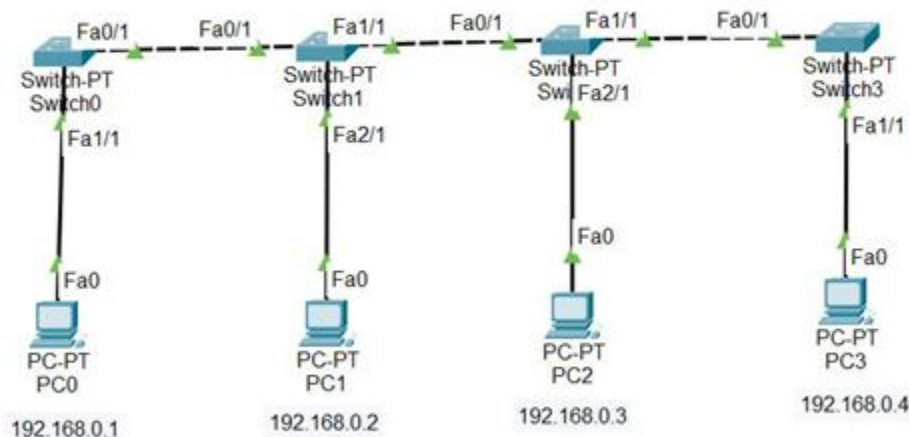**Steps to Configure and Setup Bus Topology in Cisco Packet Tracer :**

Step 1: First, open the cisco packet tracer desktop and select the devices given below:

S.NO	Device	Model-Name
1.	PC	PC
2.	Switch	PT-Switch

IP Addressing Table

S.NO	Device	IPv4 Address	Subnet Mask
	pc0	192.168.0.1	255.255.255.0
	pc1	192.168.0.2	255.255.255.0
	pc2	192.168.0.3	255.255.255.0
	pc3	192.168.0.4	255.255.255.0

- Then, create a network topology as shown below image:
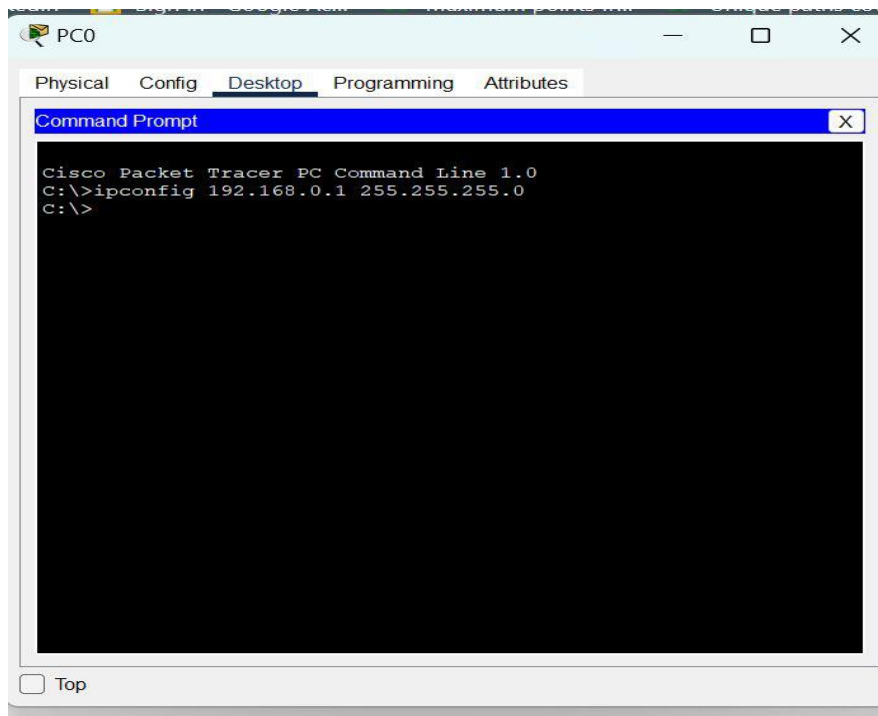- Use an Automatic connecting cable to connect the devices with others.

Step 2: Configure the PCs (hosts) with IPv4 address and Subnet Mask according to the IP addressing table given above.

- To assign an IP address in PC0, click on PC0.
- Then, go to desktop and then IP configuration and there you will IPv4 configuration.
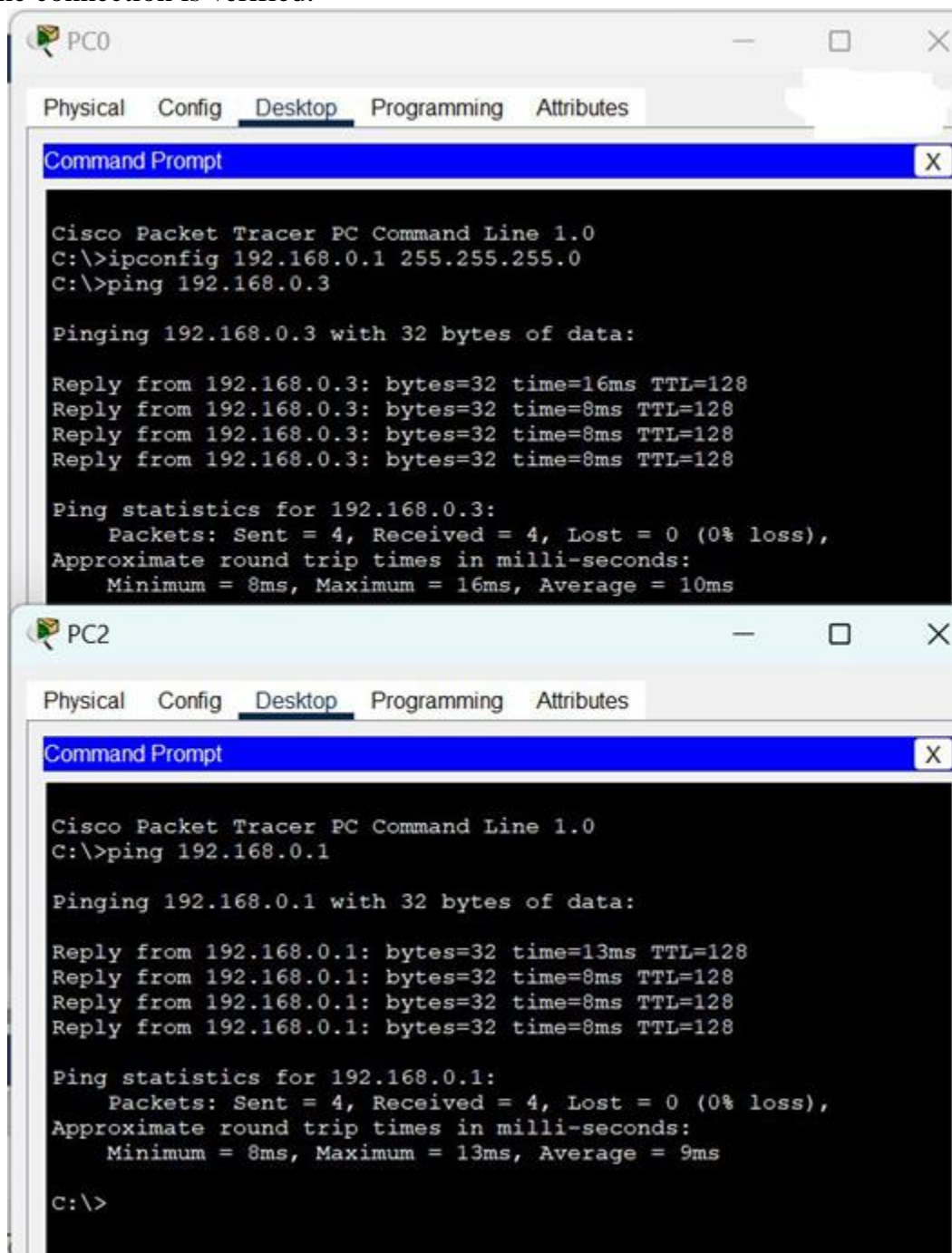- Fill IPv4 address and subnet mask.

- Assigning an IP address using the ipconfig command, or we can also assign an IP address with the help of a command.
- Go to the command terminal of the PC.
- Then, type ipconfig <IPv4 address><subnet mask><default gateway>(if needed)
Example: `ipconfig 192.168.0.1 255.255.255.0`

- Repeat the same procedure with other PCs to configure them thoroughly.

Step 3: Verify the connection by pinging the IP address of any host in PC0.

- Use the ping command to verify the connection.
- As we can see we are getting replies from a targeted node on both PCs.
- Hence the connection is verified.

Simulation Result:

A simulation of the experiment is given below we have sent two PDU packets one targeted from PC0 to PC2 and another targeted from PC3 to PC1.
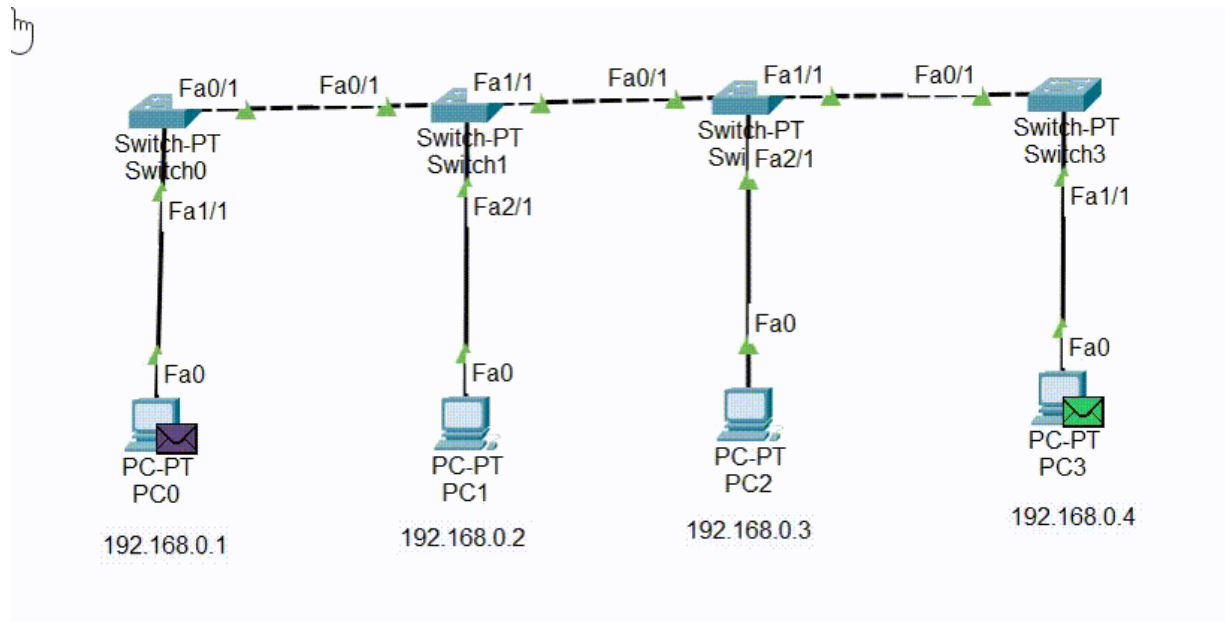
# Implementing of Star Topology

A star topology for a Local Area Network (LAN) is one in which each node is connected to a central connection point, such as a hub or switch. Whenever a node tries to connect with another node then the transmission of the message must be happening with the help of the central node. The best part of star topology is the addition and removal of the node in the network but too many nodes can cause suffering to the network.

Implement Star Topology using Cisco Packet Tracer.

A Cisco packet tracer is a simulation tool that is used for understanding the networks. The best part of the Cisco packet tracer is its visualization you can see the actual flow of the message and understand the workflow of the network devices. Implementation of Star Topology using Cisco Packet Tracer is done using Switch.

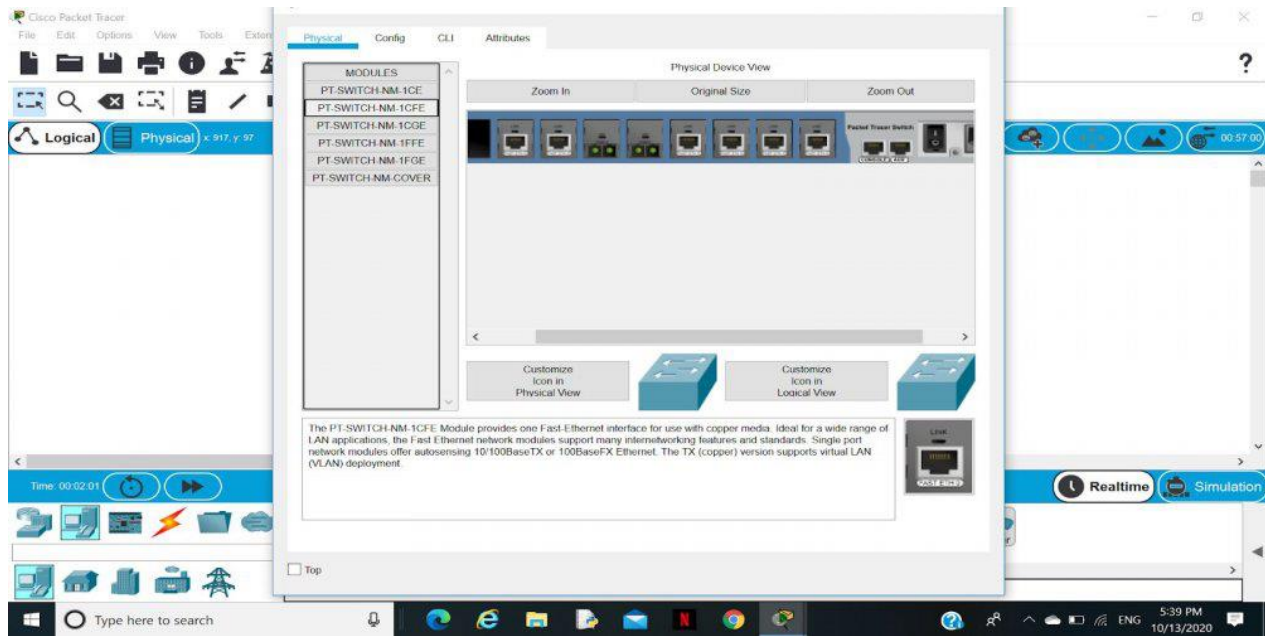**Steps Implementing Star Topology using Cisco Packet Tracer:**

Step 1: We have taken a switch and linked it to six end devices.
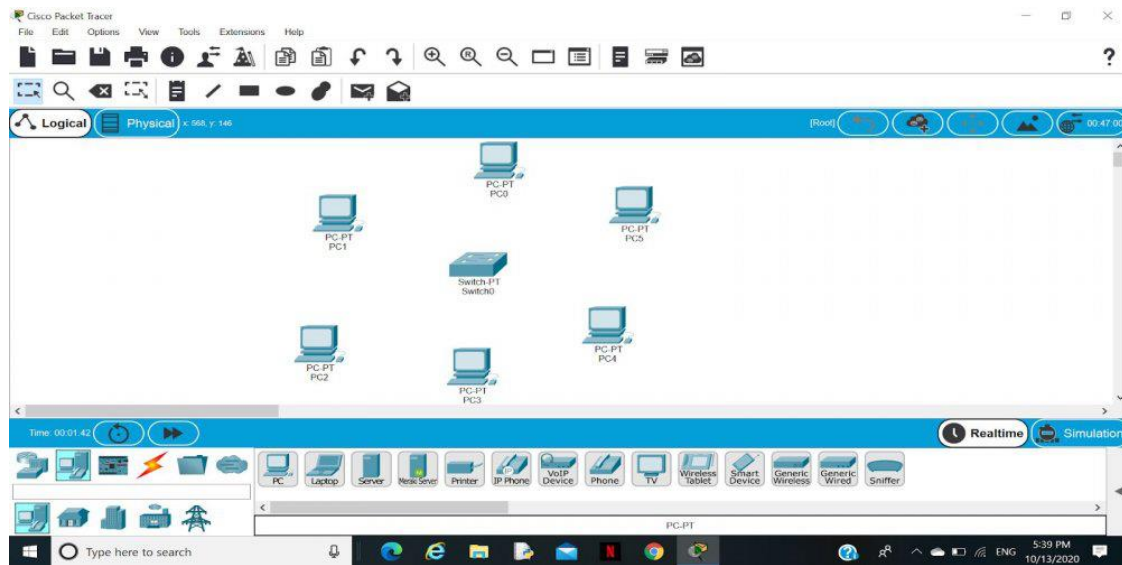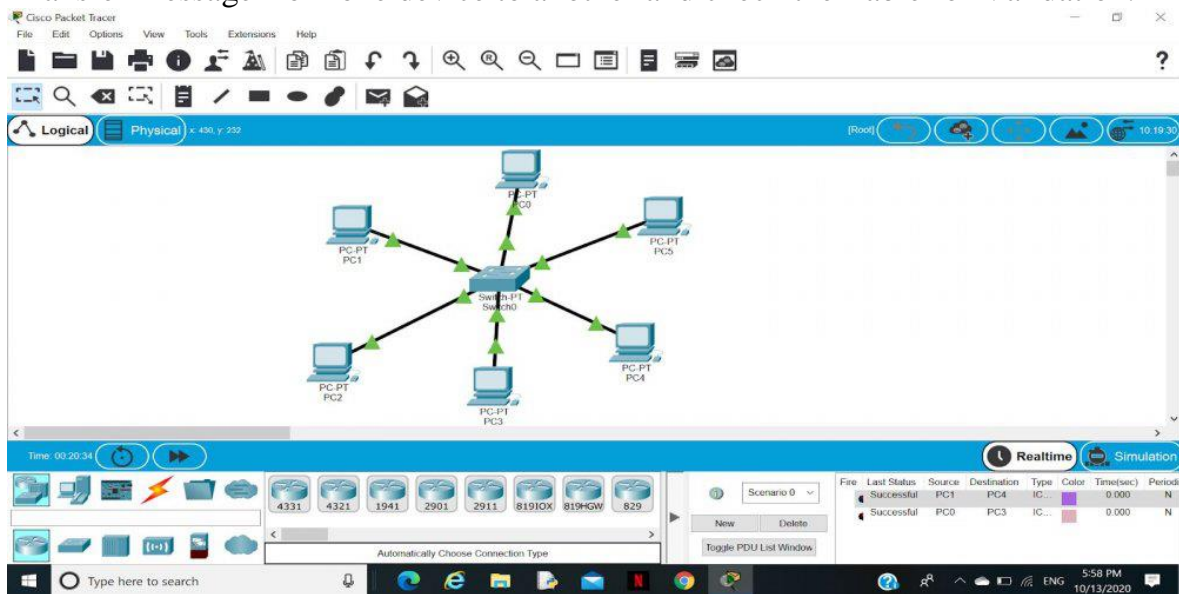
Step 2: Link every device with the switch.
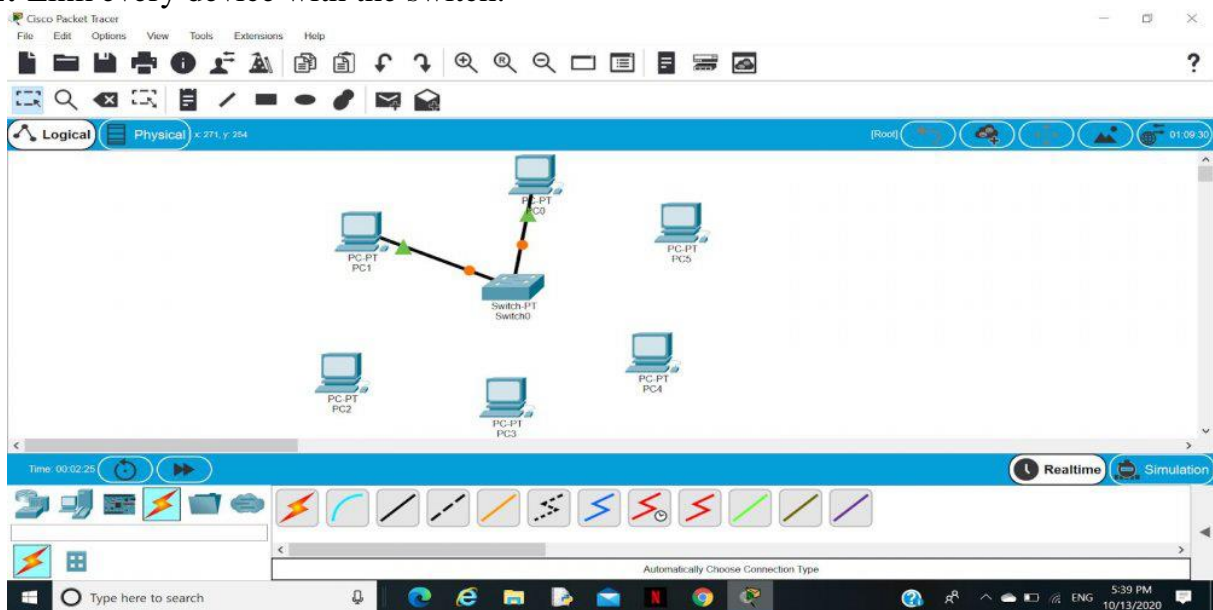
Step 3: Provide the IP address to each device.

Step 4: Transfer message from one device to another and check the Table for Validation.

Now to check whether the connections are correct or not try to ping any device and the image below is doing the same.

To do ping one terminal of one device and run the following command:
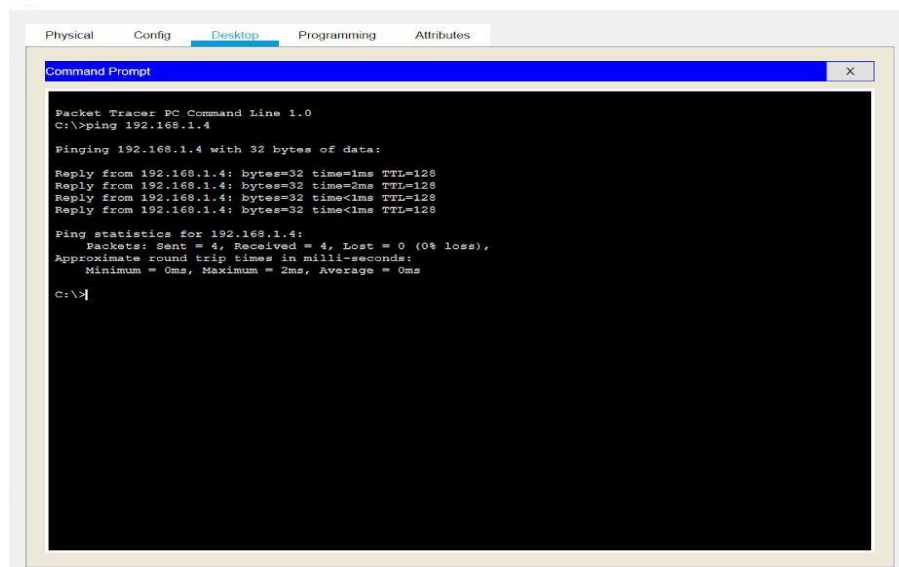
Command:

```
"ping ip_address_of _any_device"
```

Example:
```
ping 192.168.1.4
```

```
Note:If the connections are correct then you will receive the response.
```


Implementation of Ring Topology in Cisco

Ring topology is a kind of arrangement of the network in which every device is linked with two other devices. This makes a circular ring of interconnected devices which gives it its name. Data is usually transmitted in one direction along the ring, known as a unidirectional ring. The data is delivered from one device to the next until it reaches the decided destination. In a bidirectional ring, data can travel in either direction.

To learn about Ring Topology refer to the Advantages and Disadvantages of ring topology article.

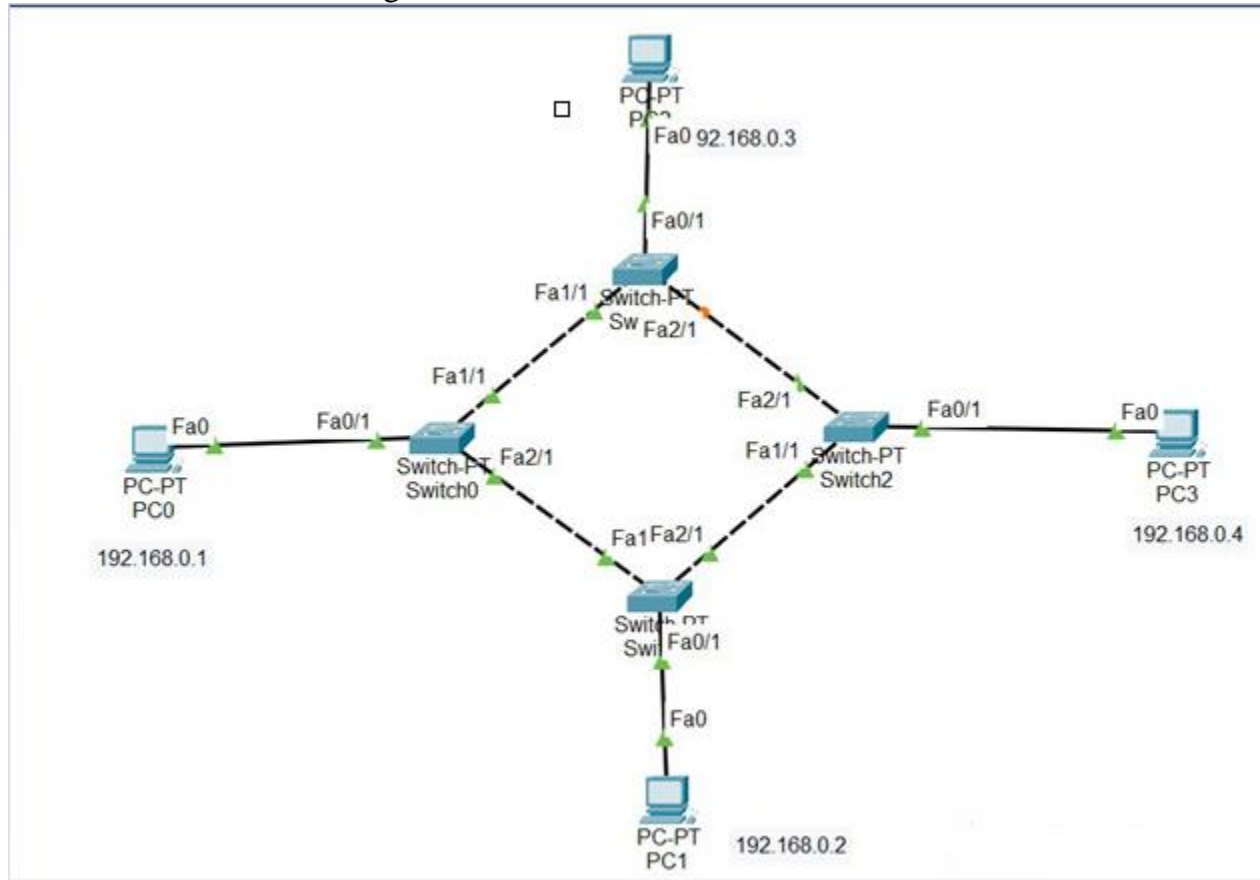**Steps to Configure and Setup Ring Topology in Cisco Packet Tracer :**

Step 1: First, open the cisco packet tracer desktop and select the devices given below:

S.NO	Device	Model Name
1.	PC	PC
2.	Switch	PT-Switch

IP Addressing Table

S.NO	Device	IPv4 Address	Subnet Mask
1.	pc0	192.168.0.1	255.255.255.0
2.	pc1	192.168.0.2	255.255.255.0
3.	pc2	192.168.0.3	255.255.255.0
4.	pc3	192.168.0.4	255.255.255.0

- Then, create a network topology as shown below the image.
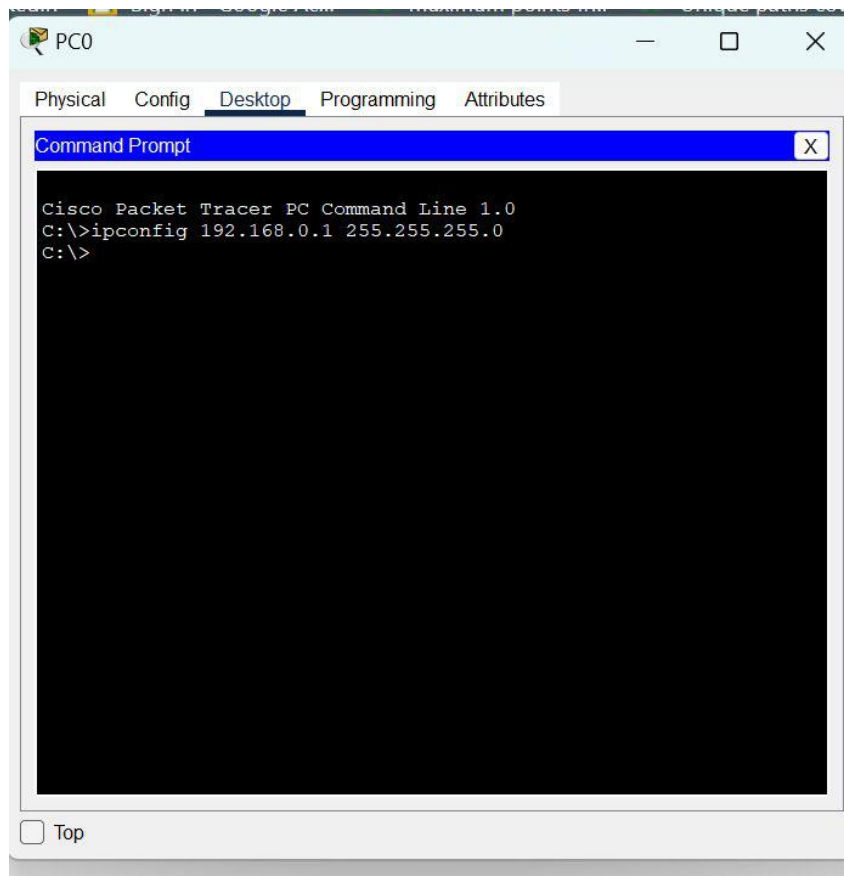- Use an Automatic connecting cable to connect the devices with others.

Step 2: Configure the PCs (hosts) with IPv4 address and Subnet Mask according to the IP addressing table given above.
- To assign an IP address in PC0, click on PC0.
- Then, go to desktop and then IP configuration and there you will IPv4 configuration.
- Fill IPv4 address and subnet mask.

- Assigning IP address using the ipconfig command, or we can also assign an IP address with the help of a command.
- Go to the command terminal of the PC.
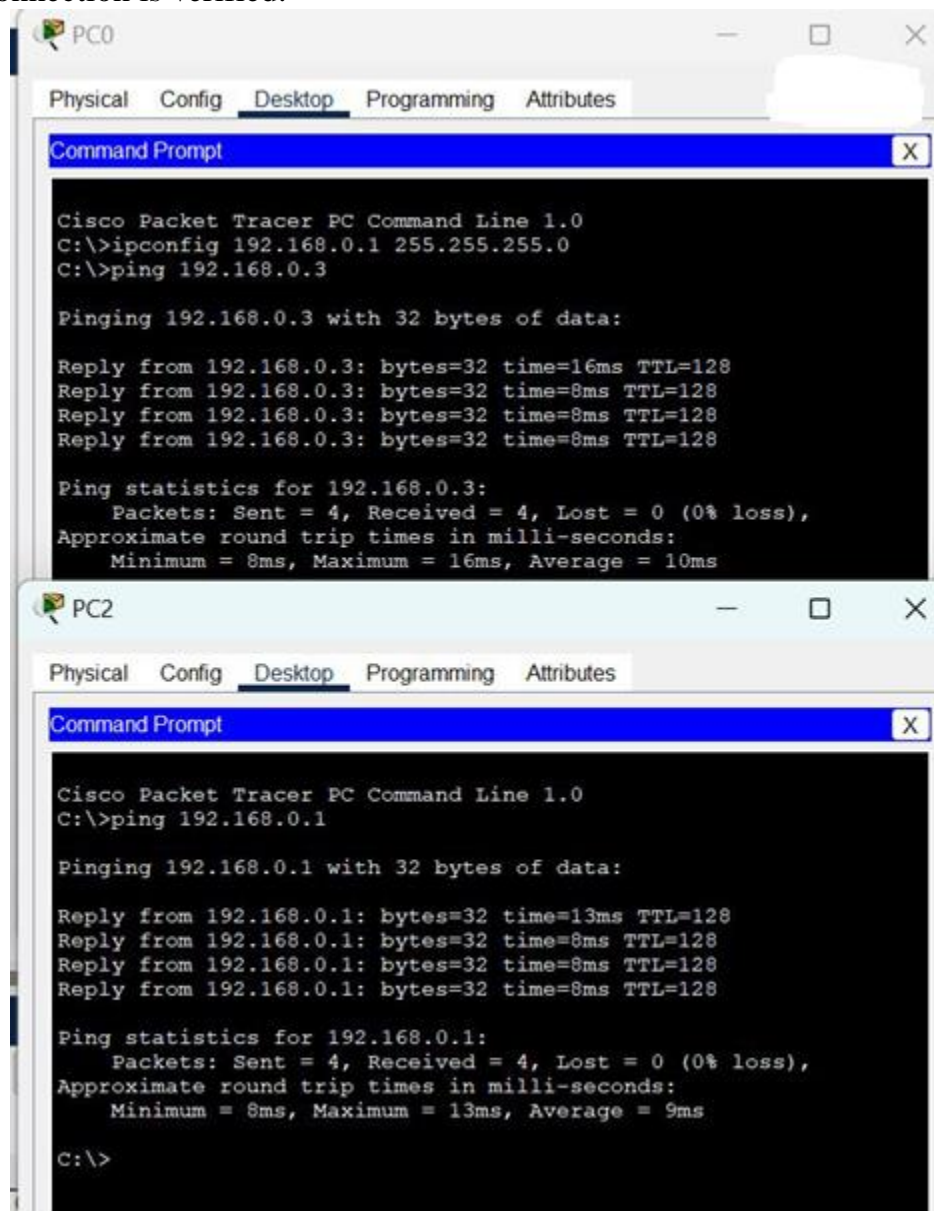- Then, type ipconfig <IPv4 address><subnet mask><default gateway>(if needed)
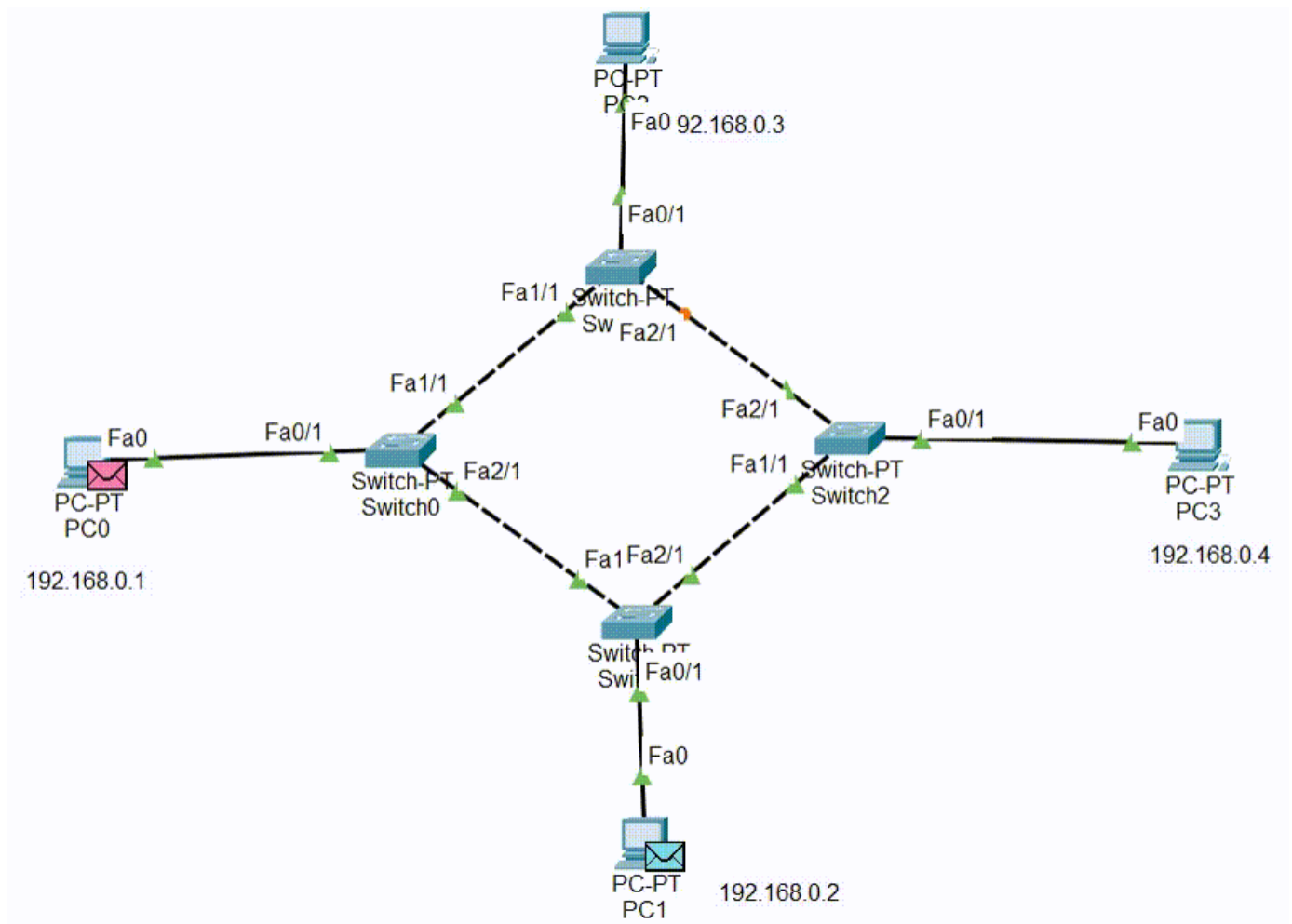
Example: `ipconfig 192.168.0.1 255.255.255.0`

- Repeat the same procedure with other PCs to configure them thoroughly.

Step 3: Verify the connection by pinging the IP address of any host in PC0.

- Use the ping command to verify the connection.
- As we can see we are getting replies from a targeted node on both PCs.
- Hence the connection is verified.

- A simulation of the experiment is given below we have sent two PDU packets one targeted from PC0 to PC2 and another targeted from PC1 to PC3.

Implementation of Tree Topology in Cisco

In the tree topology of networking, the elements and devices are arranged like a tree structure and have branches of connections between the devices connected to each other. To implement tree topology in Cisco there are various steps as follows:

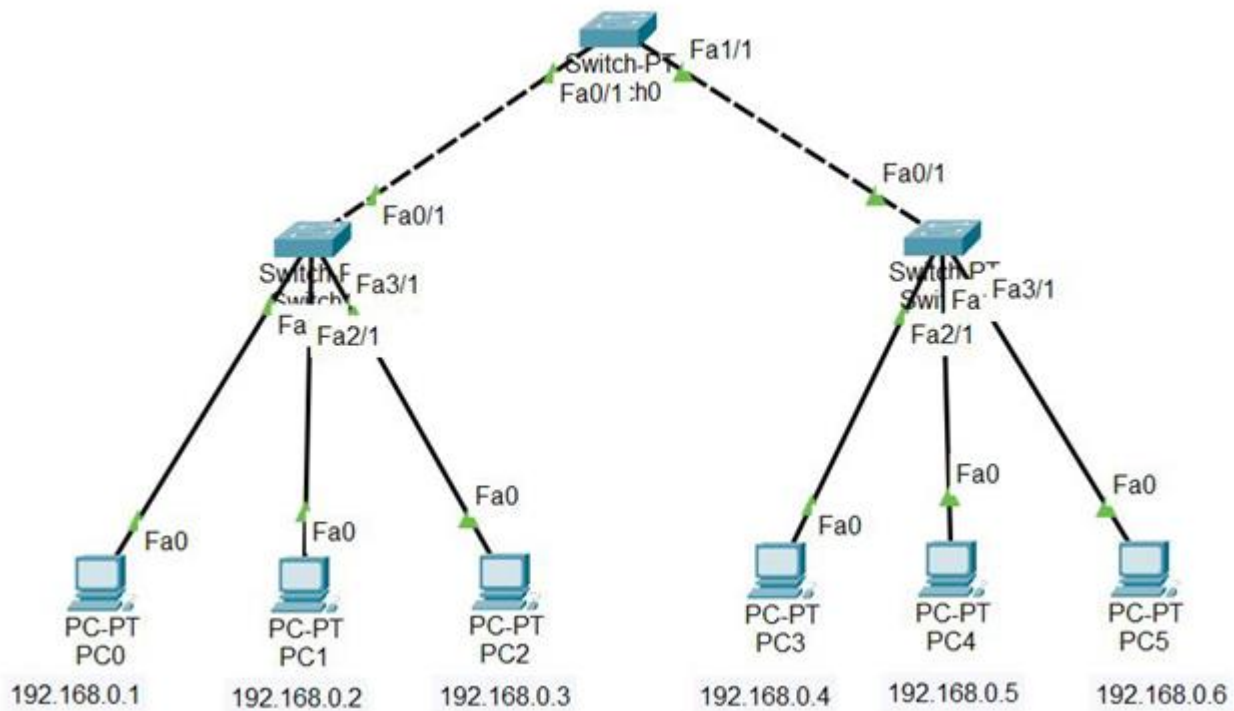### Steps to Configure and Setup Tree Topology in Cisco Packet Tracer:

Step 1: First, open the Cisco packet tracer desktop and select the devices given below:

S.NO	Device	Model-Name
1.	PC	PC
2.	switch	PT-switch

IP Addressing Table

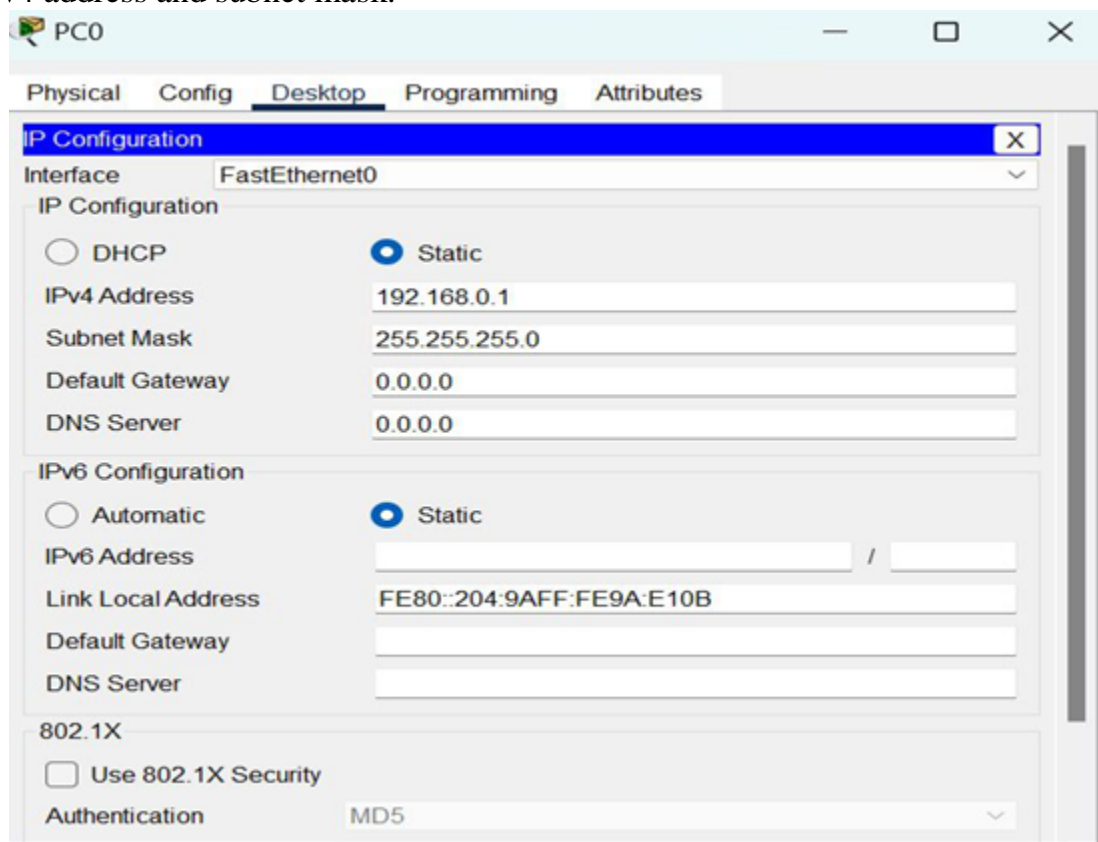| S.NO	Device	IPv4 Address	Subnet Mask
1.	pc0	192.168.0.1	255.255.255.0
2.	pc1	192.168.0.2	255.255.255.0
3.	pc2	192.168.0.3	255.255.255.0
4.	pc3	192.168.0.4	255.255.255.0
5.	pc4	192.168.0.5	255.255.255.0
6.	pc5	192.168.0.6	255.255.255.0

- Then, create a network topology as shown below the image.
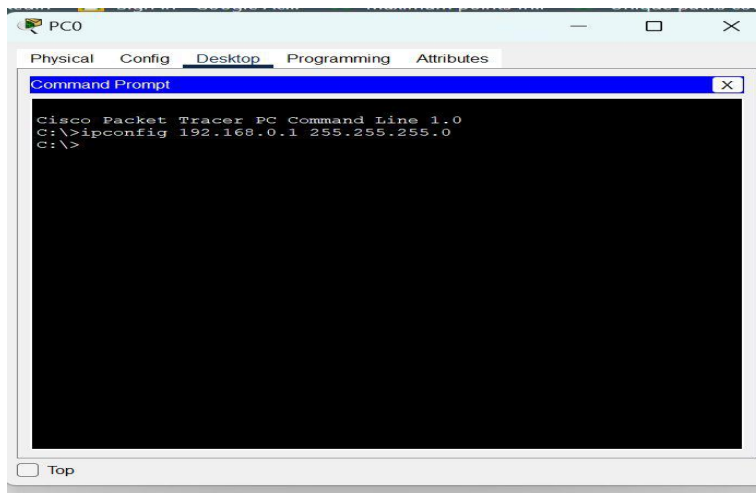- Use an Automatic connecting cable to connect the devices with others.

Step 2: Configure the PCs (hosts) with IPv4 address and Subnet Mask according to the IP addressing table given above.

- To assign an IP address in PC0, click on PC0.
- Then, go to desktop and then IP configuration and there you will IPv4 configuration.

- Fill IPv4 address and subnet mask.

- Assigning an IP address using the ipconfig command, or we can also assign an IP address with the help of a command.
- Go to the command terminal of the PC.
- Then, type ipconfig <IPv4 address><subnet mask><default gateway>(if needed)
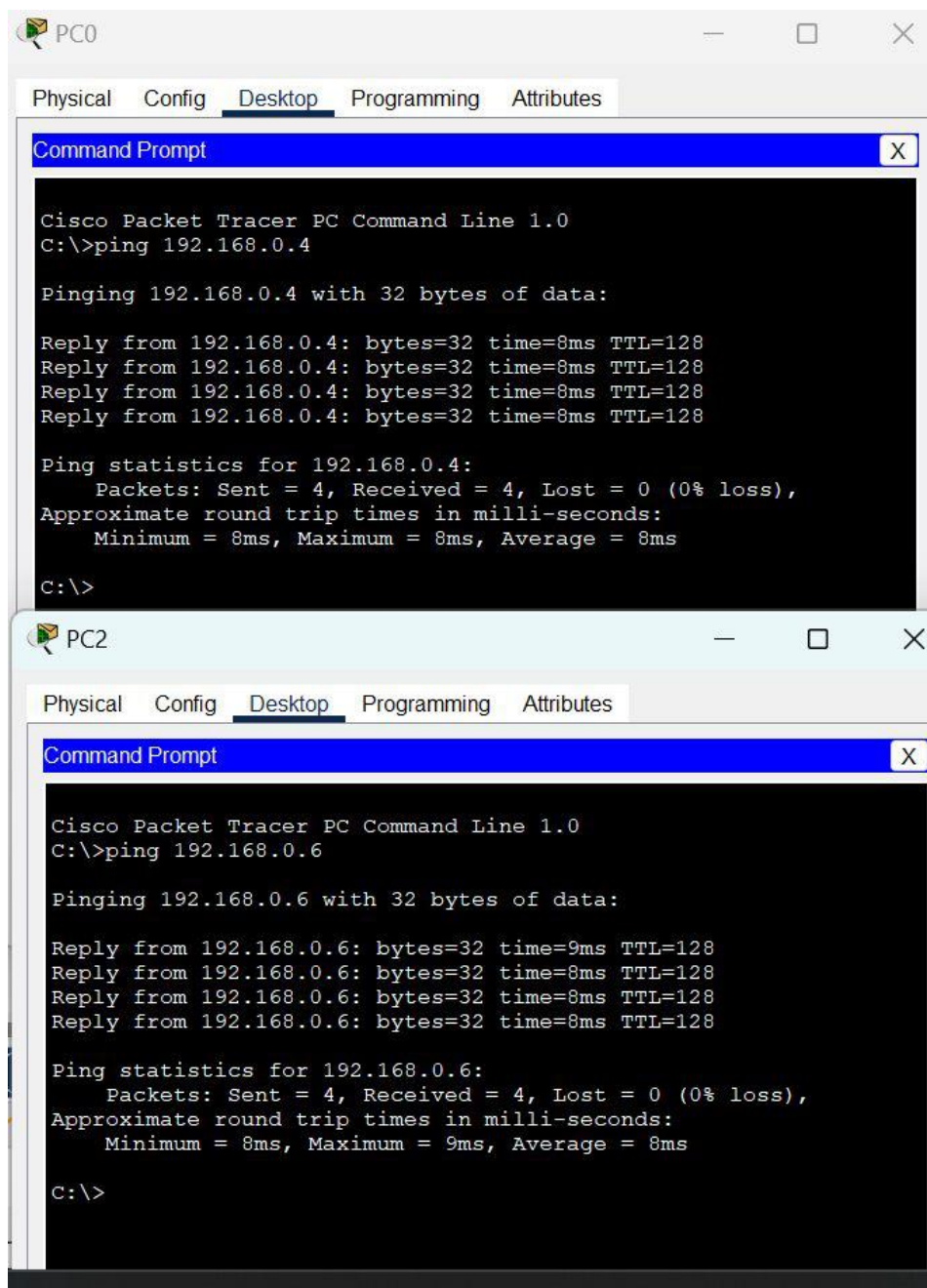
```
Example: ipconfig 192.168.0.1 255.255.255.0
```

- Repeat the same procedure with other PCs to configure them thoroughly.

Step 3: Verify the connection by pinging the IP address of any host in PC0.

- Use the ping command to verify the connection.
- We will check if we are getting any replies or not.
- As we can see, we are getting replies from a targeted node on both PCs.
- Hence the connection is verified.

```
ping <targeted node's IP address>
```

- A simulation of the experiment is given below we have sent two PDU packets one targeted from PC0 to PC3 and another targeted from PC1 to PC5.