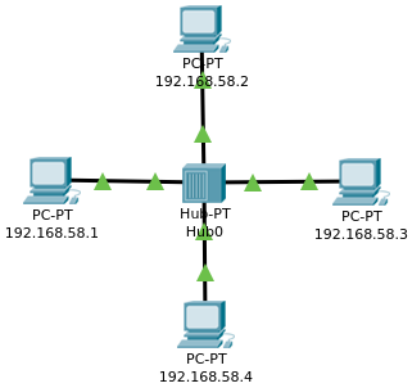
Practical Assignment – 2: Network Topologies

7358 | Umang Kumar | 10 August 2022

Demonstration 1: Star Topology

In the star topology, all the computers connect with the help of a hub. This cable is called a central node, and all other nodes are connected using this central node. It is most popular on LAN networks as they are inexpensive and easy to install.

With Hub:



With Switch:

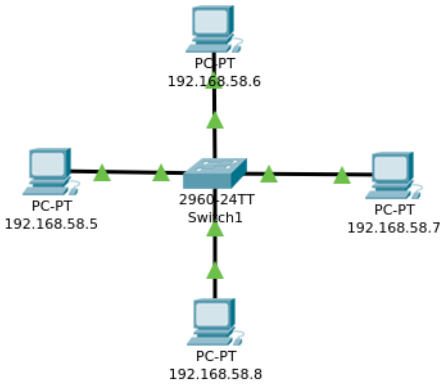


Figure 1

Advantages:

- Easy to troubleshoot, set up, and modify.
- Only those nodes are affected, that has failed. Other nodes still work.
- Fast performance with few nodes and very low network traffic.
- In Star topology, addition, deletion, and moving of the devices are easy.

Disadvantages:

- If the hub or concentrator fails, attached nodes are disabled.
- Cost of installation of star topology is costly.
- Heavy network traffic can sometimes slow the bus considerably.
- Performance depends on the hub's capacity.
- A damaged cable or lack of proper termination may bring the network down.

Steps Implementing Star Topology using Cisco Packet Tracer:

Step 1: Take a Hub/Switch and link it to four end devices.
Step 2: Provide the IP address to each device.
Step 3: Transfer message from one device to another and check the Table for Validation.

1. **With Hub**

Screenshots of Star Topology Simulation, using Hub. (Packet transfer from 192.168.58.1 to 192.168.58.3)

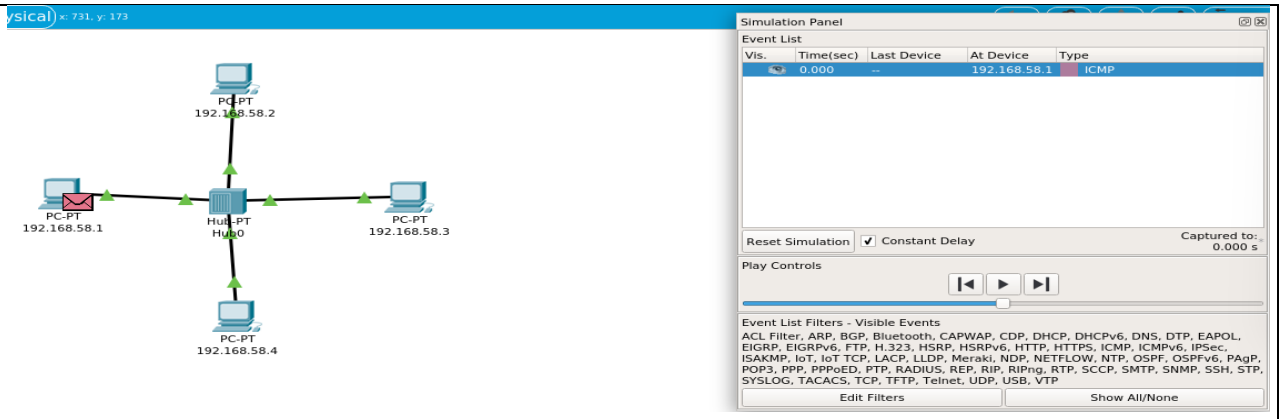


Figure 2

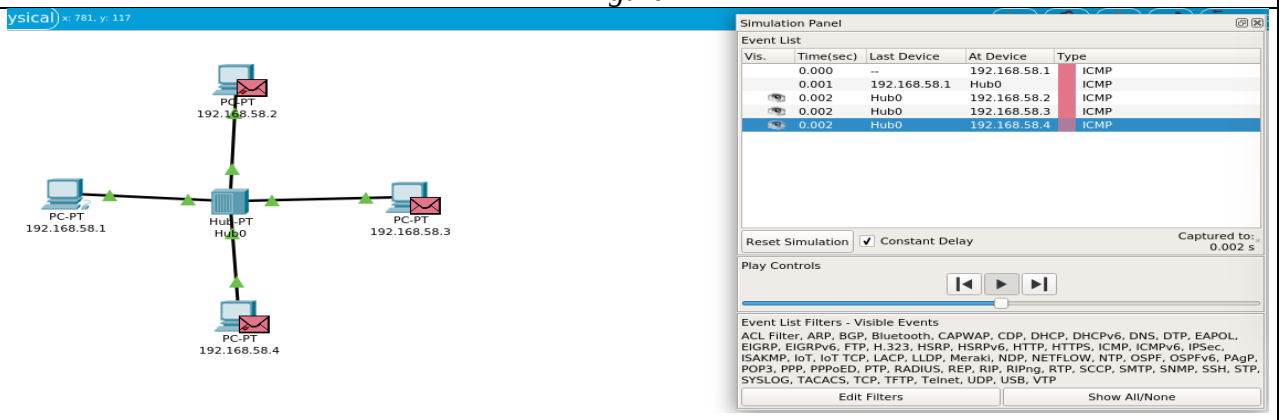


Figure 3

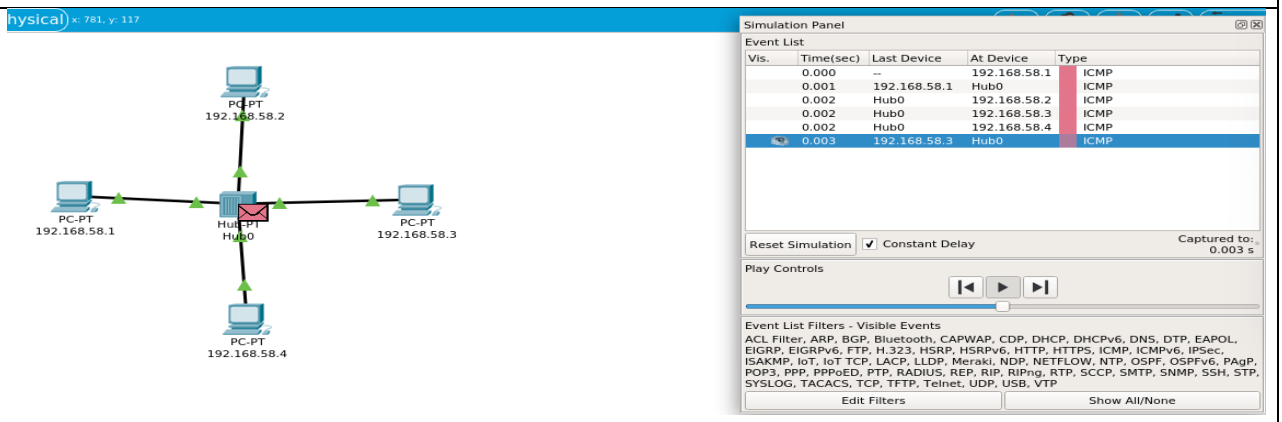


Figure 4

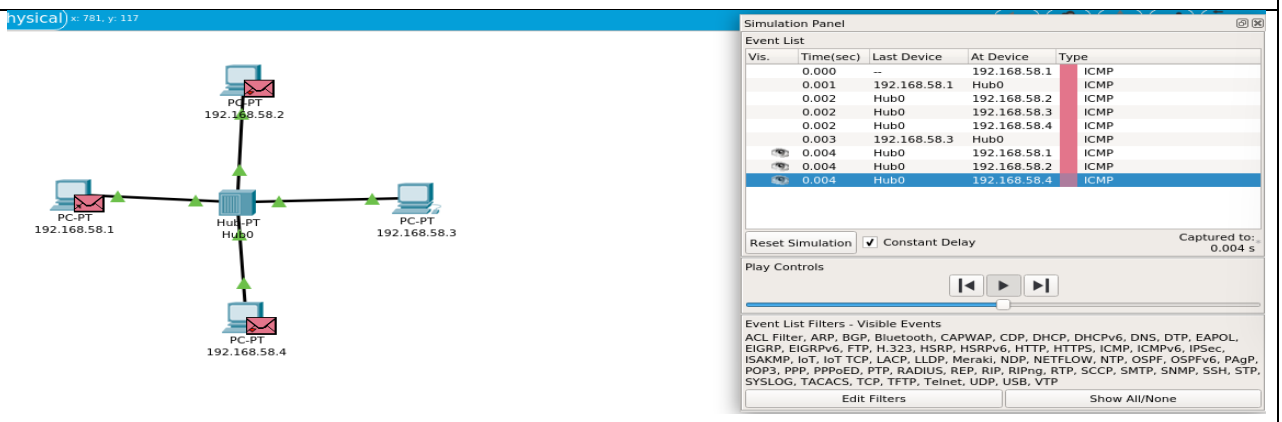


Figure 5

Simulation Panel

Screenshot of Simulation Panel, for the above implemented topology.

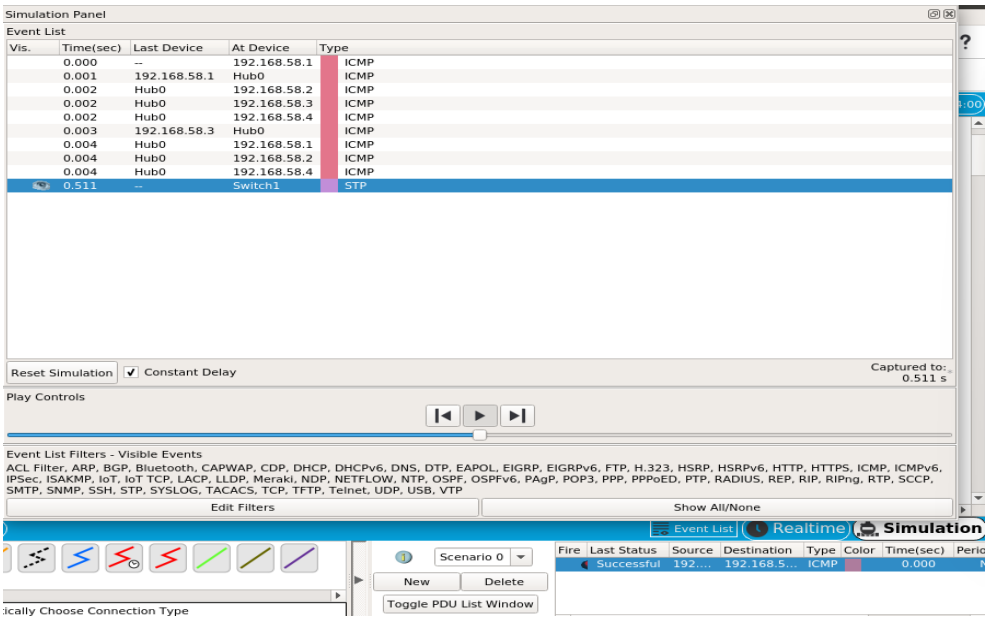


Figure 6

IP Addresses

IP configurations of the devices used for demonstration.

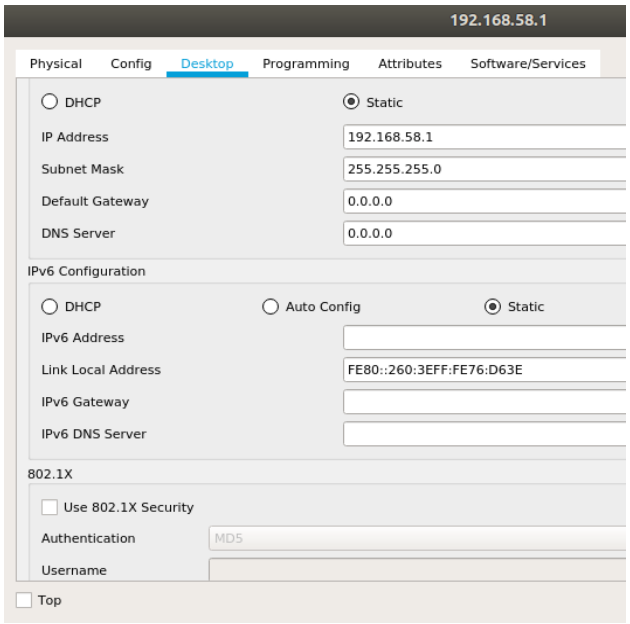


Figure 7

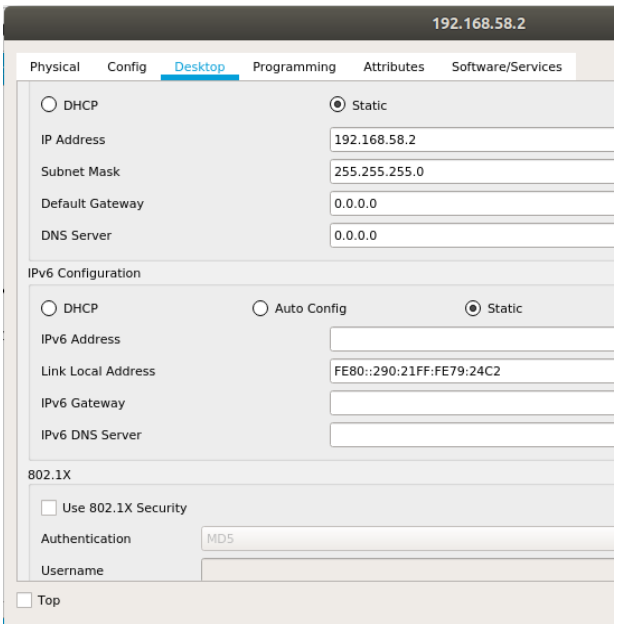


Figure 8

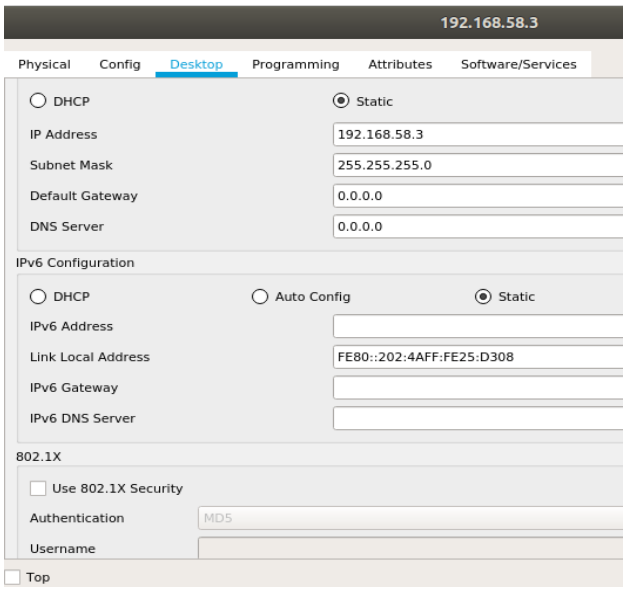


Figure 9

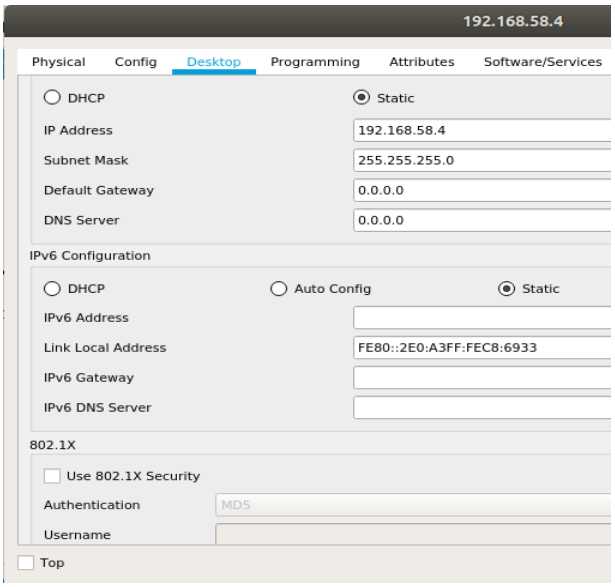


Figure 10

Ping

Screenshot of Star Topology Simulation, using ping. (Packet transfer from 192.168.58.1 to 192.168.58.4)

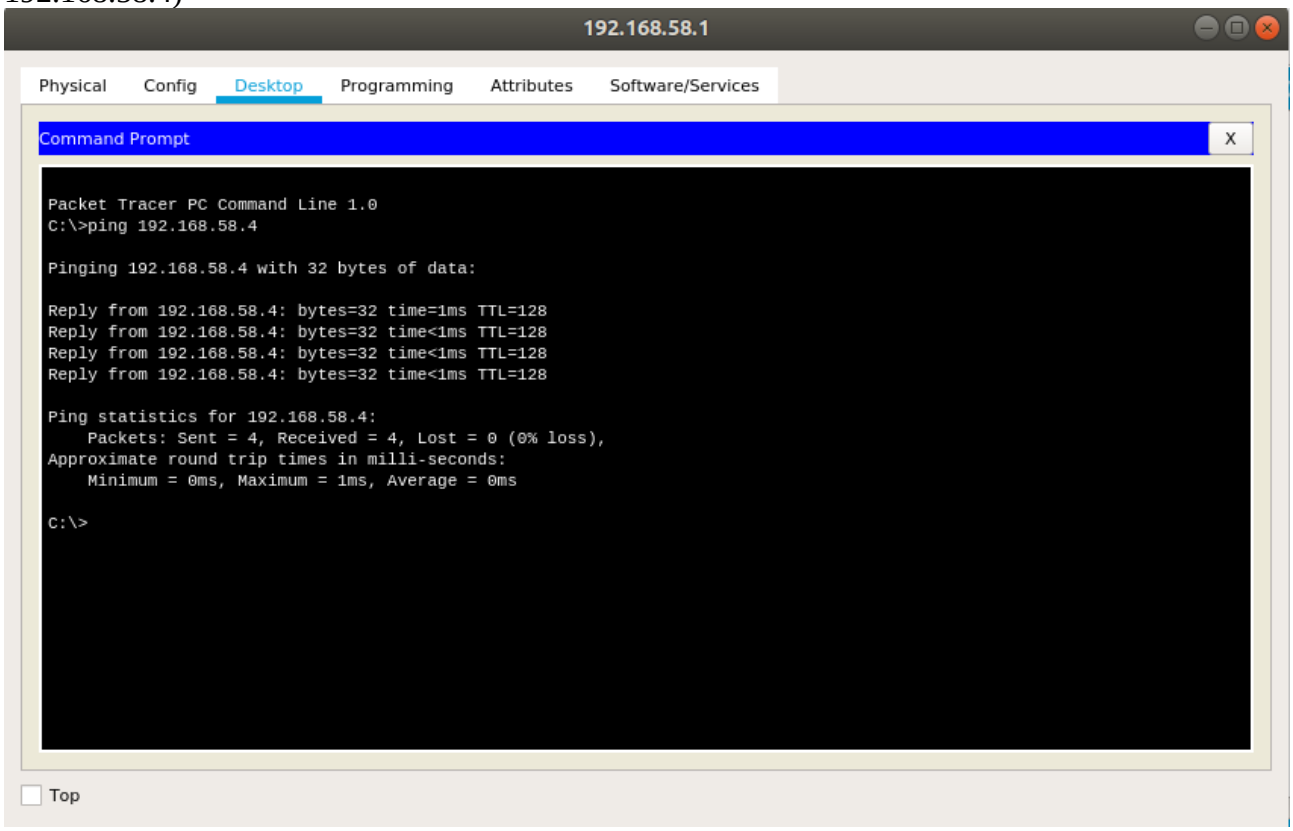


Figure 11

2. With Switch

Screenshots of Star Topology Simulation, using Switch. (Packet transfer from 192.168.58.5 to 192.168.58.8).

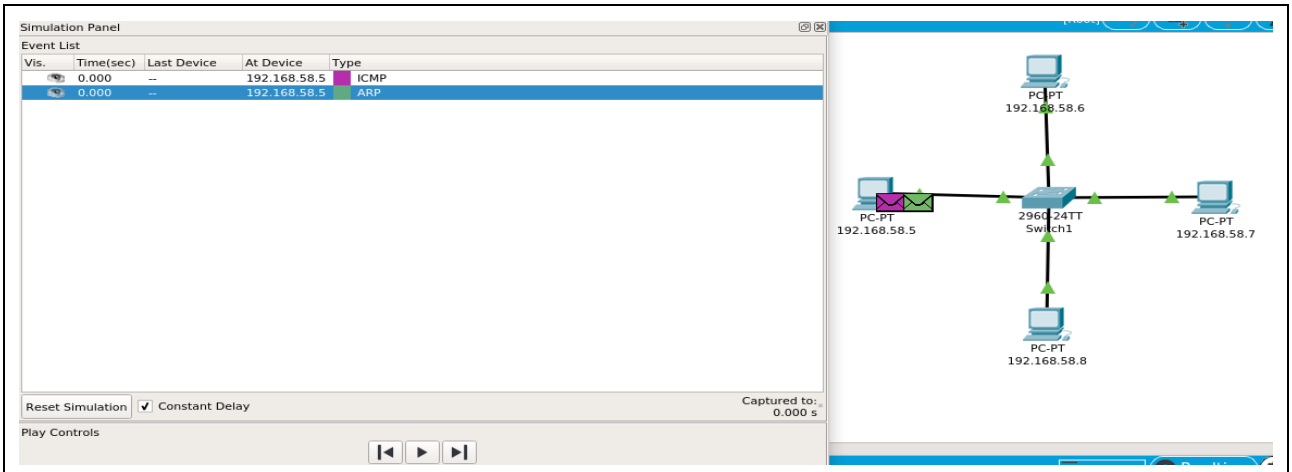


Figure 12

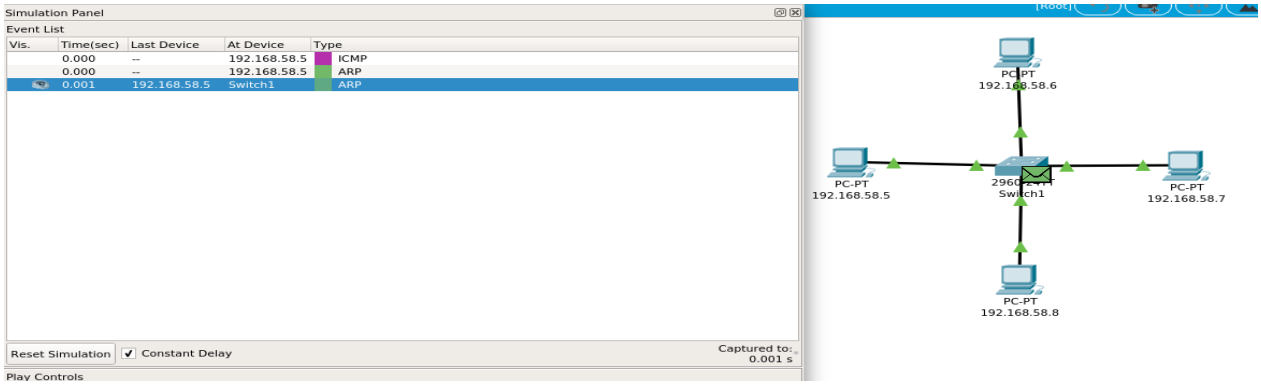


Figure 13

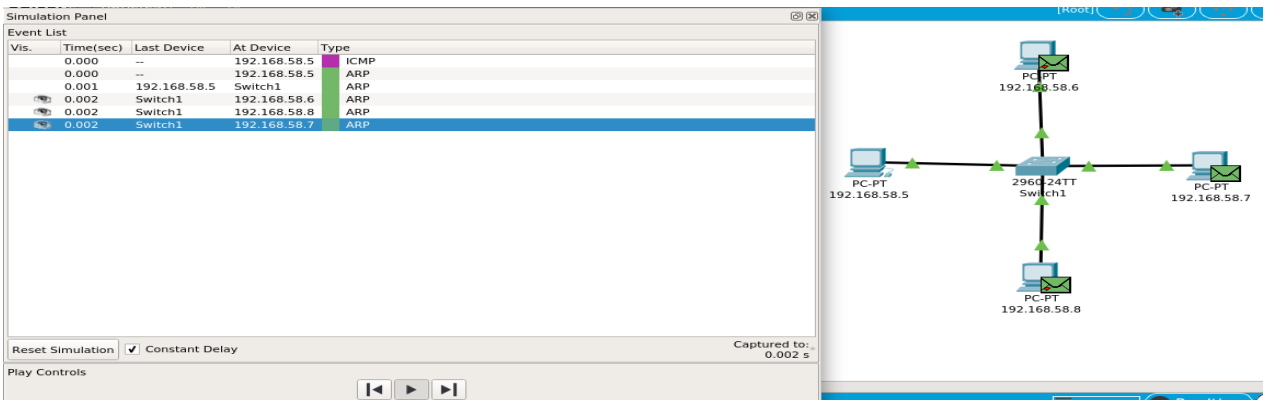


Figure 14

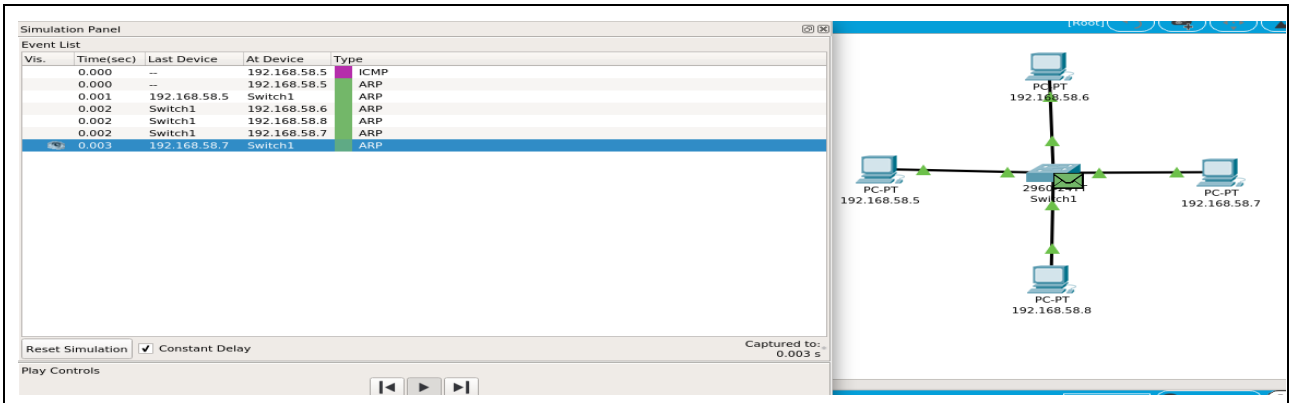


Figure 15

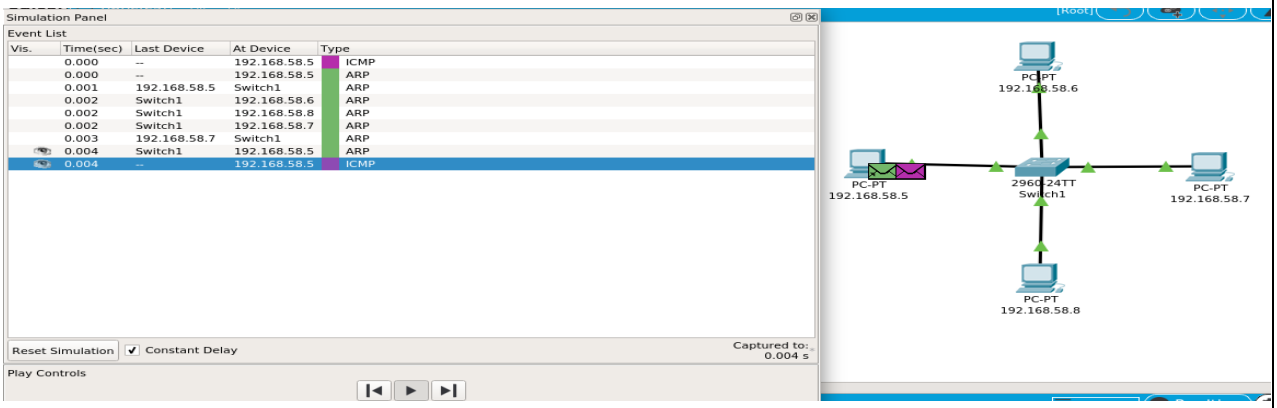


Figure 16

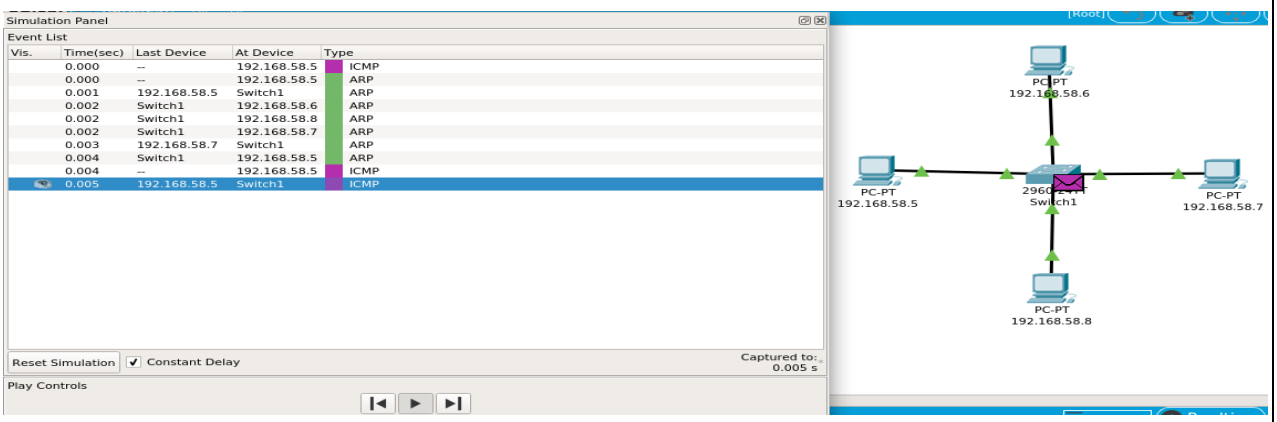


Figure 17

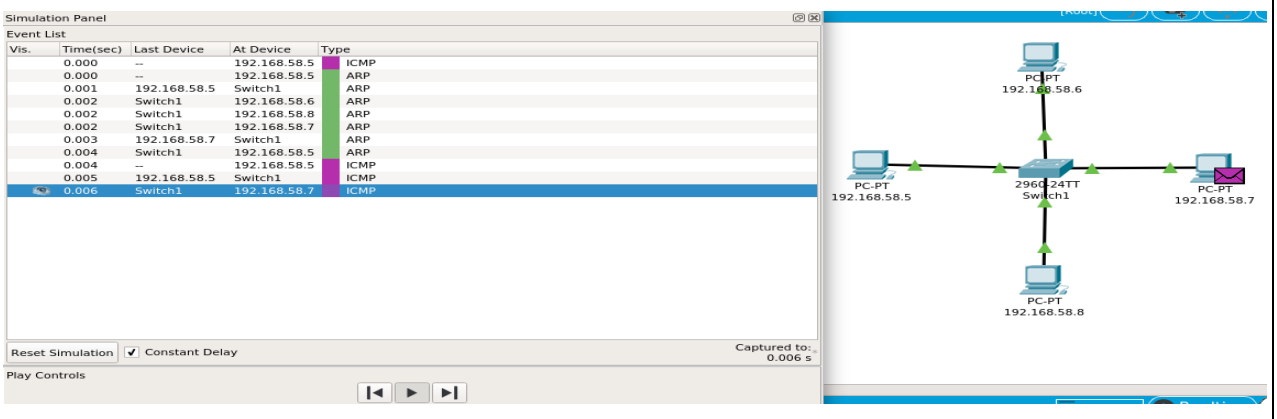


Figure 18

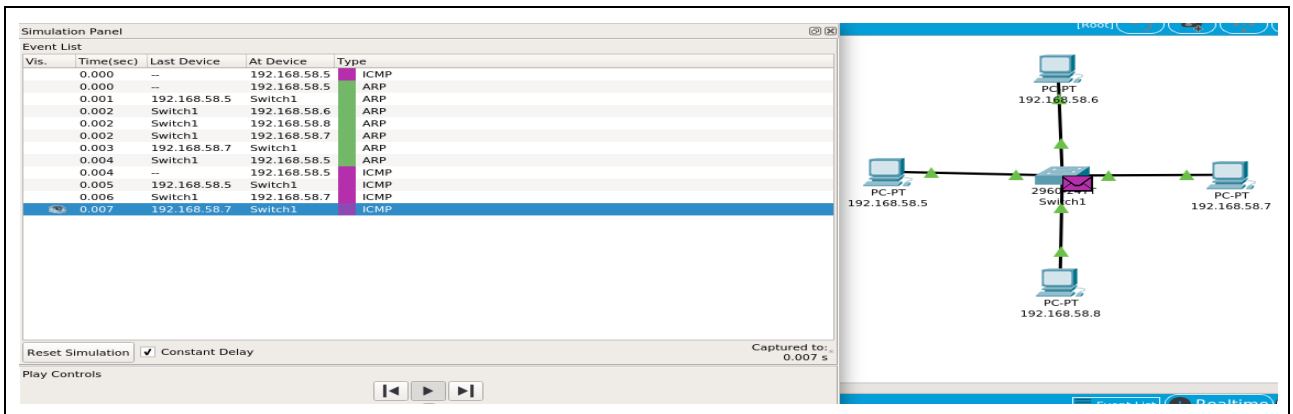


Figure 19

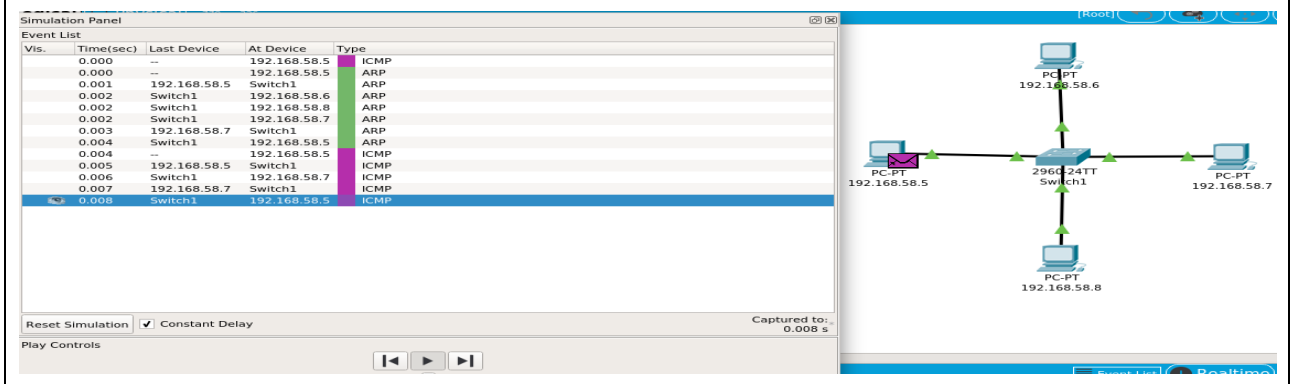


Figure 20

Simulation Panel

Screenshot of Simulation Panel, for the above implemented topology.

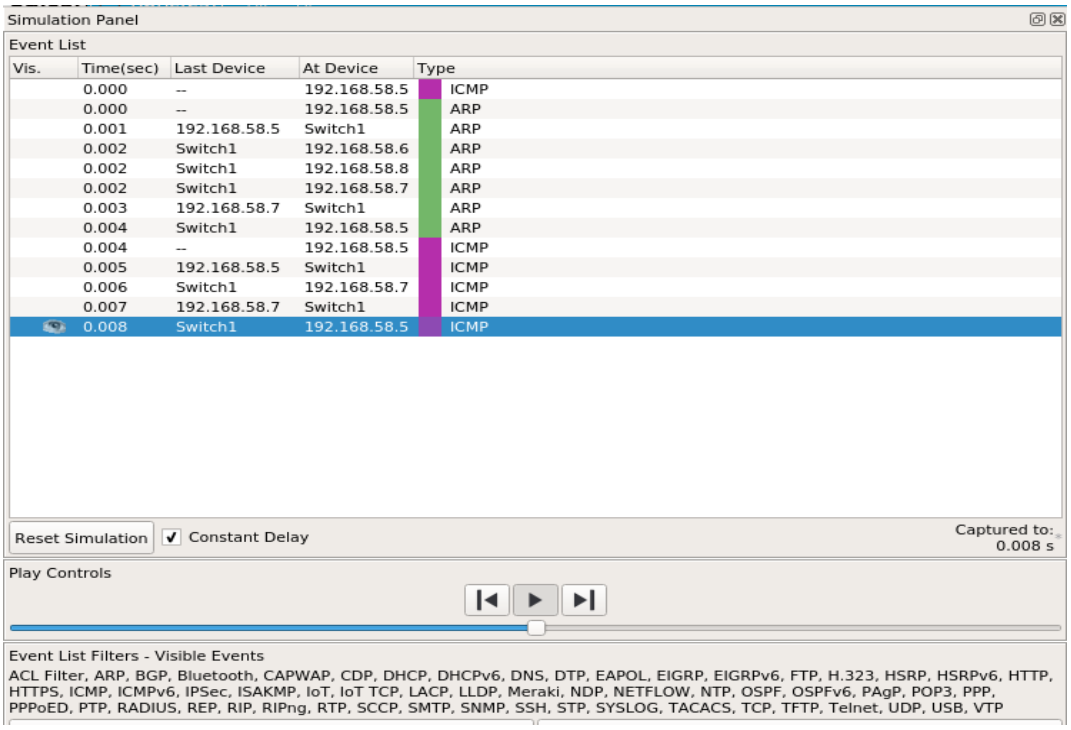


Figure 21

IP Addresses

IP configurations of the devices used for demonstration.

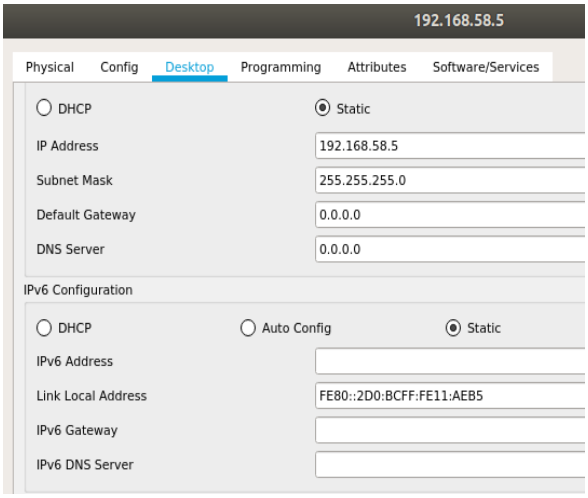


Figure 22

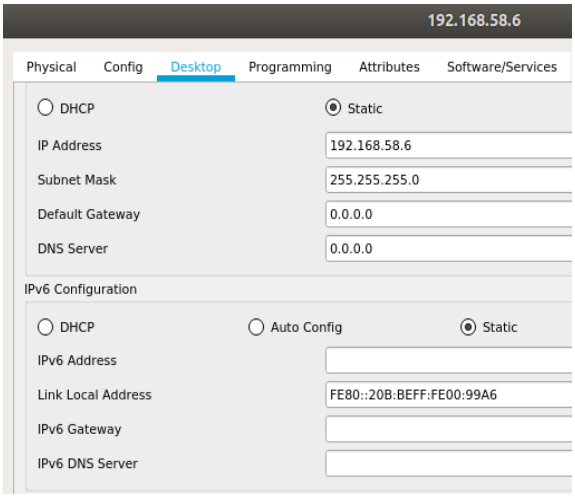


Figure 23

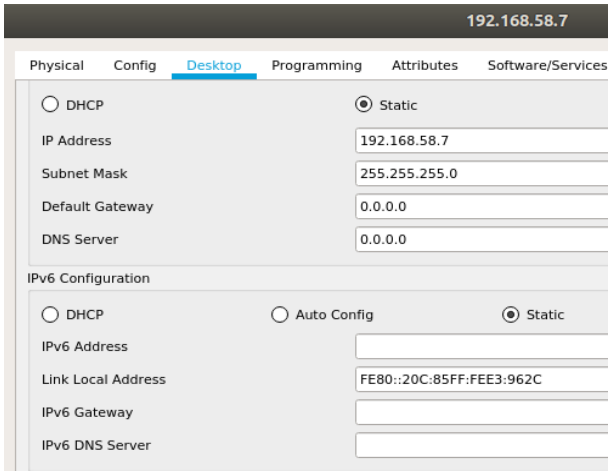


Figure 24

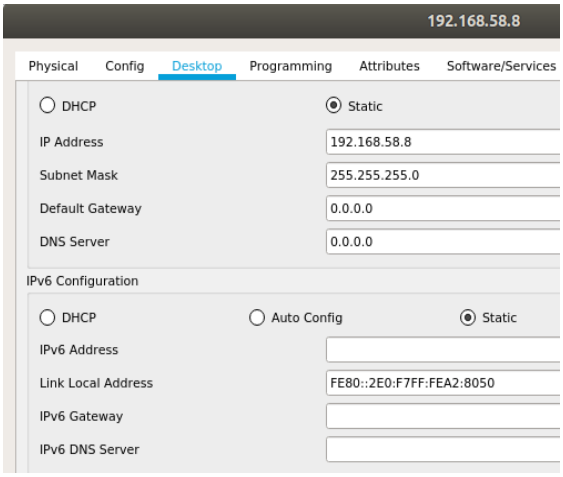


Figure 25

Demonstration 2: Bus Topology

Bus topology uses a single cable which connects all the included nodes. The main cable acts as a spine for the entire network. One of the computers in the network acts as the computer server. When it has two endpoints, it is known as a linear bus topology.

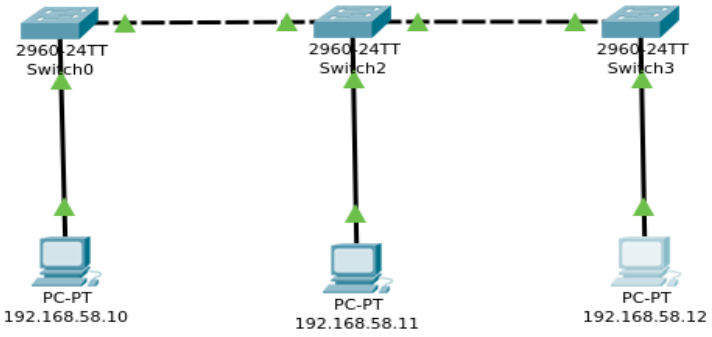


Figure 26

Advantages:

- Cost of the cable is very less as compared to other topology, so it is widely used to build small networks.
- Famous for LAN network because they are inexpensive and easy to install.
- It is widely used when a network installation is small, simple, or temporary.
- It is one of the passive topologies. So, computers on the bus only listen for data being sent, that are not responsible for moving the data from one computer to others.

Disadvantages:

- In case if the common cable fails, then the entire system will crash down.
- When network traffic is heavy, it develops collisions in the network.
- Whenever network traffic is heavy, or nodes are too many, the performance time of the network significantly decreases.
- Cables are always of a limited length.

Steps Implementing Bus Topology using Cisco Packet Tracer:

- Step 1: Take four switches and connect them to create the main cable.
- Step 2: Link every device with the main cable via 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.

Screenshots of Bus Topology Simulation. (Packet transfer from 192.168.58.1 to 192.168.58.3)

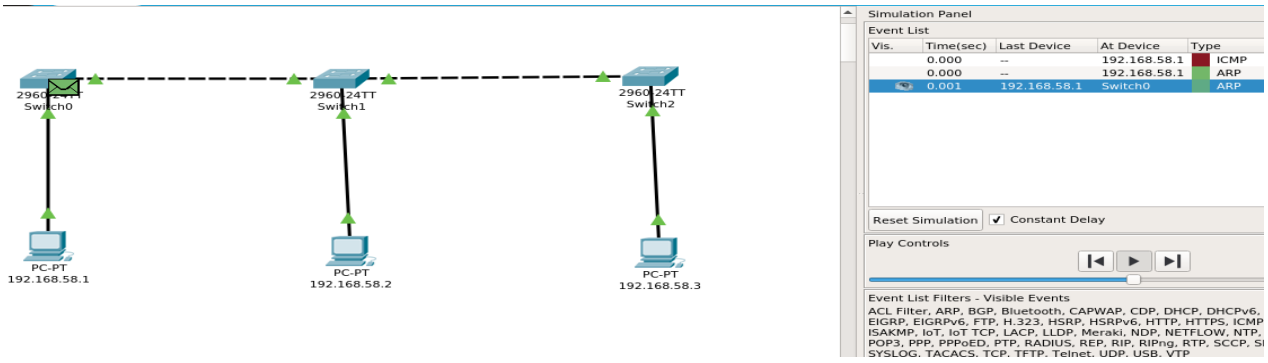


Figure 27

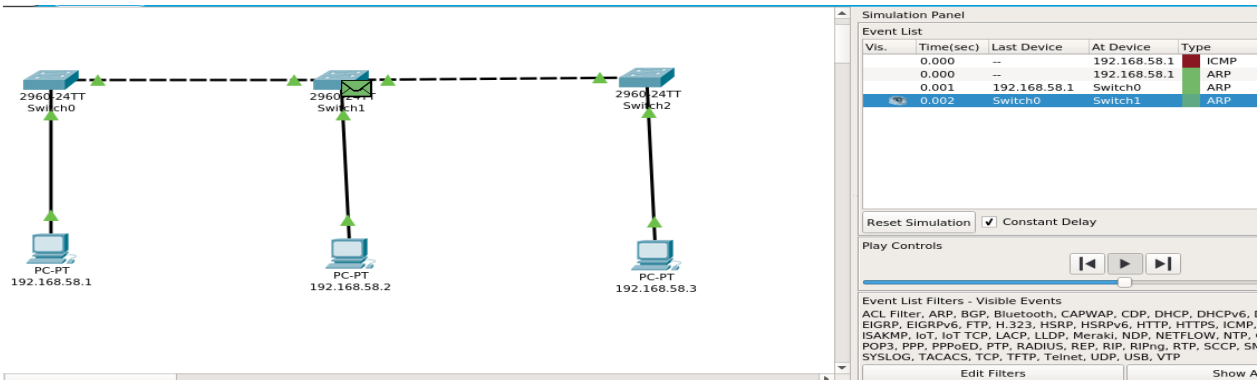


Figure 28

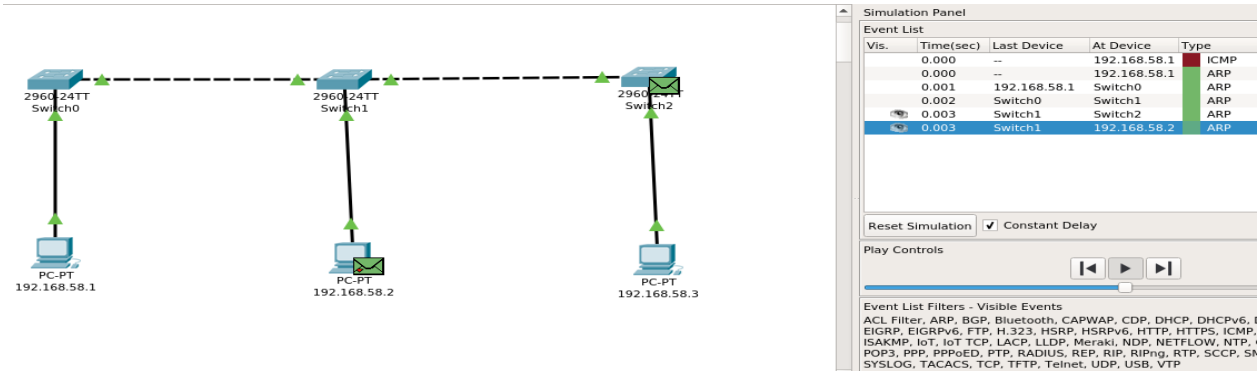


Figure 29

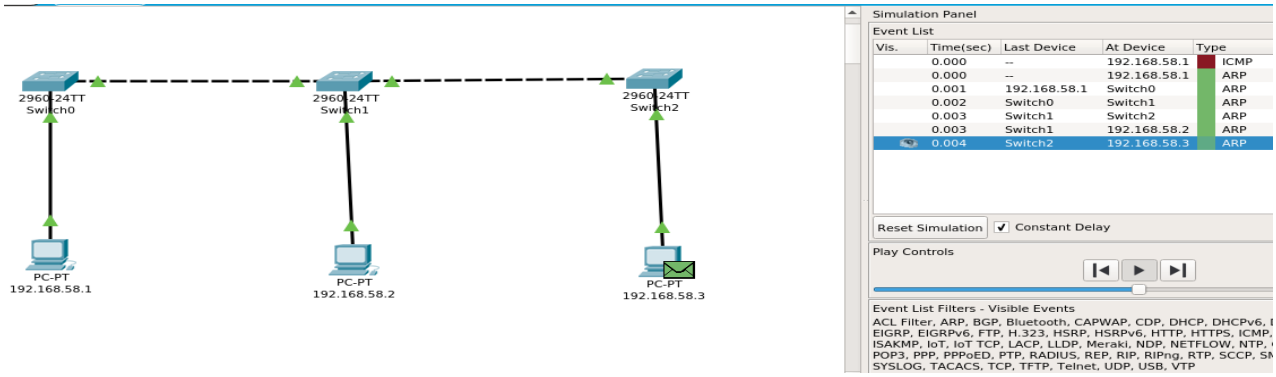


Figure 30

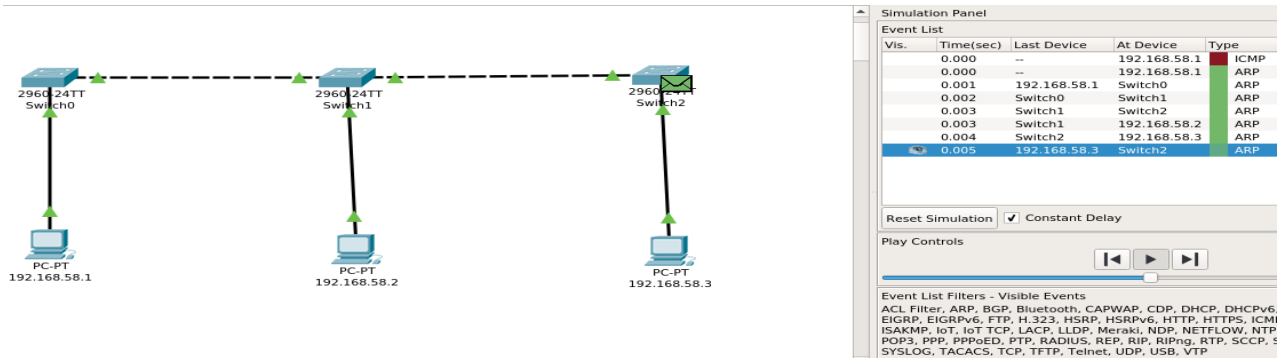


Figure 31

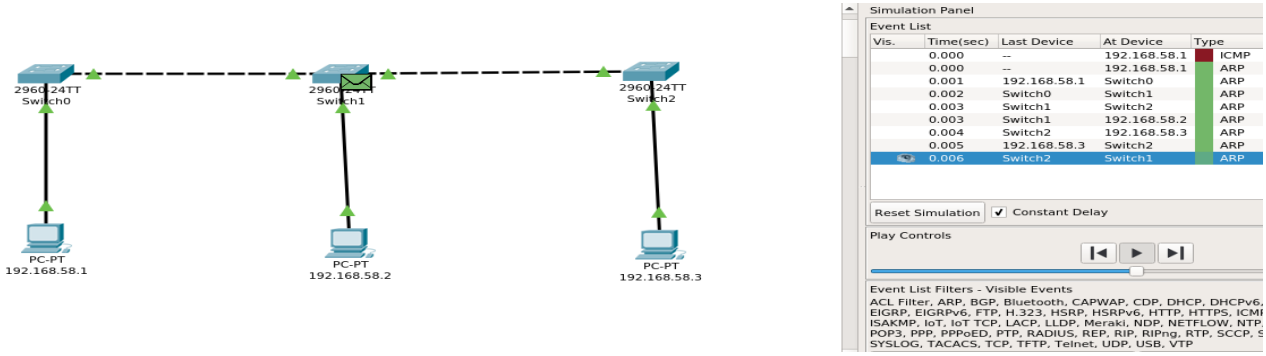


Figure 32

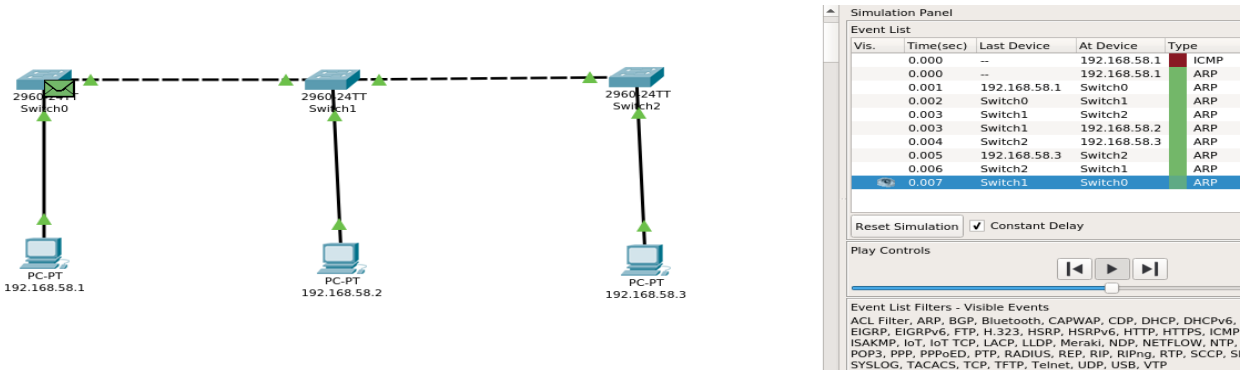


Figure 33

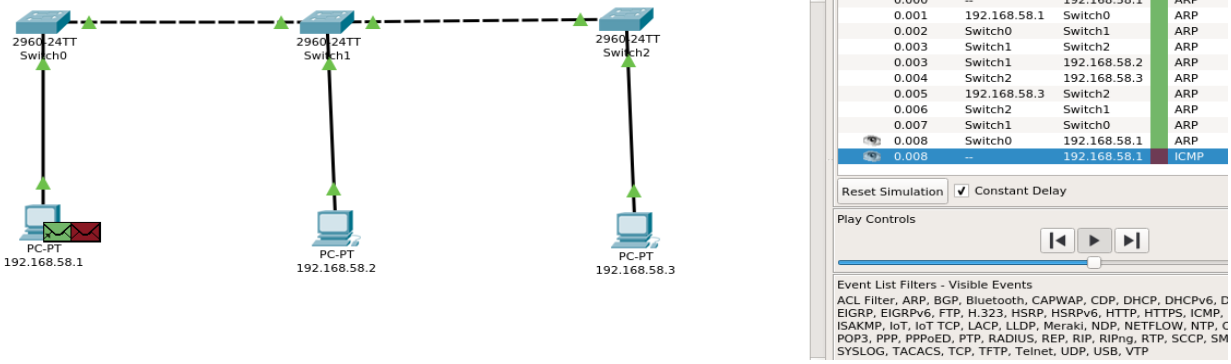


Figure 34

Simulation Panel

Screenshots of Simulation Panel, for the above implemented topology.

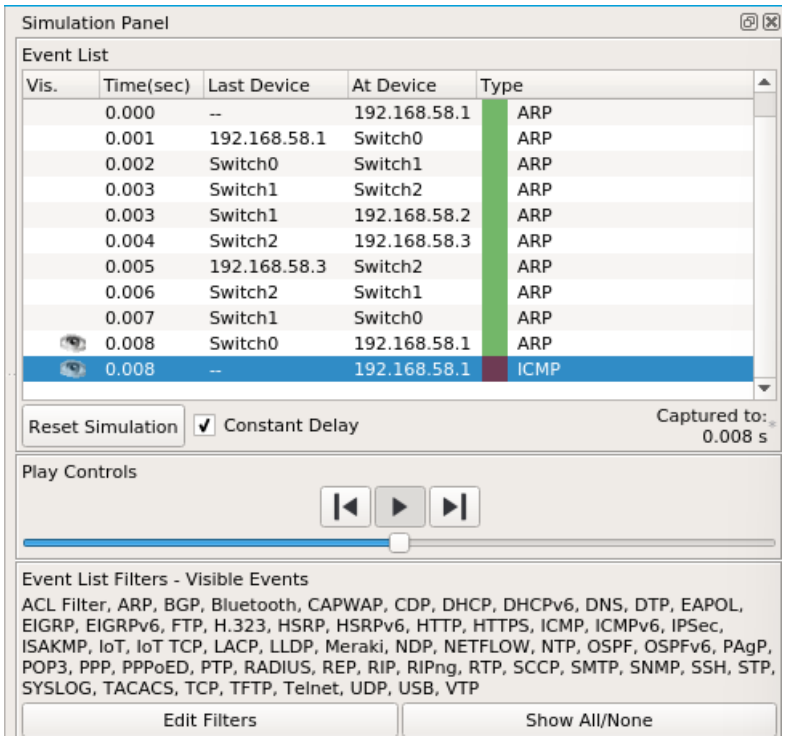


Figure 35

IP Addresses

IP configurations of the devices used for demonstration.

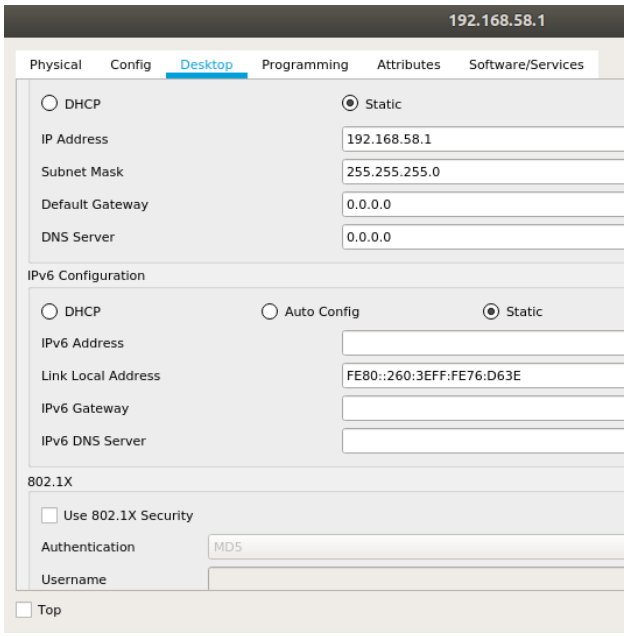


Figure 36

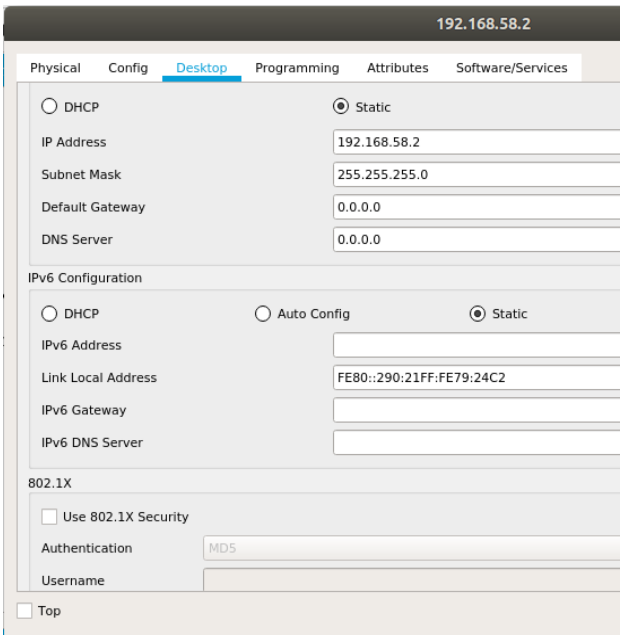


Figure 37

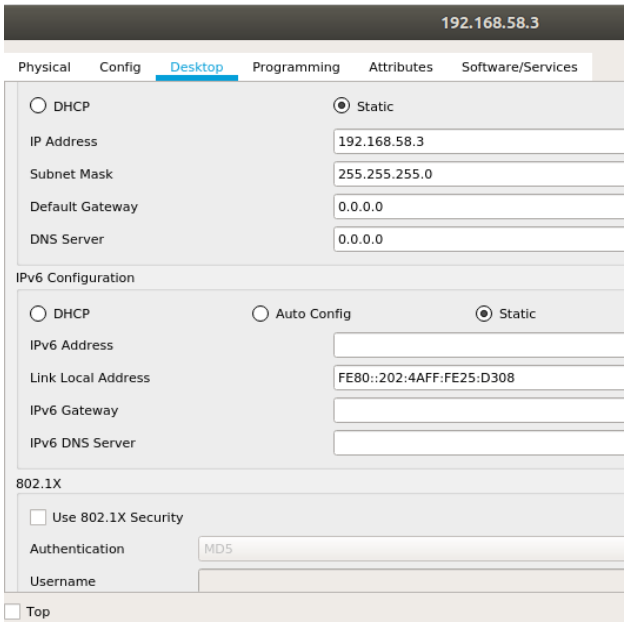


Figure 38

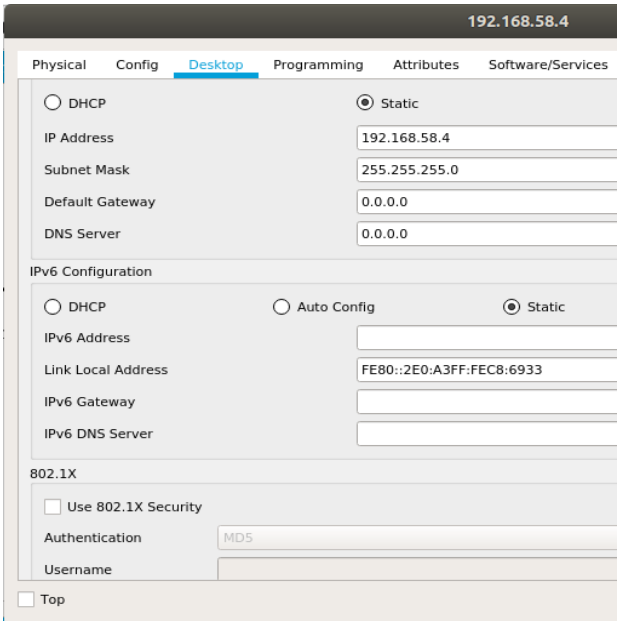


Figure 39

Demonstration 3:

Ring Topology In a ring network, every device has exactly two neighbouring devices for communication purpose. It is called a ring topology as its formation is like a ring. In this topology, every computer is connected to another computer. Here, the last node is combined with a first one. This topology uses token to pass the information from one computer to another. In this topology, all the messages travel through a ring in the same direction.

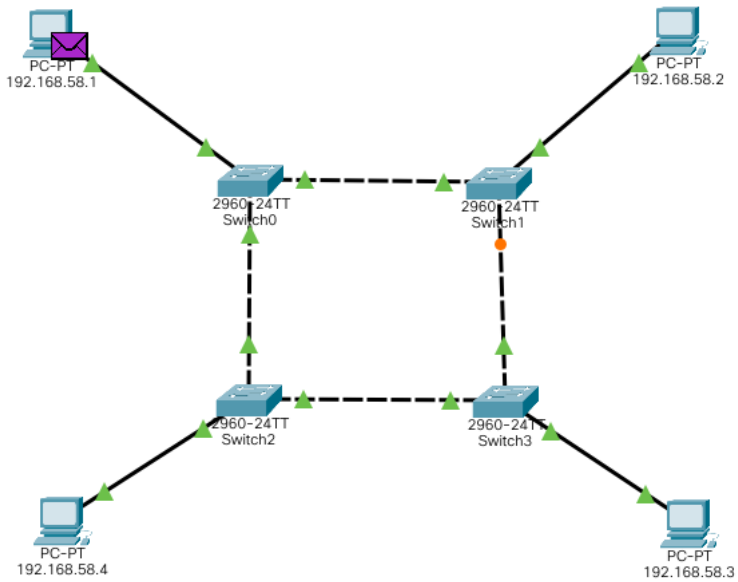


Figure 40

Advantages:

- Easy to install and reconfigure.
- Adding or deleting a device in-ring topology needs you to move only two connections.
- Offers equal access to all the computers of the networks.
- Faster error checking and acknowledgment.

Disadvantages:

- Unidirectional traffic.
- Break in a single ring can risk the breaking of the entire network.
- In the ring, topology signals are always circulating, which develops unwanted power consumption.
- It is very difficult to troubleshoot the ring network.
- Adding or removing the computers can disturb the network activity.

Steps Implementing Ring Topology using Cisco Packet Tracer:

- Step 1: Take four end devices and connect every end device to a different switch.
- Step 2: Link switches in a way such that every switch is connected to two other switches, forming a ring.
- Step 3: Provide the IP address to each device.
- Step 4: Transfer message from one device to another and check the Table for Validation.

Screenshots of Ring Topology Simulation. (Packet transfer from 192.168.58.1 to 192.168.58.3)

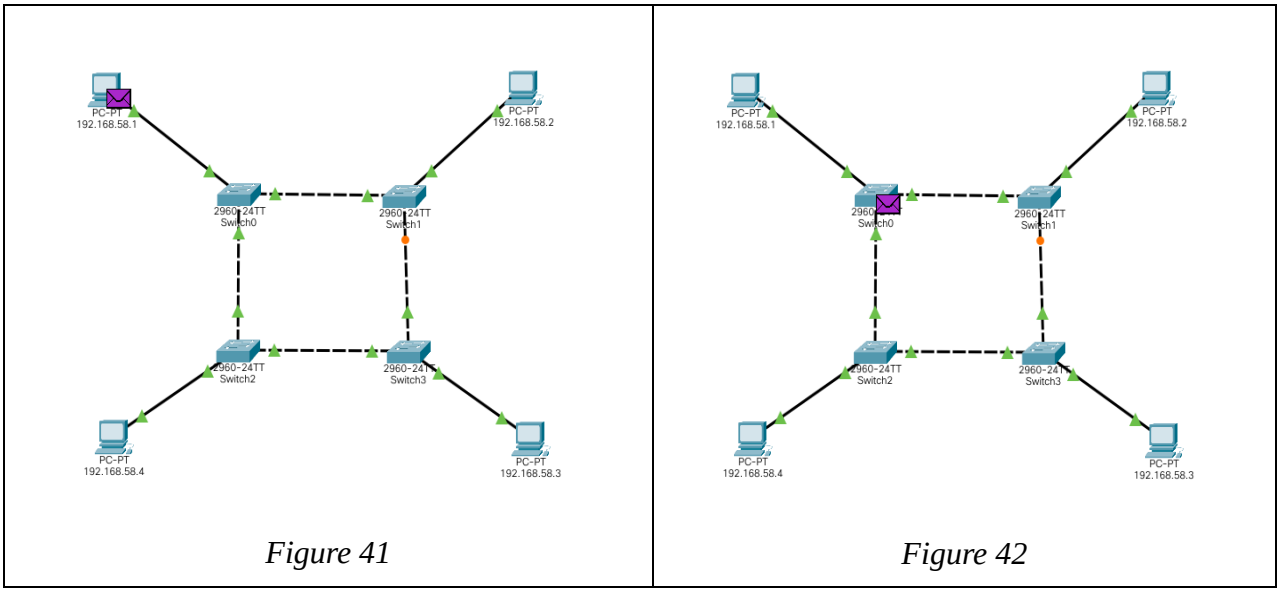


Figure 41

Figure 42

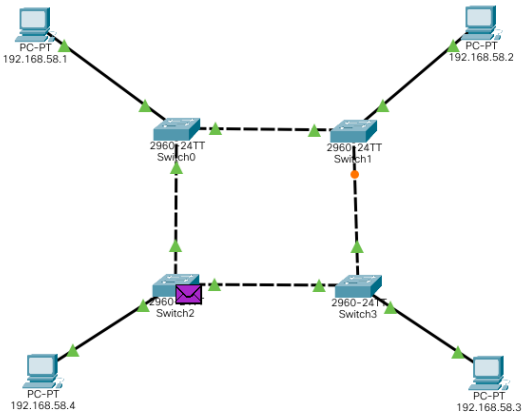


Figure 43

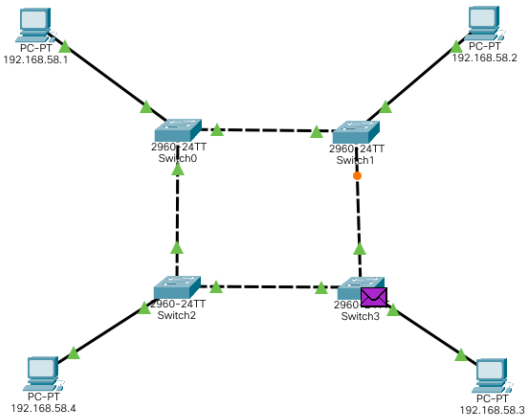


Figure 44

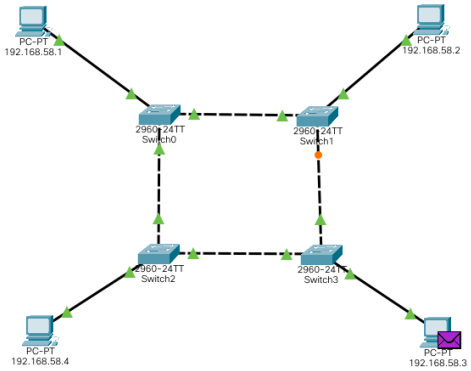


Figure 45

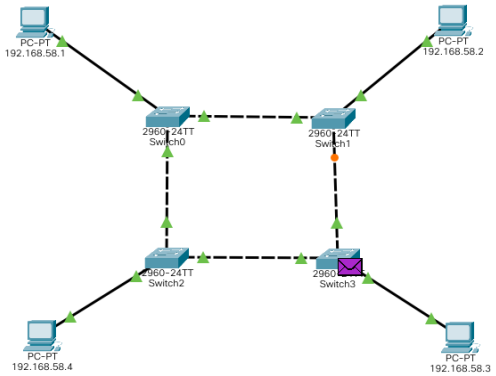


Figure 46

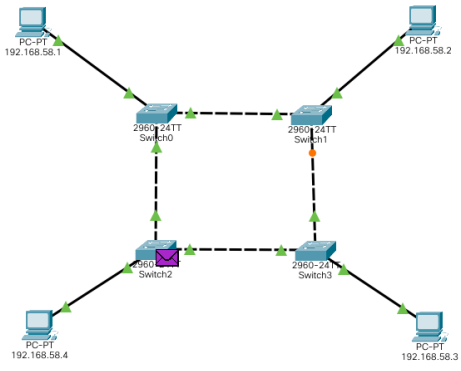


Figure 47

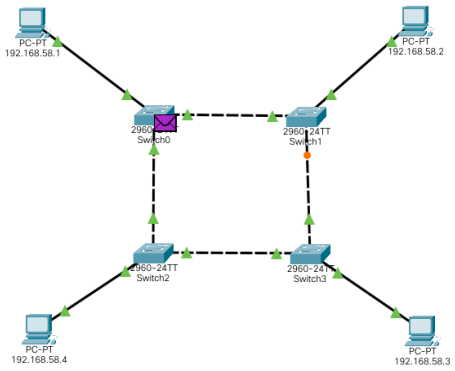


Figure 48

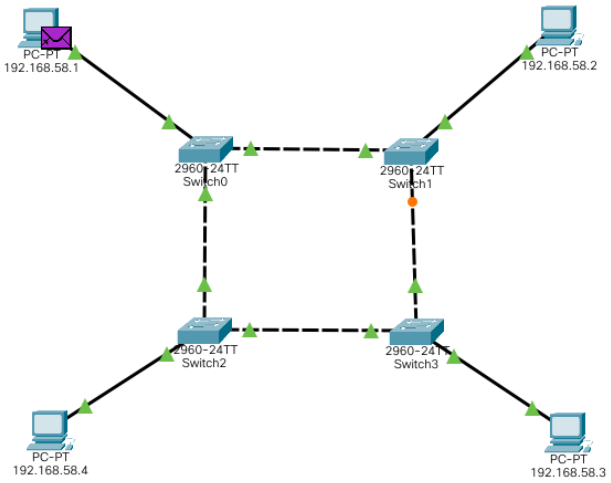


Figure 49

Simulation Panel

Screenshots of Simulation Panel, for the above implemented topology.

Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device
	0.000	--	192.168.58.1
	0.001	192.168.58.1	Switch0
	0.002	Switch0	Switch2
	0.003	Switch2	Switch3
	0.004	Switch3	192.168.58.3
	0.005	192.168.58.3	Switch3
	0.006	Switch3	Switch2
	0.007	Switch2	Switch0
	0.008	Switch0	192.168.58.1
	1.633	--	Switch2
	1.634	Switch2	192.168.58.4
	1.634	Switch2	Switch0
	1.634	Switch2	Switch3
	1.635	Switch0	Switch1
	1.635	Switch0	192.168.58.1
	1.635	Switch3	192.168.58.3
	1.635	Switch3	Switch1
	1.636	Switch1	192.168.58.2
	2.973	--	Switch3

Figure 50

IP Addresses

IP configurations of the devices used for demonstration.

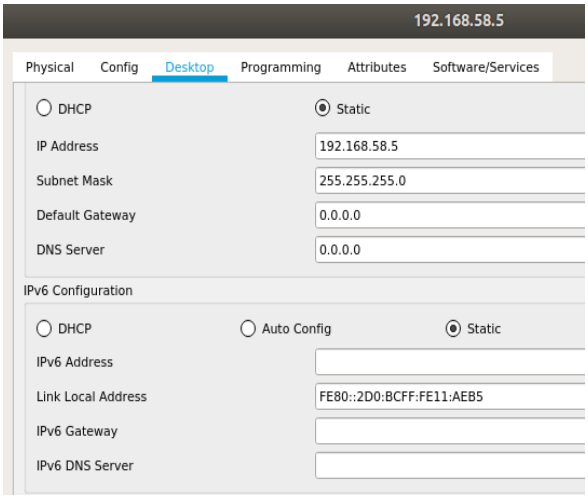


Figure 51

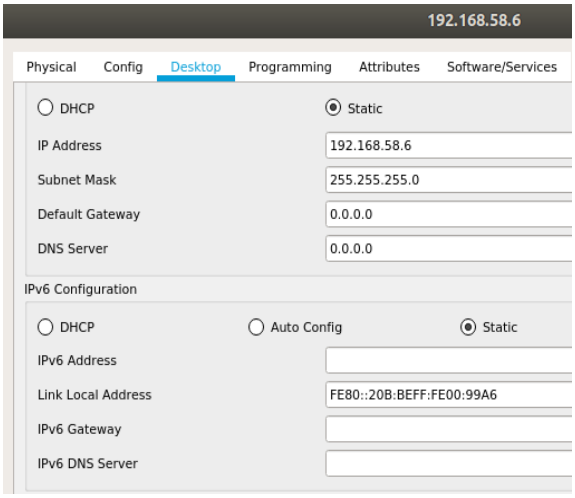


Figure 52

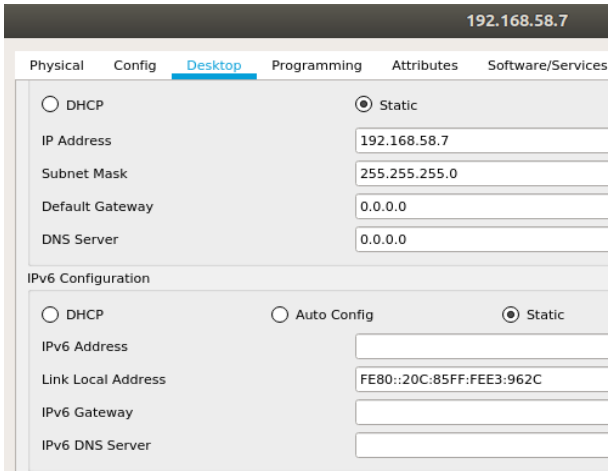


Figure 53

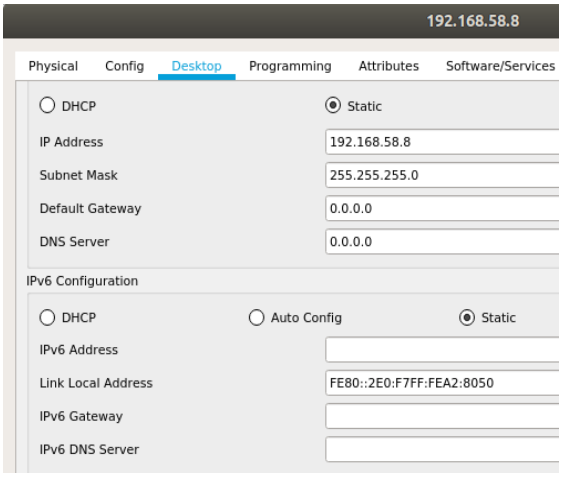


Figure 54

Demonstration 4: Mesh Topology

The mesh topology has a unique network design in which each computer on the network connects to every other. It is developing a P2P (point-to-point) connection between all the devices of the network. It offers a high level of redundancy, so even if one network cable fails, still data has an alternative path to reach its destination.

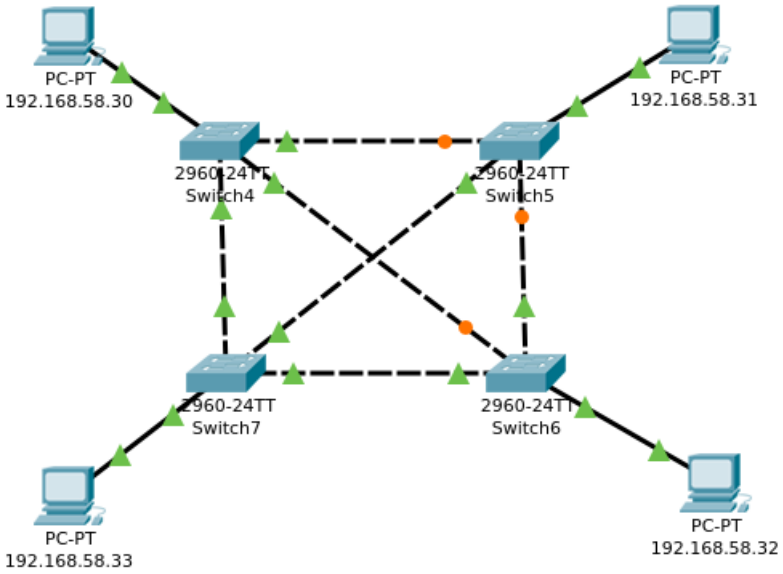


Figure 55

Advantages:

- The network can be expanded without disrupting current users.
- No traffic problem as nodes has dedicated links.
- A mesh topology is robust.
- It has multiple links, so if any single route is blocked, then other routes should be used for data communication.
- P2P links make the fault identification isolation process easy.
- Every system has its privacy and security.

Disadvantages:

- Installation is complex because every node is connected to every node.
- It is expensive due to the use of more cables. No proper utilization of systems.
- It requires a large space to run the cables.

Steps Implementing Mesh Topology using Cisco Packet Tracer:

- Step 1: Take four end devices and connect every end device to a different switch.
- Step 2: Link every switch with every other 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.

Screenshots of Mesh Topology Simulation. (Packet transfer from 192.168.58.30 to 192.168.58.33)

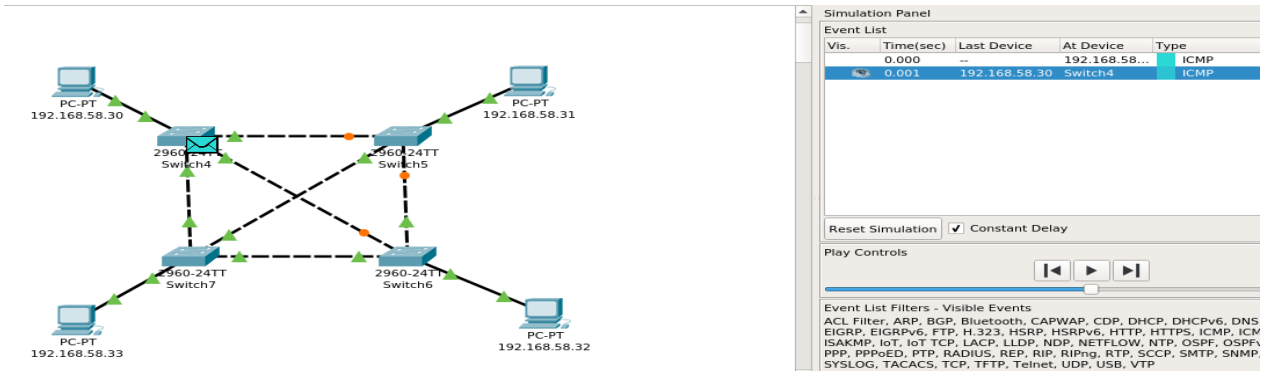


Figure 56

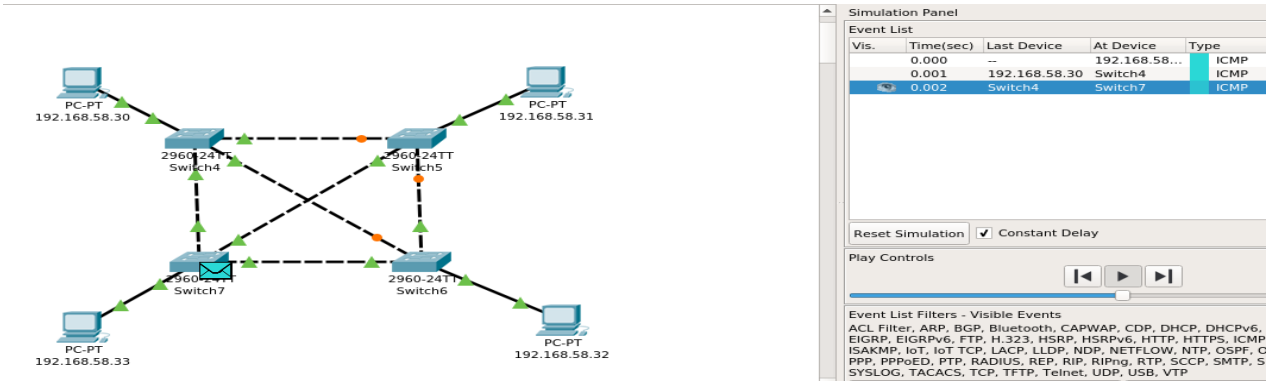


Figure 57

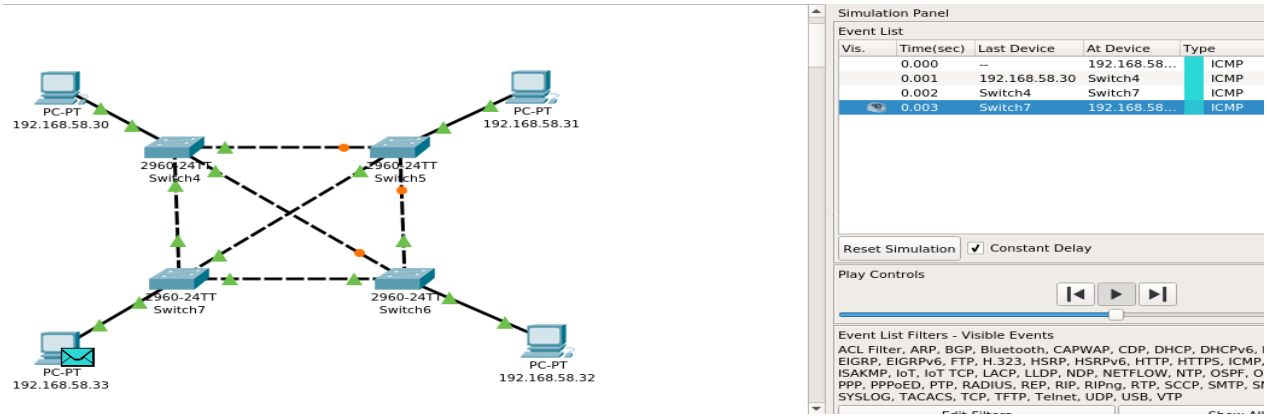


Figure 58

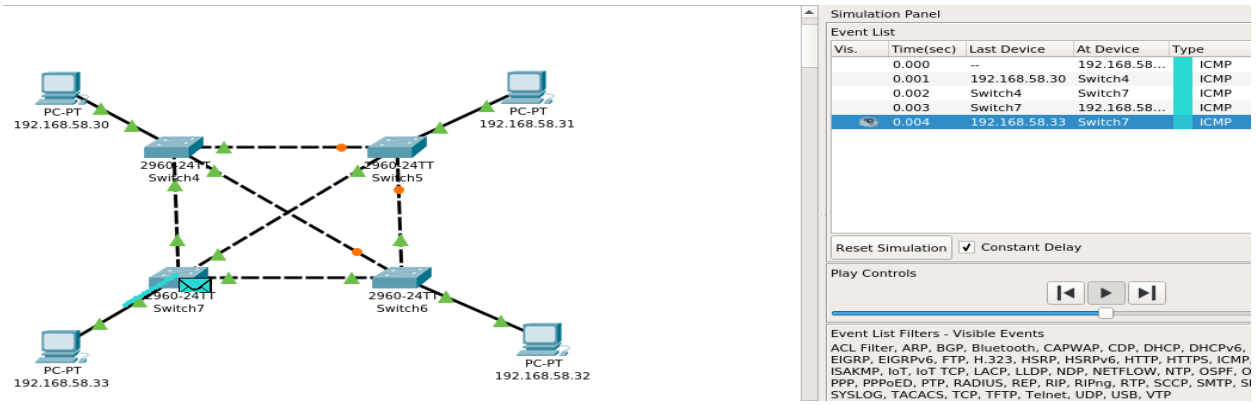


Figure 59

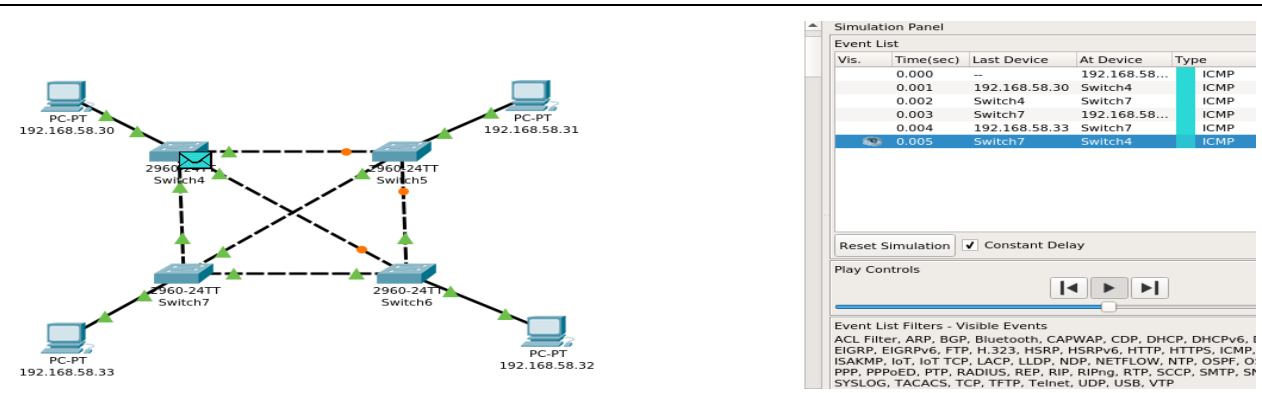


Figure 60

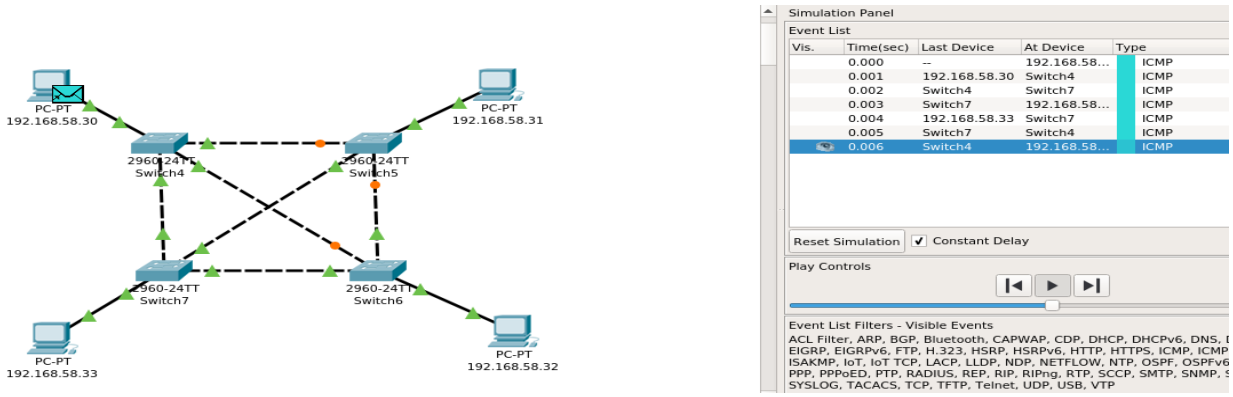


Figure 61

Simulation Panel

Screenshots of Simulation Panel, for the above implemented topology.

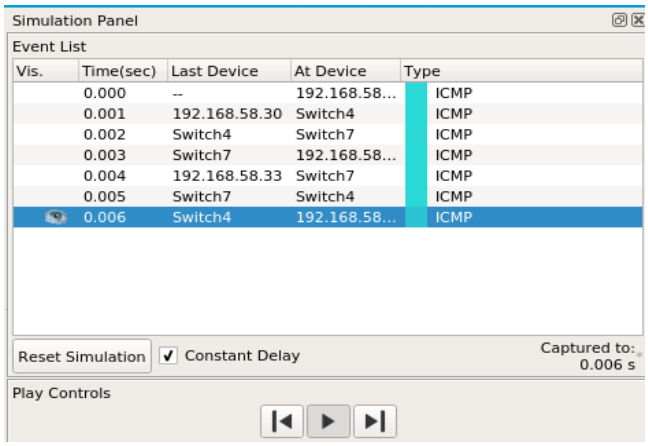


Figure 62

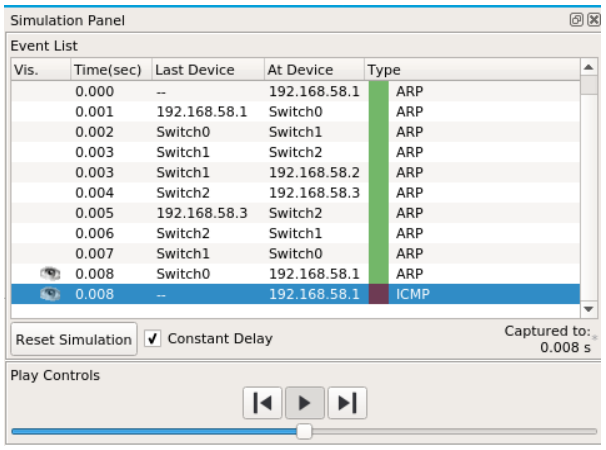


Figure 63

IP Addresses

IP configurations of the devices used for demonstration.

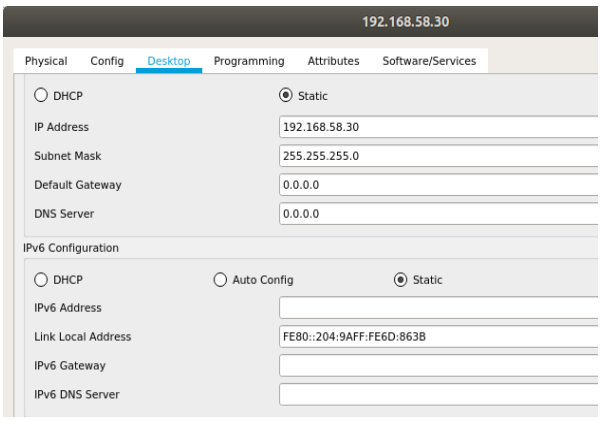


Figure 64

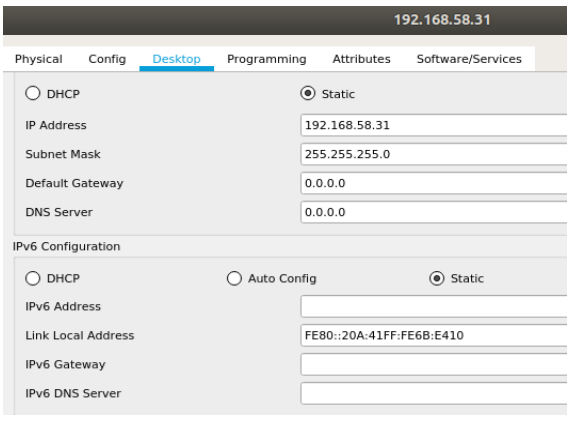


Figure 65

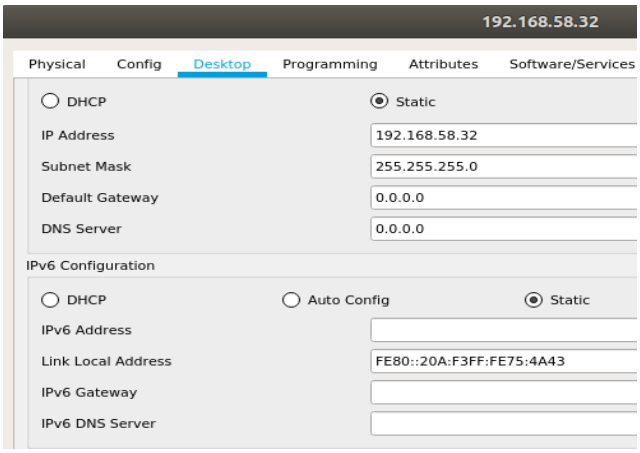


Figure 66

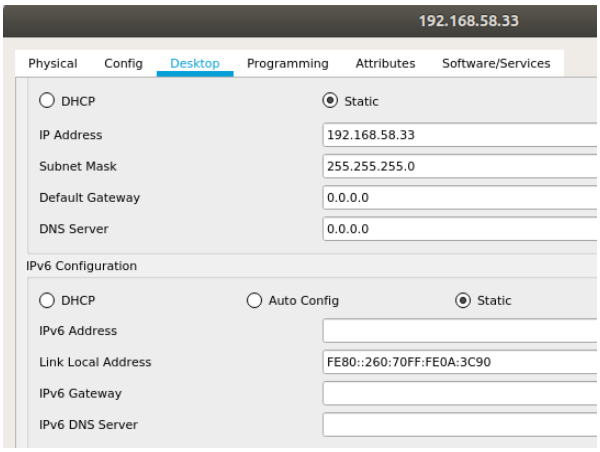


Figure 67