ASSIGNMENT 1&2

19ECE311: Computer Networks

Submitted by,

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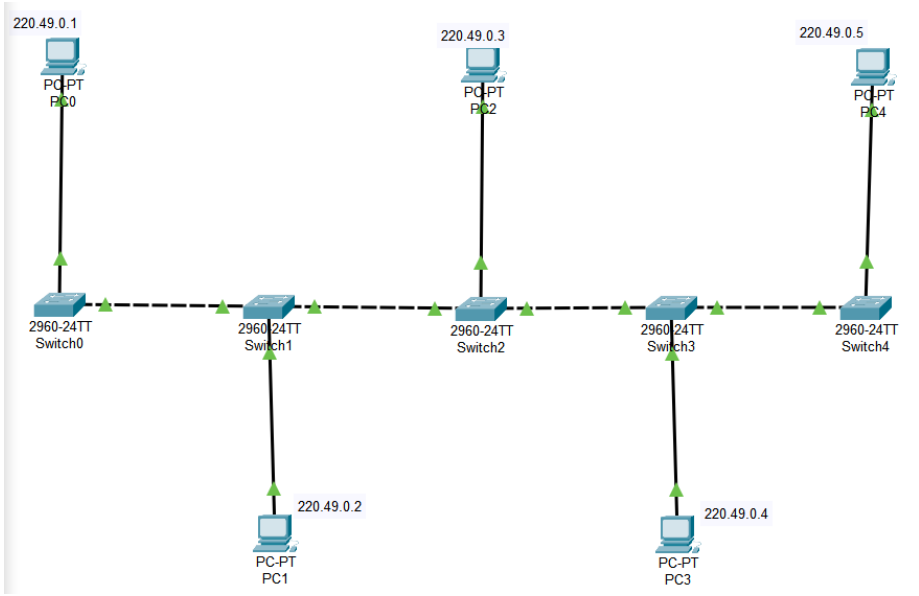
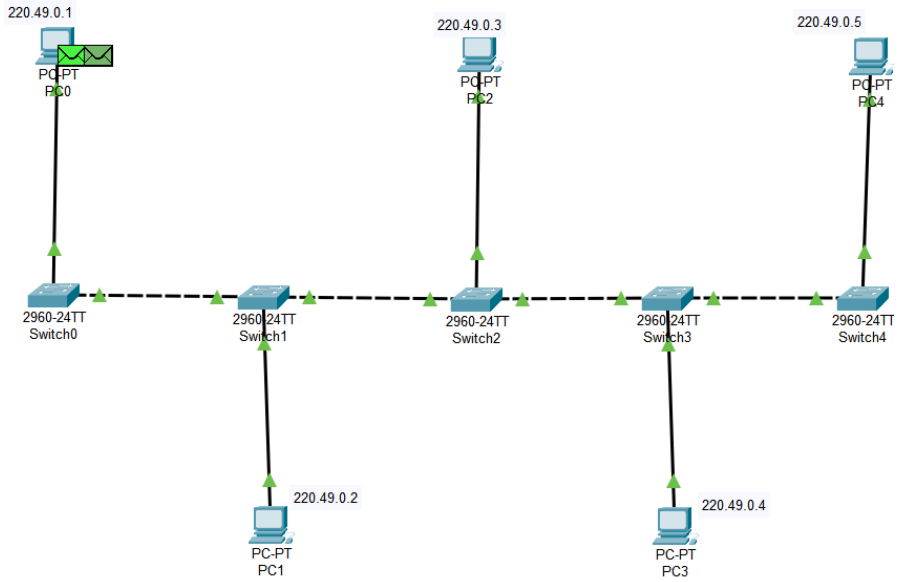
AM.EN.U4ECE22049

Q. Build a LAN using 5 packets. Implement each topology separately and show the packet transmission statistics using cisco packet tracer.

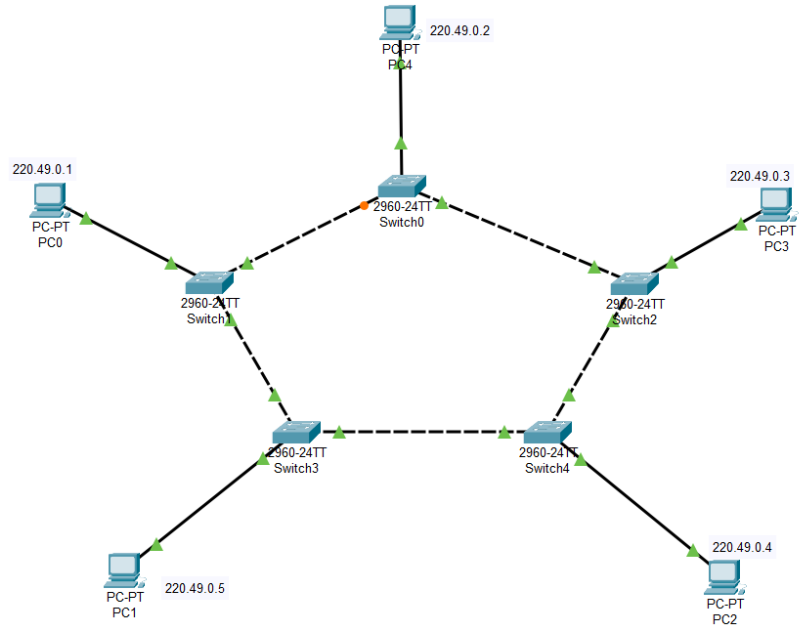
1. Bus Topology

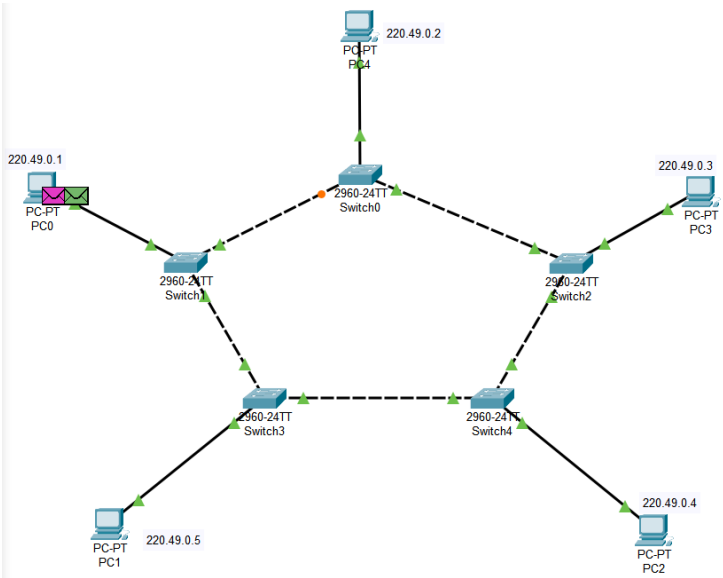




```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.49.0.5

Pinging 220.49.0.5 with 32 bytes of data:

Reply from 220.49.0.5: bytes=32 time<1ms TTL=128
Reply from 220.49.0.5: bytes=32 time=7ms TTL=128
Reply from 220.49.0.5: bytes=32 time=8ms TTL=128
Reply from 220.49.0.5: bytes=32 time<1ms TTL=128

Ping statistics for 220.49.0.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 8ms, Average = 3ms

C:\>
```

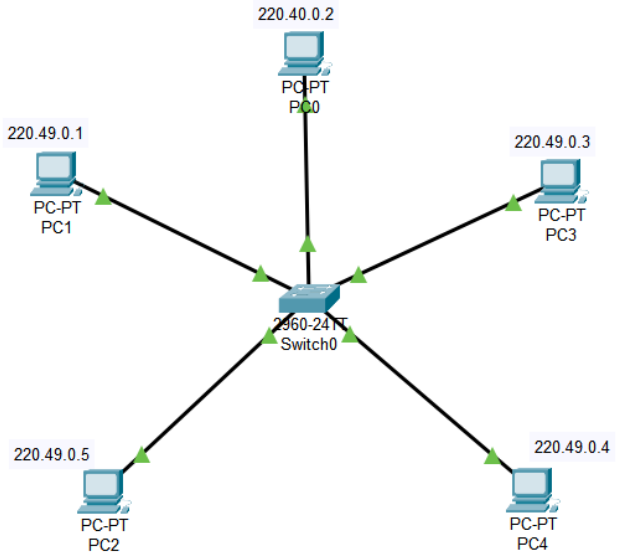
2. Ring Topology

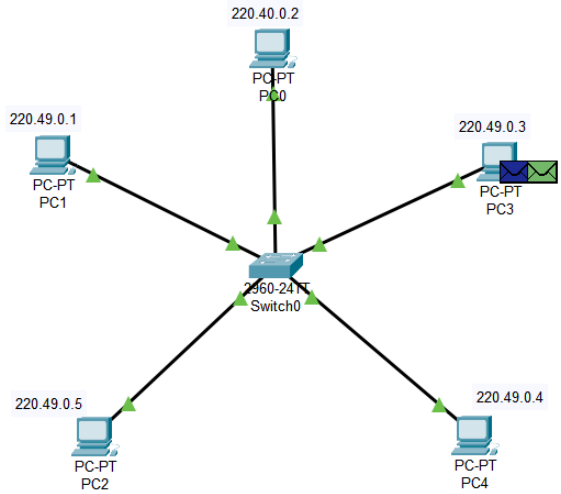




```
C:\>ping 220.49.0.5

Pinging 220.49.0.5 with 32 bytes of data:

Reply from 220.49.0.5: bytes=32 time=2ms TTL=128
Reply from 220.49.0.5: bytes=32 time<1ms TTL=128
Reply from 220.49.0.5: bytes=32 time<1ms TTL=128
Reply from 220.49.0.5: bytes=32 time<1ms TTL=128

Ping statistics for 220.49.0.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 2ms, Average = 0ms

C:\>
```

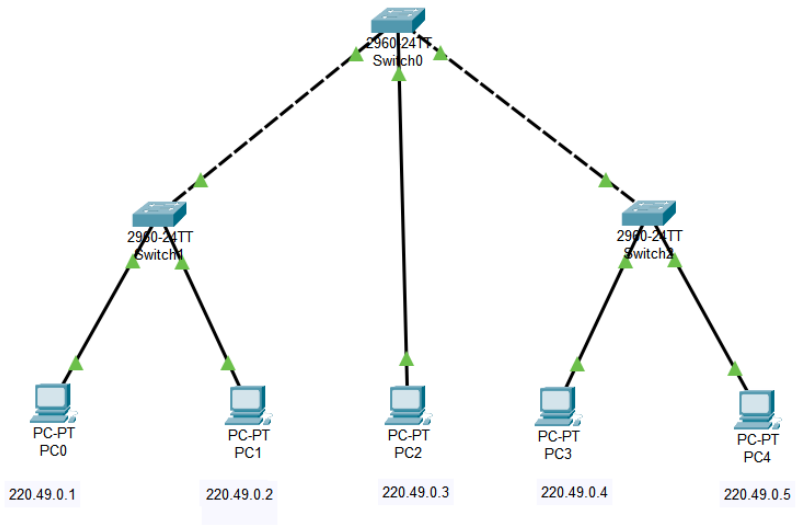
3. Star Topology

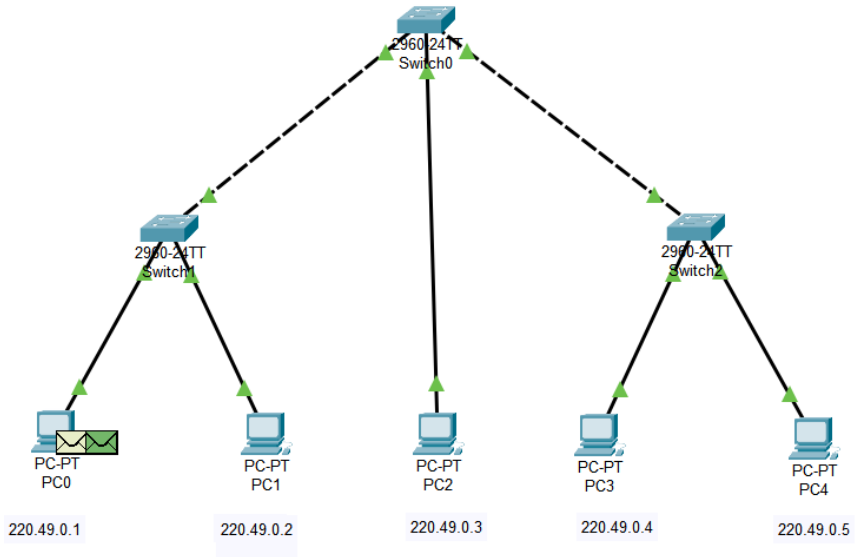




```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.49.0.1

Pinging 220.49.0.1 with 32 bytes of data:

Reply from 220.49.0.1: bytes=32 time<1ms TTL=128
Reply from 220.49.0.1: bytes=32 time<1ms TTL=128
Reply from 220.49.0.1: bytes=32 time<1ms TTL=128
Reply from 220.49.0.1: bytes=32 time=1ms TTL=128

Ping statistics for 220.49.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

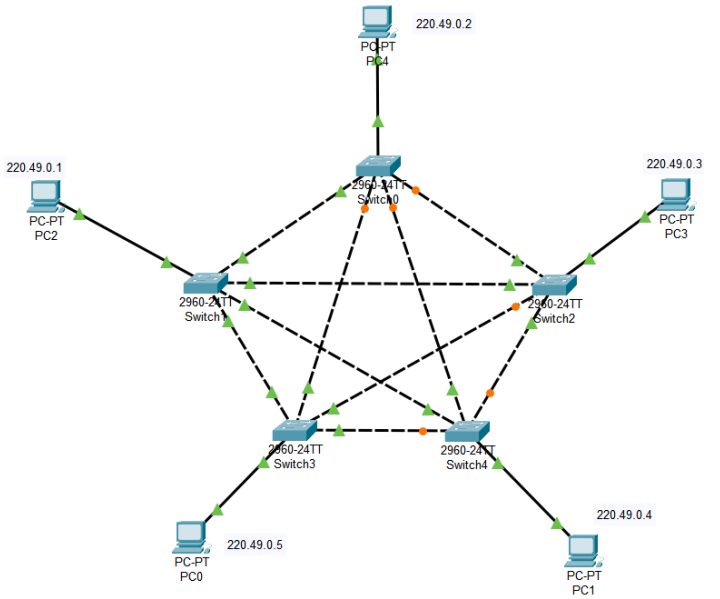
4. Tree/Hierarchical Topology

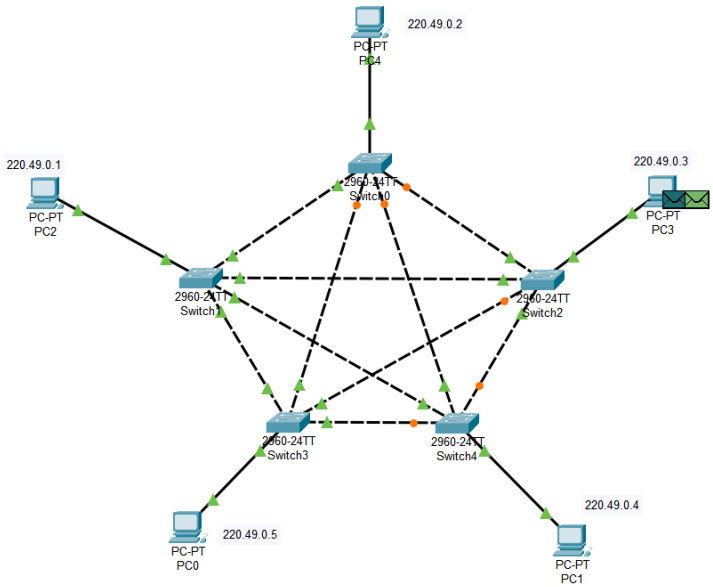


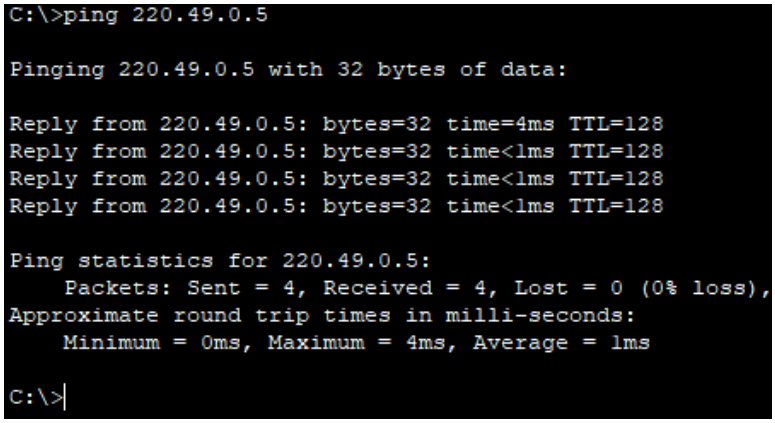


```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.49.0.3

Pinging 220.49.0.3 with 32 bytes of data:

Reply from 220.49.0.3: bytes=32 time<1ms TTL=128
Reply from 220.49.0.3: bytes=32 time<1ms TTL=128
Reply from 220.49.0.3: bytes=32 time<1ms TTL=128
Reply from 220.49.0.3: bytes=32 time=1ms TTL=128

Ping statistics for 220.49.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

5. Mesh Topology







Observation

Cisco Packet Tracer was used to implement each of the five network topologies: Bus, Ring, Star, Tree, and Mesh. Five PCs were used in each topology, and the right networking equipment, including hubs and switches, were used in accordance with the topology specifications. The provided format (220.49.x.x) was used to assign IP addresses, and simulation mode was used to test packet transmission. In accordance with each topology's structure, the appropriate connections were made.

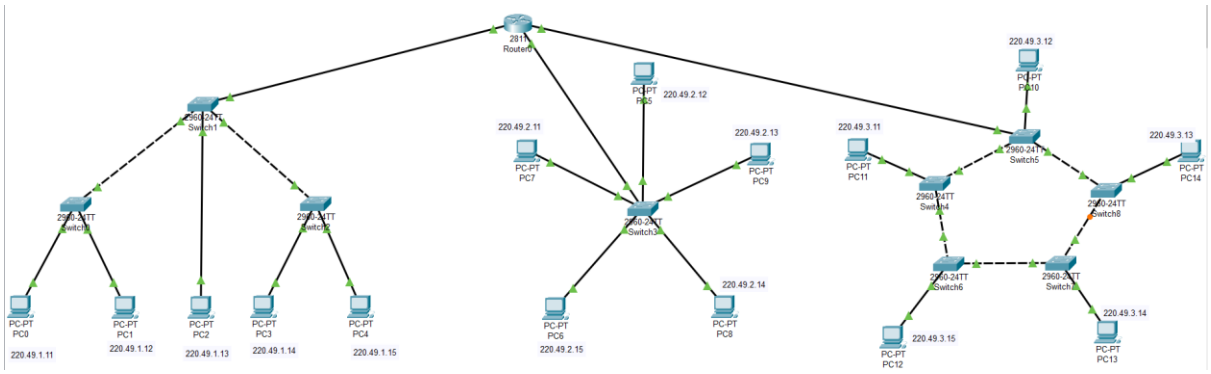
Result

All devices were able to successfully communicate with each other through a common medium (hub) in the Bus topology; however, if numerous devices transmitted at the same time, the network might become crowded. In order to ensure dependable transmission, devices in the Ring topology communicated sequentially, forwarding packets to the subsequent device in the ring. The Star topology provided quick and centralized communication by allowing all devices to communicate effectively through a central switch. By linking several switches in a parent-child relationship, the Tree topology demonstrated a hierarchical communication model. Lastly, all of the devices were connected in the mesh topology, which ensured high fault tolerance by offering multiple communication paths and complete redundancy.

Interference

By simulating packet transmission, each topology was successfully constructed and validated. Each network structure's traits and actions were noted: Bus topology is straightforward but prone to collisions; Ring topology guarantees sequential delivery but is highly reliant on each link; Star topology is centralized and manageable but is reliant on the switch; Tree topology facilitates scalable hierarchical networks; and Mesh topology provides maximum reliability but adds complexity and cabling. All things considered, this exercise aided in comprehending the practical benefits and drawbacks of each network topology as well as its operational behaviour.

2. Create 3 LAN networks connected via a single Router (CPT). Choose appropriate router, connection and configure it. Each LAN network is configured via Tree, Star and Ring topologies respectively.
The IP addresses for the implementation of topologies should be chosen based on the 5 digits of your Roll No.
Ex: U4ECE220XX for A batch
U4ECE221XX for B batch
Ex IP address for Roll no 12 (for A and B batch) is:**220**.**12**.x.x for A batch and **221**.**12**.x.x for B batch. You may take the subsequent IP addresses based on the mentioned roll number IP.

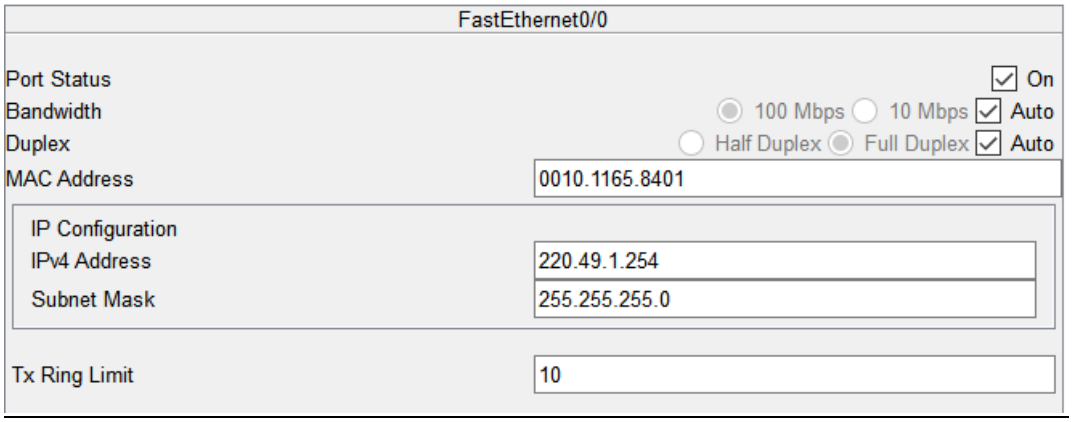


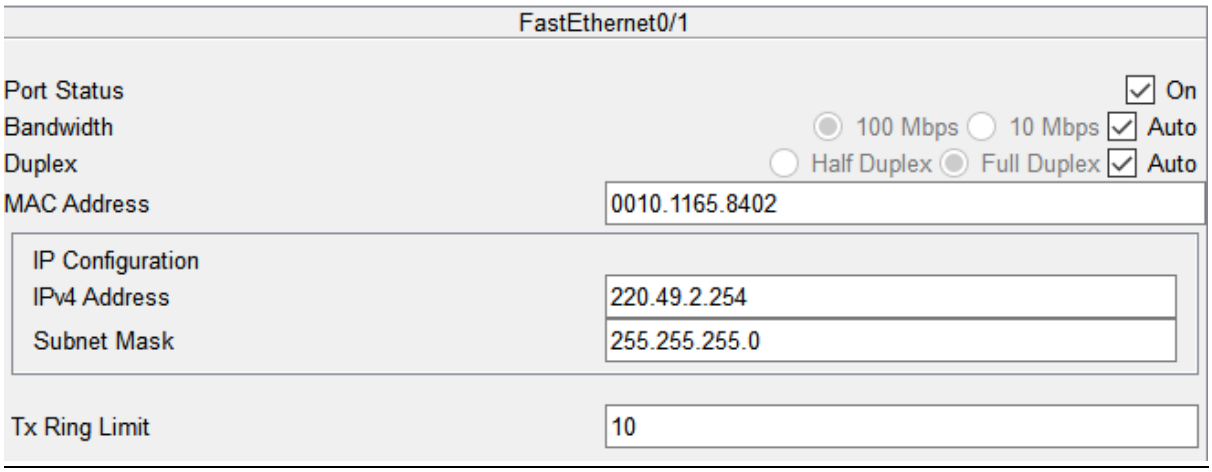
LAN1 (Tree topology) : IP Addresses – 220.49.1.11 - 220.49.1.15

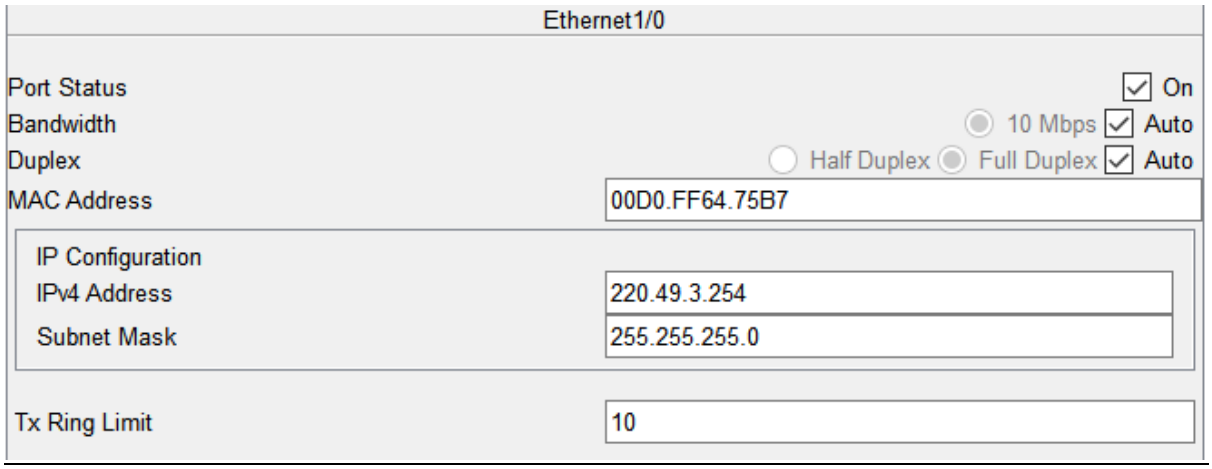
LAN2 (Star topology) : IP Addresses – 220.49.2.11 - 220.49.2.15

LAN3 (Ring topology) : IP Addresses – 220.49.3.11 - 220.49.3.15

Router Configuration







FastEthernet0/0 → Connected to LAN1 (Tree Topology)

FastEthernet0/1 → Connected to LAN2 (Star Topology)

Ethernet1/0 → Connected to LAN3 (Ring Topology)

Ping PC's

```
C:\>ping 220.49.2.15

Pinging 220.49.2.15 with 32 bytes of data:

Reply from 220.49.2.15: bytes=32 time<1ms TTL=127
Reply from 220.49.2.15: bytes=32 time<1ms TTL=127
Reply from 220.49.2.15: bytes=32 time=1ms TTL=127
Reply from 220.49.2.15: bytes=32 time<1ms TTL=127

Ping statistics for 220.49.2.15:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

```
C:\>ping 220.49.1.14

Pinging 220.49.1.14 with 32 bytes of data:

Reply from 220.49.1.14: bytes=32 time=1ms TTL=127
Reply from 220.49.1.14: bytes=32 time<1ms TTL=127
Reply from 220.49.1.14: bytes=32 time<1ms TTL=127
Reply from 220.49.1.14: bytes=32 time<1ms TTL=127

Ping statistics for 220.49.1.14:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

```
C:\>ping 220.49.3.11

Pinging 220.49.3.11 with 32 bytes of data:

Reply from 220.49.3.11: bytes=32 time<1ms TTL=127
Reply from 220.49.3.11: bytes=32 time<1ms TTL=127
Reply from 220.49.3.11: bytes=32 time<1ms TTL=127
Reply from 220.49.3.11: bytes=32 time<1ms TTL=127

Ping statistics for 220.49.3.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Observations

Three separate LAN networks configured with Tree, Star, and Ring topologies were successfully created and connected to a Cisco 2811 router using three interfaces (FastEthernet0/0, FastEthernet0/1, Ethernet1/0). Each LAN was assigned a distinct IP address range based on the roll number (220.49.x.x series). PCs within each LAN were configured with correct IP addresses, subnet masks, and default gateways matching their respective router interfaces. The connection between PCs and switches used appropriate cabling, and router interfaces were enabled and correctly configured.

Result

The three LANs were successfully interconnected through the router, and communication across different LANs was verified using ping tests. Initially, the first ping packet sometimes timed out due to ARP (Address Resolution Protocol) resolution delay; however, all subsequent ping requests were successful with no packet loss. Devices from one LAN could successfully communicate with devices in another LAN through the router, indicating proper routing and configuration.

Inference

The task demonstrated how multiple LANs, each with a different network structure, could be integrated through a router to create a larger, scalable network. It emphasized the importance of accurate IP addressing, proper gateway assignment, and router interface configuration to ensure seamless inter-network communication. Additionally, it highlighted practical network behaviour such as ARP resolution delay during the initial connection attempt. Overall, the assignment helped understand router-based communication between segmented LANs and the importance of proper topology selection and configuration in building reliable networks.