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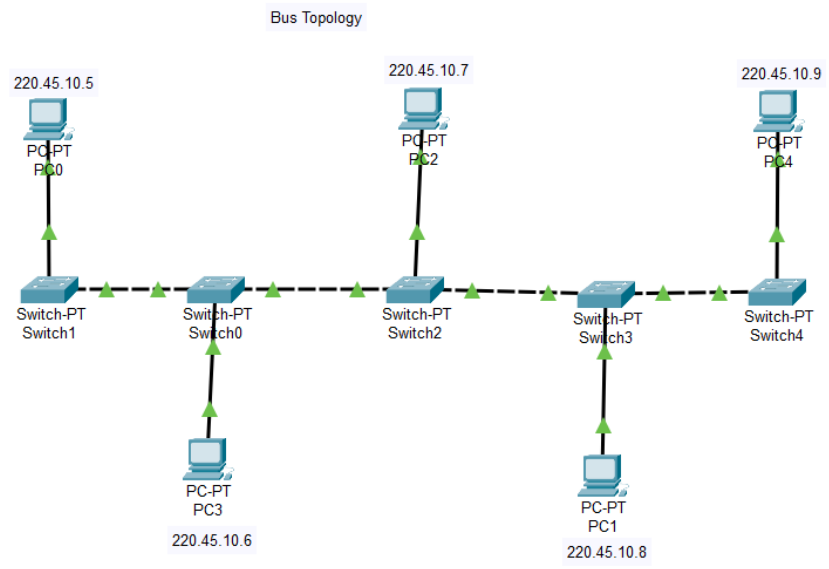
Assignment- 1 and 2

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

i. Bus Topology:



Command Prompt Output:

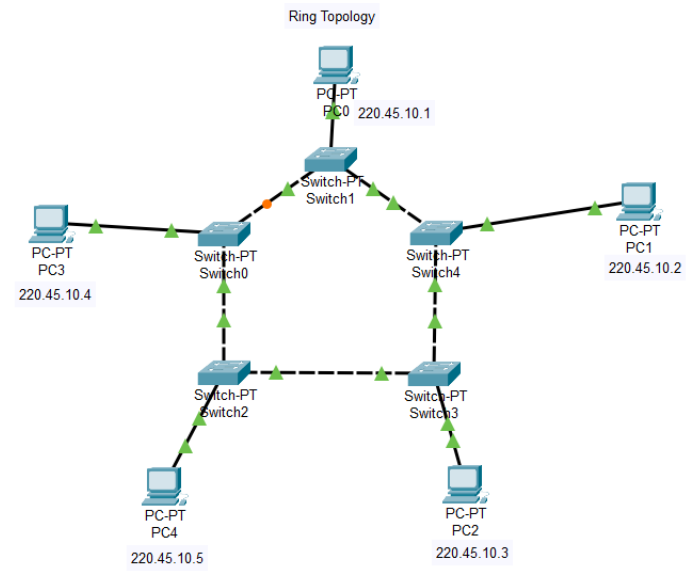
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.45.10.8

Pinging 220.45.10.8 with 32 bytes of data:

Reply from 220.45.10.8: bytes=32 time=3ms TTL=128
Reply from 220.45.10.8: bytes=32 time<1ms TTL=128
Reply from 220.45.10.8: bytes=32 time<1ms TTL=128
Reply from 220.45.10.8: bytes=32 time<1ms TTL=128

Ping statistics for 220.45.10.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 3ms, Average = 0ms
```

ii. Ring Topology



Command Prompt Output

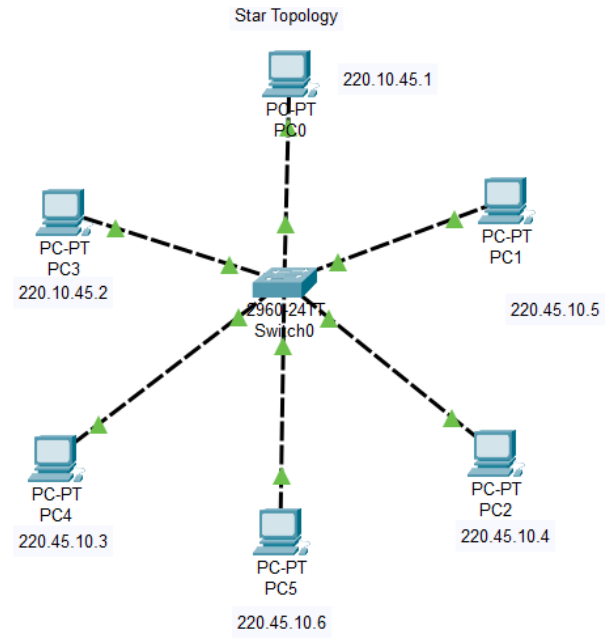
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.45.10.4

Pinging 220.45.10.4 with 32 bytes of data:

Reply from 220.45.10.4: bytes=32 time<1ms TTL=128
Reply from 220.45.10.4: bytes=32 time=1ms TTL=128
Reply from 220.45.10.4: bytes=32 time=2ms TTL=128
Reply from 220.45.10.4: bytes=32 time<1ms TTL=128

Ping statistics for 220.45.10.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 2ms, Average = 0ms
```

iii. Star Topology



Command Prompt Output:

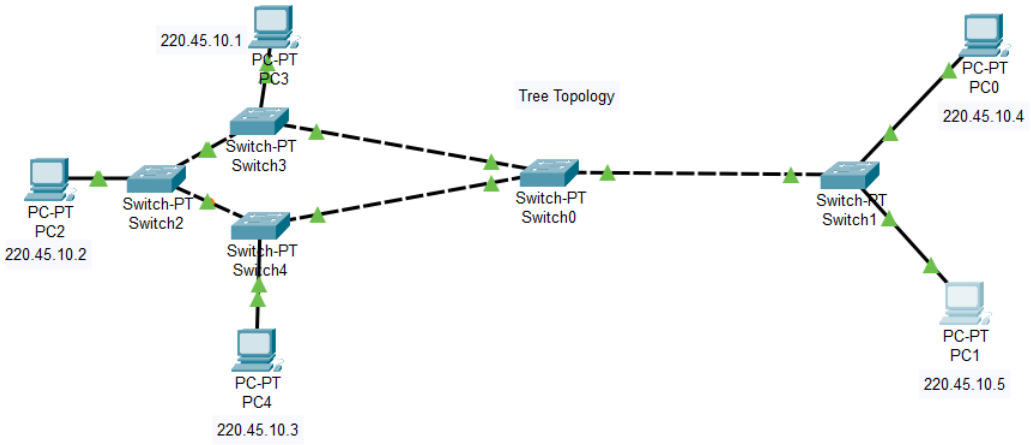
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.45.10.6

Pinging 220.45.10.6 with 32 bytes of data:

Reply from 220.45.10.6: bytes=32 time=1ms TTL=128
Reply from 220.45.10.6: bytes=32 time<1ms TTL=128
Reply from 220.45.10.6: bytes=32 time<1ms TTL=128
Reply from 220.45.10.6: bytes=32 time<1ms TTL=128

Ping statistics for 220.45.10.6:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

iv. Tree Topology



Command Prompt Output:

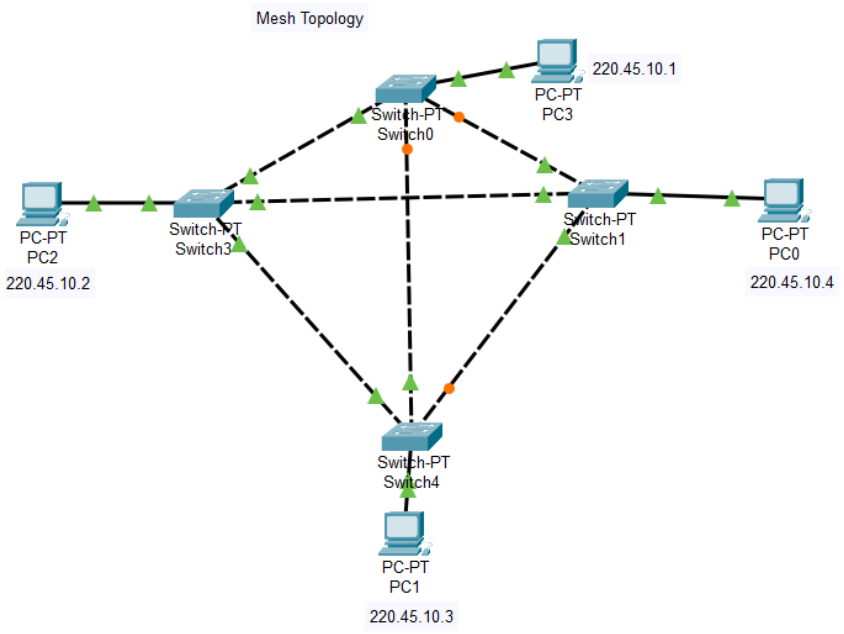
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.45.10.1

Pinging 220.45.10.1 with 32 bytes of data:

Reply from 220.45.10.1: bytes=32 time<1ms TTL=128
Reply from 220.45.10.1: bytes=32 time<1ms TTL=128
Reply from 220.45.10.1: bytes=32 time<1ms TTL=128
Reply from 220.45.10.1: bytes=32 time<1ms TTL=128

Ping statistics for 220.45.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

v. Mesh Topology



Command Prompt Output:

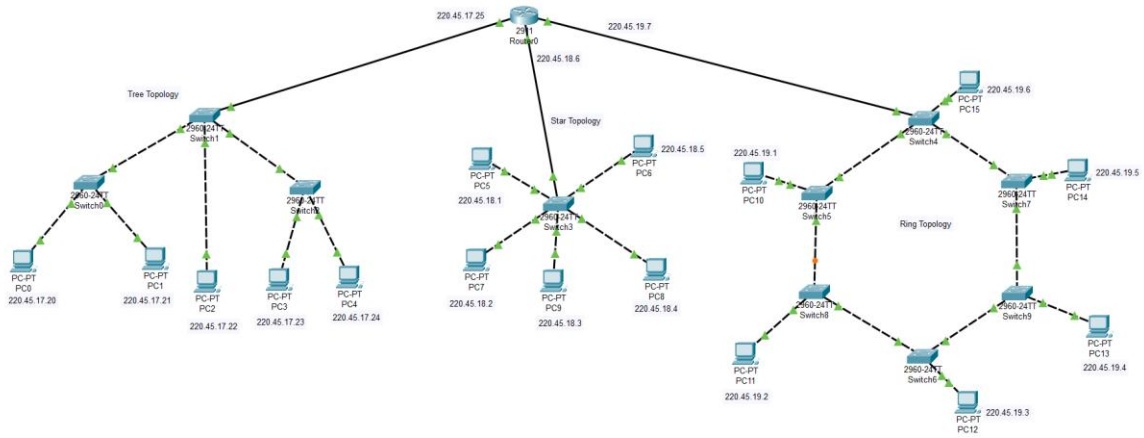
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.45.10.3

Pinging 220.45.10.3 with 32 bytes of data:

Reply from 220.45.10.3: bytes=32 time<1ms TTL=128
Reply from 220.45.10.3: bytes=32 time<1ms TTL=128
Reply from 220.45.10.3: bytes=32 time<1ms TTL=128
Reply from 220.45.10.3: bytes=32 time=1ms TTL=128

Ping statistics for 220.45.10.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

(Q) 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.

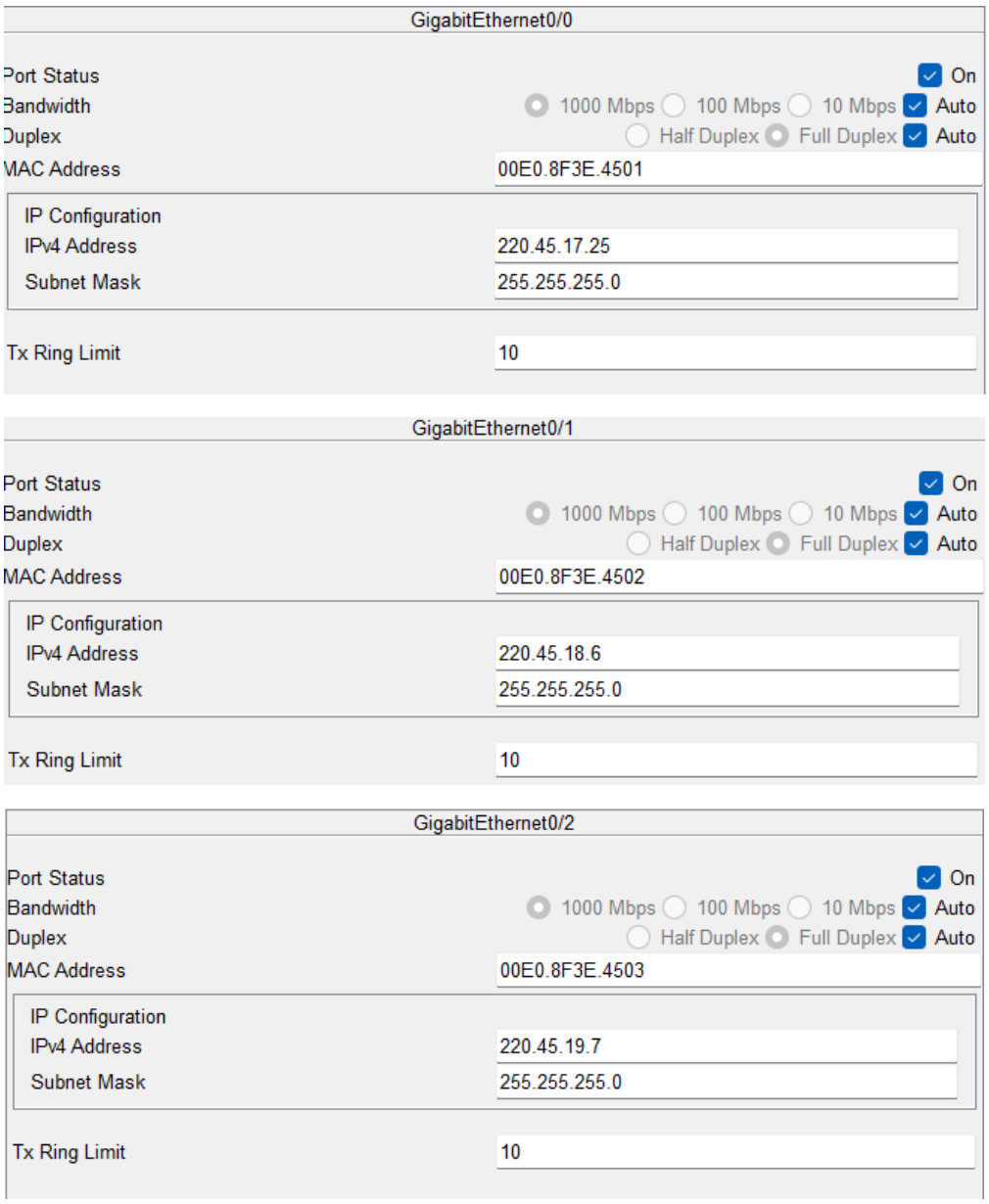


LAN1 (Tree topology) : IP Addresses – 220.45.17.20 - 220.45.17.25

LAN2 (Star topology) : IP Addresses – 220.45.18.1 - 220.45.18.5

LAN3 (Ring topology) : IP Addresses – 220.45.19.1 - 220.45.19.6

Router Configuration:



GigabitEthernet0/0 → Connected to LAN1 (Tree Topology)

GigabitEthernet0/1 → Connected to LAN2 (Star Topology)

GigabitEthernet0/2 → Connected to LAN3 (Ring Topology)

Command Prompt Outputs:

```
C:\>ping 220.45.19.4

Pinging 220.45.19.4 with 32 bytes of data:

Reply from 220.45.19.4: bytes=32 time<1ms TTL=127
Reply from 220.45.19.4: bytes=32 time<1ms TTL=127
Reply from 220.45.19.4: bytes=32 time<1ms TTL=127
Reply from 220.45.19.4: bytes=32 time<1ms TTL=127

Ping statistics for 220.45.19.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

```
C:\>ping 220.45.18.1

Pinging 220.45.18.1 with 32 bytes of data:

Reply from 220.45.18.1: bytes=32 time<1ms TTL=127
Reply from 220.45.18.1: bytes=32 time<1ms TTL=127
Reply from 220.45.18.1: bytes=32 time<1ms TTL=127
Reply from 220.45.18.1: bytes=32 time<1ms TTL=127

Ping statistics for 220.45.18.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
C:\>ping 220.45.17.20

Pinging 220.45.17.20 with 32 bytes of data:

Reply from 220.45.17.20: bytes=32 time<1ms TTL=127
Reply from 220.45.17.20: bytes=32 time<1ms TTL=127
Reply from 220.45.17.20: bytes=32 time<1ms TTL=127
Reply from 220.45.17.20: bytes=32 time<1ms TTL=127

Ping statistics for 220.45.17.20:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Results:

In this assignment, various network topologies were implemented using Cisco Packet Tracer, with all IP addresses formatted as 220.45.x.x based on my roll number AM.EN.U4ECE22045.

First, a bus topology was built. In this topology, all devices were connected to a single backbone cable in a linear manner. Packet transmission was successfully observed; when one PC sent data, it was visible to all PCs, but only the intended recipient accepted the packet. Command prompt outputs confirmed successful pings between devices, with minimal packet drops when the number of devices remained low.

Next, a ring topology was constructed where each device was connected to exactly two other devices, forming a closed loop. Data transmission occurred through intermediate devices before reaching the

destination. Command prompt outputs showed successful pings across the network, indicating that the ring topology was properly established and functioning.
Following this, a star topology was implemented where all devices connected individually to a central switch. Packet transmission was observed to be efficient and direct, with the switch handling all the traffic between devices effectively. Command prompt outputs displayed successful pings with minimal latency, showing the advantages of centralized communication.
Then, a tree topology was created, forming a hierarchical structure by combining multiple star topologies. Communication between different levels of the network was successful, with switches correctly routing the packets. Command prompt outputs showed stable connectivity between leaf and root nodes, demonstrating the scalability and organization of the tree network.
A mesh topology was also implemented where every device was connected to every other device. Packet transmission was highly reliable due to the presence of multiple redundant paths. Even when certain links were intentionally disabled, communication remained uninterrupted. Command prompt outputs confirmed successful pings and automatic rerouting of data through alternate paths, illustrating the mesh network's superior fault tolerance.
Finally, three LAN networks were created and connected via a single router. LAN1, using tree topology, had the IP range 220.45.17.20 to 220.45.17.25. LAN2, using star topology, was assigned IP addresses from 220.45.18.1 to 220.45.18.5. LAN3, using ring topology, operated within the IP range of 220.45.19.1 to 220.45.19.6. The router was configured with three interfaces: GigabitEthernet0/0 connected to LAN1, GigabitEthernet0/1 connected to LAN2, and GigabitEthernet0/2 connected to LAN3. Inter-LAN communication was tested through pings across different LANs, and successful packet transmissions were observed, confirming proper router configuration and effective inter-network communication.

Inference:

From the simulation and configuration of different network topologies and their interconnection via a router, several important conclusions were drawn. Each topology displayed distinct behaviors and characteristics. The bus topology was simple to set up but suffered from potential congestion and lack of fault tolerance; any break in the main cable could bring down the entire network. The ring topology enabled orderly data flow but posed risks because failure in any single link or device could disrupt the entire network. The star topology, on the other hand, proved to be highly efficient, with easy fault isolation and straightforward management via the central switch. It showed the best performance among the simple topologies. The tree topology provided a scalable and organized network structure, making it suitable for larger setups where hierarchical communication is needed. It combined the benefits of star and bus topologies while allowing easier expansion. The mesh topology delivered the highest reliability, with redundant paths ensuring that communication continued even if some connections failed. However, it was noted that the complexity and cabling requirements of a full mesh topology made it impractical for smaller or budget-conscious networks.
The router configuration exercise demonstrated the critical role routers play in connecting different LANs, even if each LAN uses different internal topologies. Assigning correct IP ranges and connecting the LANs to separate router interfaces enabled seamless communication across different networks. The command prompt outputs confirmed that devices in different LANs could successfully reach each other via the router, showing that the routing tables and interface settings were correctly configured.
Overall, star topology was observed to offer the best balance between efficiency and simplicity for most small to medium networks. Mesh topology offered unmatched fault tolerance but at the cost of complexity, making it more suitable for critical networks where downtime is unacceptable. Tree topology provided an excellent structure for scaling large networks efficiently. This assignment reinforced the practical skills needed to design, implement, and troubleshoot different types of networks. It also highlighted the importance of careful IP planning, understanding of device roles like switches and routers, and appropriate selection of topology based on specific network requirements.