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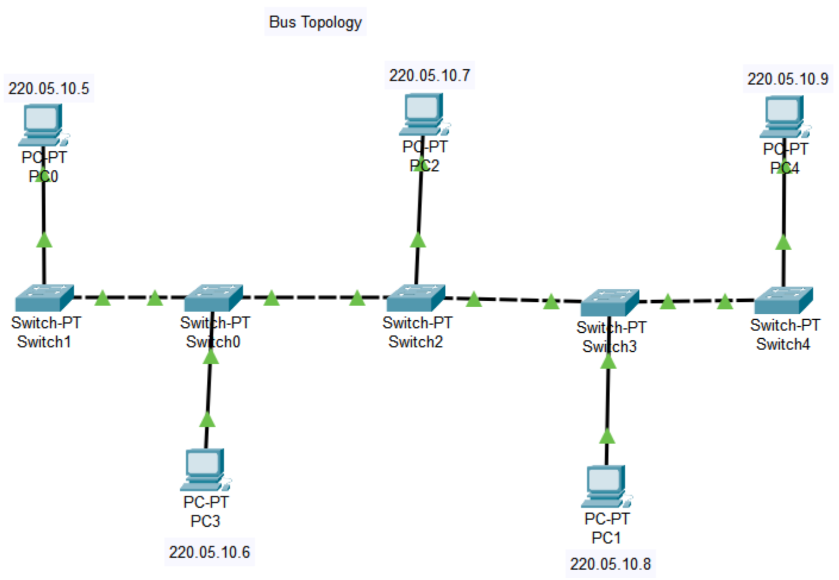
Assignment- 1 and 2

(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:

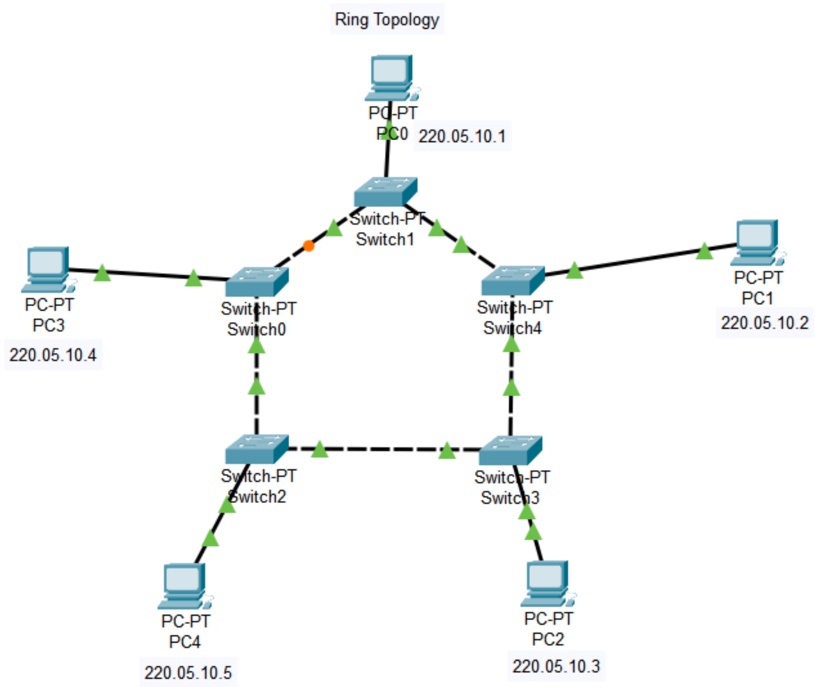
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.05.10.5

Pinging 220.05.10.5 with 32 bytes of data:

Reply from 220.5.10.5: bytes=32 time<1ms TTL=128
Reply from 220.5.10.5: bytes=32 time<1ms TTL=128
Reply from 220.5.10.5: bytes=32 time=7ms TTL=128
Reply from 220.5.10.5: bytes=32 time=4ms TTL=128

Ping statistics for 220.5.10.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 7ms, Average = 2ms
```

ii. Ring Topology



Command Prompt Output

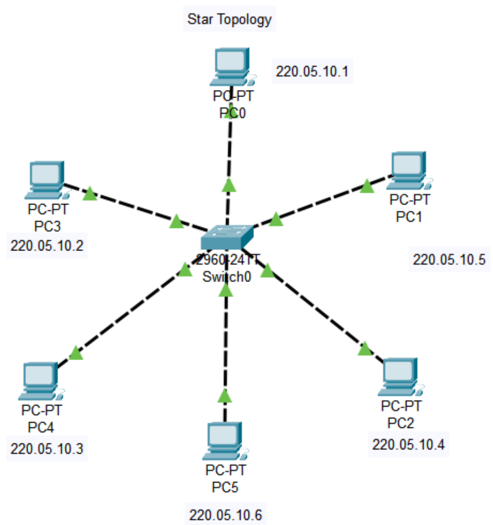
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.05.10.1

Pinging 220.05.10.1 with 32 bytes of data:

Reply from 220.5.10.1: bytes=32 time=10ms TTL=128
Reply from 220.5.10.1: bytes=32 time<1ms TTL=128
Reply from 220.5.10.1: bytes=32 time<1ms TTL=128
Reply from 220.5.10.1: bytes=32 time<1ms TTL=128

Ping statistics for 220.5.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 10ms, Average = 2ms
```

iii. Star Topology



Command Prompt Output:

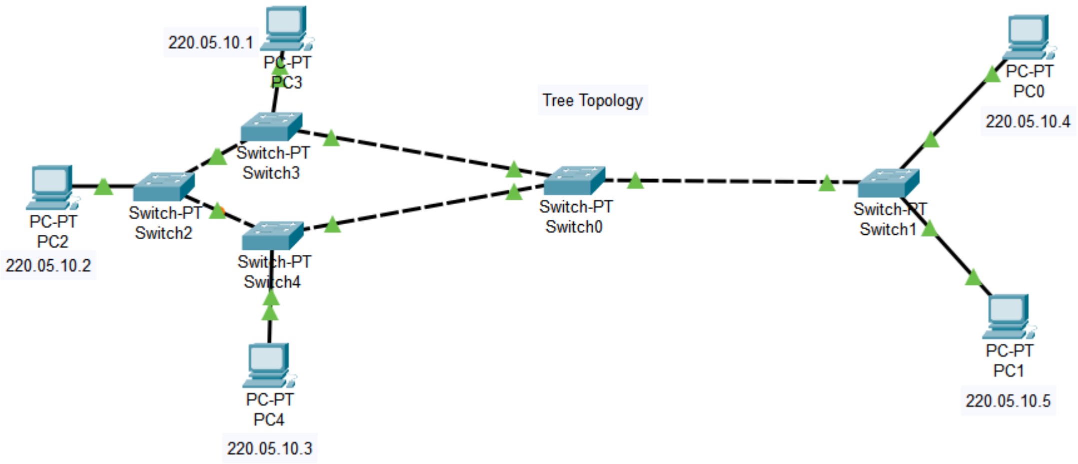
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.05.10.4

Pinging 220.05.10.4 with 32 bytes of data:

Reply from 220.5.10.4: bytes=32 time<1ms TTL=128
Reply from 220.5.10.4: bytes=32 time<1ms TTL=128
Reply from 220.5.10.4: bytes=32 time=1ms TTL=128
Reply from 220.5.10.4: bytes=32 time<1ms TTL=128

Ping statistics for 220.5.10.4:
    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:

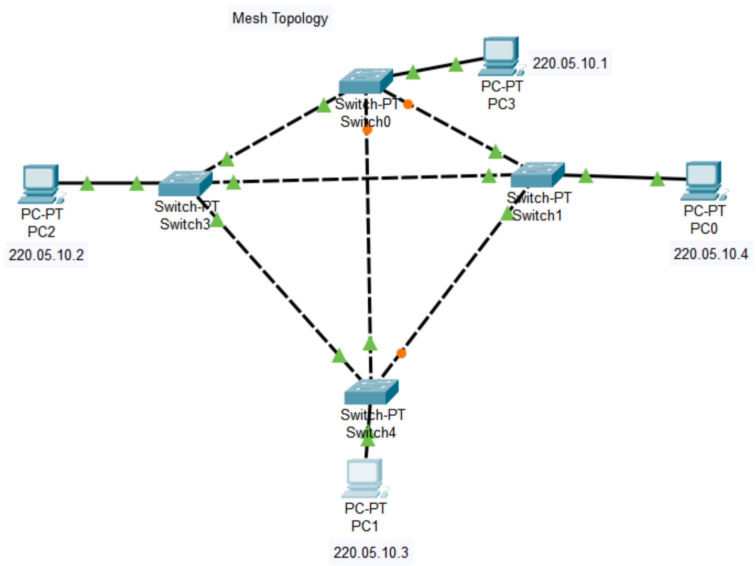
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.05.10.4

Pinging 220.05.10.4 with 32 bytes of data:

Reply from 220.5.10.4: bytes=32 time=1ms TTL=128
Reply from 220.5.10.4: bytes=32 time=1ms TTL=128
Reply from 220.5.10.4: bytes=32 time<1ms TTL=128
Reply from 220.5.10.4: bytes=32 time<1ms TTL=128

Ping statistics for 220.5.10.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

v. Mesh Topology



Command Prompt Output:

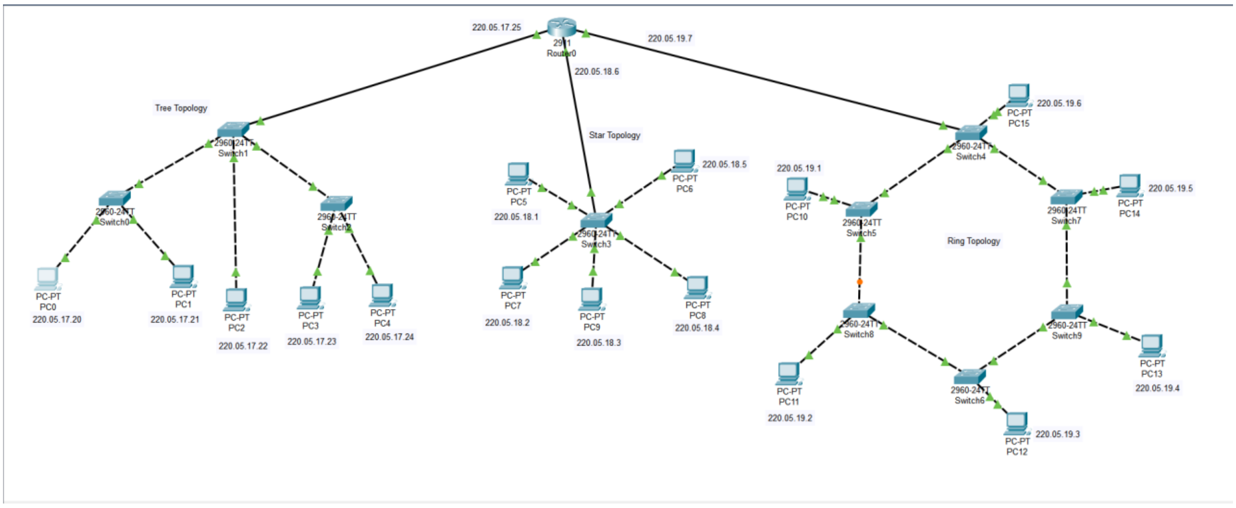
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.05.10.2

Pinging 220.05.10.2 with 32 bytes of data:

Reply from 220.5.10.2: bytes=32 time=1ms TTL=128
Reply from 220.5.10.2: bytes=32 time<1ms TTL=128
Reply from 220.5.10.2: bytes=32 time<1ms TTL=128
Reply from 220.5.10.2: bytes=32 time<1ms TTL=128

Ping statistics for 220.5.10.2:
    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.

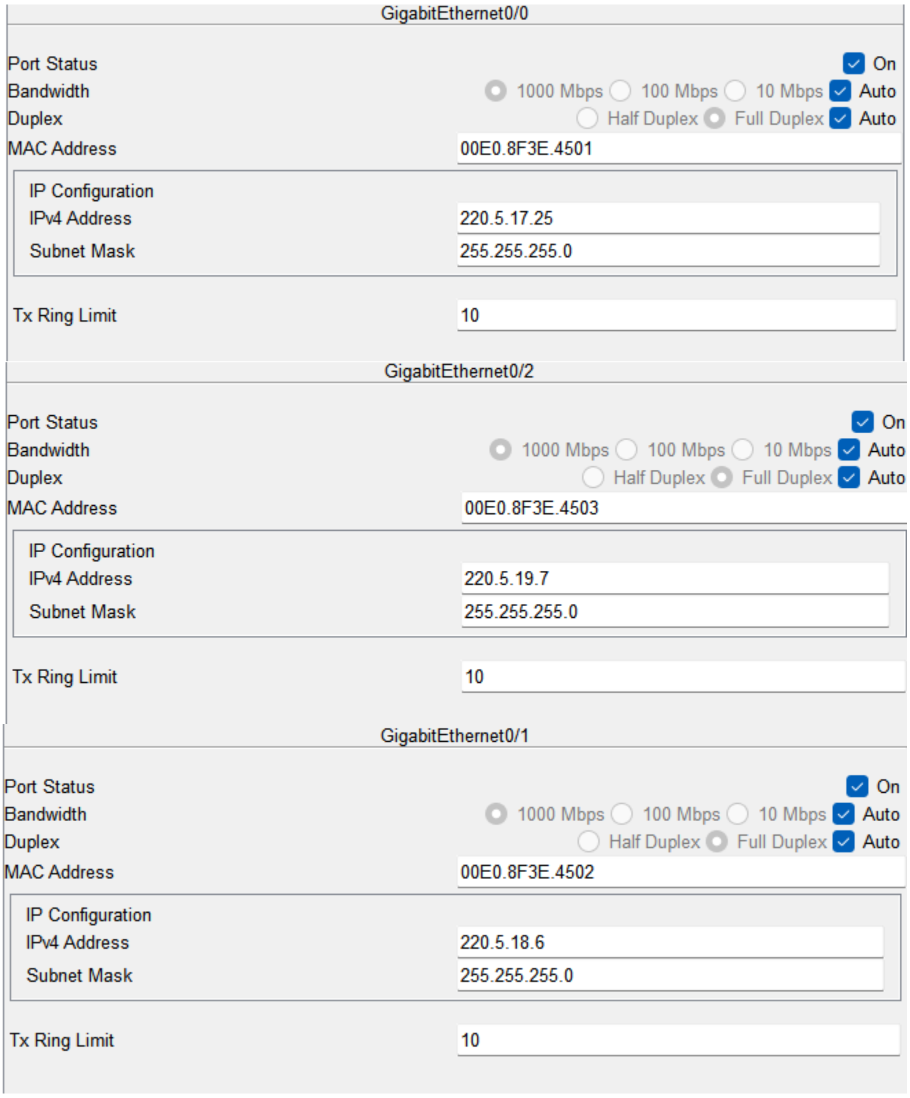


LAN1 (Tree topology) : IP Addresses – 220.45.17.20 - 220.05.17.25

LAN2 (Star topology) : IP Addresses – 220.45.18.1 - 220.05.18.5

LAN3 (Ring topology) : IP Addresses – 220.45.19.1 - 220.05.19.6

<u>Router Configuration</u>:



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 220.05.19.4

Pinging 220.05.19.4 with 32 bytes of data:

Request timed out.
Reply from 220.5.19.4: bytes=32 time=53ms TTL=127
Reply from 220.5.19.4: bytes=32 time<1ms TTL=127
Reply from 220.5.19.4: bytes=32 time<1ms TTL=127

Ping statistics for 220.5.19.4:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 53ms, Average = 17ms

C:\>ping 220.05.19.4

Pinging 220.05.19.4 with 32 bytes of data:

Reply from 220.5.19.4: bytes=32 time<1ms TTL=127
Reply from 220.5.19.4: bytes=32 time<1ms TTL=127
Reply from 220.5.19.4: bytes=32 time=1ms TTL=127
Reply from 220.5.19.4: bytes=32 time<1ms TTL=127

Ping statistics for 220.5.19.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.05.19.4

Pinging 220.05.19.4 with 32 bytes of data:

Reply from 220.5.19.4: bytes=32 time<1ms TTL=128
Reply from 220.5.19.4: bytes=32 time<1ms TTL=128
Reply from 220.5.19.4: bytes=32 time<1ms TTL=128
Reply from 220.5.19.4: bytes=32 time<1ms TTL=128

Ping statistics for 220.5.19.4:
    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, multiple network topologies were implemented using Cisco Packet Tracer, with all IP addresses formatted as 220.05.x.x, based on my roll number AM.EN.U4ECE220005. The first topology designed was the bus topology, where all devices were connected to a single linear backbone cable. Packet transmission was successful, with data sent from one PC being visible to all others, but only accepted by the intended recipient. Command prompt outputs confirmed successful pings with minimal packet loss, especially when the number of connected devices was low. Next, a ring topology was created, where each device connected to exactly two others, forming a closed loop. Data packets traveled through intermediate devices to reach their destination, and ping results verified successful communication across the network. Following this, a star topology was implemented with all devices individually connected to a central switch. Packet transmission was efficient, with the switch effectively managing traffic between devices. The command prompt showed low latency and successful pings, highlighting the benefits of centralized communication. A tree topology was then formed by combining multiple star topologies into a hierarchical structure. Communication across different levels of the network was smooth, and ping results confirmed stable connectivity between root and leaf nodes, showcasing the tree topology's scalability. A mesh topology was also implemented, where every device was connected to all others, ensuring high fault tolerance. Even when specific links were intentionally disabled, communication remained uninterrupted through alternate paths, as confirmed by successful ping tests. Finally, three LANs were created using different topologies and connected via a single router. LAN1 (tree topology) used IPs from 220.05.17.20 to 220.05.17.25, LAN2 (star topology) had addresses from 220.05.18.1 to 220.05.18.5, and LAN3 (ring topology) operated within 220.05.19.1 to 220.05.19.6. The router was configured with three interfaces GigabitEthernet0/0, 0/1, and 0/2—connecting to LAN1, LAN2, and LAN3 respectively. Inter-LAN communication was tested using pings, and successful packet exchanges confirmed proper router configuration and effective communication between networks.

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.