ASSIGNMENT 1&2

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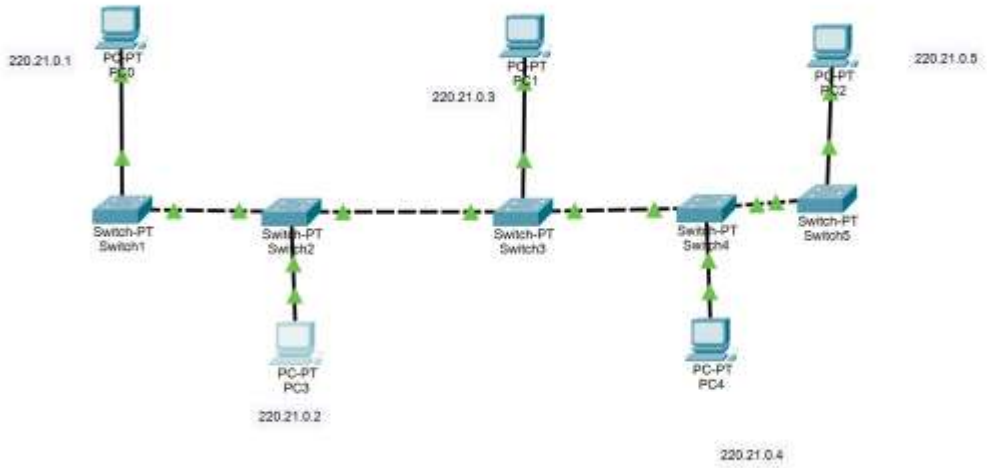
ASSIGNMENT 1:

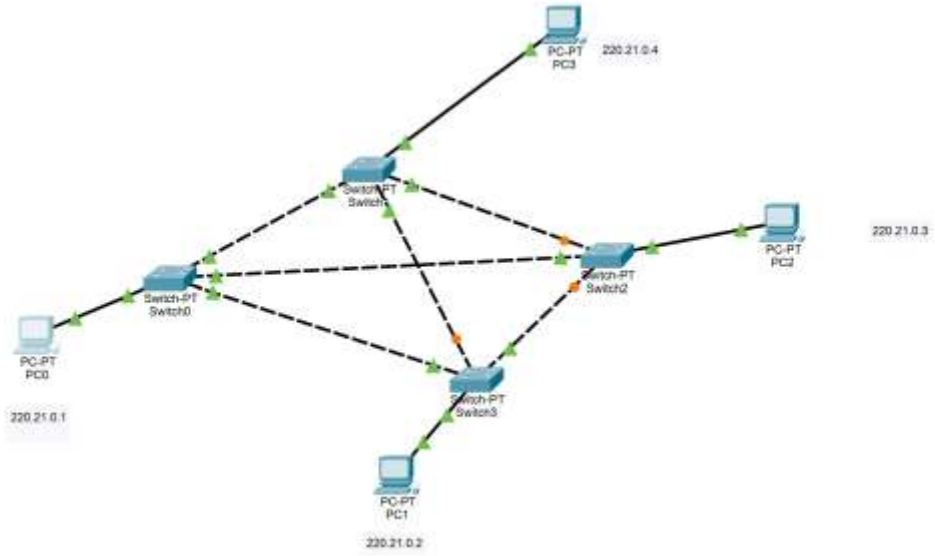
(Q)Create all the topologies discussed in class in Cisco Packet Tracer (CPT).

BUS TOPOLOGY:




```
Cisco Packet Tracer PC Command Line 1.0
C:\>piping 220.21.0.4
Invalid Command.

C:\>ping 220.21.0.4

Pinging 220.21.0.4 with 32 bytes of data:

Reply from 220.21.0.4: bytes=32 time<1ms TTL=128
Reply from 220.21.0.4: bytes=32 time=10ms TTL=128
Reply from 220.21.0.4: bytes=32 time<1ms TTL=128
Reply from 220.21.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 220.21.0.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 10ms, Average = 2ms
```

MESH TOPOLOGY:

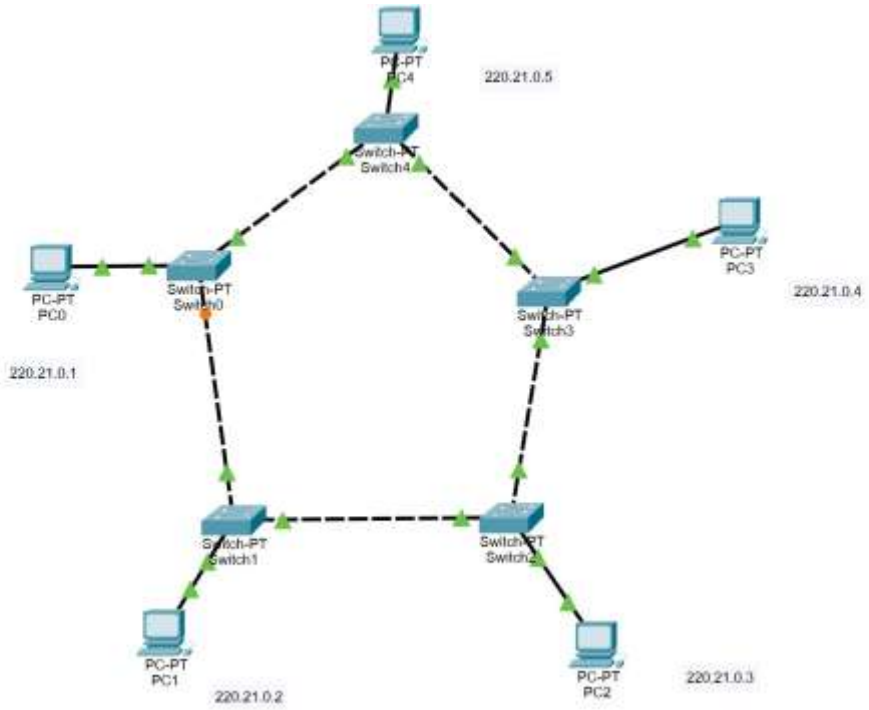


Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.21.0.3

Pinging 220.21.0.3 with 32 bytes of data:

Reply from 220.21.0.3: bytes=32 time=1ms TTL=128
Reply from 220.21.0.3: bytes=32 time=1ms TTL=128
Reply from 220.21.0.3: bytes=32 time<1ms TTL=128
Reply from 220.21.0.3: bytes=32 time<1ms TTL=128

Ping statistics for 220.21.0.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

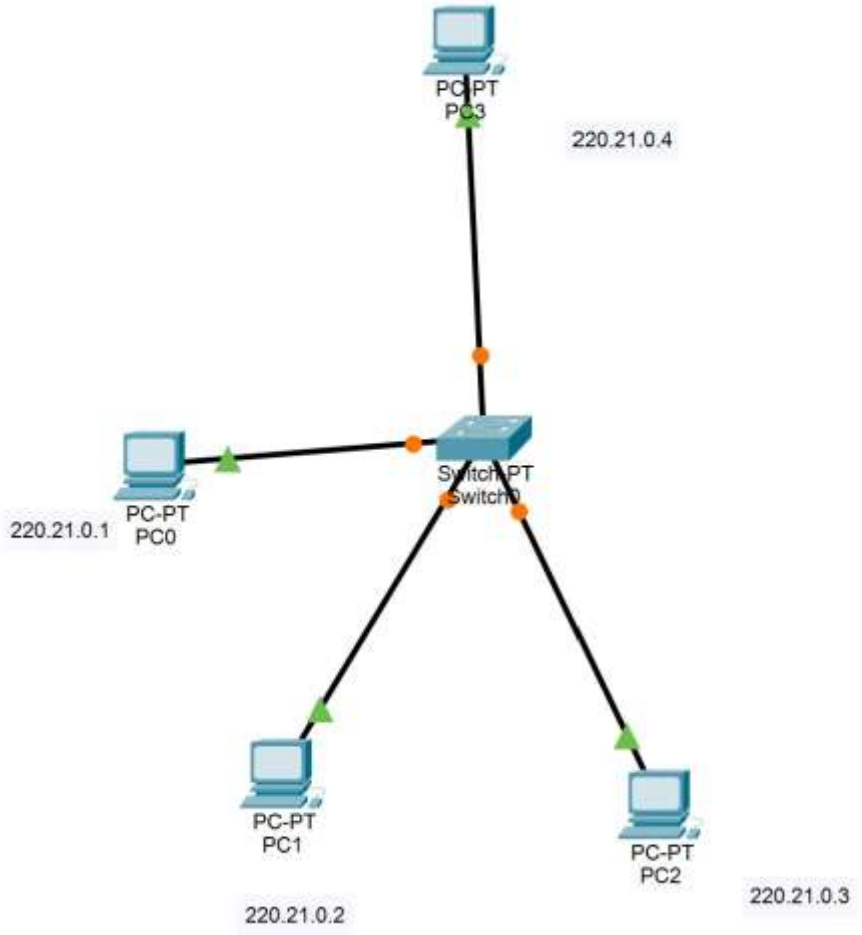
RING TOPOLOGY:

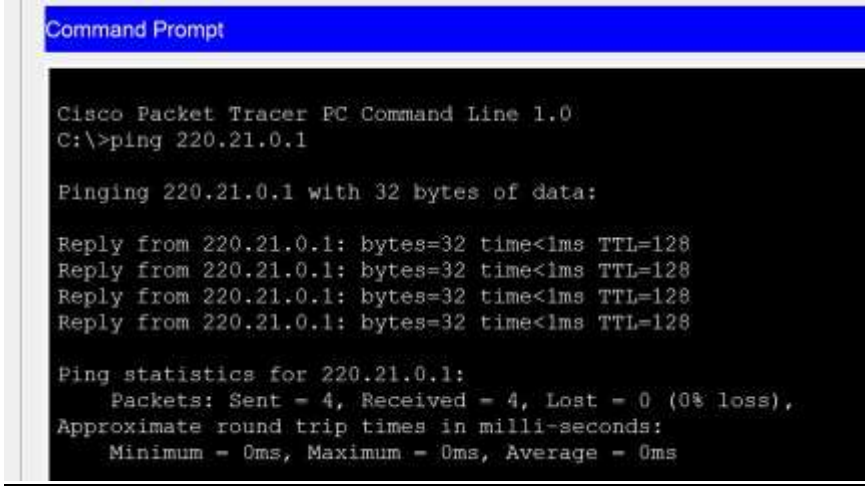


Command Prompt

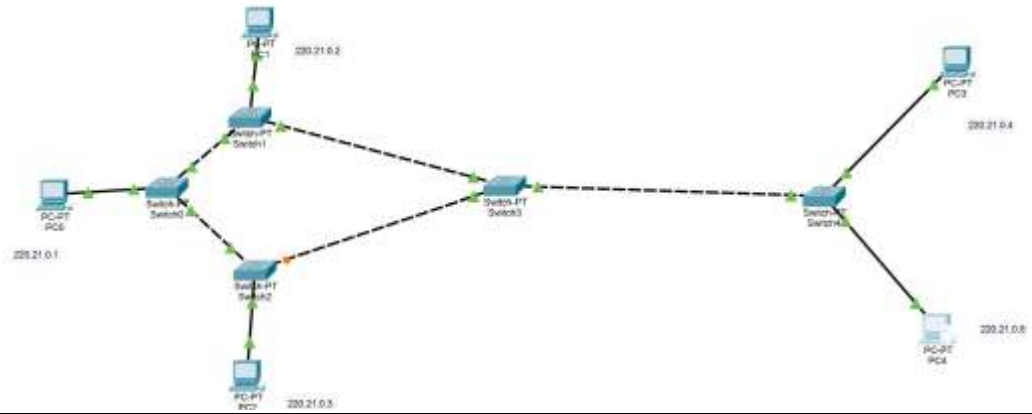
```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.21.0.2

Pinging 220.21.0.2 with 32 bytes of data:

Reply from 220.21.0.2: bytes=32 time<1ms TTL=128
Reply from 220.21.0.2: bytes=32 time<1ms TTL=128
Reply from 220.21.0.2: bytes=32 time<1ms TTL=128
Reply from 220.21.0.2: bytes=32 time<1ms TTL=128

Ping statistics for 220.21.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

STAR TOPOLOGY:





TREE TOPOLOGY:



```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.21.0.4

Pinging 220.21.0.4 with 32 bytes of data:

Reply from 220.21.0.4: bytes=32 time<1ms TTL=128
Reply from 220.21.0.4: bytes=32 time<1ms TTL=128
Reply from 220.21.0.4: bytes=32 time<1ms TTL=128
Reply from 220.21.0.4: bytes=32 time<1ms TTL=128

Ping statistics for 220.21.0.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

OBSERVATION:

In this simulation, different standard network topologies were individually designed and implemented using Cisco Packet Tracer:

- Tree Topology: A hierarchical structure combining characteristics of both star and bus topologies. Easy to expand, but highly dependent on the root node.
- Mesh Topology: Each device is connected to every other device, offering full redundancy and fault tolerance, though requiring a large number of connections.
- Bus Topology: A single backbone cable connects all devices. It is simple and cost-effective but prone to collisions and difficult to troubleshoot if the backbone fails.
- Ring Topology: Devices are connected in a closed loop, where data travels in one or both directions. Predictable performance but sensitive to failures unless dual rings are implemented.
- Star Topology: All devices are individually connected to a central device (switch/hub), offering high reliability and ease of fault isolation but depending heavily on the central device.

Each topology was built and tested for successful communication between devices (using ping), and all were verified to function correctly .

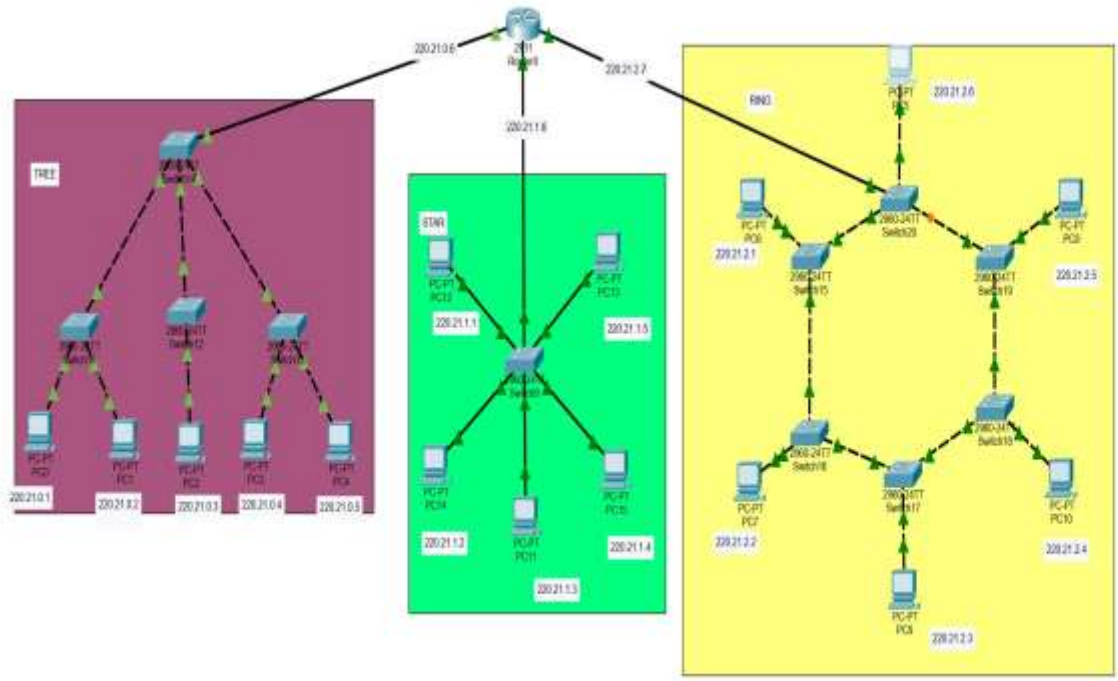
INFERENCE:

The exercise demonstrated that each network topology offers unique advantages and trade-offs:

- Star and Tree topologies are more scalable and easier to manage, making them popular choices for modern networks.
- Mesh topology provides maximum redundancy and fault tolerance but at a high cost of cabling and complexity.
- Bus topology is suitable for small, simple networks but lacks scalability and reliability.
- Ring topology ensures orderly data transfer but is vulnerable to single points of failure without redundancy mechanisms.

ASSIGNMENT 2:

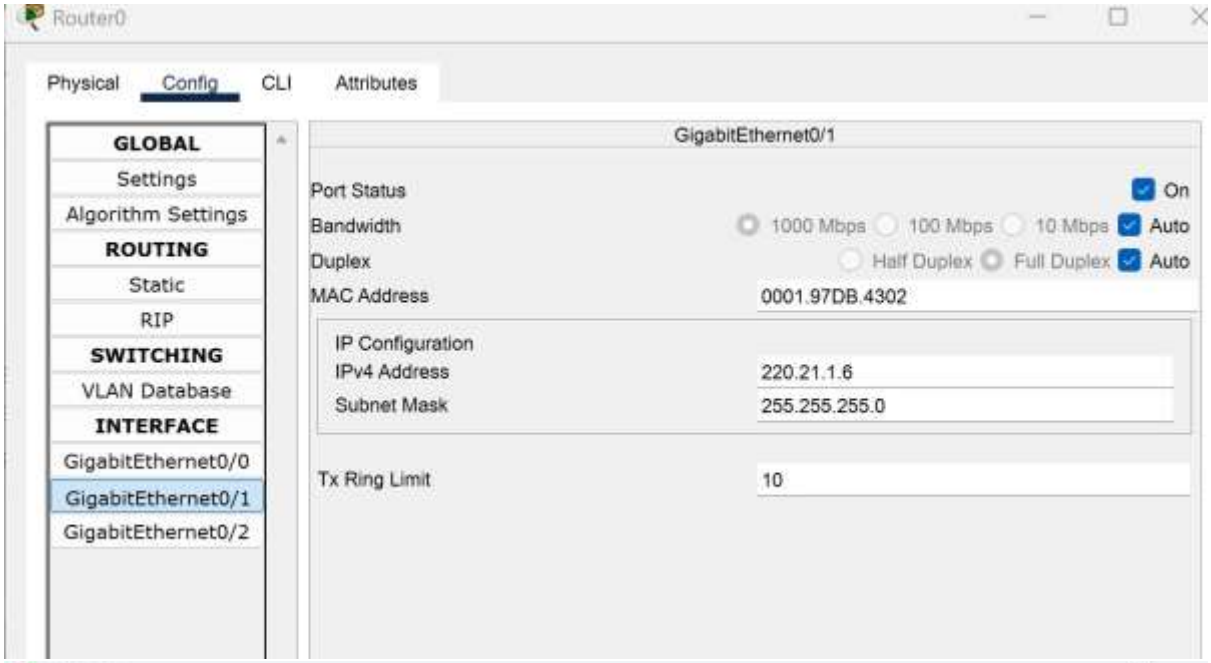
(Q) Create 3 LAN networks connected via a single Router (CPT). Choose appropriate router, connection and configure it. Each LAN network is configured via Tree, Star and Ring topologies respectively.

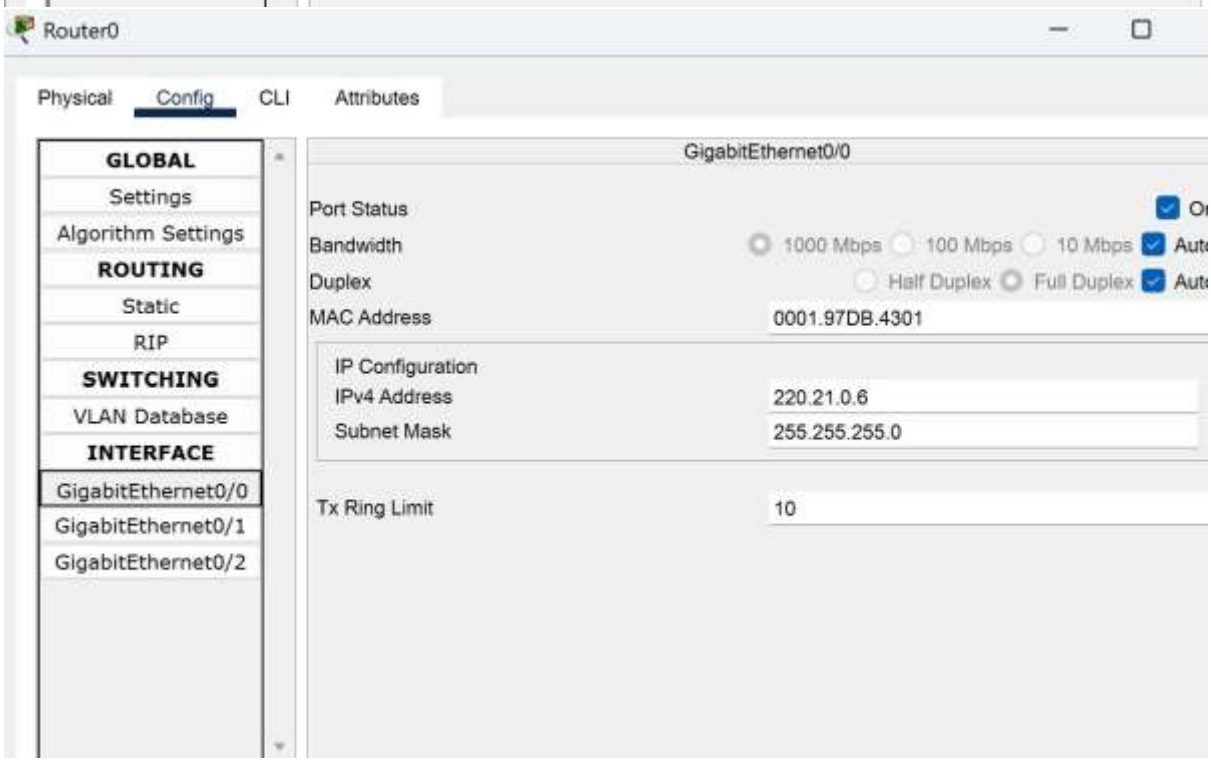


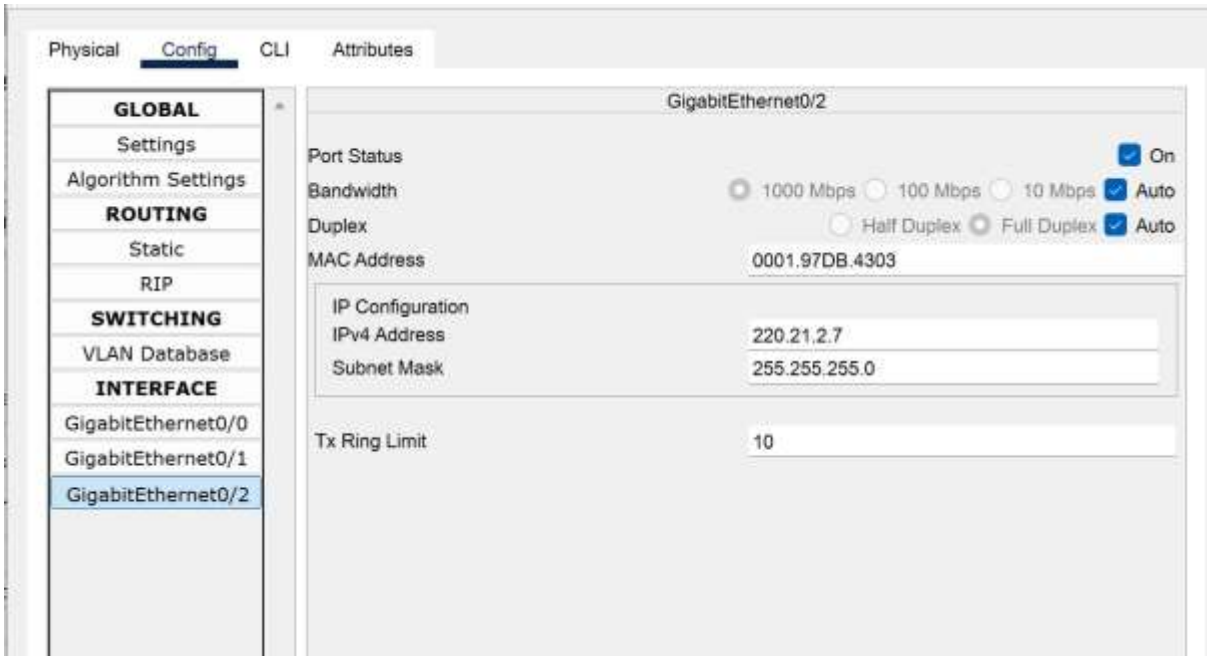
IP Addresses – 220.21.1.1 - 220.21.1.5 LAN2 (Star topology)

IP Addresses –220.21.2.1-220.21.2.6 LAN3 (Ring topology)

IP Addresses – 220.21.0.1-220.21.0.5(Tree topology)


Router0
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0
GigabitEthernet0/1
GigabitEthernet0/2
GigabitEthernet0/1
Port Status
On
Bandwidth
1000 Mbps
100 Mbps
10 Mbps
Auto
Duplex
Half Duplex
Full Duplex
Auto
MAC Address
0001.97DB.4302
IP Configuration
IPv4 Address
220.21.1.6
Subnet Mask
255.255.255.0
Tx Ring Limit
10


Router0
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
GigabitEthernet0/0
GigabitEthernet0/1
GigabitEthernet0/2
GigabitEthernet0/0
Port Status
Bandwidth
1000 Mbps
100 Mbps
10 Mbps
Duplex
Half Duplex
Full Duplex
MAC Address
0001.97DB.4301
IP Configuration
IPv4 Address
220.21.0.6
Subnet Mask
255.255.255.0
Tx Ring Limit
10

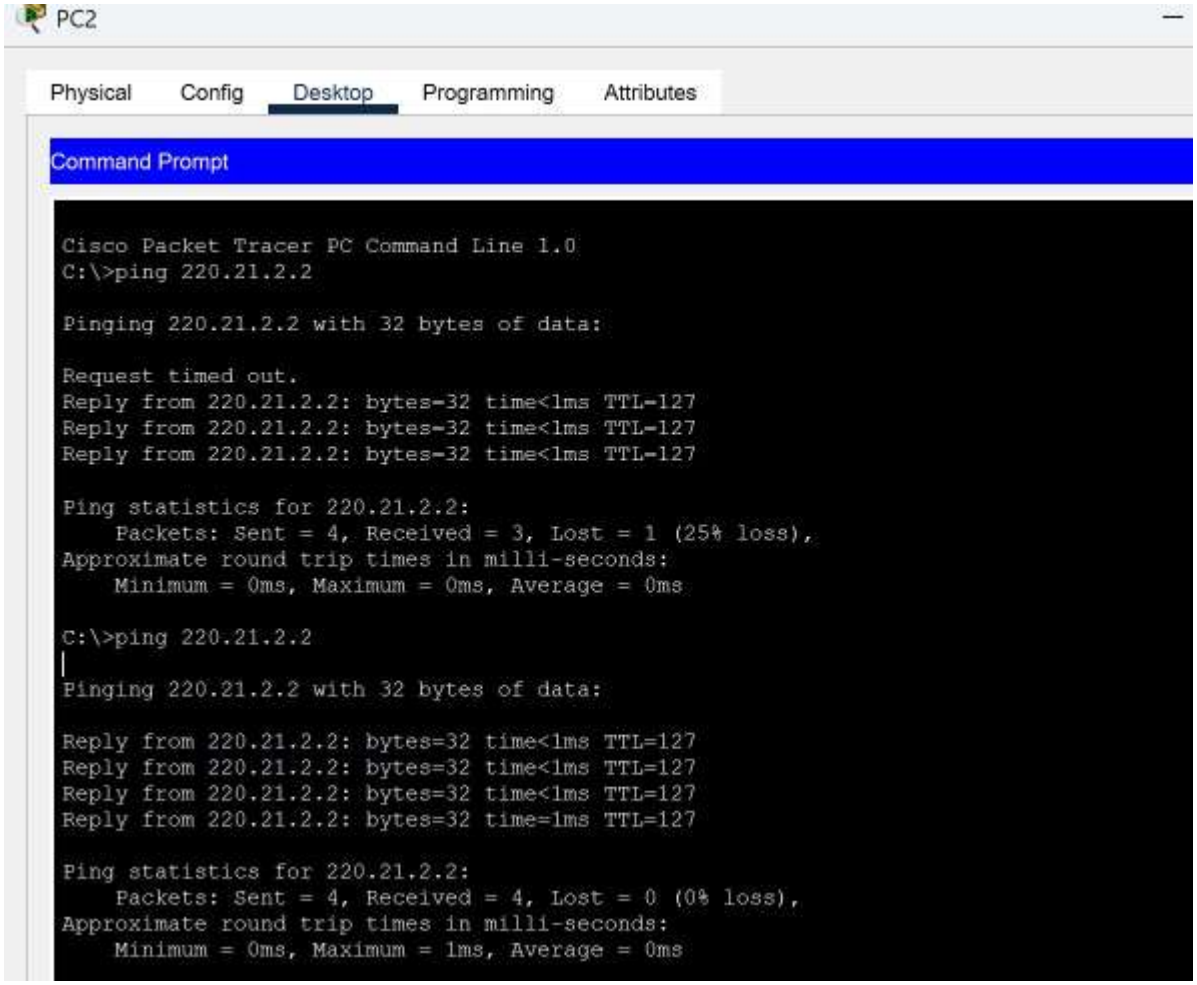


GigabitEthernet0/0 → Connected to LAN1 (Tree Topology)

GigabitEthernet0/1 → Connected to LAN2 (Star Topology)

GigabitEthernet0/2 → Connected to LAN3 (Ring Topology)

RESULT




```
C:\>ping 220.21.1.3

Pinging 220.21.1.3 with 32 bytes of data:

Request timed out.
Reply from 220.21.1.3: bytes=32 time<1ms TTL=127
Reply from 220.21.1.3: bytes=32 time<1ms TTL=127
Reply from 220.21.1.3: bytes=32 time<1ms TTL=127

Ping statistics for 220.21.1.3:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 220.21.1.3

Pinging 220.21.1.3 with 32 bytes of data:

Reply from 220.21.1.3: bytes=32 time<1ms TTL=127
Reply from 220.21.1.3: bytes=32 time<1ms TTL=127
Reply from 220.21.1.3: bytes=32 time<1ms TTL=127
Reply from 220.21.1.3: bytes=32 time<1ms TTL=127

Ping statistics for 220.21.1.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

INFERENCE:

In this simulation, a centralized router is configured to connect three distinct LAN networks, each adopting a different topology to understand their structural and operational differences. The router's interfaces were mapped as follows:

- GigabitEthernet0/0 → Connected to LAN1 (Tree Topology)
- GigabitEthernet0/1 → Connected to LAN2 (Star Topology)
- GigabitEthernet0/2 → Connected to LAN3 (Ring Topology)

The IP addressing was structured systematically based on the roll number series (220.21.X.X),

- LAN1 (Tree Topology): 220.21.0.1 – 220.21.0.5
- LAN2 (Star Topology): 220.21.1.1 – 220.21.1.5
- LAN3 (Ring Topology): 220.21.2.1 – 220.21.2.6

OBSERVATIONS:

- Tree Topology (LAN1) offers a hierarchical, easily scalable structure ideal for expanding networks, though failure in higher-level nodes could impact large sections of the network.
- Star Topology (LAN2) provides high reliability and ease of troubleshooting, as each device is independently connected to a central switch, but it heavily depends on the switch's availability.
- Ring Topology (LAN3) ensures each device is connected to exactly two other devices, forming a closed loop; although data transmission is orderly, a break in the ring can disrupt communication unless dual ring redundancy is used.

The router acts as a backbone, facilitating inter-network communication between different LANs. Proper IP addressing and physical organization ensured smooth connectivity, easy troubleshooting, and efficient packet routing.

From this we are able to demonstrate a proper implementation of network design concepts and real time IP address planning all under a unified routing framework.