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AM.EN.U4ECE22047

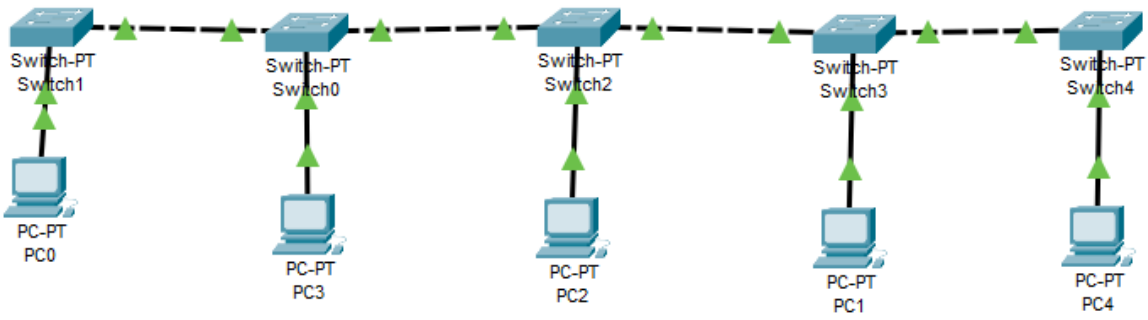
19ECE311-COMPUTER NETWORKS

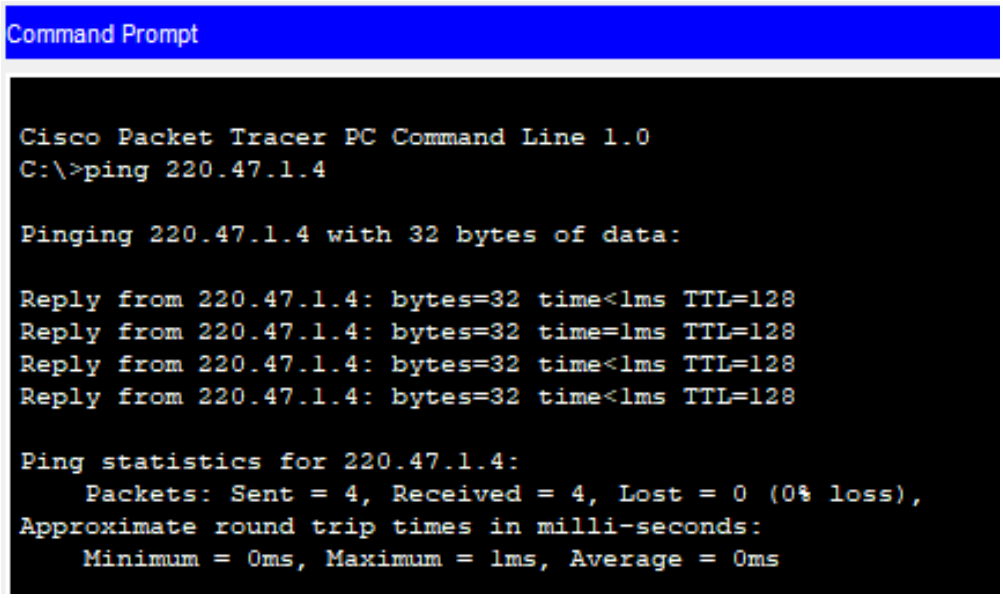
ASSIGNMENT

1. **Create all the topologies using Cisco Packet Tracer**

- **Bus topology:**

  All devices are connected to a single backbone cable. It's easy to install and low cost but hard to troubleshoot, and if the main cable fails, the whole network goes down.

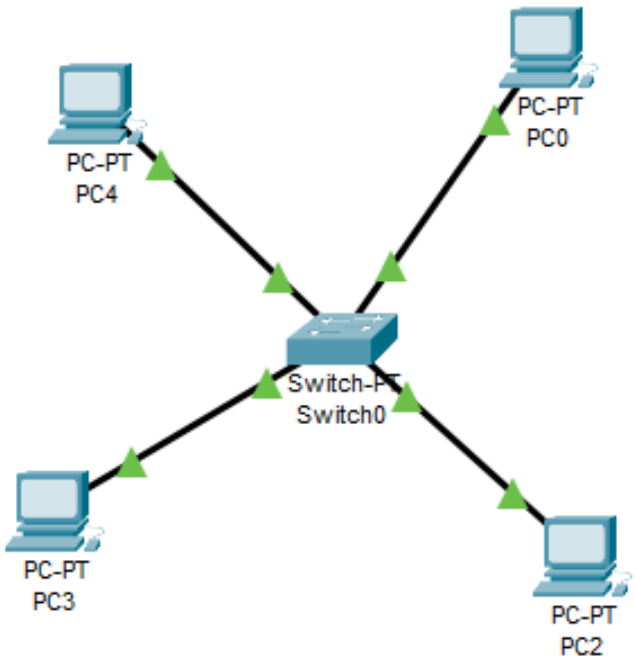




PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC0	PC2	ICMP		0.000	N	0	(edit)
	Successful	PC3	PC0	ICMP		0.000	N	1	(edit)
	Successful	PC0	PC4	ICMP		0.000	N	2	(edit)
	Successful	PC2	PC1	ICMP		0.000	N	3	(edit)
	Successful	PC3	PC4	ICMP		0.000	N	4	(edit)
	Successful	PC2	PC1	ICMP		0.000	N	5	(edit)
	Successful	PC0	PC4	ICMP		0.000	N	6	(edit)
	Successful	PC3	PC4	ICMP		0.000	N	7	(edit)

- **Star Topology:**
  Every device connects individually to a central hub or switch. It's easy to manage and expand, but if the hub fails, the entire network is affected.



```
Command Prompt

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.47.1.3

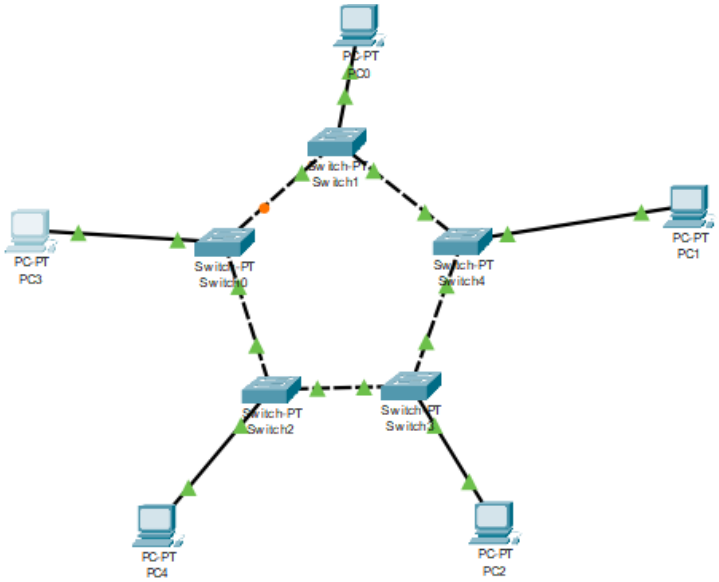
Pinging 220.47.1.3 with 32 bytes of data:

Reply from 220.47.1.3: bytes=32 time<1ms TTL=128
Reply from 220.47.1.3: bytes=32 time<1ms TTL=128
Reply from 220.47.1.3: bytes=32 time<1ms TTL=128
Reply from 220.47.1.3: bytes=32 time<1ms TTL=128

Ping statistics for 220.47.1.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC4	PC2	ICMP		0.000	N	0	(edit)
	Successful	PC4	PC3	ICMP		0.000	N	1	(edit)
	Successful	PC4	PC0	ICMP		0.000	N	2	(edit)
	Successful	PC4	PC3	ICMP		0.000	N	3	(edit)
	Successful	PC0	PC2	ICMP		0.000	N	4	(edit)
	Successful	PC0	PC3	ICMP		0.000	N	5	(edit)
	Successful	PC3	PC0	ICMP		0.000	N	6	(edit)

- **<u>Ring Topology</u>**:
  Devices are connected in a closed loop where data travels in one direction (or both in dual-ring). It's organized and good for heavy traffic, but a single break can disrupt communication.



Command Prompt

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Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.47.1.4

Pinging 220.47.1.4 with 32 bytes of data:

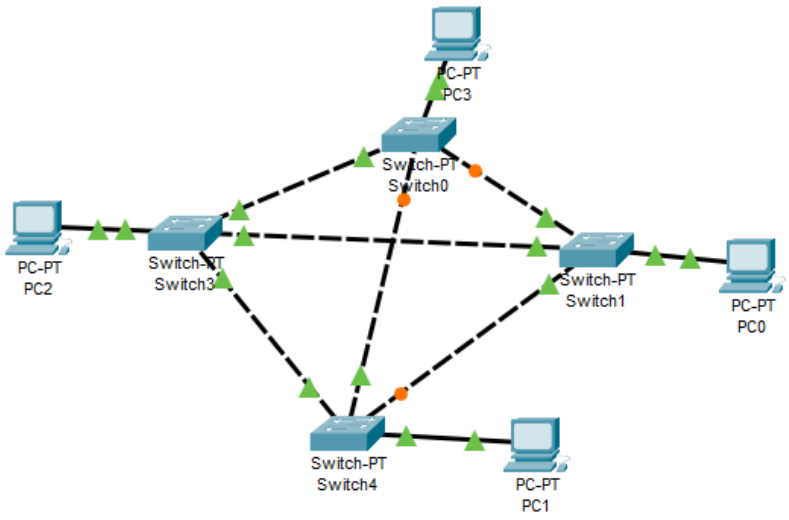
Reply from 220.47.1.4: bytes=32 time<1ms TTL=128
Reply from 220.47.1.4: bytes=32 time<1ms TTL=128
Reply from 220.47.1.4: bytes=32 time<1ms TTL=128
Reply from 220.47.1.4: bytes=32 time<1ms TTL=128

Ping statistics for 220.47.1.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC0	PC4	ICMP		0.000	N	0	(edit)
	Successful	PC3	PC2	ICMP		0.000	N	1	(edit)
	Successful	PC1	PC4	ICMP		0.000	N	2	(edit)
	Successful	PC0	PC2	ICMP		0.000	N	3	(edit)
	Successful	PC3	PC1	ICMP		0.000	N	4	(edit)
	Successful	PC1	PC4	ICMP		0.000	N	5	(edit)
	Successful	PC0	PC2	ICMP		0.000	N	6	(edit)

- **<u>Mesh Topology</u>**:
  Every device is connected to every other device, ensuring multiple paths for data. It's very reliable and fault-tolerant but expensive and complex to set up.



Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.47.1.3

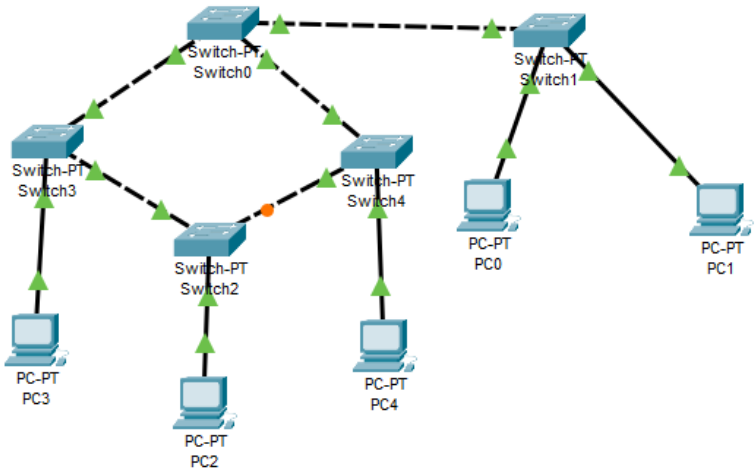
Pinging 220.47.1.3 with 32 bytes of data:

Reply from 220.47.1.3: bytes=32 time<1ms TTL=128
Reply from 220.47.1.3: bytes=32 time<1ms TTL=128
Reply from 220.47.1.3: bytes=32 time<1ms TTL=128
Reply from 220.47.1.3: bytes=32 time<1ms TTL=128

Ping statistics for 220.47.1.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC2	PC0	ICMP		0.000	N	0	(edit)
	Successful	PC2	PC3	ICMP		0.000	N	1	(edit)
	Successful	PC2	PC1	ICMP		0.000	N	2	(edit)
	Successful	PC2	PC0	ICMP		0.000	N	3	(edit)
	Successful	PC3	PC0	ICMP		0.000	N	4	(edit)
	Successful	PC0	PC2	ICMP		0.000	N	5	(edit)
	Successful	PC1	PC3	ICMP		0.000	N	6	(edit)

- **<u>Tree Topology</u>**:
  A combination of star topologies arranged in a hierarchical structure. It's scalable and easy to manage in parts, but if the main "root" node fails, large parts of the network can go down.



```
ommand Prompt

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.47.1.3

Pinging 220.47.1.3 with 32 bytes of data:

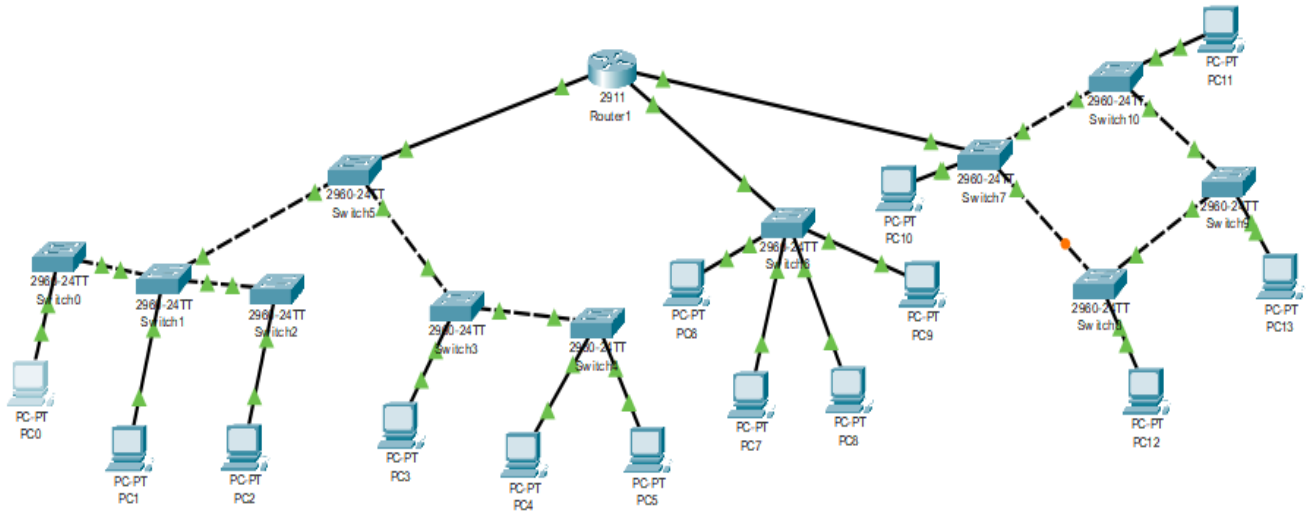
Reply from 220.47.1.3: bytes=32 time<1ms TTL=128
Reply from 220.47.1.3: bytes=32 time<1ms TTL=128
Reply from 220.47.1.3: bytes=32 time=1ms TTL=128
Reply from 220.47.1.3: bytes=32 time<1ms TTL=128

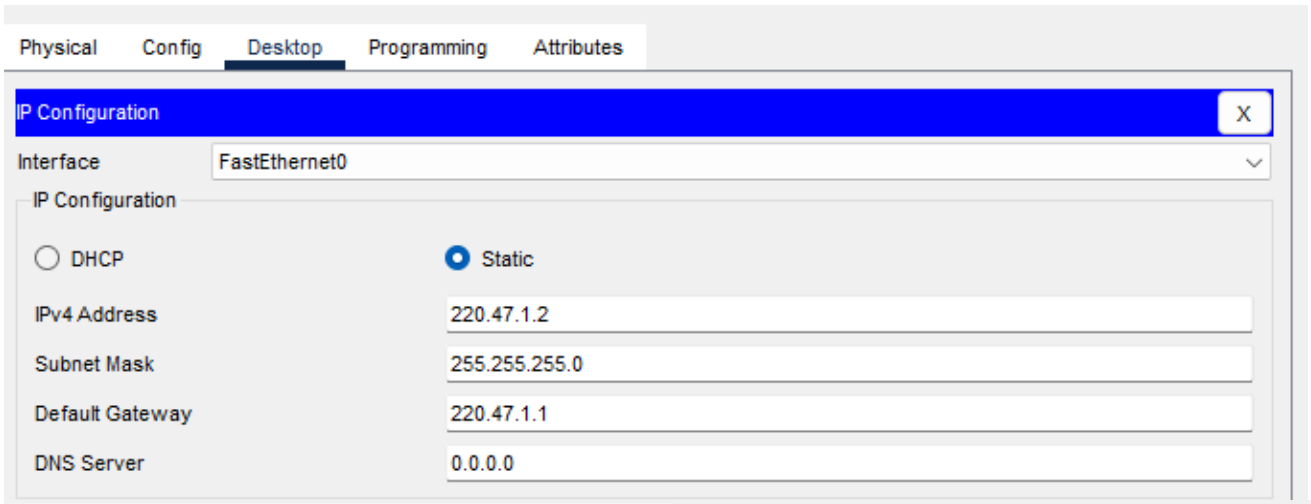
Ping statistics for 220.47.1.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

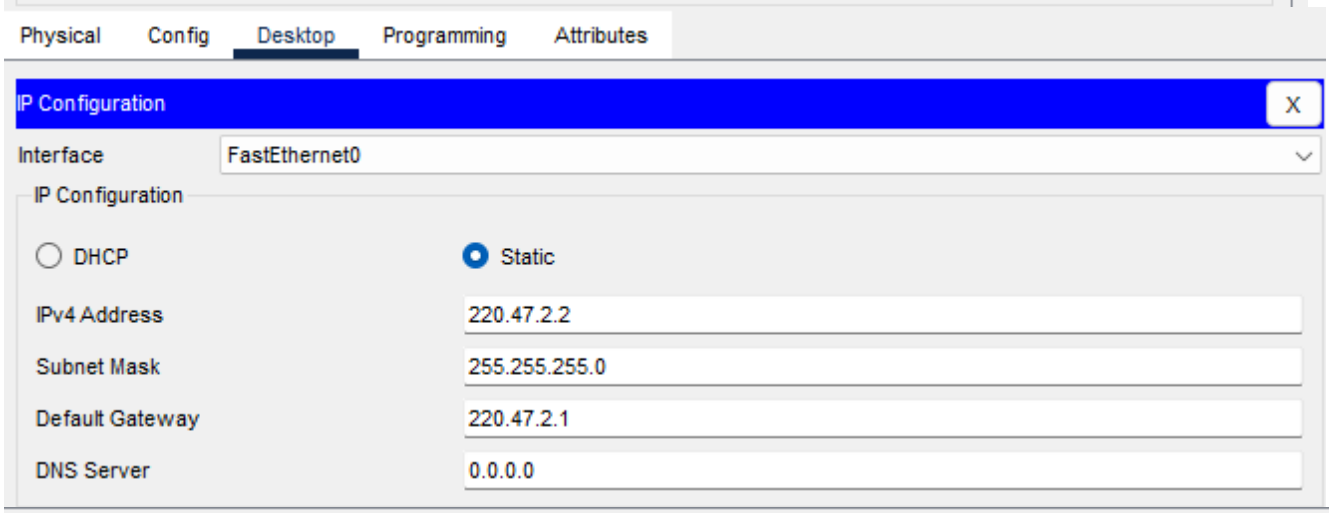
C:\>
```

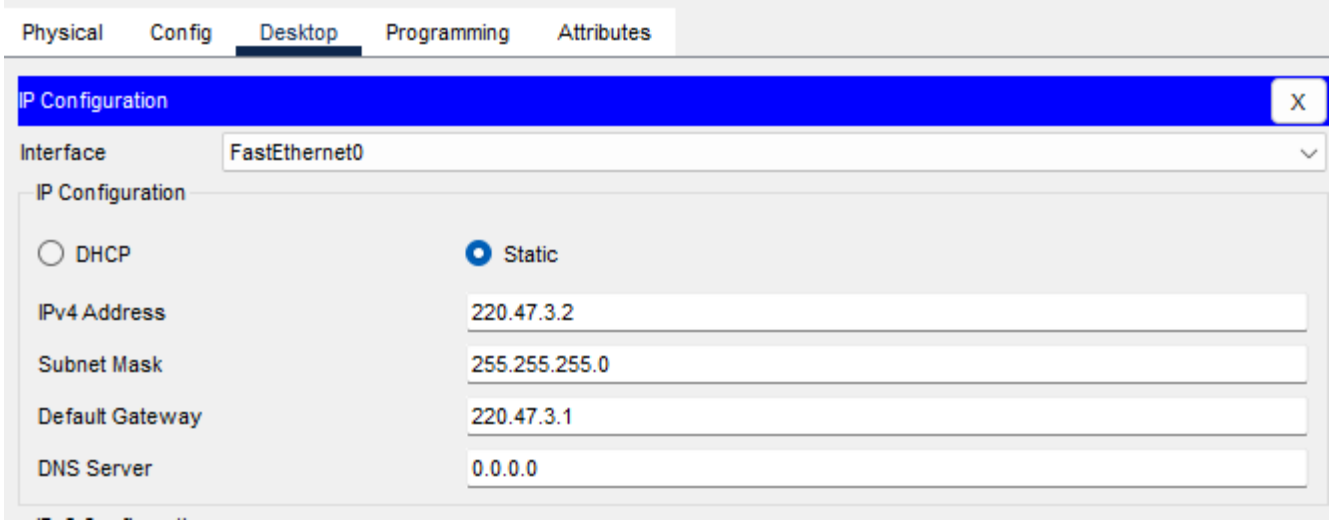
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC3	PC2	ICMP		0.000	N	0	(edit)
	Successful	PC2	PC0	ICMP		0.000	N	1	(edit)
	Successful	PC2	PC1	ICMP		0.000	N	2	(edit)
	Successful	PC4	PC0	ICMP		0.000	N	3	(edit)
	Successful	PC1	PC2	ICMP		0.000	N	4	(edit)
	Successful	PC3	PC0	ICMP		0.000	N	5	(edit)
	Successful	PC4	PC1	ICMP		0.000	N	6	(edit)

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.**




Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
220.47.1.2
Subnet Mask
255.255.255.0
Default Gateway
220.47.1.1
DNS Server
0.0.0.0


Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
220.47.2.2
Subnet Mask
255.255.255.0
Default Gateway
220.47.2.1
DNS Server
0.0.0.0


Physical
Config
Desktop
Programming
Attributes
IP Configuration
X
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
220.47.3.2
Subnet Mask
255.255.255.0
Default Gateway
220.47.3.1
DNS Server
0.0.0.0

PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC0	Router1	ICMP		0.000	N	0	(edit)
	Successful	PC6	Router1	ICMP		0.000	N	1	(edit)
	Successful	PC12	Router1	ICMP		0.000	N	2	(edit)
	Successful	PC0	PC6	ICMP		0.000	N	3	(edit)
	Successful	PC8	PC12	ICMP		0.000	N	4	(edit)

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 220.47.1.1

Pinging 220.47.1.1 with 32 bytes of data:

Reply from 220.47.1.1: bytes=32 time<1ms TTL=255
Reply from 220.47.1.1: bytes=32 time=1ms TTL=255
Reply from 220.47.1.1: bytes=32 time<1ms TTL=255
Reply from 220.47.1.1: bytes=32 time<1ms TTL=255

Ping statistics for 220.47.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 220.47.1.2

Pinging 220.47.1.2 with 32 bytes of data:

Reply from 220.47.1.2: bytes=32 time=5ms TTL=128
Reply from 220.47.1.2: bytes=32 time=7ms TTL=128
Reply from 220.47.1.2: bytes=32 time=5ms TTL=128
Reply from 220.47.1.2: bytes=32 time=7ms TTL=128

Ping statistics for 220.47.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 5ms, Maximum = 7ms, Average = 6ms
```

```
C:\>ping 220.47.1.3

Pinging 220.47.1.3 with 32 bytes of data:

Reply from 220.47.1.3: bytes=32 time<1ms TTL=128
Reply from 220.47.1.3: bytes=32 time<1ms TTL=128
Reply from 220.47.1.3: bytes=32 time<1ms TTL=128
Reply from 220.47.1.3: bytes=32 time<1ms TTL=128

Ping statistics for 220.47.1.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Result and Inference:

While designing and implementing the three LAN topologies (Tree, Star, and Ring) connected through a single router in Cisco Packet Tracer, several important observations were made. The Tree topology showcased a hierarchical arrangement, which made it easy to expand the network; however, any failure in a higher-level device led to connectivity issues for all devices connected below it. In the Star topology, every device was directly linked to a central switch, providing a stable and efficient setup. Individual link failures did not impact the rest of the network, although a failure in the central switch resulted in complete network disruption. The Ring topology involved each device connecting to exactly two others, forming a closed loop. This arrangement ensured efficient data flow but made the network vulnerable, as a single break could affect the entire communication path. The router efficiently connected all three LANs, with IP addresses correctly assigned according to the roll number-based scheme, allowing successful communication between the networks. Accurate cabling and thorough configuration were critical to achieving proper connectivity and successful ping responses. This exercise emphasized the significance of selecting suitable topologies depending on factors like scalability, fault tolerance, and efficiency, while also reinforcing the need for careful IP addressing and router setup to ensure smooth network operation.