M.Kumarasamy College of Engineering
NAAC Accredited Autonomous Institution
Approved by AICTE & Affiliated to Anna University
ISO 9001:2015 Certified Institution
Thalavapalayam, Karur, Tamilnadu.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

LABORATORY MANUAL

REGULATION 2023

CSB1311– COMPUTER NETWORKS LABORATORY

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

VISION OF THE INSTITUTION

To emerge as a leader among the top institutions in the field of technical education

MISSION OF THE INSTITUTION

- Produce smart technocrats with empirical knowledge who can surmount the global challenges
- Create a diverse, fully-engaged, learner-centric campus environment to provide quality education to the students
- Maintain mutually beneficial partnerships with our alumni, industry, and Professional associations

VISION OF THE DEPARTMENT

- To achieve education and research excellence in Computer Science and Engineering

MISSION OF THE DEPARTMENT

- To excel in academic through effective teaching learning techniques
- To promote research in the area of computer science and engineering with the focus on innovation
- To transform students into technically competent professionals with societal and ethical responsibilities

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: Graduates will have successful career in software industries and R&D divisions through continuous learning.

PEO 2: Graduates will provide effective solutions for real world problems in the key domain of computer science and engineering and engage in lifelong learning.

PEO 3: Graduates will excel in their profession by being ethically and socially responsible.

PROGRAM OUTCOMES (POs)

Engineering students will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- **PSO1: Professional Skills:** Ability to apply the knowledge of computing techniques to design and develop computerized solutions for the problems.
- **PSO2: Successful career:** Ability to utilize the computing skills and ethical values in creating a successful career.

SYALLABUS

LIST OF EXCERSISE WITH CO PO MAPPING

Ex. No.	Title of the Excersise	Cos	POs	PSOs
1	Simulate Different Networks and Topologies.	CO1	PO1-10	PSO1,PSO2
2	Configure and analyze packet switching and circuit switching.	CO1	PO1-10	PSO1,PSO2
3	Implement Error Detection and Correction.	CO2	PO1-10	PSO1,PSO2
4	Simulate Flow and Error control mechanisms.	CO2	PO1-10	PSO1,PSO2
5	Simulate Different routing protocols.	CO3	PO1-10	PSO1,PSO2
6	Simulate subnetting and CIDR implementation.	CO3	PO1-10	PSO1,PSO2
7	Implement Process-to-Process Communication Using TCP.	CO4	PO1-10	PSO1,PSO2
8	Implement Process-to-Process Communication Using UDP.	CO4	PO1-10	PSO1,PSO2
9	Configuring DNS and Web Services.	CO5	PO1-10	PSO1,PSO2
10	Simulate Email, FTP services.	CO5	PO1-10	PSO1,PSO2

HARDWARE REQUIREMENTS

- Personal Computer
- Network Switch
- CAT 5/CAT 6 Cables

SOFTWARE REQUIREMENTS

- JDK 2.1
- Packet Tracer /NS or Equivalent

TABLE OF CONTENTS

SIMULATE DIFFERENT NETWORKS AND TOPOLOGYS

Exercise.No:1

Aim:

To simulate different types of networks and network topology using network simulation tools in order to analyze their structure, performance, and behavior under various conditions.

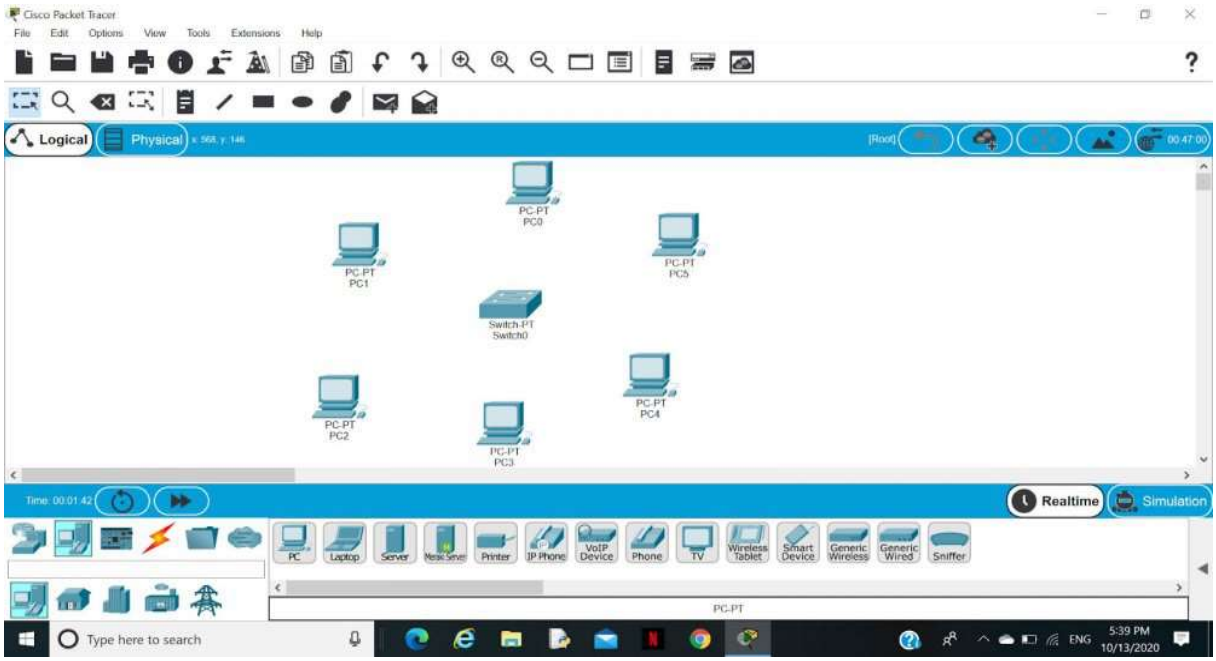
Procedure:

A star topology for a Local Area Network (LAN) is one in which each node is connected to a central connection point, such as a hub or switch. Whenever a node tries to connect with another node then the transmission of the message must be happening with the help of the central node. The best part of star topology is the addition and removal of the node in the network but too many nodes can cause suffering to the network.

A Cisco packet tracer is a simulation tool that is used for understanding the networks. The best part of the Cisco packet tracer is its visualization you can see the actual flow of the message and understand the workflow of the network devices. Implementation of Star Topology using Cisco Packet Tracer is done using Switch.

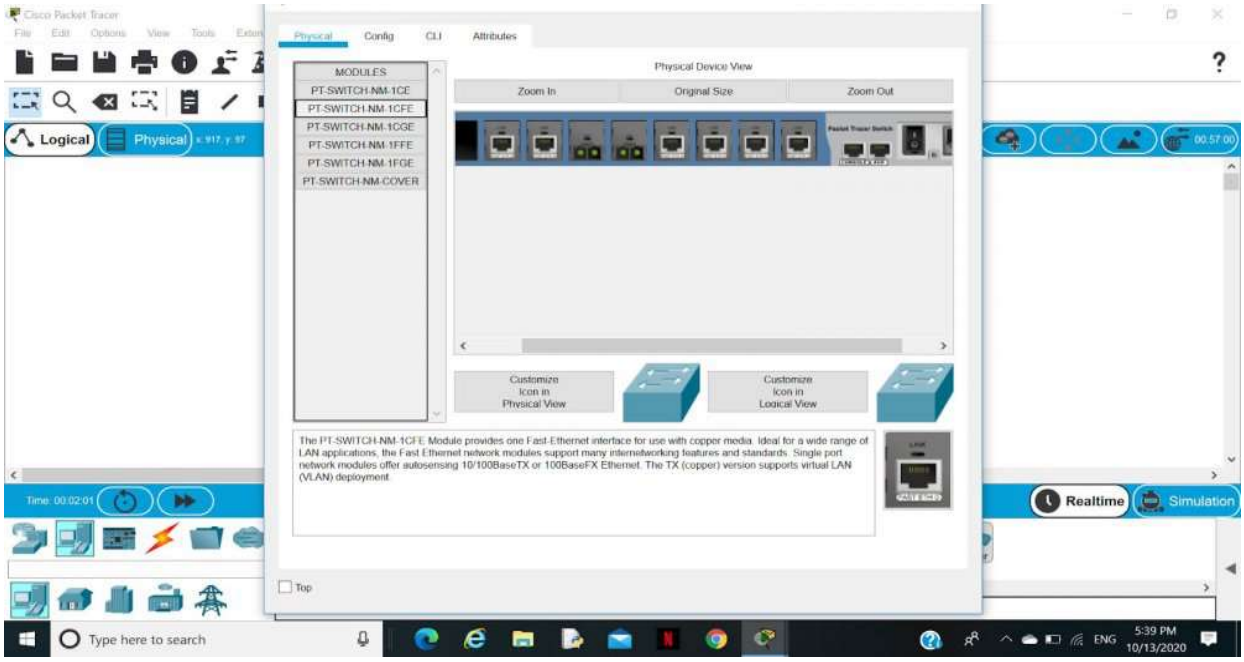
Steps Implementing Star Topology using Cisco Packet Tracer:

Step 1: We have taken a switch and linked it to six end devices.

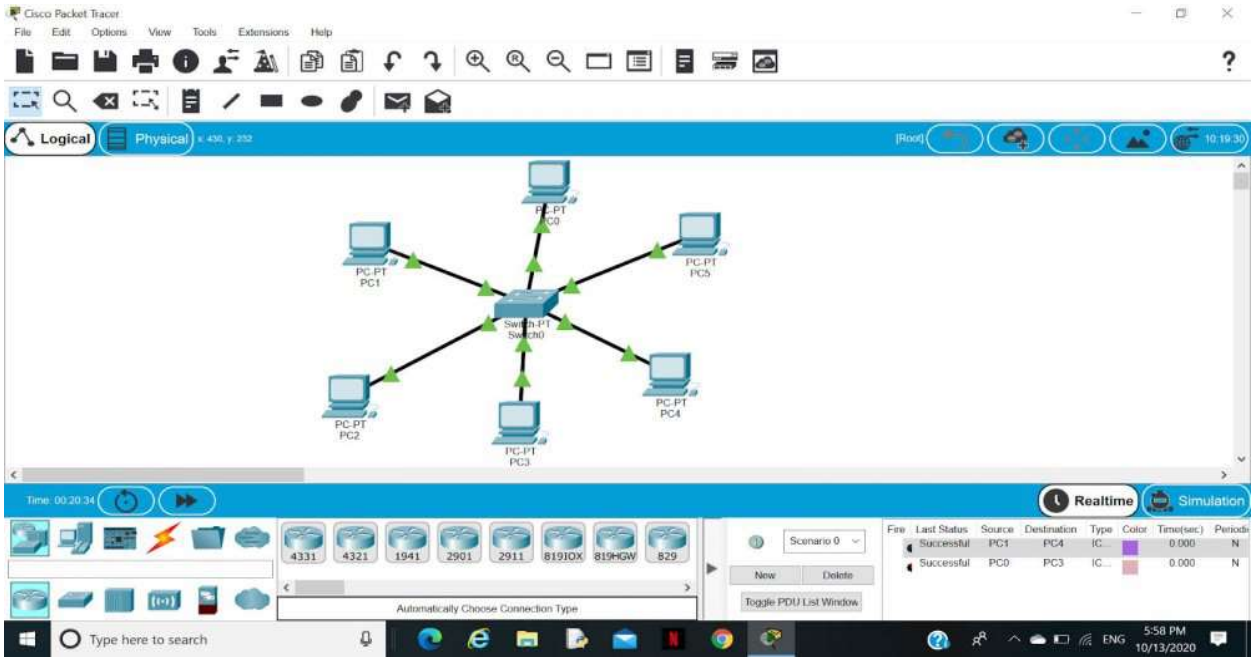


Step 2: Link every device with the switch.

Step 3: Provide the IP address to each device.



Step 4: Transfer message from one device to another and check the Table for Validation.



Now to check whether the connections are correct or not try to ping any device and the image below is doing the same.

To do ping one terminal of one device and run the following command:

Command:

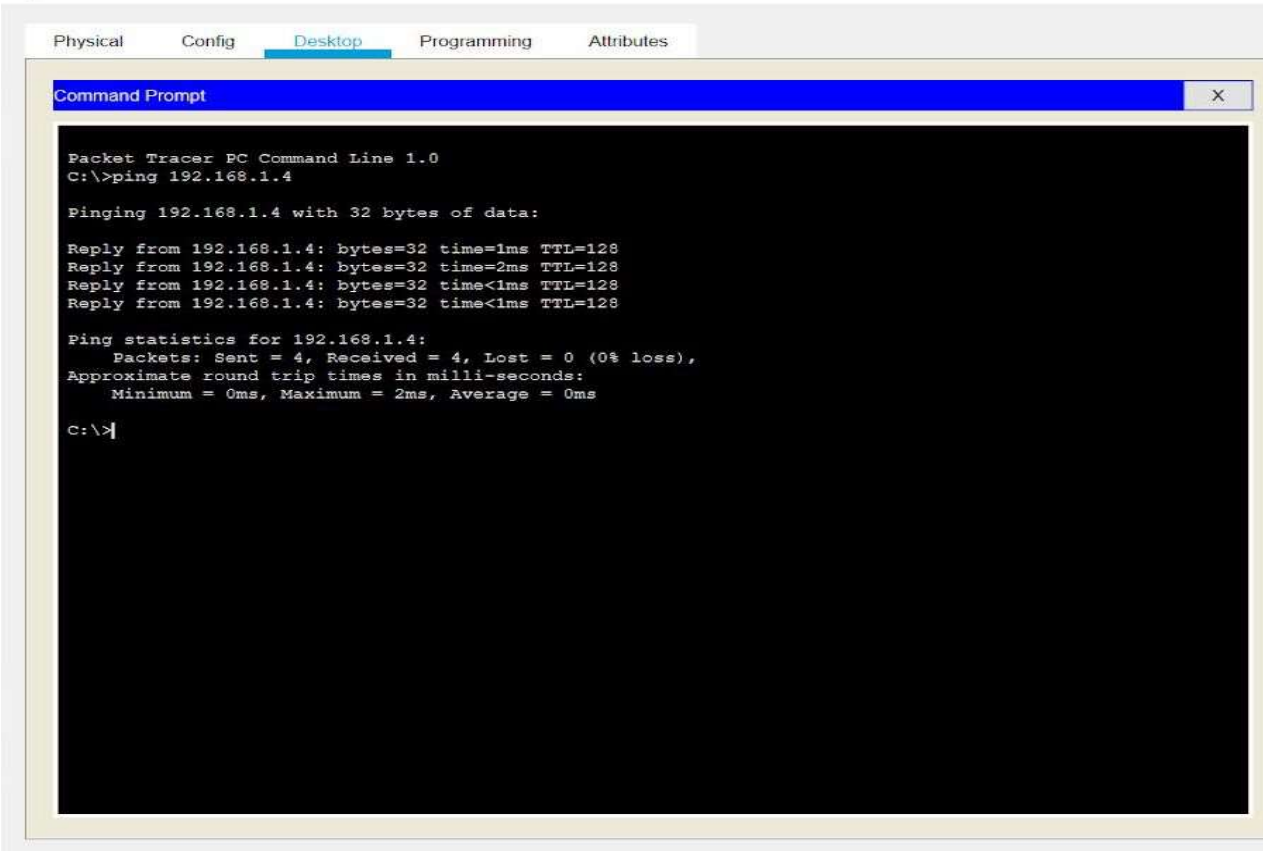
"ping ip_address_of _any_device"

Example:

ping 192.168.1.4

Note:If the connections are correct

then you will receive the response.



BUS TOPOLOGY:

A bus topology is a network in which nodes are directly linked with a common half-duplex link. A host on a bus topology is called a station. In a bus network, every station will accept all network packets, and these packets generated by each station have equal information priority. A bus network includes a single network segment and collision domain.

- **Open Cisco Packet Tracer.**
- - **Add Devices:**

    3 PCs: PC0, PC1, PC2

    1 Switch: (e.g., 2960)

- **Connect the Devices:**

    Use **Copper Straight-Through** cables:

    PC0 → Switch FastEthernet0/1

    PC1 → Switch FastEthernet0/2

    PC2 → Switch FastEthernet0/3

    PC2 → Switch FastEthernet0/3

- **Configure IP Addresses:**

    PC0: 192.168.1.1 / 255.255.255.0

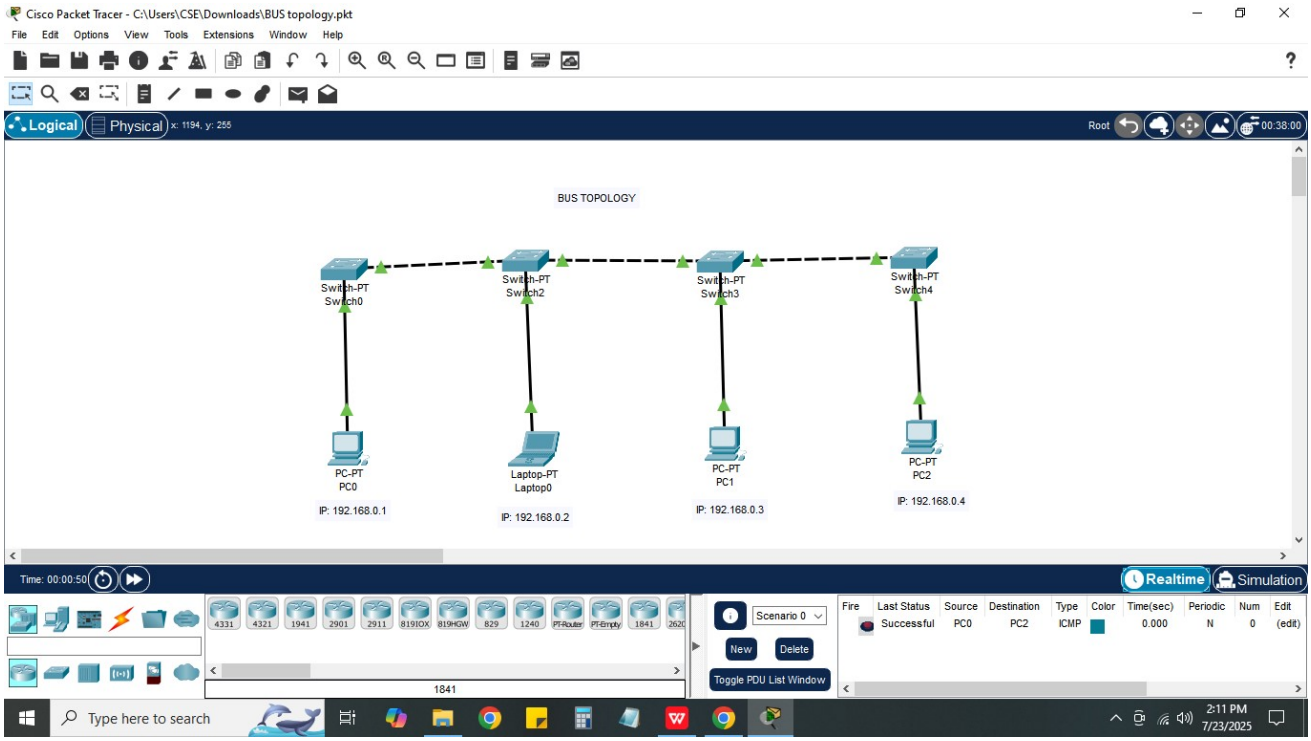
    PC1: 192.168.1.2 / 255.255.255.0

    PC2: 192.168.1.3 / 255.255.255.0

    PC2: 192.168.1.3 / 255.255.255.0

- **Test Communication:**

    Use `ping` from PC0 to PC1 and PC2 to verify successful packet transmission.



RING TOPOLOGY:

Ring topology is a kind of arrangement of the network in which every device is linked with two other devices. This makes a circular ring of interconnected devices which gives it its name. Data is usually transmitted in one direction along the ring, known as a unidirectional ring. The data is delivered from one device to the next until it reaches the decided destination. In a bidirectional ring, data can travel in either direction

Step 1: Add Devices

Drag and drop 4 PCs: PC0, PC1, PC2, PC3

Step 2: Connect the Devices in a Ring

Use Copper Cross-Over Cable to connect:

PC0 ↔ PC1

PC1 ↔ PC2

PC2 ↔ PC3

PC3 ↔ PC0 (Completes the Ring)

Cross-over cables are used for direct PC-to-PC communication.

Step 3: Assign IP Addresses

Manually configure each PC with IPs in the same subnet:

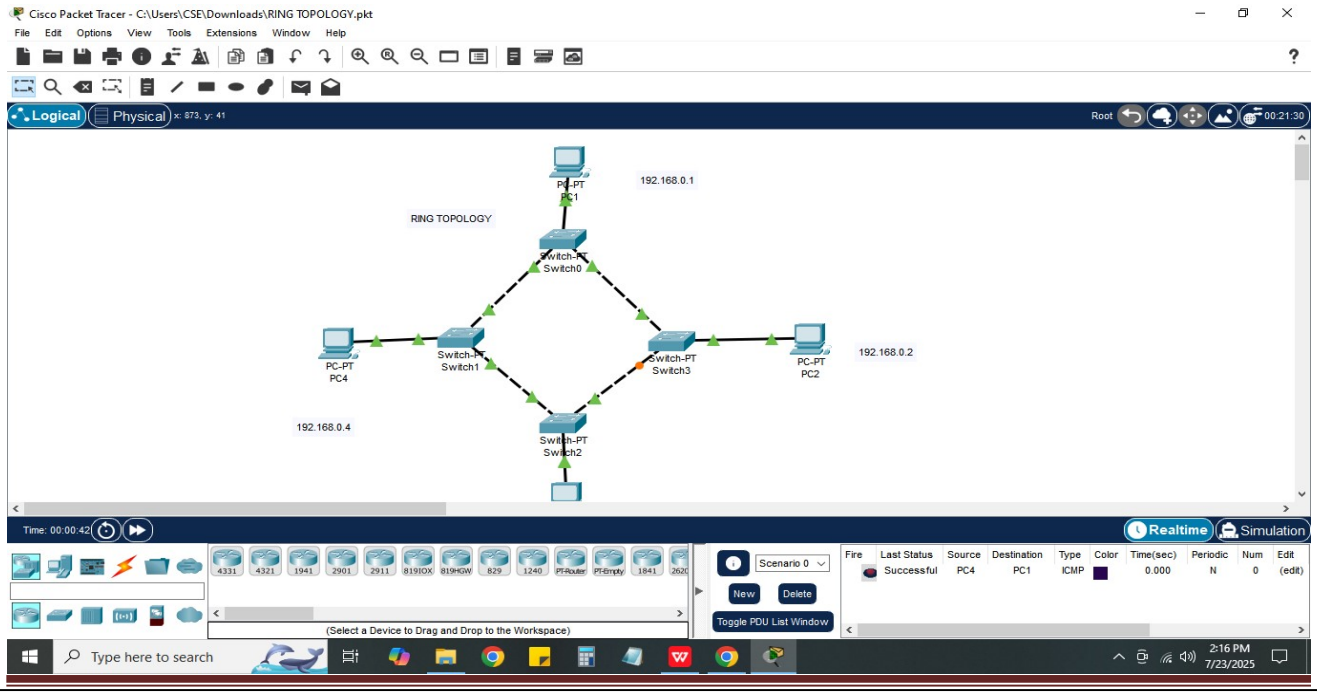
PC	IP Address	Subnet Mask
PC0	192.168.1.1	255.255.255.0
PC1	192.168.1.2	255.255.255.0
PC2	192.168.1.3	255.255.255.0
PC3	192.168.1.4	255.255.255.0

Click each PC → Desktop → IP Configuration → Enter IP and Subnet.

Step 4: Test Connectivity

Go to PC0 → Command Prompt → Type: ping 192.168.1.2, ping 192.168.1.3, etc.

Repeat the pings from other PCs.



LOCAL AREA NETWORK:

To design and simulate a simple Local Area Network consisting of 3 PCs, 1 Laptop, and 1 Printer using Cisco Packet Tracer, and test their connectivity.

Requirements:

Cisco Packet Tracer

3 PCs (PC0, PC1, PC2)

1 Laptop

1 Printer

1 Switch (e.g., 2960)

Copper straight-through cable

Steps to Create the LAN:

Step 1: Add Devices

From End Devices, drag:

3 PCs (PC0, PC1, PC2)

1 Laptop

1 Printer

From Switches, drag 1 Switch (e.g., 2960)

Step 2: Connect Devices

Use Copper Straight-Through Cables to connect:

PC0 → Switch

PC1 → Switch

PC2 → Switch

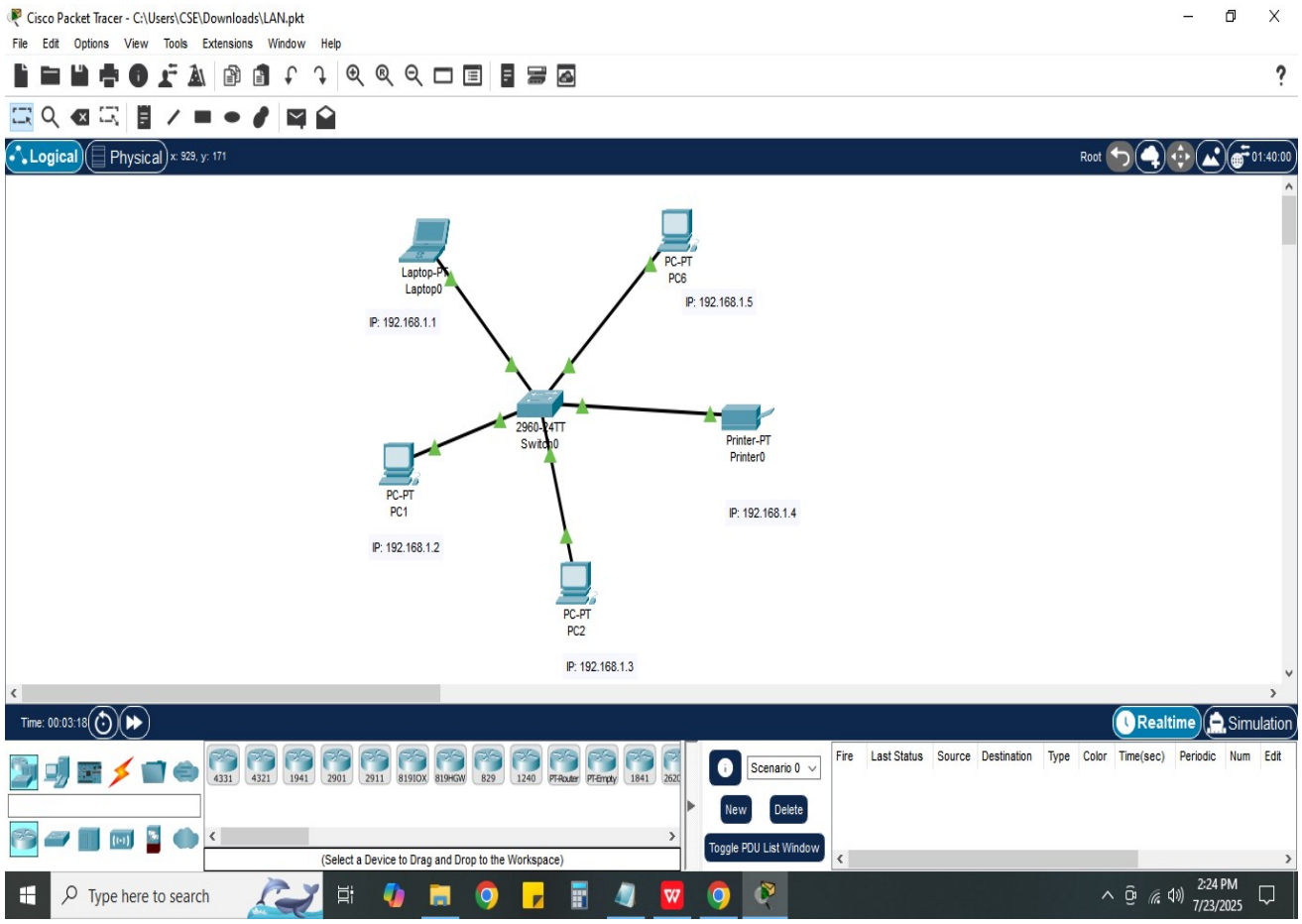
Laptop → Switch

Printer → Switch

Step 3: Assign IP Addresses

Device	IP Address	Subnet Mask
PC0	192.168.1.2	255.255.255.0
PC1	192.168.1.3	255.255.255.0
PC2	192.168.1.4	255.255.255.0
Laptop	192.168.1.5	255.255.255.0
Printer	192.168.1.10	255.255.255.0

To assign IP:
Click on each device → Desktop → IP Configuration → Enter IP & Subnet
Step 4: Test Connectivity
Open Command Prompt from any PC/Laptop
Run: ping 192.168.1.10 (to ping the printer)
Try pings between all devices to verify LAN communication



METROPOLITAN AREA NETWORK

To simulate a Metropolitan Area Network (MAN) using Cisco Packet Tracer, connecting multiple Local Area Networks (LANs) spread across a city-like area.

A Metropolitan Area Network (MAN) connects multiple LANs located in different buildings or locations across a city or metropolitan region. It is larger than a LAN but smaller than a WAN.

Requirements:

Cisco Packet Tracer

2 or more Switches (for LANs)

2 or more Routers (to connect LANs over MAN)

PCs (2 per LAN)

Serial and Ethernet cables

IP addressing plan

Step-by-Step Setup of MAN in Packet Tracer:

Step 1: Create Two LANs (e.g., LAN-A and LAN-B)

For Each LAN:

Add 1 Switch

Add 2 PCs (e.g., PC0 and PC1 for LAN-A, PC2 and PC3 for LAN-B)

Connect PCs to their respective switch with copper straight-through cables

Step 2: Add Routers for Each LAN

Add 2 Routers: Router0 (for LAN-A), Router1 (for LAN-B)

Connect Router0 ↔ SwitchA using Ethernet cable

Connect Router1 ↔ SwitchB using Ethernet cable

Step 3: Connect Routers (MAN link)

Use Serial cable (DCE) to connect:

Router0 Serial0/0/0 ↔ Router1 Serial0/0/0

Set clock rate on DCE side (Router0)

Step 4: Assign IP Addresses

LAN-A (192.168.1.0/24)

PC0: 192.168.1.2 / 255.255.255.0

PC1: 192.168.1.3 / 255.255.255.0

Router0 G0/0: 192.168.1.1 / 255.255.255.0

LAN-B (192.168.2.0/24)

PC2: 192.168.2.2 / 255.255.255.0

PC3: 192.168.2.3 / 255.255.255.0

Router1 G0/0: 192.168.2.1 / 255.255.255.0

Router-to-Router Serial (10.0.0.0/30)

Router0 S0/0/0: 10.0.0.1 / 255.255.255.252

Router1 S0/0/0: 10.0.0.2 / 255.255.255.252

Step 5: Configure Routing (Static Routing)

Router0:

ip route 192.168.2.0 255.255.255.0 10.0.0.2

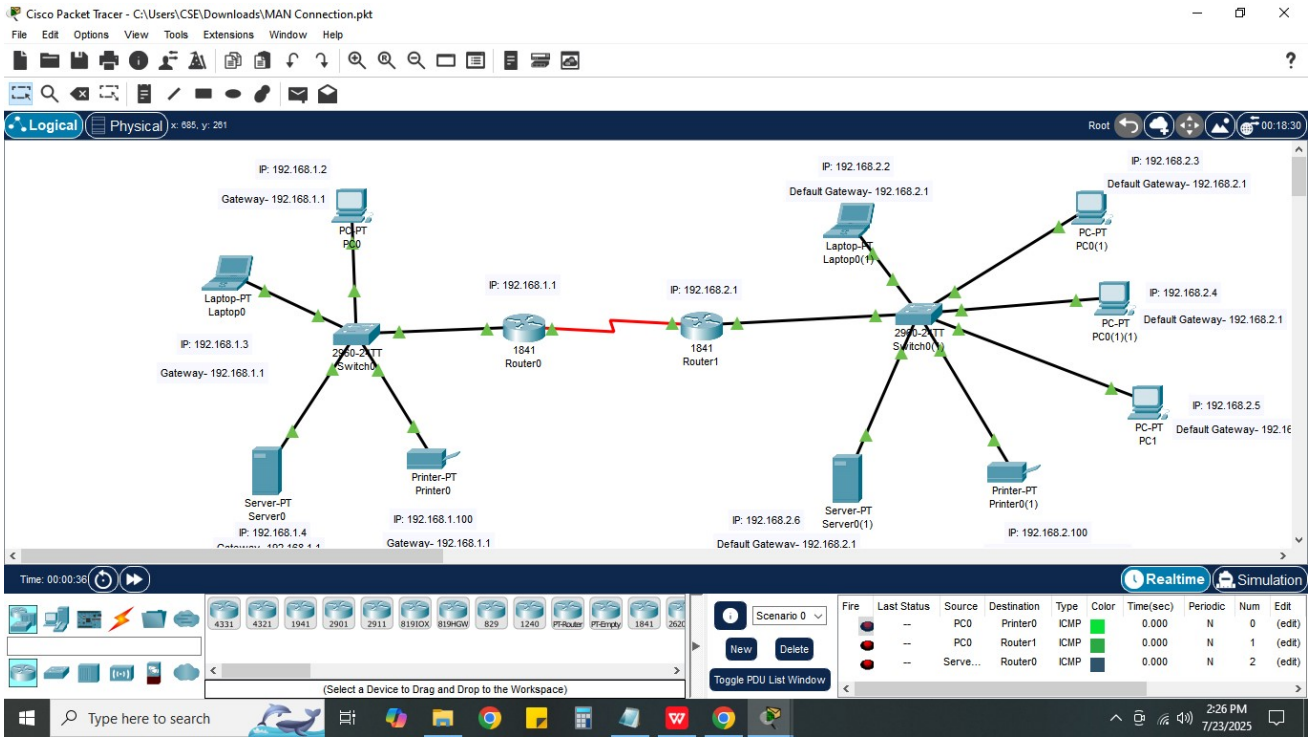
Router1:

ip route 192.168.1.0 255.255.255.0 10.0.0.1

Step 6: Test Connectivity

From PC0 (LAN-A), ping PC2 (LAN-B): ping 192.168.2.2

Verify successful communication between both LANs via the MAN link.



WIDE AREA NETWORK (WAN):

To simulate a Wide Area Network (WAN) that connects multiple branch offices to a main office via routers using a cluster cloud in Cisco Packet Tracer**.**

Location	**Subnet**	**Gateway IP**	**Connected Router**	**Router IP**
Branch1	192.168.1.0/24	192.168.1.1	Brance1 (1841)	192.168.1.1
Branch2	192.168.2.0/24	192.168.2.1	Brance2 (1841)	192.168.2.1
Main Office	192.168.3.0/24	192.168.3.1	Main (1841)	192.168.3.1

Step 1: Add Devices
3 Routers (1841): Brance1, Brance2, Main
3 Switches (2960-24TT): One per site
8 End Devices (PCs and Laptops)
1 Cluster Cloud (to connect routers via WAN links)

Step 2: Connect Devices
LAN Connections:
Use Copper Straight-Through Cables:

PCs/Laptops ↔ Switches
Switch ↔ Router GigabitEthernet0/0

WAN Connections:
Use Serial DCE Cables from routers to the Cluster Cloud:
Branch1 Serial 0/0/0 ↔ Cluster
Branch2 Serial 0/0/0 ↔ Cluster
Main Serial 0/0/0 ↔ Cluster

(Assign one router with DCE cable and use clock rate command.)

Step 3: Assign IP Addresses
Branch1:
PC IPs: 192.168.1.2, 192.168.1.3
Gateway: 192.168.1.1
Router Brance1 G0/0: 192.168.1.1
Branch2:
PC IPs: 192.168.2.2, 192.168.2.3
Gateway: 192.168.2.1
Router Brance2 G0/0: 192.168.2.1

Main:
PC IPs: 192.168.3.2, 192.168.3.3, 192.168.3.4, 192.168.3.5
Gateway: 192.168.3.1
Router Main G0/0: 192.168.3.1
WAN Serial IPs (examples):
Brance1 S0/0/0: 10.0.0.1 / 255.255.255.252
Main S0/0/0 (to Brance1): 10.0.0.2
Branch2 S0/0/0: 10.0.0.5 / 255.255.255.252
Main S0/0/1 (to Brance2): 10.0.0.6
Step 4: Router Configuration

On Branch1 Router:

```
interface g0/0
 ip address 192.168.1.1 255.255.255.0
 no shutdown

interface s0/0/0
 ip address 10.0.0.1 255.255.255.252
 clock rate 64000
 no shutdown

ip route 192.168.2.0 255.255.255.0 10.0.0.6
ip route 192.168.3.0 255.255.255.0 10.0.0.2
```

On Branch2 Router:

```
interface g0/0
 ip address 192.168.2.1 255.255.255.0
 no shutdown

interface s0/0/0
 ip address 10.0.0.5 255.255.255.252
 clock rate 64000
 no shutdown

ip route 192.168.1.0 255.255.255.0 10.0.0.1
ip route 192.168.3.0 255.255.255.0 10.0.0.6
```

On Main Router:

```
interface g0/0
 ip address 192.168.3.1 255.255.255.0
 no shutdown

interface s0/0/0
 ip address 10.0.0.2 255.255.255.252
 no shutdown

interface s0/0/1
 ip address 10.0.0.6 255.255.255.252
 no shutdown

ip route 192.168.1.0 255.255.255.0 10.0.0.1
ip route 192.168.2.0 255.255.255.0 10.0.0.5
```

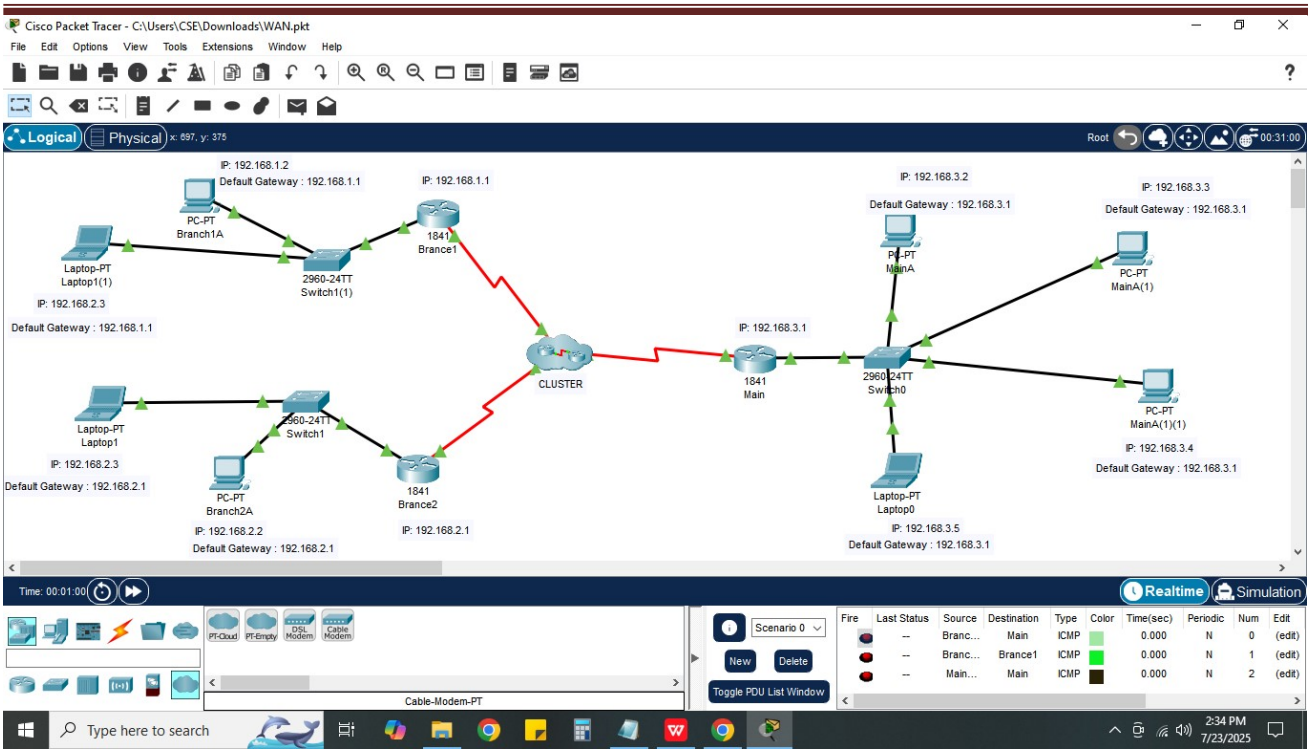
Step 5: Test Connectivity

Go to any PC (e.g., in Main)

Open Command Prompt

Run: ping 192.168.1.2, ping 192.168.2.2

All devices should successfully ping each other if routes are configured properly.



CONCLUSION:

The simulation of different types of networks and network topologies using network simulation tools such as Cisco Packet Tracer has helped in understanding the structural layout, data flow, and performance characteristics of each topology.