EX.NO:16	Case study of Networking Cables in Computer Networking
DATE:	

Aim

To explore and understand the characteristics,construction and performance of the network cables.

Types of Ethernet Cables

Mainly there are three types of ethernet cables used in LANs

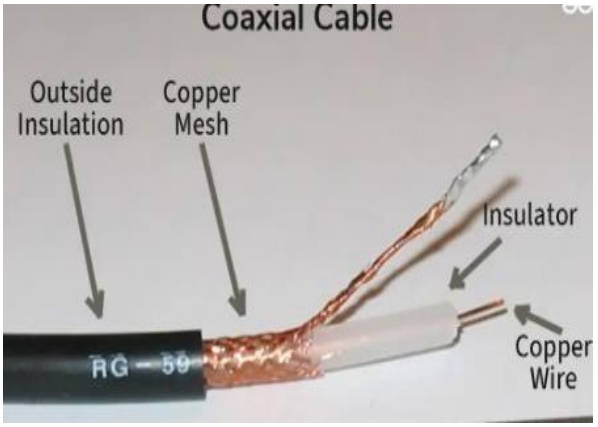
- Coaxial Cables
- Twisted Pair Cables
- Fiber optic Cables

1. Coaxial Cables

- A coaxial cable is used to carry high-frequency electrical signals with low losses. It uses 10Base2 and 10Base5 Ethernet variants. It has a copper conductor in the middle that is surrounded by a dielectric insulator generally made of PVC or Teflon.
- The dielectric insulator is surrounded by a plaited conducting metallic shield which reduces Electromagnetic Interference of the metal and outside interference and finally, the metallic shield is covered by a plastic covering called a sheath usually made of PVC or some other fire-resistant plastic material.
- Its maximum transmission speed is 10 Mbps. It is usually used in telephone systems, cable TV, etc.

Design

- Coaxial cable design choices affect physical size, frequency performance, attenuation, power handling capabilities, flexibility, strength, and cost.
- It consists of an inner conductor which might be solid or stranded surrounded by an insulator and, to provide flexibility, it is further surrounded by a copper mesh which is further surrounded by a plastic or insulating jacket.



Coaxial Cable

Types of Coaxial Cables

- **Hardline Coaxial Cable: It** is used in applications where high signal strength is required, this type is most commonly used. They are used in internet lines and telephone lines.
- **RG-6 Coaxial Cable:** It is used where better signal quality is required; it has a thicker dielectric insulator, they are used in broadband internet, cable TV, etc.
- **Tri-Axial Cable:** They offer more bandwidth and interference rejection; they use an additional copper braid shield. Commonly used in connecting cameras and cable TVs. Etc.

Types of Connectors Used in Coaxial Cable

- BNC (Bayonet Neil Concelman)
- N series Connectors
- F Type Connectors
- SMA or Subminiature Connector
- TNC (Threaded Neil Concelman) etc.

2. Twisted Pair Cable

A twisted pair is a copper wire cable in which two insulated copper wires are twisted around each other to reduce interference or crosstalk. It uses 10BASE-T, 100BASE-T, and some other newer ethernet variants. It uses RJ-45 connectors.

Design: A twisted pair cable usually contains two or more conducting wires either shielded by an insulator or not and, further these twisted pairs of wires are coated for protection from any damage.

Types of Twisted Pair Cable

- **Shielded Twisted Pair (STP) Cable:** In STP the wires are covered by a copper braid covering or a foil shield, this foil shield adds a layer that protects it against interference leaking into and out of the cable. Hence, they are used for longer distances and higher transmission rates.
- **Unshielded Twisted Pair (UTP) Cable:** Unshielded twisted pair cable is one of the most commonly used cables in computer networks at present time. UTP consists of two insulated copper wires twisted around one another, the twisting of wires helps in controlling interference.

Categories of UTP Cables

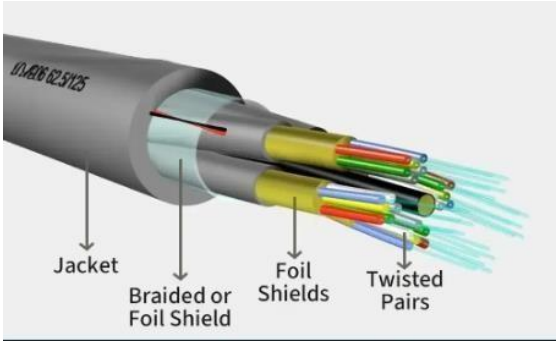
Category	Bandwidth	Speed	Use
1	1.4 MHz	1 Mbps	Telephone wire
2	4 MHz	4 Mbps	Transmission Lines
3	16 MHz	16 Mbps	10BaseT Ethernet
4	20 MHz	20 Mbps	Used in Token Ring
5	100 MHz	100 Mbps	100BaseT Ethernet
5	100 MHz	1 Gbps	Gigabit Ethernet
5e	100 MHz	1 Gbps	Gigabit Ethernet
6	250 MHz	10 Gbps	Gigabit Ethernet
7	600 MHz	10 Gbps	Gigabit Ethernet
7a	1 GHz	Up to 10 Gbps	Gigabit Ethernet
8	2 GHz	25 Gbps to up to 40 Gbps	Data centers

3. Fiber Optic Cable

- Fiber optic cables use optical fibers which are made of glass cores surrounded by several layers of covering material generally made of PVC or Teflon.
- It transmits data in the form of light signals due to which there are no interference issues in fiber optics.
- Fiber optics can transmit signals over a very long distance as compared to twisted pairs or coaxial cables.
- It uses **10BaseF, 100BaseFX, 100BaseBX, 100BaseSX, 1000BaseFx, 1000BaseSX,** and 1000BaseBx ethernet variants. Hence, it is capable of carrying information at a great speed.

Design

- An optical fiber consists of a core and a cladding chosen for their total internal reflection due to the difference in refractive index between the two.
- In real optical fibers, the cladding is usually covered with a layer of acrylate or polyimide polymer.
- The coating protects the fiber from damage and several layers of protective sheathing, depending on the application are added to form the cable.



Fiber Optic Cable

Types of Fiber Optics Cable

- **Single-Mode Fiber:** It uses one single ray of light to transmit data. It is used for long-distance transmission.
- **Multi-Mode Fiber:** It uses multiple light rays to transmit data. It is comparatively less expensive.

Types of Connectors Used in Fiber Optics Cable

- ST (Straight-Tip) Connector
- FC (Fiber Channel) Connector
- SC (Subscriber) Connector
- LC (Lucent) Connector

Conclusion

- Ethernet cables are used to connect devices to a network, allowing them to communicate with each other and access the internet.
- These cables come in different types, each designed to support various speeds and performance levels.
- They are essential for both home and office networks, ensuring stable and reliable connections.

EX.NO:17	Case study of networking devices in computer network
DATE:	

Network Devices: Network devices, also known as networking hardware, are physical devices that allow hardware on a computer network to communicate and interact with one another.

Types of Networking devices

- Hub
- Switch
- Router
- Bridge
- Gateway
- Modem
- Repeater
- Access point

Hub

- Hubs were popular in earlier network implementations but have been largely replaced by switches due to their limitations in terms of performance and functionality. While they operate at the same OSI layer as switches (Layer 2), hubs are essentially multi-port repeaters that broadcast data packets to all connected devices.
- Unlike switches, which create individual connections to devices, hubs share the available bandwidth among all connected devices. This results in slower data transfer speeds and increased network congestion as the number of connected devices grows. As a result, hubs are mostly obsolete in modern network setups.

Switch

- Switches are another essential component of computer network hardware. They enable devices within a local area network (LAN) to communicate with each other by forwarding data packets between them. Unlike routers, which operate at the network layer (Layer 3) of the OSI model, switches operate at the data link layer (Layer 2).
- Switches create dedicated connections between devices, allowing for faster and more efficient data transfer compared to hubs. They use MAC addresses to identify and forward data packets to the intended recipient, reducing network congestion and improving overall network performance.
- Managed switches offer advanced features such as VLAN support, Quality of Service (QoS) prioritization, and Spanning Tree Protocol (STP) to ensure network stability and efficient resource utilization. They provide greater control and flexibility for network administrators, making them suitable for larger and more complex networks.

Router

- Routers are critical pieces of network hardware that connect multiple networks together. They act as gateways, directing data packets between different networks while ensuring efficient transmission. Routers use routing tables and protocols to determine the best path for data packets to reach their destination, considering factors such as network congestion, latency, and available bandwidth.
- Modern routers often have additional features, such as built-in firewalls and Virtual Private Network (VPN) capabilities, enhancing network security and remote access. They are also essential for enabling wireless connectivity in home and office networks, providing Wi-Fi access to multiple devices.

- Routers typically have multiple ports to connect devices, including Ethernet ports for wired connections and antennas or radio interfaces for wireless connections. They play a crucial role in directing and managing network traffic, making them a core component of any computer network.
- While a hub connects multiple devices, a network bridge connects two or more network segments and filters the traffic between them. Their role is to isolate local segment traffic and reduce traffic congestion for better network performance. A local bridge connects two or more network segments within the exact physical location or LAN. In contrast, a remote bridge connects network segments that are geographically separated, often over a WAN link.

Types of Bridges

There are two types of bridges:

- Transparent bridges
- Source bridges

Let’s look at each of these:

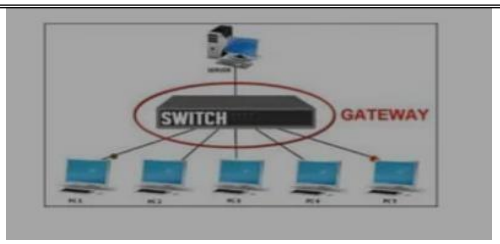
- **Transparent bridges** build and maintain a MAC address table by examining incoming frames' source addresses and making forwarding decisions by checking the destination MAC address against this table.
- **Source bridges** used a different approach and were commonly used with token ring networks, which are virtually obsolete. Bridges operate at the OSI model's data link layer (Layer 2). You will most likely never work with either type of bridge today.

Gateway

A common network device used to connect networks is a gateway. A gateway connects different networks and enables communication between them. Think of it as a translator that converts data from one protocol or format to another. This helps ensure compatibility between diverse network environments. A gateway is essential for communication that must traverse different network architectures.

Example of Gateway

A typical example of Gateway network device is a LAN that connects to a vast area network (WAN) or the internet. These devices usually work at the OSI model's Transport and Session layers (Layer 5 and 6). Gateways may also provide security features, such as firewalls, and offer network performance optimization features.



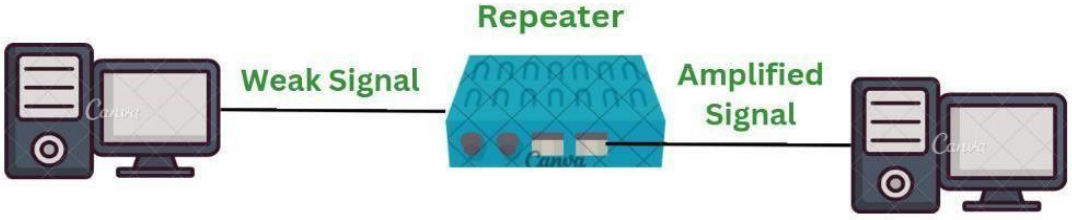
Gateway

Modem

- Modems, short for modulator-demodulators, are network devices that enable the transmission of digital data over analog mediums, such as telephone lines or coaxial cables. They convert digital signals from computers and network devices into analog signals that can be transmitted over these mediums and vice versa.
- Modems allow devices to establish a connection with an Internet Service Provider (ISP) and access the internet. They typically have various ports, such as Ethernet ports for wired connections and phone jacks for DSL (Digital Subscriber Line) connections.
- With the advent of broadband internet, modems have become faster and more efficient, supporting technologies like cable internet, fiber-optic connections, and DSL. They are often combined with routers to provide both internet access and network connectivity in a single device.

Repeater

- Repeaters are defined as a networking device that is used to amplify and generate the incoming signal. Repeaters work at the physical layer of the OSI model.
- The main aim of using a repeater is to increase the networking distance by increasing the strength and quality of signals.
- The performance of Local Area Networks (LANs) and Wide Area Networks (WANs) repeaters are used. Using repeaters helps to reduce error, and loss of data and provides with delivery of data at specified locations only.
- The major advantage of using a repeater is that it provides with transfer of data with more security and over a long distance.



Access point

- Access point can technically involve either a wired or wireless connection, it commonly means a wireless device.
- An Ap works at the second OSI layer, the Data Link layer, and it can operate either as a bridge connecting a standard wired network to wireless devices or as a router passing data transmissions from one access point to another.
- Access points typically are separate network devices with a built-in antenna, transmitter and adapter.
- Access points are transmitters/receivers (transceivers) that connect to a network through an interface such as a bus or connector. They receive, store, and transmit data between the wireless local-area network (WLAN)

Access point

Result

Thus the case study of networking devices in computer networking was discussed and studied successfully.

EX.NO:18	Implementation of Point to Point Communication Network using Cisco packet tracer
DATE:	

Ex.No:4

Aim

To implement the point to point network using cisco packet tracer.

Apparatus Required

Cisco packet tracer tool

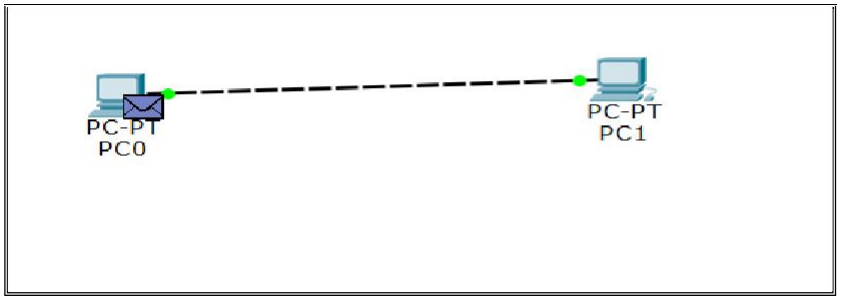
2 PC's

Cross over cable – To connecting same devices

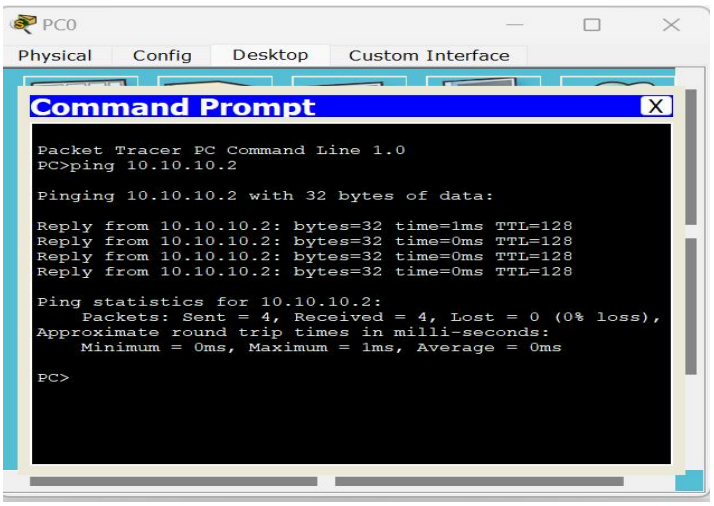
Implementation

- Take Pc1 and fix it as shown in fig
- Take Pc2 and fix it as shown in fig
- Connect two PCs using cross over cable
- PC1-Desktop-IP config-IP address-10.10.10.1
- PC2-Desktop-IP config-IP address-10.10.10.2
- ping pc1 to pc2
- ping 10.10.10.1 to 10.10.10.2
- After pinging,The system is ready for the communication.

Point to Point network



ping pc1 to pc2



Result

Thus the point-to-point network setup was successfully implemented, All configurations were verified, and the ping tests confirmed network connectivity.

EX.NO:19	Implementation of Local area network using Hub in cisco packet tracer
DATE:	

Ex.No:5

Aim

To implement local area network using hub in cisco packet tracer.

Apparatus Required

Cisco packet tracer tool

4 PCs

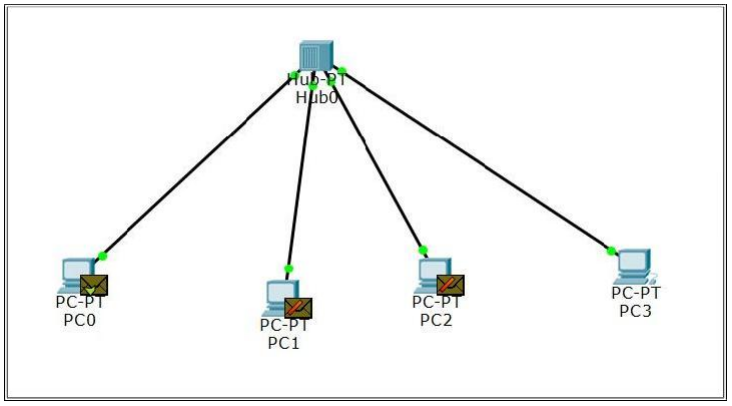
Hub

Straight through cable – For connecting different devices in a network

Implementation

Hub

- Hubs were popular in earlier network implementations but have been largely replaced by switches due to their limitations in terms of performance and functionality. While they operate at the same OSI layer as switches (Layer 2), hubs are essentially multi-port repeaters that broadcast data packets to all connected devices.
- Unlike switches, which create individual connections to devices, hubs share the available bandwidth among all connected devices. This results in slower data transfer speeds and increased network congestion as the number of connected devices grows. As a result, hubs are mostly obsolete in modern network setups.



LAN using Hub

- Take hub in cisco packet tracer and fix it.
- Take four PC's and connect each PC's to hub.

- Give PC1-IP address-10.10.10.1
- Give PC2-IP address-10.10.10.2
- Give PC3-IP address-10.10.10.3
- Give PC4-IP address-10.10.10.4
- Wait until arrow become green
- ping pc1 to pc4
- After pinging the system is ready for the communication.

Result

Thus the LAN network using hub setup was successfully implemented, All configurations were verified, and the ping tests confirmed network connectivity.

EX.NO:20	Creating a topology using router in Cisco packet tracer
DATE:	

Ex.No:6

Aim

To implement a network topology using router in Cisco packet tracer.

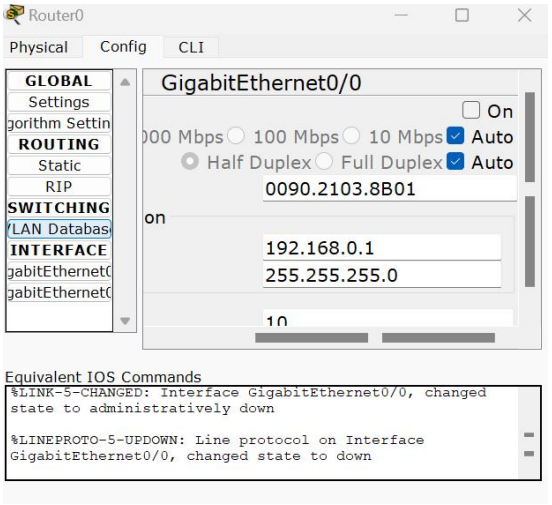
Apparatus Required

1. Cisco packet tracer tool
2. Router
3. 2 switches
4. 6 PC's
5. Striaght through cable – For connecting different devices in a network
6. Automatic Cable

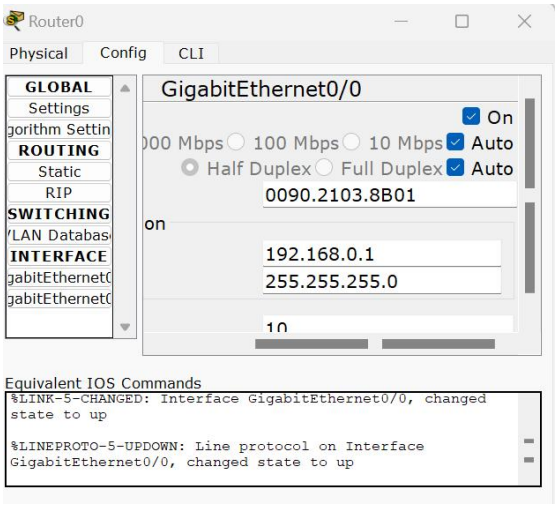
Implementation

- Take router in cisco packet tracer and fix it.
- Take two switches for making different Local area network.
- Take 6 PC's and fix it for making LAN.
- Using straight through cable and connect first three pc to switch1 connect remaining pc to switch2.
- Furtherly connect each switch to router using straight through cable or automatic cable.
- Router-gigabit 0/0 port – IP address -192.168.0.1
- Router-gigabit 0/1 port -IP address-10.10.10.1
- Assign default gate way for LAN 1 Pcs as 192.168.0.2
- PC0->IP->192.168.0.2,Default gate way->192.168.0.1
- PC1->IP->192.168.0.3,Default gate way->192.168.0.1
- PC2->IP->192.168.0.4,Default gate way->192.168.0.1
- Assign default gateway for LAN 2 Pcs as 10.10.10.1
- PC3->10.10.10.2,Default gate way->10.10.10.1
- PC4->10.10.10.3,Default gate way->10.10.10.1
- PC5->10.10.10.4,Default gate way->10.10.10.1
- Wait until arrow become green.
- Go to simulation mode sent the message to PC1 to PC5,Now the two different network was connected through the default gateway.without default gateway the message is not send to the receiver.
- Default gateway is used to connect the two different LAN's for data transmission.

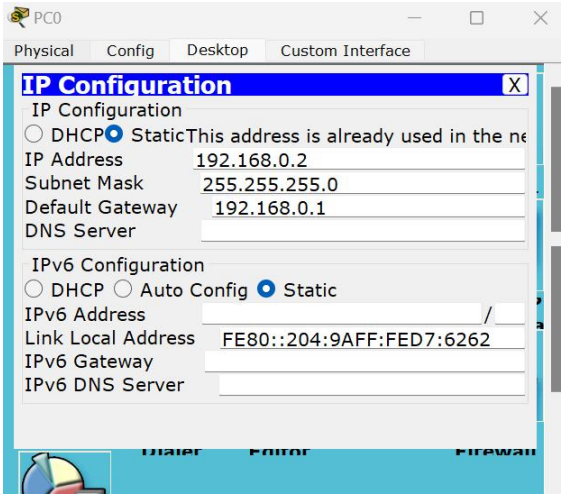
Router-Gigabitethernet0/0 -OFF state

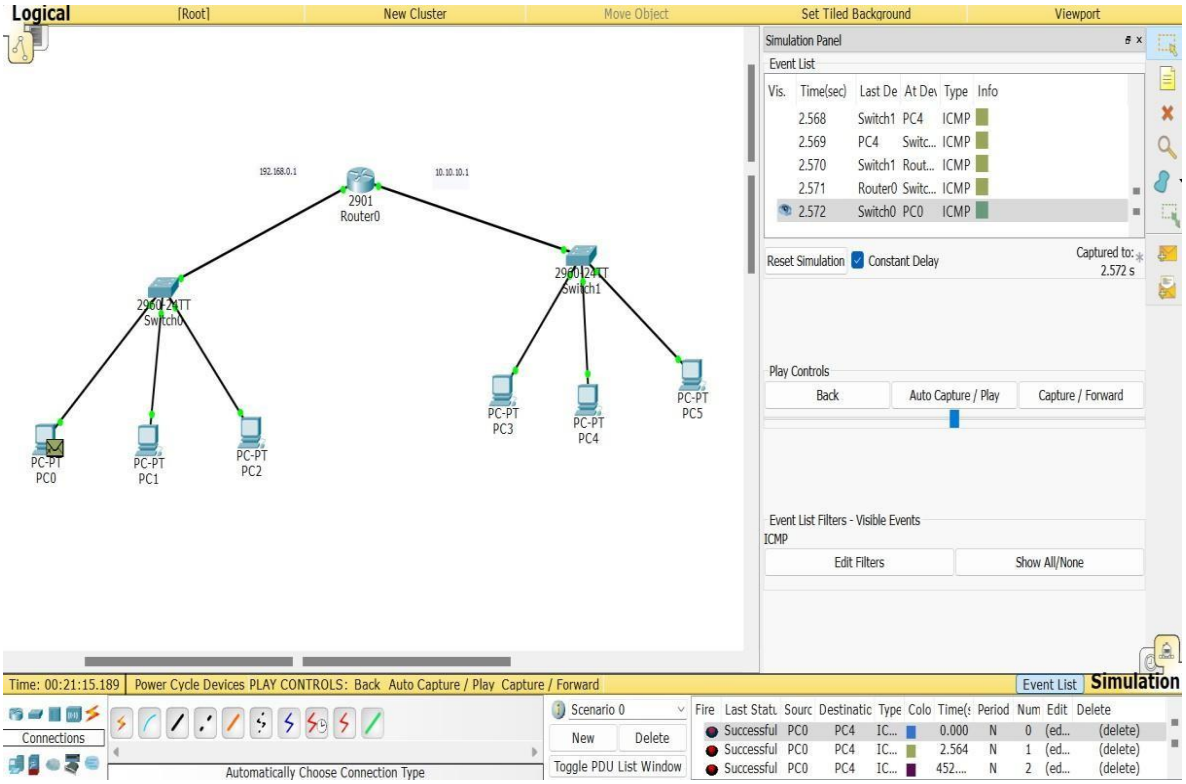


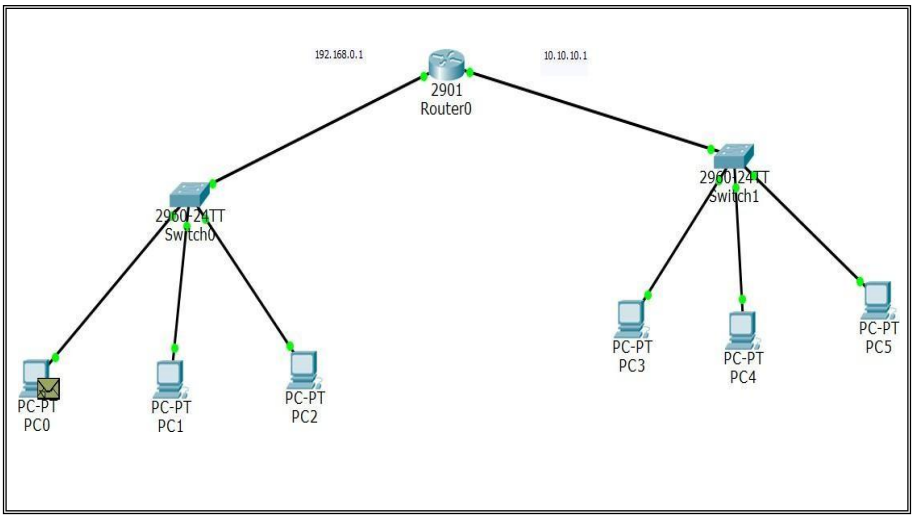
Router-Gigabitethernet0/0 -ON state



To fix the IP address for PC0







Creating a topology using router in cisco packet tracer

Result

Thus the topology was created successfully using router, All configurations were verified,and the ping tests confirmed network connectivity.