Lab/Project Report

Only for course Teacher						
		Needs Improvement	Developing	Sufficient	Above Average	Total Mark
Allocate mark & Percentage		25%	50%	75%	100%	25
Problem understanding & Analysis	7					
Implementation	8					
Report writing	10					
					Total obtained mark	
Comments						

Semester: Fall 2024

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Batch: 38 **Section:** A2

Course Code: SE226 **Course Name:** Data Communication and Networking Lab

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Submission Date: 11/12/2024

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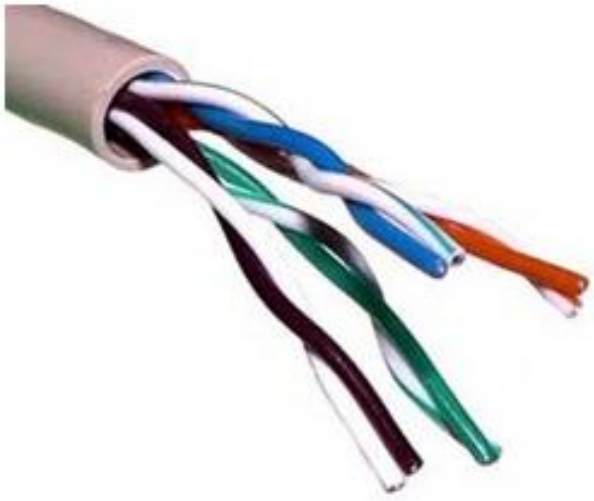
Lab Report

1. UTP, STP straight and cross-over wiring

UTP (Unshielded Twisted Pair): UTP, which stands for Unshielded Twisted Pair, is a type of twisted pair cable commonly used for data and voice transmission. Its frequency range makes it suitable for efficiently transmitting both types of signals. It lacks additional shielding, making it lightweight and cost-effective. It is more susceptible to electromagnetic interference (EMI) but is commonly used in environments with low EMI, such as home networks or offices.



Picture: Unshielded Twisted Pair cable

It is ideal for general-purpose networking, like LANs in offices or residential settings.

STP (Shielded Twisted Pair): STP, which stands for Shielded Twisted Pair, is a type of twisted pair cable designed to reduce electromagnetic interference (EMI) and crosstalk. It includes an additional layer of shielding around the twisted wires, which enhances its performance in environments with high EMI. STP cables are heavier and more expensive than UTP but are ideal for use in industrial settings, data centers, and other areas where signal interference is a concern.

Picture: Shielded Twisted Pair cable

It is Suitable for networks in factories, data centers, or areas with potential signal interference.

Cross-over Wiring: Cross-over wiring is a method of configuring Ethernet cables to connect two similar devices directly, such as two computers or two switches, without needing an intermediate device like a router. In this setup, the transmit (TX) pins on one end are connected to the receive (RX) pins on the other. This type of wiring is achieved by using the T568A standard on one end of the cable and the T568B standard on the other. Cross-over cables are less common today due to advancements like auto-MDI/MDIX in modern devices, but they are still important to understand for legacy systems and manual network setups.

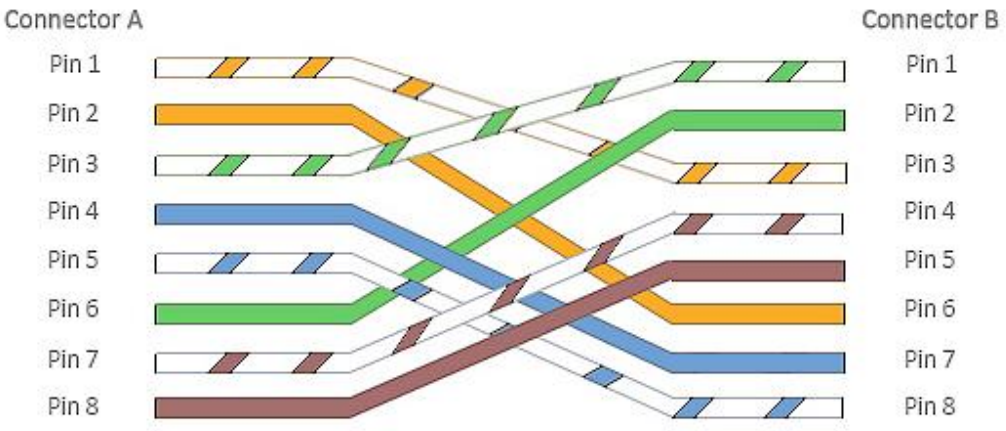
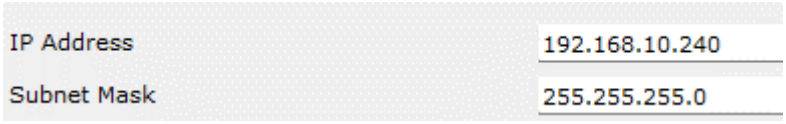


Figure: Cross-over Wiring

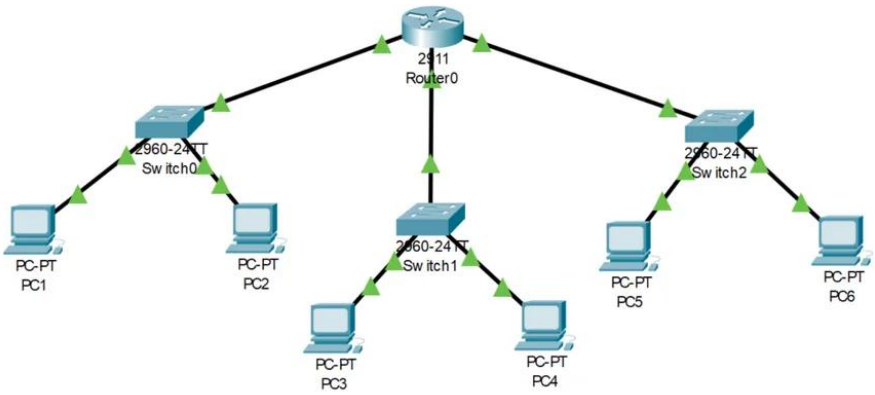
2. IP address and Packet Tracer

IP Address: All the computers connected to the Internet communicate with each other through underground cables, underwater cables, or wireless connections. When I want to download a file, load a webpage, or do anything online, my computer needs an address so other computers can locate it and send the file or webpage I requested. This address is technically called an **IP Address**, which stands for **Internet Protocol Address**.



Picture: IP Address

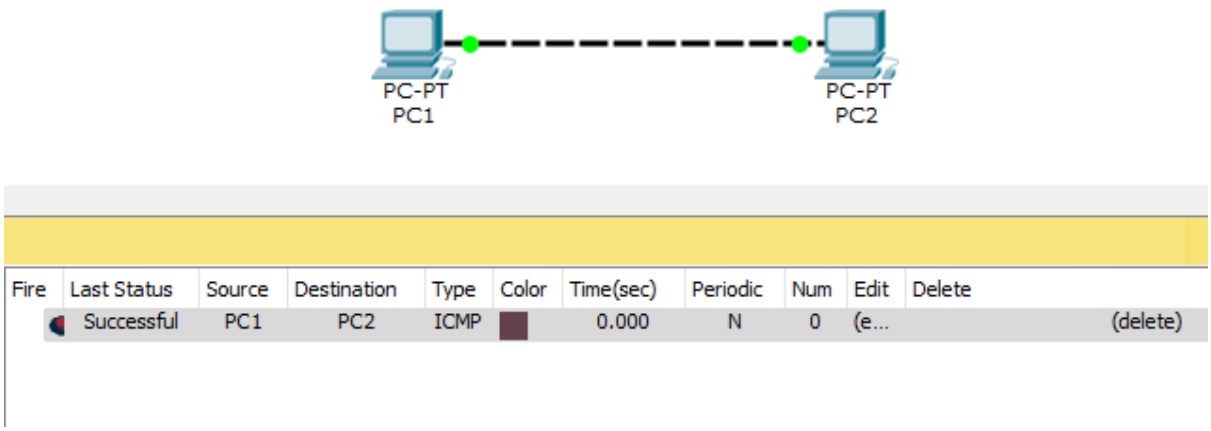
Packet Tracer: Packet Tracer is a simulation tool used to design and test computer networks. It allows us to create virtual networks with devices like routers, switches, and computers, helping us understand how networks work. For example, when we simulate data being sent between two devices, Packet Tracer shows how data travels through the network using protocols like TCP/IP. This helps us learn how devices communicate and troubleshoot network issues in a safe, controlled environment without needing physical hardware.



Picture: Cisco Packet Tracer simulation

3. P2P connection

A Peer-to-Peer (P2P) connection refers to a direct link between two devices or nodes that communicate and share data without requiring a central server. In this setup, both devices act as equals, meaning they can function as both clients and servers.



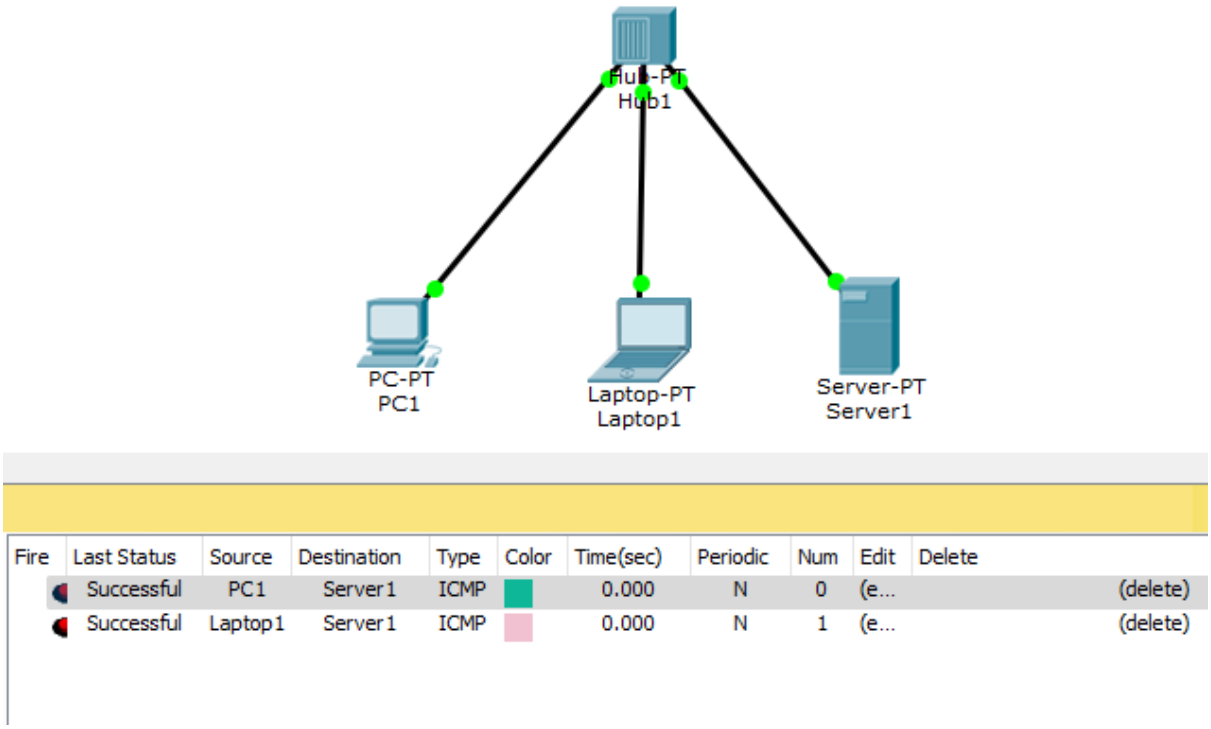
Picture: Point to Point Connection

Steps:

1. Taking two PC
2. Connecting them with cross-over wire because they belong to the same layer
3. Setting the IP for PC1 as 192.168.10.1 and for PC2 as 192.168.10.2
4. Opening the Command Prompt from PC2 and typing ping 192.168.10.1
5. Sending a message from PC1 to PC2 (Successful)

4. LAN connection using Hub

A Local Area Network (LAN) created by a hub is a type of network where multiple devices, such as computers, printers, or other networked devices, are connected to a central hub. The hub acts as a connection point and allows the devices to communicate with each other. However, the hub is not intelligent; it broadcasts any data it receives to all connected devices, which can cause unnecessary traffic and reduce network efficiency.



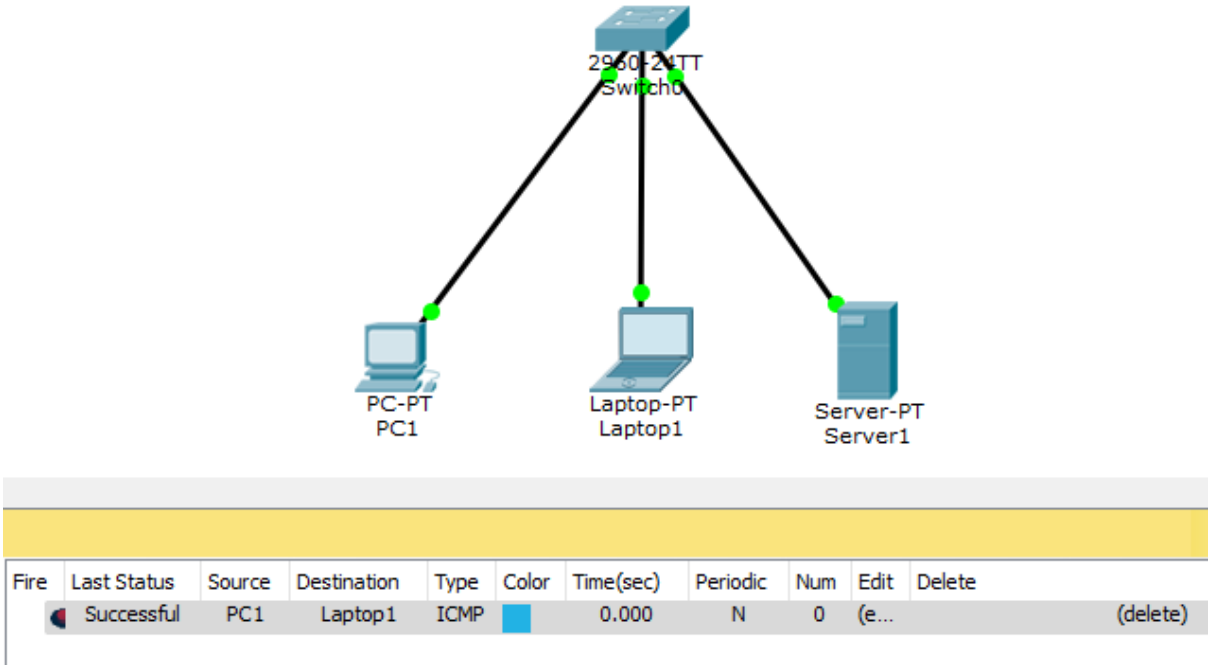
Picture: LAN using Hub

Steps:

1. Taking three end devices and a Hub
2. Connecting the end devices with the Hub with Straight Through wire because they belong to different layers
3. Setting the IP for PC1 as 192.168.10.1, Laptop1 as 192.168.10.2, and Server1 as 192.168.10.3
4. Opening the Command Prompt from Server1 and typing ping 192.168.10.1
5. Sending a message from PC1 to Server1 (Successful)

5. Introduction of Switch and established a connection with switch

Switch is a networking device used to connect multiple devices like PCs, printers, or servers within a Local Area Network (LAN). Unlike a hub, a switch is smarter because it can direct data to the specific device it is intended for, instead of broadcasting it to all connected devices. This makes communication faster and more efficient.



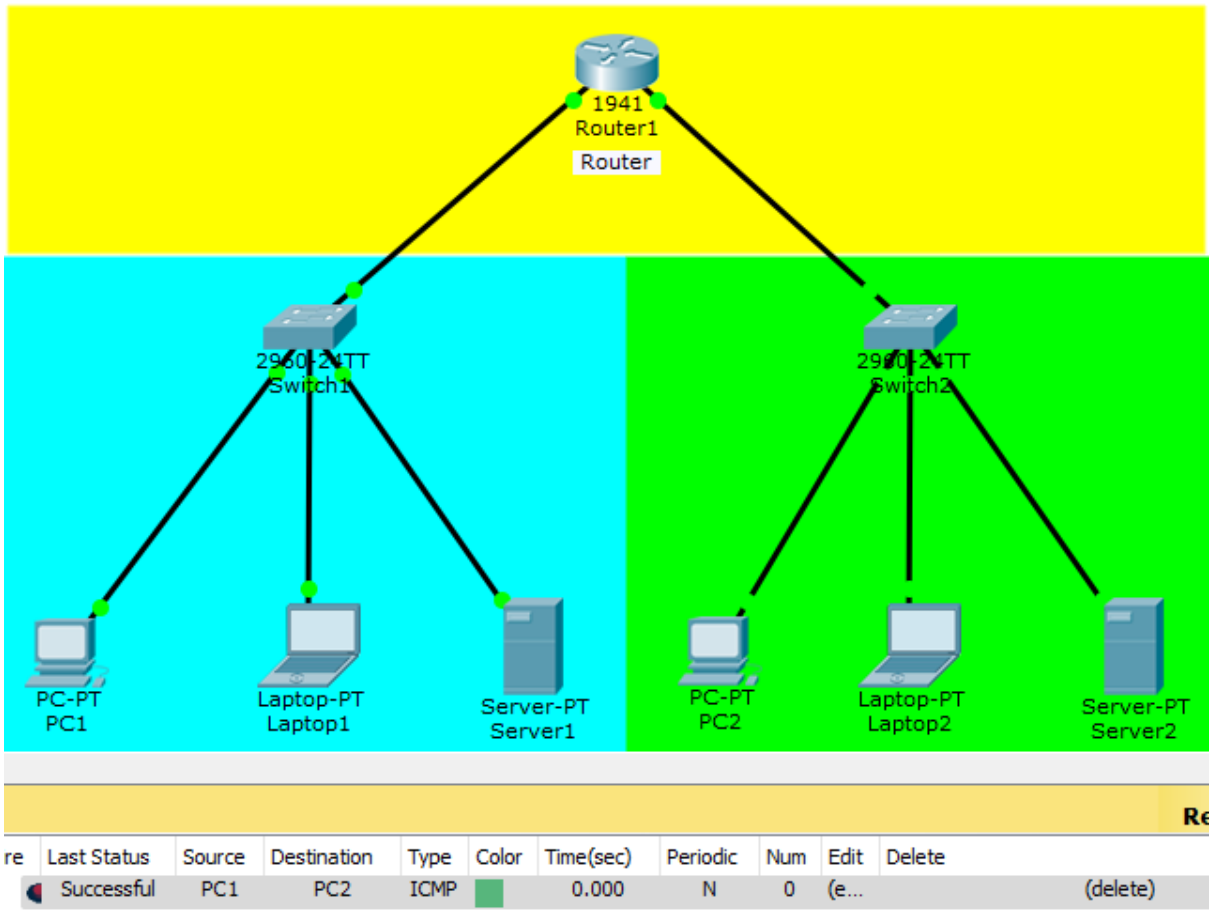
Picture: LAN using Switch

Steps:

1. Taking three end devices and a Switch
2. Connecting the end devices with the Switch with Straight Through wire because they belong to different layers
3. Setting the IP for PC1 as 192.168.10.1, Laptop1 as 192.168.10.2, and Server1 as 192.168.10.3
4. Opening the Command Prompt from Laptop1 and typing ping 192.168.10.1
5. Sending a message from PC1 to Laptop1 (Successful)

6. Basic concepts of Router Configuration, single router configuration, setting name of the router

In Cisco Packet Tracer, a Router is a networking device that connects multiple networks together and directs data packets between them.



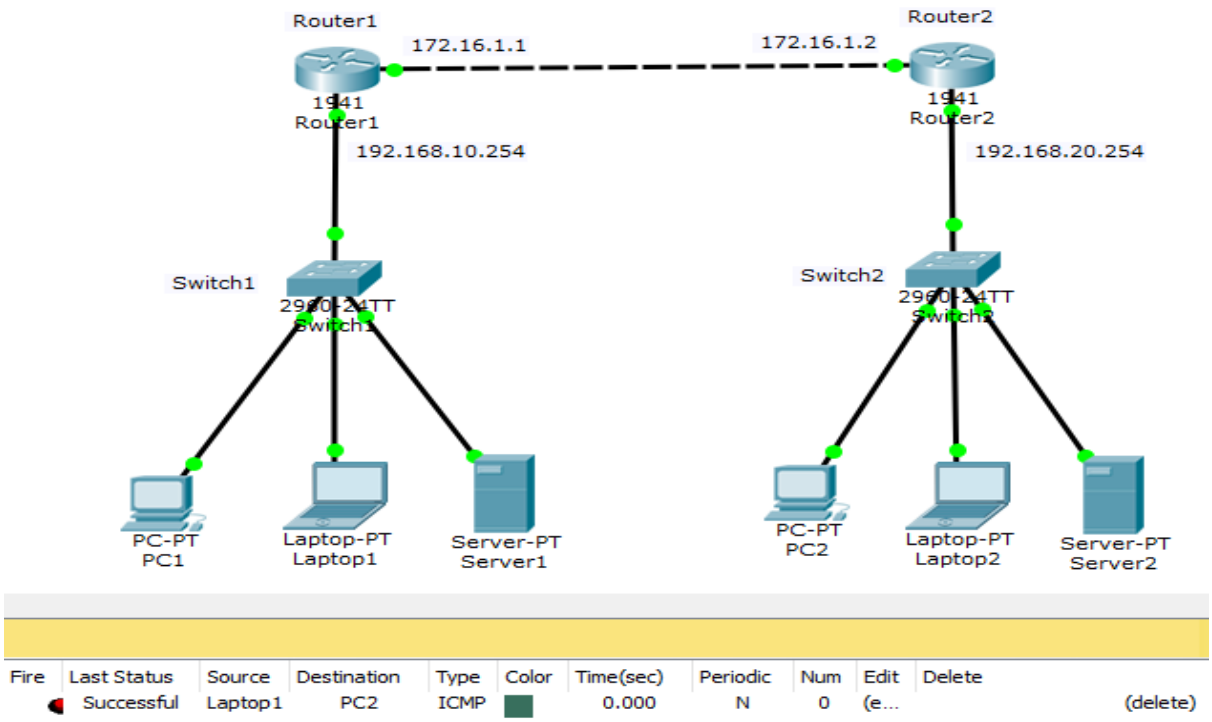
Picture: Connection between two networks through a Router

Steps:

1. Creating two networks using switches
2. The end devices of first network (Blue) are assigned IP addresses as 192.168.10.1, 192.168.10.2, and 192.168.10.3. Similarly for the second network IP addresses are assigned as 192.168.20.1, 192.168.20.2, and 192.168.20.3
3. Setting the IP for Router GigabitEthernet0/0 as 192.168.10.254, and similarly for GigabitEthernet0/1 as 192.168.20.254
4. Turning on both GigabitEthernet0/0 and GigabitEthernet0/1 ports
5. Setting the default gateway of the end devices same as the router port that belongs to them
6. Sending a message from PC1 to PC2 (Successful)

7. Multiple router configuration, setup connection between multiple router

Here is an example of how two or more routers are connected together:



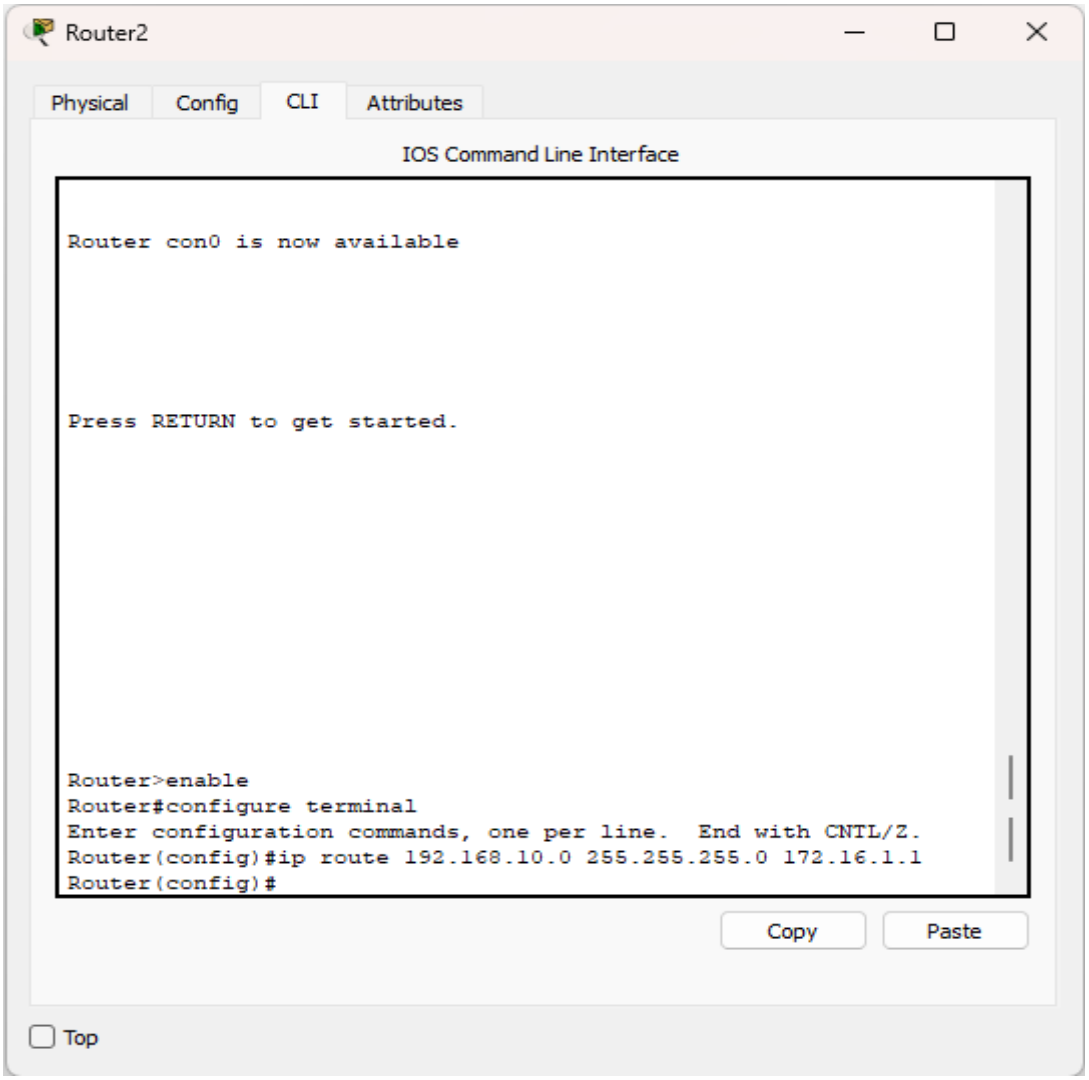
Picture: Connection between two Routers

Steps:

1. Creating two different networks with two routers
2. Setting the GigabitEthernet0/0 IP as 192.168.10.254, GigabitEthernet0/1 IP as 172.16.1.1 for Router1, similarly for Router2 GigabitEthernet0/0 IP 192.168.20.254 and GigabitEthernet0/1 IP 172.16.1.2.
3. Now setting the GigabitEthernet0/0 IP as the default gateway for all the end devices of each router from each network.
4. Setting the 'Static Routes' of Router1 by inserting the network address 192.168.20.0 in the 'Network' field, 255.255.255.0 in the 'Mask' field, and 172.16.1.2 in the 'Next Hop' field.
5. Setting the 'Static Routes' of Router2 by inserting the network address 192.168.10.0 in the 'Network' field, 255.255.255.0 in the 'Mask' field, and 172.16.1.1 in the 'Next Hop' field.
6. Sending a message from Laptop1 to PC2 (Successful)

8. Static and Routing Implementation

Here is how I implemented Static Routing in Cisco Packet Tracer using CLI:



Picture: Connection between two Routers

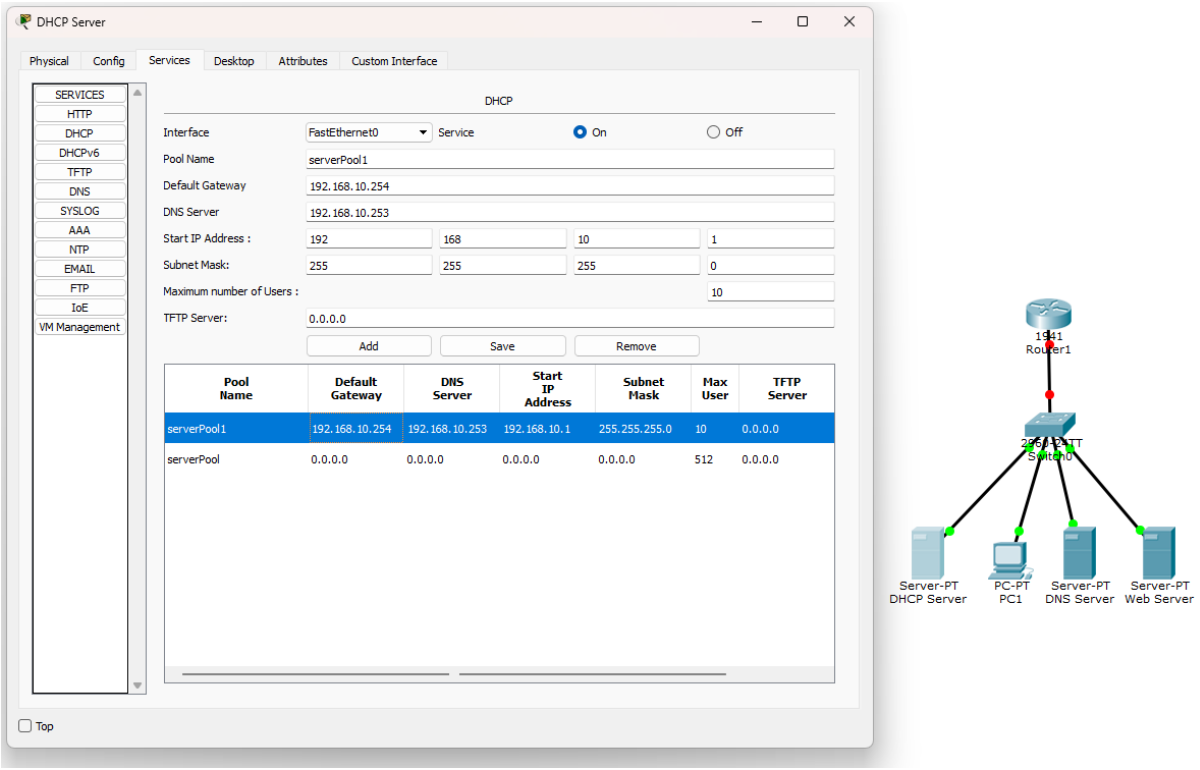
Steps:

1. Clicking on the CLI
2. Enabling the CLI for prompt
3. Setting the 'Static Routes' of Router2 by inserting the network address 192.168.20.0, subnet mask 255.255.255.0, and next hop 172.16.1.2

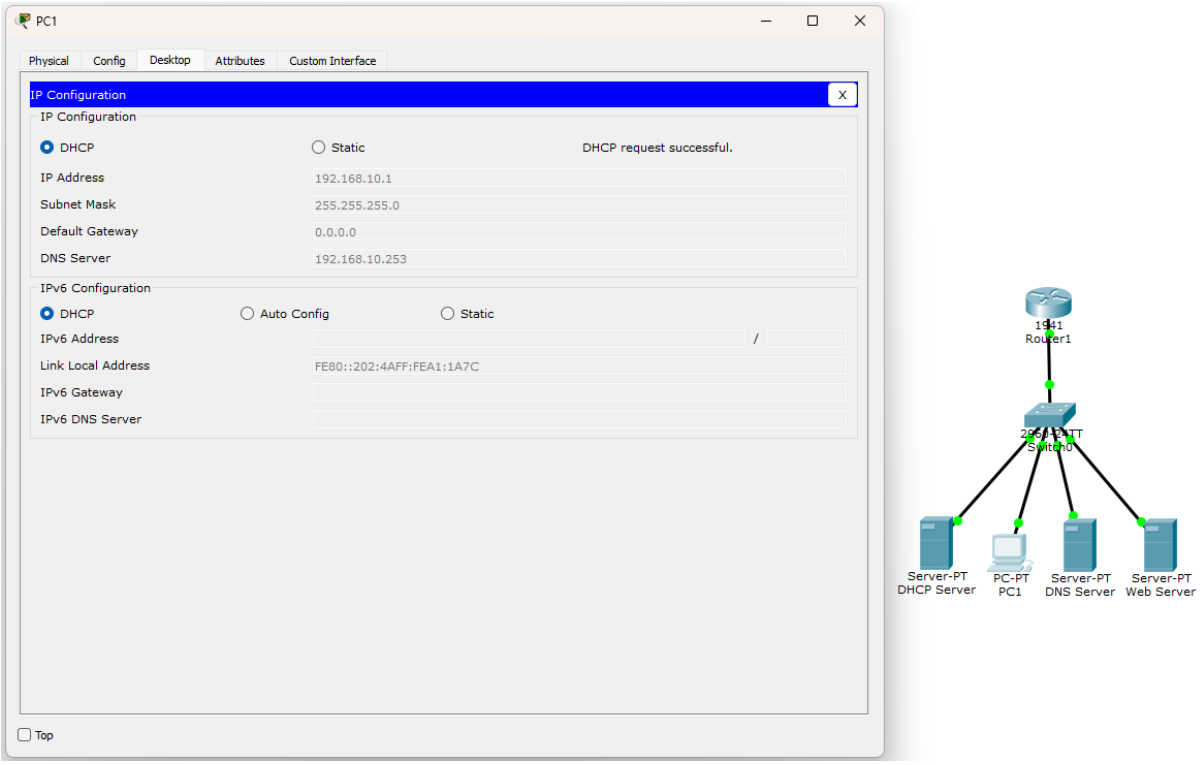
9. DNS, DHCP, Web server configuration

Here is how DNS, DHCP, and Web servers are configured in Cisco Packet Tracer:

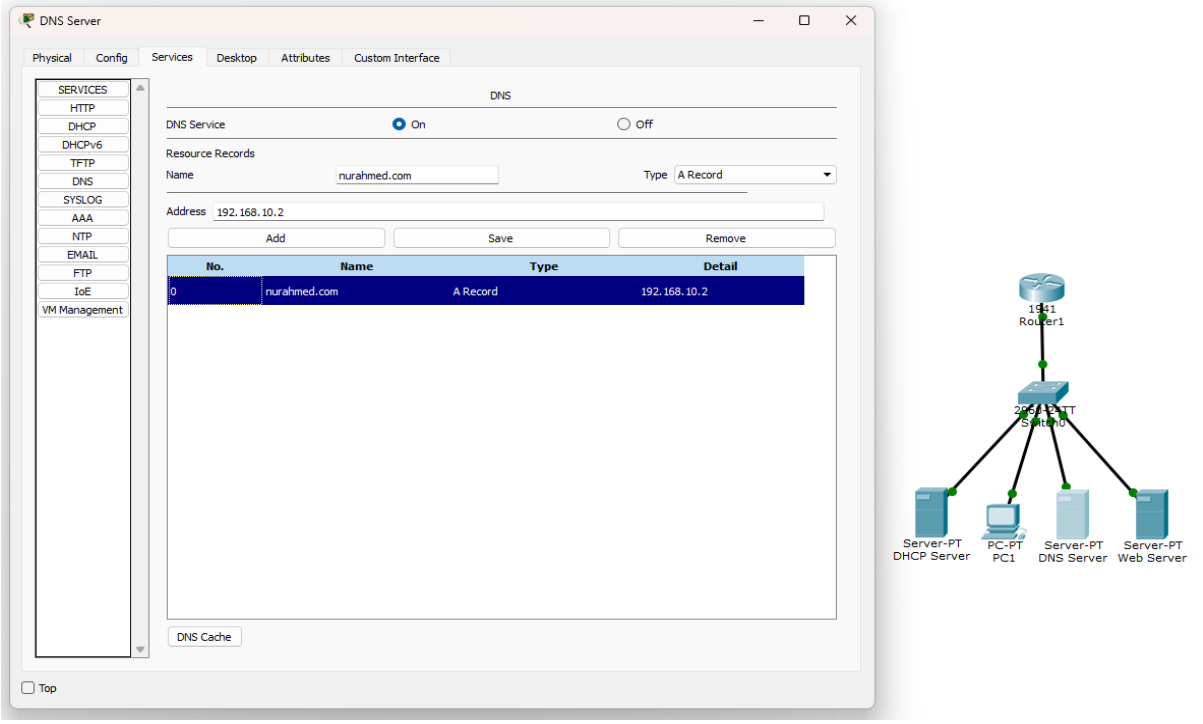
At first, I took 3 different servers (DHCP, DNS, and Web Server) along with a PC (PC1), a Switch (Switch1), and a Router (Router1) and connected them with straight through wires. Then I assigned IP addresses to each of those servers along with DNS server IP (192.168.10.253) and Default Gateway (192.168.10.254). After that I opened DHCP server – Services – DHCP, and then turned on the DHCP. After that I configured everything as shown in the image.



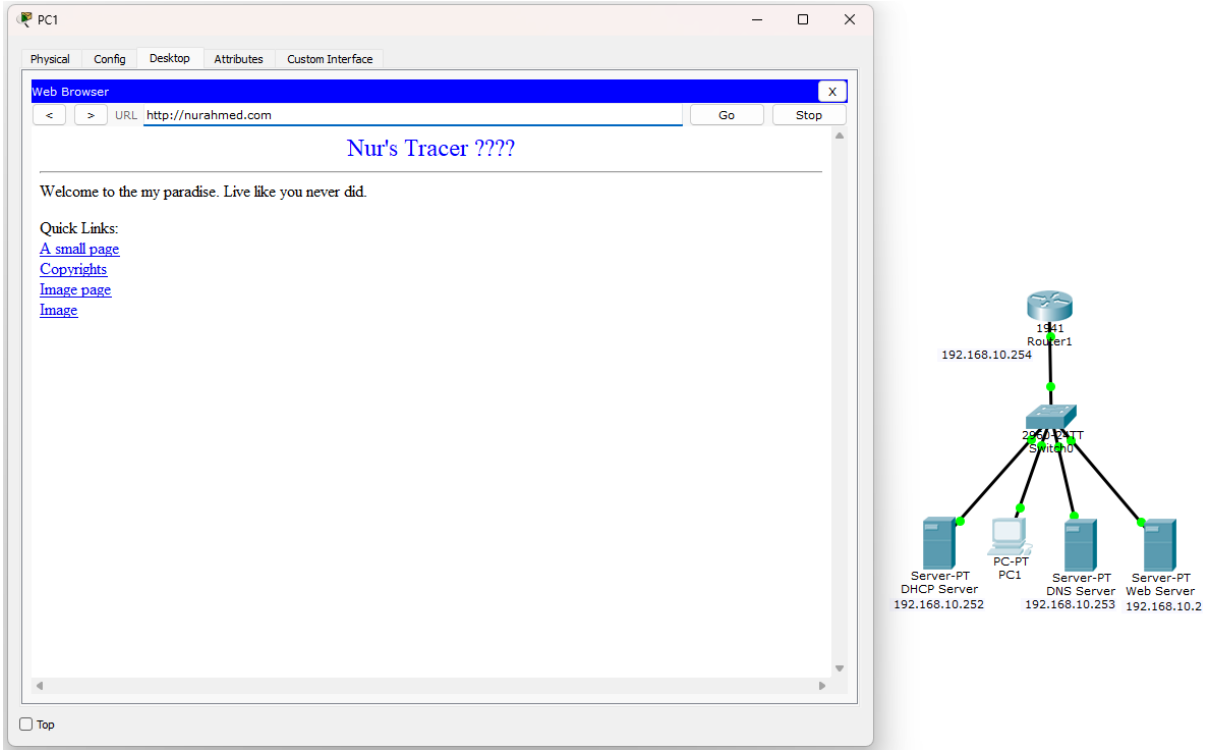
After that, I went to the PC1 – Desktop – IP Configuration and then selected DHCP instead of Static. Automatically the IP address, Subnet Mask, and DNS Server IP is set.



Then I went to the Web Server –Services – HTTP and turned on the HTTP. Then I modified the HTML code a bit. After then I went to the DNS server – Services – DNS and turned on the DNS and set a domain name for the Web Server IP address.



Finally, I went back to the PC1 – Desktop – Web Browser and typed the domain name that I set in the Web Server and everything worked out as I thought, which is shown in the image:



10. Industry Session (Data Center Visit)

Our course teacher Dr. Mohammad Azam Khan sir arranged an Industry Session for us and took us to the Data Center of Daffodil International University. We had an amazing experience as we have seen all the networking devices in real life for the first time. We saw how everything is organized in Data Center. We found every element that we used in the simulation software Cisco Packet Tracer. That was one of the best experiences of my life.

Here are some pictures of the Industry Session: