Lab number 4

Aim/Title: To study DHCP, DNS and Web Server Setup

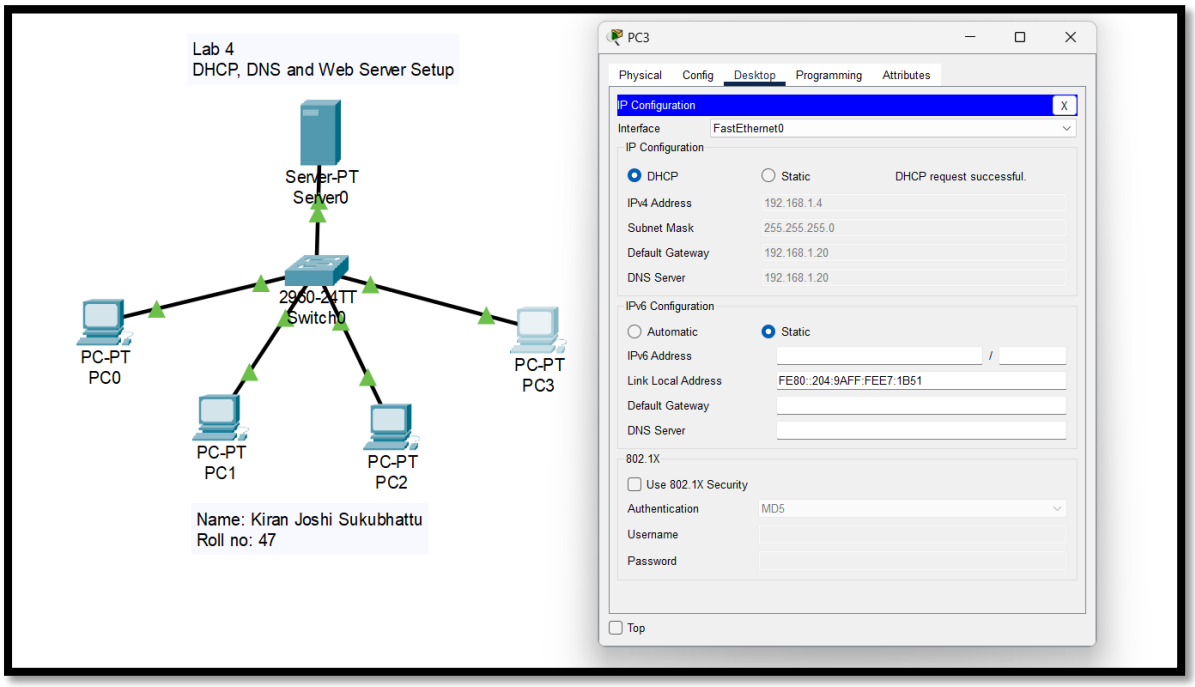
Theory:

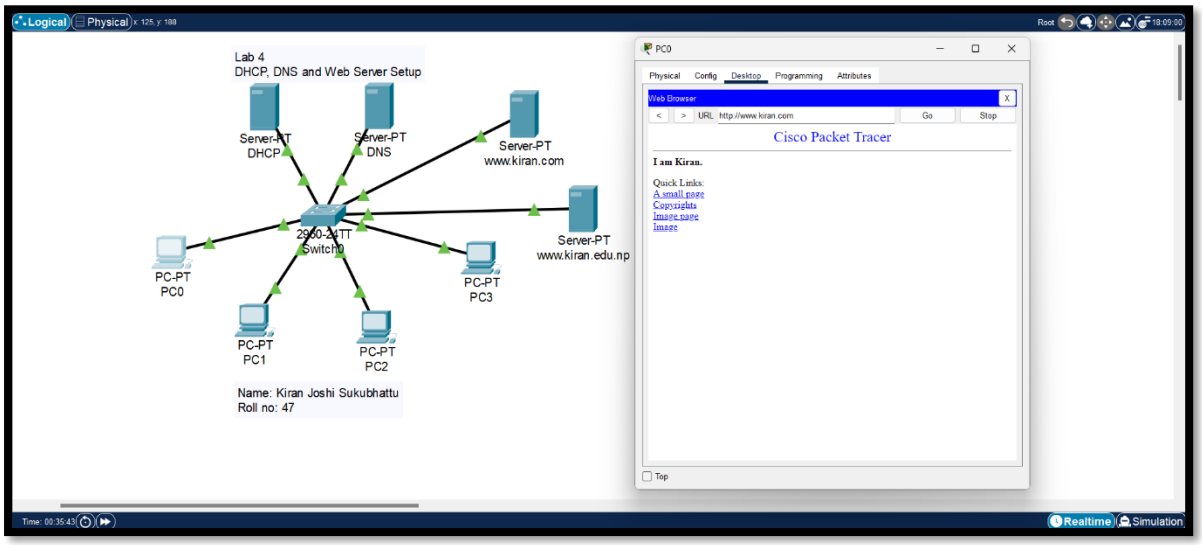
In modern computer networks, DHCP (Dynamic Host Configuration Protocol), DNS (Domain Name System), and web servers play essential roles in ensuring efficient communication and resource accessibility.

- DHCP (Dynamic Host Configuration Protocol) is a network protocol used to dynamically assign IP addresses and other network configuration details, such as the subnet mask, default gateway, and DNS server information, to devices (clients) in a network. This automated process eliminates the need for manual configuration of network parameters, reducing human errors and streamlining network management. DHCP ensures efficient IP address allocation, particularly in large or dynamic networks where devices frequently join and leave. For example, in a corporate environment, as users connect their laptops or mobile devices to the network, DHCP assigns them valid IP addresses automatically, ensuring smooth connectivity without requiring manual intervention.
- DNS (Domain Name System) is a hierarchical and decentralized naming system responsible for translating human-readable domain names (e.g., www.kiran.com) into machine-readable IP addresses (e.g., 192.168.1.4). This process allows users to easily access websites and network resources without needing to remember complex numeric IP addresses. DNS servers play a crucial role in both local networks and the global internet, enabling devices to locate and communicate with each other efficiently. For instance, when a user types a website URL into their browser, the DNS server quickly translates that URL into the corresponding IP address, allowing the user to access the web content without any delay.
- Web Servers are systems designed to host and serve content, such as websites, to clients (browsers or other applications) over the internet or within a local area network (LAN). Common web server software like Apache or NGINX listens for incoming HTTP or HTTPS requests, processes them, and responds by sending the requested web page, file, or other resources back to the client. Web servers are vital for delivering content to users in real-time, ensuring that web applications and services remain accessible. For example, when a user accesses www.kiran.com, the web server hosting that domain retrieves the necessary files (HTML, images, etc.) and sends them to the user's browser for display.

In this lab, you configure a network with DHCP, DNS, and Web Server setups using Cisco Packet Tracer to simulate and analyze the functionality of a local area network (LAN) with interconnected devices. This hands-on simulation enables the demonstration of how these services collaborate to automate IP address assignment, resolve domain names, and provide content hosting for client access.

Working Procedure:





1. **Initial Setup:**

In the above two images a 2960-24TT switch is used to interconnect multiple PCs and servers. Various servers are set up for different roles: DHCP, DNS, and Web Server. The PCs are configured to automatically obtain IP addresses from the DHCP server.

2. **DHCP Configuration:**

The DHCP server dynamically assigns IP addresses to the connected PCs.When a PC is configured to use DHCP, it sends a request to the DHCP server, and the server provides a unique IP address along with other necessary configurations, such as the default gateway and DNS server addresses.In the screenshot (PC3), DHCP successfully assigned the IP address 192.168.1.4 with a default gateway of 192.168.1.20 and DNS server address of 192.168.1.20.

3. **DNS Server Setup:**

The DNS server is responsible for resolving domain names to IP addresses. For example, the domain www.kiran.com is resolved to a specific IP address.Clients (PCs) use the DNS server to translate URLs into IP addresses so that they can communicate with the web server hosting the website.

4. **Web Server Configuration:**

The web server hosts the website www.kiran.com. It listens to HTTP requests from the client PCs.PC0's web browser (shown in the image) successfully accesses the website hosted on the server, demonstrating that the DNS resolution and web server setup are functioning correctly.

Setup Steps:

1. **Setting up the DHCP Server:**
    - Drag and drop a server into the network, connect it to the switch, and configure it as a DHCP server.
    - On the server's interface, enable DHCP and configure the IP address range (e.g., 192.168.1.1 - 192.168.1.254).
    - Assign the appropriate default gateway (e.g., 192.168.1.20) and DNS server IP address (e.g., 192.168.1.20).
2. **Configuring DNS Server:**
    - Set up a separate server as the DNS server and connect it to the network switch.
    - Configure the DNS server to resolve domain names like www.kiran.com and www.kiran.edu.np to their corresponding IP addresses.
3. **Web Server Setup:**
    - Use a server to host the website www.kiran.com and configure it to respond to HTTP requests.
    - Ensure the server's web service is running and that it is reachable by its domain name, which is resolved by the DNS server.
4. **Configuring the PCs:**
    - Configure each PC (PC0 to PC3) to obtain its IP address automatically via DHCP.
    - Confirm the IP address assignment by checking the DHCP success message and ensuring that the correct default gateway and DNS server addresses are obtained.

5. **Testing the Setup:**
    - On the PCs, open a web browser and access the website using its domain name (e.g., www.kiran.com).
    - The web page should load successfully, demonstrating that DHCP, DNS, and the web server are working together seamlessly.

Conclusion:

This lab demonstrates the importance of proper DHCP, DNS, and web server configuration within a LAN. DHCP reduces the administrative burden by dynamically assigning IP addresses, while DNS translates domain names into IP addresses for easier access to network resources. A correctly configured web server responds to client requests, showing the overall functionality of a well-designed network. By simulating this setup in Cisco Packet Tracer, we can understand the fundamental roles of these components and ensure efficient communication between devices within a network.

Discussion:

In this lab, we successfully configured DHCP, DNS, and web servers within a local area network (LAN) using Cisco Packet Tracer. The DHCP server dynamically assigned IP addresses to devices, simplifying network management and reducing manual configuration. The DNS server translated human-readable domain names (e.g., www.kiran.com) into IP addresses, enabling seamless navigation within the network. Additionally, the web servers hosted and served web content to clients, demonstrating how devices could access websites using domain names. Overall, the lab effectively showcased how these essential services collaborate to ensure efficient communication and resource access in a network.