EAST WEST UNIVERSITY

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Creating a Network System using CISCO Packet Tracer

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Abstract—This study presents the design and implementation of a network for East West University, utilizing Cisco Packet Tracer to cover 15 departments with 75 devices, including laptops, printers, and other generic devices. The network incorporates servers such as - DNS, DHCP, and Web Server with static IP addresses for efficient management. Access points are included to provide free Wi-Fi in designated zones, and additional access points are used to connect wireless devices in each department. The implementation demonstrates the importance of proper network planning, appropriate network management tools, and a well-designed network capable of meeting the diverse needs of an academic environment. The results of this study indicate the importance of network planning, design, and implementation for the efficient operation of academic institutions, and highlight the potential benefits of a well-designed network.

Keywords— CISCO, IP, generic devices, server, HTTP, ethernet, port, DNS, DHCP, web, cross-over, straight-through

I. Introduction

Networking plays a crucial role in the modern world, enabling the exchange of information and resources among users and devices. To meet the diverse needs of an academic environment, it is essential to design and implement a well-structured and efficient network. Cisco Packet Tracer is a powerful simulation tool that allows users to create and test network topologies using virtual devices and simulated command-line interfaces. In this project, we utilized Packet Tracer to design and implement a network for East West University, consisting of 15 departments with a minimum of 5 end devices each. Our network utilized a STAR topology and included various devices such as generic PCs, printers, and smartphones, along with three servers - DNS, DHCP, and Web Server - for efficient management. The implementation demonstrates the importance of proper network planning, appropriate network management tools, and a well-designed network capable of meeting the diverse needs of an academic environment.

II. Environment Setup

In the current study, Cisco Packet Tracer is being utilized to design and implement a network that covers 15 departments of East West University, comprising a total of 143 devices including laptops, printers, and smartphones. To ensure seamless network access, wireless access points have been incorporated, and DHCP has been employed to assign IP addresses to the devices. Additionally, the network includes three servers - DNS, DHCP, and Web Server - with static IP addresses assigned to them for efficient and effective management. Proper network planning and the use of appropriate network management tools are emphasized in this implementation.

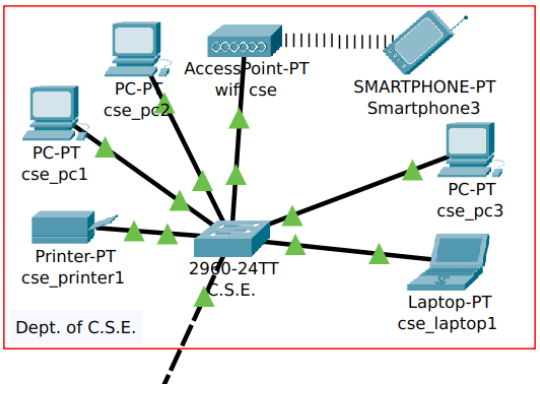

Fig. 1 Design of a specific department

III. Devices Used

A total of 143 devices were used in this project. The devices are listed below:

A. Switch

We started with a switch(2960-24TT) as the main switch for all the network. The 2960-24TT offers

24 port POE [1]. It also has dual-purpose uplinks for Gigabit Ethernet uplink flexibility, allowing use of either a copper or a fiber uplink [2].

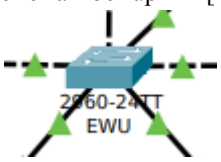

Fig. 2 2960-24TT switch

We also used the same type of switch throughout the network to connect between devices.

B. End Devices

We used Desktop, Laptop, Printers, Wireless Access Points, Smartphones, and Tablets as end devices in this project. Each department has 5 or more end devices connected to their designated switch.

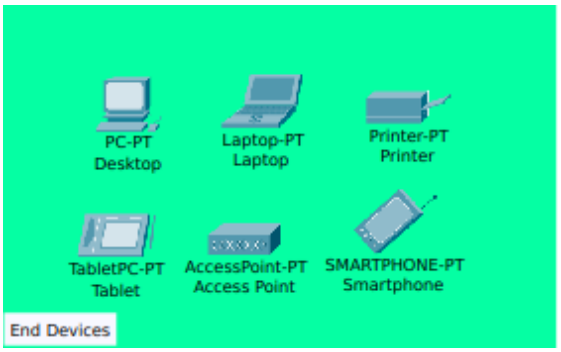

Fig. 3 End devices

Each Department has a password protected Access Point from which wireless devices can connect to the network.

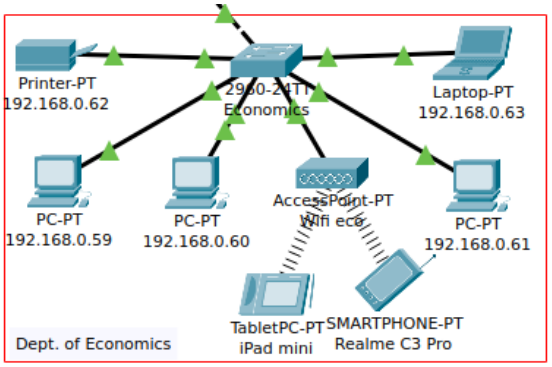

Fig. 4 End devices connected to a department's switch

C. Servers

The PC programs that issue service requests are called requesters, and the host programs that issue replies are called servers. Servers can give PC requesters access to host computer data, commands and resources such as printers and storage [3]. In computing, a server is a computer program or a device that provides functionality for other programs or devices, called "clients." This architecture is called the client-server model, and servers are used to manage network resources, store data, run applications, or provide other services to clients. In other words, a server is a central computer or system that acts as a hub for multiple users or devices, providing them with access to shared resources or services.

There are many different types of servers, each designed to perform specific tasks and functions. Some common types of servers include web servers, file servers, email servers, application servers, database servers, print servers, and game servers. Each type of server has its own unique purpose and characteristics, and can be used in a variety of settings, from businesses and organizations to personal use at home.

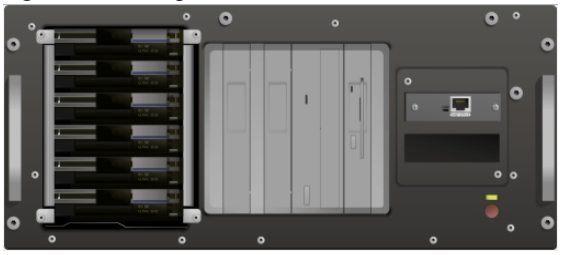

Fig. 5 Server physical device view

For this project, we used 3 kinds of servers—DHCP, HTTP/Web, and DNS.

1) DHCP Server: A DHCP server is a type of network server that automatically assigns IP addresses and network configuration information to devices on a network. This server can provide a central point of management for all network devices, allowing network administrators to easily configure and update network settings without having to manually assign IP addresses or reconfigure devices. DHCP servers are commonly used in enterprise networks to simplify network administration and reduce the likelihood of errors and conflicts that can occur when IP addresses are assigned manually.

In a large network, a DHCP server automatically assigns and manages IP addresses for each device, ensuring that there are no conflicts or duplicate addresses. This allows for efficient use of available IP addresses and simplifies network management, as network administrators do not have to manually assign IP addresses to each device. Additionally, a DHCP server can provide other configuration information, such as the default gateway and DNS server, to each device, making it easier to set up and manage network resources.

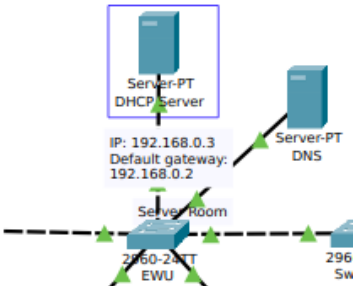

Fig. 6 DHCP server

The DHCP server is configured to serve IP addresses starting from 192.168.0.4. The default gateway is set up at 192.168.0.2.

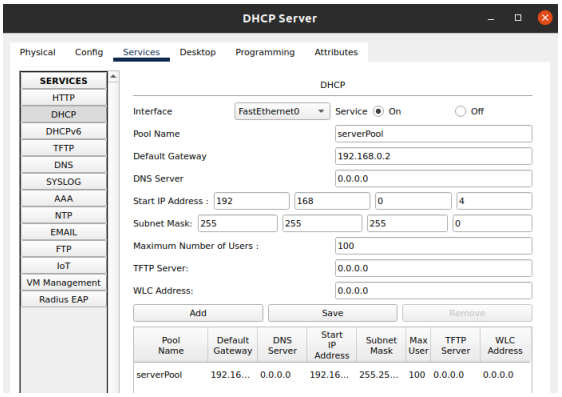

Fig. 7 DHCP server configuration

2) HTTP/Web Server: A web or HTTP server is a computer program that stores, processes, and delivers web pages to clients upon request. It is a software application that runs on a server and is responsible for handling HTTP requests from web clients, such as web browsers, and sending back HTTP responses containing requested web content, such as HTML pages, images, or other resources. The web server communicates with the client using the HTTP protocol, which allows clients to make requests and receive responses over the internet. Examples of web servers include Apache HTTP Server, Microsoft IIS, and Nginx.

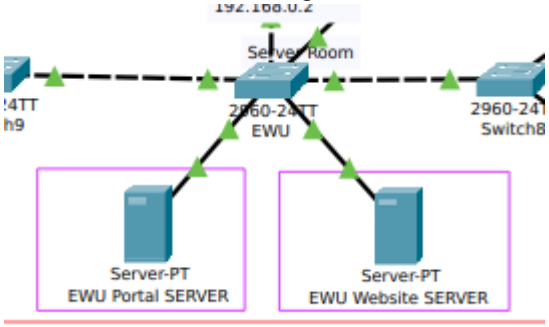

Fig. 8 HTTP/Web server

In Cisco Packet Tracer, a web server is a network device that serves as a host for web content, such as web pages, multimedia files, and other web resources. It is designed to handle HTTP requests and deliver web content to clients over the network. In Cisco Packet Tracer, a web server is represented as a server device with a special HTTP service that allows it to respond to web requests. It is commonly used in small to medium-sized networks for hosting internal web pages, intranet portals, and other web-based applications.

There are 2 web servers in this project, one serving a sample of the varsity website, the other serving a demo student portal.

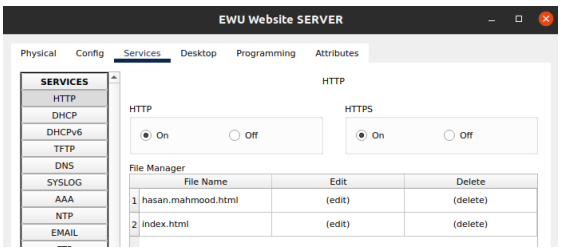

Fig. 9 EWU web server configuration

3) DNS Server: A DNS server is a computer that holds a database of domain names and their corresponding IP addresses. When a user enters a website URL into their browser, the browser sends a request to a DNS server to translate the domain name into an IP address. This translation is necessary because computers communicate using IP addresses, while humans find it easier to remember domain names. The DNS server checks its database for the requested domain name and returns the corresponding IP address to the user's browser, allowing the browser to establish a connection with the web server hosting the website. Without DNS servers, users would have to remember IP addresses for all the websites they want to visit, which would be challenging and impractical.

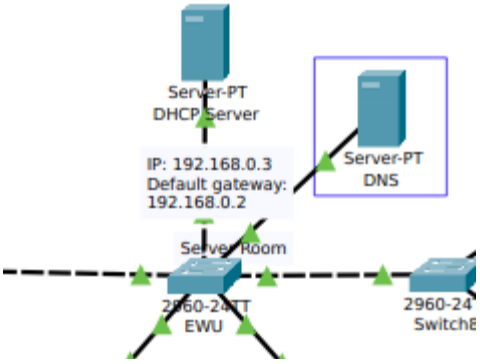

Fig. 10 DNS server

The DNS server is configured to serve from 2 IP addresses. The first domain “ewubd.com” will resolve to 192.168.0.201 and the second domain “portal.ewubd.com” will resolve to 192.168.0.202.

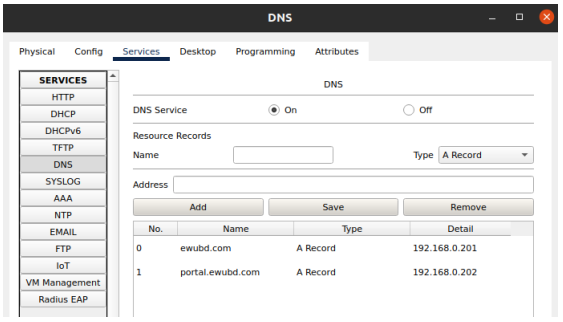

Fig. 11 DNS server configuration

IV. Cables

We used 2 types of cables for connecting different devices. For switch-to-switch connection, we used a copper crossover cable. From a switch to a generic device or a server connection, we use a copper straight through cable.

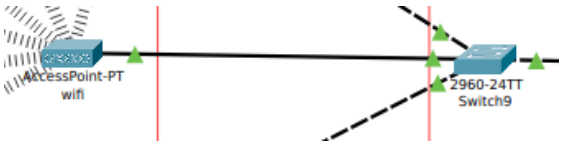

Fig. 12 Copper straight through cable

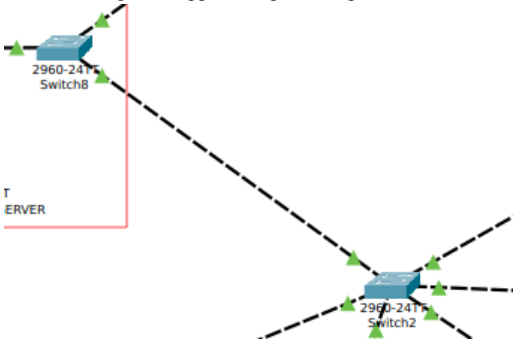

Fig. 13 Copper crossover cable

V. Websites

We created a few web pages with HTML, and CSS that are stored and served to clients from the web servers. The DNS resolves the domain names IP addresses. (Source codes available at https://github.com/IshmamR/EWU_Network)

A. EWU home page

The home route serves a dummy webpage for East West University.

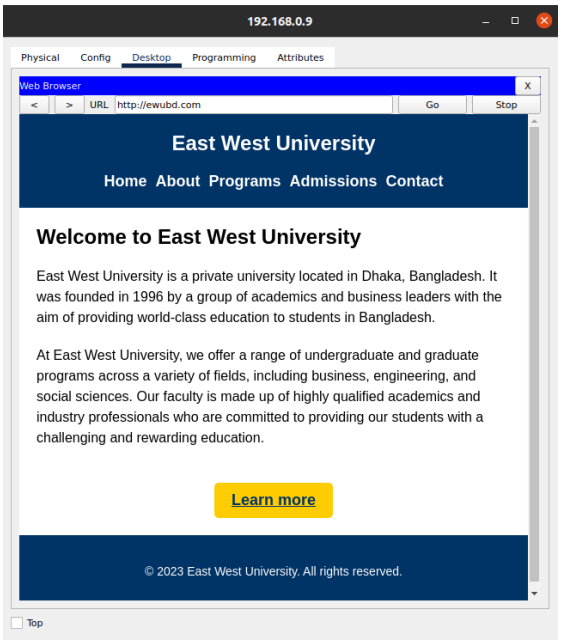

Fig. 14 EWU home page

B. Faculty page:

We added a faculty introduction page for our course instructor Dr. Hasan Mahmood Aminul Islam at https://ewubd.com/hasan.mahmood.html.

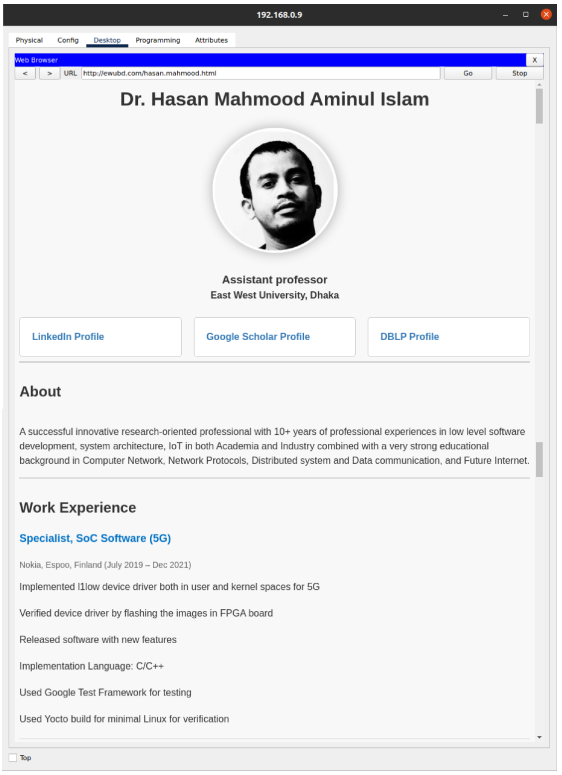

Fig. 15 Faculty introduction page

C. Portal

A student portal demo site to simulate a form submission in a website.

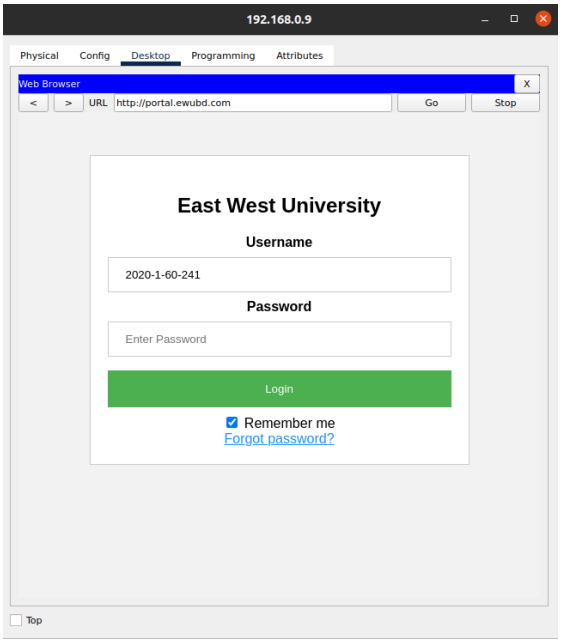

Fig. 16 Portal page

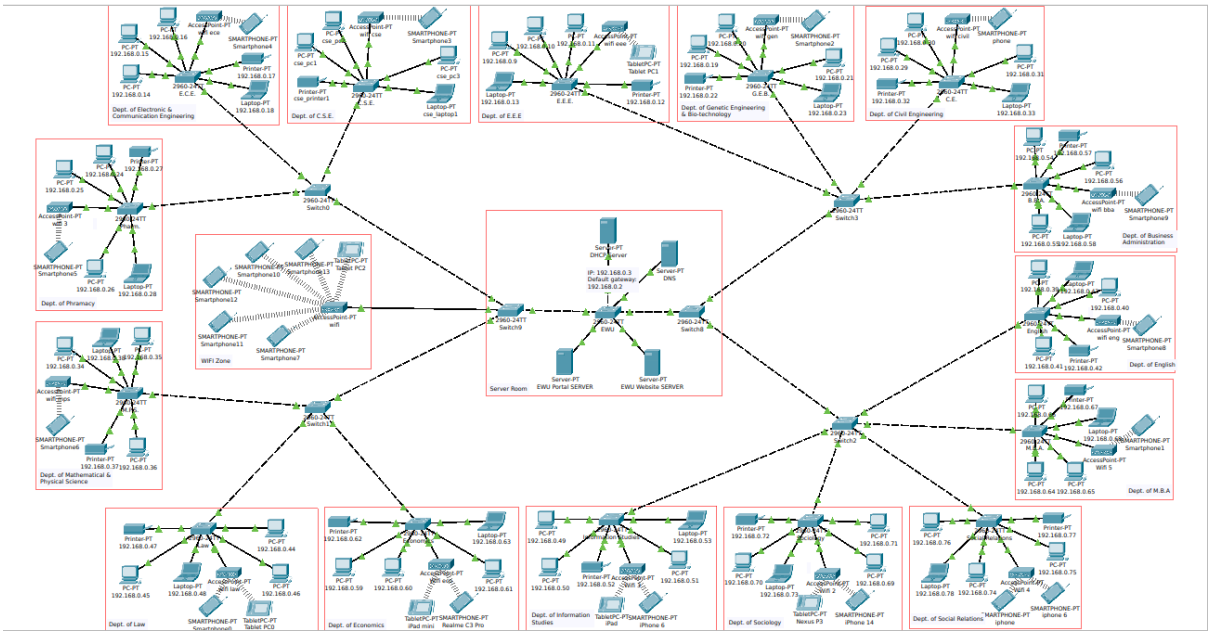

Fig. 17 Complete view of the network

VI. Conclusions

In conclusion, the implementation of the Cisco Packet Tracer network for the university has been successful in achieving our objectives of providing seamless connectivity and efficient network management. By incorporating various network components such as switches, access points, and servers, we have ensured that the network can handle the demands of a modern university. The network design and implementation have also highlighted the importance of proper planning and utilization of appropriate network management tools. Overall, we are confident that the network infrastructure we have established will be a valuable asset to the university community, and we hope that this study can serve as a useful reference for future network implementation projects.

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