

NETWORK DESIGN FOR UNIVERSITY

Abstract—

The purpose of this project is to design a suitable network system for universities. The aim was to design a network with high-quality security and low cost, in such a way that network devices of universities, will meet standards associated with the universities. This project will help to enhance education. There are many devices that were used in designing the network, such as routers, switches, backup, firewall, and servers. All devices were connected to each other to make integration network system and configured by putting IP addresses to all devices. Although the budget for this design network was low, it needed to have a high level of security. Accordingly, it incorporated several mechanisms including a firewall device that prevents any unfavourable data from entering into the network. Additionally, all devices in the network were secured by passwords, and these passwords were encrypted to be more secure.

I. INTRODUCTION

Technology has reached its highest peak of development, especially in making life easier for people. well implemented technology is faster than human in processing calculation and is more accurate. technology has become an important concept in our life. it assists in connecting communities together. obviously, people have started to use technology in every field of life including education, health, the military, etc. the computer network represents a component, especially on how it enhances the functional **performance in different fields and organizations**, such as companies and schools. a school's computer network performs so many functions, such as connecting students with the university, faculty, and the library. most universities today use the network to provide online education by connecting widely dispersed students with their professors directly. For this reason, computer networks play a vital role in the education area by providing efficient communications for the university environment. However, the design of computer networks differs from one university to another. This is as a result of Many factors which determine the differences. Such Factors include; adaptability, integration, resilience, Security, and cost. Installing networks in a university Relies on the university's budget, which differs by Institution and from country to country. For Instance, there are many countries whose universities Do not have the financial capability for designing the 'perfect' or ideal network page layout

II Objectives

The main goal of this project is to present a Local Area Network design suitable for universities in developing countries.

Many universities in developing countries are searching for ways to integrate networks that have security, backup, and other features available in a university network in a developed country. The universities in developing countries are faced with challenges in designing a network that is equal in the standards used by developed countries.

III. Reliability

Reliability refers to the ability of the computer network's hardware and software component to consistently perform according to its specifications. This project's network will be highly reliable in performance because its components will be chosen from Cisco company, a major and well-regarded manufacturer. Reliability of the security in the network is in high level. This is because there are many powerful devices used to secure data like the firewall device that is used in filtering data entering into the network. If any issue happens to the data, there is a way of restoring the data from backup servers. Each computer in the network has anti-virus to protect users' data.

IV. Network Topology

A network topology defines how hosts are connected to a computer network. It characterizes how the PCs and other hosts are organized, and linked to each other. There are many types of network topology such as Point-to-Point, Bus, Star, Ring, and Mesh topology. Each type has a different set of advantages.

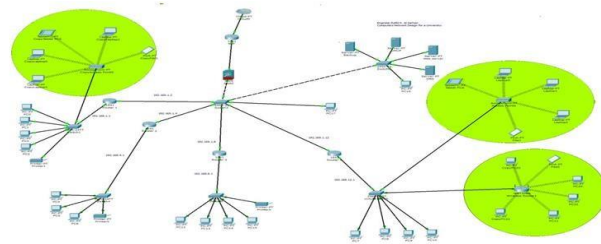


Fig. 1 The access point is star topology.

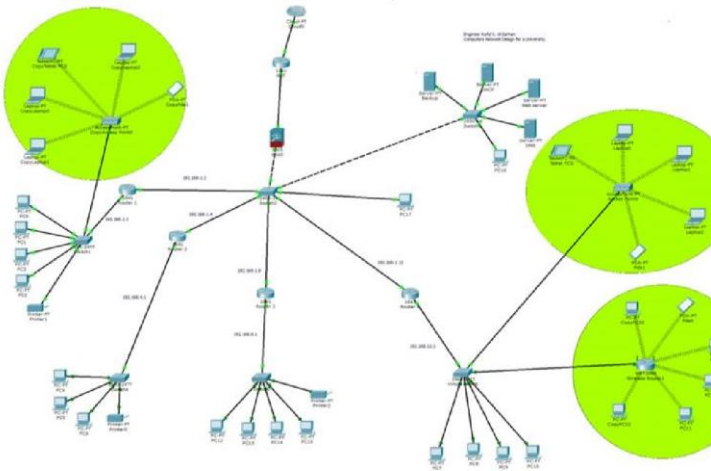
V. Equipment Used

Each network must have a media for transferring information from one node to another, or from one device to other devices. These media play a significant role in determining the transmission speed of the network, maximum distance, shielding against interference, and the cost of the network. There are two options for general use: One of them is a physical connection, and the other one is wireless.

A. Wi-Fi

The Wi-Fi is one type of wireless communication device used for connecting to a network. It is imperative for daily life's communication. Wi-Fi signal must be made available to connect inside all buildings at the University. This is because all students and faculties make good use of the Wi-Fi connection with them tablets, phones, and laptops, etc. The wireless local area network (WLANs) that will be used in this project network design is (802.11).

Fig.2 Different types of wireless is used in A.



B. Firewall

A firewall is a device or software designed to secure the network and its resources from external threats. The firewall is usually deployed where the network is linked to a Wide Area Networks (WAN). Firewall devices will be connected to the Local Area Network (LAN) and NAT system. The firewall prevents external users from gaining access to the network resources and local data

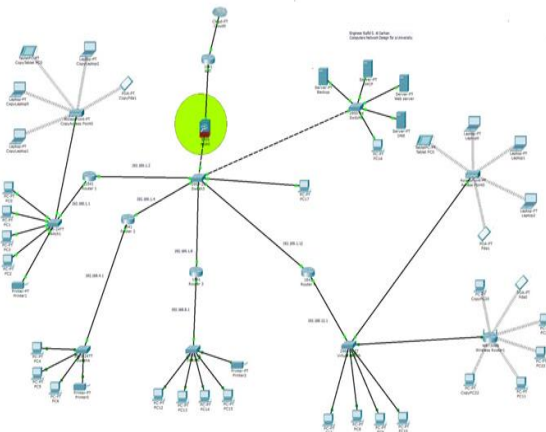


Fig.3 Firewall

C. Virtual Switch

A virtual switch or (vswitch) is a software application that permits correspondence between virtual machines. A virtual switch accomplishes More than simply forward information bundles. It keenly coordinates the correspondence on a Network by checking information parcels before moving them to a destination. In this network Design, the Switch is used between the access point and the personal computers as shown in figure 4.

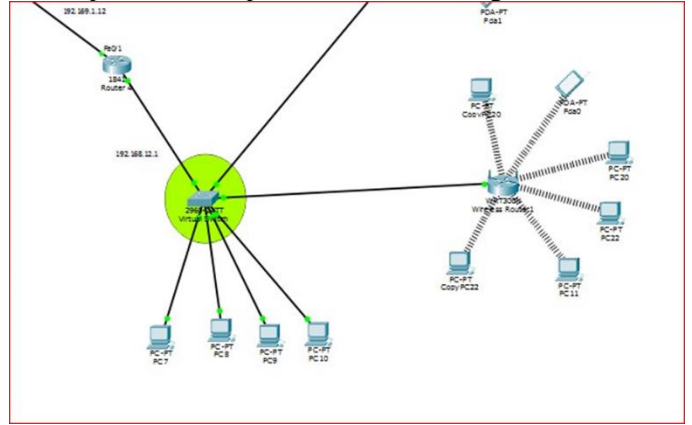


Fig.4 Virtual Switch

VI. Individual Systems/Components

All devices in the network system must have a tool for security. This is because each device has an important data. When some devices in the network do not have any tools of security, that device will affect other devices in the network. This is because all devices are connecting to each other. affect other devices in the network. This is because all devices are connecting to each other. Shown in fig. 5.



Fig .5

VII. Background Information On TCP/IP

A. The Internet Protocol (IP) Address

The internet protocol (IP) address is a 32-bit number. It is divided into two components. The first one is a network

Address, and the other one is a host address. The name of this division is called subnet mask or slash (/ + number) such as this IP 255.255.224.0/19 which has subnet mask (/19). When changing the subnet from decimal numbers (Human numbers) to binary numbers (Machine numbers), it will become 11111111.11111111.11100000.00000000. References.

B. DHCP (Dynamic Host Configuration Protocol)

DHCP allows each computer to get its IP address automatically from a pool of addresses with said pool being established by the network administrator and managed by a DHCP server. Companies and organizations use this kind of IP configuration most often due to the ease of setup.

IX. Network Device

A. Switches

Switches are devices used on the network to transmit and receive data from one device to another or to many devices depending on the message intended. A switch provides the full bandwidth of the network to each port, thereby reducing collisions on the network. Switches also perform functions from the Data Link Layer (Layer 2 on the OSI [Open Systems Interconnection] Model).

B. Routers

A router is a networking device that forwards data packets between computer networks. The router chooses the best path to transfer data packets to their destination in the most efficient manner. Think of a router as a traffic cop at a busy intersection. This traffic cop makes determinations on which vehicles get through, which vehicles are not permitted on the path and the destination that the vehicles may take.

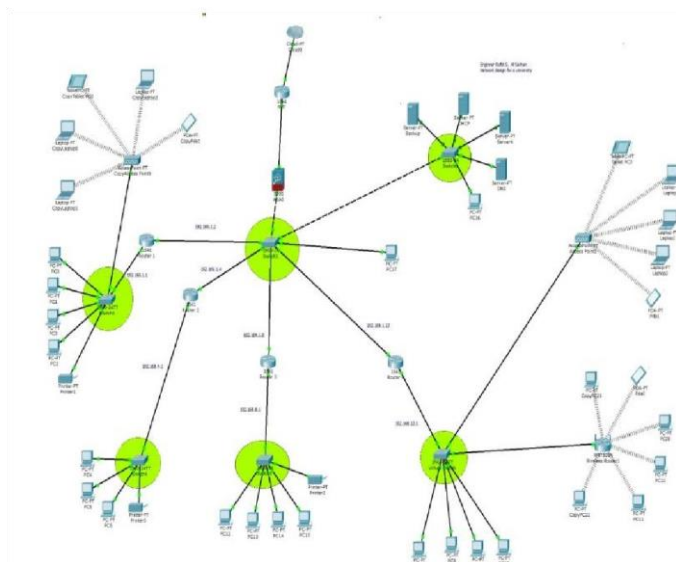


Fig.6 Switches and Routers in the network

C. WIRELESS ACCESS POINT

An access point is a wireless service device used for networks. Wireless access point service plays a significant role in this design and is very important for educational institutions. The universities must Have a wireless network available. This is because it is an important part of communication in education acknowledgment.

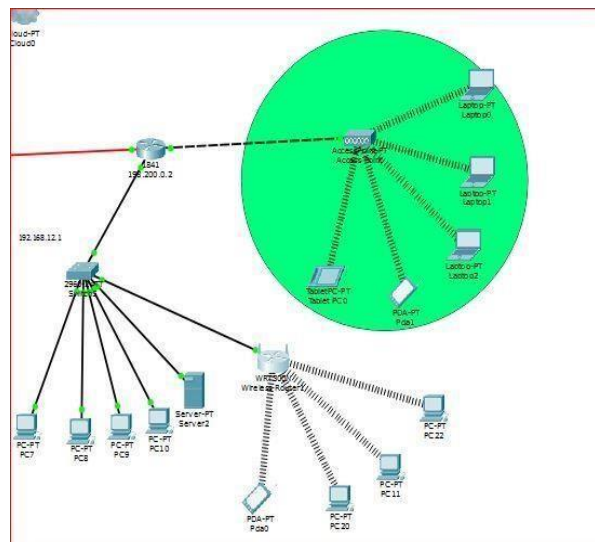


Fig.7 Access point connected with the router

X. Servers

The term server refers to a device or a computer program that supports other devices or programs which are called clients. This is known as the client-server model; one server can support many clients and can give different functionalities or characteristics to different clients

A. DHCP Server

Dynamic host Configuration protocol (dhcp) server will be connected to the switch device In order to connect to many computers. Each Computer that is connected to the network needs an Ip address.

B. DNS Server

The Domain Name System (DNS) is a server service that maps a domain name to IP addresses. DNS server translates a domain name to the IP address. IP address contains 32 bit. Since people cannot easily memorize all numbers of IP addresses, it is easier for them to memorize domain names of IP addresses.

XI. Conclusion

In this network design, an integrated network design for universities has been presented. This network design is composed of many sections. First, we started to explain the design constraints.

Many universities are eager to design a network that meets standards of developed countries but has always been faced with cost implementation barrier.

This design allows for future expansion, as universities using this design can connect 3115 additional hosts, allowing for per host costs, like cabling. The additional hosts can be included without exhausting the available IP address. Also, if there are high budget, they can develop the network system to become more powerful, have a high level of security and many servers can be added to the network.

Lastly, as cheap and effective as the methods of designing a network in this research are, it is not limited to only developing countries. Developed countries that are trying to cut cost in any of their network design projects can also adopt the methods used in this network design.

XIV. REFERENCES:

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