CS150: INTRODUCTION TO COMPUTER NETWORK & SECURITY

ASSIGNMENT 1 DESIGNING A BASIC NETWORK

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Executive Summary

- Project Overview

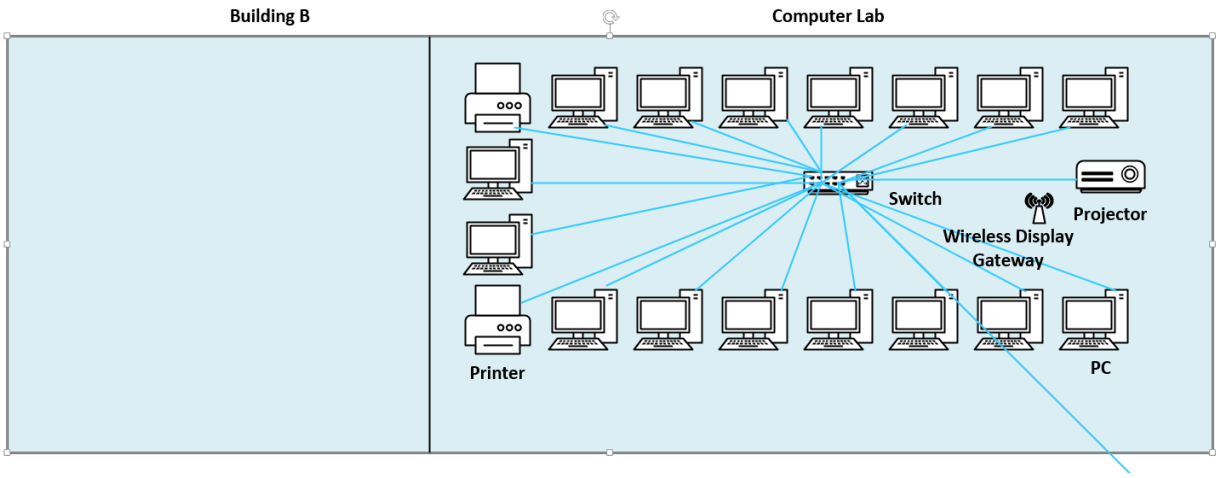
This document will explain the framework of the Imaginary College's fundamental network infrastructure. The key objective of this network design is to provide the college with a strong and a dependable as well as cost effective network system that supports the college's day to day tasks and future expansion.

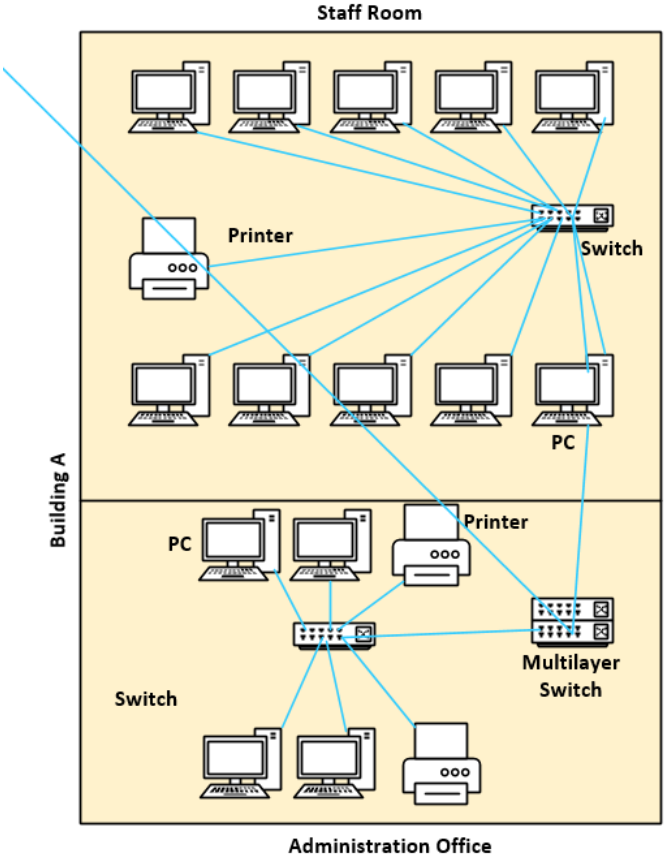
- Objective

Our main objective is to boost connection for strengthening the imaginary college's network system. We want to make sure that the network is reliable and works smoothly among all the departments and the remotes offices with its peak performance. We will assure that the network structure of the imaginary college is fully dependable and it will help the users of the network to accomplish their day to day tasks. We will assure that the security of this network system will help protect all files and all computer components from any type or virus, hazardous file or even any miscellaneous files. We will ensuring this design with scalability that simply means that there will be space available for the future expansion as well as advancements in technological terms without any complication.

Proposal

Design Diagram:





Internet Connectivity

Network requirements:

- Based on the physical topology of the imaginary college. The network is divided into two areas (Building A & building B). Both buildings have a separation distance of 200 meters. This is an important key factor when designing the network infrastructure.

1. **Building A (Staff Room & Administration Office)**

- The staff room is 576m2 and the Administration office is 96m2. This helps us understand the devices that can be installed in a room without congestion.

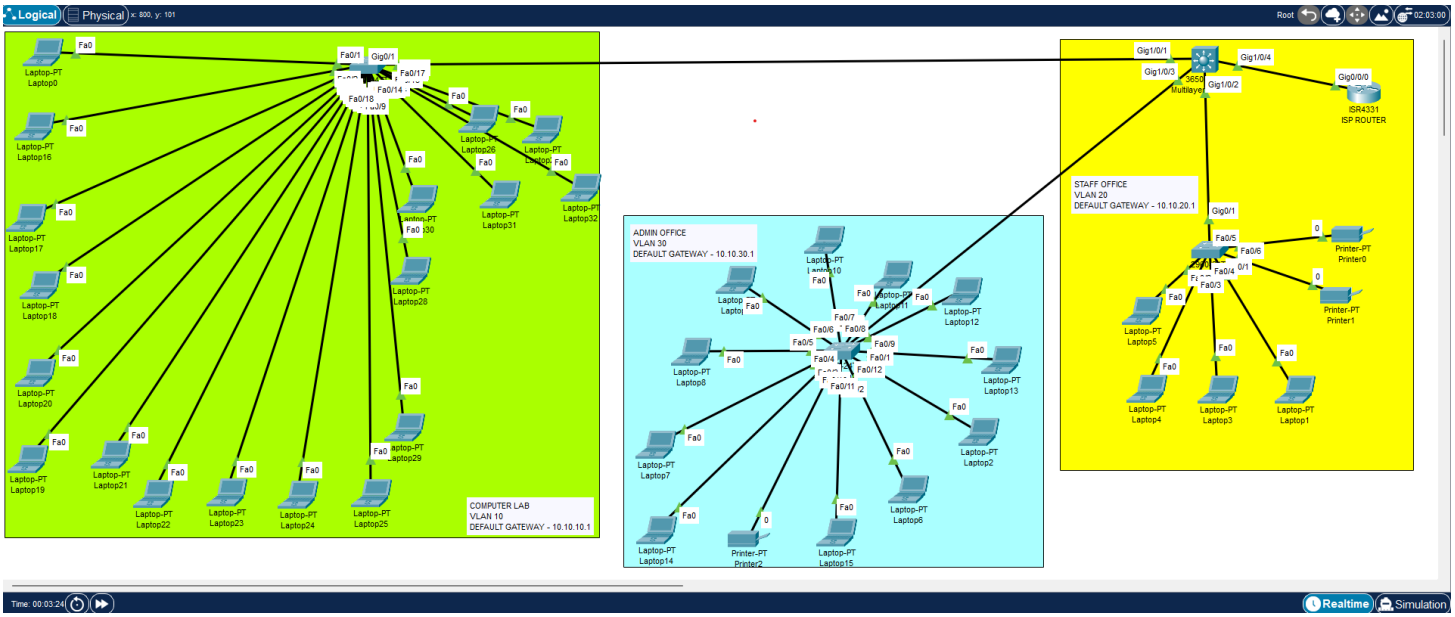
2. **Building B (Computer Lab)**

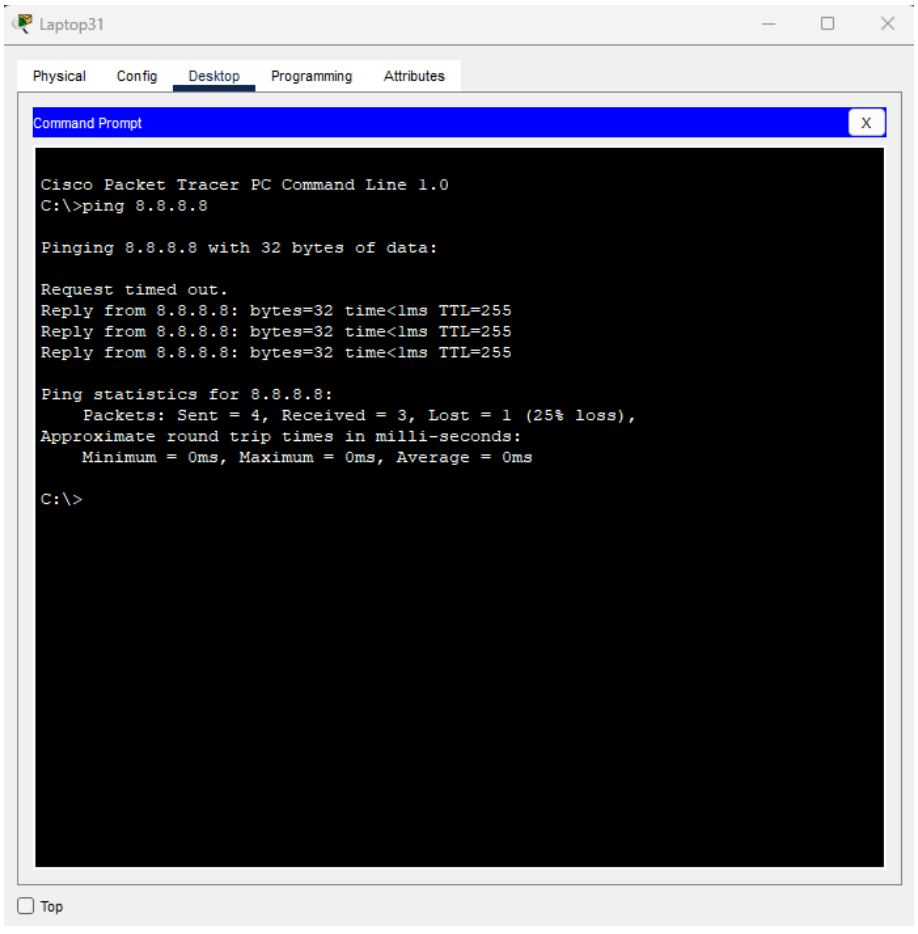
- The computer lab is the largest room compared to the rooms in building A. Therefore, it has room for more devices.

Devices used in the network:

Devices	Quantity
Computers	30
Switch(2960 IOS15)	3
Multilayer Switch(3650-24ps)	1
Projector	1
Printer	5
Wireless Display Gateway	1

Diagram from packet tracer:





-To check the internet connection, I used command prompt to ping to the Google DNS server (8.8.8.8).

-Also the VLANs were pinged to ISP.

Implementation:

Each room had a dedicated access layer switch configured with VLANs that in turn connected to a core multilayer switch with switch virtual interfaces configured. The multilayer switch then connected to an ISP router responsible for routing traffic to the internet.

Bill of materials:

Material	Model	Cost Per Unit	Shipping Cost
Computers	Dell OptiPlex 3000	$789.00 x 30	$232.20
Switch	Cisco Catalyst 3650 Switch	$6,989.21 X 3	-
Multilayer Switch	Cisco Catalyst 2960-X Switch	$3,589.22	-
Projector	Optoma LED Projector ML 1050ST+	$769.95	$211.22
Printer	BROAGE HP Laser-Jet Pro 4001 DW	$369.00 x 5	$190.68
Wireless Display Gateway	Wepresent WICS-2100	$595.00	$168.95
Ethernet Cables	RJ45 Cat-6 Ethernet Patch Cable	$6.29 per 7.6m x 1000	$31.02
Fiber Optics Cable	SFP+ DAC Twinax Cable	$199.99/300m	$86.79
	Total Cost+Shipping		≈ $58,847.65

Purpose of each material

Material	Purpose
Computers	This will provide an interactive interface to the users (students, staffs & instructors) to carry out their tasks. Also helps the users to store information and access the internet.
Switch	A switch allows connection between multiple devices (Computers, Projectors, Printers). Packets are sent and received through multiple devices.
Multilayer Switch	A multilayer switch combines the functions of a traditional switch, router, and other network devices.
Projector	A projector is used to cast the instructor's computer screen to the front of the room for all the students to see.
Printer	Prints and scans important documents; also allows users to print documents from their computers via LAN (Local Area Network) connection.
Wireless Display Gateway	Is a wireless display adapter that allows instructors to mirror their screen to the projectors
Ethernet Cables	Ethernet devices are used to connect devices to the LAN. Supports connection distance up to 100 meters.
Fiber Optics Cable	Allows data transfers in the form of light at a much greater distance (40km-100km) and much faster speeds (up to 10Gbs depending on your connection).

Reason for selection of material:

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Security Details

Security is one of the essential factors of network designing it is a security system that helps to protect the computer and the network system as well as the data in it. It also protects the computers from unauthorized access, different types of security threats and cyber-attacks as well. The firewall manages the ingoing and the outgoing of the traffic to see whether the traffic involves any miscellaneous files. It is extremely important to have a security system for the networking system in order to keep the communication safe and secure**. For security purposes managed Cisco catalyst switches were used which were configured with VLANs for traffic segregation and collision detection and avoidance. Since the ports for the managed switches were in their own collision domains they were no chances of a network loop occurring in the network that would cause disruptions to the business operation.**

Monitoring Details

- Before Network Configuration

Before we setup the network structure, there must be an evaluation carried out so that we have a fair idea of the cost and the requirements. We should plan the network as such that it gives out the best expected results. A site is also required where the network structure will be set up. The layout plan will be made, cabling infrastructure will be added in the network diagram. After completing the network diagram and the costing there will be a proposal made to the organization so that the organization decide if the design will meet the demand and then appropriate tools, hardware, software will be chosen to begin with set up.

- During Network Configuration

Many monitoring is done during the setup. Real-time monitoring procedures will be carried out so that the installation process can be tracked. Simultaneous equipment test is carried out to check whether the equipment are functioning properly and give the best and accurate results such as speed tests. If there is a fault seen there will be fixing done as soon as possible to eliminate the issues. Then there will be security mechanisms added to the network structure as it is one of the essential part of the network configuration system. Security elements such as firewall and intrusion detection system will be added to the system for a safer and secure network system which protects the computer system from hazardous and miscellaneous files. Then elements like IP addresses, serial numbers network setting will be done so that the devices are able to communicate and fully functional.

- After Network Configuration

After completing with the network structure, several tests are carried out to check for errors and to check to see if all the components in the structure functions accurately. Security auditing will be done to act again any risk arousing to damage or affect the network system and the data in it. There will also be expansion slots available for future expansions. Troubleshooting tools will also be used to detect component breakdowns and the connection difficulties. Frequent backup is also done for data safety and one of the major one is the maintenance of the network system so that the system continues to function properly and give its best results.

Drawbacks & Limitations

During the completion of this project, the following limitations were encountered:

1. Due to the use of the simulation tool for designing the network architecture few bugs were noticed during the configuration of the devices whereby certain modules used in the devices were giving errors.
2. The simulation tool did not support some of the modules that were required to connect a fiber optic SFP to the network switches.

Conclusion

In conclusion, this assignment helped me in understanding the basic fundamental of networking and also gave me a fair idea of how it works in a real world scenario. Using notes from the lectures; my own knowledge & help from my peers we were able to successfully complete this assignment.