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An Undergraduate Internship Project Report on Design and Configuration of Structured LAN of Shaheed Monsur Ali Medical College

Anik, Saif Islam

Independent University, Bangladesh

An Undergraduate Internship Project Report
on
Design and Configuration of Structured LAN of Shaheed Monsur Ali Medical College

By

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Autumn, 2022

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Department of Computer Science & Engineering

Independent University, Bangladesh

January 19, 2023

Dissertation submitted in partial fulfillment for the degree of
Bachelor of Science in Computer Science

Department of Computer Science & Engineering
Independent University, Bangladesh

Attestation

This is to authenticate that I, ***Saif Islam Anik*****,** have completed the report titled "***Design and Configuration of Structured LAN of Shaheed Monsur Ali Medical College***" and submitted it in partial fulfillment of the requirement for the Degree of Computer Science and Engineering from Independent University, Bangladesh. It has been completed under the guidance of my university supervisor, ***Mr. Abu Sayed,*** and my company supervisor, ***Md. Mahbub-Ul-Huq Alvi***, the project coordinator at ***Global Informatics Ltd***. This work has not been submitted as a project to this university previously, nor has it been submitted to any other institution. All the sources of information used in this project report have been properly acknowledged.

31/01/2023

Signature Date

Saif Islam Anik

Name

Acknowledgement

First and foremost, I would like to thank Almighty Allah for providing me with the motivation and strength to work hard during my internship as a result of His mercy and grace.

I would like to thank the company's ***CEO,*** sir, for giving me the opportunity to work as an intern for Global Informatics Ltd. (GIL), as well as ***Md. Mahbub-Ul-Huq Alvi,*** sir who is my external supervisor at Global Informatics Ltd. I would also like to thank ***Md. Khalekuzzaman Robiul*** and ***Md. Minhazur Rahman***, who guided me and provided me with proper resources, guidance, advice, and motivation to work hard, for which I am immensely thankful. My internship at GIL allowed me to work with the networking engineers there, who trusted me to work with them on such a large project and initially directed me to how the company deals with other companies and the type of engineering knowledge required in this industry. To create this report and other paperwork for the internship report and elsewhere, I would like to express my gratitude to all of the members of Global Informatics Ltd., who have always advised and helped me with their hands and pens. Furthermore, I must highlight the amazing working atmosphere and dedication of this firm, which have enabled me to deal with a variety of issues.

Last but not least, I would like to thank my parents for their constant support and encouragement.

Saif Islam Anik
31/01/2023
Dhaka, Bangladesh.

Letter of Transmittal

January 31,
2023,
Mr. Abu Sayed
Lecturer
School of Computer Science and Engineering
Independent University Bangladesh

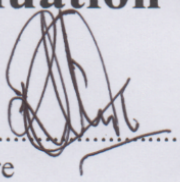
Subject: **Submission of Internship Report**

Dear Sir,
It is with great pleasure that I am presenting the internship report on the project ”Designing and Configuration of Structured LAN” at Global Informatics Ltd. I was involved in this project for the completion of my bachelor's in Computer Science and Engineering degree. I am happy to inform you that I have successfully completed my internship for 12 weeks at Global Informatics Ltd. under the supervision of Md. Mahbub-Ul-Huq Alvi, who is the senior software engineer at Global Informatics Ltd. This internship has given me both academic and practical exposure. The internship has given me the opportunity to develop a network in a corporate environment. I tried to make this report as informative as possible with the experience I gained during my internship period. In order to prepare a well-organized internship report, I followed the guidelines and described the required fields with sufficient details. I, however, sincerely believe that this report will serve the purpose of my internship program.

I am hoping that this report will be interesting, unique, and informative. I also hope that this meets your expectations. I have tried my best to avoid my mistakes and deficiencies and hope that this report will satisfy you. I would like to end by thanking you again for helping me and giving me the chance to submit this report to you.

Sincerely,
Name: **Saif Islam Anik**
ID: 1831003

Evaluation Committee



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Signature

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Name Rubayed Mehedi

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Internal Examiner-1 / Panel Member-1

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Sabrina Alam

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Name

Sabrina Alam

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External Examiner-2 / Panel Member-2

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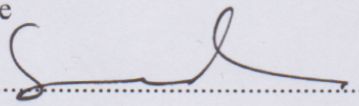

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Name

Md Abu Sayed

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Supervisor of the intern

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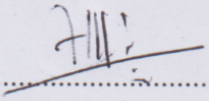
Signature



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Name

Mahady Hasan

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Head, Department of Computer Science & Engineering

Abstract

An internship is characterized as acquiring real-world experience from a wide range of organizations, which facilitates connecting academic theory with practical application. It is significant since it is the first opportunity a student has to gain in-depth practical knowledge from various organizations. I had the chance to work and study with a technical team when I was given the opportunity to do an internship at Global Informatics Ltd. For Shaheed Monsur Ali Medical College, the project's objective is to build LAN networking. This report covers the entire project that I acquired knowledge of throughout my internship.

As an assistant, I worked with the Organizing group. During the starting period of my internship, I was new to the larger part of the materials since I lacked formal skills in Organizing commerce. Global Informatics Ltd. has given me the chance to develop professionally and uncovered me to the arranged setup procedure, which I might utilize in the future. Before beginning the projects, I had to finish my learning sessions, and for this particular session, I had to learn about the product's functionality, networking topologies, and wire administration.

I've detailed my three-month internship experience and my work with Global Informatics Ltd. in my report. I've included every action I did that helped me reach my goals. I've noted every skill I've developed over this time. I went into great detail about my responsibilities, my collaboration with the technical team, and how I handled the task that was assigned to me. I contributed to the project's design and configuration.

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Chapter 1

Introduction

1.1 Overview/Background of the work

In this digital age, computer LAN Networks are essential. Once we dream that a machine like a computer might one day replace our struggle to hard work and perform the same tasks we do, faster. In the same way, we never imagined that our data would be transferred securely through a network over a million miles distance in a few seconds via computer.

A network is a collection of two or more connected electronic devices or computers for resource sharing and data exchange. Because data are the most important and valuable things, and now a day's, people are so hungry in terms of gathering information and communication. Through computer networking, employees can exchange ideas and work more effectively. The company's revenue and the workforce's productivity rise as a result. More importantly, computer networking improves how companies offer the rest of the world.

My project is to design and configure an organizational Structured Wired LAN Network: A local area network (LAN) is a collection of computers and related peripherals that connect remotely or over a wired network to a server located within a specific geographical region. A local area network can handle two or three users working from home or thousands of users in the corporate headquarters. LANs are set up by homeowners and information technology (IT) managers so that network nodes can communicate with one another and share resources like printers or network storage.
Local area networks connect computers and give users shared access to printers, data, and other resources. The two main types of local area network architecture are peer-to-peer and client-server architectures. Multiple client devices are linked to a central server on a client-server local area network, which controls network traffic, device access, file storage, application access, and device management.

Md. Khalekuzzaman Robiul and Md. Minhazur Rahman, the networking engineer of Global Informatics Ltd, is accommodating in this program and gives me daily work assignments. As part of this internship program, I'm learning to manage a project professionally. During this period, I'll also learn about LAN and its design, Rj45 color-coding cabling, UTP cable features, maintenance, reporting, and other things.

1.2 Objectives

The main goals of this report are to fulfill the requirements of the BSc Internship program and to present the knowledge and information that has been achieved during the internship period under the Organization.
LAN networking transfers all of an organization's data from one user to another. It allows us to share, store, and collect valuable data from enterprises while connecting users inside and between branches. The LAN Network is essential for securing an organization's whole system and can be utilized for business purposes. We use Cisco and Rosenberger products for all of our infrastructure. Regarding this project, there are some objectives given below:

- The primary objective of this project is to build a Structured LAN networking that should be reliable, upgradeable, and user-friendly.
- The secondary objective is that the cost of building a secured LAN networking should be reasonable (60-80 lac Taka).
- The final objective is to complete the project within three months.

1.3 Scopes

The possibilities after the complete construction of the LAN Networking are given below:

- Transfer any secure information or resources from one branch to the head office using Structured LAN Networking.
- Secure the network by applying switch port security, MAC address binding, and Encrypted password.
- The network structure of Shaheed Monsur Ali Medical College for efficient connectivity and load Balancing.

Chapter 2

Literature Review

2.1 Relationship with Undergraduate Studies

I was able to participate there and collaborate on this project at Global Informatics Ltd. thanks to the skills and information I learned while taking classes at Independent University, Bangladesh (IUB).
The following are the courses that I found helpful:

CSE-406: *Cryptography and Network Security*.

This course introduces the principles and practice of cryptography and its use in network security. Topics include the nature and types of security attacks; key-based cryptography, symmetric and asymmetric keys; cryptanalysis; Feistel cipher structure; conventional encryption algorithms, DES and triple DES; the critical distribution problem; Asymmetric cryptography: public key cryptography, message authentication, hash function, RSA and Diffie-Hellman algorithms, a model for network security, digital signature, a digital certificate, and quantum cryptography. Prospective students should have a background in computer networks.

CSE 316: *Data Communication and Networking*.

It thoroughly examines computer networks and the underlying data communication protocols. Topics covered are network categories and topologies, the OSI model and TCP/IP protocol suite, TCP/IP applications, FTP, SMTP, HTTP, and WWW, transport layer protocols, link layer protocols, internetworking devices, repeaters, bridges, and routers, routing algorithms, IP addressing, subnetting, domain name systems, network programming, LAN types and technology, MAC protocols, high-speed LANs and Gigabit Ethernet, Wireless LANs, MAN, circuit switching, switching, and packet switching, ISDN, Frame Relay, and ATM, SONET/SDH, spectrum and bandwidth, digital transmission, encoding, modulations.

CSE 400: *Data Communication*.

This course teaches the design, implementation, and management techniques essential for robust engineering networks. Topics include networking principles, data representation, encoding/decoding and analysis, data transmission channels and their characteristics, baseband and broadband transmission, transmission media and networks, modulation techniques, modems, interfaces, multiplexing, error handling, and switching techniques. An introduction to advanced communication techniques and the internet is also provided.

2.2 Related Work

A type of cable called a structured cabling system that is connected to hardware helps in providing a thorough telecommunications infrastructure. It can be used for a variety of purposes, including phone service, printing, document sharing, and data transmission across a computer network.
There are several LAN networking-related projects currently on the market, and they are all somewhat comparable to my idea, with a high proportion of similarities. A few LAN projects are listed below.

- **Bangladesh Atomic Energy Commission (BAEC) :** Using the most recent technology, a secure network and system design in a Linux and Windows environment. They also did the Design, planning & deployment of LAN at BAEC Head Quarter. They Configured the router , server and operating system.

- **Structured Network Design and Implementation for a Small Office HomeOffice:** In this project, the processes (or phases) of a structured network architecture were provided, and a real-world case study was used to show how the processes may be practically implemented. WireShark protocol analyzer and Cisco Packet Tracer software were first used to model the concept.

- **Simulation of Local Area Network:** This project explains how to create a simulation model of the Lan using the Cicsco Packet Tracer tool. The project offers insight into a number of concepts, including IP address configuration, topology design, and how to transfer information in packet form within a single network. as well as the utilization of Virtual Area Networks (VLANs) to divide the traffic produced by the various departments.

- **Simulation of the Local Area Network Design for Use in the Department of Civil and Electrical/Electronics Engineering, University of Agriculture, Makurdi Using the OSPF Routing Protocol :** This project uses the Cisco Packet Tracer to create an open shortest path first (OSPF) local area network (LAN) for the department of electrical and electronic engineering. In order to reduce isolated users and workgroups, the project's goal is to enable systems and devices to communicate with one another and should be able to provide the desired information. Physical systems and devices should also be able to maintain and provide satisfactory performance, reliability and security, and resource sharing. These networks must be routed to one another in order for these devices to communicate over them. To check whether the devices can communicate, the LAN will be tested using a ping message command after routing is complete.

Chapter 3

Project Management & Financing

3.1 Work Breakdown Structure

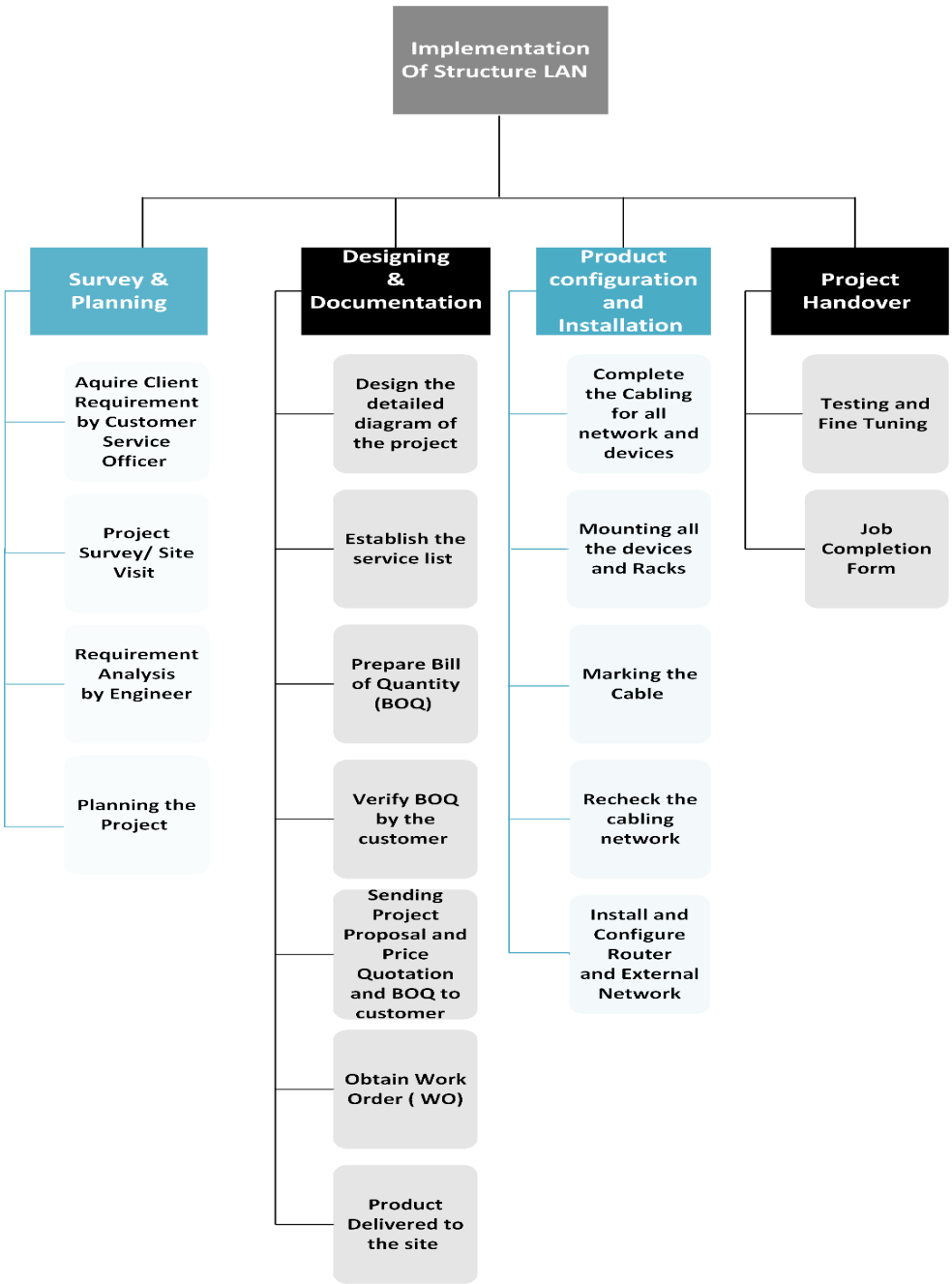


Figure 3.1: WBS of LAN Networking for Shaheed Monsur Ali Medical College

3.2 Process-Wise Time Distribution

Table 3.2: Process-Wise Time Distribution of LAN networking for Shaheed Monsur Ali Medical College

Task Name	Duration	Start Date	End Date	Work
Survey & Planning	**10 days**	**September - September**		**10%**
Acquire Client Requirement by Customer Service Officer	01 day	September 15, 2022	September 15, 2022	
Project Survey/ Site Visit	01 day	September 17, 2022	September 17, 2022	
Requirement Analysis by Engineer	02 days	September 18, 2022	September 19, 2022	
Planning the Project	06 days	September 18, 2022	September 24, 2022	
Designing & Documentation	**13 days**	**September - October**		**20%**
Design the detailed diagram of the project	04 days	September 25, 2022	September 29, 2022	
Establish the service list	01 day	September 29, 2022	September 29, 2022	
Prepare Bill of Quantity(BOQ)	01 day	October 1, 2022	October 1, 2022	
Verify BOQ by the customer	01 day	October 2, 2022	October 2, 2022	
Sending Project Proposal and Price Quotation and BOQ to customer	01 day	October 3, 2022	October 3, 2022	
Obtain Work Order (WO)	01 day	October 4 2022	October 4, 2022	
Product Delivered to the site	04 days	October 5, 2022	October 9, 2022	
Product configuration and Installation	**56 days**	**October - December**		**60%**
Complete the Cabling for all network and devices	30 days	October 10, 2022	November 13, 2022	
Mounting all the devices and Racks	10 days	November 14, 2022	November 24, 2022	
Marking the Cable	03 days	November 26, 2022	November 28, 2022	
Recheck the cabling network	02 days	November 29, 2022	November 30, 2022	
Install and Configure Router and External Network	10 days	December 03, 2022	December 13, 2022	
Project Handover	**05 days**	**December - December**		**10%**
Testing and Fine Tuning	04 days	December 14, 2022	December 18, 2022	
Job Completion Form	01 day	December 20, 2022	December 20, 2022	

3.3 Gantt Chart

A Gantt chart is a visual assist for planning, controlling, and keeping track of particular activities and visualizing multiple tasks and projects that occur sequentially within an organization and how far they have gone. It consists of a task list with progress bars for each activity.
The project timeline is shown by horizontal bars of varying lengths, including task durations, start and end dates, and task sequences. They are used by management to plan and schedule such projects so that resources can be allocated optimally and that prioritized projects can finish before less important ones begin.
Gantt charts are used in heavy industries for projects like dams, bridges, and highways, as well as software development and building out of other goods and services.

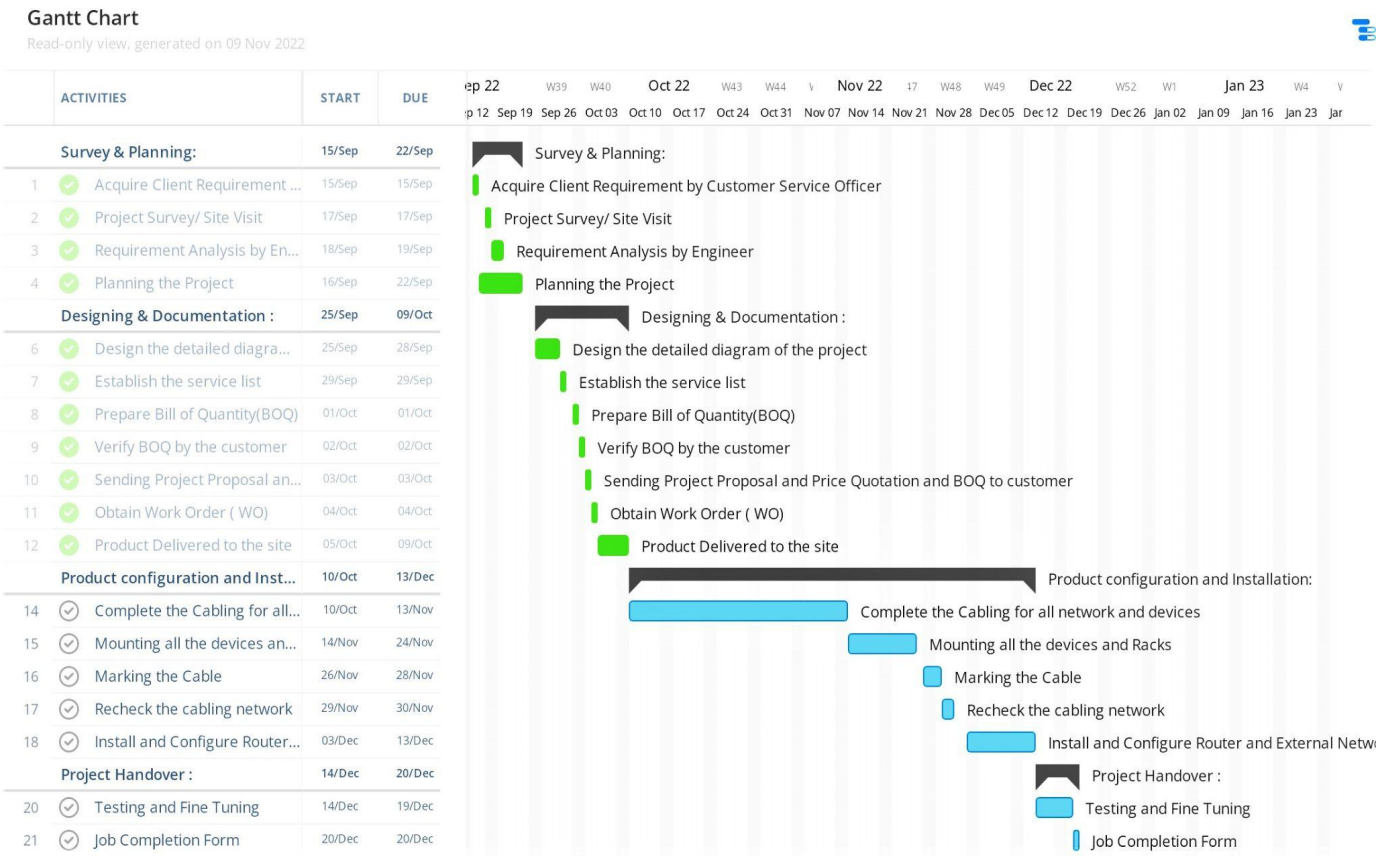


Figure 3.3: Gantt Chart of LAN Networking for Shaheed Monsur Ali Medical College

3.4 Process/Activity Wise Resource Allocation

Survey and Planning: The first goal is to persuade the customer to use our services and request a site visit to proceed with the following steps. After the customers' confirmation to visit the site, the IT member or engineer visits for a survey and acquires the exact requirements of the customer and the scope of the work in different sectors. After the survey, the engineer starts to plan how to execute the project.

Design and Documentation: The second goal is to design the architectural diagram of the LAN structure project and list the required products, product pricing, and service list documentation to be presented at the official board meeting. Then a Bill of Quantities (BOQ), a price quotation, and the architectural diagram are sent via email to the customer for approval. And after approval from the customer, we receive a work order. And the products are prepared to be delivered to the site.

Product Configuration and Installation: The third goal is to complete the cabling for the structured LAN network and for the devices to work correctly. This is the most essential part of the project, and any malfunction can severely impact the project and the reputation of the company. The next step is to mount all the network devices and the switch racks. After mounting, labeling the cable is essential so that engineers can sort out cable problems quickly if any arise. The last and most crucial part is configuring all the devices (for example, the switch and router).

Project Handover: The final goal is to hand over the project to the customer after it has been fine-tuned and to receive the job completion form.

3.5 Estimated Costing

Table 3.5: Product list and Costing of LAN Networking for Shaheed Monsur Ali Medical College Company

S/N	Component Name	Model	Quantity	Unit Price (TK)	Unit	Total Price (TK)
1	**Fiber Optics**	**Rosenberger**	170	220	Box	37,400
2	**UTP Cable** Cat-6 (1*305 m), blue.	**Rosenberger**	60	16,500	Box	990,000
3	**24-port Patch Panel** cat6 24 port with Modular	**Rosenberger**	7	9,500	Nos	76,000
4	**Wire manager** 1U Wire Manager.	**Rosenberger**	7	2,500	Nos	20,000
4	**Face Plate** faceplate (single port and a shutter)	**Rosenberger**	160	200	Nos	32,000
5	**Connector** Cat-6. 20pcs in one packet	**Micronet**	3	800	Box	2400
6	**Modular** Rj-45 Modular, Cat-6	**Rosenberger**	160	350	Nos	56,000

7	**Patch Cord** 5M LC-LC Fiber Patch Cord	**Rosenberger**	160	150	Nos	24,000
8	**Network Cabinet** 15U Wall Mount network cabinet with PDU 600mm x 600mm	**Toten**	7	13,500	Nos	94,500
9	**Router** 24 Ports Router	**Edge-Core**	6	75,000	Nos	450,000
10	**Core Switch** Cisco 24-Port Gigabit PoE+ SFP Managed Switch	**Cisco**	3	65,000	Nos	195,000
11	**Distribution Switch** 24-Port Gigabit SFP with 4-Port shared copper and 4-Port 10G SFP Enterprise L2 Managed	**Cisco**	4	65,000	Nos	260,000
12	**SFP Module** 1.25G Single-mode SFP Transceiver	**N/A**	6	1500	Pair	9000
14	**TJ Box** Box 8 (indoor) terminal junction	**N/A**	20	110	Nos	2200
15	**Local Accessories** PVC Pipe, Channel, Flexible Pipe, Royal Plug, Screw, Jointer, Clamp	**N/A**	N/A	50,000 (Approx.)	Lot	50,000 (Approx.)
16	**Server** Dell PowerEdge T140 16GB Intel Xeon E-2224 Tower Server	**Dell**	12	210,000	Nos	252,000
17	**Access Control**	**N/A**	1	18,000	Nos	18,000
18	**Access Point** U6-LR Wi-Fi 6 Long Range Access Point	**Ubiquiti**	7	27,500	Nos	192,500
19	**User- PC** C3105i Intel 8GB DDR4 RAM 18.5 in Monitor	**Ryans**	70	43,700		3,059,000
20	**User- Printer** Ricoh m2700	**Ricoh**	3	122,000	Nos	366,000
21	**UPS** 2kVA 72V Standard Backup Online UPS	**MaxGreen**	7	28,600	Nos	200,200
22	**Media Converter** Fiber Optic Media Converter Chassis 14 Slots Rack Mount	**N/A**	7	4,000	Nos	28,000
Total						**6,414,200**

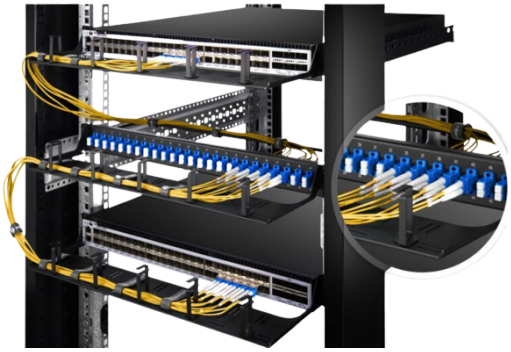
3.6 Implementation Devices

Lan Cabling Key Products:

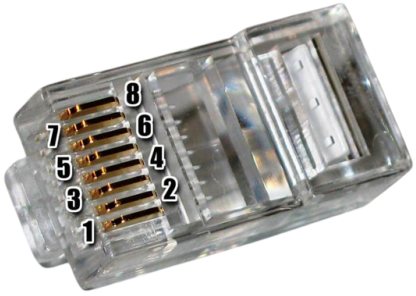
- **Unshielded Twisted Pair (UTP):** Unshielded Twisted Pair cable is known as UTP. A 100-ohm copper cable called UTP is made up of 2 to 1800 unshielded twisted pairs that are encased in an outer jacket. They don't have a metal shield. As a result, the wire has a small diameter yet is not shielded from electrical interference. The twist increases its resistance to EMI and electrical noise.

- **Single-Mode Fiber Optic Cable:** Only one mode of light can pass through the small diameter core of a single-mode fiber optic line. And this resulted in fewer light reflections as the light traveled through the body, which decreased attenuation and allowed the signal to go farther.

- **Patch Panel:** A patch panel is a collection of circuits that are connected to jacks and are typical of the same or similar type. They are used for convenient, flexible monitoring, linking, and testing of circuits.



- **Rj-45 Connector:** A modular connector that is frequently used to terminate twisted pair and multi-conductor flat wire is the eight position eight contacts (8P8C) connector.



- **Module And Network Wall Face Plate:** A wall plate, face plate, surface-mount box, or patch panel can be equipped with various low-voltage electrical jacks or optical connectors using modules, which are standardized snap-in packages.

- **Rack:** A computer rack, often known as a rack, is a metal frame used to carry different hardware components, including servers, hard drives, modems, and other electronic devices. All of the network equipment is housed in it.

- **Network Switch:** A computer rack, often known as a rack, is a metal frame that is used to carry different hardware components, including servers, hard drives, modems, and other electronic devices. All of the network equipment are housed in it.

- **Patch Cord:** An electrical or optical cable known as a patch cable, patch cord, or patch lead is used to join (or "patch-in") one electronic or optical device to another for signal routing.

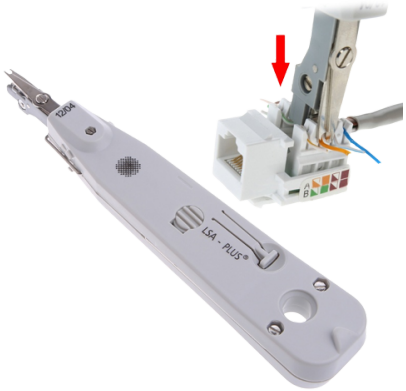
Lan Cabling Implementation Tools:

- **Cable LAN Tester:** A cable A network cable's connection is tested with a LAN tester. Confirm that both ends of the line have all 8 necessary pins.

- **Cable Stripper:** A compact, portable tool called a wire stripper is used to remove the electrical insulation from electric lines.

- **Crimping Tool:** Using a crimping tool, you may secure a connector to the end of a cable**.**

- **Punch-Down Tool:** The cable is inserted into insulation-displacement connectors on punch-down blocks, patch panels, keystone modules, and surface mount boxes using a punch-down tool, a network implementation tool.



- **Set of Screwdrivers:** A screwdriver is a hand-held or electric tool used for driving or removing screws. A standard simple screwdriver consists of a handle, a shaft, and a tip that is used to turn the screw's head.

Chapter 4

Methodology

The Prepare, Plan, Design, Implement, Operate, and Optimize (**PPDIOO**) methodology from Cisco is the foundation for the network design methodology described in this section. This methodology mirrors the lifespan of a network. The PPDIOO phases, their relationship to the network design methodology, and the advantages of the lifecycle approach to network design are discussed in the following sections. The design technique is thoroughly explained in the following parts.

1. Prepare phase: In the Prepare phase, organizational (business) requirements are established, a network strategy is created, a high-level conceptual architecture is proposed, and technologies that can best support the architecture are identified. Evaluating the business case for the suggested design makes it possible to build financial support for the network strategy.

2. Plan phase: During this stage, the network needs must be determined based on the network's objectives, the location where it will be deployed, the users of which network services, etc. In the planning phase, evaluating the locations where a new network will be installed and any current networks is also necessary. A gap analysis is conducted to see if the current system infrastructure, locations, and operating environment can support the proposed system. The tasks, responsibilities, important deadlines, and resources needed to accomplish the network improvements are managed with a project plan. The scope, cost, and resource characteristics specified in the first business requirements should be reflected in the project plan. This stage results in a list of network specifications.

3. Design phase: The network design specialist's activities are guided by the first requirements established in the planning phase. When updating an existing network, these specialists design the network following those initial specifications, taking into account any extra information learned from network analysis and network audit, as well as discussions with managers and network users. The resulting network design definition includes specifications for availability, reliability, security, scalability, and performance, in addition to meeting existing business and technological requirements. The implementation activities are built on the foundation of this design specification.

4. Implement phase: Once the design has been accepted, implementation and verification can start. The objective of device integration is to integrate devices without destabilizing the current network or introducing weak points, so the network and any extra components are established following the design criteria.

5. Operate phase: The effectiveness of the design is ultimately evaluated during operation. In the Operate phase, network health is maintained through routine tasks, such as maintaining high availability and cutting costs. Initial data for the Optimize phase of the network lifecycle is provided by fault detection, fault correction, and performance monitoring throughout everyday operations.

6. Optimize phase: The Optimize phase's proactive network management approach aims to find and fix issues before they become serious and impact the organization. When proactive management cannot anticipate and mitigate failures, Reactive fault detection and repair (troubleshooting) are required.

Chapter 5

Body of the Project

For readers who wish to know in-depth and in detail what's been done, how it was performed, what the consequences were, and what recommendations and findings may be drawn, the project's body in the report is a complete discussion of the work.

5.1 Work Description

After joining Global Informatics Ltd. as a networking intern, I was assigned a project to design and configure the structured LAN. This project is based on the networking system of Shaheed Monsur Ali Medical College. The user and components on this designed network are connected physically, using Intranet and Ethernet cable, and virtually, using Access Points and Routers. This study of the project is crucial for understanding the network system, which includes network devices, physical and wireless communication, routing protocols, network monitoring tools, network security tools, and more for networking-related enterprises. The designing and configuration part of this project is done with Microsoft Visio and Cisco Packet Tracer.

5.2 Requirement Analysis

Rich Picture

A rich image is a graph frame used in a project's early stages. This allows us to see what happens within the framework. This allows the group to develop a shared vision for building the framework. The following is a detailed image of the Information Center Screen Framework:

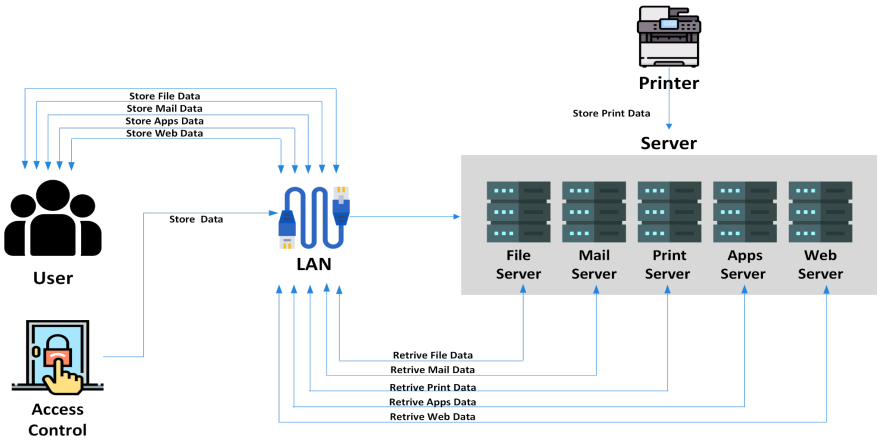


Figure 5.2: Rich Picture of LAN Networking for Shaheed Monsur Ali Medical College

Functional and Non-Functional Requirements

The process of identifying user expectations for a new or modified product is called requirements analysis, sometimes known as requirements engineering. These characteristics, known as needs, must be quantitative, relevant, and comprehensive. Such criteria are commonly referred to as functional specifications in software engineering. The study of requirements is a crucial part of project management.

Requirements analysis includes frequent communication with system users to determine specific feature expectations, resolving conflict or uncertainty in requirements as demanded by various users or groups of users, avoiding feature creep, and documenting all aspects of the project development process from beginning to end. Rather than attempting to modify customer expectations to match the criteria, energy should be focused on ensuring that the finished system or product fits client needs.

Requirements analysis is a collaborative process that needs knowledge of hardware, software, and human factors engineering, as well as interpersonal skills.

Functional Requirement:

- Physical Secure Premises (Access Control)
- Stable network infrastructure servers
- Secure network components (firewalls, routers, switches)
- Secure local communication (authentication, encryption)
- All the users and departments must be able to access the storage server.

Non-Functional Requirement:

- This network topology must be scalable for future growth.
- The Project team needs around 6/7 days to hand over the project after mounting and configuration.
- The location of the project must be suitable for building the network.

5.3 System Analysis

Systems analysis analyzes, models, and examines an information system to enable logical decisions. It involves gathering and analyzing data, determining issues, and breaking complex scenarios into their component elements. A system analysis is carried out to look at a system or specific features and define its objectives.
It is a method of problem-solving that enhances the system and ensures that every part of it operates effectively to achieve its goals.

5.3.1 Six Element Analysis

Table 5.3.1: Six Element Analysis of LAN Networking for Shaheed Monsur Ali Medical College

Process	Task					
	Human	**Hardware (Non-Computing)**	**Hardware (Computing)**	**Software**	**Database**	**Network and Communication**
Survey	**1. Engineer:** Surveying the project specifications from the project site. **2. Intern:** Interns are also been involved in the Surveying phase	**1. Pen & Paper** Pen & paper were needed by the engineer for taking notes about the project requirements	**1. Laptop / PC** Laptop/Pc needs for Documentation and a softcopy of information is kept for listing the Products required	**1. Ms Word,** Microsoft Word is used to prepare the documentation Of the products required	**None**	**Internet** The Internet also uses to email the products required to client and office.
Planning and Designing	**1. Engineer:** Planning the Client requirements for Designing work process **2. Intern:** Interns are also been involved in the Planning and designing phase	**1. Pen & Paper** Pen & paper were needed by the engineer for taking notes about the project requirements	**1. Laptop / PC** Laptop/Pc needs Documentation and a softcopy of information is kept for the preparation of quotation **2. Printer** Uses for a hardcopy of the quotation	**1. Ms Word,** This Microsoft Word is used to prepare the documentation and quotation of project **2. Ms Visio** This Microsoft Word is used to prepare the design of the Network	**None**	**Internet:** Wi-fi connected printed uses the internet to receive printing information from the laptop/PC. The Internet also uses to email the client the design.
Installation	**1. Engineer:** Install the required products for the LAN network.	**1. Pen & Paper** Pen & paper were needed by the engineer for taking notes of the installation	**1. Laptop / PC** Laptop/Pc needs for Documentation of the products used.	**1. Ms word** Uses for keeping the records of the products used	**None**	**None**

		process and marking the cable. **2.Implement ation Tools** The implementatio n tools are needed to set up the LAN Network.				
Configurati on	**1. Engineer:** Configuring the Switches and Routers. **2. Intern:** Interns are also been involved in Configuration phase	**1. Pen & Paper** Pen & paper were needed for keeping notes of the configuration code.	**1. Laptop / PC** Laptops were needed for configuring the switch and Router.	**1. Cisco** Cisco is used for configuring the Switch and Router.	**None**	**None**
Network testing	**1. Engineer:** Engineer test the LAN Network for ensuring the project working well.	**1.Pen & Paper** Pen & Paper Were used for keeping the notes of the problems occurred due to error in the configuration	**1. Fluke tester** Used to troubleshooting cable, all while maintaining a higher grade of accuracy **2. Cable tester** Used to verify that all of the intended connections exist. **3.Laptop / PC** Laptop were needed for testing the LAN Network	**1. Cisco** **2. Fluke tester** **3. Cable tester**	**None**	**Internet:** Internet connecting are required for testing the Networking
Maintenanc e	**1. Engineer:** After the project done Maintenanace of the Network is done by engineer	**1.Pen & Paper** Pen & paper were need by the engineer for taking notes for maintenance	**1.Laptop / PC** Laptop were needed the maintence	**1. Fluke tester** **2. Cable tester**	**None**	**Internet:** Internet connecting are required for maintaining the Networking.

5.3.2 Feasibility Analysis

A network feasibility study evaluates a network project in order to determine the expected capital and operating costs as well as the effects of these costs on the project's ability to generate revenue. For a communications service provider to decide whether a LAN Networking project will be successful or not, feasibility studies are essential. If we want to start a new project, we should do it first. It is a crucial aspect in assessing if the project can and should proceed forward, if not the most crucial one.

Technical Feasibility:

To create the project, technical feasibility is the first step. Before evaluating technical feasibility, we should first analyze if the necessary hardware can sufficiently store the company's critical data. This technical feasibility analysis is carried out to check the technical requirements of the network, including hardware and software. This analysis is done to determine whether managing these technical devices will be effective and successful during the network construction phase. My project's most important networking hardware are Switches, Routers, Servers, Cables, etc. The functionality of these goods will decide the strength of my LAN networking project. The switch, router, servers, and cables, in particular are four pieces of my project's hardware of exceptional grade. Therefore, this project is technically possible.

Operational Feasibility:

Only if the project's requirements are met, and the operation is successful and maintained once the Structured LAN Networking is completed will the project be judged successful in the Operational Feasibility sector. The operational feasibility of equipment determines whether it will perform successfully when designed and depends on human resources. The new structure and network design are expected to meet the expectations of the business while also meeting operational constraints. The project was successful because the design and construction were successful, and high-speed internet connectivity was established, making the work more productive.

Economical Feasibility:

The economic viability of a project is an essential component since it provides various details about the project, such as the site required, the tools and supplies needed, the building materials, and the workforce necessary for production.

This analysis looks at the project's cost and benefits. This sector is responsible for the expenses connected with surveying, building, and configuration. The data were examined to determine whether or not the project would be economically viable. Because this was such a massive project, the budget talks with LAN Networking were carefully managed while keeping the company's sales and profits in mind, confirming the projects were financially sustainable.

Scheduling Feasibility:

This study looked at the project's timeline to guarantee that it was completed on time. The project will be an accomplishment if the deadline is met. Our crew constructed the network far ahead of schedule, despite the project's stated completion deadline of three months.

5.3.3 Problem Solution Analysis

This section outlines the challenges identified, investigated, and, ultimately, a solution created to address those problems. The following issues have been identified:

- **Communication:** It took a lot of work to find the head engineer available. He was also working on another project correspondingly. As a result, it wasn't easy to always contact the head engineer to plan and design the project.
  Solution: We had to sit with the engineer for problem-solving sessions ⅔ times a week. And contact him all the time over the phone and through emails.

- **Technology:** The need for more networking devices on the market was a significant difficulty during the project's implementation. We have to push back our timeline even further due to this issue. Industrial goods are expensive and challenging to install, configure and maintain. The solution is also costly.
  Solution: If products are not or costs increase, we must look for alternative devices.

- **Poor Internet:** Workplaces may need a strong internet connection to complete tasks quickly. Therefore, we must make sure that the required web speeds provide.
  Solution: We have to look for an ISP provider to provide the right internet speed or not. Users will experience a significantly smoother and faster working experience because of the office's fibers association, which features a 100 Mbps web transfer speed.

- **Codes not easily editable:** Configuration codes are not easily editable. If any mistakes happen, we must edit it from two to three steps behind.
  Solution: So we have to type the configuration code more carefully.

5.3.4 Effect and Constraints Analysis

Effects:

- **Implementation Cost:** Although LAN dramatically reduces costs by sharing resources, the initial cost of establishing the network is vast. This is mainly because creating a server requires specialized software. Additionally, obtaining hardware tools like routers, hubs, switches, and cables is necessary for the initial setup. As the importers cannot import products, the pricing

- **Location:** Location is a problematic type of issue since it might present limitations that have a direct effect on the design. LAN is typically designed to cover a short distance (up to 10km). It is most likely used in tiny places such as businesses, banks, and schools. This is because its cabling system can only be stretched so far.

- **Infrastructure equipment:** If a company does not intend to update existing devices, it may limit the design, mainly if new additions of hardware or protocols are not supported to optimize the design.

Constraints:

- The project's primary constraint was collecting information because most of it was classified and confidential. Global Informatics Ltd cannot publish any report-related information to maintain corporate privacy. As a result, gathering the original data for this report took a lot of work.
- Furthermore, employees from various departments needed to familiarize themselves with the overall charging and billing process, making information collecting more challenging.

5.4 System Design

The process of defining a system's components, including modules, architecture, features, interfaces, and data, based on the specified requirements is known as systems design. A business or organization's unique goals and needs are satisfied by identifying, developing, and creating systems.

5.4.1 Network Diagram- Structured LAN

A network diagram is a picture that shows how a computer or communications network is organized. It demonstrates the routers, devices, hubs, firewalls, and other network building blocks as well as how they interact. A local area network (LAN) is represented in this network diagram:

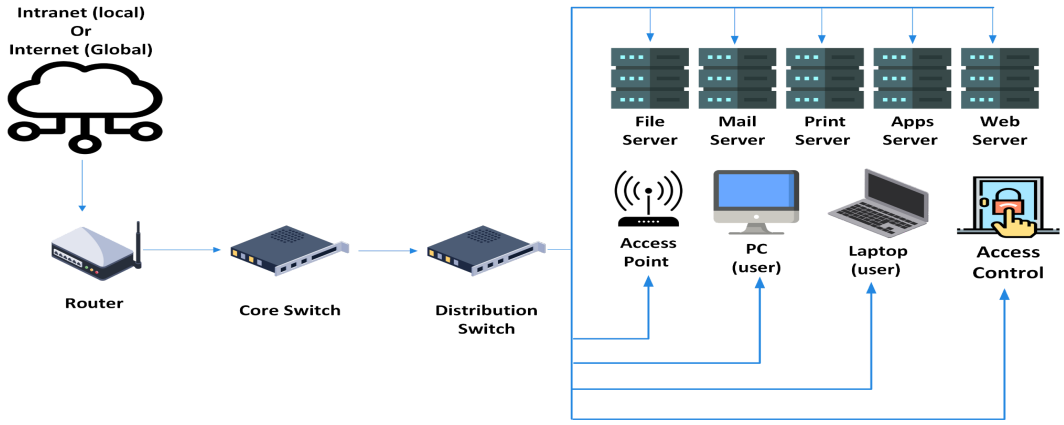


Figure 5.4.1: Network Diagram of LAN Networking for Shaheed Monsur Ali Medical College

5.4.2 Activity Diagram- Structured LAN

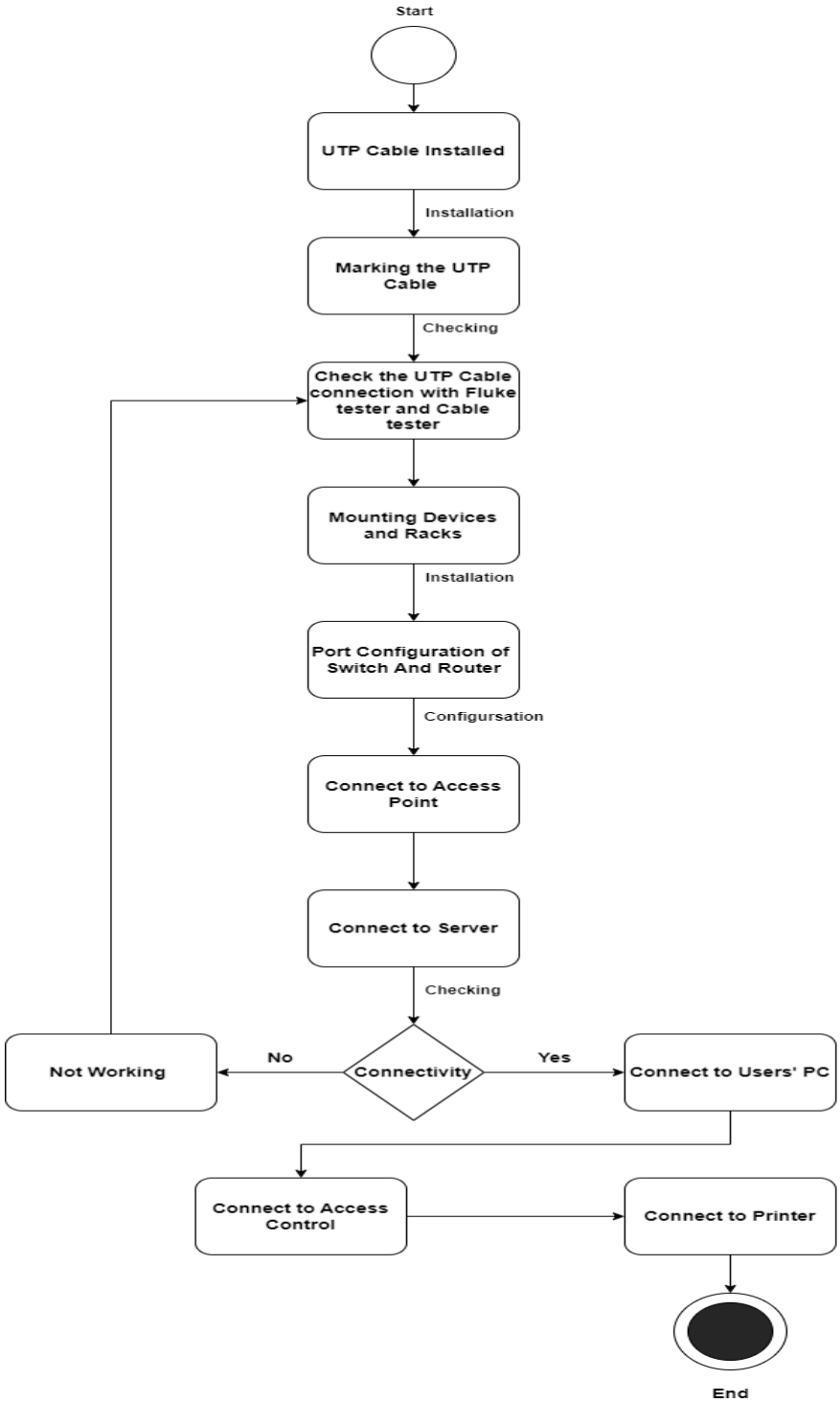
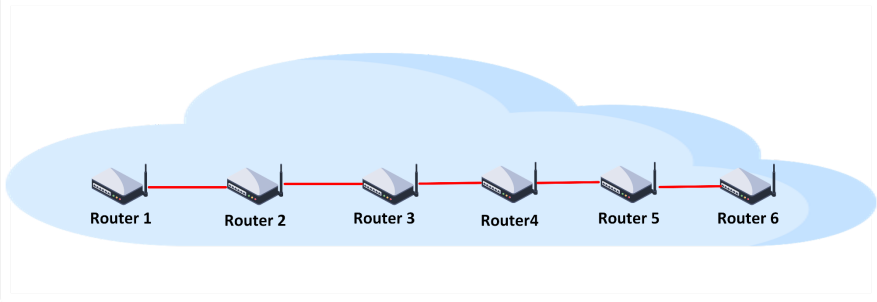


Figure 5.4.1: Activity Diagram of LAN Networking for Shaheed Monsur Ali Medical College

5.4.3 Architectural Diagram - Structured LAN

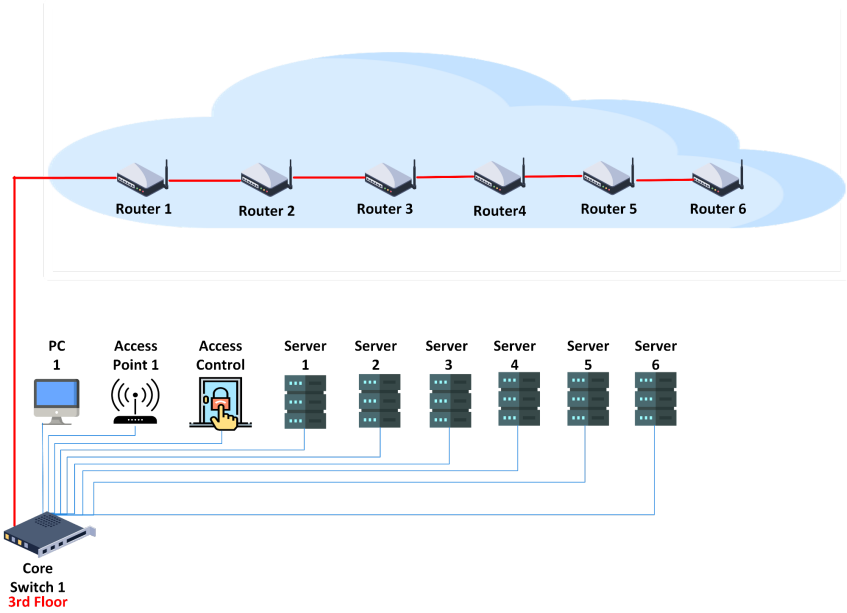
Part- 1 Routers Connection

These are the 23 Ports Router, they all are connected with Fiber optics cables. Router 1 is for head office router and router 2, router 3 and router 4 are backups of the router 1. Router 5 is for Branch 2 and Router 6 is for Branch 1 and they don't have any backup routers. The red wire is the fiber optical cable that are connecting the routers.



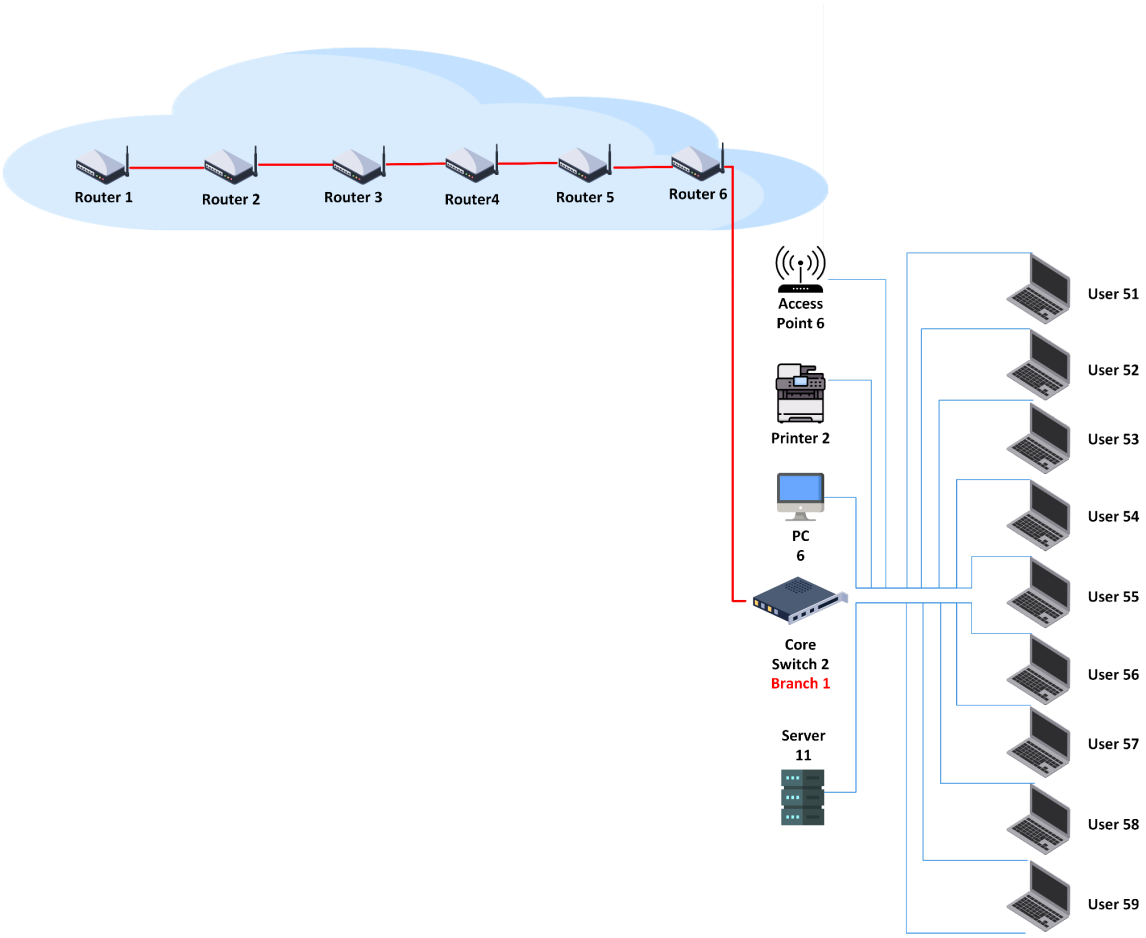
Part- 2 Routers to Headoffice Switch

Router 1 is connected to the Core Switch 1 with fiber optical cable. The red cable is the fiber optical cable, through which the internet flows to switch and the components. The blue cables that connecting the switch with the components is UTP cable. Here 6 servers is used to store the whole networks' data and files. There is a an Access Control system to restrict the unauthorise people entry.



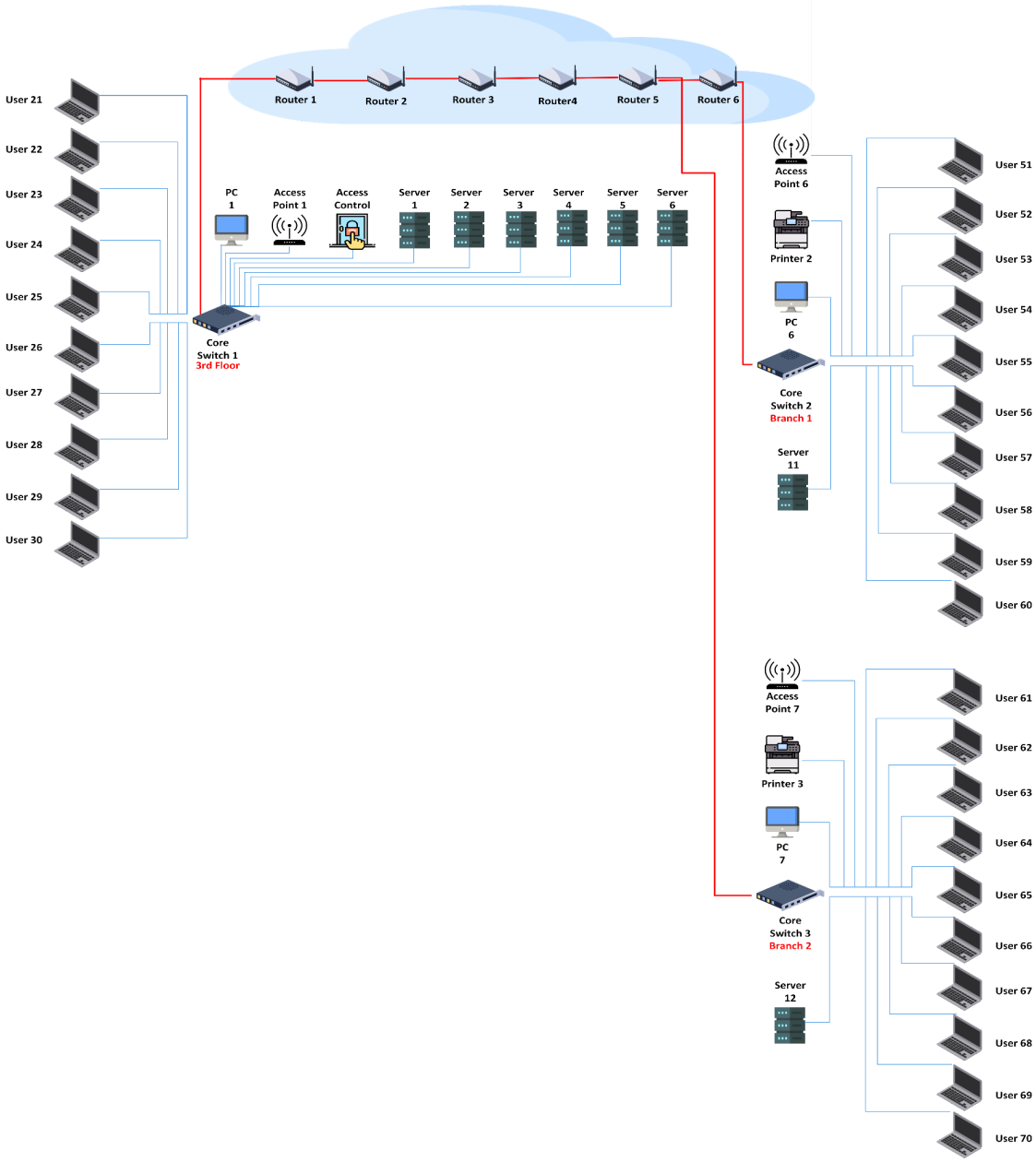
Part- 3 Router to Branch Office Switch

Router 6 is connected to the Core Switch 2 with fiber optical cable. The red cable is the fiber optical cable, through which the internet flows to switch and the components. The blue cables that connecting the switch with the components is UTP cable. Additionally there are printer and an access point to increase the wifi recheability.



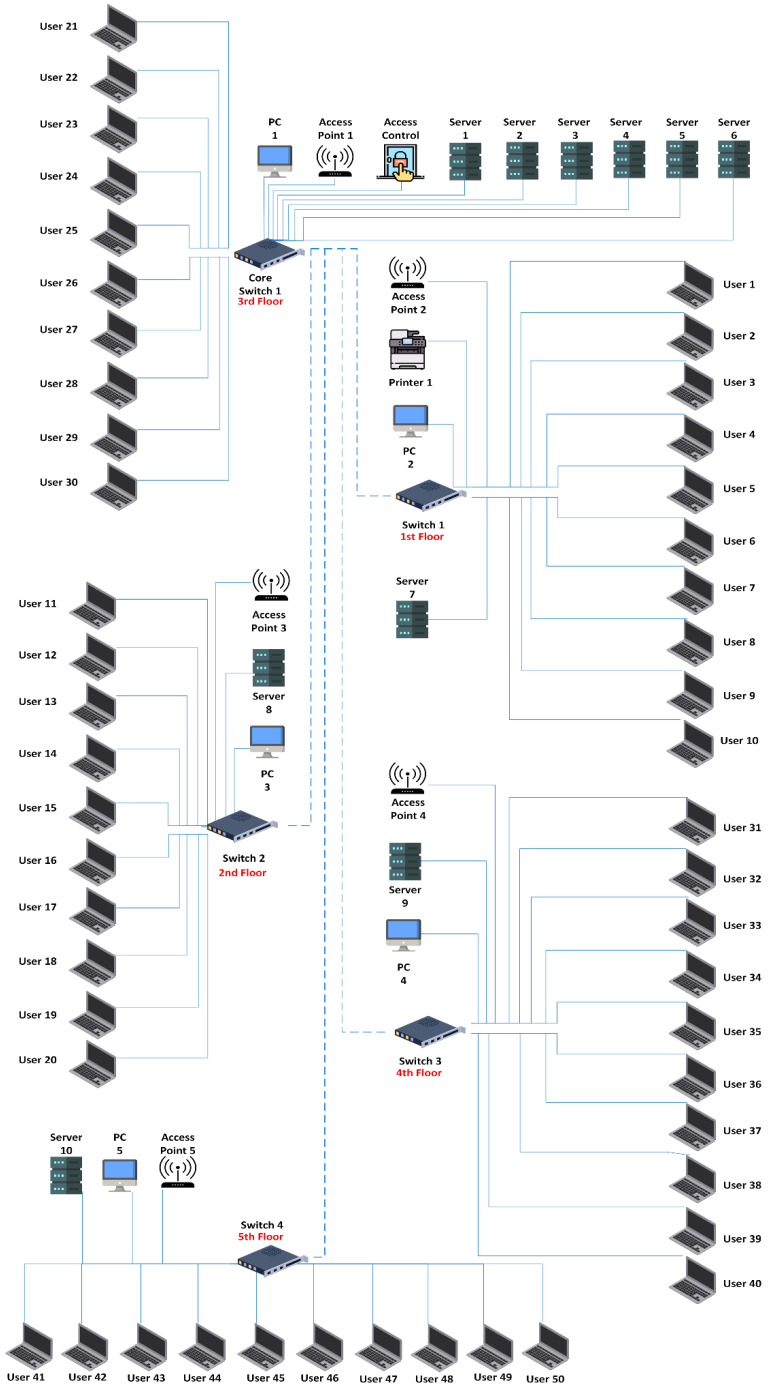
Part- 4 Headoffice Switch to branch Office Switch

Switch 1 is connected to Switch 2 and Switch 3 though all the routers using the Fiber Optical Cables. If any user send, collect and store any data from any of the servers that are connected to the switch can complete the action easily because they are all connected to each other.



Part- 5 Head Office Main Switch to Other Switch

When the internet from the routers come to core switch 1 all the other switch also get the internet connection because all the switch in the head office are connected together with the UTP caple.



Part- 6 Main Diagram

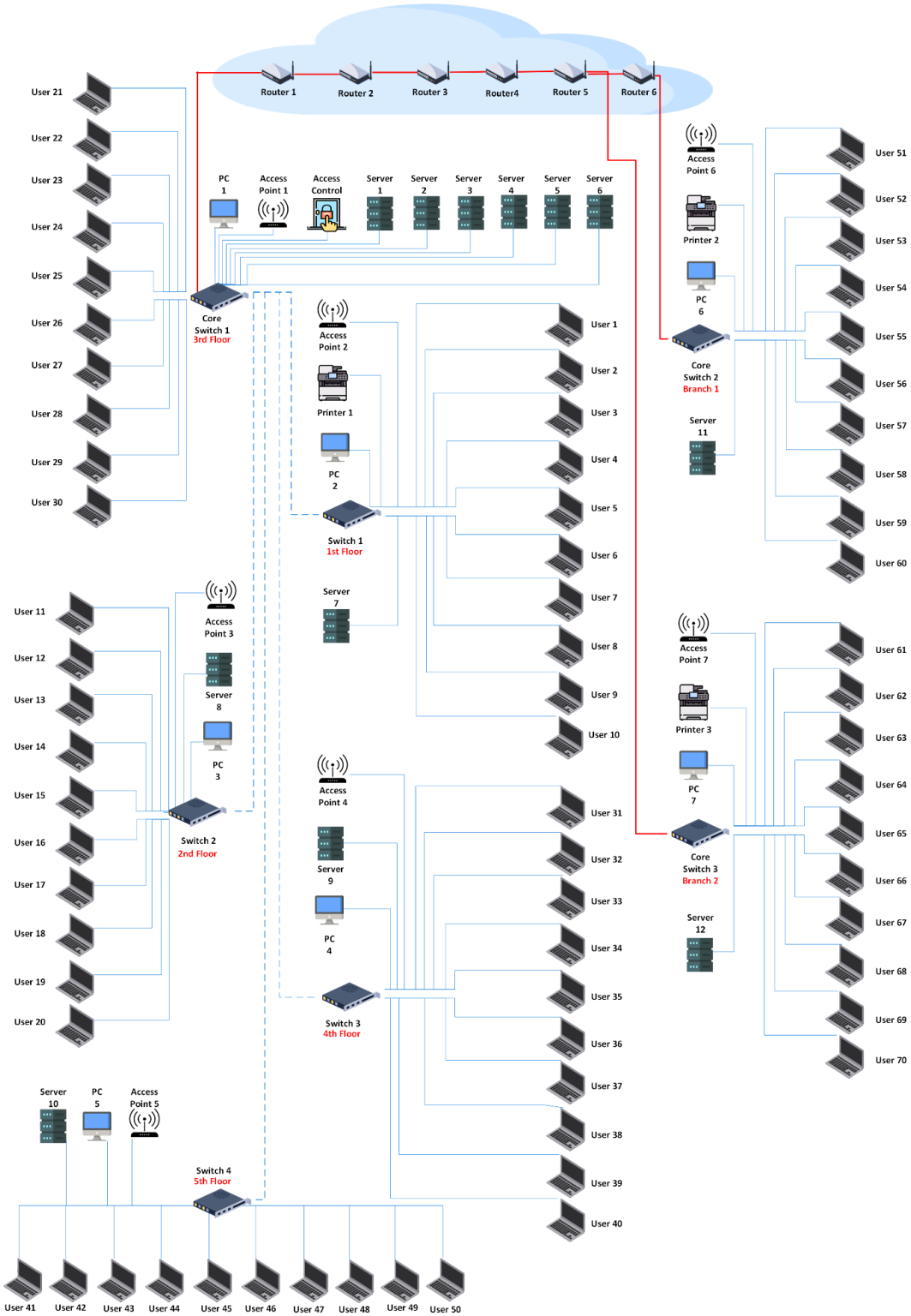


Figure 5.4.5: Architectural Diagram of LAN Networking for Shaheed Monsur Ali Medical College

5.4.4 Logical Network Diagram - Structured LAN

A logical network diagram represents how data travels through a network. Subnets (including VLAN IDs, masks, and addresses), network equipment such as routers, and routing protocols are generally portrayed in logical network diagrams.

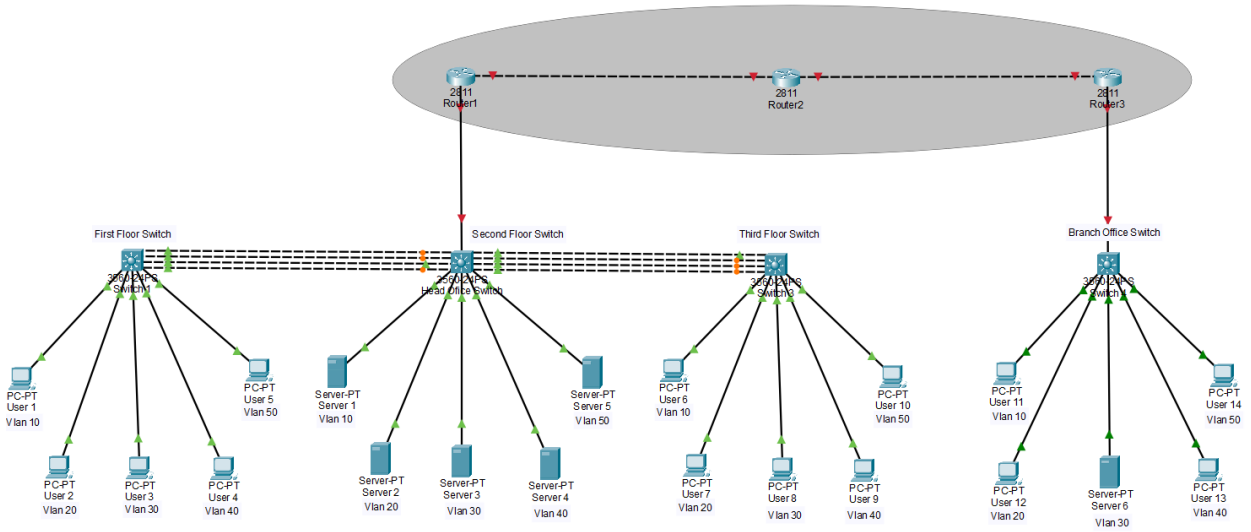


Figure 5.4.6: Logical Network Diagram of LAN Networking for Shaheed Monsur Ali Medical College

The diagram above is the test case logical network diagram used only to test the Router and Switch Configurations code testing. It is the simplest version of the original project.

First Floor Switch :
Here first floor switch is connected to the second floor switch, where switch 1s' port no. 1 2 3 4 are conected to the head office switches' port no. 1 2 3 4. And port no.5 6 7 8 9 are connected to user no, 1 2 3 4 5.

Second Floor Switch:
Then Head office second floor switches' port no. 1 2 3 4 are connect to first floor switch and port no. 5 6 7 8 is connected to third floor switch at port no. 1 2 3 4. And server 1 2 3 4 5 are connecte to port no. 9 10 11 12 13.

Second Floor Switch to Router 1:
Port no. 24 is connected to the Router 1 Fa 0/1.

Router 1 to Router 2:
Port no. Fa 0/0 is connected to Fa 0/0 of router 2

Router 2 to Router 3:
Port no. Fa 0/1 is connected to the Fa 0/1 of Router 3

Branch Office Switch:
Switch 4s' port no. 1 2 3 4 5 is connected to the use User no. 11 12 13 14 and server no. 6. And port 24 is connected to the Fa 0.0 of router 3.

5.5 Implementation

Switch

1) **A username and a password being set to get login**

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname Switch 1
                        ^
% Invalid input detected at '^' marker.

Switch(config)#hostname Switch1
Switch1(config)#enable secret LAN7444
Switch1(config)#line console 0
Switch1(config-line)#password LAN
Switch1(config-line)#Login
Switch1(config-line)#exit
Switch1(config)#
```

2) **By typing (#line vty 0 4) only five users can log in from a remote place. Although 16 users can log in but Ciscos' Standard form is only 5 users.**

```
Switch1(config)#line vty 0 4
Switch1(config-line)#password LAN
Switch1(config-line)#login
Switch1(config-line)#exit
```

3) **Port Configuration for the rest of the port from 5- 24 ports**

```
Switch_0(config)#interface range fastEthernet0/5-24
Switch_0(config-if-range)#switchport mode access
Switch_0(config-if-range)#switchport port-security
Switch_0(config-if-range)#switchport port-security maximum 1
Switch_0(config-if-range)#switchport port-security mac-address sticky
Switch_0(config-if-range)#switchport port-security violation shutdown
Switch_0(config-if-range)#shutdown
```

4) **Creating VLAN**

```
Switch1(config)#vlan 10
Switch1(config-vlan)#exit
Switch1(config)#vlan 20
Switch1(config-vlan)#exit
Switch1(config)#vlan 30
Switch1(config-vlan)#exit
Switch1(config)#vlan 40
Switch1(config-vlan)#exit
Switch1(config)#vlan 50
Switch1(config-vlan)#exit
Switch1(config)#
```

5) Setting the PC to VLAN

```
Switch1(config)#interface fastEthernet 0/5
Switch1(config-if)#description "User1_vlan10"
Switch1(config-if)#switchport mode access
Switch1(config-if)#switchport access vlan 10
Switch1(config-if)#no shutdown

Switch1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/5, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/5, changed state to up

Switch1(config-if)#exit
Switch1(config)#
```

```
Switch1(config)#interface fastEthernet 0/6
Switch1(config-if)#description "User2_vlan20"
Switch1(config-if)#switchport mode access
Switch1(config-if)#switchport access vlan 20
Switch1(config-if)#no shutdown

Switch1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/6, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/6, changed state to up

Switch1(config-if)#exit
Switch1(config)#
```

```
Switch1(config)#interface fastEthernet 0/7
Switch1(config-if)#description "User3_vlan30"
Switch1(config-if)#switchport mode access
Switch1(config-if)#switchport access vlan 30
Switch1(config-if)#no shutdown

Switch1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/7, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/7, changed state to up

Switch1(config-if)#exit
Switch1(config)#
```

```
Switch1(config)#interface fastEthernet 0/8
Switch1(config-if)#description "User4_vlan40"
Switch1(config-if)#switchport mode access
Switch1(config-if)#switchport access vlan 40
Switch1(config-if)#no shutdown

Switch1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/8, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/8, changed state to up

Switch1(config-if)#exit
```

```
Switch1(config)#interface fastEthernet 0/9
Switch1(config-if)#description "User5_vlan50"
Switch1(config-if)#switchport mode access
Switch1(config-if)#switchport access vlan 50
Switch1(config-if)#no shutdown

Switch1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/9, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/9, changed state to up

Switch1(config-if)#exit
```

6) Configuring Trunk Port and EtherChannel

Trunk Port:

```
Switch1(config)#
Switch1(config)#interface range fastEthernet 0/1-4
Switch1(config-if-range)#speed 100
Switch1(config-if-range)#duplex full
Switch1(config-if-range)#
%LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down

%LINK-3-UPDOWN: Interface FastEthernet0/2, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to down

%LINK-3-UPDOWN: Interface FastEthernet0/3, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to down

%LINK-3-UPDOWN: Interface FastEthernet0/4, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/4, changed state to down

Switch1(config-if-range)#switchport trunk encapsulation dot1q
Switch1(config-if-range)#switchport mode trunk
Switch1(config-if-range)#
```

EtherChannel:

```
Switch1(config-if-range)#channel-protocol lacp
Switch1(config-if-range)#channel-group 1 mode active
Switch1(config-if-range)#
Creating a port-channel interface Port-channel 1

Switch1(config-if-range)#do wr
Building configuration...
[OK]
Switch1(config-if-range)#
```

Configuration Code

Step-1 Password is given to restrict the unauthorized user to entre the Switch.

> enable
 # configure terminal (Configuring the ternminal)
 # hostname Switch 0 (Giving the name to the switch)
 # enable secret LAN7444 (Securing the switch so that unauthorize people can't enter)
 # line console 0 (0 because only one user can login from console port)
 # password LAN (password is set for only one user)
 # login (so that password will be asked when login through console port)
 # exit

Step-2 Setting the number of user who can entre remotely.

 # line vty 0 4 (vty- uses for how many user can login remnotely, normally 16 user can login, But ciscos's standard is 5 user)
#password LAN (password is set for 5 user)
#login (for giving password, if don't want to give password then type, #no login.)
#exit

Step-3 Port Security is given here for the rest of the port 5-24 number ports. (MAC Address Configured)

#interface range fastEthernet 0/5-24 (Selectinf from 5-24 ports)
#switchport mode access (Giving Command to Switch Port Security)
#switchport port-security (Enabling Port-Security)
#switchport port-security maximum 1 (From one port one MAC address can go)
#switchport port-security mac-address sticky (First computer that connect that is the First user automatically)
#switchport pore-security violation shutdown (If any unauthorized user try to connect to this port then it will shutdown automatically)
#Shutdown
#exit

Step-4 Five (VLAN 10, VLAN 20, VLAN 30, VLAN 40, VLAN 50) Vlans configured to the Switch.

#vlan 10
#exit
#vlan 20
#exit
#vlan 30
#exit
#vlan 40
#exit
#vlan 50
#exit

Step-5 Giving the description and Access to VLAN and turning ON the User (PC) / Server that is connected to the switch.

PC-0

#interface fastEthernet 0/5 (5 number port of the switch is connected to this PC)
#description "PC0_vlan10" (description of the PC)
#Switchport mode access (Giving Access to the port)
#Switchport access vlan 10 (Giving Access to VLAN 10 to this port)
#no shutdown
#exit

PC-1

#interface fastEthernet 0/10 (10 number port of the switch is connected to this PC)
#description "PC1_vlan20" (description of the PC)
#Switchport mode access (Giving Access to the port)
#Switchport access vlan 20 (Giving Access to VLAN 20 to this port)
#no shutdown
#exit

PC-2

#interface fastEthernet 0/15 (15 number port of the switch is connected to this PC)
#description "PC2_vlan30" (description of the PC)
#Switchport mode access (Giving Access to the port)
#Switchport access vlan 30 (Giving Access to VLAN 30 to this port)
#no shutdown
#exit
#do wr (To save the configuration)
#do show run (to check the VLAN is configured to the ports or not)

Step-6 Trunk port and Ether Channel Configuration

Note: Trunking the port because all the four ports of switch must behave similarly. Four ports that are connected to the other Switch, Ether Channel need to be configured for redundance. Because we are using two ports only and other 6 ports of bosth switches are backup.
Ether Channel have two types of protocol Pagp and lacp.

#interface range fastEthernet 0/1-4 (Selectinf from 1-4 ports)
#Speed 100 (Fixing the Speed to 100)
#duplex full
#Switchport mode trunk (All the four ports are trunked so their behavior and characteristics are same)
#Channel-protocol lacp
#Channel-group 1 mode active (In this switch 48 channels can be created but only one is selected)
#do wr (To save the configuration)

Router:

1) Setting Log in Password

```
Router>enable
Router#configuration terminal
                    ^
% Invalid input detected at '^' marker.

Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname Router1
Router1(config)#enable secret Router7444
Router1(config)#line console 0
Router1(config-line)#password Router
Router1(config-line)#login
Router1(config-line)#line vty 0 4
Router1(config-line)#passwod Router
                     ^
% Invalid input detected at '^' marker.

Router1(config-line)#password Router
Router1(config-line)#login
Router1(config-line)#exit
Router1(config)#
```

2) Inter Vlan Configuration

```
Router1(config)#interface fastEthernet 0/1
Router1(config-if)#no shutdown
```

3) Creating Sub Interface for VLAN 10, 20, 30, 40, 50

```
Router1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

Router1(config-if)#
Router1(config-if)#interface fastEthernet 0/1.10
Router1(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/1.10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1.10, changed state to up

Router1(config-subif)#encapsulation dot1q 10
Router1(config-subif)#ip  address 192.168.10.1 255.255.255.0
Router1(config-subif)#exit
```

```
Router1(config)#interface fastEthernet 0/1.20
Router1(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/1.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1.20, changed state to up

Router1(config-subif)#encapsulation dot1q 20
Router1(config-subif)#ip  address 192.168.20.1 255.255.255.0
Router1(config-subif)#exit
Router1(config)#interface fastEthernet 0/1.30
Router1(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/1.30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1.30, changed state to up

Router1(config-subif)#encapsulation dot1q 30
Router1(config-subif)#ip  address 192.168.30.1 255.255.255.0
Router1(config-subif)#exit
Router1(config)#interface fastEthernet 0/1.40
Router1(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/1.40, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1.40, changed state to up

Router1(config-subif)#encapsulation dot1q 40
Router1(config-subif)#ip  address 192.168.40.1 255.255.255.0
Router1(config-subif)#exit
Router1(config)#interface fastEthernet 0/1.50
Router1(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/1.50, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1.50, changed state to up

Router1(config-subif)#encapsulation dot1q 50
Router1(config-subif)#ip  address 192.168.50.1 255.255.255.0
Router1(config-subif)#exit
Router1(config)#
```

4) IP from 1 to 30 is Excluding from router for

```
Router1(config)#
Router1(config)#ip dhcp excluded-address 192.168.10.1 192.168.10.30
Router1(config)#ip dhcp excluded-address 192.168.20.1 192.168.20.30
Router1(config)#ip dhcp excluded-address 192.168.30.1 192.168.30.30
Router1(config)#ip dhcp excluded-address 192.168.40.1 192.168.40.30
Router1(config)#ip dhcp excluded-address 192.168.50.1 192.168.50.30
```

5) DHCP is creating for PC to get IP

```
Router1(config)#ip dhcp pool Lan10
Router1(dhcp-config)#network 192.168.10.0 255.255.255.0
Router1(dhcp-config)#default-router 192.168.10.1
Router1(dhcp-config)#dns-server 8.8.8.8
Router1(dhcp-config)#exit
```

```
Router1(config)#ip dhcp pool Lan20
Router1(dhcp-config)#network 192.168.20.0 255.255.255.0
Router1(dhcp-config)#default-router 192.168.20.1
Router1(dhcp-config)#dns-server 8.8.8.8
Router1(dhcp-config)#exit
Router1(config)#ip dhcp pool Lan30
Router1(dhcp-config)#network 192.168.30.0 255.255.255.0
Router1(dhcp-config)#default-router 192.168.30.1
Router1(dhcp-config)#dns-server 8.8.8.8
Router1(dhcp-config)#exit
Router1(config)#ip dhcp pool Lan40
Router1(dhcp-config)#network 192.168.40.0 255.255.255.0
Router1(dhcp-config)#default-router 192.168.40.1
Router1(dhcp-config)#dns-server 8.8.8.8
Router1(dhcp-config)#exit
Router1(config)#ip dhcp pool Lan50
Router1(dhcp-config)#network 192.168.50.0 255.255.255.0
Router1(dhcp-config)#default-router 192.168.50.1
Router1(dhcp-config)#dns-server 8.8.8.8
Router1(dhcp-config)#exit
Router1(config)#
```

Configuration Code:

Step-1 Password is given to restrict the unauthorized user to entre the Router.

> enable
 # configure terminal (Configuring the ternminal)
 # hostname Router 1 (Giving the name to the switch)
 # enable secret Router7444 (Securing the switch so that unauthorize people can't enter)
 # line console 0 (0 because only one user can login from console port)
 # password Router (password is set for only one user)
 # login (so that password will be asked when login through console port)
 # exit

Step-2 Setting the number of user who can entre remotely.

 # line vty 0 4 (vty- uses for how many user can login remnotely, normally 16 user can login, But ciscos's standard is 5 user)
#password LAN (password is set for 5 user)
#login (for giving password, if don't want to give password then type, #no login.)
#exit

Step- 3 Configuration of inter Vlan

#interface fastEthernet 0/1 (Setting the port number**)**
#no shutdown
#exit

Step-4 Creating the sub-interface for VLAN 10, 20, 30, 40, 50

#interfaec fastEthernet 0/1.10 (.10 for remembering this vlan**)**
#encapsulation dot1q 10 (this sub interface is created for Vlan 10**)**
#ip address 192.168.10.1 255.255.255.0 (Router interface is created to VLAN 10**)**
#exit
#interfaec fastEthernet 0/1.20 (.10 for remembering this vlan**)**
#encapsulation dot1q 20 (this sub interface is created for Vlan 20**)**
#ip address 192.168.20.1 255.255.255.0 (Router interface is created to VLAN 20**)**
#exit
#interfaec fastEthernet 0/1.30 (.10 for remembering this vlan**)**
#encapsulation dot1q 30 (this sub interface is created for Vlan 10**)**
#ip address 192.168.30.1 255.255.255.0 (Router interface is created to VLAN 30**)**
#exit
#interfaec fastEthernet 0/1.40 (.10 for remembering this vlan**)**
#encapsulation dot1q 40 (this sub interface is created for Vlan 40**)**
#ip address 192.168.40.1 255.255.255.0 (Router interface is created to VLAN 40**)**
#exit
#interfaec fastEthernet 0/1.50 (.10 for remembering this vlan**)**
#encapsulation dot1q 50 (this sub interface is created for Vlan 50**)**
#ip address 192.168.50.1 255.255.255.0 (Router interface is created to VLAN 50**)**
#exit

Step-5 IP address excluded for Printer or other for manual configuration vlan

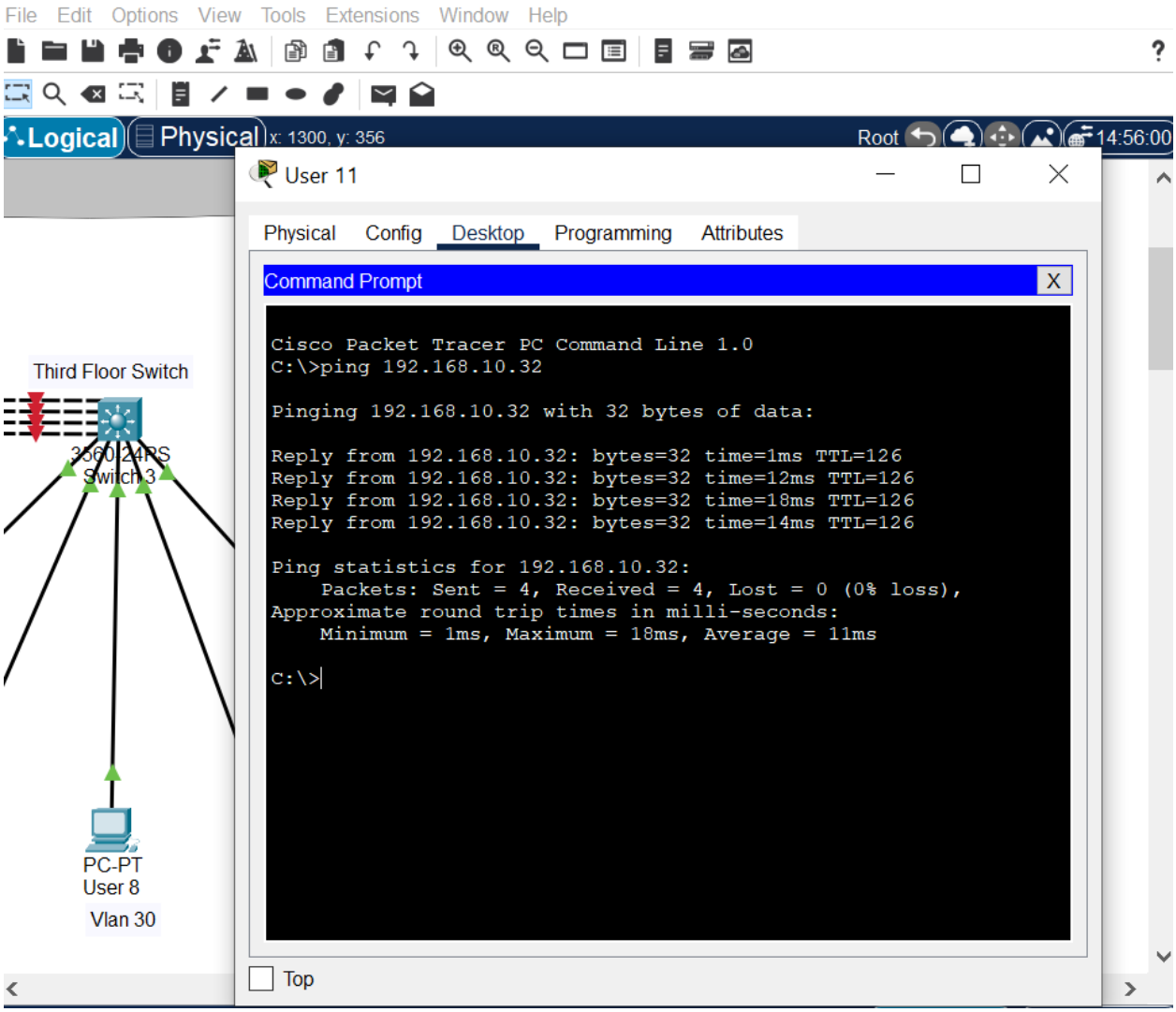
#ip dhcp excluded-address 192.168.10.1 192.168.10.30 (1-30 IP Address is excluded for Printer or other for vlan 10**)**
#ip dhcp excluded-address 192.168.20.1 192.168.20.30 (1-30 IP Address is excluded for Printer or other for vlan 20**)**
#ip dhcp excluded-address 192.168.30.1 192.168.30.30 (1-30 IP Address is excluded for Printer or other for vlan 30**)**
#ip dhcp excluded-address 192.168.40.1 192.168.40.30 (1-30 IP Address is excluded for Printer or other for vlan 40**)**
#ip dhcp excluded-address 192.168.50.1 192.168.50.30 (1-30 IP Address is excluded for Printer or other for vlan 50**)**

Step:6 Giving the Vlan 10, 20, 30, 40, 50 pool the IP Address

#ip dhcp pool lan 10 (Name set for vlan 10 Dhcp pool)
#network 192.168.10.0 255.255.255.0 (31-254 IP Created)
#default-router 192.168.10.1 (default gateway)
#dns-server 8.8.8.8 (only 1 dns server can be there in Cisco)
#exit
#ip dhcp pool lan 20 (Name set for vlan 20 Dhcp pool)
#network 192.168.20.0 255.255.255.0 (31-254 IP Created)
#default-router 192.168.20.1 (default gateway)
#dns-server 8.8.8.8 (only 1 dns server can be there in Cisco)
#exit
#ip dhcp pool lan 30 (Name set for vlan 30 Dhcp pool)
#network 192.168.30.0 255.255.255.0 (31-254 IP Created)
#default-router 192.168.30.1 (default gateway)
#dns-server 8.8.8.8 (only 1 dns server can be there in Cisco)
#exit
#ip dhcp pool lan 40 (Name set for vlan 40 Dhcp pool)
#network 192.168.40.0 255.255.255.0 (31-254 IP Created)
#default-router 192.168.40.1 (default gateway)
#dns-server 8.8.8.8 (only 1 dns server can be there in Cisco)
#exit
#ip dhcp pool lan 50 (Name set for vlan 50 Dhcp pool)
#network 192.168.50.0 255.255.255.0 (31-254 IP Created)
#default-router 192.168.50.1 (default gateway)
#dns-server 8.8.8.8 (only 1 dns server can be there in Cisco)
#exit
#do wr

5.6 Testing

1) Ping from User 11 to user 1



2) Ping Tunnel from Router 3 to Router 1

```
Router(config-if)#do ping 100.100.100.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 100.100.100.1, timeout is 2 seconds:
..!!!
Success rate is 60 percent (3/5), round-trip min/avg/max = 0/0/1 ms

Router(config-if)#
Router(config-if)#
```

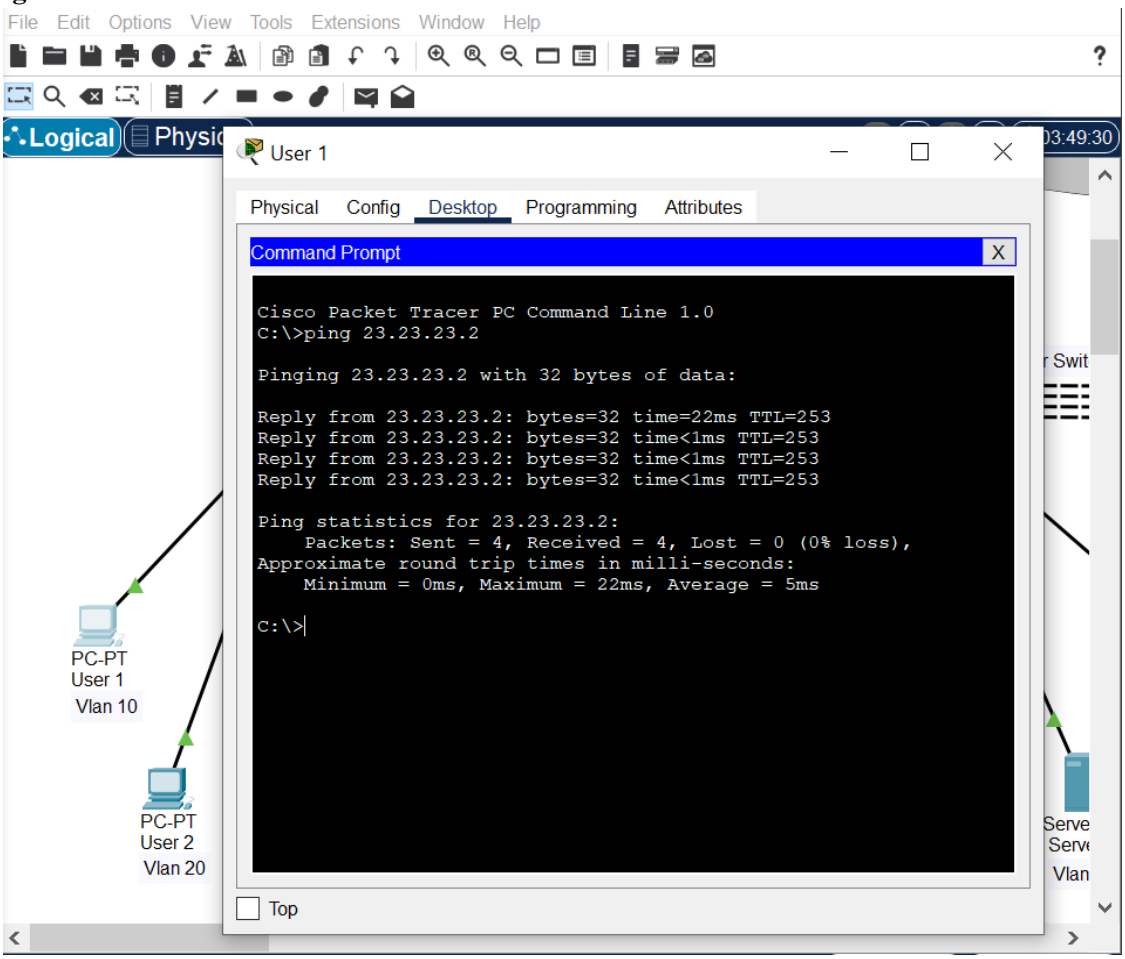
3) Ping IP address from Router 3 to Router 1

```
Router(config-router)#do ping 120.120.120.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 120.120.120.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/3 ms

Router(config-router)#
```

4) Ping Router 3 from User 1



Chapter 6

Results & Analysis

I will be working on the design and configuration here around the results and effectiveness of the venture. This networking project entailed the responsibility of sharing and interconnecting with the user to improve Shaheed Monsur Ali Medical College's creative capabilities. The LAN Networking construction, completed by our company's team, has significantly advanced Shaheed Monsur Ali Medical College's creative framework. The system was successfully adopted following an exhaustive testing phase focused on the business's demands, goals, and objectives.

The implementation was also done so that their IT team could always build a business-driven network architecture using the specific, making it easier to select the appropriate hardware platforms, technological features, and protocols to implement the overview of the research design at a later time.

As a result, the core network is more adaptable to changing technical or business requirements. Furthermore, the server systems are kept flexible to allow developers to perform their duties as soon as they are completed and then distribute through server farms while considering a range of limits, design flaws, principles, and varied requirements.

Chapter 7

A Project as Engineering Problem Analysis

Internal project guidance is provided via engineering problem analysis. It is the breakdown of sustainability, social and environmental effects and studies, ethics, and ethical issues into their essential elements to get at their key aspects and links to each other and external factors.

7.1 Sustainability of the Project/Work

A lot of elements affect the viability of the product/long-term work. Sustainability refers to a product's ability to be maintained and enhanced. Understanding sustainability ideas and developing a solid plan are essential for preventing project failure. The product's long-term viability can be classified into three categories:

- **Community Sustainability:**
  The word "community sustainability" refers to how much the community, or network users, will contribute to the project's long-term viability. Our task is for Shaheed Monsur Ali Medical corporation, but their office user will use it after it is released. Our service will continue if we can successfully utilize the network services and technological infrastructure accessible to us.

- **Financial Sustainability:**
  This relates to how the Networks' operating costs will be maintained once the service has been launched and whether it will produce enough income to generate an acceptable profit. Our company's pricing for building the network is also profitable. By doing so, the company will be able to maintain its financial stability and generate profits in the future.

- **Organizational Supportability:**
  It is about how the organization will continue to operate after the network is released. Following the network's release, the organization often maintains the network through its present team, an extended team, or a brand new team. Organizations also upgrade their projects by adding fresh features to products, and they may shift to other projects, grow their teams, form new groups, and so on. Our organization is constantly contributing to the development of our systems with the help of our team, who continually attempt to advance their organizing knowledge and abilities.

7.2 Social and Environmental Effects and Analysis

Every action has a social and environmental impact. LAN networking is essential in our daily life. Even organizations, corporate offices, banks, schools, and, increasingly, most residences are only inoperable with networking associations. Because networks are the core of innovation use, all effort undertaken by our firm includes social and natural recommendations.

- **Social Effect:**
  Our project will have a positive social impact on the employees of Shaheed Monsur Ali Medical College. Daily, work will be easier and more efficient. Our technology allows for the exchange of files, documents, and information among branches in different locations, improving the flexibility with which data can be shared. More importantly, greater data-sharing accuracy will help the company's customers.

- **Environmental Impact:**
  Aside from that, LAN networking harms the environment. According to one study, WiFi access points utilize 24316.30 Wh of power per year and emit 14.83 kg of carbon dioxide annually. And for the Ethernet switch, 17706.15 Wh was used, resulting in a CO2 emission of 10.80 kilograms.

7.3 Addressing Ethics and Ethical Issues

In our modern era, faking someone has become quite easy. Without your knowledge, someone can pretend to be you and use your information to do something illegal or conduct a crime. It has become critical to secure user data since. Otherwise, someone might easily hack the system and steal personal information.

- **Organizing:**
  Moral utilitarian planning ensures that networking does not waste our clients' time by being well-planned, essential, and beneficial. The company was able to deliver the guaranteed organizing hardware and is now providing genuine transmission capacity requirements to the office.

- **Enthusiastic Organizing:**
  The passionate moral organization enables individuals to easily identify why they need to be moral rather than simply following a rule. Our clients will be unable to make moral decisions if they do not fully know the issues, so we must explain the consequences so that the other party understands what will happen if an unethical alternative is chosen.

- **Ethical Organizing:**
  Highminded organizing is characterized by acting confidently, being eager, and participating in permitted exercises. It also involves the corresponding trading of data, information, and assets and a significant moral impact on internal arrangement.

Chapter 8

Lesson Learned

8.1 Problems Faced During Internship

This section discusses the challenges identified, inspected, and, ultimately, a solution developed to resolve those difficulties. For me, an internship is a whole new experience. During my internship, I encountered some challenges and issues for which I had to find answers. My internship has given me a lot of knowledge. This has been an entirely new learning experience for me, and I have thoroughly enjoyed it. The following are the difficulties that have been recognized:

- **Adjusting to Corporate Culture:**
  The culture of each corporate office is not defined; rather, it must be acquired and adjusted to the employees' overall behavior. After being exposed to such an environment, adjusting to the company's learning and working periods was difficult. My internship's learning portion comprised hardware, network topology, and self-education in dealing with various types of people from different departments and networking architectural design.

- **Adapting to New Technologies:**
  Because this was my first time working as a LAN Networking architect in an office environment, I had to learn and adapt to the company's new technology. Although obtaining the skill set was achievable, using them in real-life scenarios proved difficult. At the start of our internship, I learned for the first time about Wiring Management, Product Specification, and Topologies.

- **Identifying and Fixing Errors:**
  There were frequent errors in the configuration codes that were challenging to spot and even more challenging to address once discovered.

- **Keeping up to Speed:**
  Acquiring new technologies and setting them into use was a slow process initially because it was the first time I had ever utilized them in an office setting. As a result, meeting weekly deadlines proved challenging, slowing the overall rate of networking architecture development.

8.2 Solution to Those Problems

With the guidance of my supervisor and technical experts on the Shaheed Monsur Ali Medical College project, I conquered the challenges that emerged during my internship. My work placement was a combination of working and learning. To ensure that I was familiar with the field of work, my supervisor first presented and educated me on the principles of technology that I would need to use in real-life projects, as well as the type of commercial work being done in this part of the business. This helped me overcome the difficulties and obstacles I experienced while developing the system.

- **Adjusting to Corporate Culture:**
  My superiors and coworkers at Global Informatics Ltd, particularly my supervisor, were truly helpful, which gave me the confidence to open up and contribute more to the project's operations. Seniors in the organization helped me better understand the project's principles and how it operates, allowing me to understand the project more clearly and put more effort into it. Their eagerness encouraged me to ask questions, push myself outside my comfort zone, and gradually adapt to the firm's corporate culture.

- **Adapting to New Technologies:**
  Adopting new technology was a complex condition for me at first. However, with the assistance of my supervisor and the Network Developer team, I became accustomed to the entire process after a few days.

- **Identifying and Fixing Errors:**
  We have a project team connected to a shared file on Google Drive, where we are constantly updating the design and configuration code we are working on. This makes it easy for the network developer team and me to know the state of the code-base and rectify issues in the configuration scripts.

- **Keeping up to Speed:**
  It was a slow process for me at first because it was my first time using it in an office setting. Maintaining the job load and speed was easy after a few days.

Chapter 9

Future Works & Conclusion

9.1 Future Works

Working as an intern at Global Informatics ltd. has energized me to seek a career. Working in a network-based organization was a critical learning angle around the capacities of work within the Computer Networks segment, which features a massive field of commercial work. Although higher-level organize engineering and examination are optional, the basics of how an arrangement is built and how a benefit is provided can be learned.

Besides the business has plan to add firewall to the network system and add more User and Servers. And they also planned to install IP PBX phone and IP Surveillance.

9.2 Conclusion

I gained knowledge and valuable expertise during my internship in various professional network design domains. This internship offered me the opportunity to see how people act in commercials. I had also adapted to the workplace culture. I learned something new daily from the office, my boss, and my teammates. Global Informatics Ltd. provided me with an excellent learning experience. Despite their heavy workload, my CEO, supervisors, and colleagues were all incredibly helpful in adjusting to my new job.

I interacted with my more experienced colleagues during my internship to solve difficulties and overcome personal obstacles. Fortunately, I could attend several meetings with top management, during which we reviewed the company's objectives, priorities, and requirements, as well as the project's cost and timeline.

Interns are frequently allowed to work on live projects and contribute to the workflow of an existing project in the office. I was worthy of a chance, so I was assigned tasks that would help me advance in every aspect of my career. As the youngest and least experienced team member, I received a lot of guidance from the company's employees. I also learned how to use tools and strategies to create a project. Finally, I'd like to thank my Global Informatics supervisors (Mr. Rabiul and Mr. Minhaz) for introducing me to the practical work of network engineering by aiding me with Structured LAN Networking and showing me how to achieve the best outcomes. Their advice helped me get through my internship. Their support and encouragement have given me the confidence to work on such a stage.

Chapter 10

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An Undergraduate Internship/Project on

Design and Configuration of Structured LAN of Shaheed Monsur Ali Medical College

By

Saif Islam Anik
Student ID: 1831003
Autumn, 2022

Consent from Supervisor

The student modified the internship final report as per the recommendations made by his academic supervisor and/or panel members during and/or before final viva, and the department can use this version for archiving as well as the OBE course material for CSE499.

(Signature of the Supervisor)

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