Independent University **Bangladesh (IUB)**

IUB Academic Repository

Internship Reports Summer 2023

2023-10-05

An Undergraduate Internship/Project on Network Infrastructure Design & Deployment for Softex Sweater Industries (Pvt.) Ltd.

Rahman, Md. Towfiq Sadat

Independent University, Bangladesh

https://ar.iub.edu.bd/handle/11348/668

Downloaded from IUB Academic Repository



An Undergraduate Internship/Project on Network Infrastructure Design & Deployment for Softex Sweater Industries (Pvt.) Ltd.

By

Md. Towfiq Sadat Rahman

Student ID: **1730592**

Summer, 2023

Supervisor:

Ms. Kaniz Fatema

Senior Lecturer

Department of Computer Science & Engineering
Independent University, Bangladesh

October 5, 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

I solemnly attest to the validity and originality of the report titled **"Network Infrastructure Design & Deployment for Softex Sweater Industries (Pvt.) Ltd."** This comprehensive document encompasses a networking project executed by me, Md. Towfiq Sadat Rahman (1730592), as a requirement for the Computer Science degree awarded by Independent University, Bangladesh (IUB). The successful completion of this project is a result of dedicated effort and sincere commitment.

Furthermore, I affirm that all the work presented in this report is entirely my own and has not been previously submitted to any academic institution, including IUB. Additionally, I acknowledge and provide proper credit to all sources of information and references utilized in the preparation of this Project Report.

Towfiq

Signature

10.10.2023

Date:

Md. Towfiq Sadat Rahman

Name

Acknowledgement

In the name of Allah Most gracious Most Merciful, I would like to thank Almighty Allah for granting me the fortitude and opportunity to engage in meaningful work. It has been a distinct honor and privilege to be part of the dynamic and cohesive family at Softex Sweater Industries (Pvt.) Ltd. It is my pleasure and privilege that I had the opportunity work at Softex Sweater Industries (Pvt.) Ltd. I wish to convey my sincere appreciation to all the remarkable individuals within my team and the wider Softex family whose unwavering commitment and collective efforts have enriched my internship experience.

I am deeply indebted to my mentor, Ms. Kaniz Fatema, Senior Lecturer in the Department of Computer Science and Engineering at Independent University, Bangladesh. Her invaluable guidance, constant support, astute critiques, and sagacious counsel have been instrumental in shaping both my learning journey and the preparation of this internship report.

My heartfelt gratitude extends to Mr. Md. Rezwan Selim, Managing Director of Softex Sweater Industries (Pvt.) Ltd., and Mr. Ashikul Hoque Sarker, Head of HR, Admin & Compliance, for their gracious encouragement and support throughout this endeavor. I would also like to acknowledge the entire team at Softex Sweater Industries for their collaboration, which was pivotal in the successful completion of this internship project/report.

Furthermore, I extend my heartfelt thanks to my cherished family members and dear friends for their unwavering and boundless support.

Letter of Transmittal

October 5, 2023

Ms. Kaniz Fatema
Senior Lecturer,
Department of Computer Science & Engineering,
Independent University, Bangladesh,
Dhaka, Bangladesh

Subject: Submission of Internship Report

I am pleased to submit my internship report, titled "Network Infrastructure Design & Deployment," as a requirement for the completion of my internship at Softex Sweater Industries (Pvt.) Ltd. I want to express my gratitude to my supervisor, Ms. Kaniz Fatema, for her guidance and mentorship throughout this internship. This report encompasses the findings, analyses, and recommendations derived from my practical experiences and contributions during my internship period. I also express my sincere appreciation to Mr. Md. Rezwan Selim, Managing Director of Softex Sweater Industries (Pvt.) Ltd., and Mr. Ashikul Hoque Sarker, Head of HR, Admin & Compliance, for their support and for providing me with the opportunity to contribute to the organization.

This report highlights my experiences and contributions during my internship and reflects my growth and practical skills. I look forward to discussing it with you during the evaluation.
Thank you for considering my report.

Sincerely,
Md. Towfiq Sadat Rahman
ID: 1730592
School of Engineering & Computer Science,
Independent University, Bangladesh

Evaluation Committee

Supervision Panel

15.10.2023	
Academic Supervisor	Industry Supervisor

Panel Members

15/10/23	Asif 15/10/23
Panel Member 1	Panel Member 2

Office Use

Program Coordinator	Head of the Department

Abstract

My project report for Softex Sweater Industries (Pvt.) Ltd. centers on "Network Infrastructure Design and Deployment". This report is on the development of the network infrastructure for Factory-1 (DEPZ), Factory-2 (Sreepur) and Head Office (Gulshan-2) post the recent departmental relocation. The goal of this project is to elevate our network performance, security, and accessibility to meet the evolving demands of our operations.

This project will entail a comprehensive assessment and redesigning of the existing network infrastructure at both Factory-1, Factory-2 and Head Office. Additionally, the installation of CCTV IP surveillance system at two locations. Through meticulous analysis, we will identify areas for improvement, optimization, and potential security enhancements. The goal is to design and implement an upgraded network framework that ensures seamless communication, with increased bandwidth, and robust security protocols that meets all operational requirements and also future proofing the networking capacities, considering all existing systems such as E-mail server, access control system etc. The network server room setup, installation and configuration will be aligned with BEPZA compliance, ensuring the highest standards of operation.

During the internship, a strong focus will be on teamwork, evaluations, and ongoing enhancements. Scheduled feedback sessions will provide valuable insights for constructive assessments and continuous learning experiences.

As part of the project, I will focus on network deployment, server configuration, network installation and optimization, installation of CCTV surveillance system, user support and training to ensure a smooth transition for our team. The report begins with a problem statement, followed by a comprehensive literature review that explores relevant topics for network infrastructure.

Contents

Attestation i

Acknowledgement ii

Letter of Transmittal iii

Evaluation Committee iv

Abstract v

List of Figure ix

Chapter 1 1

1. Introduction 1

1.1 Overview/Background of the Work 1

1.2 Objectives 2

1.3 Scopes 3

Chapter 2 5

2. Literature Review 5

2.1 Relationship with Undergraduate Studies 5

2.2 Related works 7

Chapter 3 8

3. Project Management & Financing 8

3.1 Work Breakdown Structure 8

3.2 Process/Activity wise Time Distribution 10

3.3 Gantt Chart 11

3.4 Process/Activity wise Resource Allocation 11

3.5 Estimated Costing 13

Chapter 4 19

4. Methodology 19

Chapter 5 22

5. Body of the Project 22

5.1 Work Description 22

5.2 Requirement Analysis 23
5.2.1 Rich Picture 24
5.2.2 Functional and Non-Functional Requirements 25
5.3 System Analysis 27
5.3.1 Six Element Analysis 27
5.3.2 Feasibility Analysis 28
5.3.3 Problem Solution Analysis 29
5.3.4 Effect and Constraints Analysis 31
5.4 System Design 31
5.4.1 Network Topology 31
5.4.2 Architecture 33
5.5 Implementation 37
..... 41
..... 41
5.6 Testing & Output 42
5.6.1 Test Results 42
Chapter 6 43
6. Results & Analysis 43
Chapter 7 45
7. Project as Engineering Problem Analysis 45
7.1 Sustainability of the Project/Work 45
7.2 Social and Environmental Effects and Analysis 46
7.3 Addressing Ethics and Ethical Issues 47
7.3.1 Internal Security Risks and Employee Monitoring 47
Chapter 8 48
8. Lesson Learned 48
8.1 Problems Faced During this Period 48
8.2 Solution of those Problems 50

Chapter 9 53

9. Future Work & Conclusion 53

9.1 Future Works 53

9.2 Conclusion 54

Bibliography 55

List of Figure

Figure 1: Work Breakdown Structure 8
Figure 2: Process/Activity Wise Time Distribution 10
Figure 3: Gantt Chart for the Project 11
Figure 4:Process/Activity wise Resource Allocation 11
Figure 5: PPDIOO Cycle of a network 19
Figure 6: Rich Picture of the Networking System 24
Figure 7: Star Topology used for Softex Sweater Industries (Pvt.) Ltd. 31
Figure 8: CCTV layout for DEPZ Factory First Floor 33
Figure 9: CCTV layout for DEPZ Factory Ground Floor 33
Figure 10: CCTV layout for DEPZ Factory Second Floor 34
Figure 11: CCTV layout for DEPZ Factory Third Floor 34
Figure 12: CCTV layout for Sreepur Factory 35
Figure 13: The BGP Peer Connection 37
Figure 14: DHCP Server for one network: 38
Figure 15:Address List for Head Office 38
Figure 16: Address List, DHCP and DHC server Pool Setup 38
Figure 17: DNS Setup 39
Figure 18: Interface Setup 39
Figure 19: Interface 1 NVR 40
Figure 20: Interface 2 NVR for IP Block 40
Figure 21: Every Computer with Static Configuration with Manual IP 41
Figure 22: Remote Configuration 41
Figure 23:Ping Test Cross Department 42
Figure 24: Ping Test 42

Chapter 1

1. Introduction

1.1 Overview/Background of the Work

In the realm of network infrastructure, the aspiration is to craft an ideal networking system tailored to the needs of our organization. This system aims to be seamlessly integrated, user-friendly, and equipped with an intuitive interface. Such a system would incorporate a task management component to facilitate operational ease for our team, ensuring that it can be efficiently managed across various locations. The network architecture encompasses a reliable Local Area Networking (LAN) and Wide Area Networking (WAN) configurations. While all factories are equipped with manageable switches, some portion of the factory is simple outfitted for optimal performance.

The Goal is to integrate the existing systems for the company and implement a scalable networking system that allows data sharing, security, CCTV monitoring, access control system, integration and the usability of local email server, IP telephone, enterprise resource planning, Environment management system for server room.

The essence of this network is to create a unified environment, connecting our factories via these networking paradigms. A Local Area Network (LAN) will be used for intra-office connections, to fulfill the daily work requirements and Wide Area Network (WAN) will serve as the backbone. This network stands as an invaluable resource accessible to all units within our organization, fostering efficient data sharing and seamless communication. The primary objective of this project is to garner practical insights into network administration, operations, and the utilization of tools within our organization's network. Within the realm of network management, practical familiarity is indispensable.

Research and engagement in network management provide a robust framework for acquiring essential skills. Innovative concepts within the domain of network infrastructure, router configuration, data processing, and personal computer communication systems all contribute to an enriched learning experience.

1.2 Objectives

1. Develop an Integrated Network Infrastructure:

Ensure the integration of existing systems to enhance data sharing, security, and operational efficiency.

2. Design a Scalable Networking System:

Implement a scalable networking system that accommodates future growth and technological advancements and enable CCTV monitoring, access control system integration, local email server, IP telephone setup, enterprise resource planning (ERP) server deployment, and environment management system for the server room.

3. CCTV Surveillance System design and setup:

Design and install a CCTV surveillance system to monitor critical areas within the factory premises. Determine optimal camera placement, configure video recording and storage systems, and set up remote access for monitoring and reviewing footage.

4. File Sharing and Communication:

Establish an environment that fosters efficient data sharing and seamless communication between different users within the organization, including Mobile devices. Utilize Local Area Networking (LAN) for intra-office connections.

Allow users to engage in Team meetings and online meetings via Microsoft Teams or Zoom.

5. Manageability of the Network:

Develop hands-on experience in network management, including network infrastructure, router configuration and manage network remotely.

6. Research and Skill development:
Engage in research activities related to network infrastructure, addressing real-world challenges and innovative solutions.

1.3 Scopes

1. Network Infrastructure Assessment and Design:
Evaluate the existing network infrastructure at Softex Sweater Industries (Pvt.) Ltd. Identify areas that require improvement or optimization to meet the organization's needs. Design a comprehensive network infrastructure plan that includes LAN, WAN and VPN configurations.

2. Network Server Room Setup:
Plan and implement the setup of network server rooms at relevant locations and ensure the proper organization and management of networking equipment.

3. Network Setup and Configuration:
Configure the network components, including switches, routers, and other networking devices. Ensure the network is set up to provide seamless connectivity and ensure redundancy connectivity for Internet.

4. Wi-Fi Network Deployment:
Deploy Wi-Fi networks where necessary to provide wireless connectivity. Ensure security and reliability in Wi-Fi network setups.

5. Security:
Implement security measures to safeguard the network infrastructure, including firewalls rules.

6. User Support and Training:
Provide user support to ensure that employees can effectively use the new network infrastructure. Conduct training sessions for relevant staff members on network usage and best practices.

7. CCTV Surveillance System Integration and installation:
Setup a CCTV surveillance system to enhance security and monitoring.

8. Compliance with BEPZA Regulations:

Ensure that all aspects of the project adhere to the regulations and compliance standards set by the Bangladesh Export Processing Zones Authority (BEPZA).

Chapter 2

2. Literature Review

2.1 Relationship with Undergraduate Studies

In the context of my internship project at Softex Sweater Industries (Pvt.) Ltd., I leveraged the knowledge and skills I gained from various courses at Independent University, Bangladesh (IUB). These courses served as a foundation, but I also recognized the need to further enhance my competencies to meet the specific demands of the company which I had to resort to online resources. Below are some of the courses that significantly contributed to my professional growth:

ENG 105: Business English, the importance of business English is of paramount as I had to communicate with vendors and management via emails and I had to maintain professionalism.

CSE 104: Electrical Circuit Analysis and CSE 204: Digital Logic Design allowed me to understand how electrical components work

CSE 213: Object Oriented Programming, this course has been the most beneficial as this course allowed me to compartmentalize my project. The principles of object-oriented programming were instrumental in structuring and organizing my project, facilitating efficient compartmentalization

CSE 214: Computer Organization and Architecture familiarized me with networking computer hardware. This course deepened my familiarity with computer hardware, especially pertaining to networking, providing essential insights for optimizing network infrastructure, which allowed me to research on hardware compatibility.

CSE 303: Database Management and CSE 307 - System Analysis and Design allowed me to divide my project into sections allowing me to further dissection my project

CSE 309, Web Application and Internet: covered some of the important technologies such as HTML, CSS and JavaScript. The Implementation of Framework was introduced.

CSE 316: Data Communication and Computer Networks Understanding data communication and computer networks was fundamental for optimizing network infrastructure and ensuring seamless data flow.

CSE 400: Data Communication This course provided in-depth knowledge of data communication, which underpinned my project's networking aspects, enhancing data transfer efficiency.

CSE 402: Wireless Networking & Mobile Communication Insights into wireless networking and mobile communication technologies have been crucial for ensuring connectivity and accessibility within our network infrastructure.

CSE 451: Software Engineering Knowledge of software engineering principles guided the development and maintenance of software components within our project, ensuring robustness and reliability.

MIS 341: Computers in Business Understanding the role of computers in business processes was vital for aligning our network infrastructure with the company's operational needs.

MIS 442: Management Information System Insights from this course were instrumental in designing an effective information system for our project, enhancing data management and decision-making capabilities.

MIS 465: E-commerce & Web App This course covered essential technologies, including e-commerce and web application development, which directly contributed to the implementation of our project's online components.

2.2 Related works

Some real-Life Implementation of Networking Infrastructure would be the Internet Service Providers on a larger Scale, such as Link3, Amra Networks, Amber IT, Carnival Internet.

Small office and small businesses (SOHO), College or university campus area networks often interconnect various facilities, including administrative and academic buildings, university libraries, student centers, residence halls, gymnasiums, and additional structures like conference centers, technology hubs, and training institutes require strong network infrastructure to facilitate their operation.

Chapter 3

3. Project Management & Financing

3.1 Work Breakdown Structure

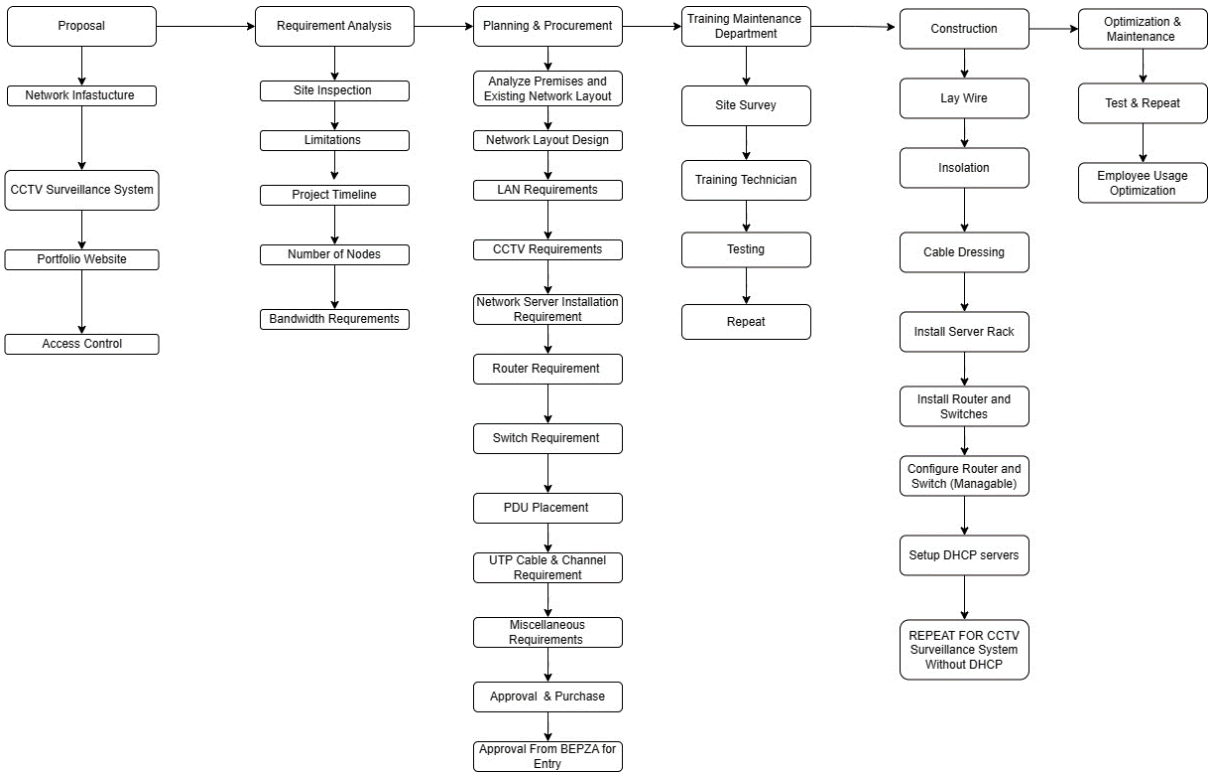

Figure 1: Work Breakdown Structure

In our project, we have developed a work breakdown structure that outlines our workflow, clarifies scopes, and assigns responsibilities in a well-organized manner. This work breakdown structure has been created to ensure the smooth and efficient management of this project. We adopted a top-down approach and created a phase-based WBS. In this portion of the report some part of the work has been done in collaboration with the commercial department for safe entry of the networking and CCTV surveillance items into the factory premises.

In the first part of the WBS is the proposal where the project proposal is pitched to the management for approval. Here, four project proposal was delivered to the management, but the management decided to approve on the network infrastructure and the CCTV surveillance system initially, as these were most relevant decision for the company at this yearly quarter.

In the phase of requirement analysis, the organizational requirements were captured and understood location wise. Here site visitation and surveying employees lead to the understanding of the working limitations as it is an active factory with over 400 machineries, with 9 organizational departments operating employees, and over 1200 workers. Here the numbers of nodes or computers and laptops were determined, alongside the placement location for CCTV camera were also determined.

Planning and procurement were the heart and brains of this project, as limitations faced by the organization due to recent covid-19 breakout all around the world. The organizations were faced with budgetary limitation on IT developments. In this part the existing network analysis was done and new network design was developed that can result in future proofing companies need. Requirements for the entire project was determined via site visitations and listing products based on the number of nodes that can operate in the premises. Here the deciding factor was the available space for the office rooms as a maximum number of nodes was estimated in the purchase of router and network switches.

In the fourth phase of this project, the maintenance department employees of Softex were trained to do the work of the technicians which they were accustomed to. The purpose of this was to meet the budgetary confinement as compromise with networking devices was not an option.

Following to the construction, optimization and maintenance of the project was done in collaboration of the maintenance and IT department.

3.2 Process/Activity wise Time Distribution

S/L	TASKS	Days
1.	Proposal	10
2.	Requirement Analysis	14
3.	Planning & Procurement	35
4.	Training Maintenance Department	7
5.	Construction	20
6.	Optimization & Maintenance	10 and Ongoing
TOTAL		96+

Figure 2: Process/Activity Wise Time Distribution

The Time distribution of this project as determined while site visitation, as this introduced many challenges that that lengthened the project completion time. As Mentioned in the table the proposal took 10 days, following with requirement analysis with 14 days, Planning & procurement took the longest as this projects main challenge was zero down time for the existing network, when the networking project was under construction. As throughout the work days the Merchandising, Commercial department and Inspection from QAD engages in many conferences, E-mail correspondences and online inspections thus working during the work time was a big challenge as this could lead to network downtime.

3.3 Gantt Chart

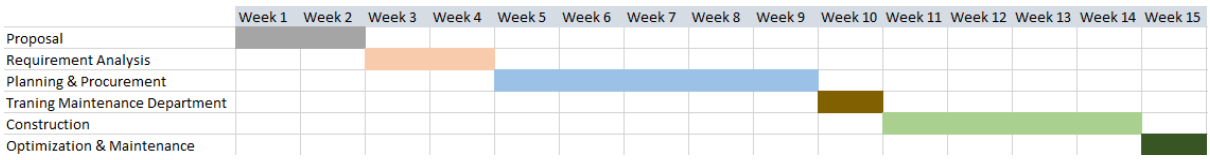

Figure 3: Gantt Chart for the Project

The Gannt chart in the above figure signifies the time distribution for this networking project. As observed from the Gantt chart, work time period for the six-work breakdown structure is identified. The times frame for each task along has been strategically design so that the work flow of the factory is unhampered.

3.4 Process/Activity wise Resource Allocation

S/L	TASKS	Work Percentage
1.	Proposal	5%
2.	Requirement Analysis	15%
3.	Planning & Procurement	40%
4.	Training Maintenance Department	7%
5.	Construction	30%
6.	Optimization & Maintenance	3%
TOTAL		100%

Figure 4:Process/Activity wise Resource Allocation

The distribution of resources per process or activity is the reflection of task accomplished with the quality of effort put into the work for each set of tasks set out in the work breakdown structure.

1. Proposal played an integral part of this project as this allowed the management to decide as per their requirements and importance of these projects that were proposed. As a financial and quarterly milestone decision has to be made during this time.

2. Requirement analysis this most crucial but mostly mistaken part of a project as understanding clients (employees) requirements and delivering accordingly has always been a challenge.

3. Planning & procurement is almost half the project, as it is the most important part of the project as proper planning and vendor choice had to be made meeting both managerial requirement and budgetary requirement. Decision had to be made keeping in mind the economic feasibility and future scalability of this network.

4. Training maintenance department as described previously, this contributed to our financial limitations. Smooth training and testing will lead to successful implementation of the project, thus substantial time and effort was allocated for training.

5. Construction of the project involved the majority of the physical and technical effort. Major challenges and setbacks were faced during construction as work space was pre occupied by machinery workers and employees.

6. Optimization & maintenance was comparatively the least challenging work of them all it was all achievable via remote management on desktop or mobile app.

3.5 Estimated Costing

CCTV SREEPUR FACTORY				
SL	Description of Goods (Sreepur Factory)	Qty	Unit price	Amount
01.	32 CH 4K H.265 Network Video Recorder (NVR) (NVR- Support Up to 12MP) Model : NVR 5832-4K Brand :Dahua , Origin : China (Total 48 TB)	01 No.	46,000.00	46,000.00
02.	HDD 6 TB. Brand: Seagate *For 60 Days Backup.	08 Nos.	19,500.00	1,56,000.00
03.	32" LED TV Sony	02 Nos.	36,000.00	72,000.00
04.	2 Megapixel HD Network IR-Bullet/Dome DH- IPC-HFW-1220SP/ IPC-HDW1220SP Brand: DAHUA ,MADE IN CHINA Lens : 3.6mm fixed lens (6mm, 8mm option,	26 Nos.	5,000.00	1,30,000.00
05.	16-Port PoE Gigabit Switch Brand: Tenda Model: TEF-1218P Made In China.	01 Nos.	17,000.00	17,000.00
06.	08-Port PoE Gigabit Switch Brand: Tenda Model: TEF-1109P Made In China.	02 Nos.	6,000.00	12,000.00
07.	MK With Combine	05 Nos.	400.00	2,000.00
08.	Twin Core Power Cable	200 M	20.00	4,000.00
09.	RJ 45 Connector	65 Nos.	50.00	3,250.00
11.	9 U Rack	01 No.	10,000.00	10,000.00
12.	Supply of Category 6 Ethernet Cable (Cat 6), Brand : Digilink	04 Boxs.	10,500.00	42,000.00
13.	PVC Conduit with	400 M	25.00	10,000.00
14.	Camera Stand & Fittings Accessories	04 Nos.	1,000.00	8,000.00

SOFTEX HEAD OFFICE LAN						
SL	Item	Description	Qty	UOM	Unit Cost (BDT)	TOTAL COST (BDT)
1	Fetch Plate	Dual	1	Pcs	320	320
2	Patch Panel	24 Port	1	Pcs	9,700	9,700
3	Fetch Plate	Single	11	Pcs	160	1,760
4	Modular	Link Basic	13	Pcs	330	4,290
5	MK Box		13	Pcs	28	364
6	MK Box Screw	1’5”	26	Pcs	3.5	91
7	Channel	1”	10	Pcs	56.5	565
8	Channel	2”	6	Pcs	152	912
9	Screw	Star Screw 1”	100	Pcs	2.48	248
10	Royal Plug		100	Pcs	1	100
11	UTP Cable	Cat-6	1	Box	14,640	14,640
12	Wall Clip	6 mm	2	Box	115	230
13	Cable Tie		1	Pack	145	145
14	Electric Tape		2	Pcs	62.5	135
15	Royal Bolt	10 No.	4	Pcs	17	58
16	R.J45 Connector	Mikronet	10	Pcs	30	300
17	UTP Patch Cord	1M	15	Pcs	305	4,575
18	UTP Patch Cord	2M	13	Pcs	420	5,460
	TOTAL COST (BDT)					**43,893**

DEPZ FACTORY LAN

SL No.	Description	Per unit	Net Price	VAT Rate	VAT Amount (Taka)	Total Price (Gross Amount) (Taka)
1	1 Pcs Electric Tape	27.91	27.91	7.50	2.09	30
2	1 Pcs Masking Tape (1 inch)	83.72	83.72	7.50	6.28	90
3	1-unit 9U Rack Charge for Factory (DEPZ)	11,627.91	11,627.91	7.50	872.09	12,500
4	1-unit MikroTik RB3011UiAS Router Charge for Factory (DEPZ)	17,674.42	17,674.42	7.50	1,325.58	19,000
5	1 unit Switch Non manageable (24port)	4,837.21	4,837.21	7.50	362.79	5,200
6	1 unit Switch Non manageable (8port)	930.23	930.23	7.50	69.77	1,000
7	100 Pcs Royal Plug	93.02	93.02	7.50	6.98	100
8	14 Pcs MK Box	416.74	416.74	7.50	31.26	448
9	15 Pcs Channel 1.5	1,116.28	1,116.28	7.50	83.72	1,200
10	15 Pcs Modular.	3,279.07	3,279.07	7.50	245.93	3,525
11	15 Pcs PVC Band.	97.67	97.67	7.50	7.33	105
12	2 Pcs Channel	195.35	195.35	7.50	14.65	210
13	2 Pkt Cable Tie.	260.47	260.47	7.50	19.53	280
14	2.5 Box/ 2500 feet UTP CAT-6 Cable Charge for Factory (DEPZ)	29,767.44	29,767.44	7.50	2,232.56	32,000
15	20 Pcs Channel	837.21	837.21	7.50	62.79	900
16	4 Pcs Royal Bolt (10 No)	93.02	93.02	7.50	6.98	100

SL No.	Description	Per unit	Net Price	VAT Rate	VAT Amount (Taka)	Total Price (Gross Amount) (Taka)
17	40 Pcs MK Box Screw 1.5	111.63	111.63	7.50	8.37	120
18	50 Pcs 1 inch PVC Pipe.	4,651.16	4,651.16	7.50	348.84	5,000
19	50 Pcs 1 inch PVC Socket Jointer.	325.58	325.58	7.50	24.42	350
20	6 Pcs Single Fetch Plate.	558.14	558.14	7.50	41.86	600
21	8 Pcs Double Fetch Plate.	833.49	833.49	7.50	62.51	896
22	80 Pcs 1 inch Screw.	111.63	111.63	7.50	8.37	120
23	80 Pcs RJ45 Connector	1,116.28	1,116.28	7.50	83.72	1,200
24	Fetch Plate	-				330
25	Modular	-				4,420
26	Fetch Plate	-				1,815
27	Flexible Pipe	-				600
28	MK Box	-				360
29	Channel	-				420
30	Channel	-				480
31	Screw	-				150
32	Royal Plug	-				60
33	UTP Cable	-				15,350
34	Switch	-				3,850
35	Cable Tie	-				300
36	Electric Tape	-				130
37	R.J45 Connector	-				600
38	TOTAL					**113,839**

CCTV DEPZ FACTORY				
SL/No	Description of Goods (Sreepur Factory)	Qty	Unit price	Amount
01.	64 CH 4K H.265 Network Video Recorder (NVR) (NVR- Support Up to 12MP) Model: NVR 5832-4K Brand: Dahua, Origin : China	01 No.	86,000.00	86,000.00
02.	HDD 6 TB. Brand: Seagate *For 60 Days Backup.	08 Nos.	24,000.00	192,000.00
03.	32'' LED TV Sony	01 Nos.	36,000.00	36,000.00
04.	2 Megapixel HD Network IR-Bullet/Dome DH- IPC-HFW-1220SP/ IPC-HDW1220SP Brand: DAHUA, MADE IN CHINA Lens: 3.6mm fixed lens (6mm, 8mm option,	64 Nos.	5,000.00	3,20,000.00
05.	16-Port PoE Gigabit Switch Brand: Tenda Model: TEF-1218P Made In China.	04 Nos.	17,000.00	68,000.00
06	Miscellaneous, Fitting and channel and UTP cable Rosenberg	8 Box		2,88,000.00
	GRAND TOTAL			**990,000.00**

ISP BANDWIDTH - SOFTEX SWEATER INDUSTRIES (PVT.) Ltd.			
SL	Branch Name	New B/W	New B/W
1	SOFTEX SWEATER INDUSTRIES (PVT.) Ltd. Factory (DEPZ)	15360 Kbps FDX	51200 Kbps FDX
2	SOFTEX SWEATER INDUSTRIES (PVT.) Ltd. (Sreepur)	6144 Kbps FDX	10240 Kbps FDX
3	SOFTEX SWEATER INDUSTRIES (PVT.) Ltd. (Head Office)	15360 Kbps FDX	20480 Kbps FDX
	TOTAL	**26,325**	**26,325**

S/L	PARTICULAR	COST
1.	CCTV SREEPUR	512,250
2.	CCTV DEPZ	990,000
3.	LAN HEAD OFFICE	43,893
4.	LAN DEPZ	113,839
5.	INTERNET BANDWITH	AS PREVIOUS
	GRAND TOTAL	**1,659,982**

Chapter 4

4. Methodology

The methodology used in this internship project was meticulously structured to ensure a systematic and efficient approach to the design and deployment of the network infrastructure for Softex Sweater Industries (Pvt.) Ltd. This methodology encompassed a mixture of internal and external data sources, using both primary and secondary research techniques. Here Primary data collection was achieved with structed interviews with stake holders, site visitation, employee survey, and the secondary method of data collections was visitation to Kung Keng Textile Bangladesh Co. Ltd, YKK Bangladesh, to understand and learn from their approaches when establishing a network infrastructure for a large-scale company.

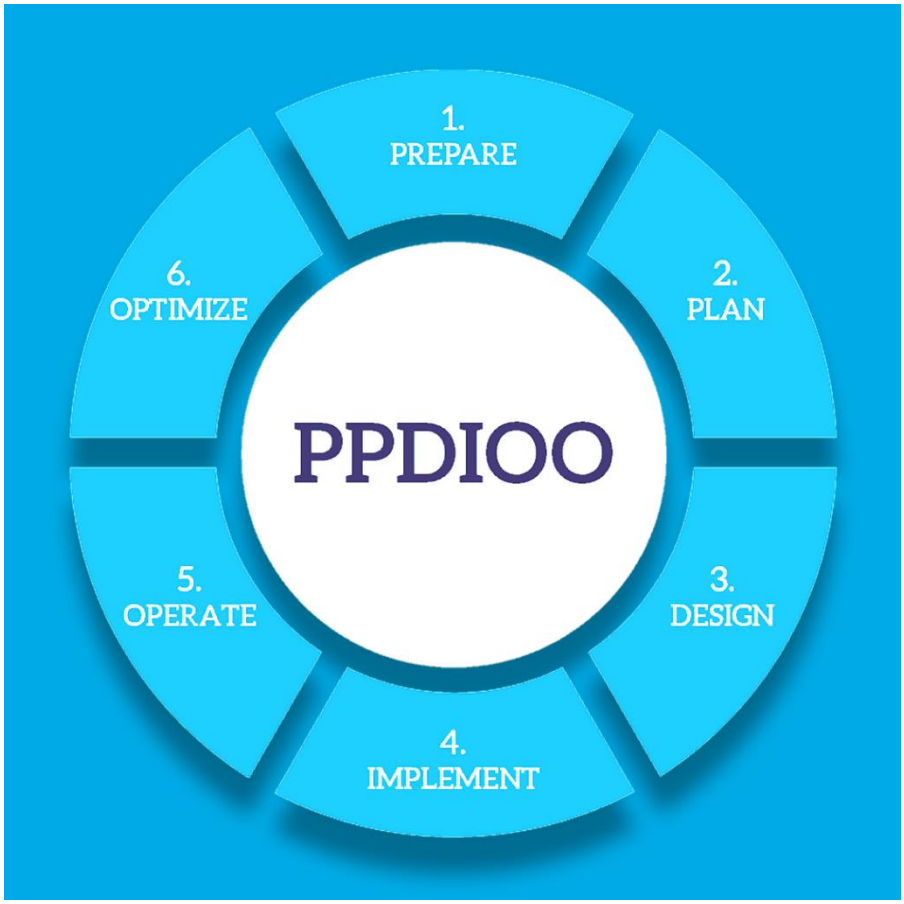

Figure 5: PPDIOO Cycle of a network

We also took inspiration from Cisco's PPDIOO methodology [1], a comprehensive framework reflecting the lifecycle of a network, to shape our network design approach for this project. The network creation process is thoughtfully segmented into six distinct phases within this lifecycle strategy, presenting several notable advantages, including:

Enhanced Network Availability: Elevating the reliability and accessibility of the network. Cost Optimization: Lowering the overall cost associated with network ownership, a critical consideration in today's business landscape. Accelerated Service Access: Speeding up access to essential applications and services.

Heightened Business Agility: Enabling the organization to adapt swiftly to changing demands and opportunities. In contemporary corporate environments, the total cost of network ownership holds tremendous significance. Business leaders are continually exploring avenues to curtail IT-related expenses. Additionally, maintaining high network availability remains a top priority, as it directly impacts revenue generation. Network disruptions can result in substantial financial losses. Furthermore, in a productive work environment, seamless access to network applications and services is imperative. Thus, the network lifecycle serves as an accelerator, facilitating rapid access to these critical components.

This methodology encompasses six distinct phases, each playing a pivotal role in the network's lifecycle:

Prepare: This phase entails defining the organizational needs, formulating a network strategy, and conceptualizing a high-level architecture that identifies the most suitable technologies to support this design. Additionally, it assesses the business viability of the network strategy by examining the business case for the proposed architecture.

Plan: In the planning phase, we identify initial network requirements based on our objectives, facilities, user requirements, and other factors. We also perform a comprehensive site characterization and evaluate any existing networks. This involves conducting a gap analysis to determine if the current system infrastructure, sites, and operational environment can effectively support our proposed system. We develop a project plan that assists in managing tasks, responsibilities, critical milestones, and

resource allocation necessary for implementing network changes.

This project plan aligns closely with the scope, cost, and resource parameters established in our original business requirements.

Design: The design phase is driven by the initial requirements outlined during the planning stage. This design specification forms the foundation for our implementation activities.

Implement: During the implementation phase, we re-constructed the network to integrate additional components according to the design specifications.

Operate: This phase represents the ultimate test of the design's suitability. It involves day-to-day network operations, ensuring high availability while optimizing costs. Activities such as fault detection, correction, and performance monitoring are conducted as part of routine operations, providing initial data for the optimization phase.

Optimize: Proactive network management is the focus during the optimization phase. Our aim is to identify and address issues before they impact our organization. While proactive management is the preferred approach, reactive fault detection and correction (troubleshooting) are essential when unforeseen failures occur. In the PPDIOO process, the optimization phase may even trigger a network redesign if persistent network problems, performance shortfalls, or new application requirements emerge, aligning with our organizational and technical needs.
These phases are carefully orchestrated to ensure a holistic and efficient approach to network design and deployment, aligning perfectly with our project's objectives and the evolving needs of Softex Sweater Industries (Pvt.) Ltd.

Chapter 5

5. Body of the Project

5.1 Work Description

Softex Sweater Industries (Pvt.) Ltd. specializes in the design and manufacturing of the highest quality knitted sweaters for several global brand buyers such as Peek & Cloppenburg, Promod, CAMAIEU, INDITEX & ETAM. Our high-tech machinery, imported from Germany and China, was particularly selected and our workforce highly trained to meet the ever-changing needs of today's apparel buyers. We specialize in fine gauge, intarsia and jacquard sweaters. The company's management is amply equipped with a multitude of trained specialists, enabling our customers to get hands-on service with production details. Customers can enjoy the benefit of having industry leading expertise that fits their needs in terms of price and performance.

My project was to lay foundation to the companies networking system, which enabled all managerial and non-managerial employees to share data from computers systems for collaborative work, email correspondence, inspection report submission, attendance submission, presentation submission, online conference.

Separately I have been responsible installation and setup of 94 (64+27+3) IPTV CCTV camera with 2 NVR and other associated systems. My project responsibility was to supervise, construct, training and configure both systems, on server and user end.

5.2 Requirement Analysis

The Primary requirements of this project are listed below:

1. **Network File Sharing:** Enable secure and efficient sharing of files among employees to enhance collaboration and data accessibility.

2. **Collaborative Work:** Facilitate seamless collaboration through shared document.

3. **Network Printer:** Implement networked printing solutions for centralized access to printers, optimizing resource utilization and ease of use.

4. **Conferencing:** enabling the employee to support virtual meetings, enhancing communication and reducing the need for physical presence.

5. **Wireless Connectivity:** Ensure comprehensive and robust Wi-Fi coverage to provide uninterrupted wireless access for employees and guests within the organization.

6. **CCTV Surveillance for Monitoring:** Deploy surveillance cameras for real-time monitoring of critical areas, enhancing security and incident prevention.

7. **CCTV Surveillance for Inspection:** Store and manage surveillance data for inspection and investigation purposes, complying with BEPZA regulatory requirements.

8. **Online File Submission:** Allow the employee to submit large files electronical by profile stable and fast network.

5.2.1 Rich Picture

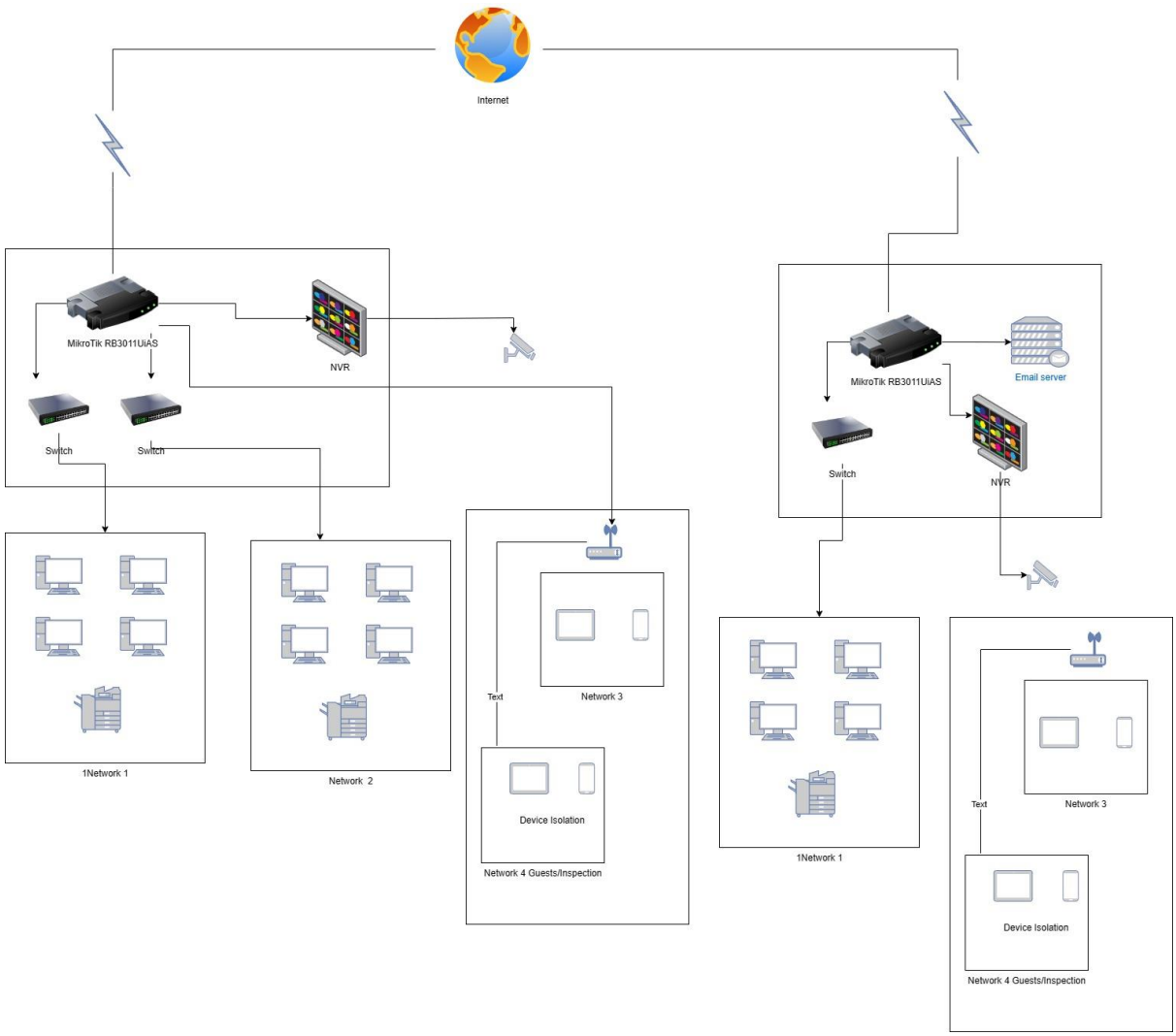

Figure 6: Rich Picture of the Networking System

5.2.2 Functional and Non-Functional Requirements

Functional Requirements:

Network Connectivity: The network must provide reliable connectivity between the company's head office, factory locations, and remote offices.

Data Sharing: The network should facilitate seamless data sharing and communication among employees across different locations.

Internet Access: Ensure high-speed and uninterrupted internet access for day-to-day operations, including online communication and research.

CCTV Integration: Integrate CCTV cameras into the network for surveillance and security monitoring.

Access Control: Implement an access control system to restrict physical and digital access to sensitive areas and data.

Email System: Deploy a local email server to enhance internal communication efficiency.

Scalability: The network should be designed to accommodate future expansion, including additional users, devices, and locations.

Non-Functional Requirements:

Security: Implement robust security measures to protect the network infrastructure and sensitive data.

Scalability: Design the network to be scalable to accommodate future growth and technological advancements.

Reliability: Ensure high availability and reliability of network services to minimize downtime.
Performance: The network should offer optimal performance, especially for critical applications.

Usability: The network infrastructure should be user-friendly, with intuitive interfaces and clear documentation.

Compliance: Adhere to industry-specific regulations and compliance standards regarding data security and privacy.

Response Time: Define acceptable response times for network operations and monitor and optimize accordingly.

Interoperability: Ensure that network components and software systems can seamlessly work together.

Training: Provide training to staff for efficient operation and maintenance of the network.

Documentation: Maintain comprehensive documentation for network configuration and troubleshooting.

Cost-Effectiveness: Strive for a cost-effective solution that aligns with the project budget and provides value for money.

5.3 System Analysis

5.3.1 Six Element Analysis

Process	System Roles					
	Human	**Non-Computing Hardware**	**Computing Hardware**	**Software/ System**	**Database**	**Network and Communication**
1. Sending and Receiving Email	**Office Employees:** In order to have a smooth communication of official affairs.	Monitor, Mouse, Keyboard etc.	Desktop, Laptops or smartphones.	Internet Browsers or Microsoft Outlook.	Zimbra mail server Database.	Internet Connection.
2. Using Microsoft Excel and Power point	**Office Employees:** In order to do various official works.	Monitor, Mouse, Keyboard etc.	Desktop, Laptops or smartphones.	Microsoft Excel and PowerPoint .	None	None
3. Using google Docs	**Office Employees:** In order to do various official works.	Monitor, Mouse, Keyboard etc.	Desktop, Laptops or smartphones.	Internet Browsers, Google chrome, Firefox Microsoft Edge.	None	Internet Connection.
4. Share and collaborate work on documents via private LAN	**Office Employees:** In order to do various official works.	Monitor, Mouse, Keyboard etc.	Desktop, Laptops or smartphones.	Windows operating system.	None	Local Area Network (LAN).
5. Live View	**Managerial Employees:** Login to the SmartPSS app, select live, drag and drop the camera.	Monitor, Mouse, Keyboard etc.	Desktop, Laptops or smartphones.	Internet Browsers, SmartPSS app, Windows operating system.	Network video recorder (NVR).	Internet Connection.
6. Playback and export CCTV Videos	**Managerial Employees:** Log in, click playback, select time date, record and export clip.	Monitor, Mouse, Keyboard etc.	Desktop, Laptops or smartphones.	Internet Browsers, SmartPSS app, Windows operating system.	Network video recorder (NVR).	Internet Connection.
7. Use Browser	**Commercial Executives:** Visit export-oriented sites, fill up forms, download	Monitor, Mouse, Keyboard etc.	Desktop, Laptops or smartphones.	Internet Browsers, Google chrome, Firefox	None	Internet Connection.

	documents, leave applications.			Microsoft Edge.		
8. Manage employee record with BEPZA	**HR:** Open app, Login, and Operate	Monitor, Mouse, Keyboard etc.	Desktop, Laptops or smartphones.	Internet Browsers, Google chrome, Firefox Microsoft Edge.	BEPZA database	Internet Connection.
9. Network Printer	**User: Send** Print Document	Monitor, Mouse, Keyboard etc.	Desktop, Laptops or smartphones.	Windows OS	PC	Local Area Network (LAN).

5.3.2 Feasibility Analysis

A feasibility study serves as a critical assessment of various aspects of a project, shedding light on how these aspects can contribute to its development and revealing potential challenges along the way. To comprehensively gauge the feasibility of constructing an organizational network, specifically a Campus network, we meticulously examined several key feasibility factors [2].

Operational Feasibility:

Operational feasibility hinges on the project's ability to fulfill all its requirements and maintain successful operation once the network is established. In our case, this criterion was met exceptionally well. The project's design and construction were executed seamlessly, resulting in a robust network infrastructure with fast internet connectivity. This enhancement significantly boosted overall operational efficiency.

Technical Feasibility:

Technical feasibility delves into the assessment of available resources, encompassing hardware, software, and essential technologies. This evaluation ensures the project's technical viability by scrutinizing the capability of managing the various technical components efficiently.

Our project primarily relied on critical networking hardware such as routers, switches, UTP, and Fiber cables. Notably, the quality of these components was of paramount importance, and our meticulous selection of high-quality hardware, including 4-core optic fibers and Cisco routers and switches, ensured the network's technical feasibility.

Economic Feasibility:

Economic feasibility centers on analyzing the project's cost-benefit equation. This facet evaluates the financial implications of surveying, construction, and configuration processes, determining whether the project aligns with economic feasibility. Given the project's substantial scope, we diligently conducted budget negotiations with SBL, meticulously considering the company's profit margins. These efforts resulted in a project that was not only technically sound but also economically feasible.

Scheduling Feasibility:

Scheduling feasibility revolves around evaluating the project's timeline to ensure timely completion. Meeting project deadlines is crucial for its success. Our project was originally slated for completion within four months, and we are pleased to report that our team exceeded expectations by delivering the network well ahead of schedule.

In summary, the comprehensive analysis of these feasibility factors underscores the favorable conditions for initiating the network construction project. It highlights that the project aligns with operational, technical, economic, and scheduling feasibility, positioning it for success in enhancing Softex Sweater Industries' network infrastructure.

5.3.3 Problem Solution Analysis

This section delves into the comprehensive identification, examination, and strategic resolution of various pressing issues. The following challenges were discerned during the analysis:

Inadequate Internet Connectivity: Robust and uninterrupted internet access is essential for efficient office operations, necessitating the provision of requisite internet speeds.

Establishing a Stable Network: The creation of a reliable and consistent network infrastructure is imperative to ensure seamless workflow within the office. Enhancing **Security Measures:** File security systems is paramount to safeguard sensitive data and operations.

Inadequate Power Backup: In light of Bangladesh's frequent power cuts and load shedding, addressing power backup inadequacies is crucial to prevent disruptions during working hours.

To address these challenges effectively, the following solutions were formulated:
Mitigating Poor Internet Connectivity: The implementation of a 70 Mbps fiber connection within the factory and office infrastructure will significantly enhance internet speed, fostering a smoother and more efficient work environment a redundant connection was maintained to ensure maximum network uptime.

Establishing a Stable Connection: To further optimize the working experience, new desktop configurations equipped with the latest software systems have been deployed, enhancing connectivity through LAN connections and Wi-Fi connection. Along with BDIX connectivity.

Strengthening Security Measures: Advanced firewall systems have been introduced, complemented by the integration of cutting-edge security software to fortify the overall security framework un authorized access to website and social media was also restricted.

Addressing Power Backup Shortcomings: All desktops have been equipped with backup power support, providing up to 15 mins of uninterrupted operation courtesy of 650va UPS for individual computer, backing that with the Factory generator and Online IPS resulting in uninterrupted power supply.

These comprehensive solutions were designed to not only address the identified challenges but also elevate the network infrastructure at Softex Sweater Industries (Pvt.) Ltd., ensuring its resilience, efficiency, and security in alignment with the project's objectives.

Surveillance System: Both the factories were equipped with surveillance system that contributes to added security for the company’s premises and also contribute to compliance requirements.

5.3.4 Effect and Constraints Analysis

Our network infrastructure project for Softex Sweater Industries (Pvt.) Ltd. will significantly enhance the productivity and operational quality of the organization. The innovative technical solutions we have introduced will empower Softex Sweater Industries (Pvt.) Ltd. by providing a flexible and promising framework for its operations. Softex Sweater Industries (Pvt.) Ltd. is a prominent player in the industry, and our project aims to elevate its technological standards. As a renowned entity, Softex Sweater Industries is poised to benefit greatly from the network infrastructure implementation. The utilization of high-speed fiber internet connections will serve as a substantial asset, greatly enhancing communication and overall work efficiency.

This project is tailored to align with the specific needs and aspirations of Softex Sweater Industries, ensuring a seamless integration of advanced technology to support and augment its business operations.

5.4 System Design

5.4.1 Network Topology

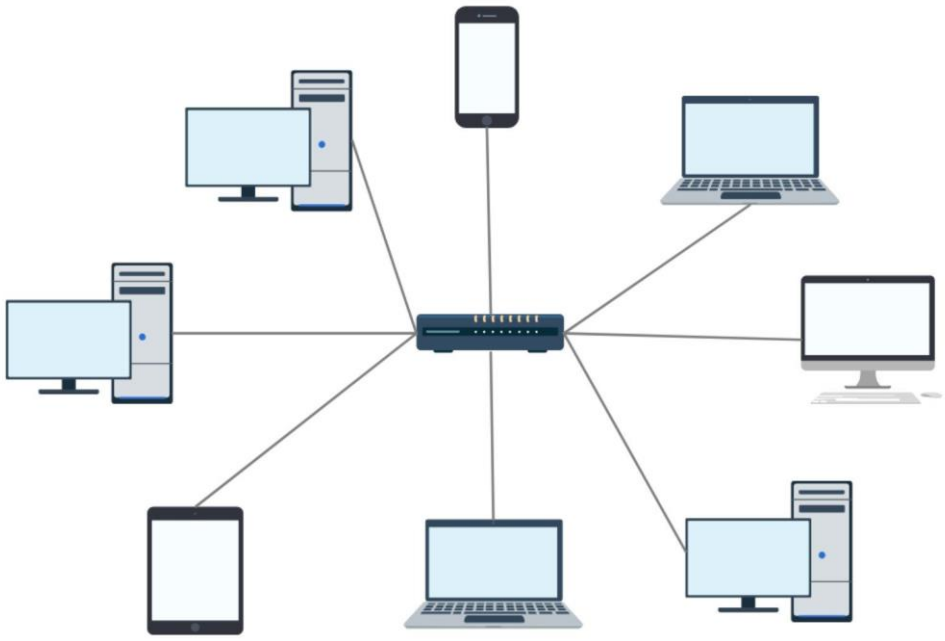

Figure 7: Star Topology used for Softex Sweater Industries (Pvt.) Ltd.

A Star topology [3] was used for the company

In Softex Sweater Industries (Pvt.) Ltd., the majority of departments feature a setup comprising 8-10 desktop computers interconnected through a Local Area Network (LAN). This network structure, depicted in Figure 5.4, incorporates Virtual LANs (VLANs) facilitated by dedicated switches. There eight departments in DEPZ Factory and Sreepur, with two departments located in Head Office-Gushan-2. Totaling to a 50 Computer network setup. Additionally with ninety-four CCTV IP Surveillance Systems requirements. The networks were created sperate and no overlapping was allowed. The networks for IP cameras and other devices were completely separate.

To ensure efficient IP address management and internet connectivity, Dynamic Host Configuration Protocol (DHCP) is utilized. In certain requirements the DHCP server was turned off to add a layer of security for trespassers. Routers are configured to provide IP addresses through DHCP, along with Network Address Translation (NAT) settings that enable other devices to access the internet seamlessly. This architecture caters to the specific networking needs of the organization.

5.4.2 Architecture

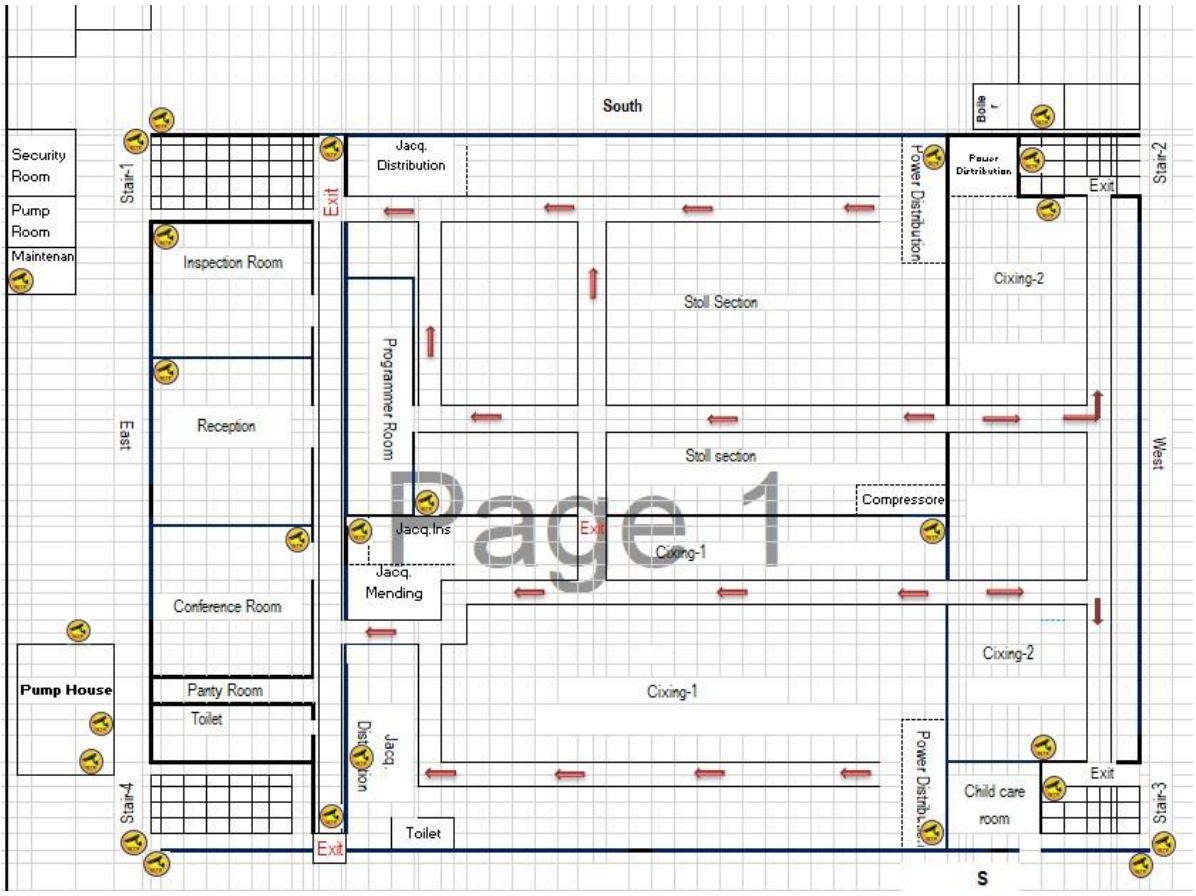

Figure 9: CCTV layout for DEPZ Factory Ground Floor

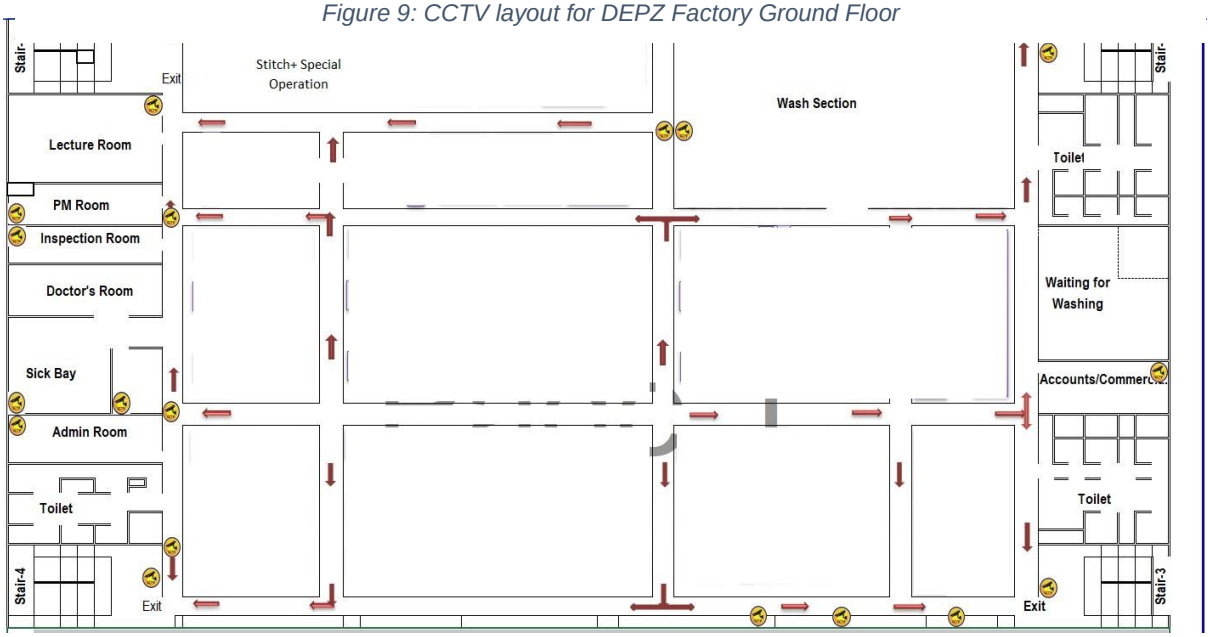

Figure 8: CCTV layout for DEPZ Factory First Floor

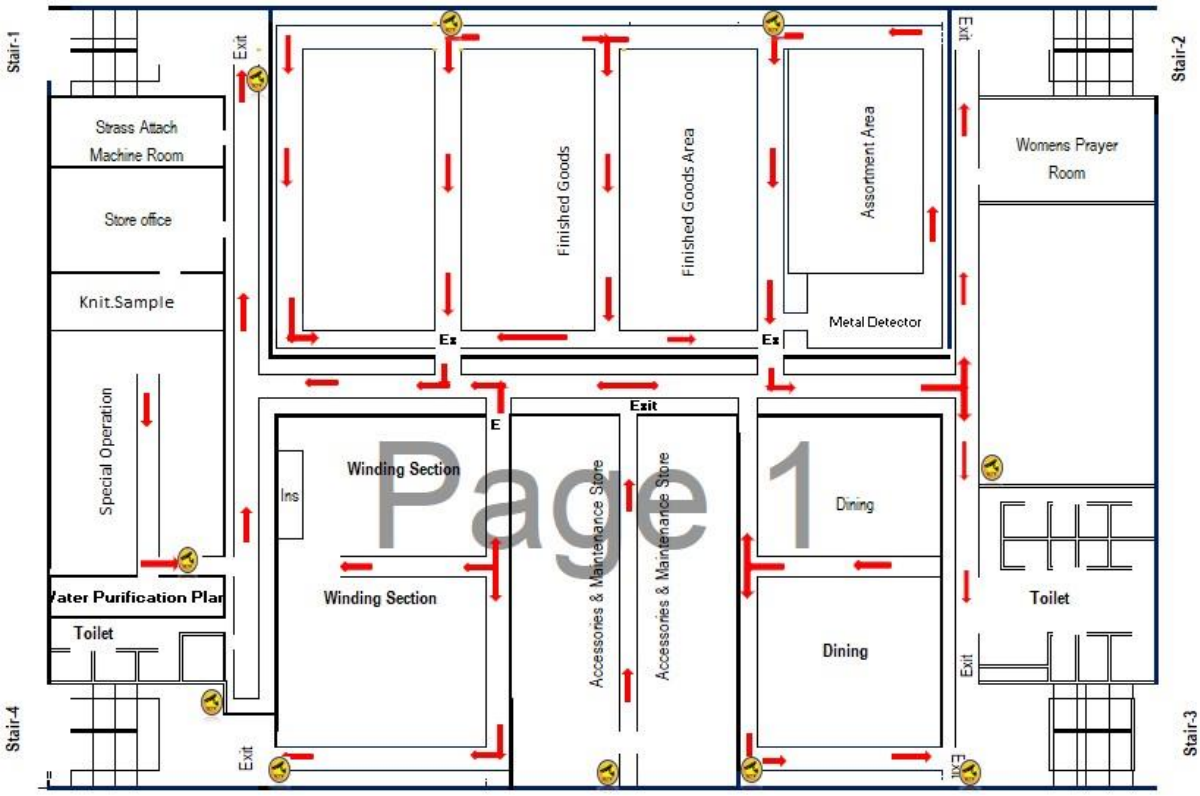

Figure 10: CCTV layout for DEPZ Factory Second Floor



Figure 11: CCTV layout for DEPZ Factory Third Floor

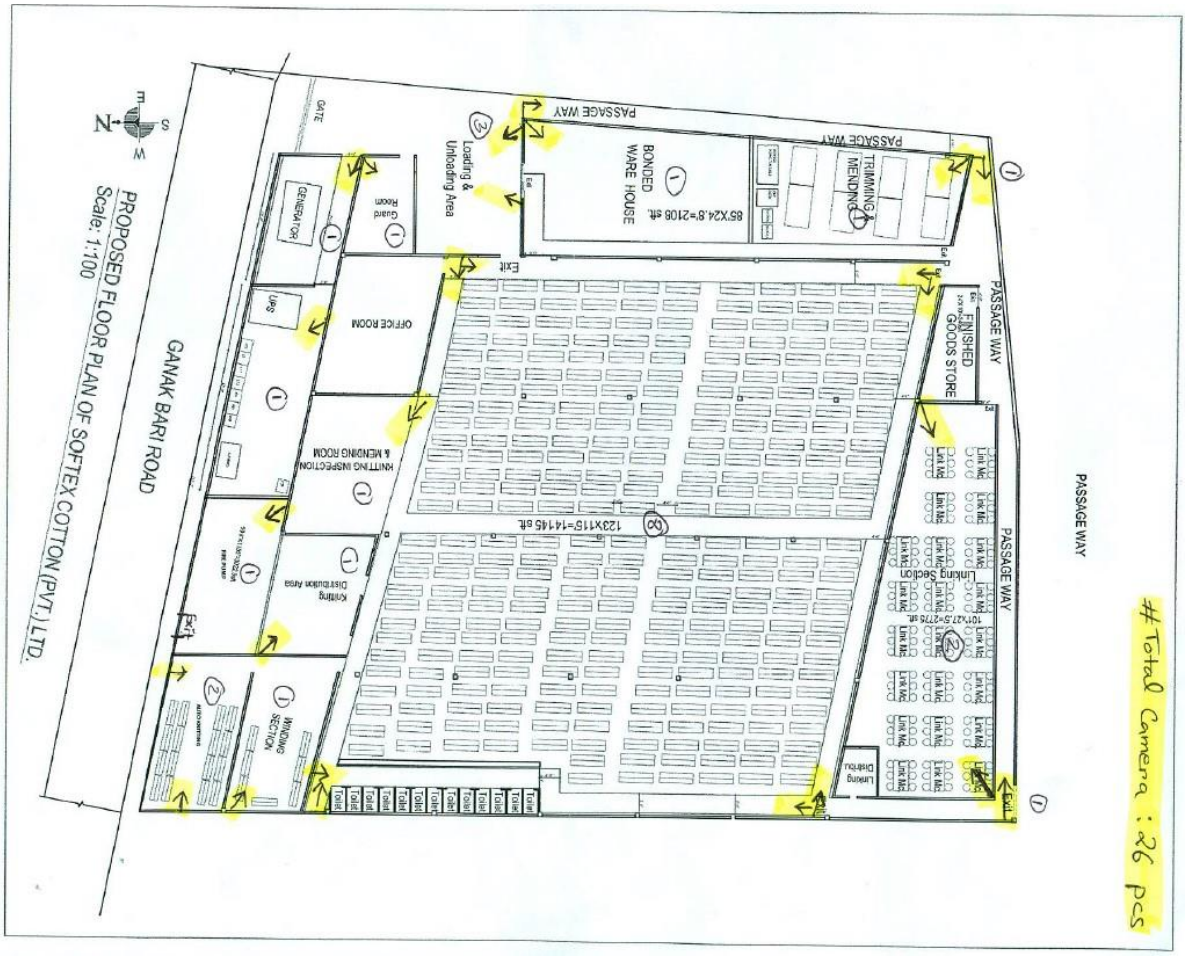

Figure 12: CCTV layout for Sreepur Factory

The architecture for the networking system is similar to the rich picture provided, with 94 IP CCTV Cameras 3 NVR, 70 computer and Mobile devices, 7 network printers. The ideology of the structure was intact. While keeping all guest devices outside of the company network. With two wired networks in DEPZ premises with and five different wireless network separating inspection and guest with the office employee or staff members. Dealing with data security and network breach with the utmost importance. The structure for the network infrastructure will be explained below.

The calculation of the maximum network capacity was based on determining the optimal number of nodes that can be accommodated within the office rooms for wired connections. Additionally, for wireless connectivity, the implementation of mesh routers was planned to ensure a seamless wireless network experience. This forward-looking approach to infrastructure implementation anticipates potential future expansion, and it is reassuring to note that we have already factored in the maximum number of nodes into our design.

While project requirements can be expansive, it's crucial to strike a balance between scalability and budget constraints. The possibility of future company growth may necessitate additional investment in routers and more intricate network development. Therefore, the selection of networking devices and products was meticulously considered, taking into account both financial limitations and the feasibility of achieving a valuable return on investment (ROI) [4].

IP Protocols used for communication were TCP/IP Protocol, BGP, OSPF, RIP, ARP, DCHP, DNS, Firewall rules etc. [5]

5.5 Implementation

In the implementation phase, the architecture of our networking system mirrors the rich picture provided on a much larger scale. We've successfully integrated 94 IP CCTV cameras, 3 NVRs, 70 computers and mobile devices, and 7 network printers into the network. Our core principle has been to maintain the integrity of the network structure while securely isolating all guest devices from the company network.

Within the DEPZ premises, we've established two separate wired networks and five distinct wireless networks. This segmentation efficiently separates inspection processes from guest access and the office employee or staff members, ensuring enhanced data security and a robust defense against network breaches.

In the upcoming sections, we will delve into a detailed explanation of the network infrastructure structure, covering key elements, configurations, and security measures to provide a comprehensive understanding of our implementation strategy.

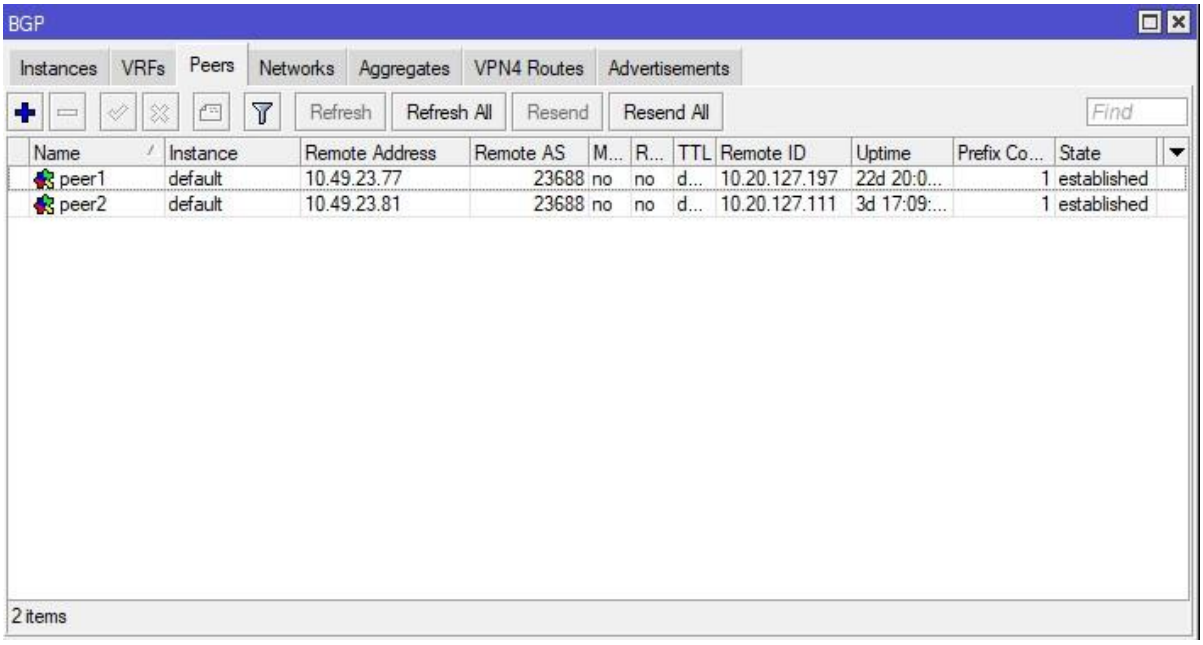

Figure 13: The BGP Peer Connection

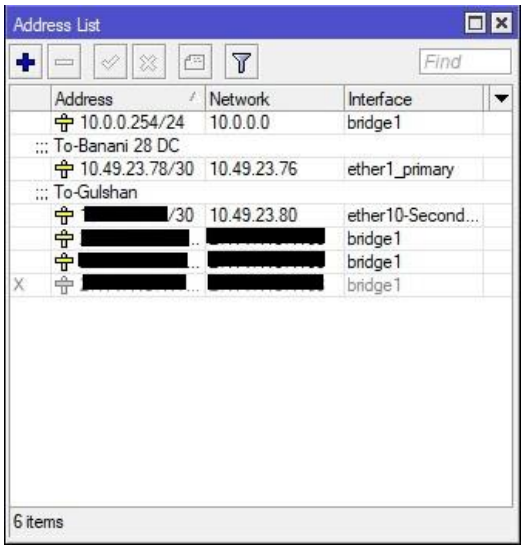

Figure 15:Address List for Head Office

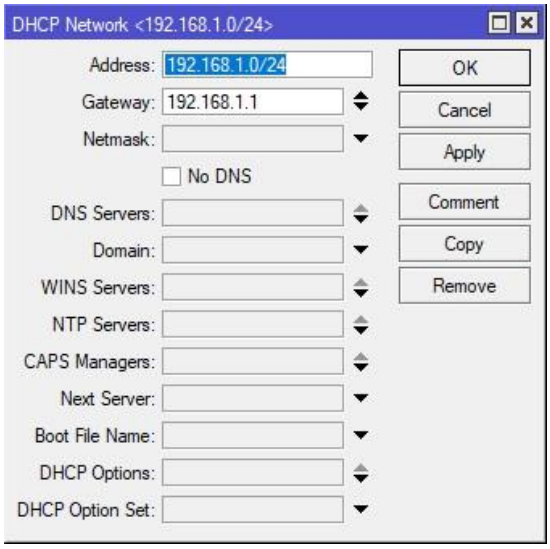

Figure 14: DHCP Server for one network:

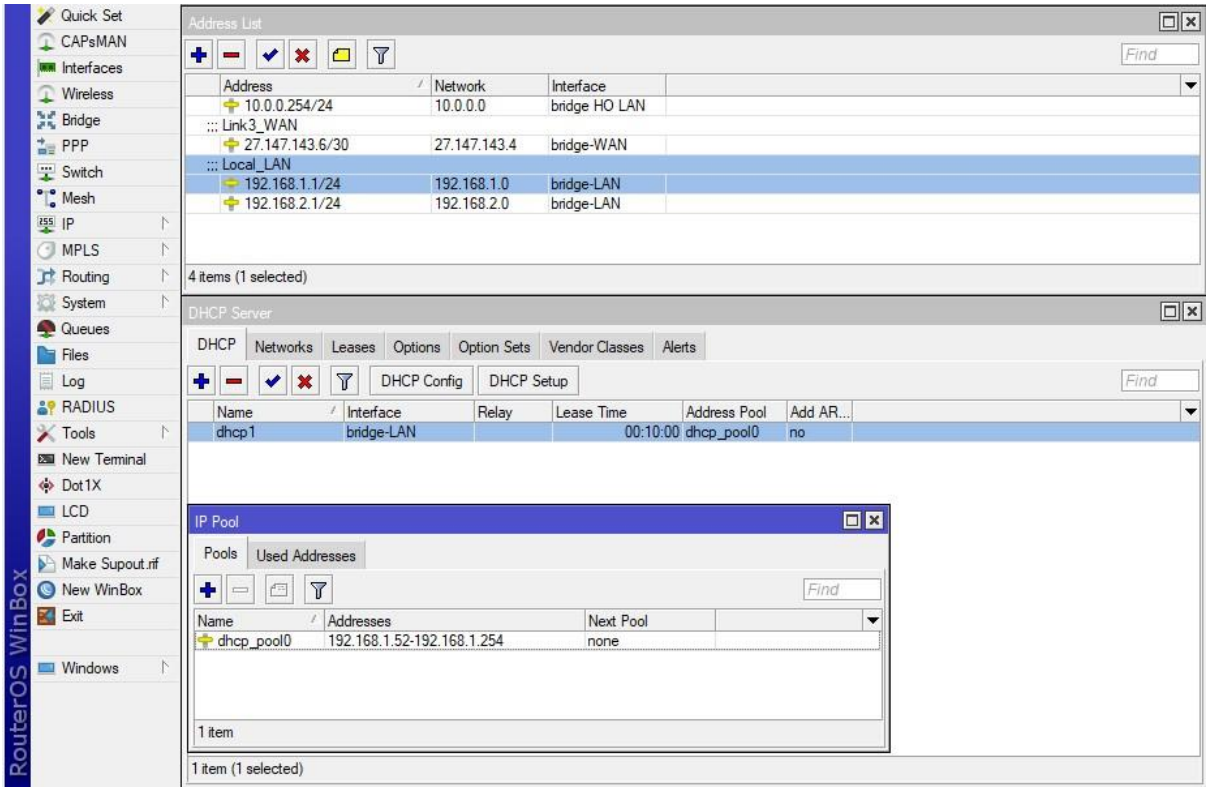

Figure 16: Address List, DHCP and DHC server Pool Setup

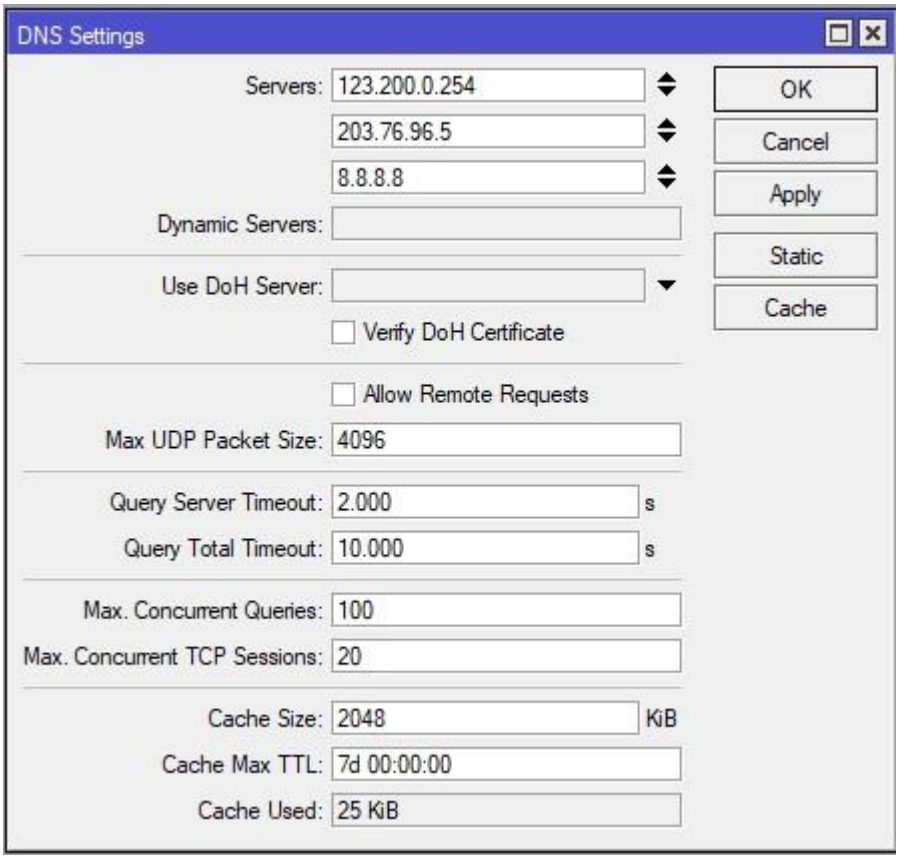

Figure 17: DNS Setup

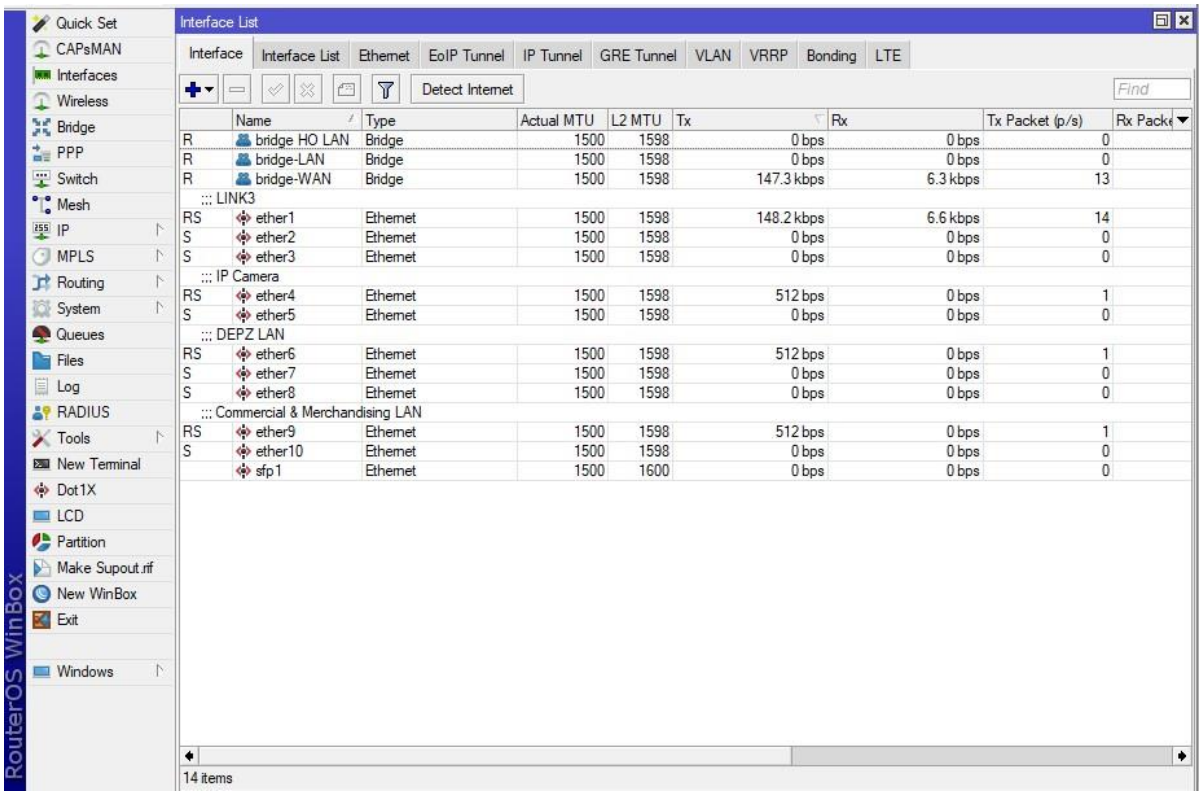

Figure 18: Interface Setup

The CCTV Surveillance NVR was first assembled, and all 14 drives were installed in the respective NVR, after the NVR was installed. Each an every camera was manually configured an initialized for the first time assigning static IP for each camera and password respectively. With the setup of the NVR the devices were connected and tested

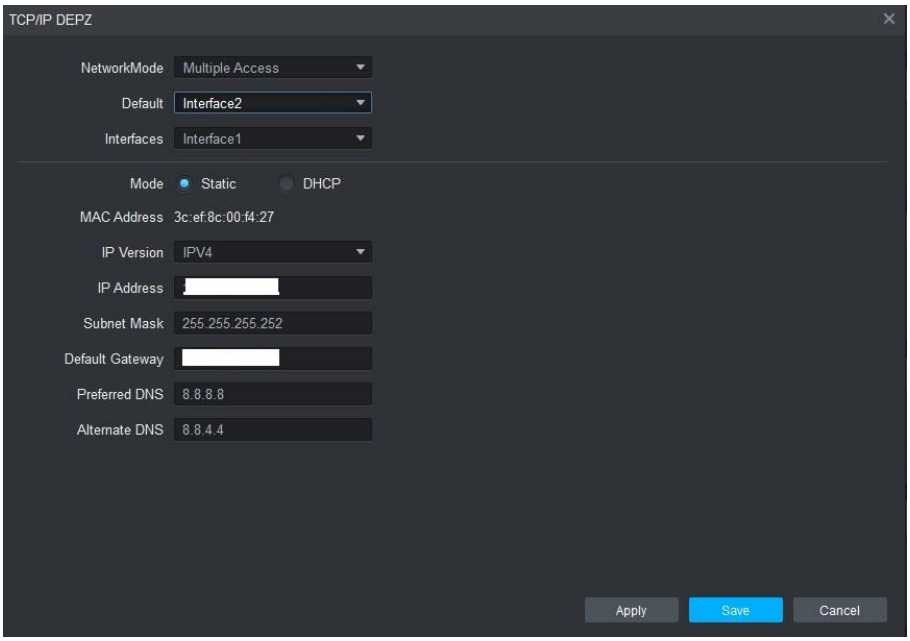

Figure 19: Interface 1 NVR

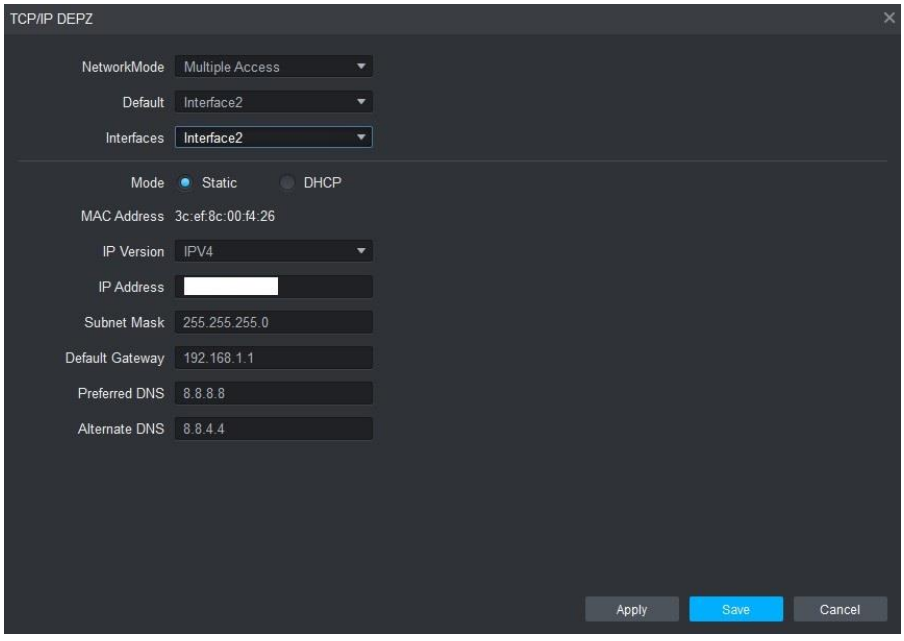

Figure 20: Interface 2 NVR for IP Block

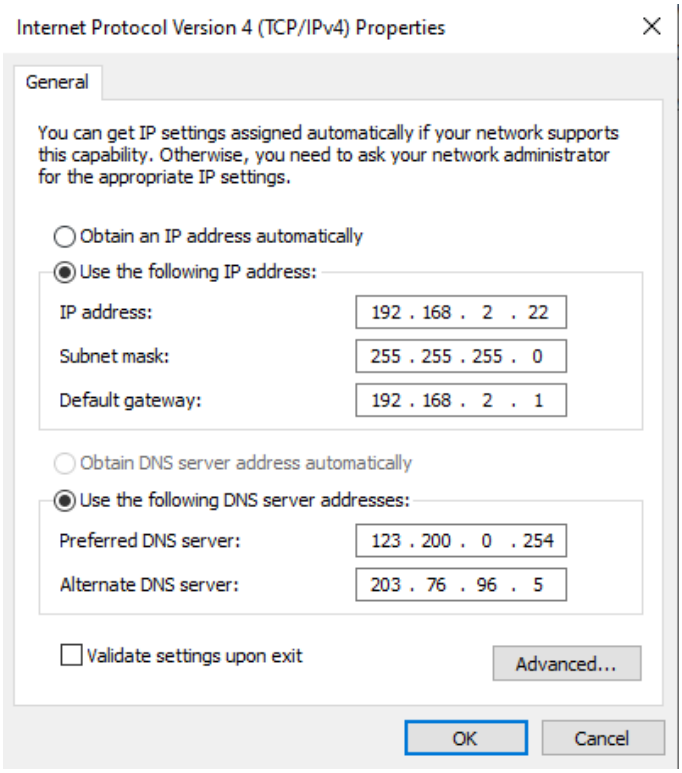

Figure 21: Every Computer with Static Configuration with Manual IP

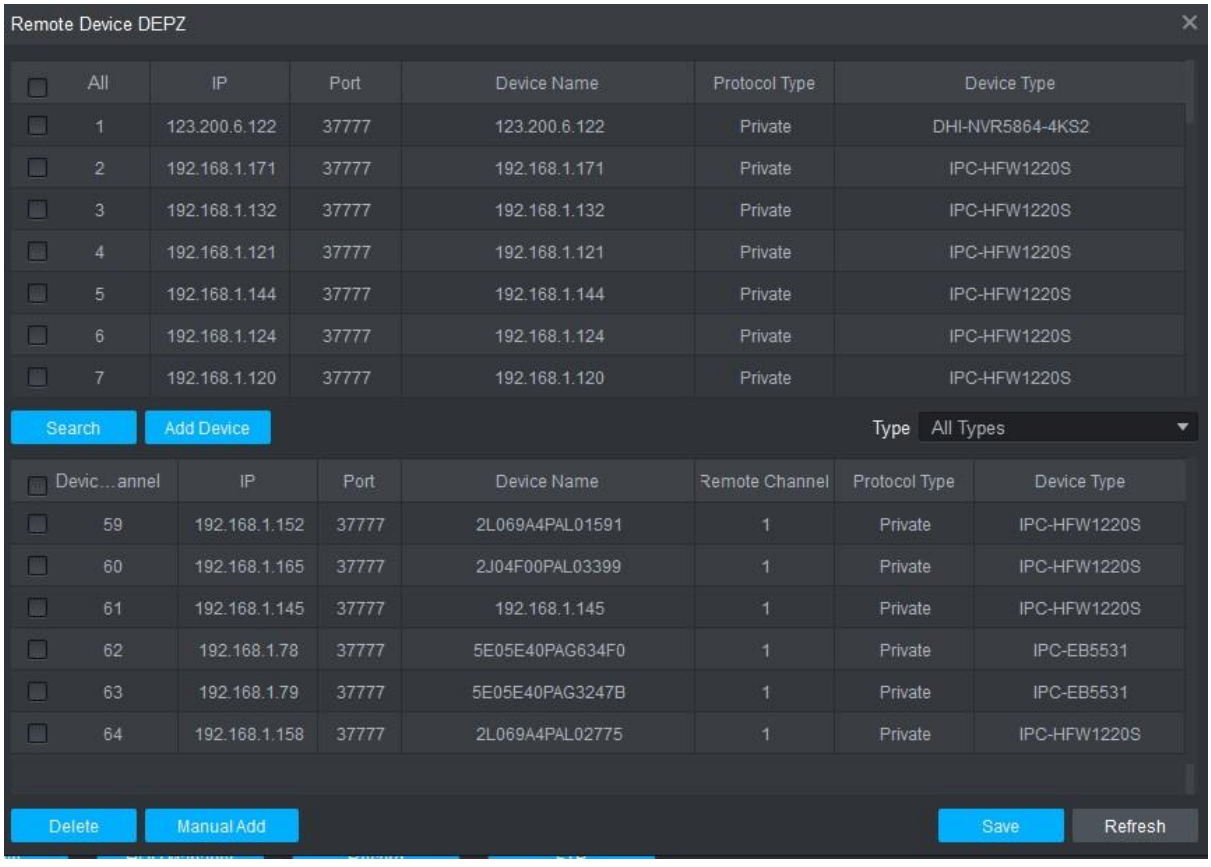

Figure 22: Remote Configuration

5.6 Testing & Output

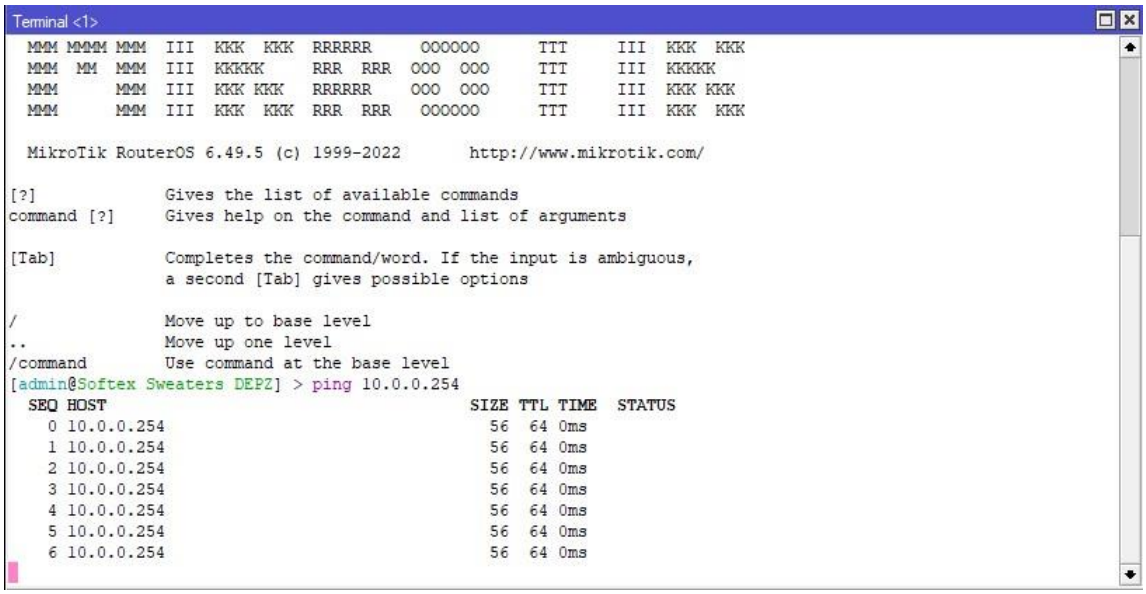

Figure 24: Ping Test



Figure 23:Ping Test Cross Department

5.6.1 Test Results

The network connectivity operates seamlessly, as evidenced by the successful ping tests conducted between the two PCs and Timeout between Cross departmental ping, as illustrated in Figure 23 and Figure 24. This affirms the effective configuration and connectivity of the network.

Chapter 6

6. Results & Analysis

The Network Infrastructure Design & Deployment project at Softex Sweater Industries (Pvt.) Ltd. has brought about substantial enhancements in the company's technological framework. In this section, we will delve into the project's outcomes and its impact on Softex Sweater Industries' operational landscape.

This comprehensive networking project along with CCTV IP Surveillance System encompassed the procurement and implementation of technical equipment, aiming to elevate the organization's technological capabilities. In alignment with the project's objectives, our dedicated IT and maintenance team, successfully established a robust network infrastructure, fostering a conducive working environment within Softex Sweater Industries (Pvt.) Ltd. This technological advancement addresses previous resource constraints within the organization, notably in terms of stability and availability of network uptime. The integration of high-speed fiber internet connectivity has greatly enhanced operational efficiency, particularly in tasks involving data entry and information processing. The CCTV surveillance system has allowed an extra layer of security, to be implemented while inspecting problematic situation that arises within the industry with worker or employees. This also allowed mangers and head of departments to closely monitor and track shipments from different locations.

The project's completion heralds a new era for Softex Sweater Industries (Pvt.) Ltd. marked by improved internal communication among employees and cost-effective operations. Furthermore, the company is now better equipped to collect and report data efficiently, positioning itself as a technologically advanced entity in its industry. This transformation will not only benefit Softex but also contribute to inspire IT development in industries.

To summaries the achieved goals through this project are:

1. Network Infrastructure Reinforcement.
2. A reliable and robust intra office network.
3. Improved data sharing.
4. High speed transmission.
5. Employee satisfaction.
6. Increase Efficiency.
7. Individual Bandwidth Control.
8. Future Readiness for scalability and infrastructure adaptation.
9. The budget Adherence well within limit.
10. Integration with existing systems.

In conclusion, our project has yielded significant positive outcomes for Softex Sweater Industries (Pvt.) Ltd. By enhancing the network infrastructure, introducing advanced technology, empowering employees, and ensuring future readiness, we have not only met the project's objectives but also positioned the organization for sustained success in an increasingly digital world. The cost-effective nature of the project further underscores its value to the company.

Chapter 7

7. Project as Engineering Problem Analysis

7.1 Sustainability of the Project/Work

When considering the long-term viability of our project, several crucial factors come into play. Sustainability, in this context, pertains to the project's ability to be maintained and improved over time. To ensure the success of our project, it's imperative to grasp the principles of sustainability and formulate an appropriate plan.

The sustainability of our project can be categorized into three integral components:

a. **Operational Sustainability:** Operational sustainability centers around how effectively the end-users, in our case, the staff at Softex Sweater Industries (Pvt.) Ltd., can support the long-term viability of our network. Our project's sustainability hinges on our ability to ensure reliable network services and proficiently utilize the technological infrastructure at hand.

b. **Financial Sustainability:** Our project's financial sustainability is a paramount consideration. It's essential that the costs associated with constructing and maintaining the network are not only covered but also contributes into generating a profit as without proper networking and internet services the scalability of the company’s operation is impossible.

c. **Organizational Sustainability:** Our company places significant emphasis on continually enhancing our services. This is made possible through our dedicated employees who continuously seek to enhance their networking knowledge and skills. This strategic approach equips us to effectively address unique challenges in our industry and maintain a competitive edge.

In conclusion, our project's sustainability is underpinned by its operational, financial, and organizational aspects. By addressing these components, we ensure that the project remains robust, profitable, and poised for long-term success at Softex Sweater Industries (Pvt.) Ltd. The new network infrastructure will greatly enable the company growth and efficiency.

7.2 Social and Environmental Effects and Analysis

Networking plays an indispensable role in modern society, touching various aspects of our daily lives. It's the backbone of functionality for businesses, corporate offices, banks, educational institutions, and even many households. Given its pivotal role in technology, any project initiated by our organization carries significant social and environmental implications. Without Internet business operation is unimaginable.

Our Network Infrastructure Design & Deployment project at Softex Sweater Industries (Pvt.) Ltd. represents a substantial enhancement to their technological framework. This improvement doesn't just benefit the company's workforce but also has a broader impact on the office staff members and employee.

a. **Social Impact:** Our project has a positive social effect on Softex Sweater Industries' employees. It simplifies and enhances daily work processes, facilitating seamless communication among offices located in different regions. This, in turn, improves the efficiency of information sharing. Crucially, it ensures greater accuracy in data sharing, which ultimately benefits the company's customers.

b. **Environmental Impact:** Networking initiatives can sometimes have adverse effects on the environment. In our project, we employed approximately 4575 meters of concealed UTP cat6 cables, which will not contribute to visual pollution. Given the absence of an underground optic fiber cable system in Bangladesh, electric poles were used, posing the risk of fires and, consequently, air pollution.

In summary, our network infrastructure project along with CCTV Surveillance System not only empowers Softex Sweater Industries (Pvt.) Ltd. but also has significant social and environmental implications that underscore the importance of responsible technological advancements.

7.3 Addressing Ethics and Ethical Issues

When considering ethics in computer networking we talk about security of personal data. This project has not violated any rights of the employees, when the project was carried out. Furthermore, each individual devices are password locked by their user so that un authorized access can be restricted [4]. When setting up the CCTV Surveillance Cameras, Humans right and compliance restrictions were kept in mind, along with BEPZA restriction on which areas of the premises are permitted and not permissible for CCTV surveillance. Although when working through the project some ethical barriers were pushes, but considering my commitment to Softex and their great discipline, even though it resulting in an extension of 10 days of extra work we had to redo the work to maintain compliance.

7.3.1 Internal Security Risks and Employee Monitoring

Security risks can originate not only from external threats but also from within an organization, especially from personnel responsible for maintaining security. These insider threats can be challenging to detect and may introduce malware into an organization's private network. Therefore, monitoring employees and recording their activities can be a crucial source of information for identifying potential insider threats within an organization. Best practices for addressing this include the use of keylogger malware or ethical hacking techniques and the implementation of behavior logs.
Keyloggers are employed within the framework to capture user data and monitor activities such as emails, chats, webcam usage, and other actions requiring keyboard input. Additionally, user activity logs and other records can provide further insights into employee actions. Behavior logs track real user behavior, including online browsing history, search queries, social media interactions, and more, from multiple sources.

Although this was not implemented for Softex Sweater Industries (Pvt.) Ltd. This can be kept under consideration when dealing with internal threats.

Chapter 8

8. Lesson Learned

8.1 Problems Faced During this Period

While undertaking the project, "Network Infrastructure Design & Deployment for Softex Sweater Industries (Pvt.) Ltd.," we encountered several challenges that tested our problem-solving abilities and resourcefulness. These challenges, though formidable, provided valuable lesson learning experiences. Below, we outline the key difficulties we faced:

1. Budget Constraints

One of the foremost challenges was working within a restricted budget. Softex Sweater Industries (Pvt.) Ltd. had financial constraints that necessitated careful budget management post covid-19 pandemic worldwide. Balancing the need for cutting-edge technology with budget limitations required meticulous planning and resource allocation.

2. Travel Distance

This has been great challenge as the factories were located 40 KM DEPZ and 41 KM Sreepur factory situated from head office located in Gulshan-2. Weather has been a great challenge during this project as there has been unaffordable weather condition during this period such as heavy rainfall and storm.

3. Technical Complexity

The intricacies of modern network infrastructure posed another significant challenge. Implementing LAN, WAN, VLAN, and VPN configurations, CCTV surveillance system, along with integrating various hardware and software components, demanded a deep understanding of networking technologies. Overcoming technical complexities required continuous learning and adaptation.

4. Time Sensitivity

Time was of the essence in this project. Softex Sweater Industries (Pvt.) Ltd. needed an operational network as soon as possible to improve its day-to-day operations. Meeting project milestones and adhering to strict deadlines presented continuous time management challenges. Whereas delays were cause while working, as work were generally interrupted due ongoing work and zero down time limitation.

5. Security Concerns

Ensuring the security of the network infrastructure was paramount. Cybersecurity threats are ever-evolving, and protecting sensitive company data required constant vigilance. Integrating robust security measures and staying ahead of potential risks posed an ongoing challenge.

6. Scalability and Future-Readiness

Designing a network that could scale with the company's growth and adapt to future technological advancements was a complex task. We needed to ensure that the infrastructure we put in place would remain relevant and effective for years to come. With the future work proposals of Access Control System and portfolio website for the company, also considering increased work force, the system is ready to deal with those problem.

7. Employee Training

Introducing advanced technology to the organization meant providing adequate training to employees. Ensuring that the staff could effectively operate and maintain the new network infrastructure was a vital but time-consuming endeavor.

8. Coordination and Communication

Effective communication and coordination among team members, stakeholders, QAD inspectors and staff of the company were essential. Ensuring that everyone involved was on the same page and addressing concerns promptly was an ongoing challenge.

9. Vendor Relations

Dealing with multiple vendors for hardware and software procurement required effective vendor management. This included negotiating contracts, timely meeting, ensuring timely delivery, and resolving any vendor-related issues.

10. Compliance and Regulations

Adhering to industry-specific regulations and compliance standards was crucial. Navigating the legal and regulatory landscape to ensure that the network met all necessary requirements presented its own set of challenges.

11. Change Management

Implementing significant changes in an organization, especially related to technology, often encounters resistance. Managing change and ensuring that all stakeholders embraced the new network infrastructure was a continuous process. Despite these challenges, our dedicated team, effective problem-solving strategies, and strong collaboration with Softex Sweater Industries enabled us to overcome these obstacles and achieve the project's goals successfully. These experiences have enriched our understanding of network infrastructure deployment and will be valuable in future endeavors.

8.2 Solution of those Problems

Our team employed a combination of innovative strategies and industry best practices to address the challenges faced during the "Network Infrastructure Design & Deployment for Softex Sweater Industries (Pvt.) Ltd." project. These solutions not only helped in overcoming the difficulties but also contributed to the project's overall success. Here are the solutions for each challenge:

1. Budget Constraints

Solution: To work within the budget constraints, we conducted a thorough cost-benefit analysis of various networking solutions Choosing MikroTik [5] over Cisco greatly lowered cost. The inhouse team for maintenance was used to reduce cost which approximately save over 3,00,000/- takas. This allowed us to prioritize essential components while optimizing costs. Additionally, we explored open-source software options and negotiated with vendors to secure cost-effective deals.

2. Travel Distance

Solution: To work on this solution the office arranged my living in near the factory for a period of 15 days. For the rest of the days having a Motorcycle greatly aided to save time while travelling.

3. Technical Complexity

Solution: We invested time in comprehensive research and continuous training. By staying updated with the latest networking technologies and certifications, we enhanced our technical proficiency. Collaborating with experienced network engineers and seeking guidance, when necessary, proved invaluable in tackling complex technical issues.

4. Time Sensitivity

Solution: Efficient project management was crucial to meet tight deadlines. We adopted the concepts of agile project management methodologies [6], breaking the project into manageable phases with clear milestones. Regular status meetings, progress tracking, helped us adhere to timelines effectively.

5. Security Concerns

Solution: We implemented a multi-layered security strategy. This included firewalls, intrusion detection systems, encryption protocols, and regular security audits. Employee cybersecurity training was conducted to enhance awareness and reduce potential threats originating from within.

6. Scalability and Future-Readiness

Solution: Our design incorporated scalability from the outset. We implemented modular solutions that could be easily expanded to accommodate future growth. Regular network assessments and technology evaluations were planned to ensure continued relevance and readiness for advancements.

7. Employee Training

Solution: A comprehensive training program was developed to upskill Softex Sweater Industries' employees. This program covered network operation, troubleshooting, and cybersecurity awareness. Hands-on workshops and user-friendly documentation made the learning process efficient.

8. Coordination and Communication

Solution: Effective communication channels were established among team members, stakeholders, and Softex Sweater Industries' staff. Regular meetings, status reports, and a centralized communication platform facilitated transparency and rapid issue resolution.

9. Vendor Relations

Solution: Vendor management protocols were put in place to ensure smooth procurement and delivery processes. Contracts were negotiated with clear terms, and vendor performance was closely monitored. Promptly addressing any vendor-related issues minimized disruptions.

10. Compliance and Regulations

Solution: We engaged legal experts to navigate compliance requirements specific to the industry. Regular audits and assessments ensured that the network infrastructure consistently met regulatory standards.

11. Change Management

Solution: Change management strategies were implemented to address resistance to change. We conducted workshops, communicated the benefits of the new network infrastructure, and involved employees in the decision-making process to gain their buy-in.

By implementing these solutions, we not only mitigated the challenges but also created a robust and adaptable network infrastructure for Softex Sweater Industries. This project reaffirmed the importance of effective problem-solving, adaptability, and collaboration in successfully addressing complex challenges in network infrastructure deployment.

Chapter 9

9. Future Work & Conclusion

9.1 Future Works

In the realm of network infrastructure, the journey is ongoing, and there are several avenues for future development and enhancement:

IoT Integration: As the Internet of Things (IoT) continues to grow, exploring ways to integrate IoT devices into the network can provide real-time data for various applications, including monitoring and automation.

Regular Security Audits: Conducting periodic security audits and assessments to identify vulnerabilities and ensure compliance with industry standards is crucial for maintaining a secure network environment.

Integration of Access Control System: To bolster security measures, we recommend the integration of an access control system. This will enable precise control over physical access to critical network infrastructure components.

Portfolio Website Development: The creation of a portfolio website for Softex Sweater Industries (Pvt.) Ltd. would enhance their online presence and provide a platform to showcase their products and services to a broader audience.

Advanced Monitoring and Analytics: Implementing advanced network monitoring tools and analytics can provide real-time insights into network performance, facilitating proactive issue resolution and optimization.

Cloud Integration: Exploring opportunities to integrate cloud-based services can enhance scalability, data redundancy, and disaster recovery capabilities while reducing infrastructure costs.

Enhanced Training Programs: Continuously investing in employee training and development ensures that the team remains proficient in managing and adapting to evolving network technologies.

Environmental Considerations: Exploring eco-friendly networking solutions and energy-efficient hardware can align with sustainability goals and reduce the environmental footprint of the network.

9.2 Conclusion

The "Network Infrastructure Design & Deployment" project for Softex Sweater Industries (Pvt.) Ltd. has been a transformative journey, marked by innovation, collaboration, and resilience. Our aim was to elevate the company's technological infrastructure to new heights, and through diligent planning and dedicated efforts, we achieved this objective.

In this endeavor, we addressed multiple challenges, from budget constraints to technical complexities, and we embraced these challenges as opportunities for growth. Our commitment to delivering a robust, secure, and scalable network infrastructure has paved the way for improved operational efficiency, enhanced security, and future readiness. As we reflect on this project, we recognize that the successful deployment of the network is just the beginning. The path ahead offers exciting possibilities, from integrating advanced security measures to exploring cloud solutions and sustainable networking practices. It is a testament to Softex Sweater Industries' commitment to staying at the forefront of technology.

We extend our gratitude to the entire team, stakeholders, and employees of Softex Sweater Industries (Pvt.) Ltd. for their unwavering support and collaboration throughout this project. Together, we have achieved a significant milestone in the journey towards a more connected, secure, and efficient future. A very special thanks to the Softex Maintenance Team. Their involvement in the completion of this project has been paramount.

This project exemplifies the power of innovation, teamwork, and a shared vision for progress. It reinforces our belief that, in the world of network infrastructure, every challenge is an opportunity, and every solution is a step towards a brighter, technologically empowered future.

Bibliography

[1] Ciscopress, "ciscopress," Cisco, 15 07 2010. [Online]. Available: https://www.ciscopress.com/articles/article.asp?p=1608131&seqNum=3.

[2] Simplilearn, "simplilearn," 1 09 2023. [Online]. Available: https://www.simplilearn.com/feasibility-study-article.

[3] "boardinfinity," [Online]. Available: https://www.boardinfinity.com/blog/star-topology/.

[4] A. Beattie, "investopedia," 11 08 2022. [Online]. Available: https://www.investopedia.com/articles/basics/10/guide-to-calculating-roi.asp.

[5] Mikrotik, "mikrotik," Atlassian, [Online]. Available: https://help.mikrotik.com/docs/display/ROS/IPv4+and+IPv6+Fundamentals.

[6] D. Langford, "Reserach Gate," Australasian Journal of Information Systems , 05 1997. [Online]. Available: https://www.researchgate.net/publication/30062908_Ethical_Issues_in_Network_System_Design.

[7] "Mikrotik," Atlastsian, [Online]. Available: https://help.mikrotik.com/docs/.

[8] altassian, "atlassian," [Online]. Available: https://www.atlassian.com/agile/project-management.

An Undergraduate Internship/Project on Network Infrastructure Design & Development for Softex Sweater Industries (Pvt.) Ltd.

By

Md. Towfiq Sadat Rahman

Student ID: **1730592**

Summer 2023

Consent from Supervisor

The student modified the internship final report as per the recommendations made by his/her 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.

This internship report is checked with Turnitin and/or Ithenticate plagiarism checker, and the score is:

Turnitin Score (%) : 7%

Ithenticate Score (%) :

10.10.2023

(Signature of the Supervisor)

KANIZ FATEMA

Name of the Supervisor

Department of Computer Science & Engineering

Independent University, Bangladesh