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An Undergraduate Internship/Project on Enterprise Network Design of ABA Group

By

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Summer, 2022

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September 14,2022

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, K M Towhidul Islam, hereby certify that the work done in this report has not been plagiarized or copied from any other source. Any reference resources which are used are mentioned in the bibliography section at the end. The report entitled "Enterprise Network Design of ABA Group" was submitted by me to fulfill the requirement for the Bachelor of Science in Computer Science and Engineering degree at Independent University, Bangladesh. It was created to showcase the internship experience that I have faces while working at ABA Group. In constructing the report the only guidance that I have received are from my internal supervisor "Ajmiri Sabrina Khan" and my external supervisor "Mahbubul Hasan".

.



14/09/22

Signature

Date

K M Towhidul Islam

Name

Acknowledgement

I would like to start by thanking Almighty Allah for His blessing and for providing me with the capacity to be able to finish my report. I would also like to express my uttermost gratitude towards my supervisor Ajmiri Sabrina Khan, lecturer of Department of Computer Science Engineering, Independent University of Bangladesh, for supporting me at every knit and knot by which it enabled me to successfully finish my project report. I would also thank my lecturers of certain courses as their teachings provided me with information, ideas and recommendations which greatly helped me to construct this project. Also my gratitude goes to the whole Department of Computer Science and Engineering at Independent University, Bangladesh as all their guidance and teachings will also help me in the long run.

Letter of Transmittal

14th September, 2022

Ajmiri Sabrina Khan

Internship Supervisor & Lecturer

Department of Computer Science and Engineering

Independent University, Bangladesh

Subject: Internship report on 'ABA Group', in Enterprise Network design.

Dear Ma'am, I am extremely grateful for the chance to submit an internship report to you on 'ABA Group', for their enterprise network design. This report is based on my three-month internship at the firm and the project on which I worked. This report is based on my experiences and the work I completed during my internship at ABA Group. Throughout my internship with the organization, I discovered that I acquired and used a variety of new skills and technology. I would be delighted if the report I have written serves its intended purpose. I am indebted to you for your time, knowledge, direction, and support. I have attempted to complete the report as accurately as feasible. I genuinely hope and pray that you will accept the report. Thank you for your co-operation and assistance throughout the semester.

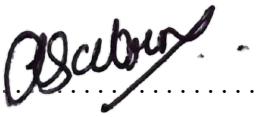
Yours sincerely,

K M Towhidul Islam

ID: 1830561

Evaluation Committee

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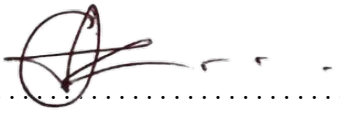
Name

Ajmiri Sabrina Khan

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Supervisor

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Name

Sanzar Adnan Alam

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Internal Examiner-1 / Panel Member-1

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Name

Tanmoy Debnath

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External Examiner / Organizational Supervisor / Panel Member-2

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Name

Dr. Mahady Hasan

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Head of the Department / Convener

Abstract

A group of computer systems with hardware computing devices connected via communication channels to allow multi-user interactions is called a computer network. Furthermore, implementing a corporate version of this network is fully network based. As IT is a secure network that is used in major companies and organizations mostly for secure and private connectivity, the main fundamental components of such a network are routers, switches, hosts and access points. Moreover, a network is defined as a system that consists of two or more these devices connected with each other for sharing of resources via channels under conventional rules known as protocols.

The purpose of this report is to highlight the detail of my experience while I was working on the project "Enterprise network design" at ABA group.

My work there was to recreate their head offices network design from a sophisticated design to a more uncomplicated one and to make an outline of the current system to enhance it if possible.

The task that I was assigned to there was to make different vlans for separate departments which are can be interconnected if the authorization is given, configure the server and fully customization of the routing protocols.

In this report I had also covered the system analysis part where it shows various analytical approaches and visualizations. Also, in some part the report the breakdown structure of various commands that was used to simulate the program is shown and lastly some future implementation that will be made in current design of the enterprise is shown.

Keywords— network, protocol, visualizations

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Chapter 1

Introduction

1.1 Overview/Background of the Work

ABA group is a renowned garment company who have been in the business for the last 3 decades and over the years they have created 7 different branches. Now to be connected with all the different branches and make its operation fluid so that their production seamlessly, that's where their network system comes into play. They have been diversifying their network system for that reason and are continuously looking for flaws and loopholes to immune their organization from cyber-attacks. My work here is to recreate their head offices network design from a sophisticated design to a more uncomplicated one and to make an outline of the current system to enhance it if possible so that in the future if the company need to renovate their network system, then they can just go through my work to ease their workload.

1.2 Objectives

The main objective here is to satisfy the data communication requirements while minimizing expenses. Nowadays internet-based economy needs maintenance all around the clock. And in case of ABA group for being such a large group this means that the business networks must be available nearly 100 percent of the time. The system must be smart enough to automatically protect itself from any unexpected security breach. Also, it's network have to be able to adjust to changing traffic loads to maintain consistent application response times.

1.3 Scopes

- The five departments, namely, Accounts, Human resource, Marketing, Sales and General Support, should have separate LAN with individual applications. However, these departments must share data.
- These departments should be able to run a telephony system with VoIP running both voice and data.
- The company should be able to run both voice and data over VLAN.
- The design should support email and communication.
- The design should also support a database server .
- The design should also accommodate the company's intranet.

Chapter 2

Literature Review

2.1 Relationship with Undergraduate Studies

Independent University, Bangladesh offers some advanced courses in the domain of Networking that helps all students in developing their own projects in networking and hardware.

- *Cse 316, Data communication computer networks:* This is the main course which helped me to understand all the basic of networking. The course taught me how the transmission of digital data between two or more computers and a computer network or data network is a telecommunication network which allows the computers to exchange data. Also, I got to learn all the topologies that exists to create a network structure. But the main focus of the course was to teach the student about the 7 layer of network which is the backbone that the computer systems use to communicate over a network.

- *Cse 400, Data communication:* It almost teaches all the same thing as 316 but in a more detailed overview of the chapters.

- *Cse 403, Network Management:* This course introduces standard networking management principles, practices and technologies. Starting with the Data Communication and Network Management Overview, the basic Standards, Models, and Language of Network Management System is introduced.

- *Cse 406, Cryptography and Network Security:* The aim of this course is to introduce us to the areas of cryptography and cryptanalysis. This course develops a basic understanding of the algorithms used to protect users online and to understand some of the design choices behind these algorithms.

- *Cse 407, Telecommunication Engineering:* In this course our university students are taught antenna theory, digital communication, information theory and coding, digital signal processing with analogue communication with the help of electronics course so that's why prerequisite of this course is Electronics I (cse 210).

- *Cse 408, Advanced Computer Network:* In this course advanced Internet procedures and technologies are described which support an efficient, effective and secure interconnection of both distributed applications and related structured data.

2.2 Related works

There are thousands of related works that have similar functionalities with my organization, as nowadays almost every medium to large companies have intranet within their own organization like say for example if we take IUB into account then we can see that their network has VoIP phones and Ip cameras, they might not have remote access network but having to implement those two, someone have to create a network design. Other notable enterprise network design could be of those of the airports which are more sophisticated as maintaining the flight management controls, flight service, arrivals and departures etc. which are all interconnected and transfers huge amount of data between them every day is not a trivial matter.

Chapter 3

Project Management & Financing

3.1 Work Breakdown Structure

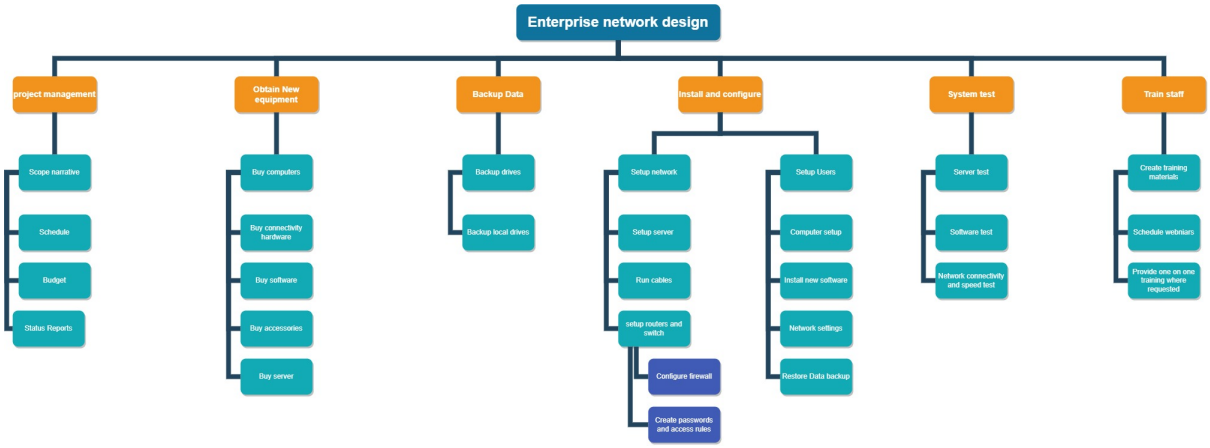


Figure 3.1: Work breakdown structure

3.2 Process/Activity wise Time Distribution

Usually, time to complete this project depends on the size of the organization, so typically it ranges from between 60-90 days. The first month goes by designing how the network will be laid on the organization, that means a design is created wherein according to the floor plan layout access point are laid to create seaming less wireless network. Then a week or two is spent on buying necessary equipment's for the project by that time if there are new employee their training gets started so that they can get accumulated with the routing of the network also by this time the supervisor makes a copy of the current data. The remaining time of the project is used to configure the network server, switches and routers and for testing the system.

3.3 Gantt Chart



Figure 3.2: Grantt Chart

3.4 Process/Activity wise Resource Allocation

Activity	Hardware	Software	Human
Project management	Laptop/Office computer		Mahbubul Alam Lutfaur Rahman
Obtain new equipment			Mahbubul Alam Lutfaur Rahman
Backup data	Server		Mahbubul Alam Lutfaur Rahman
Install and configure	UTP cable, VoIP phone	NetSupport & Putty	Mahbubul Alam Lutfaur Rahman
System test	Laptop/Office computer	NetSupport & Putty	Mahbubul Alam Lutfaur Rahman
Train staff	Laptop/Office computer	NetSupport & Putty	Mahbubul Alam Luthfaur Rahman Khalid Saifullah

Table 3.1: Activity wise resource allocation

3.5 Estimated Costing

Name of equipment	No. of units	Total amount
Cisco C1111-4P ISR 1100 Router	2	49,400*2= 98,800
Cisco SF300-24P 24-Port 10/100 PoE Managed Switch	5	24,000*5=121,000
TP-Link WR845N 300Mbps Wireless N Router	15	1,690*15= 25,350
D-Link CAT 6 UTP Cable 305M 23AWG Blue(box)	10	14,500*10=145,000
Yealink SIP-T19P-E2 IP Phone Black	80	4500*80=360,000
Yealink SIP-T19P-E2 IP Phone Black	30	3,000*30= 90,000
Computer	100	30,000*80= 2,400,000
RJ45 connector	5(100 per packet)	5*1300=6,500
Crimping tool	5	5*800=4,000
Optical fiber (4core unarmored)	1000m	1,000*15=15,000
Splicer Machine DVP-760	1	89,000

Table 3.2: Estimated Costing

Chapter 4

Methodology

To create a new design the top down network design is used and this approach consists of four phases, i)analyze requirement, ii)local network design, iii)physical network design, iv) test and optimize of the network design.

Analyze Requirement

The first phase is started by collecting information from the user. The user consists of IT division head and the staffs. Information is collected about the existing logical and physical topology along with future needs of the company. Meetings with IT division head and staff are conducted from which the following information are collected.

1. Redundancy in the network already applied in devices by using L2 redundancy.
2. Redundant of ISP and WAN link already applied in the network.
3. User access switch connectivity is cascading in the same floor and can lead single point of failure.
4. VPN remote access is already implemented in the network.
5. The existing network already used VoIP CCTV based on IP in the network but in small scale.

After discussion about existing network condition with the customers, there are some thing that needs to be improved from the network.

1. VPN Remote Access- incompatibility issue with newer endpoint.
2. Increase the availability of the network, so the redesign can minimize down time in case some devices fails to run.

Logical Network Design

The designing process of the logical network consists of the network topology design, routing protocol selection and selecting a redundancy method for increased availability. Furthermore, a hierarchical network concept was used as one of its benefits was that it can reduce network device load by resorting to use appropriate sections only per layered device. In addition, the time it takes to identify a problem and resolution is reduced by identifying on a layer basis.

Chapter 5

Body of the Project

5.1 Work Description

The place where I am doing my internship ABA Group was founded in 1992 with a goal to stand upon the global apparel landscape and today, they feature the world's top fashion outlets. But to reach this goal they have being keeping their promises and continuously expanding their sites according to the demand by their buyers. So, since its foundation, now there are 7 big sites and which creates a huge network workload to handle.

My role here was to showcase the whole network infrastructure of this enterprise in a virtual form so for that it is done in cisco packet tracer. So, for that I designed one of the floors just the way it is at the office and based on that designed the whole network in cisco packet tracer, also made some changes in the network system to enhance the current system to make a more robust one.

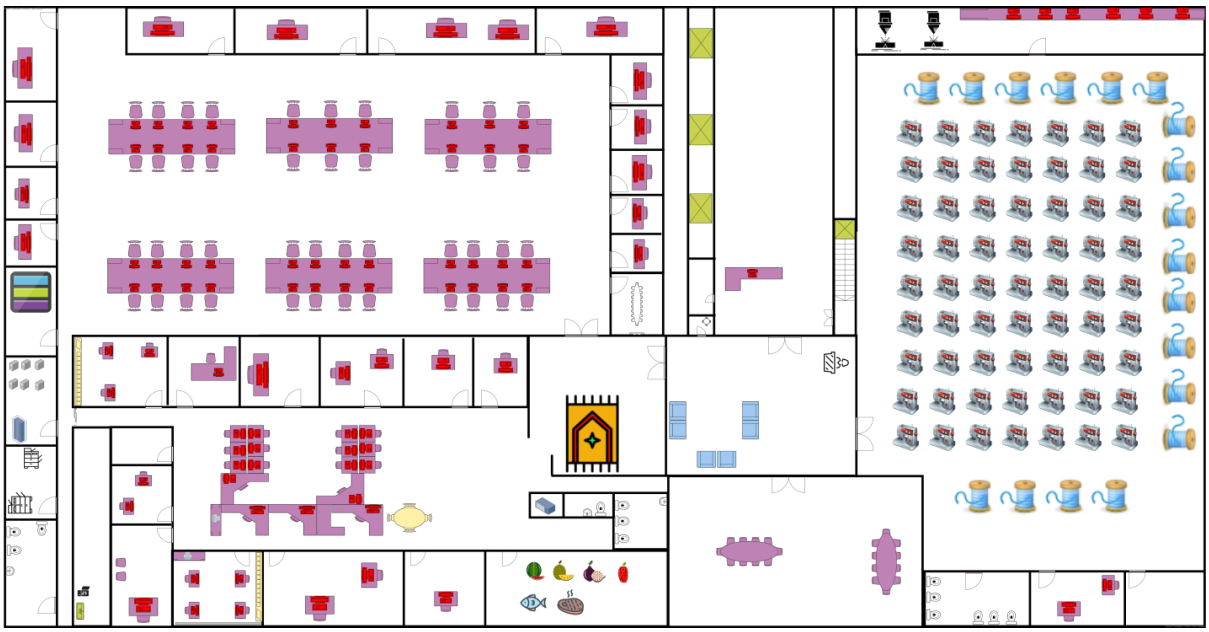


Figure 5.1: Office floorplan

5.2 System Analysis

Through the many works needed in doing system analysis, one may obtain the solutions in the system. Most systems, especially network systems, adhere to a set of principles while planning, developing, testing, and optimizing systems.

- Analyze requirements- The network analyst conducts user and technical staff interviews during this phase to better understand the business and technical objectives for a new or improved system.[1] The next step is to characterize the current network, taking into account its physical and logical design in addition to its performance.
- Develop the logical design- The logical topology of the new or improved network, network layer addressing, naming, switching, and routing protocols are all covered in this phase. Planning for security, network administration, and the preliminary research into which service providers can satisfy WAN and remote access needs are all included in logical design.
- Develop the physical design- Specific technologies and items are chosen during the physical design phase in order to achieve the logical design. Additionally, this phase must conclude with the completion of the service providers inquiry that was started in the logical design phase.
- Test, optimize, and document the design- Writing and implementing a test plan, creating a prototype or pilot, optimizing the network design, and documenting your work with a network design proposal are the last tasks in top-down network design.

These major phases of network design repeat themselves as user feedback and network monitoring suggest enhancements or the need for new applications.

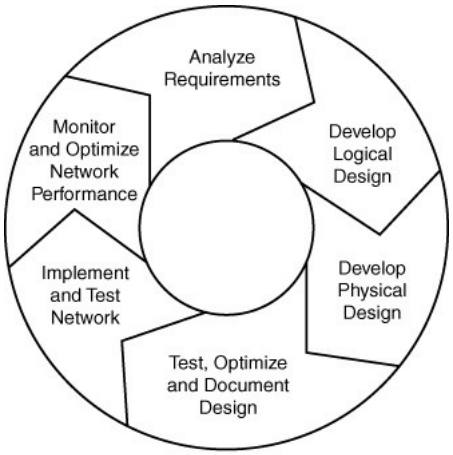


Figure 5.2: Six element analysis

5.2.1 Feasibility Analysis

A system's overall strategy is tested or evaluated for viability. The extent of computerization, recommended output and input formats, and possible advantages must all be provided in order to describe the application area, its expansion, and complexity. A technological solution must be possible before the system research can determine if it exists.

The first investigation's findings determine how far the survey is taken before becoming more in-depth research. According to its Workability influence on the organization, capacity for meeting demands, and efficient use of resources, a feasibility study is the best system suggestion.[2]

A formal proposal is what the feasibility study's findings are. This report is a straightforward formal document that describes the type and extent of the suggested system. The plan becomes a formal agreement once management examines it, paving the road for real design and implementation.

The feasibility study is an investigation that results in a written document that:

- Defines the scope of the problem.
- Identifies the elements of the problem.
- Possible criteria include: The impact of the environment, safety and manufacture ability, the political climate; the possible difficulties in the design phase; and appraisal of the return on investment.
- Identifies possible alternative solutions.
- Evaluate each solution with the criteria.

The goal of the feasibility study is to discover possible solutions and to determine which of these appear to have promise and which are not feasible and why.

Technical feasibility Technical viability focuses on the present system and how well it can support the new system; this includes the current computer system's hardware, software, and other parameters. For the technical advancements to be accommodated, there are also budgetary issues. If there is a significant budgetary limitation, the project is deemed unfeasible.
Despite being built in a broad manner, the system covers all the steps and actions taken on any social networking site. PHP and MySQL Server are the versions that are utilized in the system.[3]
The system's features are up-to-date and tailored to the needs of the customer. Like profile creation, buddy addition, and other features necessary for the jobseeker control panel. The most recent version of the MySQL server is used as the backend, and it permits seeing the contents of the database as well as its connections to other databases, including their main and foreign keys. The hassle of altering each and every code may be avoided by just making any upgrades in the source code. The source code managing the database connection may be readily changed if the most recent version of PHP MySQL is installed in the near future. Since the

most recent version has no impact on the fundamental code, the programs are easily adaptable to the modifications.
My-SQL server is easy to use and secure, and it can manage massive amounts of data. Using PHP facilitates the design of our application's windows. Less time is needed for PHP's complete open database communication with the MY-SQL server, data accessibility, responses, and output.

Operational Feasibility Depending on the complexity of the installed computerized system, high-quality staff should be engaged to ensure the system runs smoothly after the transition from the current manual system to the computerized system.[4] Therefore, the platform and tools should be chosen such that, once the system is up and running, finding the necessary staff to ensure its effective operation shouldn't be a concern.
Due to its extremely user-friendly environment and ease of use by users, this project is operationally practicable. Additionally, the site's layout makes it simple to study how each sort of user interacts with it. Consequently, a novice web developer may quickly comprehend the project.

Behavioral Feasibility This element of the study examines the degree of user acceptability of the system. This includes the user-training procedure, which must be accepted as a requirement in order for the user to become used to the system. The degree of user acceptability only depends on the system that has been established, and it has a moderate technical requirement because only very small or no adjustments are needed to deploy the system. The users would undoubtedly approve this product once it is launched since it will enable them to save time and money.

Economic Feasibility The most popular technique for determining whether a new system is effective is economic analysis. The process, sometimes referred to as cost/benefit analysis, is figuring out the predicted savings and advantages from a prospective system and comparing them to their expenses. The choice to develop and deploy the system is taken if advantages outweigh expenses.

Cost and study This is an analysis of the costs to be incurred in the system and the benefits derivable out of the system. Time based study This research looks at how long it takes to get a return on your investment. the advantages that resulted from the system. Another consideration is a project's potential worth. Due to the project's manageable operation and development expenses, it is also economically feasible.[5] Additionally, because of how frequently consumers utilize it, there will be several sponsors for the website. Therefore, the application's advantages will undoubtedly outweigh the expense of developing or maintaining it.

Schedule Feasibility If a project takes too long to finish before it is beneficial, it will fail. This often entails calculating how long the system will take to create and determining if it can be finished in a specific amount of time using techniques like payback period. A project's schedule's viability as a measure of its timeliness.

5.2.2 Problem Solution Analysis

When I started doing this internship about the enterprise network I faced numerous challenges, and of all of it the hilarious one was that I forgot most of the things that I learnt in university course as it had been 1.5 years since I did the basic course of networking where it is also know as CCNA course. Also while physically going through the hardware I came to know that most of the time our company's network traffic was slowing down and so my supervisor taught me to closely monitor the team's usage and find out that they aren't doing anything out of the network's capabilities as network slow down if an ehternet breakdown caused by alignment or FCS errors, so he also told me to take close look at all the network cable to see if there's a problem.

Another problem arise when I was doing the simulation in cisco packet tracer that is the network looks like it's down and it happened as the network address couldn't connect to the DHCP server. Sometimes this occurs because the DHCP server may be out of IP addresses also it could be if the computer to the DHCP server never actually made it to the server so that it could process the request. I learned that fixing it is quite easy, the solution to it is checking how many people in the team are affected, is it just one computer or everyone is having the same issue. Troubleshooting how many user are affected will help what to do next, as if it just occers to a single pc then checking their NIC settin and make sure that they're configured to a DHCP server and not in to a Vlan pathway. If it the other way round where every team is affected then it could be the server issue as the server has likely run out of accessible IP addresses or it could also be DHCP service is deactivated.

Another problem I learned that is when the company's DNS server is down then any device in all the team won't be able to send a connection request to the server. The first action is fixing DNS server is to check the client configuration and see what DNS server they are using. In my company they were using 192.168.139.199 is preferred dns and 192.168.139.96 as alternate.

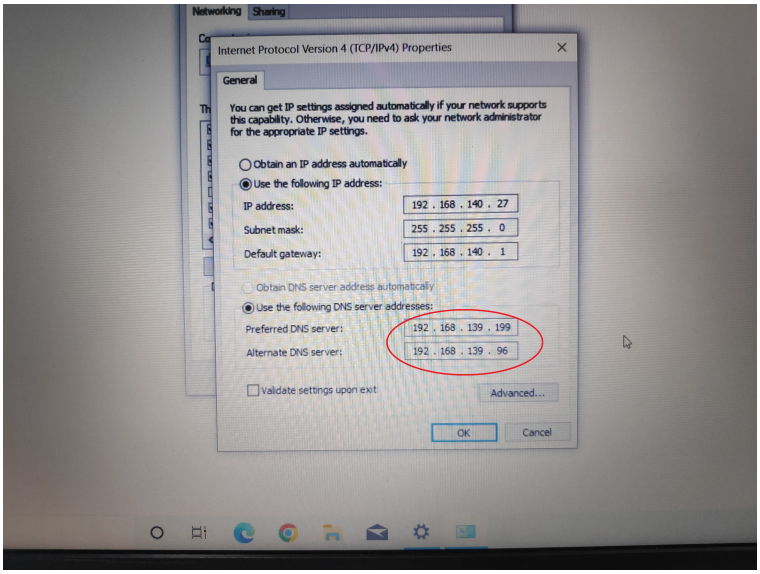


Figure 5.3: DNS Server IP

Also running a test on the DNS server and checking if the test flag any error like response time or packet loss in a DNS check tool can be used to pinpoint the issues if no error are found then the report should be like this below.

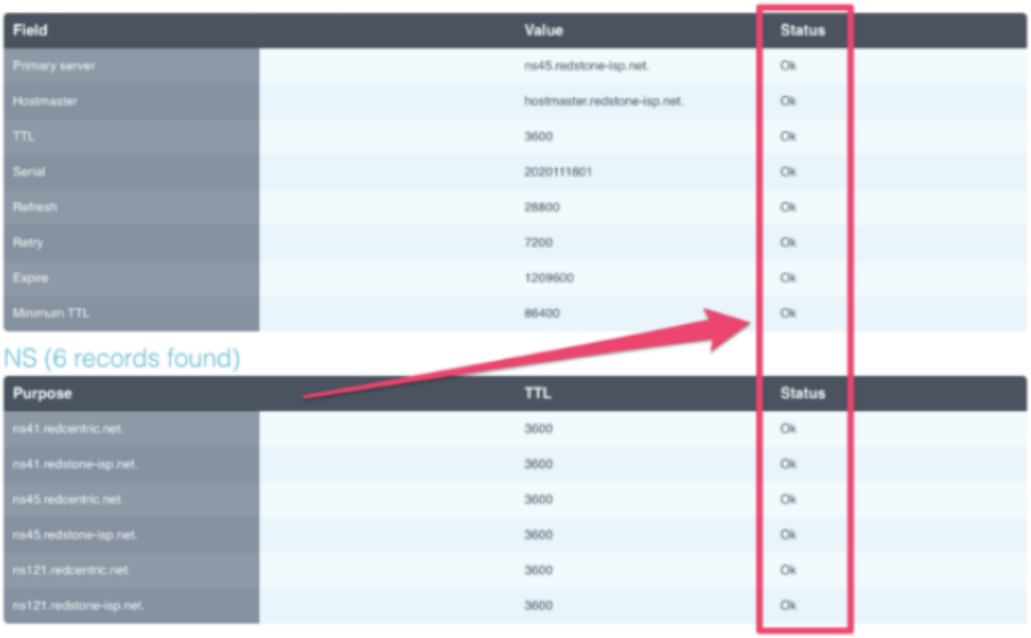


Figure 5.4: DNS Check Tool

5.3 System Design

Trunks

Networking devices at the distribution and access layers frequently have trunk connections setup. Trunks are used to transfer traffic from different VLANs between devices over a single channel. When creating the trunk links, the network designer takes into account the overall VLAN architecture and network traffic patterns.

Redundant Links

Devices at the distribution layer can be set up to load balance traffic between links when there are redundant links between them. The redundant links at the distribution layer are shown in the above figure. Another choice that expands the bandwidth accessible to apps is load balancing.

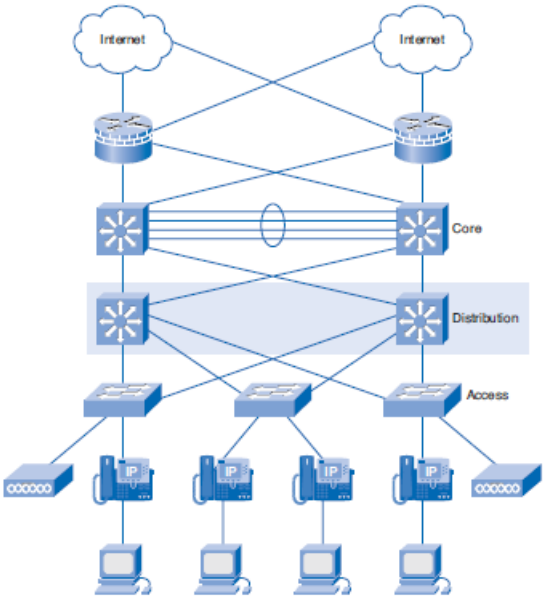


Figure 5.5: Network redundancy

Distribution Layer Topology

Networks with distribution layers are often connected using a partial-mesh architecture. This architecture has sufficient redundant pathways to make sure the network can withstand a device or link loss. Gigabit connections are used to connect distribution layer devices that are housed in the same wire closet or data center.[6] Fiber cable is utilized when there is a greater distance between the devices. Due to the high cost of switches that handle multiple high-speed fiber connections, careful planning is required to guarantee that there are enough fiber ports available to deliver the required bandwidth and redundancy.

Building a redundant Network at the distribution layer

The network designer uses redundancy in the network to lower downtime. Switches at the access layer and devices at the core layer are connected redundantly to devices at the distribution layer. These connections offer backup routes in the event that a device or link malfunctions. The distribution layer's routing protocol is used by the Layer 3 devices to promptly respond to connection failures so they don't interfere with network operations.[7] If STP is not enabled, providing numerous connections to Layer 2 switches may result in unpredictable network behavior. In a Layer 2 network without STP multiple connections might result in broadcast storms. Switches end up with a flood of traffic since they are unable to properly learn the ports. STP ensures that only one way is active between two devices by disabling one of the links. The switch updates the spanning tree topology and immediately starts utilizing the backup link if one of the links breaks.

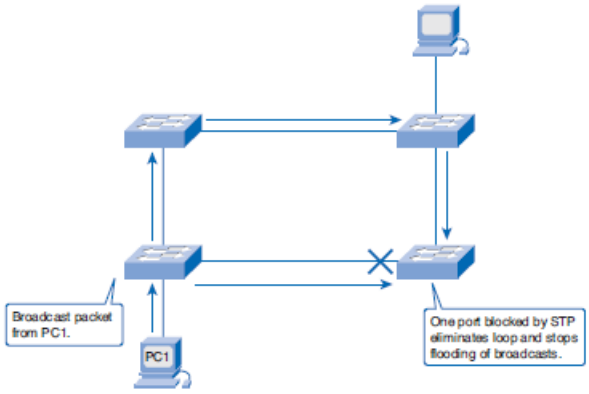


Figure 5.6: STP protocol

5.3.1 Current system

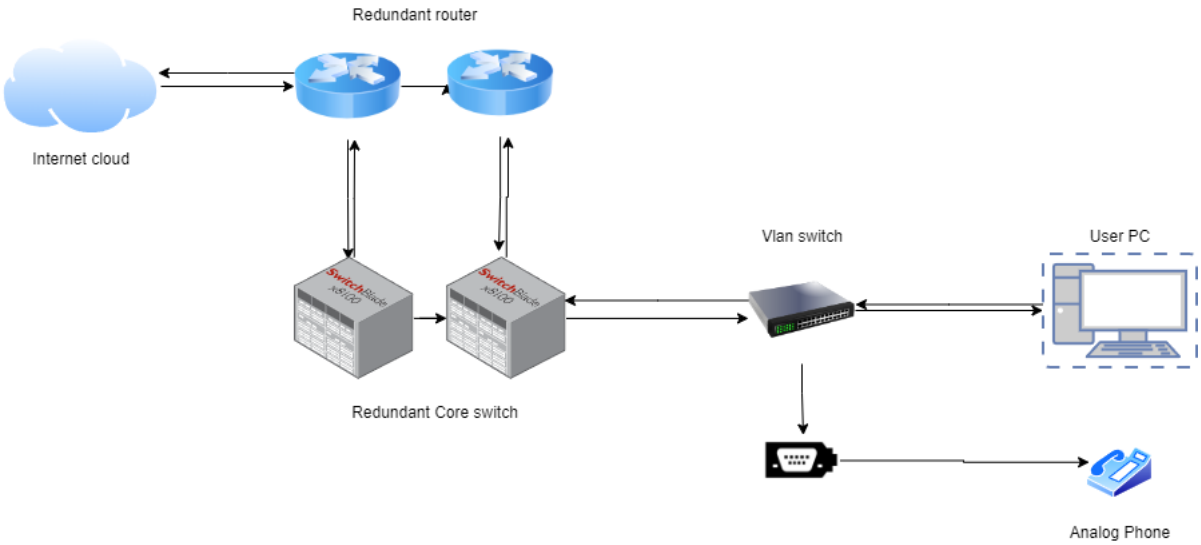


Figure 5.7: Current system

5.3.2 Future Upgrade

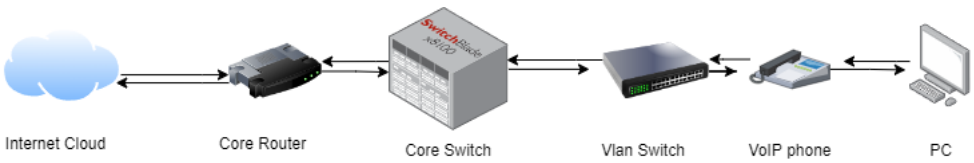


Figure 5.8: Future Upgrade system

5.3.3 Functional and Non-Functional Requirements

5.4 Product Features

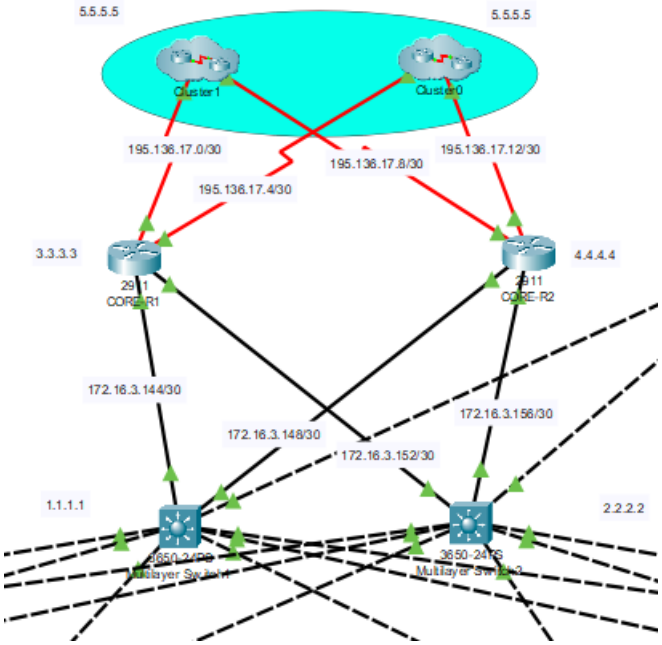


Figure 5.9: Core layer

The network system in ABA Group is a very robust on, like many other companies they get their network from 2 different Isp providers and which are individually connected to both their core routers. So due to this they are getting network redundancy so that if 1 connection fail then the other will still be running.

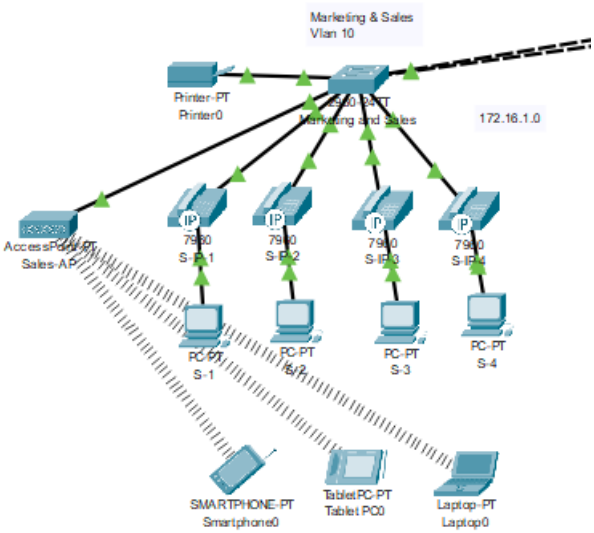


Figure 5.10: Distribution layer

Each of the department is connected to a separate switch so that instead of connecting to a single switch and doing there vlans which is going to be clustered and not easy to understand, so a separate switch for each department have been created for better user friendly, and those switches are connected to 2 other core switches for network redundancy.

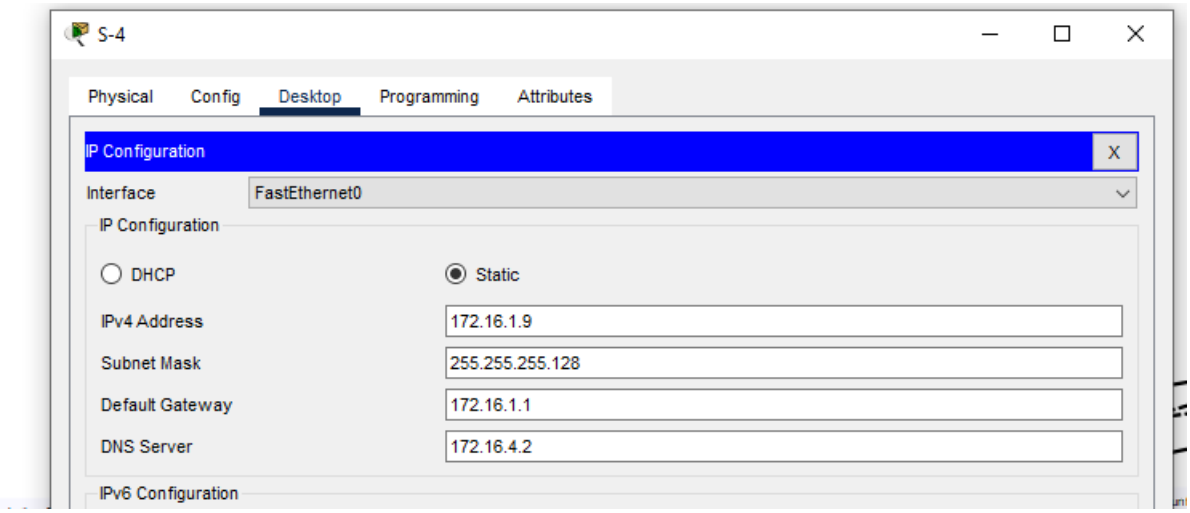


Figure 5.11: Static ip setting

For each computer that is in the company a static ip have been set instead of connecting it with the DHCP server so that when the IT people are connecting to their pc, then they know which pc to connect.

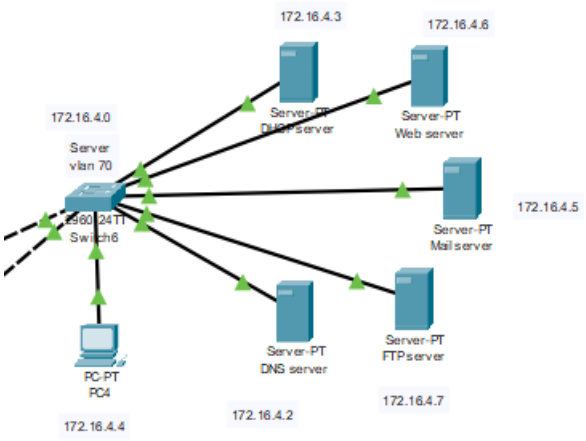


Figure 5.12: Server configuration

This switch is only dedicated to the server room and is connected to all the servers which are the DHCP, web, mail, FTP and DNS server. Also all the servers available here are DNZ server so that there is extra security here and the files are not easily stolen or are not attacked by the outsiders.

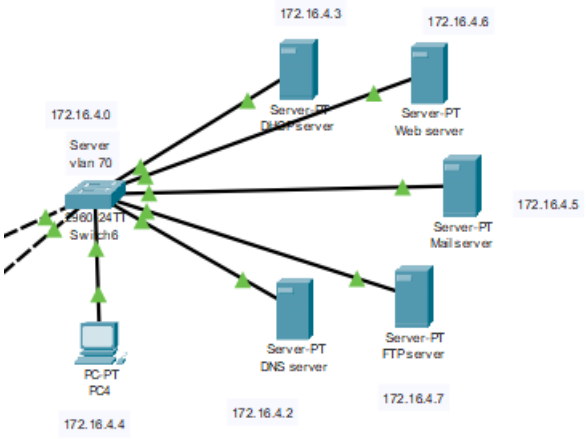


Figure 5.13: OSPF configuration command

In the core router and switch it is configured with OSPF protocol as OSPF protocol has no limitations in hop protocol and they are not using RIP protocol as that has only 15 hops at most. So OSPF converges faster than RIP and has better load balancing. OSPF multicasts link-state updates and sends the updates only when there is a change in the network.

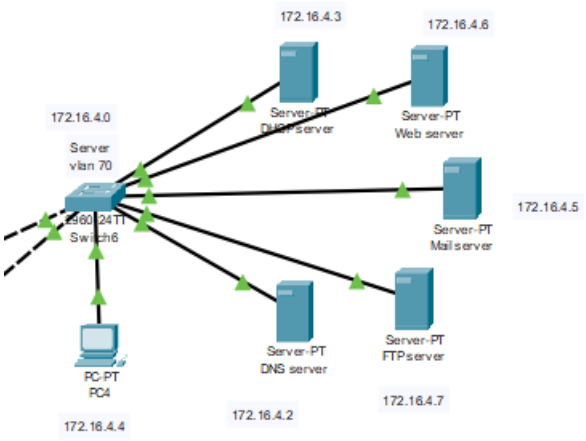


Figure 5.14: DHCP server Configuration

This is how the dhcp server have been configured as it provides automatic ip configuration to the devices that want to be set with a dhcp protocol. So here all the department the Sales, HR, Accounts, Eng all are connected with the dhcp server and can have a max user of between 116-118 which is enough for a particular department.

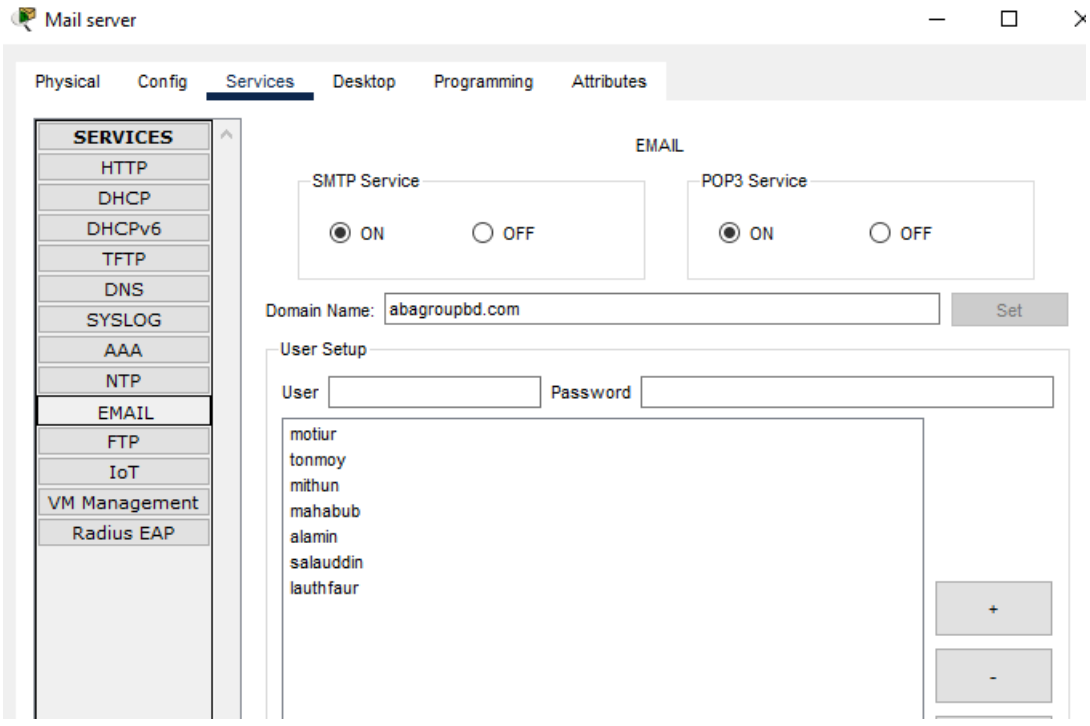


Figure 5.15: Mail server Configuration

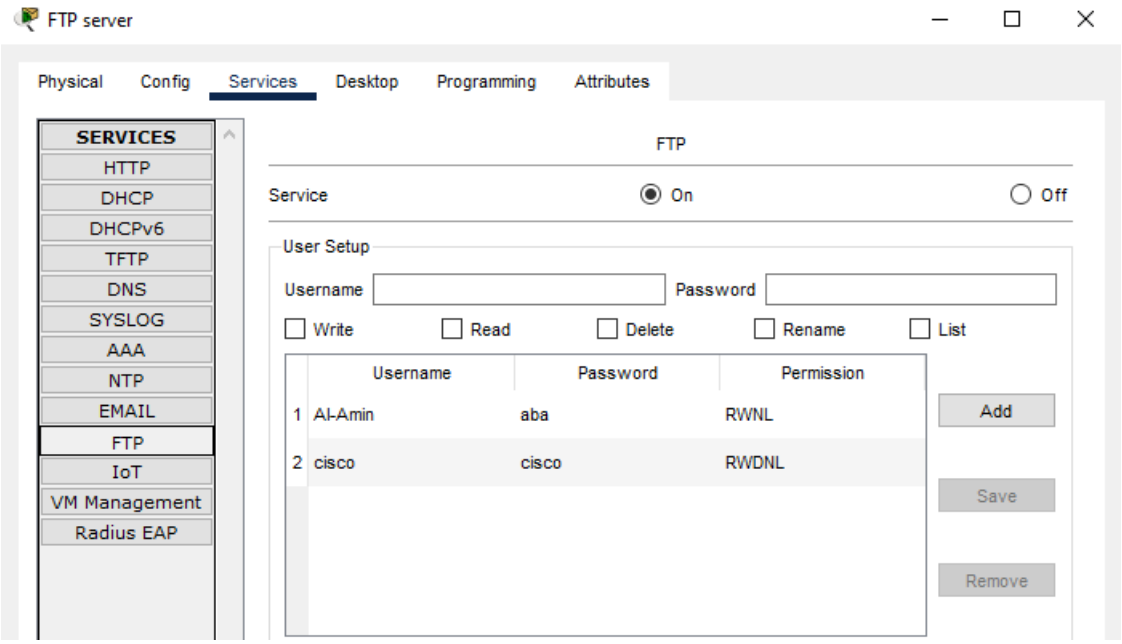


Figure 5.16: FTP server Configuration

The following pictures show the configured mail and ftp server. So for the mail server only the IT people will be able to add the mail user ids in the mail server and set the domain name otherwise it won't work. And for the FTP server the user will be able to read write delete a file if they give the permission and can also set it with a password.

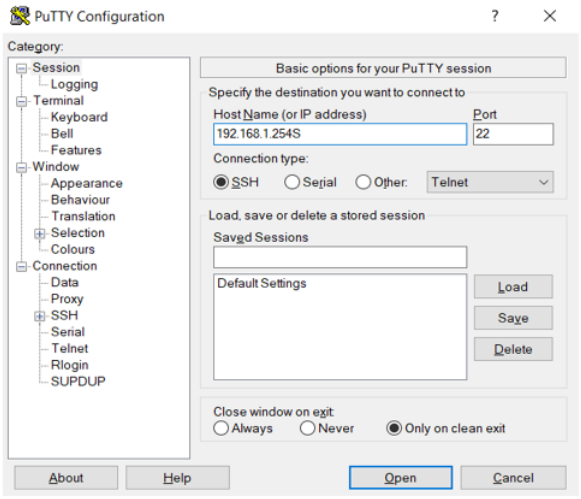


Figure 5.17: Putty Configuration

As nowadays everything is getting easier so all the new switches and enterprise routers come with putty. So instead of manually hocking the ends of the switches to a pc with a serial port and configuring it from there, the putty interface made it easier for the user to just login it with the hostname and port number.

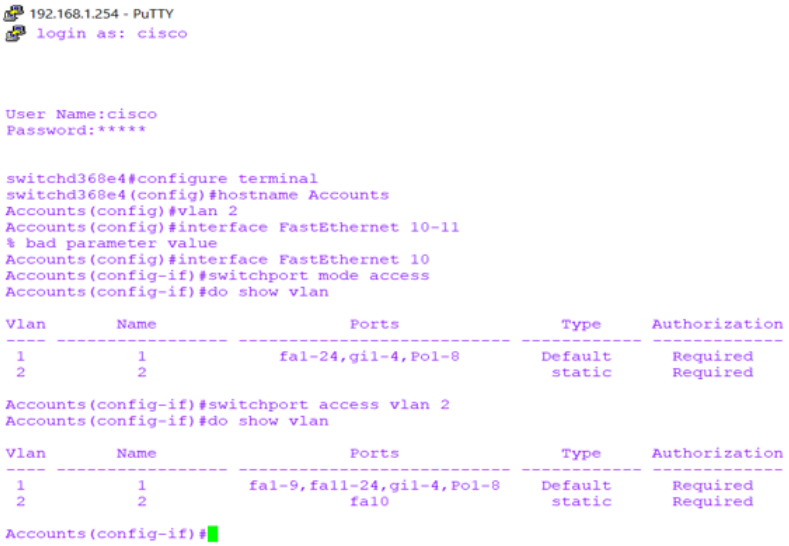


Figure 5.18: Physical Switch Configuration using Putty 2

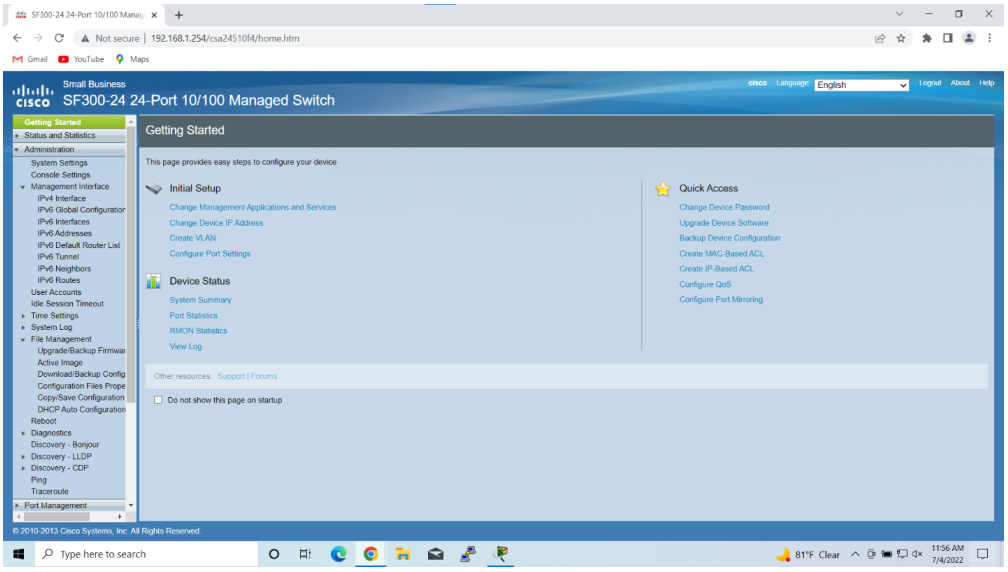


Figure 5.19: Physical Switch Configuration using Switch's GUI

The diagram above shows the GUI mode of the switch, so user can set everything from here instead of manually typing all the commands which can sometimes be nerve racking.

5.4.1 Architecture

In this project cisco packet tracer was primarily used to simulate the whole networking design but while working on office where hardware (switch) was also provided by my supervisor, so there I had to use putty where by logging in with the host IP and port number of the selected device one can open up the terminal to configure the device also the newer devices have GUI mode just like the interface that everyone uses to set up their normal routers at home.

Chapter 6

Results & Analysis

6.1 Overview

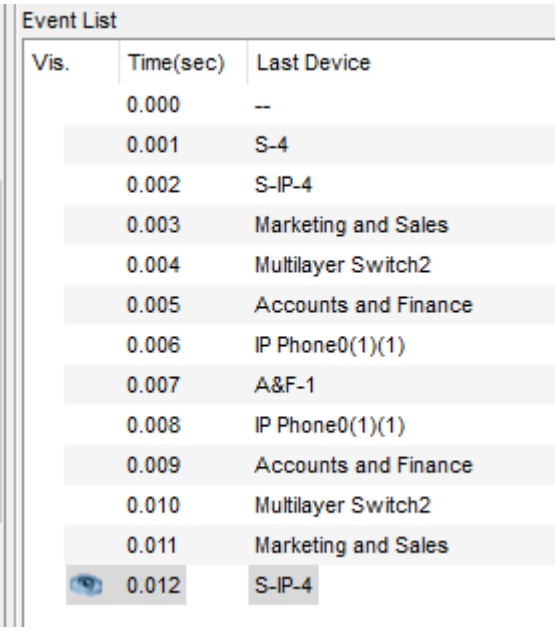


Figure 6.1: Result

When a packet is sent from one of the computers to another, then the above picture shows how is is being done. So the packet from the pc is being transmitted to the switch from there it is going to the core switch which is acting as ip routing and from there to the next switch of the desired pc. And then it is following the same route to transmit the message back.

6.2 Testing Result

Several new functionalities have been incorporated as a result of changes in specific requirements. I had tested the program whenever new functionalities were incorporated. I planned to finish the design and development process before moving on to testing, however owing to

time constraints, I had to complete all 3 phases at the same time. Many test cases had failed, necessitating the efforts of me to correct the bugs and errors. Not only did I run into faults throughout the development and testing phases.

Chapter 7

Project as Engineering Problem Analysis

7.1 Sustainability of the Project/Work

The term "sustainability" refers to a product's ability to be maintained and upgraded. In today's environment, any program that is released must be maintained and regularly updated for the benefit of its users.

Community Sustainability

By developing this project it will significantly impact the community because people will be relieved of the hassle as when there is a pre existing design then implementing it will not be difficult. [8]

Organizational Sustainability

After the project is completed, the application may be maintained and upgraded by the same team, or the company may grow the team by adding more members to the project in order to improve the project. The company intends to expand more functionalities. [9] development team will resolve any faults reported by its users. As stated in previous sections of this study, the application will be maintained and updated on a regular basis to improve the experience of clients so that the project is organizationally sustainable.

7.2 Addressing Ethics and Ethical Issues

With the proliferation of data collecting, hacking, and criminality in the world of smartphones, some unstated norms and ethics principles must be observed while developing.

Data Security: The Database stores data on the dmz server. When compared to on-premises security, cloud services provide more robust data security; as a result, there is a low risk of data exposure to the public so using a cloud based server will be effective. Firebase Security Rules act as a barrier between users' data and malevolent users. [10]

Data Storage: Since all application data is stored in the onsite database, so there is a slight risk of data loss or leakage due to system failure. If the data were retained on-cloud, there would be no risk of data loss due to system failure or other disasters.

Collecting user data: The system will collect only user data relevant to the business. The user's data will be gathered only if the user gives permission to collect the data or willingly provides their data on our application.

Sharing User Data: Despite the fact that the data obtained is unlikely to cause any privacy concerns for most users, the system does not give any service, business, or third-party access to the information acquired.

Chapter 8

Lesson Learned

8.1 Problems Faced During this Period

Due to the fact that my firm requested that I develop a professional network design, and this was my first time designing a network for an organization, the skill set required for this process was fairly extensive. I was required to learn plenty of new skills in order to incorporate different functionalities necessary for my application, such as how to connected all the pcs to the dhcp server and ftp server and also providing OSPF routing in the core switcher and router. I was assigned a team member to assist me with my project. Throughout the network development process, I encountered numerous challenges whenever I introduced a new feature or made a modification, such as when I send a ping to a particular pc my messages remain undelivered. Solving the bugs was a challenging effort for me, as some of the issues were extremely difficult to discover and, once located, took an unusual amount of time to resolve.

8.2 Solution of those Problems

Despite the fact that designing a professional application was new to me, I overcame obstacles and accomplished my goals through dedication to my job and hard effort. Working alone on the project was initially challenging since all of the responsibilities that should have been carried out by a team were instead handed to me to fulfill on my own. However, as I gained knowledge and experience, I adapted to performing duties alone, and after a while, I improved at my work. I tested my simulation multiple times whenever I added new features or made changes to it to make sure any flaws or problems I found were fixed. It took a lot of time, but I was able to fix every problem I ran across, which helped me in the long run and prevented me from having to spend the time and energy needed to go through a full application to discover the error commands.

Chapter 9

Future Work & Conclusion

9.1 Future Works

This project, Enterprise Network Design, is still evolving, and we intend to add additional features to it. Some of the features that we have plan to add in the upcoming future are:

1. Using Site-to-site VPN
2. Secure Access Service Edge
3. 5G connectivity
4. Wi-Fi 6 and 6E
5. Cloud-managed popularity
6. Managed service options
7. AI and machine learning

9.2 Conclusion

Working as an intern on the project at ABA Group was a wonderful experience. During my internship, I learned and applied a lot about networking and cisco packet tracer. I was challenged to quickly adjust to changes and come up with rational answers. Throughout my project, I discovered how to collaborate with my supervisor to overcome obstacles. I persevered despite the significant stress of creating a professional application on my own, and I was able to fulfill my goal of creating the application in accordance with the specifications. I've had the chance to learn more about the development environment and acquire professional experience thanks to this internship opportunity. I want to express my gratitude to everyone who made my experience as an intern special.

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An Undergraduate Internship/Project on Enterprise Network Design of ABA Group

By

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Student ID: **1830561**

Summer, 2022

Consent Form

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

(Signature of the Supervisor)

Ms. Ajmiri Sabrina Khan

Department of Computer Science & Engineering

Independent University, Bangladesh