



An Undergraduate Internship/Project on Topic
**Network Infrastructure and Router Configuration
for NRBC Bank**

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May 12, 2022

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

Department of Computer Science & Engineering

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Attestation

This is to certify that the report titled “**Network Infrastructure and Router Configuration for NRBC Bank**” - A network based project which is completed by me, Zawad Yalmie Sazid (1610074) submitted in partial fulfilment of the requirement for the Degree of Computer Science from Independent University, Bangladesh (IUB). It project has been completed under the guidance of Mohammad Noor Nabi (Internal Supervisor) and Mr. Razidul Islam (External Supervisor).

I also certify that; all my work is original and has not been submitted earlier to this university or any other institution. All the source of information used in this Project Report has been duly acknowledged in it.

Signature

Date

Acknowledgement

I would like to use this opportunity to thank everyone who has helped me throughout this internship session. I am grateful for their aspiring guiding, invaluable constructive criticism, and pleasant advice during this period. I am thankful to them for sharing their truthful and insightful perspectives on a variety of topics linked to the course.

I am grateful to Independent University, Bangladesh (IUB) for offering me this course, and I express my thanks to my faculty and internship supervisor, Mohammad Noor Nabi.

I want to express my heartfelt gratitude to him. I am indebted to Independent University, Bangladesh (IUB) for their guidance and constant supervision, as well as for sharing vital course information.

I am very much grateful to my external supervisor, Mr. Razidul Islam, who provided me with the assistance and support that I required to complete my internship and project. I would want to express my heartfelt gratitude to the IT Department of NRBC Bank and employees for their time and consideration in guiding me through this internship.

Lastly, I would also like to thank my parents for not just financially supporting me, but also for believing in me and motivating me to reach my goals.

Letter of Transmittal

Date: 12th May, 2022

Mohammad Noor Nabi

School of Computer Science and Engineering

Independent University Bangladesh.

Subject: Submission of Internship Report.

Dear Sir,

It is a great pleasure to submit my internship report on “Network Infrastructure and Router Configuration for NRBC Bank”. I have tried to narrate my project works, achievements, and experiences in this report. All the works presented here are done with utmost sincerity and honesty.

During my internship, I worked for three months at NRBC Bank, where I not only received real-world experience but also learned about the department's processes and numerous aspects. This report provides a thorough examination of the office network as well as the network department's functions. I have conducted all of the project works that I have done during my internship times, notably their requirements, functionality, and technical specifications, as a document of my effort during the internship periods.

I hope and pray that this report will be fascinating and meet your expectations. I've done my best to prevent any flaws. I'd also like to express my gratitude for allowing me to submit this report.

Sincerely,

Zawad Yalmie Sazid

ID- 1610074

Evaluation Committee

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Signature

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Supervisor

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Abstract

The banking industry in Bangladesh has pursued a strategy of branch expansion and growth, as well as the development of bank network infrastructure and router configuration. Both individuals and the government rely heavily on the services offered by banks in the financial markets to conduct their daily business and operate effectively. In order to determine how effectively commercial banks work in practice, there is nothing a nation can achieve on its own without interacting with other countries in some way. The primary reason for this is that no nation is self-sufficient in terms of having all it needs to provide for its citizens. It is possible for a nation to be able to generate more of a certain thing than it requires. Despite the fact that everyone in the globalization era is somehow involved in international trade, this study has been designed to serve the purpose of providing an overview of import and export procedures, with a special emphasis on foreign remittances and those from the perspective of the local office. The research provides an insight into the procedures and formalities that are maintained when dealing with international trade, including import, export, and international remittance. The research was carried out mostly with the use of secondary data sources such as manuals, annual reports, and other papers.

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Chapter 1 Introduction

1.1 Overview/Background of the Work

An ideal bank networking system will be completely network-based and simple to use, with a friendly user interface and a task management system for staff, so that any banking system can manage their networking system in some way. Head office, branch office, and other offices are maintained by LAN, MAN, WAN, VLAN, VLSM, and VPN, and some branches are maintained by manageable switch, and other branches are maintained by manageable switch. Local Area Networking (LAN) is used by Local Area Networking system to connect two or more offices or buildings together. A metropolitan area network (MAN) is used by a small town for example, whereas a wide area network (WAN) is used by a large city for example, Users of this networking system, which is utilized by all financial institutions, may benefit from it by sharing their data extremely effortlessly. As a result, any user may get information on the Network Structure and Security of the Banking System instantaneously and from any location.

The primary goal of this study was to gain valuable practical experience in order to disseminate information about data center administration, networking operations, and the use of tools in a bank's network center. This is a significant benefit in terms of gaining expertise about data centers in a hands-on environment. A bank's network operation relies on various instruments, which may be converted between analogue and digital communication systems. Computer networks, which transfer information and communicate with one another, are a useful adjunct to relevant knowledge and understandings. As a student of research in the subject of data center management, gaining practical experience via research in data center management is a thorough and effective means of acquiring the essential competence. Innovative concepts in the research fields of bank network infrastructure and router configuration, data processing, and personal computer correspondence systems provide a smart member to practical learning and understandings in the area of bank network infrastructure and router configuration. As an understudy, getting hands-on experience by taking on an entry-level role in a server farm's executive team is a major and effective way to gain valuable knowledge and expertise.

1.2 Objectives

- i. To develop and simulate a secure network system in order to ensure that it operates properly.
- ii. To simulate a network system that is capable of doing any banking job with ease.
- iii. To have a central system in charge of the banking network.
- iv. Develop an efficient network infrastructure.
- v. Develop a secured network.

1.3 Scopes

Due to the obvious expansion in Online Banking, there are several security concerns as well as an increase in the expense of building a more robust security system for both Online Banking customers and financial institutions. In his work, Classers asserted that security is all about risks and the costs associated with them. Protecting sensitive information that is vulnerable to unauthorized access by attackers is the most crucial aspect of Online Banking security. As a result, banks must continually improve their security measures. Meanwhile, banks must control expenses in order to generate a profit. On the other hand, boosting security increases the cost for attackers to get access to the system, and increases the possibility of criminal prosecution for those who do break into the system. As a result, cybercriminals, cyberattackers, and cybercrackers may lose their desire to break into a high-security online banking system.

Chapter 2 Literature Review

2.1 Relationship with Undergraduate Studies

Computer Science (CSC) is my major concentration. During my undergraduate academic session, I have completed the course CSC430(Data Communication and Computer Networks). I have learned the basics of network categories, topologies, protocols, repeaters, bridges, routing algorithms, IP addressing, sub netting, basic commands for configuring cisco router and connecting it to switch/cloud and firewall. The knowledge and skills that I have earned from my academic session helped me working on this network firewall management project. I have also acquired on functional/non-functional requirements, Rich Picture and UML/Data flow/Use Case/Activity diagram from my CSC405(System Analysis & Design) and CSC459(Software Architecture and Component-Based Design) courses, which assisted me to design and carry out this project.

Chapter 3 Project Management & Financing

3.1 Work Breakdown Structure

1.1 Work Break Down Structure:

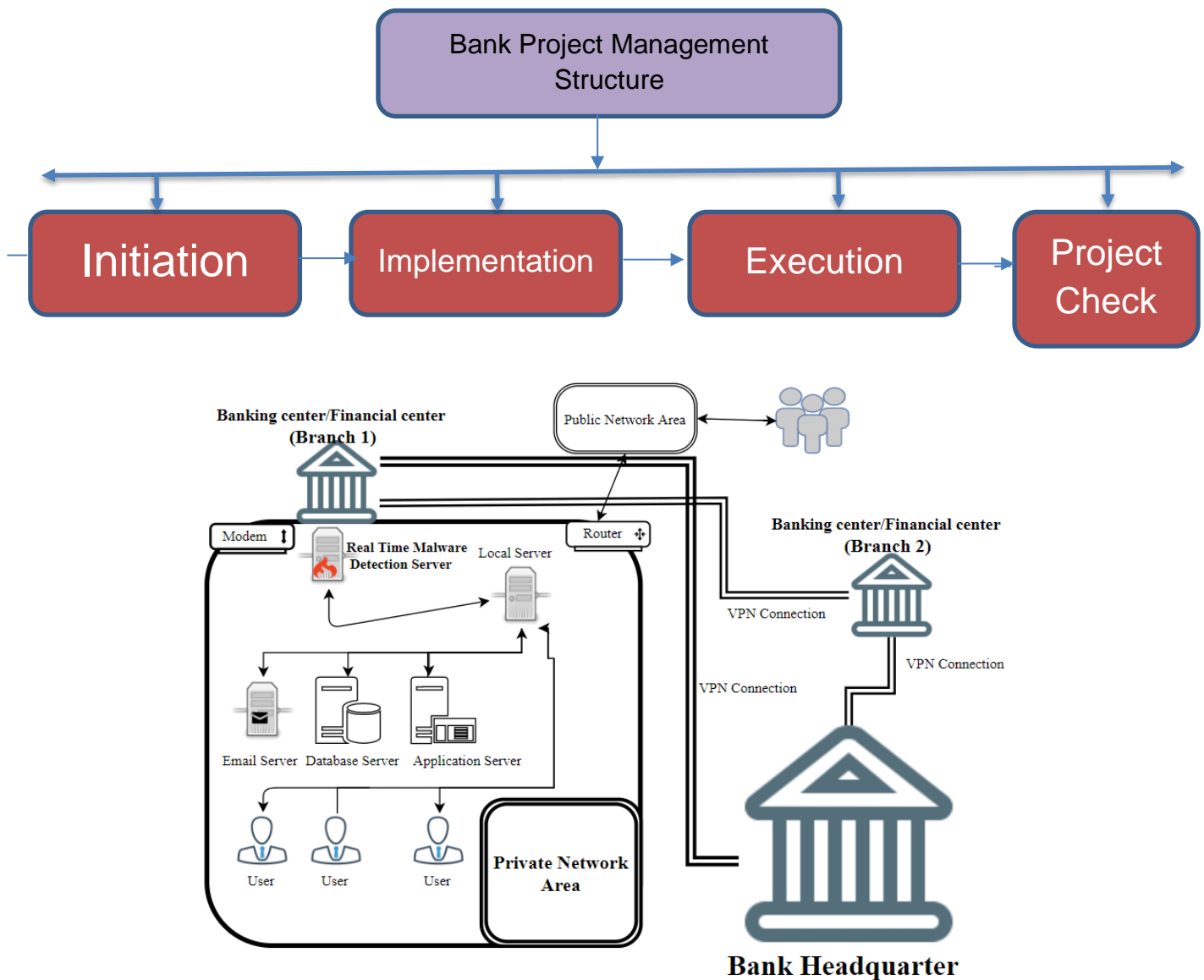


Figure 1: Project Management Structure in Flow Chart

3.2 Process/Activity wise Time Distribution

Nowadays, information technologies have developed very fast and they have been the main tool that pushes business and economy of every country. Along with all benefits, there are also

IT-related risks. Because of the widespread usage of IT in every industry, hackers have become more sophisticated in their methods to attack industries, which rely heavily on information technologies. Many government agencies and industries across the world face cyber threats. Financial services have one of the highest rates of cyber-attacks. In order to fight these cyber threats, banks need to implement different mechanisms, principles, practices, and frameworks in order to improve the internal security. The existing cybersecurity frameworks provide “what” needs to be done and they do not show “how” it needs to be achieved. Furthermore, many research papers focus on the application of a single analytical method to analyze the data and identify malware. As a result, here is a security standard lack in the banking industry in detecting infections by viruses/malware. This thesis proposes an L-based Malware Detection Framework, which combines different analytical methods and analyzes data from various sources in real-time fashion in order to identify malware activities in the banks. The developed framework is evaluated through conducting interviews with people who work in the bank industry.

3.3 Gantt Chart

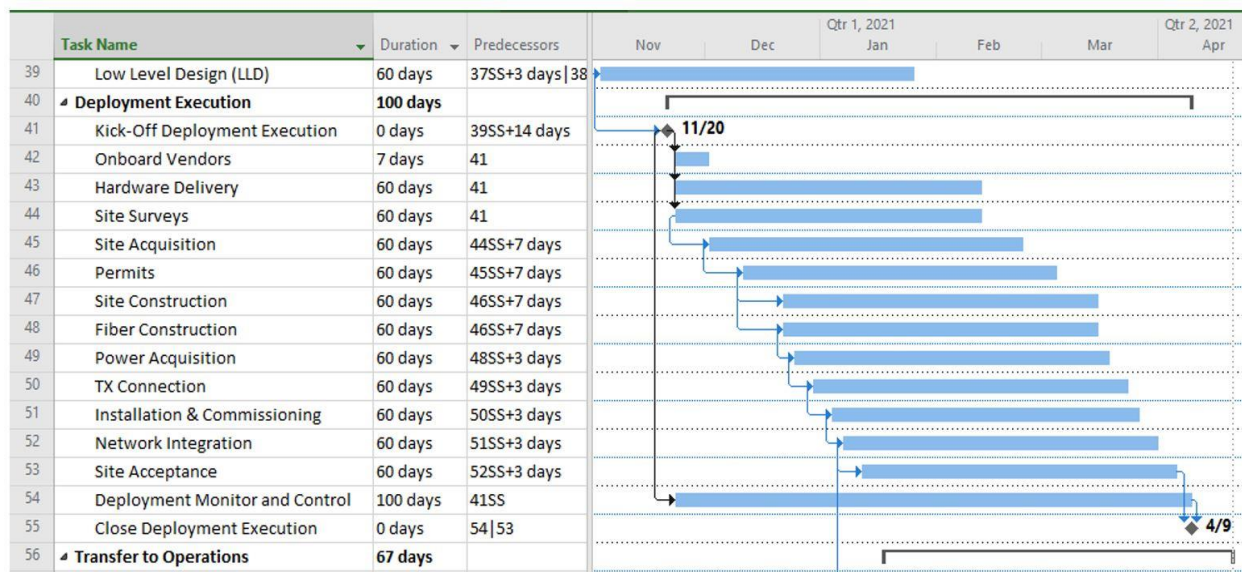


Figure 2: Gantt Chart

3.4 Process/Activity wise Resource Allocation

Initial Planning:

At the first stage of development, there are few orders that were proposed by the Organizations to get a customized development solution of tracking their employees/staffs and maintain a proper connection and also a measurement on what position of network is standing upon.

Requirement Evaluation:

For example, the features and their functions, as well as the assumption that the employee's data will be entered when the program is first released, and so on.

Design Outline:

Designing plannings where we create an efficient network infrastructure and design the features with few diagrams to implement in the real-time of the application.

Development Process:

This project was produced at various stages of the network-based implications development. This project was a touch slow at first, but fixing the amount of work distribution each day did help in developing the application to be completed on time, while working on other projects as well.

Deployment of Product:

The goal of the network deployment was to create a high-quality, usable application that met all of the dates.

3.5 Estimated Costing

Requirement Quantity Amount		
Router	6	1,850,982 BDT
Switch	6	178,836 BDT
Server	4	3,012,416 BDT
Power/Fiber Optic Cable	U+221e	2,285,491 BDT
Subtotal	-	7,327,725 BDT

Figure 3: Cost Estimation

Chapter 4 Methodology

During my internship period, I have gathered two types of information regarding NRB Commercial Bank: -

- I. internal information
- II. external information

The data was gathered using both primary and secondary recourses.

- a) Primary Data: They are original data that I have collected on the subject. During my studies, I came across several sources such as direct interviews with supervisors, employee opinions, casual conversations with employees, and so on. For example: I managed to draw their current network structure consulting with their IT Support Engineer.
- b) Secondary Data: I have gathered them as per requirement of my research for the organizational networking. In order to compile this study on network firewall management, I have gathered data from the NRBC Bank, the internet, books, teachers, and previous records.

Chapter 5 Body of the Project

5.1 Work Description

The Open Systems Interconnection (OSI) model is one of the first things we learn when we begin working in the area of computer networking. The Open Systems Interconnection (OSI) model is used to explain how data should be transmitted over a network. It is divided into seven levels, with the first layer being the lowest and progressing upwards to the seventh layer. The seven levels are identified as follows: 1-Physical, 2-Data Link, 3-Network, 4-Transport, 5-Session, 6-Presentation, and 7-Application, beginning with layer 1 at the bottom: 1-Physical, 2-Data Link, 3-Network, 4-Transport, 5-Session, 6-Presentation, and 7-Application. There are a variety of organisms that reside on each stratum. Layer 1, often known as the Physical Layer, is concerned with all of the elements that are used to create physical connection. Ethernet cables, fiber optic cables, and wall jacks are just a few examples. A hub is the most popular networking device at the Layer 1 level. It only facilitates device communication, and that is all it does. Hubs are incapable of being controlled since they lack a brain. In a network with hubs, the broadcast domain (which is the segment of a network where all nodes can communicate with one another via broadcast) and the collision domain (which is the segment of a network where data packets can collide with one another) are the same segment of a network, and they include every port on every hub connected together on a physical segment.

5.2 Requirement Analysis

This following software we have used to implement our project-

1. Windows XP or.
2. Windows 7 or Windows 8 platform.
3. Packet Tracer 5.3.3
4. Switch.
5. Router.
6. Firewall.
7. Server.

5.3 System Analysis

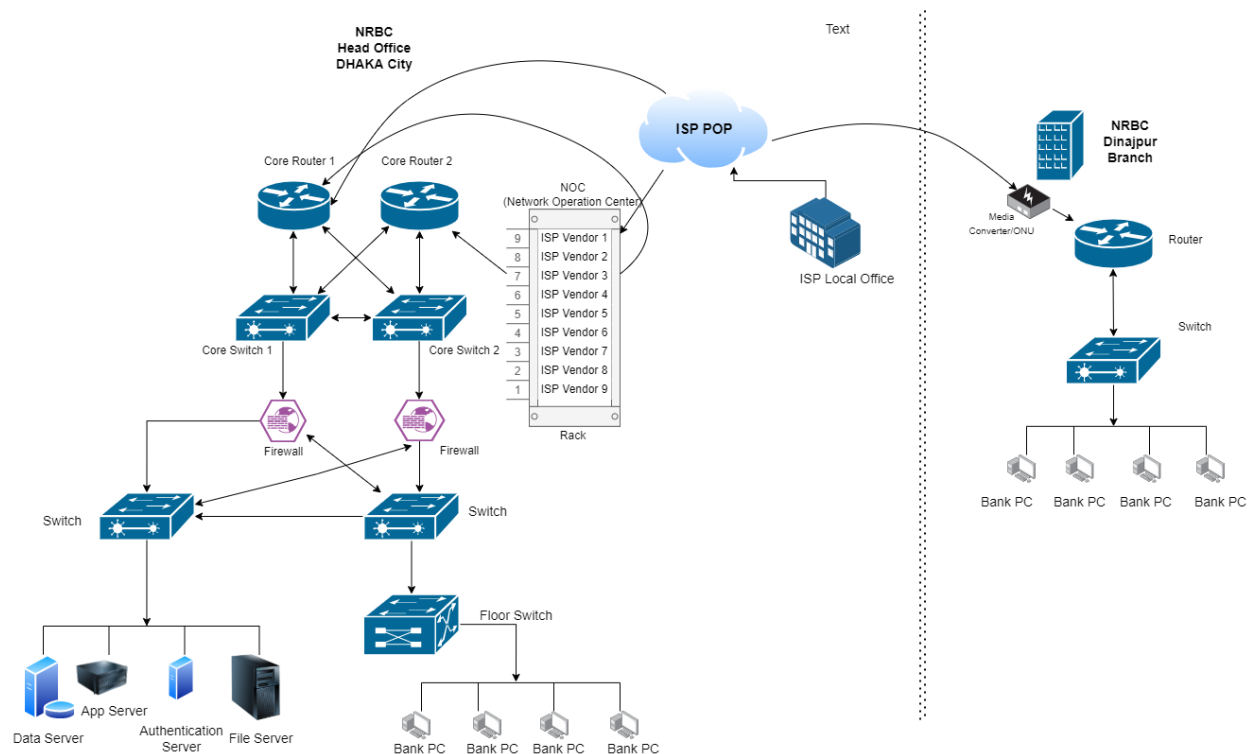


Figure 4: Proposed Network Infrastructure

A data flow diagram is a graphical representation of system needs. It specifies the data flow, the procedure, and the storage location.

5.3.2 Feasibility Analysis

The separating sales communications and multi-level marketing into smaller logical sections, the OSI model simplifies how networking protocols are created. The OSI model was designed to ensure different types of equipment (like adapters, routers, hubs and network adaptors) are compatible.

1. Provide a wide variety of choice. Customers have a wide variety of choice since software/hardware from different manufactures work together in harmony. In addition, the OSI model can fit to any compatible software/hardware from different users in other parts of the world.
2. It does not rely on a specific operating system. OSI is convenient since errors are dealt with at each level, as different levels operate automatically independent of each other. This makes it easier to troubleshoot problems that may arise at each stage, by separating the networks into small manageable pieces.

3. The user can understand the common terms used in networking. OSI model also help the user to understand different networking terms and functional relationship applied on multiple networks. In addition, the user also understand how new technologies are developed in the existing networks.

4. Interprets product functionality at each stage. The OSI model simply uses different stages of functionality. For instance, each stage has specific functions to ensure all networks operate without technical hitches. Also, each layer has its own interface specifications and a well-defined connector.

5. Encrypt data for security purposes. Decryption and encryption services are also available for security purposes. Expansion and compression of messages is simplified to ensure it travels from one system to another efficiently.

6. It is easier to add multiple network models. The OSI model is designed in such a way that user further extend new protocols within the process. This means you can use additional layered architecture other than the existing one. Due to its complexity, poor performance can be obtained in day-to-day applications, thereby it requires great technical know-how.

5.3.3 Problem Solution Analysis

The aim of this system is to overcome the lacking of the manual system. All branches of the Bank situated at District level provide the Banking services to customers and had to send report to the central branch manually, which sometimes create problem to get up-to-date information rapidly. But now through this system whenever any transaction will be taking place it will store in the central database and authorized person can get necessary information or report when they get into the system from any branches through Wide Area Network (WAN). Routers are generally known as intermediate systems, which operates at the network layer of the OSI reference model, routers are devices used to connect two or more networks (IP networks) or a LAN to the Internet. A router acts as a packet filter when it forwards or denies packets according to filtering rules. As a Layer 3 device, a packet-filtering router uses rules to determine whether to permit or deny traffic based on source and destination IP addresses, source port and destination port, and the protocol of the packet. These rules are defined using access control lists or ACLs. Banking system in Bangladesh all banks has an IT department. IT department solution all type of IT problem and serve the core network. IT creates a core network diagram. This diagram involves all type of useable network mechanism (Switch, Router, Firewall, Server) etc. Simulation is the most important of any system. An accurate system design, accurate performance and accurate Simulation give best performance of a system. Now we discuss and simulate the OSPF protocol. Open Shortest Path First (OSPF) is a routing protocol developed for Internet Protocol (IP) networks by the interior gateway protocol (IGP) working group of the Internet Engineering Task Force (IETF)

5.3.4 Effect and Constraints Analysis

This project has proven that a standard network system can be designed with less cost. Although we used the cheapest devices in designing the network, the security of this network turned out to be very strong. This is because the firewall and backup devices used in this network are of good quality. All networks need many servers for doing their work. For this research, we did not use all servers because of cost, but we used some important servers such as DNS and DHCP. These servers help the network to perform their functions in a smooth way. 71 It can be seen in this research that various costs were minimized in order to maximize the quality of the designed network. Although there may have been some challenges in this project due to some financial constraints, at the end our aim was achieved by designing a network for developing countries with minimal cost. For example, we made use of some cheap devices for the network security, but the most interesting part is that, at the end of the day, all challenges and constraints were overcome. This research has also demonstrated that economy problems of a country cannot hinder the success of a technological invention. Many developing countries who aspire to be in the same technological league as the developed countries, will be very hopeful. This is because this project has deeply provided a way to adopt a cheap and effective solution to designing a standard network, especially when a budget is not favorable. Lastly, as cheap and effective as the methods of designing a network in this research are, it is not limited to only developing countries. Developed countries that are trying to cut cost in any of their network design projects can also adopt the methods used in this research

5.4 System Design

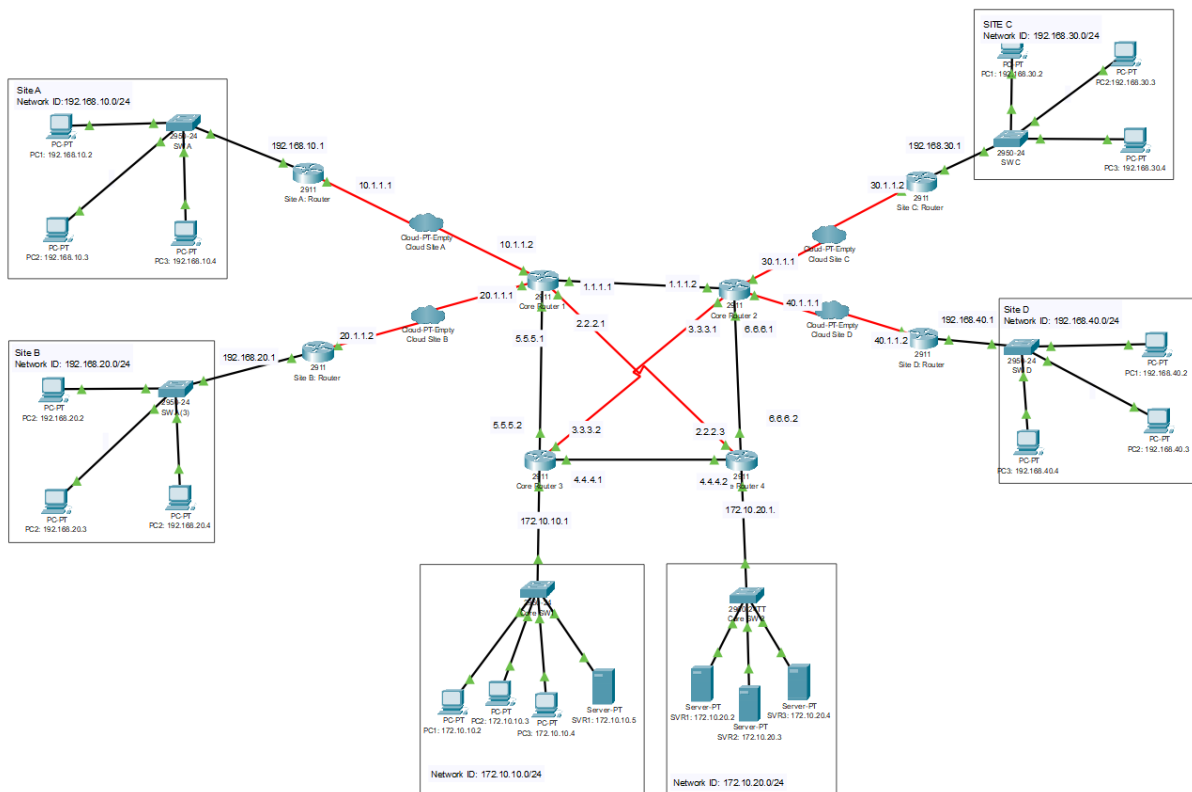


Figure 5: Implemented Proposed Network Infrastructure.

5.5 Implementation

Project: Configuration			
Steps:	Device:	Commands:	Explanation
1. Security Configuration	Switch and Router	SwA(Config)#enable secret 1234	Enablement password
		SwA(Config)#hostname	
		SwA(Config)#line console 0	Console Password
		SwA(Config)#password 123	
		SwA(Config)#exec-timeout 5 30	ask password for 5 minutes 30 seconds
		SwA(Config)#login	
		SwA(Config)#exit	
		SwA(Config)#line vty 0 4	Telnet
		SwA(Config)#password 123	
		SwA(Config)#exec-timeout 5 30	
		SwA(Config)#login	
2. Mac Binding			
	Switch	SwA(Config)#int fa 0/0	Mac binding to the port
		SwA(Config-if)#switchport mode access	
		SwA(Config-if)#switchport port-security maximum 1	Max 1 MAC can be bind to this port.
		SwA(Config-if)#switchport port-security mac-address sticky	To bind the MAC to port
	verify	show running-config	
3. Router configuration			
	Router	RtA(Config)#int fa 0/0	
		RtA(Config-if)#ip address 192.168.10.1 255.255.255.0	Allocate IP to each interface
		RtA(Config-if)#no shutdown	to wake the port Up
	verify	RtA>show ip route	
	OSPF configuration	CoreR1(Config)#router ospf 10	
		#router-id 1.1.1.1	Router ID
		#network 10.1.1.0 255.255.255.0 area 0	
		#network 20.1.1.0 255.255.255.0 area 0	Advertised networks
		#network 1.1.1.0 255.255.255.0 area 0	
		#network 2.2.2.0 255.255.255.0 area 0	
		#network 5.5.5.0 255.255.255.0 area 0	
	verify	CoreR1>show ip route ospf	
		CoreR2>show ospf neighbor	

4. IPsec-ISKMAP (VPN)

		#license-----securityk9	security license is installed on router or not
	ACL 100	RtA(config)# crypto isakmp policy 1	ISAKMP Policy (Phase 1) Key Gen
		RtA(config-isakmp)# encr 3des	
		RtA(config-isakmp)# hash md5	
		RtA(config-isakmp)# authentication pre-share	
		RtA(config-isakmp)# group 2	
		RtA(config-isakmp)# lifetime 86400	
		RtA(config)# crypto isakmp key cisco123 address 10.1.1.2	Accesslists
		RtA(config)# access-list 100 permit ip 192.168.10.0 0.0.0.255 20.1.1.0 0.0.0.255	
		RtA(config)# access-list 100 permit ip 192.168.10.0 0.0.0.255 1.1.1.0 0.0.0.255	
		RtA(config)# access-list 100 permit ip 192.168.10.0 0.0.0.255 5.5.5.0 0.0.0.255	
		RtA(config)# access-list 100 permit ip 192.168.10.0 0.0.0.255 2.2.2.0 0.0.0.255	
		RtA(config)# crypto ipsec transform-set TS esp-3des esp-md	IP Sec Transform Set (Phase 2)
		RtA(config)# crypto map CMAP 10 ipsec-isakmp	Crypto map creation
		RtA(config-crypto-map)# set peer 10.1.1.2	
		RtA(config-crypto-map)# set transform-set TS	
		RtA(config-crypto-map)# match address 100	
		RtA(config)# interface s 0/3/0	
		RtA(config-if)# crypto map CMAP	Crypto map apply

Above is the document of a single network device, which you may replicate further, if needed.

All the configuration of the switches will remain same for all.

All the configuration of the routers will remain equivalent and changes only the IP addresses.

VPN Configuration will remain same for the routers where VPN needed to built, eg CoreR1 to RtA etc. The Acl and Gateway will change accordingly

Mac-binding is done by port-binding to a specific MAC, when that MAC will disconnect, no other device can jump in.

ACL are created on all the routers where VPN needed to be configured.

5.6 Testing

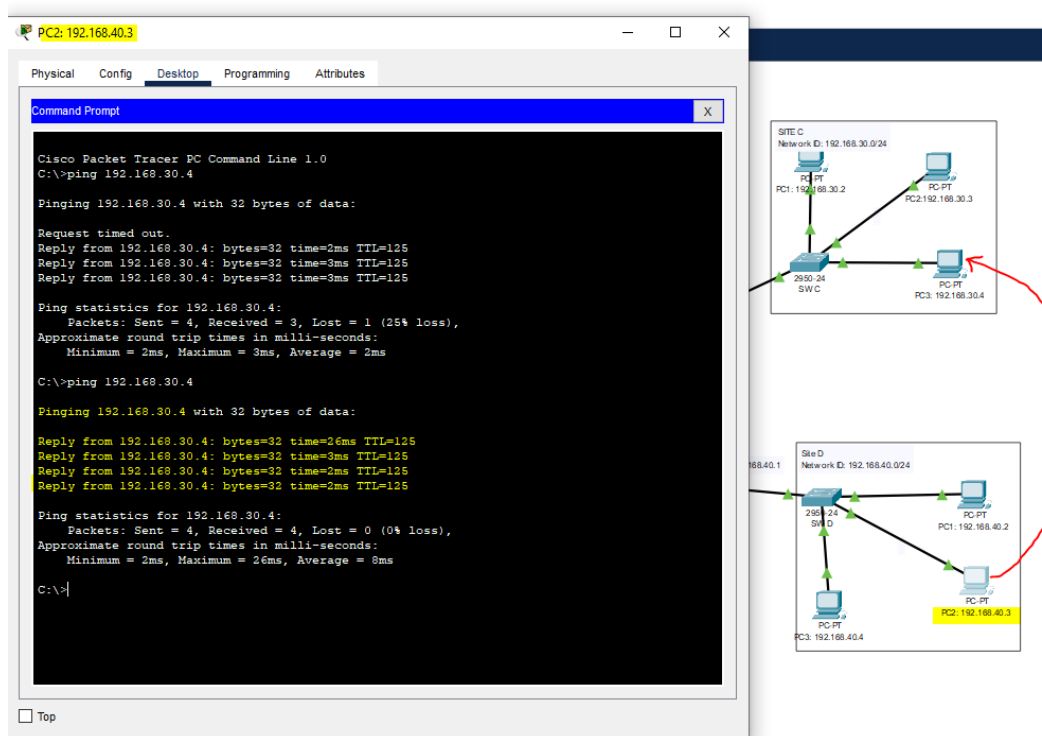


Figure 6: Pinging from one pc to another pc

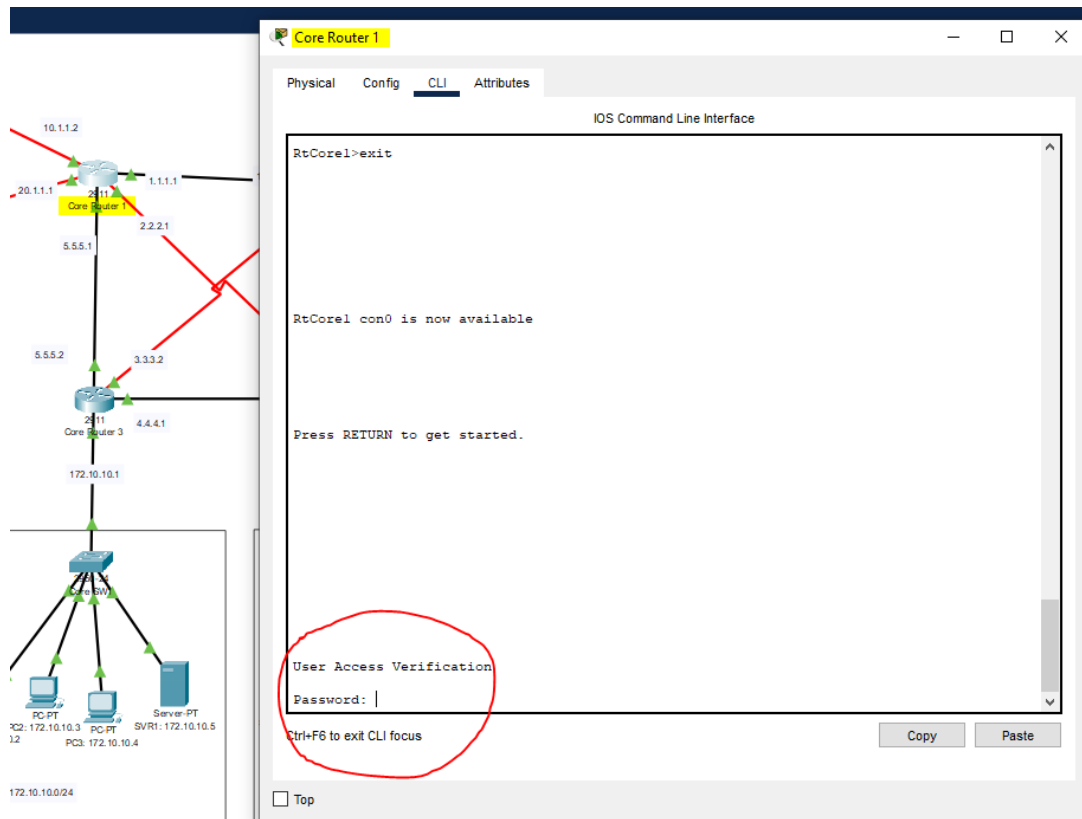


Figure 7: Asking for password when core router 1 is being accessed

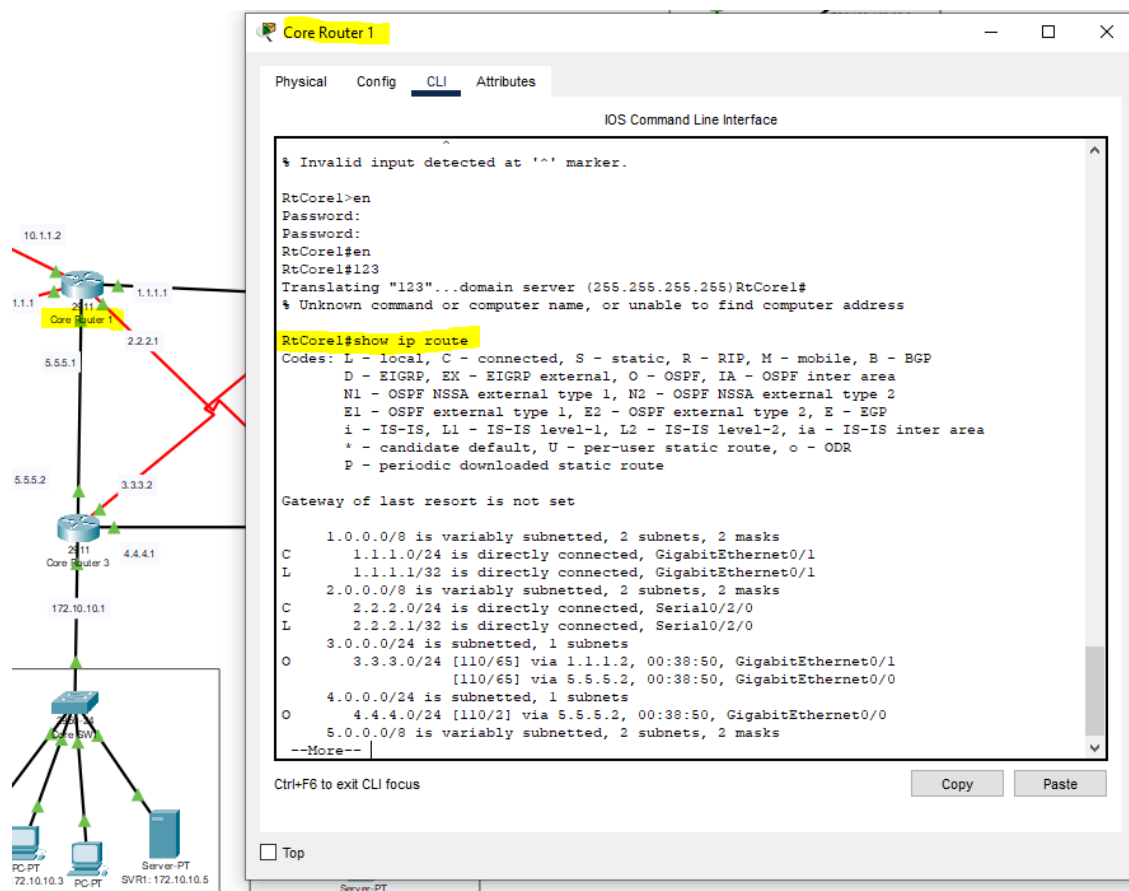


Figure 8: Verifying Core Router 1

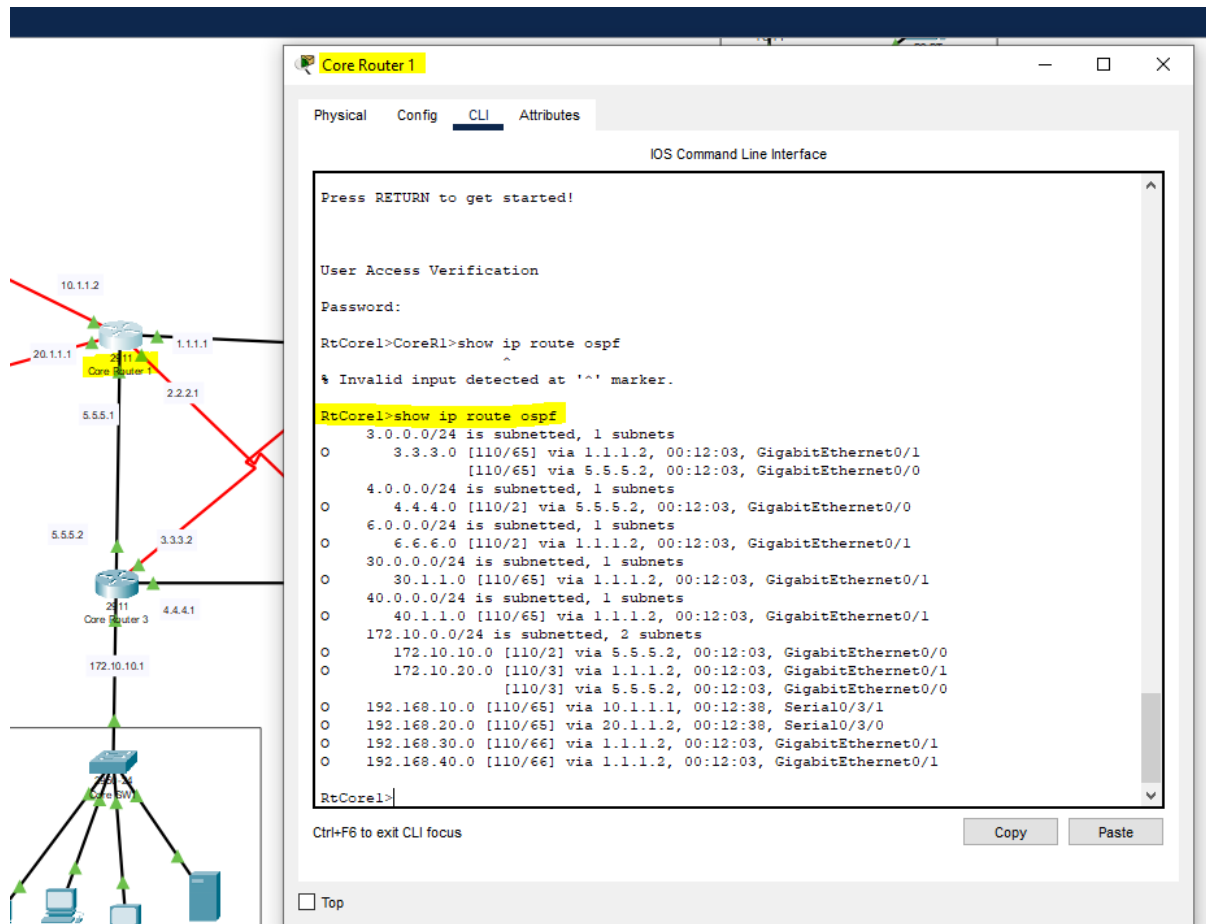


Figure 9: Core Router 1 IP Route OSPF

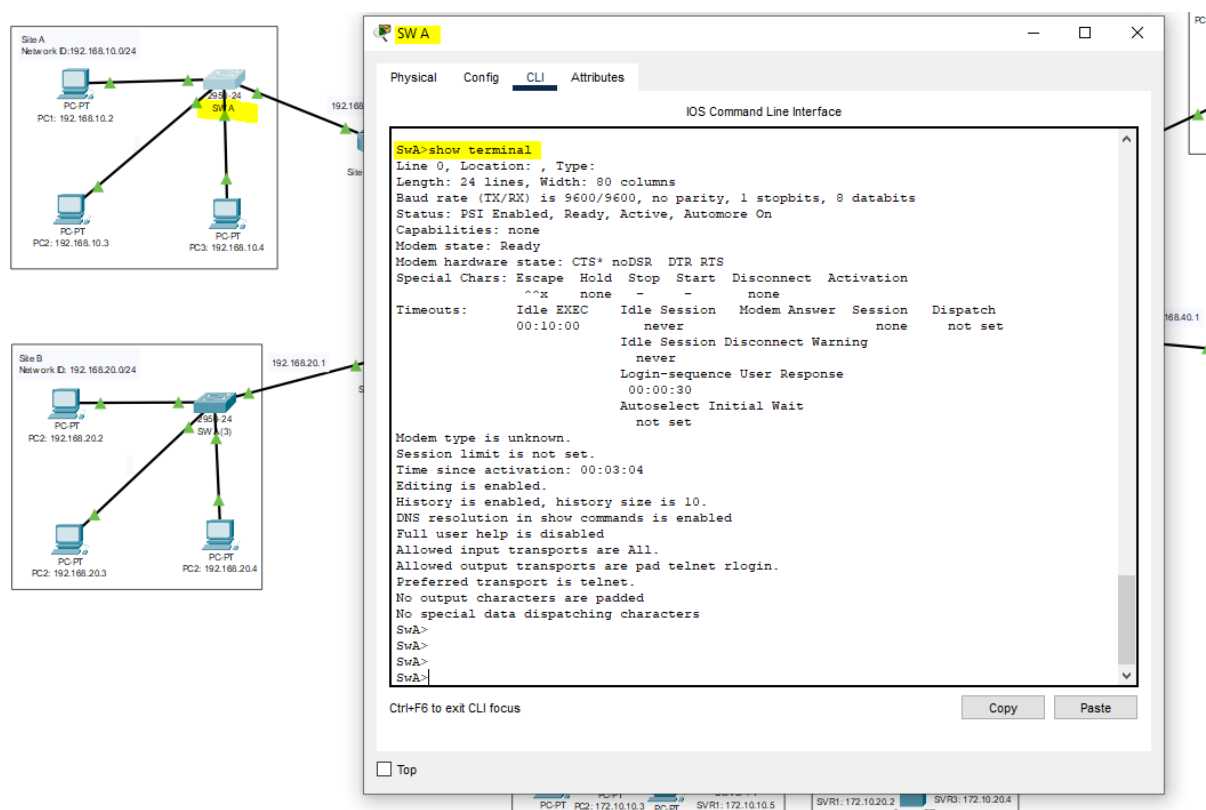


Figure 10: Switch 1 config

Chapter 6 Results & Analysis

Chapter 7 Project as Engineering Problem Analysis

7.1 Sustainability of the Project/Work.

In order to identify the need, the "Literature review" data collection and analysis method is used. To obtain the necessary information, conducting a study of well-documented literature is required.

Suggestion:

This phase is closely related to the first phase and it is concerned with finding preconditions for the defined problem which was described in the awareness phase. With this phase, the research process starts throughout analysis of documented literature written in this area. The goal is to find possible answers in order to help to develop the framework. The output of this phase is tentative design and it is used in the next steps.

Development:

The artifact is developed based on existing principles, practices, tools, and techniques in the literature which were defined in the suggestion phase. The goal of this phase is to develop an artifact.

Evaluation:

The developed artifact (L-based Malware Detection Framework) is evaluated throughout conducting interviews with people who work inside bank institutions to verify whether this framework is feasible or not.

Conclusion:

The final phase ends the research cycle. It wraps up the results, effort and the knowledge gained.

7.2 Social and Environmental Effects and Analysis

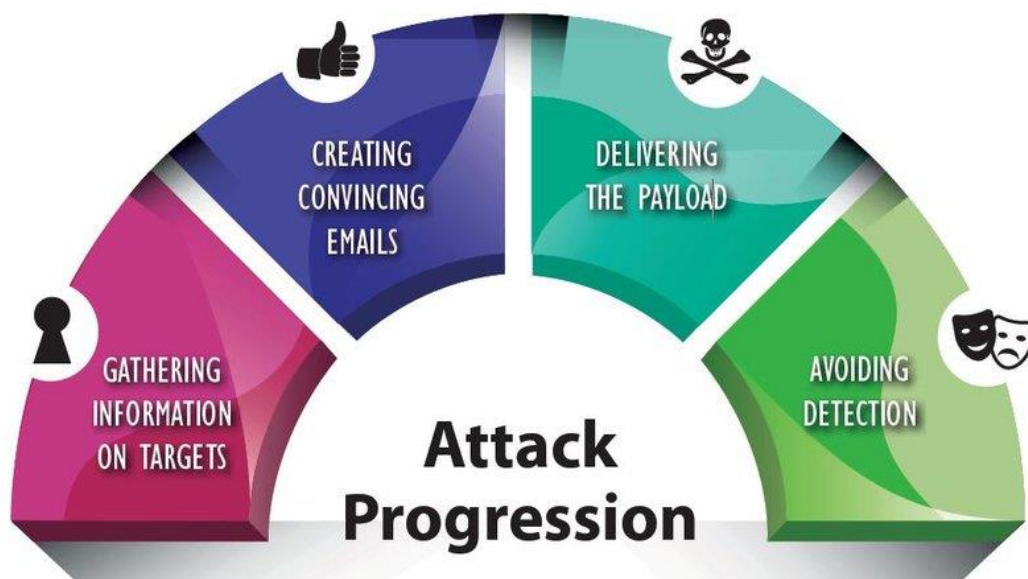


Figure 11: Social Effect

Individuals inside a firm should be targeted initially, with data collection beginning as soon as possible after that. In order to obtain even more social information about their victims and their ties with friends and coworkers, attackers utilize social media sites such as Facebook, LinkedIn, and Twitter. An further method by which thieves gain data is via capturing data, which is data that is transmitted and received by the target in a shared network and then storing it.

7.3 Addressing Ethics and Ethical Issues

Security risks may emerge not just from external sources, but also from inside financial institutions, from staff who are responsible for maintaining security. It was stressed that these dangers are difficult to detect and that they have the potential to infiltrate an organization's private network by bringing malware with them. Because of this, watching workers and recording their activities may be regarded one of the most effective data sources for discovering harmful insiders in an organization. Methods such as the use of keylogger malware or so-called ethical hacking, as well as the use of behavior logs, are examples of good practices.

To capture user data and monitor emails, chats, webcam images, and anything else that necessitates the use of a keyboard, keyloggers are used in the framework. Additional user data is gathered by keeping track of the workers' activity logs and other logs. Behavior logs capture information about a user's actual behavior, such as online browsing history, search queries, and clicks, social media content, browsing habits, and other information, from many sources.

The information acquired about the activity of the workers is collected on a distant server and stored as a single dataset. The information included on this site reflects the results of a study of user activity patterns. Furthermore, machine learning algorithms are applied to the data, and the result is used to establish a baseline for future behavior patterns. It is important to note that any departures from the baseline are grounds for alarm.

Chapter 8 Lesson Learned

8.1 Problems Faced During this Period

- Distance from workplace to home was quite long.
- There was no transport and lunch allowance from the bank since it was non-paid.
- Had to face difficulty finding places for lunch and finding proper transport to reach home since the workplace area was new to me.
- I had no access to their core router/switch.
- My workplace was so small, unorganised and unstable.

8.2 Solution of those Problems

- I managed my supervisor to work 3 days in a week.
- Had to use public transport and local hotel for a reasonable costed lunch.
- I overcame finding the proper transport and lunch place after few days while being with my co-worker.
- Since, I had no access to their core router/switch, I had to collect the models of the devices/components they use and their network design. Then I studied from various sources.
- Due to unstable, small workplace I had to carry my laptop to do my work portably.

Chapter 9 Future Work & Conclusion

9.1 Future Works

- i. The security and firewall system will be updated in the future.
- ii. Making the network infrastructure more organized and efficient.
- iii. Actual application in the real world.
- iv. Implementing algorithm which will handle the server load balance effectively.

9.2 Conclusion

Nowadays, technological development, and automated system development is more essential and an obvious need for the expansion of banking services because they will need less employers by using automated system. On top of that Security is a major issue regarding banking issues. With this system network will be easier to handle and it will route the data in a shortest path in a vast distributed system. In future we will try to implement it in real life so that banks can use it and get benefited from this project.

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