

**Internship on Network Management & Security System of Globaltech**

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This Report Presented in Partial Fulfillment of the Requirements for the  
Degree of Bachelor of Science in Computer Science and Engineering

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**DAFFODIL INTERNATIONAL UNIVERSITY  
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## **APPROVAL**

This internship titled “**Network Management & Security System of Globaltech**”, submitted **Aklima Khatun, ID: 182-15-11552** to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on **January 27, 2024**.

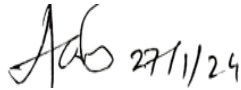
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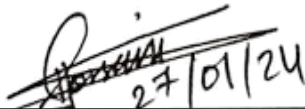
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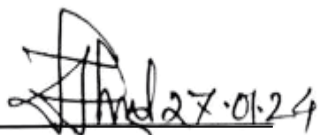
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## DECLARATION

I hereby declare that this project has been done by us under the supervision of **Md. Sazzadur Ahamed (Assistant Professor), Department of CSE** Daffodil International University. I also declare that, I collect Information from my Internship Company **Globaltech**, ISP Base Corporation, Books, Internet, and Big Brother and friends also.

### Supervised By:



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First, I express our heartiest thanks and gratefulness to Almighty Allah for His divine blessing makes me possible to complete the final year internship successfully.

I really grateful to the System Admin of Globaltech and wish our profound our indebtedness to Md. Sazzadur Ahamed (Assistant Professor), Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen is interest of our supervisor in the field of “Network Management & Security System of Globaltech” to carry out this internship. His endless patience, scholarly guidance, continual encouragement, energetic supervision, constructive criticism, valuable advice, reading many inferior drafts and correcting them at all stages have made it possible to complete this Internship.

I would like to express our heartiest gratitude to Dr. Touhid Bhuiyan, Professor and Head, Department of CSE, for his kind help to finish our project and also to other faculty members and the staff of CSE department of Daffodil International University.

I would like to thank our entire course mate at Daffodil International University, who took part in this discussion while completing the course work.

Finally, I must acknowledge with due respect the constant support and patients of our parents.

January, 2024

## ABSTRACT

This Internship on “**Network Management & Security System of Globaltech**”, Today's computer networks have gone from typically being a small local area network to wide area networks. With continuous growth of the networking, security is one of the major issues need to take into consideration. It has opened the door to learn how the security issues can be taken into consideration in a establish networks.

To reach the main goal, a detail study has been done for entire network system of Globaltech. As the Globaltech network is growing fast, it demands to overcome some serious limitations (such as security, load balancing, traffic congestion and so on) of existing networks. In this practicum work an idea has been developed to overcome these limitations. After explaining the past, existing, and proposed design, a performance study has been done by using well known packet tracer software namely "Cisco Packet Tracer". It has shown that proposed network can overcome the problems of existing network.

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# CHAPTER 1

## Introduction

### 1.1 Explanation:

In the case of WAN, LAN, and cloud-based networks, Cisco routing may provide intent-based networking. Our network routers provide features like enhanced analytics, application optimization, automated provisioning, and integrated security that provide a thorough, tried-and-true result. Cisco routers are used by associations of all sizes. Although it might be pricey, Cisco routers are user-friendly. The majority of impact site visitors also use peer-to-peer applications because of how efficiently they transfer vast volumes of data from the transmitter to the recipient.

### 1.2 Motivation:

Computer networking system as a topic it may not seem like a big issue but there is a broad area that needs to be considered for an organization as like Globaltech. Wireless and cable network connections are both used in computer networking. A computer network's infrastructure should be designed to produce the greatest results feasible. The implementation is particularly fascinating since it calls for experience and practical knowledge. We need a reliable and secure internet connection in this day and age where information security is crucial for the protection of our data and information. The majority of hacker intrusions occur through an organization's current network connection. For this reason, suitable firewalls and NATs should be installed in the network architecture. An essential component of the IT infrastructure is networking. Additionally, networking involves several network protocols, which are fascinating and make the work enjoyable. All of the aforementioned points are supported by the reason for picking this particular topic. A student's duty increases as the internship report grows. Information and plans regarding the student intern's upcoming work experience.

### 1.3 Scope of learning from this Internship:

Globaltech is a first-rate IT infrastructure & high-class IT farm. Apart from that there are so many employees a large network connection must be maintained properly because even a small amount of dishonesty can prevent a large number of workers from working. Maintaining this will give me the opportunity to learn so much in so many different areas. Every day will present a challenge. My ability to maintain my composure under duress will make me a stronger person. In the

Information and Communications Technology team, where there will be seniors with more than 10 years of experience, I will be working as an IT assistant. I will pick up a lot of knowledge from their vast expertise. Additionally, I will be helping the staff with IT, which will allow me to polish my formal demeanor. This organization's local area network (LAN) is set up in a way that necessitates careful preparation and execution. I'll be a part of this planning, which will eventually provide me the chance to get real-world expertise with local area networks. Working with these extensive network activities can only strengthen one's understanding of networking and the environment it exists in. I also had the opportunity to learn about switches, routers, and other crucial networking hardware.

#### **1.4 Internship Objective:**

CCNA operating system has a command base and graphical user interfaces and it runs very easily. Main goal is to maintain users while maintaining network security. The major goal of my internship program is to represent oneself as qualified in the targeted activity ads.

More Objective is given below:

- Physically work with packet Tracer
- Take a break from the current job in a professional setting.
- Learn about physical activity.
- Establish current connections and learn how to move about in an executive setting.
- Gain knowledge of time management, which is essential in a professional setting.
- How to fully Configure a Networking
- Improved customer support for the company

#### **1.5 Introduction of Company:**

Globaltech is a client-focused customer-oriented software development company that provides network solutions, website design & development, mobile application development services and very cost-effective strategic solutions. [1] We additionally provide information and communication technologies (ICTs), which typically include computers, cellphones, and televisions. In a very short period of time, ICTs have completely changed how people live their lives by making information easily accessible to all societal strata and expanding the social exchange platform through social media like Facebook. By enhancing citizens' rights to

knowledge, participation, and freedom of speech, ICTs have widened the range of development opportunities. However, the role of ICTs in advancing children's rights has been small and largely experimental so far. By establishing new objectives to close the digital divide, the Bangladeshi government has created the environment for growth and change through the development of ICTs.

Table 1.1 Information on the organization

<b>Organization Name</b>	<b>Globaltech</b>
<b>Type of Organization</b>	Software Company
<b>Address</b>	Hafiz Mansion 1st Floor 33 Kazi Nazrul Islam Avenue Kawran Bazar, 1215 Dhaka, Dhaka Division, Bangladesh
<b>Telephone</b>	+880255014039
<b>E-mail</b>	<a href="mailto:globaltech_bd@yahoo.com">globaltech_bd@yahoo.com</a>
<b>Website</b>	<a href="http://www.globaltechbd.com">http://www.globaltechbd.com</a>

## **CHAPTER 2**

### **ORGANIZATION**

#### **2.1 Function:**

I've finished my internship with Globaltech Bangladesh's ICT division. Helping the service support staff with everyday tasks such as accepting client complaints, opening trouble tickets, resolving issues, providing customers with the most recent information on their issues, etc. I worked on several technology-based aspects of Globaltech, including MFA, Portal based Antivirus (F-Secure), Share point, Mikrotik, Cisco etc.

- I monitored the network and analyzed network alerts to promptly fix problems.
- How to create Impact analysis.
- Configuration of OSPF, BGP, and route manipulation.
- We also using a deep packet inspector, packet capture, and packet analysis.
- Escalated client problem investigation.
- Work with Network implementation & strategy.

#### **2.2 Service provides:**

We as Globaltech we always try to provide the most effective service like we can provide custom web base application. We also provide their client demand base Software solution. We have most efficient trained staff. We have also dedicated staff for client 24 hours support.

#### **2.3 Target Group:**

- Our company may expand in a variety of industries.
- Your association operates all different kinds of enterprises, including those in education, healthcare, pharmaceuticals, woodworking, textiles, autogas stations, and garments diligence.
- We would like to advance along our trip to the highest levels of expertise and client business.

## 2.4 Strength Weaknesses Opportunities & Threats Analysis:

This is a Commercial method strategy to advance of place to progress the skill.

<b>Strength</b>	<b>Weaknesses</b>
<b>Opportunities</b>	<b>Threats</b>

### Strength:

Globaltech as an IT Farm always wants to make an impeccable effort to fix problems solving with information collection and communication also improves e-business understanding of the present network system. We are very attentive with our customers.

### Weaknesses:

Globaltech has costs associated with effort and infrastructure is our limitation. The costly final item is a more equal piece of employee. Within few years company try to build their own infrastructure to get over their limitations.

### Opportunities:

1. To boost our workforce's effectiveness.
2. Build support for and a reaction to globalization.
3. The straight forward cloud-stages approach

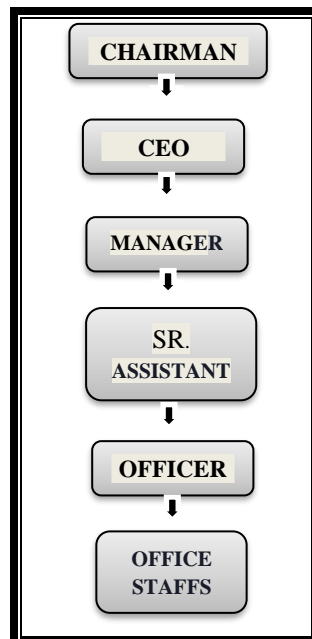


Figure 2.5.0 Organization structure of Globaltech

## CHAPTER 3

### Introduction OF Networking

Building a Network system needs Multiple computers are needed to connect together to trade lines, permit electronic dispatches, or share resources (such as CDs and printers) to form a network. The computers that make up a network can be linked together using wires, phone lines, radio waves, satellites, or infrared light beams. In reality, there are different types of computer networks exist and it can be challenging to distinguish between them, particularly when their names are so similar. In this study, the structures and operations of some of the most effective computer networks are explained.

#### 3.1 Types of Networks:

Computer networks come in many different kinds of forms. Computer networks can be classified according to their size and function.

The number of computers that make up the network as well as its geographic reach may be used to tailor a network's size. Networks can encompass everything, from a few biases scattered within a limited opportunity to millions of biases dispersed throughout the whole our surrounding environment.

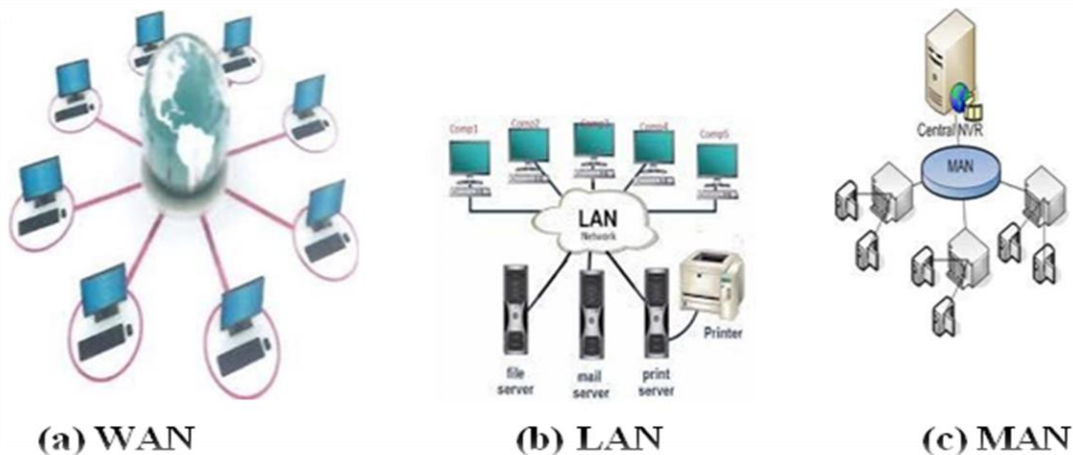


Figure 3.1 Types of networks

Wide Area Network (WAN), Local area Network (LAN) & Metropolitan Area Network (MAN) are the three different types of networks described in this diagram

A wide geographic region is covered by a wide area network (WAN), which frequently connects cities, states, nations, and even continents. Multiple local area networks (LANs), as well as other network devices, can be connected through WANs over long distances to facilitate communication and data exchange between widely separated sites.

A Local Area Network (LAN) is a type of computer network that connects devices within a limited geographical area, typically confined to a single building, office, home, or campus. Computers and other network devices placed near to one another may communicate and share resources thanks to LANs. They are frequently employed in private residences, modestly sized enterprises, academic organizations, and other regional contexts.

A Metropolitan Area Network (MAN) is a type of computer network that spans across a metropolitan area or a city. It provides data communication and connectivity to multiple locations within a larger geographical region, bridging the gap between Local Area Networks (LANs) and Wide Area Networks (WANs). MANs are designed to interconnect various LANs and other network resources within a city or town.

Ethernet is the foundation of all existing LANs, whether wired or wireless. Computers and waiters can link via wires or wirelessly. Wi- Fi Access Points deliver wireless connectivity in combine with a wired network. WAP- allowed bias serve as a link between PCs and networks. A WAP may link a hundred or indeed a thousand wireless individuals to a network. Waiters on a LAN are basically combined by line. In graphic demonstrates that compass of MAN can be in an entire, Intercity or inter-provincial. [2]

Users and computers located in one location can connect with users and computers located in other locations over a WAN made up of two or more linked Local Area Networks or Metropolitan Area Networks. In a wide area network, computers are connected through open networks that resemble phone lines, satellite links, or leased lines. Expensive leased lines are frequently utilized to create WANs in order to extend the network's capabilities between locations. A router is connected to a leased line at each end.



Table II: Differences between LAN, MAN and WAN.

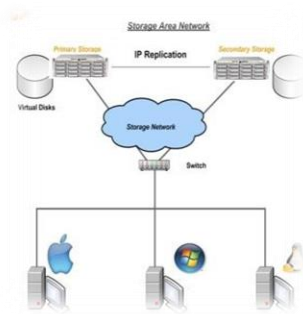
Network	Difference
<b>LAN</b>	<p><b>1.</b> A LAN (Local Area Network) is a collection of connected computers and other network devices.</p> <p><b>2. Purpose:</b> The goal of local area networks (LANs) is to make it easier for devices (such as computers, printers, servers, etc.) within a local region to communicate and share resources. They are frequently utilized in private residences, modestly sized enterprises, educational institutions, and other regional contexts.</p> <p><b>3. Technologies:</b> For wired connections, such as twisted-pair copper cables or fiber optics LANs commonly utilize Ethernet technology. Wireless LANs frequently use Wi-Fi as well.</p> <p><b>4. Ownership and Control:</b> The company or person in charge of the infrastructure of the local network frequently owns and controls LANs privately.</p>
<b>MAN</b>	<p><b>1.</b> The MAN (Metropolitan Area Network) is a wider network of connected computers and other network devices that typically spans many buildings or a sizable geographic area.</p> <p><b>2. Purpose:</b> In between LANs and WANs, MANs act as a connecting network. They provide effective data sharing and interlocation communication by connecting different LANs &amp; network resources within a city or metropolitan region.</p> <p><b>3. Technologies:</b> Due to their high data transfer speeds and capacity to go larger distances inside a metropolis, fiber optic cables are frequently used by MANs as their principal transmission medium.</p> <p><b>4. Ownership and Control:</b> Municipalities, government entities, and private companies can all own and run MANs.</p>
<b>WAN</b>	<p><b>1.</b> A collection of computers and other network devices make up a WAN (Wide Area Network). Which are linked and are not restricted to a certain location. WAN is the Internet.</p>

	<p>2. <b>Purpose:</b> Multiple LANs and MANs are connected via WANs over considerable geographic distances. They provide connection for businesses with branches or offices in several cities or nations and enable communication and data exchange between remote sites.</p> <p>3. <b>Technologies:</b> Satellite connections, MPLS circuits, leased lines, the Internet, and MPLS circuits are just a few of the transmission methods used by WANs. The choice of technology is influenced by variables including cost, distance, and the need for data transport.</p> <p>4. <b>Ownership and Control:</b> Private networks and public infrastructure, including the Internet, may be mixed together in WANs. Telecommunications corporations or Internet service providers (ISPs) may be in charge of managing larger WANs.</p>
--	--

In reality, there are so many distinct kinds of computer networks that it can be challenging to distinguish between them, especially when their names have a strong resemblance.

Numerous networks may be thought of as common a target, which implies that they are used for everything from accessing the Internet to sending information to a printer. However, certain network types do have a very specific function. The following are a few examples of networks based on their primary objective:

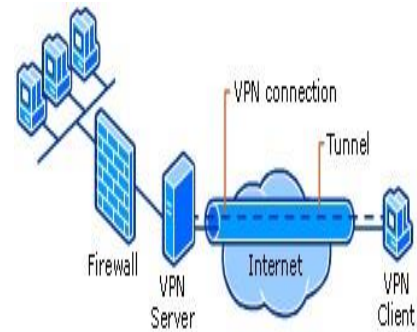
- SAN or storage area network Data transfer between storage devices and file servers may be done quickly thanks to storage area networks (SANs). [3]
- EPN or enterprise private network a firm will build up an enterprise private network to link its many corporate locations (such as product spots, offices, and stores) so that they may share computer resources.
- Virtual private network or VPN A virtual private network (VPN) is a special type of secured network. A VPN is used to offer a secure connection across a public network, such as the internet. Extra networks frequently use a VPN to establish a secure connection between a company and its designated external druggists or services. [12]



(a) SAN



(b) EPN



(c) VPN

Figure 3.2 some types of Network are used for specific purposes.

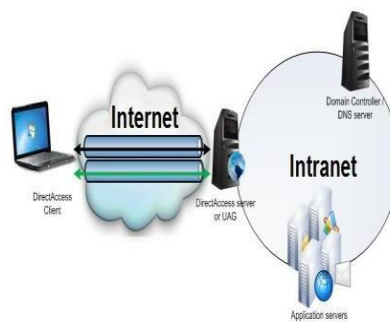
The three types of networks used to fulfill a very specific function of networks are Storage Area Network (SAN), Enterprise Private Network (EPN), and Virtual Private Server (VPN), as indicated in the diagram above.

### 3.2 Content Networks:

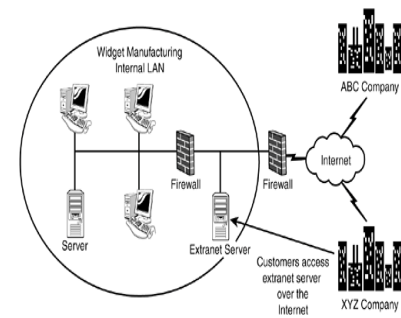
There are several kinds of computer networks in the globe. Both size and purpose can be used to describe a computer network. Many different kinds of content networks or CNs were created to make it easier for consumers to access Internet information.



(A) Internet



(B) Intranet



(C) Extranet

Figure 3.3 Three types of Content Network

Internet is a global or universal system. The web created the global communication network known as the Internet. It is made up of interconnected computers. Data is exchanged via the TCP/IP suite through data packs. In line with that, it is a network of networks. Because of this, individuals utilize it to link their personal and professional networks.

Intranet refers to material that has been accessed by members of a single association. An intranet is a private network (an internet) built on TCP/IP protocols often a business and is only accessible to the company's employees, members, or others with permission. The Internet is frequently accessible through the intranet of a company, preventing direct access from the outside through the firewall.

Extranet is accessed by collections via cross-enterprise restrictions and consists of participant material. A redundant network is a computer network that allows for restricted external access to further certain business or academic objectives. Redundant nets are additions to or sections of private intranet networks built by companies for information exchange and e-commerce.

### **3.3 Workstation:**

Workstations are named matching because typically a human user uses them to communicate with the network. Traditionally, workstations were either laptops with an integrated keyboard, monitor, and touchpad, or desktop computers with a computer, keyboard, display, and mouse. Because of the tablet computer's and touch screen devices like the iPhone and iPad's capacity to interact, our concept of a workstation is quickly evolving to encompass such devices. Because they are able to access network services and communicate with the network.

### **3.4 Description of Data Network:**

Data networks are still developing. As a result the infrastructure for high-speed networks has been expanding at an alarming rate. Prior to a few years, the standard for shared network workers was 10Mbps Ethernet & 4Mbps Token Ring. Token Ring was a common networking topology in the early days. The access technique used by Token Ring is token passing. When using token passing collisions between packets are avoided by relying on a single station that can broadcast whenever necessary. This is accomplished by transmitting a unique packet known as a token in a ring topology from one station to another. When a station receives the token it can send a packet that circles the ring in a single direction. The packet is copied when it passes by the station it is directed

to. The packet continues to round the ring without interruption before returning to the transferring unit, which removes it and transfers the token to the next station on the ring.

Fiber Distributed Data Interface (FDDI) is a different well-liked networking technique. FDDI offers 100 Mbps of data transfer. Initially, fiber-optic cable was required for FDDI networks, however at this time crooked-pair cable may be accommodated just as readily. The fiber-optic cable.

Twisted-pair cable is still used in many FDDI networks because it can be used over far larger distances. An FDDI typically has a ring topology and uses a token end access scheme. The main application of FDDI is as a backbone, a component of a network that connects many separate LANS in a building or surrounding area.

### **3.4.1 Ethernet:**

The protocol, connection, and computer chip required to connect a desktop computer or laptop to a local area network (LAN) for quick data transfer through coaxial or fiber optic cables are all part of the networking technology known as Ethernet. [3]

Ethernet's primary attributes and functionalities include:

**Physical Media:** Twisted-pair copper cables, fiber optic cables, and coaxial cables are only a few examples of the physical media that Ethernet supports for data transmission. Twisted-pair copper cables are now the most used form, with several categories (such as Cat 5e, Cat 6, and Cat 6a) enabling various data transmission speeds.

**Data Transmission:** The data connection layer, or Layer 2, of the OSI model is where Ethernet functions. In order to control how devices, use the shared network media, it employs a technique known as Carrier Sense Multiple use with Collision Detection (CSMA/CD). To prevent collisions, devices listen to the network before delivering data. However, full-duplex communication is frequently used in contemporary Ethernet networks, negating the necessity for CSMA/CD.

**Data Transfer Rates:** Ethernet is capable of transferring data at a variety of speeds. The most popular ones are 10 Mbps (Ethernet), 100 Mbps (Fast Ethernet), 1 Gbps (Gigabit Ethernet), 10 Gbps (10 Gigabit Ethernet), 25 Gbps, 40 Gbps, and 100 Gbps.

**Topology:** Ethernet networks often have a star or tree topology, in which every device is linked to a hub or central network switch. This centralized strategy makes network administration easier and boosts network efficiency.

**Switch Technology:** Ethernet switches are frequently used to divide LANs, enabling devices to connect with one another directly and without interference. By giving each connected device its own allocated bandwidth, switching enhances network performance.

### **3.5 Different type of Ethernet standard**

It will be useful to discuss the many types of networks used as the Ethernet standard in order to illustrate the fundamentals of networking technology. [3]

#### **3.5.1 Standard Ethernet**

The IEEE 802.3 standard definition for Ethernet, a method for physical communication in a local area network (LAN) is kept up to date by the Institute of Electrical and Electronics Engineers (IEEE). In general, 802.3 define the operational characteristics and physical medium of Ethernet.

The original Ethernet outlines three possible physical media and offers 10 megabits per second (Mbps) data speed.

#### **3.5.2 Fast Ethernet:**

The Fast Ethernet standard (IEEE 802.3u) was created for Ethernet networks that need quicker transmission speeds. This standard raises the Ethernet speed cap from 10 Mbps to 100 Mbps with only modest changes to the existing cable infrastructure. Fast Ethernet provides more error detection and correction in addition to faster throughput for web surfing, video, multimedia and graphics.

There are three types of fast Ethernet: 100BASE-TX which utilizes level 5 UTP cables, 100BASE-FX which uses fiber-optic cable and 100BASE-T4 which uses two more wires and level 3 UTP cable. The 100BASE-TX standard has been the most widely used because to its close compatibility with the 10BASE-T Ethernet standard.

### 3.5.3 Gigabit Ethernet:

To meet the demand for faster communication networks for applications like VoIP and multimedia, Gigabit Ethernet was developed. Ten times faster than 100Base-T, the Ethernet variation known as GigE operates. It is also referred to as 1000Base-T or "Gigabit-Ethernet over copper". It is used as the foundation for businesses and is detailed in the IEEE 802.3 standard. High performance switches, routers and servers may be connected via a gigabit Ethernet backbone using current Ethernet LANs with 10 and 100 Mbps cards. Gigabit Ethernet looks and functions just like Ethernet starting at the data link layer of the OSI model. One of the main differences between Gigabit Ethernet and other networks is the additional support for full duplex operation.

### 3.6 Comparison of Ethernet, Fast Ethernet and Gigabit Ethernet:

There are three types of transmission technology based on the Ethernet. The Ethernet, Fast Ethernet and Gigabit Ethernet are shown in Table III.

Table III. Different type of Ethernet Standard

<b>Level</b>	<b>Ethernet</b>	<b>Fast Ethernet</b>	<b>Gigabit Ethernet</b>
<b>End user</b>	Provides connectivity for low to medium volume application.	Give computers with powerful processors access to the server at 100 Mbps.	Not Typically used at this level.
<b>Work group</b>	Not typically used at this level.	Ensure communication from the server block to the backbone layer, as well as between the end user and workgroup.	Provide high Performance connectivity to the enterprise server block.
<b>Backbone</b>	Not typically used at this level.	Provide connectivity from workgroup and from the server block to the backbone.	Provides High speed backbone and network device connectivity.

### 3.7 Network Devices:

Ethernet can support both bus and star topology. The most common uses a central hub or switch through which all information is transmitted called the star topology. [6]

### 3.8 Hub:

Several twisted pair or fiber optic Ethernet devices are connected via a hub, which enables them to serve as a single network segment. Hubs operate at the OSI model's Physical layer. If that device can notice a collision it becomes a type of multi port.

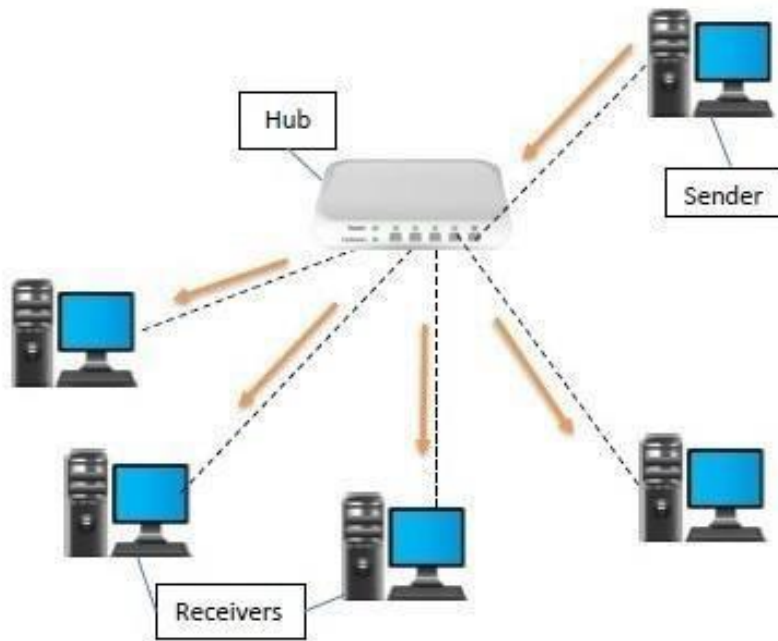


Figure 3.4 Hub

### Different types of Hub:

Along with the network interface card and cabling, one of the key components of a LAN is the network hub. The Hub's traits are shown in Table IV.



Table IV. Differences types of Network Hub

<b>Hub</b>	<b>Characteristics</b>
<b>Standalone</b>	Single-port standalone hubs are currently in production. For network growth solitary hubs often include a way to connect to other standalone hubs. Independent hubs are typically. The hubs that cost the least. Ideally they should be used in offices, departments or small autonomous workgroups that have less than 12 users per LAN.
<b>Stackable</b>	Stackable hubs function just like standalone hubs with the exception that a number of them can be "stacked" or joined together using brief lengths of specialized wire. They can function as a modular hub when controlled as a single entity. These hubs are perfect for people who wish to get started with little money. But be aware that the LAN will expand.
<b>Modular</b>	Networks frequently employ modular hubs because they may be expanded and always have a management option. A classic or card cage with several card slots that each takes a communications card, or Module is purchased as a modular hub. Typically each module includes 12 twisted pair ports and functions as a stand-alone hub. You may also buy modules that handle other kinds of network cabling such coaxial or token ring.

**Hub Divided by Working Method:**

Based on how they function, The Hubs may be divided into three groups as follows:



Table V. Differences types of Network Hub basis on Working Method

<b>Hub</b>	<b>Responsibility</b>
<b>Active</b>	Active Hub is a hub that may renew or increase the information stream as its name indicates. This form of bus has a benefit in that it not only passes the incoming signal to several devices but also amplifies it. Additionally, known as a Multiport Repeater this Bus. Before transmitting them to their destination it might enhance the qualities of an incoming signal.
<b>Passive</b>	Like a straightforward bridge passive hub operates. It is only used to link different devices together. Any incoming signal cannot be amplified or recreated by it. It takes in signals & forwards them to other devices.
<b>Intelligent</b>	The third and last sort of bus is this one. It is capable of carrying out both active and passive bus tasks. Additionally, it is capable of bridging and routing. It improves the overall network performance faster and more effective by boosting network speed and effectiveness.

### 3.9 Bridge:

By linking two or more networks, the Device forwards packets between them. Bridges often function at the level of physical networks. [4] In comparison to routers, bridges are easier and less costly. When deciding which packets to deliver between two segments they link bridges uses a basic do/don't decision. The foundation for filtering is the packet's destination address. A packet is not transmitted if its final destination is a Station on the same segment from which it originated. It is connected to and routed to a different bridge port if it is intended for a station on another LAN. Divides a big LAN into smaller chunks operate at the OSI model's data connection layer. Decreases Broadcast Domain remains same while the collision domain increases network performance.

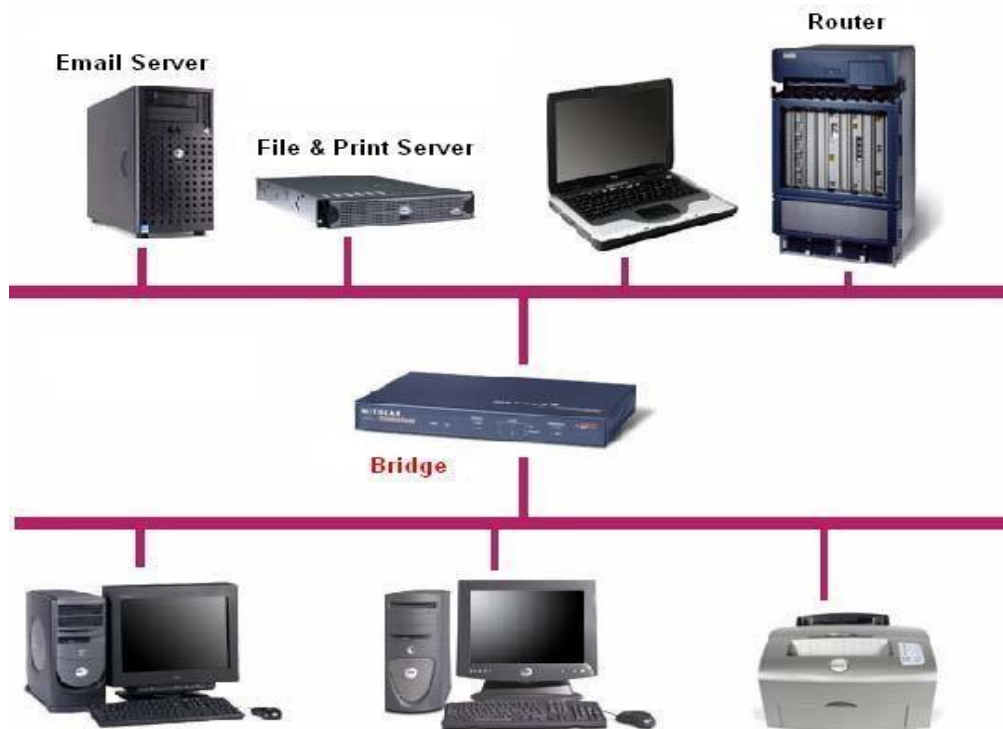


Figure 3.5 Bridge

### 3.10 Router:

A router is a type of network equipment that is essential in relaying data traffic across various networks, including LANs and WANs (wide area networks). It functions at Layer 3 of the OSI model's network layer and is in charge of forwarding data packets depending on their IP addresses. Routers are essential parts of contemporary computer networks because they allow for device connectivity and data sharing across several linked networks.



Figure 3.6 Router

### 3.11 Switch:

A switch is a network device that connects various devices in a local area network (LAN) by operating at the data link layer (Layer 2) of the OSI model. It is a vital element of contemporary computer networks that facilitates data transfer and communication between devices connected to the same network.



Figure 3.7 Switch

A network without a switch can soon become overloaded as traffic volume increases. Data is forced to scour the whole network in pursuit of its destination resulting in traffic bottlenecks.

### 3.12 Repeater:

Regenerating incoming electrical, wireless or optical signals is what network repeaters do. Active hubs for example are repeaters.

- Strengthens signal to send over long distances.
- It is able to regenerate and create real-time network signals at the bit level.
- It can add delay on signal path.
- In IEEE 802.3 and Ethernet, the 5-4-3 rule controls the number of repeaters and segments.



Figure 3.8 Repeater

### 3.13 Connection Media:

- RJ-45 (Registered Jack) connector and the jack are most common
- There may be 15-pin Attachment Unit Interface (AUI) connector
- A transceiver (transmitter\receiver) converts an AUI to an RJ-45, coax or a fiber optic Connector.

### 3.14 Network Interface card:

- Also known as a network adapter.
- A network medium Connects with a host.
- Have a distinct MAC Address to regulate data transfer.
- Transceiver might connect to the wrong media type.
- There is no standardized symbol.

### 3.15 Virtual LAN (VLAN):

The term "Virtual Local Area Network" is used. Using these network technology network managers may conceptually divide a single physical local area network (LAN) into several virtual networks, each of which can function as a stand-alone network. [10] VLANs are used to group devices based on certain characteristics, independent of where in the network they are physically located in order to enhance network administration, security and performance. An administratively specified port on a switch is connected to a logical grouping of network users and resources known as a VLAN. By allocating separate ports on the switch to various sub networks VLANs enable you to build smaller broadcast domains within a layer 2 switched internetworks.

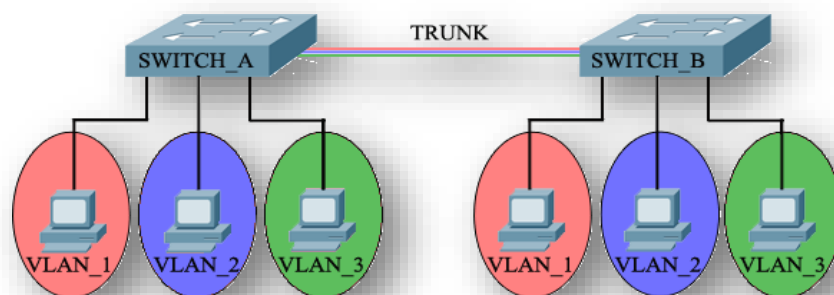


Figure 3.9 VLAN

### **3.16 Types of VLAN:**

The Cell-based VLAN & The frame-based VLAN are only two forms of VLAN that are currently feasible.

- Cell-based VLAN: Cell-based VLAN is used in ATM switched networks with LAN Emulation (also known as LANE). Without specific hardware or software, hosts on conventional LAN segments may communicate over ATM networks with LANE.
- Frame-based VLAN: Frame-based VLANs are used in Ethernet networks that use frame tagging. The two most often used types of frame tagging are IEEE 802.1Q and ISL (Inter Switch Link is a Cisco-exclusive frame-tagging). The 802.1Q standard supports all three of the 802.3 (Ethernet), 802.5 (Token-Ring) and FDDI protocols, however Ethernet is the most used.

### **3.17 Network Operating System (NOS):**

Computers that serve as servers are often operated by network operating systems. They offer the tools necessary for network functioning. Operating systems for networks are also designs. The boundary between network operating systems and stand-alone operating systems is not always clear since client computers and offer functionalities.

The following features are offered by network operating systems:

#### **3.17.1 Installed Components:**

- Client Functionality
- Server Functionality

#### **3.17.2 Functions Provided:**

- Account Administration User
- Security
- File and Print Sharing

### **3.17.3 Network Services: Security File and print sharing:**

- File Sharing
- Print Sharing
- User Administration and Backing up data

### **3.17.4 Network Operating System Example:**

- Microsoft Windows Server 2002
- Microsoft Windows Server 2003
- Microsoft Windows Server 2008
- Mac OS X
- Red Hat Linux

## CHAPTER 4

### Network of Globaltech

Every component of bringing computers together is included in networking, which is the communication between two or more networks. To allow for growth and administration without continual manual intervention, a network needs various protocols and functionalities. Large networks can relate to the three separate elements below. Original Area Network, or LAN, refers to a structure or collection of structures where users are locally linked. A computer network called the MAN, or metropolitan area network, is one that is bigger than the original area network and may span an area as vast as several megacity blocks. Remote Connections - It connects single users (telecommuters and mobile users) and branch services to a primary location or the Internet.

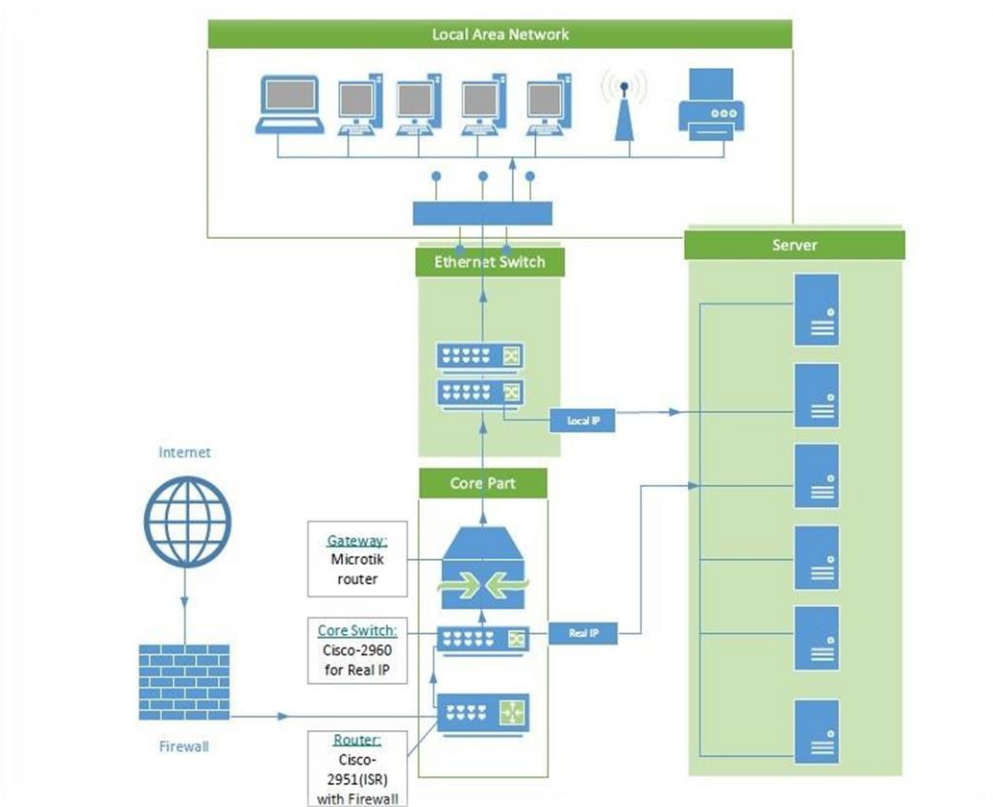


Figure 4.1 Illustrate of Globaltech Network System



## **4.1 Installed Component:**

To configure a network numerous components are required. The majority of them are:

- Desktop and Laptop Computer
- Switch
- Router
- Server
- Printer

The current network architecture of "Globaltech" is based on a star topology. There are four main divisions. The next subsections go through these main elements.

### **4.1.1 Core Part:**

In the core part of being networked have three devices they're Cisco Router 2951 ISR, Cisco 2960 as a Core switch and MikroTik router. In Globaltech being networked has two fiber connections, one is main & one is promissory that they are linked to the router, which is linked to the Core Switch, which is linked to the MikroTik router.

### **4.1.2 Ethernet Switch:**

Each computer, laptop, and network device have an Ethernet connection to a central hub. An Ethernet switch is raised into the router in the house and small office. For interoperability with lower-speed devices gigabit Ethernet (10/100/1000) switches allow 1 Gbps in addition to 10 Mbps & 100 Mbps.

In the Ethernet part of the being network are using 4 further Ethernet switches and it's connected from the MikroTik Router. The being network set the entire Ethernet switch in Rack and then made a patch panel that all the connection distributes from the patch panel to the original user or pc.

### **4.1.3 Local Area Network:**

A local area network (LAN) is a type of computer network that links computers in an enclosed space, such a home, office building, school or lab. In contrast to a wide area network (WAN) this spans a considerable geographic region and may involve leased telecommunications lines a local area network (LAN) uses locally controlled media.

The two most popular transmission methods for wide area networks are Ethernet via twisted pair cable and Wi-Fi.

LAN (Local Area Network) that all the pc, printer, laptop is connected each other by the CAT 6 cable through Ethernet Switch.

#### **4.1.4 Server:**

In Globaltech existing network there are several servers like FTP server, DNS server, Mail server, Live encoding server etc. In FTP server, DNS server, Mail server they are using Centos 5.4 as operating system and all server connected through Core switch that provide Real IP and also connected through Ethernet switch that all server connected in LAN by local user and we can also connect it from outside the world by Real IP.

##### **4.1.4.1 FTP Server:**

The File Transfer Protocol (FTP) is used to transfer computer files from one host to another host across a TCP-based network, such as the Internet.

FTP is based on client-server architecture and uses separate control and data connections between the client and the server. If the server is configured to permit it, FTP users can connect anonymously by using a clear-text sign-in protocol, frequently in the form of a username and password. For secure transmission that hides the username and password and encrypts the data, FTP is often secured using SSL/TLS (FTPS). Occasionally, SSH File Transfer Protocol (SFTP) which is technologically distinct, is also utilized.

##### **4.1.4.2 Domain Name System:**

The Domain Name System (DNS) connects vibrant data to domain names. By converting IP addresses (for example 158.49.200.111) which a networking firm requires to transport information into human-readable computer hostname for example ([www.yahoo.com](http://www.yahoo.com) / [www.globaltechbd.com](http://www.globaltechbd.com)) it acts as the Internet's equivalent of the phone book. Similar to the list of mail servers, additional information is also stored in DNS. The most important DNS foundational element of the internet.

DNS enables Internet names to be assigned to associations irrespective of the physical routing scale represented by the IP address's numeric value. By monitoring its own updates and allowing an authoritative name server for each domain DNS distributes the duty of issuing domain names and

mapping them to IP networks. Avoiding the requirement for a central register to get regular advice and updated.

#### 4.1.4.3 Mail Server:

An Internet-based mail server is one that can receive and deliver mail across any network. A mail server has the ability to receive emails from client computers and forward them to various other mail servers. A mail server has the capability of delivering emails to client PCs. A client computer is often the one you use to check your mail, such as the one you use at home or at work. In certain situations, a smartphone with email capability might also be regarded as a client PC.



Figure 4.2 How a Mail Server work

#### 4.2 Topology:

In cases where referring to communication networks, a topology is a description of the network's nodes and connecting lines' schematic architecture. Network figures can be defined in two different ways:

- Physical topology
- Logical topology

That refers to the actual geometric configuration of workstations in the physical topology of a network . There are many different types of common physical topologies some of which are listed below and shown.

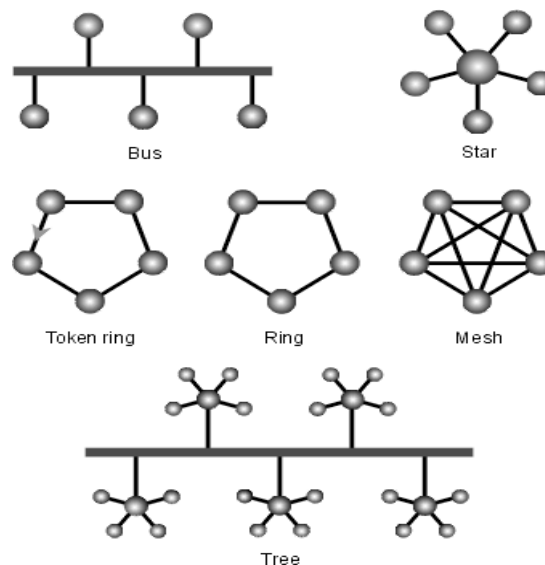


Figure 4.3 Physical topology

The routes that such signals take from node to node are referred to as the logical (or signal) topology. In many cases the logical topology and the physical topology are the same. However, not every situation is the same. For instance, although some of the networks are theoretically machine or ring networks others are physically put up via a star configuration system.

Star topology is being used in the Globaltech network. The main device connecting the entire component was a backbone of Core switches.

#### 4.3 Using Devices in Existing Network:

Numerous devices are being used in the Globaltech network at this time. Like as

- Cisco 2951 Router with Firewall
- Cisco 2960 Router as core switch
- Cisco 2960 24 port Ethernet Switch
- MikroTik Router 440G

### 4.3.1 Review of existing Network Devices:

Some of the elements used in network organization include the Cisco 2951 Integrated Service Router (ISR), the Cisco 2960 router acting as the core switch, the MikroTik router acting as the network management, and the Cisco 2960 Ethernet switch connected to every client in the current network.

The example shown in Figure below shows the current network of Globaltech.

### 4.3.2 Router and Firewall (ISR):

A router is a device that transports data packets across networks. Typically, a router connects to two networks, most often two LANs, WANs, or a LAN and its ISP's network system. Routers are found at gateways, which are the places where two or more networks converge. Routers use headers and forwarding tables for packet forwarding. They employ protocols like ICMP to communicate with one another and establish the optimum path between any two hosts.



Figure 4.4 CISCO Router

A mechanism called a firewall protects a private network against unwanted access. A firewall is a device that may be used as software or hardware.



Figure 4.5 Firewall

The Cisco 2951 Router with built-in Firewall is used in the Globaltech networking system.

Data, phone, video, and application services for small workplaces are provided by the Cisco 2951 Integrated Services Router (ISR). Key elements consist of: The CISCO 2951 Router's Key Features and Security are shown in Table VI.

Table VI. CISCO 2951 Router Key Features and Security

CISCO-2941 Router	Key features
Services	3 integrated 10/100/1000 Ethernet ports with 1 port capable of RJ-44 or SFP connectivity
	2 service module slots
	4 Enhanced High-Speed WAN Interface Card slots
	3 onboard digital signal processor (DSP) slots
	1 internal service module slot for application services
	Fully integrated power distribution to modules supporting 802.3af Power over Ethernet (PoE) and Cisco Enhanced PoE
Security	Onboard hardware acceleration for VPN encryption
	Integrated threat control using Cisco IOS Firewall, Cisco IOS Zone Based Firewall, Cisco IOS IPS, and Cisco IOS Content Filtering.
	Secure collaborative communications with Group Encrypted Transport VPN, Dynamic Multipoint VPN, or Enhanced Easy VPN.

#### 4.4 Core Switch:

A core switch is a high-capacity switch, generally deposited within the backbone or physical core of a network. Core switches serve as the gateway to a wide area network (WAN) or the Internet- they provide the final aggregation point for the network & allow multiple aggregation modules to work together.



Figure 4.6 CISCO 2960 Core switch

They make use of Cisco 2960 Router in the Globaltech networking system.

The Cisco 2960 switch features good Layer 2 threat prevention capabilities and minimal Layer 3 static routing with 16 routes as fast Ethernet access switches with simple setup. Utilizing this upgrade is easy. Entry-level office networks may now offer better LAN service to the network edge thanks to Catalyst 2960's inclusion of independent and intelligent Ethernet capabilities.

The Cisco catalyst 2960 switch lowers the total cost of ownership for the whole network while enhancing security, functionality, and availability. It is also ideal for usage in small areas like offices, classrooms, and other such places.

You may have also noticed that most Cisco users choose Cisco 2960 S switches now that the Cisco 2960 G series is EOS and EOL.

#### **4.4.1 MikroTik Router (Gateway):**

The gateway device provides remote network connectivity or an independent system outside the limits of the hosting network locations. Gates serve as a gateway to and from the network; all data transmitted internally or externally must first pass through and contact the gate in order to operate the route routes. Typically, a router is configured to serve as a gateway device to computer networks.



Figure 4.7 MikroTik Router 440 G

At Globaltech, the MikroTik Router 440 G serves as a gateway for the current network.

The RB440G is a five-port Gigabit Ethernet port. Compared to the RB440, the RB440G not only increases Gigabit speed, but also 246Mb of RAM, faster CPU and Micro SD card storage space.

The device is powered by an AR7161 680MHz Atheros CPU fast, and includes a temperature sensor and voltage monitor.

The Router OS app that comes with the RB440 allows you to turn this robust application into a more sophisticated router, firewall, or bandwidth management.

The main function is one small and powerful Router OS tool for a very special price.

The Router OS is a MikroTik standalone operating system built on the Linux 3.3.4 kernel as shown in Table V. The key characteristics of Router OS are illustrated in

The features included in the most recent Router OS version are listed in the following table:

#### **4.5 Router OS features:**

MikroTik RouterOS is the name of the operating system that runs on the MikroTik Router BOARD hardware. It may also be installed on a computer, turning it into a router that does all necessary tasks such as routing, firewall security, bandwidth management, wireless access points, backhaul connections, hotspot gateways, VPN servers and more.

Based on the Linux v2.6 kernel, MikroTik standalone operating system RouterOS aims to provide all these features with a simple installation process and user-friendly interface.

Visit <https://www.mikrotik.com/> and get the installation CD image to check out RouterOS right away. All functions are available during the free trial without any restrictions. Examples of some of the most significant aspects of RouterOS can be found in the pages that follow. [12]

#### **4.6 Configuration:**

RouterOS supports a wide range of configuration techniques, including local configuration using a keyboard and monitor, serial console with a terminal program, secure SSH and Telnet access over networks, a custom GUI configuration tool called Winbox, an easy Web-based configuration interface and an API programming interface for developing your own control application. In the



case that there is no local access and there is a problem with IP-level communications, RouterOS also permits a MAC-level-based connection using the specifically designed MacTelnet and Winbox programs.

With built-in scripting capabilities, RouterOS command-line configuration interface is both robust and simple to understand.

- Web Interface
- Winbox GUI over IP and MAC
- CLI with Telnet, SSH, Local console and Serial

#### **4.7 Firewall:**

The security measures that the firewall provides through packet filtering regulate how data flows to from and through the router. It serves as an outbound traffic filter and a way to restrict unauthorized access to networks that are directly linked to the router, together with Network Address Translation.

State full packet inspection and tracking of the status of network connections passing via RouterOS' State full firewall, which performs State full packet inspection, are characteristics of the operating system. Additionally, it supports NAT (Network Address Translation), NAT assistance for well-known apps & UPnP.

Features for using internal connections, routing & packet marking are provided by the firewall. It can also filter by other criteria like IP address, address range, port, port range, IP protocol and DSCP.

#### **4.8 Routing:**

Static routing and numerous dynamic routing protocols are supported by RouterOS:

- It supports BGP version 4 and RIP versions 1 and 2 for IPv4.
- It supports RIPng, OSPFv3, and BGP for IPv6.

In addition, RouterOS supports ECMP routing, Policy-based routing, Interface-based routing, and Virtual Routing and Forwarding (VRF). You can direct traffic that has been tagged with a routing mark to use a different ISP by using the firewall filter to mark that traffic.

VRF is now available with RouterOS's addition of MPLS capability. A routing table may exist in more than one instance within the same router simultaneously thanks to a technology called virtual routing and forwarding. Due to the independence of the routing instances, overlapping or identical IP addresses can be utilized without interfering with one another.

#### **4.9 Wireless**

Several features that RouterOS supports include:

- IEEE 802.11a/b/g/n wireless client and access point
- Nstreme and nstreme2 proprietary protocols
- Client polling
- Rts/cts
- Wireless Distribution System (WDS)
- Virtual AP
- WEP, WPA, WPA2 encryption
- Access control list
- Wireless client roaming
- WMM
- HWMP+Wireless MESH protocol
- MME wireless Routing protocol

#### **4.10 Web Proxy:**

RouterOS comes with a MikroTik custom proxy server for caching online resources and speeding up user browsing by providing consumers with cached file copies at local network speed. The following proxy server features are implemented by MikroTik RouterOS:

- Regular HTTP proxy.
- Transparent proxy.
- Access list by source destination, URL and requested method (HTTP firewall).

- Cache access list to specify which objects to cache and which not.
- Direct Access List to Specify which resources should be accessed directly and which-through another proxy server.
- Logging facility.
- SIOCKS proxy support.
- Parent Proxy support.
- Cache storage on external drivers.

In addition, RouterOS can function as a Transparent Caching server without the need for consumer PC settings. All HTTP requests will be accepted by RouterOS and forwarded to the neighborhood proxy service. The user will not notice any difference at all from this method; they will just notice a faster browsing speed.

#### **4.11 Tools:**

RouterOS also offers a wide number of tiny network utilities to assist you administer your network and streamline your daily duties. Here are a few examples:

- PING, TRACEROUTE
- BANDWIDTH TEST, PING FLOOD
- PACKET SNIFER, TORCH
- TELNET, SSH
- E-MAIL ANS SMS SEND TOOLS
- AUTOMATED SCRIPT EXECUTION TOOLS
- CALEA DATA MIRRORING
- FILE FETCH TOOL
- ACTIVE CONNECTION TABLE
- NTP CLIENT AND SERVER
- TETP SERVER
- DYNAMIC DNS UPDATER
- VRRP REDUNDANCY SUPPORT
- SNMP FOR PROVIDING GRAPHS AND STATS
- RADIUS FLIENT AND SERVER (USER MANAGER)

#### 4.12 Ethernet Switch:

Every PC and network device are connected to the Ethernet network's central hub. An Ethernet switch is built into a household or small business's router. Gigabit Ethernet (10/100/1000) switches provide 1 Gbps in addition to 10 Mbps and 100 Mbps for compatibility with lower-speed devices.

Local area network hardware for Globaltech network is currently Cisco 2960 24 port Switches.

The Cisco Catalyst 2960 LAN Base Series offers a wide range of functions. Table VII displays the salient features of the Cisco Catalyst 2960 LAN Base Series.

Table VII. Key features of Cisco Catalyst 2960 LAN Base Series

No	Key features of Cisco Catalyst 2960 LAN Base Series
1	PoE configurations with full 14.4W for up to 24 ports.
2	Intelligent features at the network edge such as sophisticated access control lists (ACLs) and enhanced security.
3	Dual-purpose uplinks for Gigabit Ethernet uplink flexibility allowing use of either a copper or a fiber uplink each dual-purpose uplink port has one 10/100/1000 Ethernet port and one Small Form-Factor Pluggable (SFP)-based. Gigabit Ethernet port with one port active at this time.
4	Network control and bandwidth optimization using advanced QoS, granular rate limiting, ACLs and multicast services.
5	Network security through a wide range of authentication methods, data encryption, technologies & NAC based on users, ports & MAC addresses
6	Easy network configuration, upgrades & troubleshooting using Cisco Network Assistant Software.
7	Auto configuration for specialized applications using Smart ports and Limited lifetime hardware warranty.
8	Software updates at no additional charge.

#### **4.13 Limitation:**

1. A person in a position of authority can easily hack the devices due to the lack of NIDS/IPS for internal security in the present network.
2. The existing network lacks load balancing.
3. Affected FTP Server as a result of virus detection tools.
4. Data flow on a network, among other things.
5. The existing network has no VLANs.

## **CHAPTER 5**

### **Conclusion**

Before entering the workforce, a student should have a real work experience in the world of major study. Now a day laborer is no longer just looking for high marks, good communication skills, and work experience. They give the applicant's previous work experience a lot of consideration. Student job possibilities are improved by prior work experience.

#### **5.1 Practicum and its Value:**

For me, practicing engineering may be equivalent to completing the journey from an engineering student life to an actual workplace in real life. It serves as a stepping stone to a career and a link between theoretical and applied knowledge. Nowadays engineers are no longer looking for high schools' studies instead they give importance the practicality of the practice, which is a practice that proves to be invaluable for new level entry engineers in the labor market.

Practicum offers not only a hands-on experience, but also a respect for “dealing” with the community. Meeting different types of people and meeting situations provides a useful environment for life. Somebody with experience may feel and believe that practicum has many more issues that need to be addressed.

#### **5.2 Experience:**

One of the best experiences of my career at "Globaltech" is actually working for the network development process. All of my experience was around network construction. The technical experience can be summarized as follow:

- How to develop a network's specific design.
- How to work on Network management techniques.
- How to build a network's security using several network devices.
- Method to set up a virtual LAN in a network.
- Dynamic routing OSPF of a network.
- How to build a network sub-interface.
- How to set up a trunk on a switch port.

### **5.3 Future Career and Scope:**

In real life finding jobs can be so difficult, if I don't have any experience. An internship will give me the chance to gain experience for my career

- In real life Configuration and storage of FTP server
- Implementing the ISP platform.
- Work as a network administrator in the office.
- Work with an IT firm.
- Become an expert in computer networks management system.
- Be able to provide technical support.

### **5.4 Professional Skill:**

I have learned various professional skills throughout my internship, including how to manage situations, operate in a team, and tackle challenges. since prior to starting the internship, I had no prior experience. I found it quite tough to go beyond any obstacles. I believe I have overcome all of the challenges. I've learned a lot about router, switch, and MUX configuration professionally.

### **5.5 Suggestion for Future Strategic Action:**

The opportunity for an internship in IT system support helps to improve problem-solving abilities. Interns from the IT department in the presence of the appropriate officials. Working with suppliers like Aruba and Net gear Wireless at Fonds Bangladesh given me both practical and technical expertise of Wi-Fi technology. In Air Voice Global Limited, I gained knowledge on how to do a site study offer the best Wi-Fi solution and set up a new Wi-Fi network. This internship will teach me many new ideas and a different way of working which will help me further my career in the field of communications. I'll have mastered the art of teamwork but sometimes I need to speak with a knowledgeable individual to get things done. The entire experience, including network monitoring, surveying, and field work has been really beneficial for my unexpectedly bright future.

## **5.6 Future of network engineering technology:**

Networking is a pointless method to begin a career in network engineering, and many people use it as a launching pad into other network engineer fields like network administrator and cloud networking. The center of the best paid occupations is held by highly qualified and experienced network engineers, yet networking itself is a pointless career.

## **5.7 Conclusion:**

"Network Management and Security System of Globaltech" is the title of the practicum project. The key problems and difficulties of this practicum work understand the current network, identifying its limitations and figuring out how to get over those restrictions. Security, load balancing, and traffic congestion have been identified to be the main restrictions in both the past and present networks of Globaltech. To get around these restrictions certain equipment that is covered in the proposed network chapter is advised to be added to the client's current network. Using Cisco Packet Tracer software, a performance analysis was conducted, and the results showed that the proposed network could significantly improve the performance of the current network.



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