A TECHNICAL REPORT ON
STUDENT INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES)

AT
GIGAXYSAFE TECHNOLOGIES LIMITED

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TITLE PAGE

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DEDICATION

I dedicate this work to my personal Lord and saviour Jesus Christ who saw me through this program. This work is further dedicated to the financial and numerous supports offered by my parents and the staff at Gigaxysafe Technologies Limited.

ACKNOWLEDGEMENT

I wish to offer my special thanks to my parents, Engr and Mrs Ita Ekanem for their support and numerous calls daily seeking assurances for my well-being. For this work to come into existence, endless thanks must be said to the staff of Gigaxysafe Technologies. Most importantly, thanks will be said to myself for the effort and time dedicated to ensuring the completion of this program.

Finally, ABASI SOSONGO.

ABSTRACT

The Student Industrial Work Experience Scheme (SIWES) was established with the aim of exposing Tertiary level students from Universities, Polytechnics and Colleges of Education to industry relevant skills and practices.

This has aided in bridging the gap between theoretical classroom discussions and workplace practical applications.

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CHAPTER ONE
INTRODUCTION

1.1 INTRODUCTION

The Student Industrial Work Experience Scheme (SIWES) is an industrial training programme designed for preparing students of tertiary education level (University, Polytechnics, etc) with industry necessary skills applicable in the real world after graduation.

1.2 STUDENT INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES) BACKGROUND

The Industrial Training Fund (ITF) created the Student Industrial Work Experience Scheme (SIWES) in 1973 to connect theoretical knowledge obtainable from tertiary institutions of learning (Universities, Polytechnics etc) and the practical skills applicable in relevant industries. This programme arose when several employable Nigerians in the labour market were noticed to lack the necessary skills expected of them in their fields of study. The ITF then established this programme to enhance the knowledge transfer from classroom to workplace by exposing these students to real life industry practices through attachments to firms and companies.

Following the establishment of SIWES in 1973/1974, the Federal Government of Nigeria officially approved and adopted the programme. As the financial stress grew on the ITF, support was withdrawn temporarily in 1978 until the Federal Government handed over its supervision to the National Universities Commission (NUC) and National Board for Technical Education (NBTE) in 1979.

The development and mainstay of SIWES in tertiary education has been of immense benefit to potential employers, lecturers/instructors and students altogether thereby proving to be a success.

1.3 OBJECTIVES OF SIWES

Below are objectives of SIWES as a programme for Tertiary Institution students**:**

- To acquire industrial skills and experience in the relevant course of study.
- To prepare students for work situations they are likely to encounter after graduation.
- To expose the students to developing techniques and methods of handling equipment and machinery.
- Small-Scale Industrialization, in the economy.
- To allow undergraduate students gain experience in preparing for postgraduate life.

1.4 BODIES INVOLVED IN MANAGEMENT OF SIWES

The bodies involved in the management of SIWES are The Federal Government of Nigeria, The Industrial Training Fund, The National Universities Commission, The National Board for Technical Education, The National Council for Colleges of Education, Prospective Employers in the labour market, Institutions of Tertiary Education and the participating students. These bodies all work together at the various points of engagement to make the programme a success.

1.5 CONCLUSION

The establishment of SIWES by ITF to develop practical skills and knowledge has proven to be a success given the long history surrounding the programme and reviews by employers, institutions and students. These skills have enabled graduates to apply and develop theoretical knowledge from inside the classroom.

CHAPTER TWO
BACKGROUND OF COMPANY/ORGANIZATION

2.1 INTRODUCTION

Gigaxysafe Technologies Limited is a privately owned Information Technology (IT) Consultancy firm located in Jabi, Abuja handling fields of modern technology such as Cloud Computing/Virtualization, Networking, Access Control, Optical Fibre technology etc.

2.2 HISTORY OF THE COMPANY

Gigaxysafe Technologies Limited was established in January 2019 by experienced cybersecurity, telecommunication, software etc personnels such as Mr Oluwaseyi Kayode, Engr Fela Nmoye, Engr Richard Oladele etc. The company was developed to deliver top notch services in the ICT market. Mr Oluwaseyi worked for several years as a data service consultant with Visafone Communications, Engr Fela worked as a senior project engineer with Visafone Communications and Doel Safety Ltd, Engr Richard worked as a systems engineer and Mr Ihesiulo worked as a software engineer and systems administrator.

By coming together, these experienced professionals combined their specialised skills to develop Gigaxysafe Technologies where Mr Oluwaseyi serves as Managing Director, Engr Fela serves as Project Director overseeing project coordination and delivery, Engr Richard serves as Senior Engineer heading Technical Unit where he oversees development and implementation of hardware, software and network protocols and Mr Ihesiulo's mathematical skills allow him serve as Software Manager developing algorithms and models for project execution.

2.3 STRUCTURE OF THE ORGANIZATION

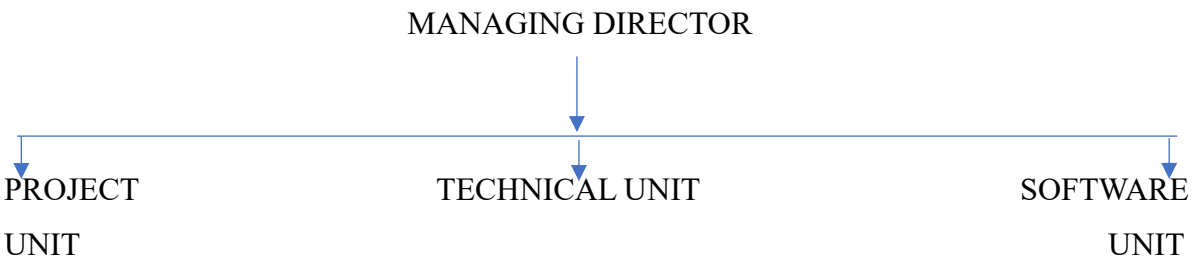
Below is a brief description of the structure of Gigaxysafe Technologies Limited:

- MANAGEMENT: This company is headed by Mr Oluwaseyi Kayode as the Managing Director. Mr Kayode is a seasoned Cybersecurity specialist with experience in system engineering, network security and security architecture. He is also a member of several

professional bodies including Nigeria Computer Society (NCS), Nigeria Internet Registration Association (NIRA), etc.

- PROJECT UNIT: The head of this unit is Engineer Fela Nmoye who has a wide and long history in process engineering and system control. His work experience includes design of security methodology, safety systems, loss prevention systems and project coordination.
- TECHNICAL UNIT: The head of this unit is Engineer Richard Oladele with experience in plant production and system engineering. He oversees the development and implementation of hardware, software and network protocols.
- SOFTWARE UNIT: The head of this unit is Mr Philip Ihesiulo experienced software engineer, systems administrator and technology consultant. He oversees the software development and algorithm/modelling problem solving techniques to provide solutions.

2.4 ORGANOGRAM



2.5 OTHERS DEEMED NECESSARY

- PERSONNEL UNIT
- MARKETING UNIT

2.6 CONCLUSION

Gigaxysafe Technologies is a privately owned company delivering turnkey solutions to clients. Gigaxysafe also ensures high quality, cost-competitive project executions given the collective experience of managers, analysts, designers etc.

CHAPTER THREE
THE PROCESS, COMPONENTS AND DESCRIPTION

3.1 INTRODUCTION

This Chapter will cover the personal tasks/projects undertaken by me as well as the supervisory work undertaken by me and supervised upon by my supervisor. Upon being assigned to the Technical Unit of Gigaxysafe Technologies, I was handed a brochure which helped explain my working scope which would cut across the fields of Voice and Data Infrastructure (IP Telephony), Networking, Optical Fibre Technology, Access Control, Security and Surveillance Systems, Home Automation Systems (Smart Homes) etc.

3.2 PROJECTS CARRIED OUT

Listed below are the personal projects or tasks embarked on by myself during the course of this industrial training at Gigaxysafe Technologies Limited as well as group projects supervised by my supervisor:

- PROTEUS PROJECT SIMULATIONS
- IOT (INTERNET OF THINGS), WORKING WITH ARDUINO
- HUAWEI CLOUD COMPUTING AND DATA VIRTUALIZATION
- WEB DEVELOPMENT INTRODUCTION WITH WORDPRESS AND HTML
- HOME AUTOMATION SETUP FOR BILAAD REALTY
- NETWORK RACK SETUP FOR IOA GROUP
- NETWORK RACK INSTALLATIONS FOR BILAAD REALTY
- ACCESS CONTROL FOR BILAAD REALTY
- VoIP SETUP FOR IOA GROUP

1 PROTEUS PROJECT SIMULATIONS

Proteus is a circuit simulation software which aids in electronic design automation on WINDOWS and MacOS. Designed by Lab Centre Electronics, Proteus allows PCB (printed circuit board) layout design, Circuit design, test and debug simulations and IOT Builder with Arduino/Raspberry Pi using the MQTT (Message Queuing Telemetry Transport) protocol.

During my internship, I took up personal projects in exploring the use of proteus professional software to try out circuit simulations and Arduino simulations in the absence of assigned tasks by my supervisor. These helped boost my skills in Proteus design.

2 IOT (INTERNET OF THINGS), WORKING WITH ARDUINO

IOT short for Internet of Things refers to the concept of creating an internetwork of "things" (assets to be controlled, monitored or measured). IOT is made up of the hardware, software and necessary protocols guiding it. This hardware includes the microcontrollers (Arduino, raspberry pi, beagle board) and smart devices, the software may be python, C++/C#, Java, B# etc and the protocols may be MQTT or CoAP (Confined Utility Protocol).

During my internship, I explored several Arduino examples available in the Arduino library as well as online projects from websites such as Wokwi.com, Reddit.com etc. These helped develop my interest and skill in electronics.

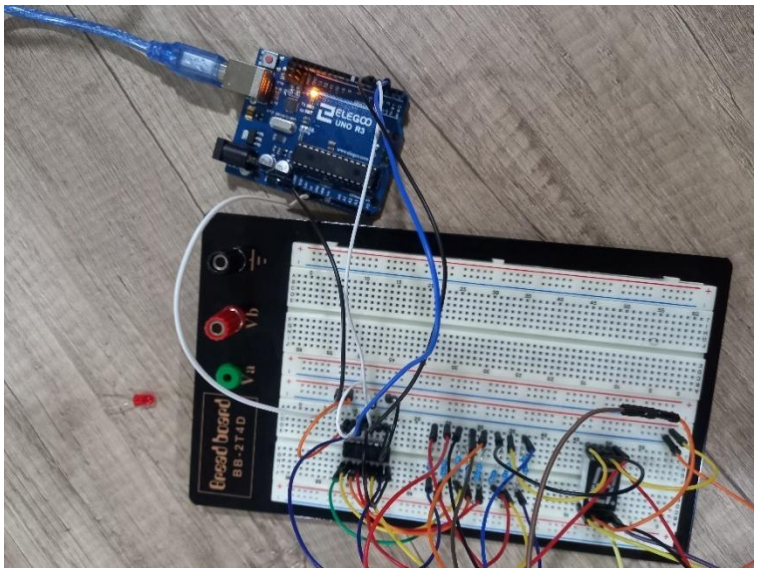


FIG 1: CONTROLLING A SEVEN-SEGMENT DISPLAY WITH ARDUINO

FIG 2: RASPBERRY PI KIT

3 HUAWEI CLOUD COMPUTING AND DATA VIRTUALIZATION

Cloud Computing is a technology in which the companies can provide cloud storage to the companies in need. The customers who are using cloud storage can access the data remotely. Cloud Computing eliminates and reduces on-site software or hardware usage. People were in need of hard drives to store the information and that too had several issues such that there may be a chance that the hard drive may corrupt. Due to Cloud Computing, the hardware usage has reduced as it can store and access data from anywhere with the help of an internet connection. The working of the cloud is very easy as they have the large availability of space in which we can store the information. The infrastructure is very fast as the transmission of data is quick. Cloud Computing works by providing permission to the user to upload and download the information which stores. We can access the data from anywhere. A user will get the initial amount of storage at a very low price.

Cloud Computing can be divided into two systems. One is front-end and the other is back-end. The two ends connect to each other with the help of an internet connection.

The backend of the cloud is the system and the front end is a computer user or client. The front end of the system has the application, which is used to access the cloud system. Moreover,

the backend has various computers, hardware, servers, and data storage systems that make the cloud.

All these features and functions managed by the central server. The central server ensures that everything runs smoothly and in a perfect manner. It is done with the help of software named Middleware, which also permits the network computer to communicate with each other.

Virtualization in Cloud Computing is making a virtual platform of server operating system and storage devices. This will help the user by providing multiple machines at the same time it also allows sharing a single physical instance of resource or an application to multiple users. The types of Virtualizations in Cloud Computing are Operating System Virtualization, Hardware Virtualization, Server Virtualization and Storage Virtualization.

During my internship, I took some online classes on Cloud Computing and Data Virtualization using the Huawei e-learning website ehuawei.com with follow up discussions with my supervisor.

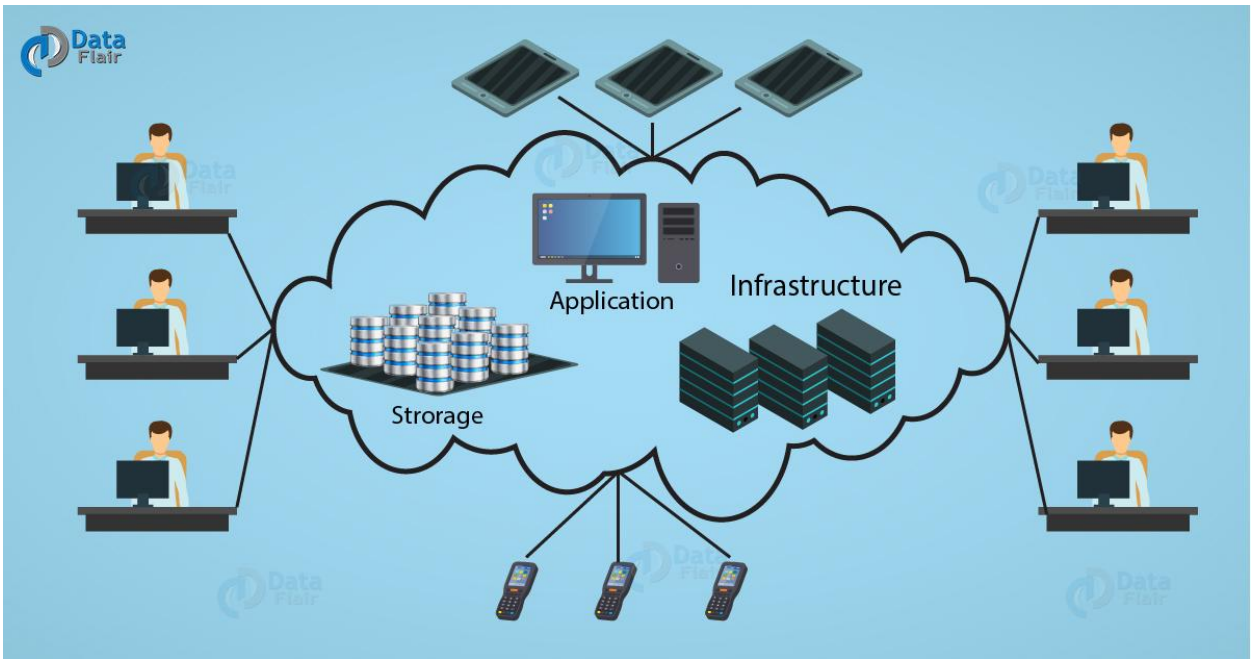


FIG 3: CLOUD COMPUTING

4 WEB DEVELOPMENT INTRODUCTION WITH WORDPRESS AND HTML

Web development refers to the building and maintenance of websites, applications, and other online platforms. It involves a combination of programming languages, tools, and technologies to create a functional and user-friendly online presence. During my internship, we focus on WordPress and HTML, two essential components of web development.

WordPress is a free, open-source Content Management System (CMS) that allows users to create and manage digital content. It's one of the most popular CMS platforms, powering over 40% of the world's websites. WordPress is the optimal choice for building blogs, e-commerce websites, and other types of websites that require frequent content updates.

HTML (Hypertext Markup Language) is a standard language used to create web pages. It's the backbone of web development, providing the structure and content that the web browser renders to the user. HTML consists of a series of elements, represented by tags, which are used to define different parts of a web page, such as: Headings (h1, h2, h3, etc.), Paragraphs (p), Links (a), Images (img), Lists (ul, ol, li), Tables (table, tr, td).
HTML provides the foundation for building web pages and applications and as such, is very important to web developers.

WordPress uses HTML to generate web pages and display content. When a post or page is developed in WordPress, the application converts the content into HTML code, which is then rendered by the web browser. WordPress themes and plugins also rely on HTML to create the visual layout and design of the desired website.

During my internship, courses in WordPress and HTML were sparingly taken to boost my knowledge of web development and understanding of how they work together.

3.3 SUPERVISORY WORKS

Listed below are the supervisory works undertaken by me under the supervision of my supervisors at Gigaxysafe Technologies Limited:

- NETWORKING
- OPTICAL FIBRE TECHNOLOGY
- VoIP CONNECTION

- ACCESS CONTROL SYSTEMS
- SECURITY AND SURVEILLANCE SYSTEMS
- HOME AUTOMATION
- ADMINISTRATIVE TASKS

1. NETWORKING

As applicable to Computing, a Network is simply the existence of a connection between devices, nodes or end systems. This connection may be established physically with the use of cabling or logically i.e wireless with the use of connectivity media such as Wi-Fi, Bluetooth etc.

To ensure the creation, maintenance and possible expansion of such connection, devices specially created for this purpose will be of great use. These devices referred to as Network Devices include Switches, Routers, Access Points, Bridges, Gateways, Modems, etc. These devices all serve important roles in the functionality of a network and its overall existence.

The connection created may be wired or wireless and as such, the media to be used varies. These include Ethernet Cables, Wi-Fi, Bluetooth, Free Space etc. At the end of these connections are the consumers which may be addressed as End Systems or Hosts. They communicate over these network devices linked by these medium to complete the network.

However, rules must exist to guide the working of networks and the exchange of data. These rules are known simply as Network Protocols. Protocols describe the format and order which messages/data will be transmitted and communicated over a network by setting rules to be obeyed.

During the course of my Industrial Training (IT) at Gigaxysafe Technologies, Networking had been a core focus of my stay there as we explored Networking from a theoretical and practical view. Slides on Networking protocols, troubleshooting for possible issues in a network were discussed with my supervisor and ideas shared. This described my theoretical experience on Networking with my supervisor briefly. From a practical view, we looked at Networking from Rack setup right up to diagnosing issues developed in the Network Rack and also the installation of devices such as Access Points, Routers, Switches, Gateways etc.

Tasks assigned during this supervised work were ceiling installation of access points in a building, assessment of faulty network device (switch), refurbishment of network racks for reuse, setting up simple networks (wired and wireless), procurement of devices and components and finally care/maintenance of network devices.

Networking as a task took place across several work environments as different projects were undertaken such as setting up a Network for BILAAD REALTY estate, regular inspection of the Network for IOA GROUP, engaging in different tasks for private clients and even diagnosis of faulty Switches in the office space.

Attached below are some images relevant to this task undertaken with the supervision of my supervisor:

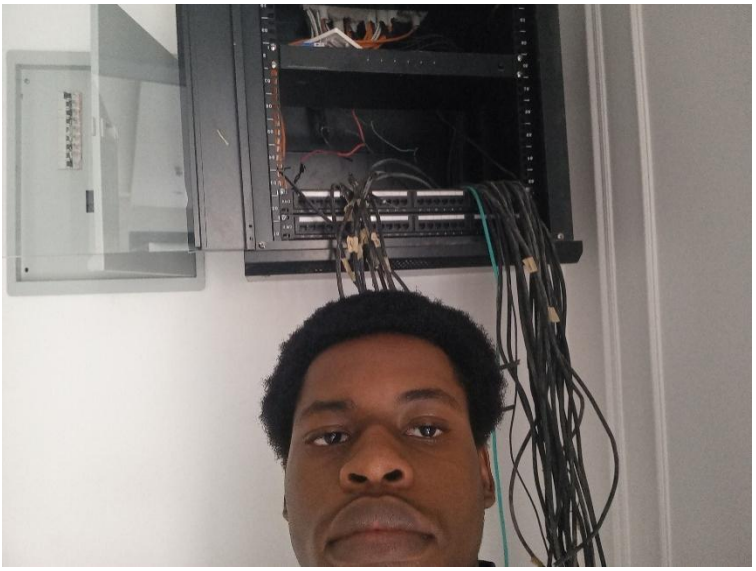


FIG 4: WORKING ON A WALL MOUNT CABINET

FIG 5: TESTING A CISCO WIRELESS CONTROLLER

FIG 6: UP CLOSE LOOK OF A WALL-MOUNT CABINET

2. **OPTICAL FIBRE TECHNOLOGY**

Optical Fibre Technology in its simplest definition is the physical medium through which information is transmitted as light pulses through specially made cables. These cables, referred to as fibre optic cables are four layered for protection of the sensitive glass core at the centre. These cables also work with the principle of total internal reflection where these light pulses are transmitted through constant bouncing effect within the glass core. This then brings the concept of Bend Sensitive and Bend Insensitive Fibre Optics.

Bend Sensitive Fibre Optics as the name would suggest are fibre optic cables with zero tolerance for sharp bends as the bending will cause micro cracks thus permitting the 'escape' of light. This may then result in attenuation and as such, total/partial loss of signal. Bend Insensitive fibre optics are much more flexible allowing for about 7500 bending cycles and as such, having somewhat of a tolerance for bending. Bend Radius plays an important role in this and as such must be noted as stated by the manufacturers in the specifications.

Optical Fibres may be plugged into the Switch with the use of Transceivers such as the SFP Transceiver which allows a paired cable to connect to a switch. However, this transceiver may develop a fault where it fails to come 'live'. This may be easily detected by using a detector such as the fibre let live fibre detector.

Fibre Optic cables undergo several processes before arriving the end user from being created at the central office to being relayed along the fibre whilst maintaining its strength then its reception at end point and transmission back to electrical signal. This reception may take place at a number of end points giving rise to the concept of FTT*X* (Fibre To The *X*) where *X* appears to represent the many possibilities of end points available.

The concept FTT*X* is then split broadly into two subgroups where the fibre is sent straight to the end user such as FTTB (Fibre To The Business), FTTH (Fibre To The Home) and the common FTTP (Fibre To The Premises) while the group defines Fibre To The Cabinet/Node (FTTC/N) where copper wires complete the connection. These cables being sensitive would require safer means for the cables. This brings up the concept of Underground fibre optics and Overhead Fibre optics.

Underground Fibre Optics are the optical fibres installed below ground level and allowed to run through conduit piping or trenches. This system has several advantages such as danger avoidance from ground level elements, out of sight neatness, dedicated channel while the disadvantages include expensive to repair, complicated installations, hard to spot damages etc.

Overhead Fibre Optics are optical fibres installed to run overhead using pole infrastructures to support it above ground level. This system essentially exists as an opposite of the underground system with inverted advantages and disadvantages as well.

During my industrial training, tasks under fibre optics varied from in-office to work site activities. In the office, functionality of fibre optics transceivers was tested using the Fibrelet Live Detector as had been described above. At a cable excavation, my supervisor and I explored the cable movement of underground fibre optics where several cables ran through conduit pipes underground. This then led to a discussion on its benefits, procedure of installation etc. The concept of Bend insensitive and bend sensitive fibre cables was introduced when a client requested the inspection of his optical fibre setup. Upon inspection, the fibre cables were suspected to have microcracks due to the excessive bending of the cables. The cables were then replaced with bend insensitive cables.

Attached below are some images relevant to this task undertaken during my optical fibre task:

FIG 7: NEAT CONNECTIONS FOR PATCH PANEL AND SWITCH

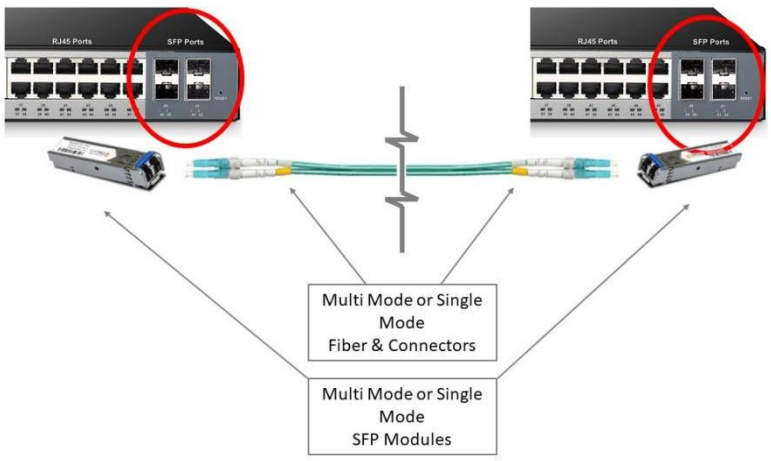


FIG 8: CREATING A NETWORK WITH OPTICAL FIBRE

FIG 9: EXPLORING UNDERGROUND OPTICAL FIBRE CONNECTIONS

3. **VoIP CONNECTION**

VoIP, short for Voice-over-IP, refers to real-time conversations engaged over the Internet similar to the traditional circuit-switch telephones. As such, it may then be referred to as Internet Telephony.

In the Network Layer, the IP protocol works to ensure the datagram units move from source to destination albeit with no assurance of packet completeness or avoidance of delay. This

lack of assurance then poses a challenge to the real-time concept of VoIP by appearing as limitations such as packet loss, delay and jitter.

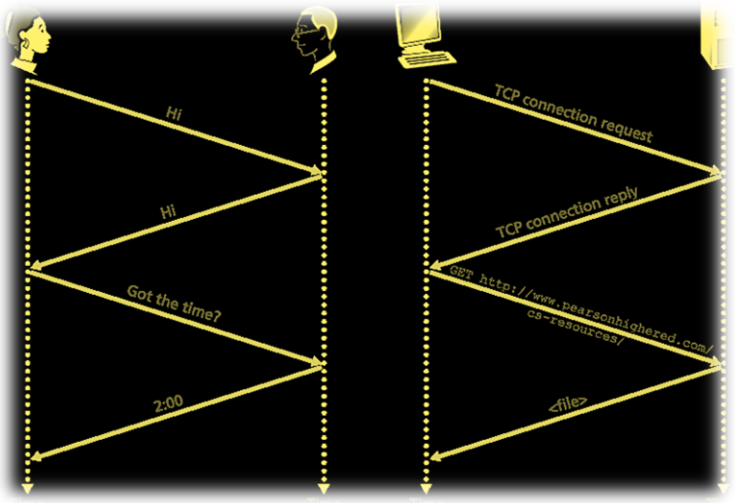


FIG 10: NETWORK PROTOCOL

Packet Loss may arise during transmission when a UDP (User Datagram Protocol, another Protocol) segment generated by the VoIP application is encapsulated in an IP Datagram. As the datagram is being transmitted, it passes through several queues while waiting to be transmitted on outbound links. In the case a queue is full, that waiting datagram may then be discarded as such, never arriving the destination along the rest. This loss may be eliminated by transmitting over TCP (Transmission Control Protocol, another protocol) instead of UDP. TCP allows for reliable data transfer although there arises the problem of end-to-end delay where the queue may be starved due to waiting on the TCP reliability checks.

Packet losses may also be reduced by using FEC (Forward Error Correction) which may help conceal the losses. In FEC, the redundant information is transmitted as well with the original information so that lost data may be recovered.

End-to-End Delay occurs when delays are accumulated during transmission, processing, queuing and propagation. To the Human ear, delays may not be picked up until possibly the delay exceeds about 400 msecs at which point its effect is felt in the conversation. As such, the receiving end of the VoIP will then disregard any packets delayed beyond a threshold.

Jitter is a phenomenon where the arrival time of packets vary from packet to packet. Consider a case where 2 packets are sent to a router with spacing of 20 msecs, packet 1 may

arrive to an empty queue but packet 2 is further delayed from packet 1 by the arrival of packets from different sources. Consider another case where packet 1 arrives to a busy router where packet 2 meets it as such, no delay exists between both packets thus somehow merging both packets. In both cases, the audio to be played at the receivers' end will certainly be unintelligible. Jitter may be avoided/reduced by using timestamps on the chunks or delaying the playout of chunks at the receiver.

A CASE STUDY OF SKYPE.

Skype is a VoIP application capable of providing host-to-host, host-to-phone, phone-to-host and multi party host-to-host services (host refers to internet connected devices operating with IP). For video and voice, Skype users make use of different codecs capable of encoding the media at different ranges and qualities. By default, Skype audio and video packets will be sent over UDP, Control packets are sent over TCP. Skype then uses FEC for loss recovery.

Skype operates a P2P (Point to Point) connection an index that links usernames to IP addresses (and maybe port numbers). This occurs across a hierarchical network of peers (pairs of hosts), classified as super peers or ordinary peers. As Skype remains proprietary, much information of its operation remains unknown to the general public.

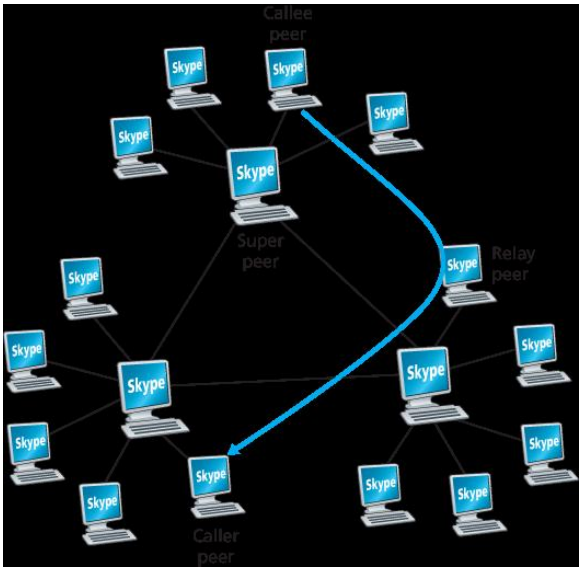


FIG 11: CASE STUDY OF SKYPE VoIP

During the course of my Industrial Training, in-office demonstrations of VoIP connections were carried out. Projects for BILAAD REALTY among others were also undertaken. The major project was the installation of several CISCO intercom phones for BILAAD. During this project, about 8 phones were used and cabled back to the Switch in the wall-mount cabinet (rack). The CAT 5 (twisted pair) cables were stripped using a stripper then fixed at the ends with RJ45 plugs by a crimping tool according to the necessary colour codes. These cables were tested for continuity using a LAN tester to ensure no cuts were present due to stripping. Following this, cables were run through the walls/ceiling (and tagged) from the central point (network rack) to exit points (sockets) where they were crimped. At the rack, these cables were plugged in while the intercom phones were plugged at the socket ends. The switch helped create the network as well as provide power for the phones.

Attached below are relevant images captured during the course of this task during the IT period:

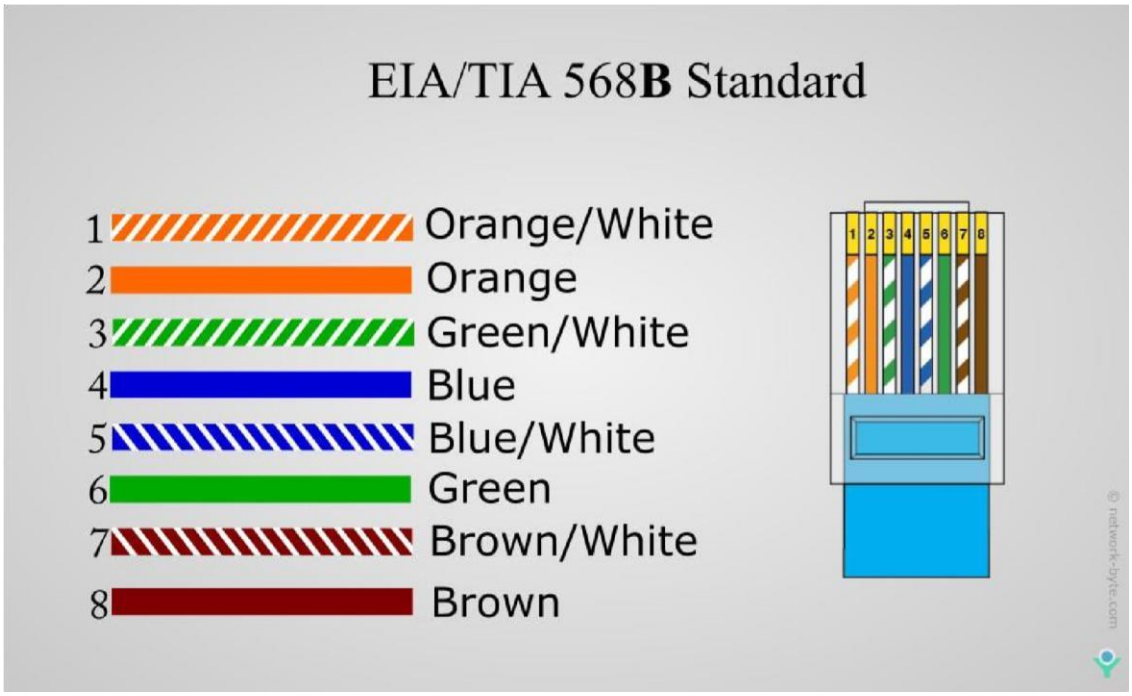


FIG 12: COLOUR CODE FOR RJ45 PLUG

FIG 13: RJ45 PLUGGED INTO PORT

4. ACCESS CONTROL SYSTEMS

In providing asset security, access control is an important aspect of any security strategy. Prevention is better than cure same as access control is better than data (asset) recovery or any other post attack technique. There are two primary types of access control: Physical Access Control and Logical Access Control.

Physical Access Control (PAC) refers to the measures taken to restrict and monitor physical access to a facility, building, or specific areas within it. The primary objective of PAC is to prevent unauthorized individuals from entering a physical space. This includes barriers (Fences, gates, walls, and doors that prevent unauthorized entry), Locks and Keys (Mechanical or electronic locks that require a key, card, or biometric authentication to gain access), Surveillance (CCTV cameras, alarms, and motion detectors that monitor and respond to potential security breaches), Access Control Systems (Electronic systems that manage and track access to a facility, including card readers, biometric scanners, and turnstiles).

Logical Access Control (LAC) focuses on restricting access to digital resources, such as computer systems, networks, and data/information. The primary objective of LAC is to prevent unauthorized access to sensitive information and systems. This includes authentication (Verifying the identity of users through passwords, tokens, or biometric), authorization (Granting/denying access to resources based on a user's identity, role, or permissions), encryption (Protecting data in transit/rest using encryption algorithms and protocols), Access Control Lists **(**ACLs**)** (Defining permissions and access levels for users and groups to specific resources).

Under Logical Access Control (LAC), firewalls play a crucial role in securing digital resources by controlling incoming and outgoing network traffic. A firewall is a network security

system that monitors and filters traffic based on predetermined security rules, ensuring that only authorized traffic reaches the protected resources. A firewall acts as a barrier between a trusted network and an untrusted network, such as the internet. It examines each packet of data transmitted between the two networks and decides whether to allow or block it based on the Source and Destination IP Addresses (The IP addresses of the sender and receiver), Ports and Protocols (The communication protocols (e.g., TCP, UDP, ICMP) and ports used by the applications), Packet Content (The actual data being transmitted)

During my internship, projects completed under the supervision of my supervisor regarding this task were access control installation for BILAAD REALTY. However, this only involved the installation of physical access control systems and were not extended to involve logical access control. Keypads and intercom systems were installed at entry points to control the entrance, this was combined with the existence of CCTV cameras covering the entry points.

5. SECURITY AND SURVEILLANCE SYSTEMS

Security and surveillance systems are means by which valuable property stays protected and secured through a system of interworking components and devices. These devices work to provide overlooking security for valuables either in noticeable positions or hidden spots.

These systems are needed for monitoring, supervision and awareness around the area of interest. Monitoring to know the live update of happenings in the area, supervision to provide real time and recorded update of happenings and awareness to provide alertness in the event of the unexpected.

Security and surveillance systems may be considered for use depending on several factors. These factors include the choice to keep it hidden or visually open, indoors or outdoors purpose, range of view to be covered, video resolution to be obtained and flexibility/scalability of the system needed.

The security and surveillance system are made of components such as security cameras (analogue or digital), cables (coaxial, twisted pair or fibre optics), video recorder (network or

digital), storage unit (hard drive, memory card), display unit, power supply pack and camera connector.

The Coaxial Cables send and receive audio, video and data transmission via electrical signals. They are mostly used for telecommunications and datacom. They may come in several forms represented by the prefix RG (short for Radio Guide). These RG cables include RG6, RG8, RG11, RG58, RG59 etc with varying advantages and applications. Coaxial cables are attached at its end with connectors connected depending on the type of connector to be used. These connectors may be chosen depending on the port size to be used and come in female (hole in the middle) and male (pin in the middle) versions as well as RP Male and Female (RP standing for Reverse Polarity meaning male RP will have a hole in the middle as opposed to a pin). Some common types of connectors are BNC (Bayonet Neil-Concelman), TNC (Threaded Neil-Concelman), F-type, N-series etc

A CCTV (Closed Circuit Television) system is usually installed with the previously stated components by linking the camera power cable to the power pack and video/audio cable to the video recorder fitted with a storage unit. The video recorder is then linked to the display unit for projection (although this remains optional). The video recorder and power pack will accept multiple cameras and the display resolution may vary from 720p to 8k resolution.

Several CCTV Camera types exist in the market and they include; Bullet CCTV, Dome CCTV, PTZ (Pan/Tilt/Mount) CCTV, Day/Night CCTV, Infrared/Night vision CCTV, Network/IP CCTV, wireless CCTVs and High-Definition CCTVs.

IP Cameras are connected over a network that allows the live footage to be accessed from anywhere in the world via the internet. Modern day CCTV systems make use of the IP Camera because of the ease of video sharing and remote monitoring as well as storage of archived footage. They may be used with a wired network connected via ethernet cable to a modem or router, or wirelessly via a Wi-Fi router

During the course of my Industrial Training, security and surveillance systems were core practical based tasks assigned to me with supervision from the supervisor. Other than the theoretical overview, my supervisor took me through demonstrations of simple CCTV connections in the office space right up to onsite connections of numerous CCTV cameras to

create systems, inspection and maintenance of CCTVs as well as mapping out connection details given customer/client specifications. The tasks also involved the procurement of devices, components needed from HIKVISION.

The projects embarked upon were for a variety of clients such as the IOA GROUP, BILAAD REALTY estates and private clients across Abuja from Lugbe to Maitama. The tasks involved here included installation of systems and follow up maintenance/inspections, mapping out connections etc. Some of the projects lasted several weeks of the IT period overlapping each other. All tasks assigned remained subject to supervision and verification by my supervisor.

Attached below are relevant images captured during the course of these tasks during the IT period:

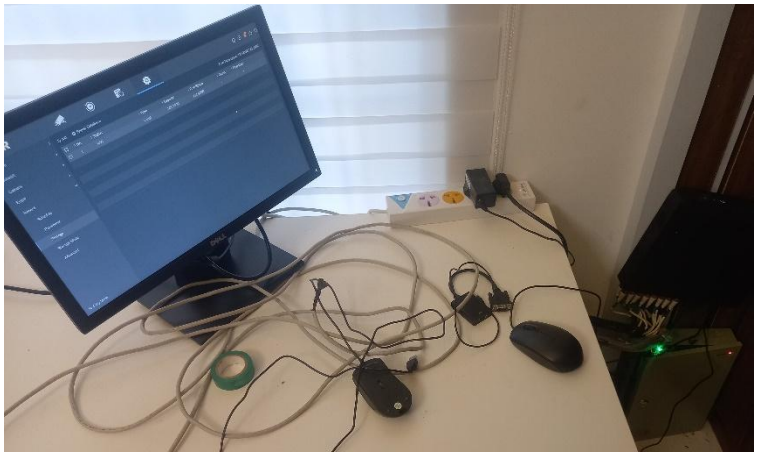


FIG 14: DISPLAY, POWER PACK AND DIGITAL VIDEO RECORDER SETUP

FIG 15: CONNECTION PORTS FOR DIGITAL VIDEO RECORDER (DVR)

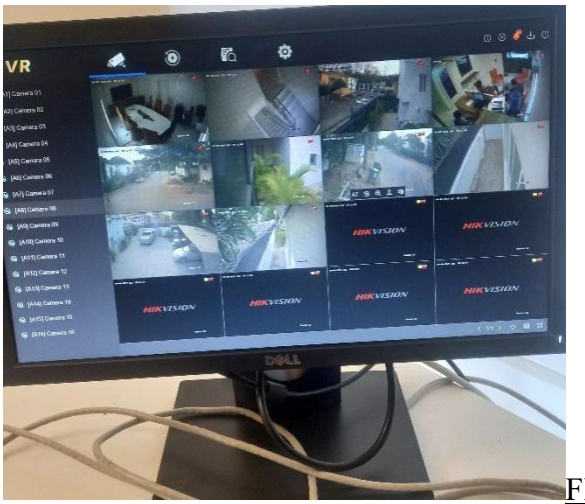


FIG 16: DISPLAY FOR CCTV SYSTEM

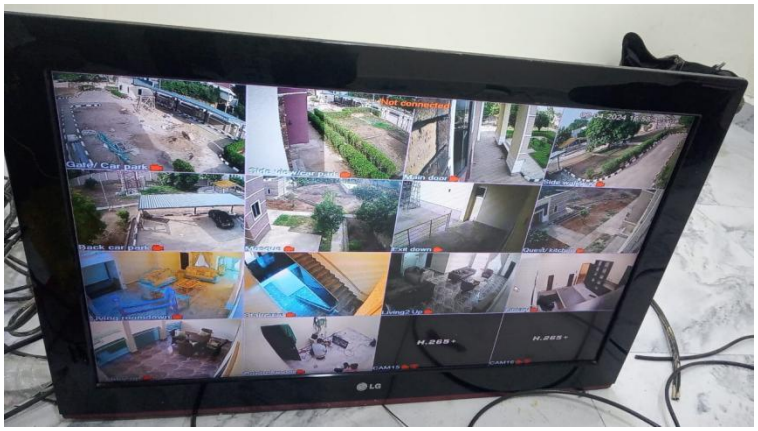


FIG 17: DISPLAY FOR CCTV SYSTEM

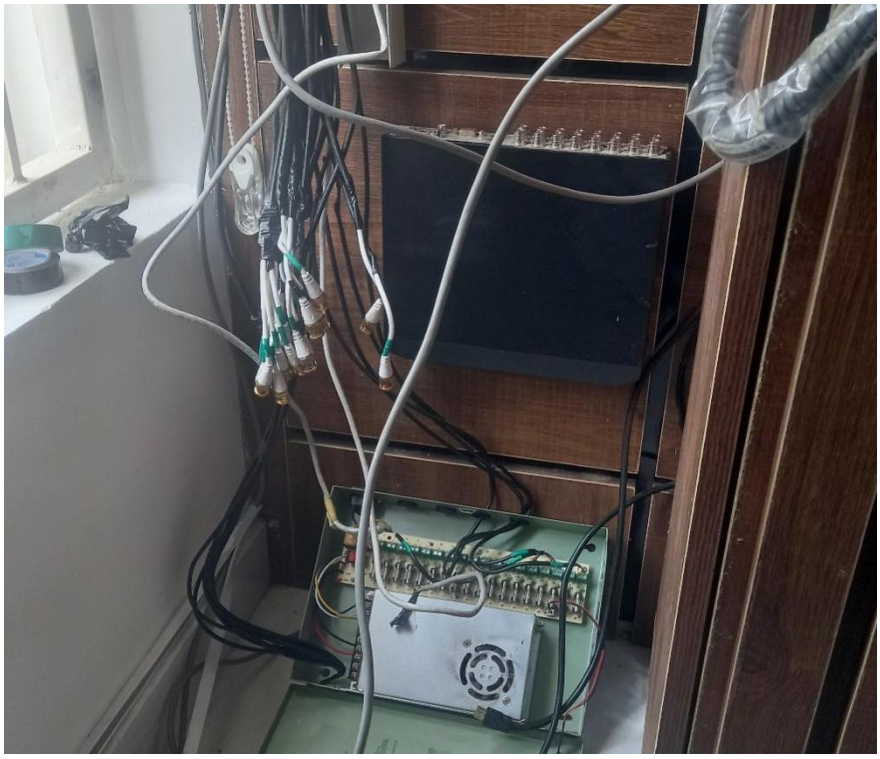


FIG 18: CONNECTING THE CABLES TO DIGITAL VIDEO RECORDER

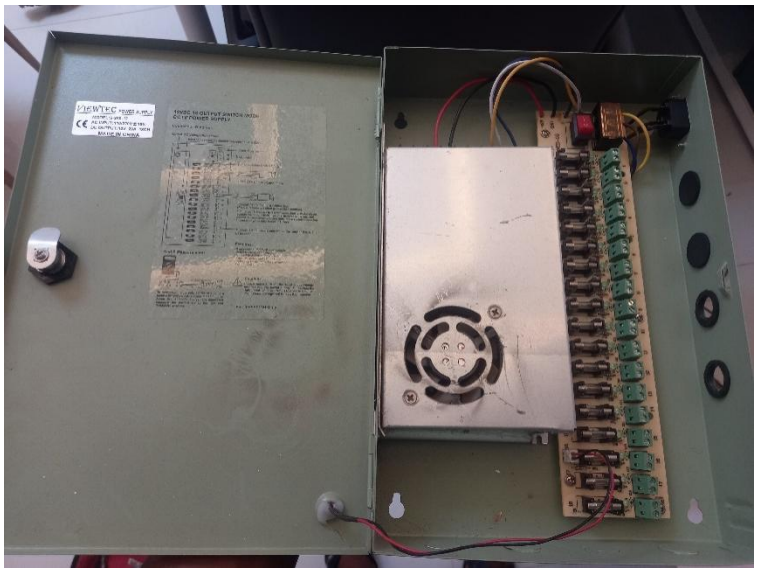


FIG 19: POWER SUPPLY FOR CCTV SYSTEM

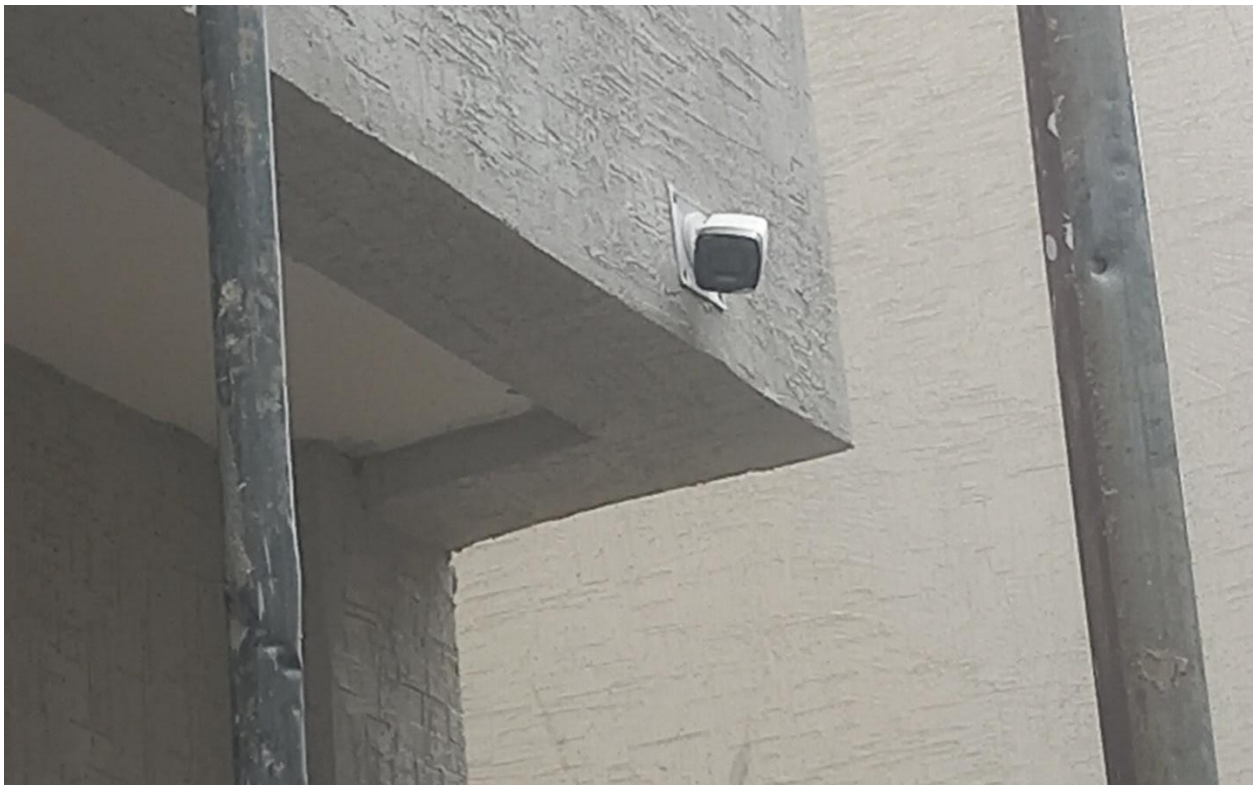


FIG 20: WALL MOUNTED CCTV CAMERA

6. **HOME AUTOMATION**

Home automation, also known as smart home technology, refers to the use of devices and systems to control and automate various aspects of a home. This can include lighting devices, temperature control, security systems, entertainment sets, and other systems, allowing users to control and monitor their home remotely using a smart device or voice assistant. Some examples are Smart thermostats that can adjust the temperature remotely, Smart lighting systems that can be controlled remotely and adjust brightness/colour based on the time of day, Home security systems that can be monitored remotely and alert detected security breaches, Smart speakers with voice assistants that can control various smart devices.

There are different types of home automation systems available such as Wired systems that use a physical connection to connect devices, Wireless systems that use Radio Frequency (RF) or Wi-Fi signals to connect devices and Hybrid systems that use a combination of wired and

wireless connections. Some popular home automation protocols include: Zigbee, Z-Wave, Bluetooth, Wi-Fi, etc while some home automation hubs include: Samsung SmartThings, Wink Hub, Apple HomeKit, Amazon Echo, Google Home etc.

Over the course of my 24 weeks internship with Gigaxysafe Technologies, as had been mentioned in **3.2,** the company undertook a project to install a home automation system for BILAAD REALTY. This system included smart lighting systems, smart speakers, smart curtains, smart temperature controls etc. The project lasted for several weeks with many starts and stops responding to customer changes of choice. Ultimately, all devices were installed and linked to the Central point at the wall-mount cabinet (network rack) with switches, patch panels and pre-amplifier stored there neatly. My assigned tasks included tagging the cables appearing at the rack end, assisting in installing the speakers, installing the light/temperature interfaces, etc.

Attached below are relevant images captured during the course of these tasks during the IT period:

FIG 21: CEILING SPEAKER

FIG 22: CONTROL INTERFACE FOR HOME AUTOMATION SYSTEMS

FIG 23: AIR CONDITIONER VENT (LEFT), SMART LIGHTING (CENTRE) AND SMART CURTAIN RAIL (RIGHT)

7. **ADMINISTRATIVE TASKS**

Other than the practical work being assigned, in-office tasks were assigned to me for the purpose of building my professional skills and effective communication. These tasks involved front desk sales of equipment, drafting of project proposals, verbal engagement with potential clients and composition of procurement mails.

Equipment sold included CISCO Intercom phones, HIKVISION CCTV cameras, CISCO Switches etc. During these sales, my technical knowledge, how little, were drawn upon to offer insight into the buyers' opinion of preferred goods. Sales Invoices were then written for purchases completed. This task was also supervised by the necessary supervisor.

Project proposals were drafted with the aim of securing a project alongside the quotations. Feasibility checks were also carried out to assess the profitability of potential projects. Some proposals proved successful while some ended unsuccessful. Each proposal was forwarded to the relevant supervisor and fully verified/corrected before being readied for use.

Verbal engagements with potential clients occurred during mapping out tasks where client preferences and opinions were noted and worked into possible connections. These were also undertaken in the presence of my supervisor who had superior influence over the discussions.

During procurement, orders were placed for delivery of devices and equipment not obtainable within Abuja. Upon delivery, these devices were tested, wrapped up and stored to be used later on. As normal, my supervisor played a watch over role during this task.

FIG 24: WORK STATION

3.4 CONCLUSION

In conclusion, this chapter shares my personal and supervisory works/tasks during my Industrial Training. On most days, my supervisor was either unavailable or the day happened to be free and as such, I felt it necessary to pick up personal tasks and projects. These have been discussed on in **3.2** while the supervised works where I either accompanied or was assigned by my supervisor were also discussed in **3.3.**

CHAPTER FOUR
WORKING EXPERIENCE

4.1 INTRODUCTION

This chapter will cover my experience, skills and lessons learnt during the course of my Industrial Training at Gigaxysafe Technologies. This chapter will also cover the problems encountered, solved as well as the related courses explored during my industrial training. In the following sections **4.2, 4.3, 4.4** and **4.5**, I will talk about the specifics of my working experience, describing the challenges I faced, and the skills I developed. I will also highlight the lessons I learned, the successes I achieved, and the areas where I grew in my pursuit of excellence.

4.2 EXPERIENCE GAINED

During my 24-week internship, I had the opportunity to gain several experiences and insights into the industrial practices in computing applications as an intern with Gigaxysafe Technologies. I gained useful knowledge and skills from my internship that helped me advance both personally and professionally. The following are some of the skills, knowledge and experiences obtained as an intern with Gigaxysafe Technologies:

INTERPERSONAL SKILLS/NETWORKING:

I got the opportunity to speak with clients and learn about their project requirements. I learned the value of providing excellent customer service as well as how to establish and preserve strong client relationships through this experience. Through written reports and face-to-face interactions with clients and coworkers, I was able to enhance my communication abilities as well. This internship also gave me the opportunity to link up with seasoned professionals in several industries such as telecommunications, software developing, cybersecurity etc as I gained guidance and mentorship from experienced professionals, learning from their experiences, and gaining valuable advice on my potential career pathway.

ADMINISTRATIVE SKILLS, FILE AND DOCUMENT HANDLING:

I learned how to keep records, draft up proposals, compose and respond corporate emails, write project reports, etc. I assisted in preparing meeting materials, such as agendas and minutes, which helped me understand the significance of effective communication and collaboration in a team setting. Also, I was tasked with running multiple projects simultaneously, which required me to work with priority, set deadlines, and allocate time efficiently to meet up. My experience with administrative tasks during my internship has helped in preparing me for a career in a professional organization with my developed essential skills in organization and communication.

CABLING WORK, CARE AND MANAGEMENT:

During my internship, I had the opportunity to participate in cabling work, which involved installing, testing, and maintaining cables for various networks and systems. Through this experience, I gained hands-on knowledge of Cable management best practices including conducting regular checks on cable connections and terminations to prevent damage or degradation, cable routing, labelling, and organization, cable testing and troubleshooting techniques to ensure reliable connections, familiarity with different types of cables (including fibre optic, coaxial, and twisted pair cables), and understanding of cable specifications and standards, such as CAT5e, CAT6, and fibre optic transceivers.

PROJECT INVOLVEMENT:

Throughout my involvement in installing network devices, setting up home automations, and configuring VoIP systems, I developed several project involvement skills that are essential for a successful project outcome. These are some of the skills I learnt from these activities: Project Planning and Management (where I learned to plan and manage projects effectively, ensuring that all tasks were completed on time and within budget and developed a detailed understanding of the project scope, timeline, and resources required to complete each task), Problem-Solving and Troubleshooting (where I developed my problem-solving skills by identifying and resolving technical issues that arose during the installation and setup process and learnt to troubleshoot and debug complex technical problems, and to think critically to find creative solutions) and Client Relationship Management (where I built strong relationships with clients by providing excellent

customer service and I learnt how to communicate effectively with clients, providing regular updates and ensuring that their expectations were managed).

TEAMWORK:

I had the opportunity to participate in various teamwork-based tasks that allowed me to develop essential skills in collaboration, communication, and problem-solving. I worked with team members to execute projects, which involved setting goals, assigning tasks, and establishing deadlines. Through this experience, I learned the importance of clear communication and adaptability in a team setting. I also collaborated with colleagues to troubleshoot complex technical issues, which required us to share knowledge, expertise, and ideas. Furthermore, I worked with team members from different departments and functions, which exposed me to various work styles, expertise, and priorities. This experience helped me develop an appreciation for the interdependence of different teams/units and the importance of collaboration in achieving common goals.

HARDWARE HANDLING:

During my internship at Gigaxysafe Technologies, I had the opportunity to work with various network devices, including routers, switches, access points, and servers. This hands-on experience allowed me to develop my skills in hardware handling, installation and troubleshooting of network devices. I installed several network devices, such as access points and switches, to ensure seamless network connectivity. I diagnosed and resolved network-related issues, such as connectivity problems, slow network speeds, and device malfunctions. I performed routine maintenance tasks, such as testing and device cleaning, to ensure optimal network performance and reliability. I upgraded network devices, such as replacing old routers with new ones and even cleaning up network racks, to improve network speed, security, and capacity. I learned to identify and distinguish between different network devices, including their functions, specifications. I learned various troubleshooting techniques, including identifying symptoms, isolating problems, and applying solutions to resolve issues.

4.3 PROBLEMS ENCOUNTERED

During my 24-week internship, I had encountered several challenges in the course of obtaining knowledge and skills. Below are some of the challenges I faced:

WEATHER:

Given the Internship took place between March and August during the peak of rainy season in the Nigerian climate, rain proved to be a challenge for me in terms of transportation to my place of attachment, work site outdoor activities etc. As well as with the expected rain, the Abuja weather patterns exposed me to uncertain conditions like extreme rain or extreme heat. The rain and flooding caused disruptions to our office operations, including power outages and internet connectivity issues and it also affected the delivery of materials to our sites, which further delayed our projects.

WORKING HOURS:

Unlike conventional work hours of 9am to 5pm present in the corporate space, having a working experience in Gigaxysafe exposed me to the reality of working for fewer hours (say 9am to 2pm) on some days to working for longer hours (9am to 8pm) on other days. This dynamism proved rather challenging for my attendance logging.

DIFFICULT CLIENTS TO ENGAGE WITH:

During my administrative tasks as described in Chapter 3, I was tasked with engaging clients in discussions for project handling and management. However, some clients proved difficult to work with given their ever-changing choices. Sometime, they had high expectations for the services we provided, which sometimes seemed unrealistic or unachievable and other times, they had limited knowledge of our services or the industry, which made it difficult to communicate effectively. This was evident during the projects for BILAAD REALTY where the projects were dragged for weeks because the clients changed their minds severally ranging from different lighting set to different position of speakers.

COMPLETING CERTIFICATIONS IN CLOUD COMPUTING/VIRTUALIZATION:

I was unable to complete the Huawei certification courses on Cloud computing/virtualization during my internship. The online course was intensive and required a significant amount of time and effort to complete and this added an extra layer of complexity to my workload, as I had to balance my daily responsibilities with the demands of the online course. This was partly because of the shift of focus to assigned tasks by my supervisor as the Huawei courses were personal projects.

AUGUST PROTESTS IN ABUJA:

For the first 10 days of August, protests existed within Abuja. This forced limitations on transportation within Abuja and slowed down activities at my place of attachment. The roadblocks and security checkpoints made it difficult for me to travel to work. I had to plan my transportation in advance and leave early to avoid getting stuck in traffic. My place of attachment had to adjust its work schedule to accommodate the protests, our office hours were reduced to minimize the risk of disruptions. The demonstrations were largely peaceful, but the heavy security presence and roadblocks caused disruptions to daily life in Abuja.

TRANSPORTATION/FINANCIAL COSTS:

Rising costs of living placed a strain on my finances during the internship period as the cost of transportation daily was also affected. The rising fuel prices coupled with fuel scarcity increased the cost of transportation, making it difficult for me to afford my daily commute and the traffic congestion in Abuja made my commute longer and more stressful.

4.4 RELATED COURSES

COMPUTER NETWORKS

Computer Networks as a course deals with the study of interconnected devices that communicate to share resources, exchange data/information and provide services. It is also extended to involve the study of network type such as Local Area Network (LAN), topology (structure type) such as Bus Topology, Star Topology and also the study of network protocols such as TCP/IP, FTP (File Transfer Protocol) etc.

My theoretical knowledge from the concepts in Computer network were very much applicable during my internship as related projects and tasks were undertaken. Tasks such as installation of switches and other network devices, cabling management and handling, network rack setup etc. This was also applicable in tasks from optical fibre technology, security and surveillance.

DATA COMMUNICATIONS AND COMMUNICATION PORINCIPLES

Data Communications and Communication Principles are similar and fundamental courses in computing studies. Data Communication is a course in the field of computer science and information technology which deals with the principles, techniques, and technologies used to transmit data between devices, networks, and systems. The course covers the concepts, protocols, and architectures that enable data communication over various types of networks, including local area networks (LANs), wide area networks (WANs), and the internet. Communication Principles is a course that explores the concepts, theories, and models of communication. The course provides students with a comprehensive understanding of the communication process, including the sender, message, channel, receiver, and feedback.

My theoretical knowledge from the concepts in both courses were applicable in tasks from VoIP installations, optical fibre technology and overall cabling works.

EMBEDDED SYSTEMS

Embedded Systems is a course that deals with the design, development, and implementation of specialized computer systems tembedded in various devices, such as consumer electronics, industrial control systems, and medical devices. The course covers the fundamental concepts, principles, and techniques of embedded systems, including hardware and

software design, programming, and testing. The course covered the applications of embedded systems in smart devices, understanding the use of IOT programming languages such as C++, etc.

My theoretical knowledge here was applicable in tasks from Home Automation, Internet of Things (IOT) working with Arduino, proteus project simulations and web development.

OPERATING SYSTEMS

Operating Systems is a fundamental course in the field of computing that deals with the design, implementation, and management of operating systems. The course covers the concepts, principles, and techniques of operating systems, including process management, memory management, file systems, and security.

My theoretical knowledge from this course was applied during the online course on Huawei Cloud Computing and Data Virtualization.

MICROPROCESSORS, SYSTEMS AND INTERFACE

Microprocessors, Systems, and Interface is a course that deals with the design, development, and implementation of microprocessor-based systems, including the interface between microprocessors and external devices. The course covers the concepts, principles, and techniques of microprocessors, systems, and interface, including microprocessor architecture, programming, and interfacing.

Theoretical knowledge from this course was helpful during my tasks from Internet of Things, Networking, Home automation and proteus simulations.

INTERNET OF THINGS (IOT)

The course content of Internet of Things (IoT) typically covers a wide range of topics, including Introduction (This topic provides an overview of the IoT concept, its history, and its applications. It also covers the benefits and challenges of IoT), IoT Architecture (This topic talks about the architecture of IoT systems, including the different layers, protocols, and technologies used), IoT Devices and Sensors (This topic explores the different types of IoT devices and sensors, including their characteristics, applications, and limitations), IoT Communication Protocols (This topic covers the various communication protocols used in IoT, such as Wi-Fi,

Bluetooth, Zigbee), IoT Security (This topic addresses the security concerns in IoT, including threats, vulnerabilities, and countermeasures), IoT Applications (This topic showcases various IoT applications, including smart homes, cities, industries, and wearables), IoT Development (This topic provides hands-on experience with IoT development, including programming languages, frameworks, and tools), IoT example studies (This topic presents real-world case studies of IoT implementations, highlighting their challenges, solutions, and outcomes), IoT Future Directions (This topic explores the future of IoT, including emerging trends and technologies).

My theoretical knowledge from IoT was very much applicable in tasks from Internet of Things as well as Home Automation (Smart Home).

TECHNICAL COMMUNICATION FOR ENGINEERS

Technical communication is a course that focuses on the effective communication of technical information to various audiences. The course covers the principles, strategies, and techniques of technical communication, writing, and oral presentation. Students are expected to possess the skills and knowledge to communicate technical information effectively to various audiences.

Theoretical knowledge from this course was particularly important in my administrative tasks and duties executed within the work space.

OBJECT ORIENTED PROGRAMMING

Object-Oriented Programming (OOP) is a fundamental course in computer engineering that introduces students to the principles and concepts of object-oriented programming. The course provides a comprehensive understanding of OOP concepts, design principles, and programming techniques, enabling students to develop robust, scalable, and maintainable software systems. The course is for undergraduate students in computer science and engineering, software engineering and related fields. It is also for professionals trying to enhance their programming skills and knowledge of object-oriented programming.

Theoretical knowledge here helped me during tasks assigned from Internet of Things, web development and cloud computing/data virtualization.

4.5 PROBLEMS SOLVED

COMPLETING CERTIFICATIONS IN CLOUD COMPUTING/VIRTUALIZATION:

To solve the issue of uncompleted certifications in these courses, I have decided to shift the conclusion of these courses in cloud computing/data virtualization to a later date whenever I will be able to complete them. This would be whenever I happen to have more free time to spare.

WEATHER:

The weather problems were overcome by putting in maximum efforts on sunny days while on rainy days, the problem was solved by buying a backpack sized umbrella for use. Weather prediction applications and forecasts were also followed and consulted daily to aid my movement.

WORKING HOURS:

This was solved by taking up side projects on less busy days and requesting to close early on longer days. The side projects kept me occupied and allowed me complete the necessary eight hours of work daily while my supervisor was kind enough to permit me end my work days when necessary.

DIFFICULT CLIENTS TO ENGAGE WITH:

My supervisor was always present doing my interactions with clients and as such, played a guidance role. My supervisor allowed me participate during the interactions while he was at the forefront of the discussions.

4.6 CONCLUSION

This chapter covered my working experienced at Gigaxysafe Technologies where **4.2** explored the experience gained (which includes the knowledge, skills and insights gained). The next section, **4.3**, covered the problems encountered during my internship talking about the challenges, downsides and drawbacks. Section **4.4** then covered the related courses relevant to the activities and tasks assigned to me. Finally, section **4.5 c**overed the solved problems during my experience.

CHAPTER FIVE
SUMMARY, RECOMMENDATION AND CONCLUSION

5.1 INTRODUCTION

In the final chapter of my documented experience as an intern at Gigaxysafe Technologies, I reflect on the culmination of my experiences, growth, and the valuable lessons I have learned during this period. This chapter serves as a conclusion to my internship experience, where I draw together the summary of my journey, acknowledge the contributions of co-workers and mentors, and share my aspirations for the future. My 6 months internship at Gigaxysafe Technologies which lasted from March 18 to August 30, was a success in my opinion. I was able to mix my theoretical knowledge from school with my practical knowledge/experience from SIWES.

During my time there, I had a wonderful working experience and enjoyed working with the people of the technical, project and software units. I was educated and instructed on a variety of topics, some of which were unfamiliar to me, while some I was familiar with or had little knowledge of.

5.2 SUMMARY

In this chapter of my experience at Gigaxysafe Technologies, I wish to reflect on the pool of knowledge, skills, and insights I've gained throughout this journey. This concluding chapter provides a summary of my experiences, emphasizing the challenges I've overcome and the growth I've achieved during my time as an intern. I express gratitude to my co-workers and supervisors for the provided guidance and support as I work towards my aspirations for a future career in Computing.

My time at Gigaxysafe Technologies provided me with an understanding of the Information Technology industry, emphasizing the concepts of project execution, customer interaction, and hardware/cabling management. Engaging in diverse projects and working closely with an experienced team gave me the opportunity to develop essential skills such as communication, adaptability to different working environments and problem-solving.

5.3 RECOMMENDATION

I would like to recommend the following changes, improvements and opinions observed and noted during my internship:

1) I believe the ITF should make provisions for monthly allowances available for students. This can help solve the financial difficulties that may arise.
2) The educational institutions and ITF should help students to get a place of attachment as soon as necessary to allow for same SIWES period and early completion of the program.
3) Supervision should be made necessary to ensure students have industrial trainings in industries relevant to their course of study.
4) Students embarking on SIWES should ensure they take their SIWES very serious in order to get the maximum benefit from the program.
5) I would like to recommend that ITF and tertiary institutions work to limit the rejections from possible employers to students.
6) I would also like to recommend potential employers should be required to offer financial assistance to students however little that may be.
7) Students in the field of computing should be exposed to more hardware-based tasks and activities during their SIWES programs. This could help improve their all-round computing knowledge and skills.
8) Having done my internship in an organization not working within conventional working hours, I recommend this should be taken into account when assessing the attendance records.

5.4 CONCLUSION

During the 24-week internship, the quality of assignments and tasks were neither challenging nor overly simple. The tasks seemed just right for my level as a beginner with background in theoretical concepts. During this internship, the skills acquired were practical applications of classroom concepts such as basic wiring, working with hardware network devices etc. The working experience also involved the daily interactions with supervisors, coworkers, industry persons who could offer advice and constructive criticism. My overall SIWES experience proved to be very successful and rewarding in my opinion.

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