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DEVELOPMENT OF CENTRALIZED INFORMATION TECHNOLOGY INFRASTRUCTURE MONITORING SYSTEM (CASE STUDY: FEDERAL COLLEGE OF ANIMAL HEALTH AND PRODUCTION TECHNOLOGY, VOM)

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ABSTRACT

Information technology (IT) comprises various technology elements that are used to collect, transform, manage or transmit data or information. Managing technology is a method of operation that pulls human resources, technology and other business assets in order to optimize the relationships between the technology functions of the business organization to function more effectively, efficiently and economically. The laborious, time-consuming and overhead expenses faced by many IT-oriented organization in procuring, deploying and maintaining of IT infrastructures is as a result of lack of clear visibility of all IT – equipment and proper managerial activities by IT – Manager. This underscores our interest to develop a centralized system for monitoring and supporting of diverse information technology infrastructures. It utilized MySQL database architecture at the back end and PHP framework at the front end. This makes it user-friendly and highly interactive. The Unified Modeling Language is adopted for the analysis and design of the system. Interactions with system administrator, aided the gathering of the required information. The dissertation achieved a reasonable level of success as it achieved all the aim and objectives of the project. The dissertation is capable of monitoring both IP address devices that are connected to departmental LAN network and non-network devices. With this type of monitoring, the activity of system administrator in monitoring and overseeing the presence of IT devices can be effectively and efficiently enhanced and potential IT problems can be easily resolved. Also, the overhead expenses and time-consuming physical inventory of information technology infrastructure faced by the department can be greatly reduced as with a single click, one can inspect all devices connected to the network. The dissertation achieved the strength of the existing system as well as improving on the limitations.

1.0 INTRODUCTION

Information technology (IT) is the use of any computer, storage, networking and other physical devices, infrastructure and processes to create, process, store, secure and exchange all forms of electronic data. Typically, IT is used in the context of business operations, as opposed to technology used for personal or entertainment purposes. The commercial use of IT encompasses both computer technology and telecommunications (Vinod, 2016).

Information Technology has a vital role in organizations today. Both technical and human components are needed in IT infrastructure management and development. Information technology infrastructure needs to be compatible and flexible as it affects the business value of information technology in the organization. IT infrastructure is the key component for smooth practices of Management Information Systems (MIS). It is the key information systems that creates, processes, stores, and generates information with the unprocessed data within and outside the organization (Rahaman, 2016). Preferably an MIS would provide outputs that are reliable, timely, and accurate to support decision making. However, MIS exclusively facilitates operational and management functions and importantly in the decision-making process of business organization (McLeod and Schell, 2014). More recently, organizations have begun to create information systems that can provide a strategic impact and earn substantial profits. An expanding literature shows that interest in developing information systems is increasing in the organization to take strategic impact. Recent research has shown that top management still needs to be convinced about the potential strategic impact of information systems in the organization.

Information Technology (IT) comprises of various technology elements that are used to collect, transform, manage or transmit data or information. These component technologies may exist alone or more commonly as part of systems which are themselves collectively becoming part of a larger "information infrastructure". Managing technology is a method of operation that pulls human resources, technology and other business assets in order to optimize the relationships between the technology functions of the business organization to function more effectively, efficiently and economically. (Rahman, 2016).

The development of "IT–Infrastructure Monitoring System" comes as a better solution with many flexible and convenient features, allowing IT administrators and users to maximize efficiency and reduce time wastage and resources. It gives detailed information about users and equipment with vendor details and will keep track of available equipment. It will definitely minimize errors and will be a very good replacement to existing repetitive manual process. (Thacker S, et al. 2018.)

The aim of this paper is to develop a Centralized Information Technology Infrastructure Monitoring System.

Definition of Terms

API: This is an acronym for application programming interface. It is a way in which two or more computer programs communicate with each other.

Host: A network host is a computer or other device connected to a computer network.

LAN: This is an acronym for Local Area Network. A local

Infrastructure: Information technology infrastructure, or IT infrastructure, refers to the combined components needed for the operation and management of enterprise IT services and IT environments.

Network: a network consists of two or more computers that are linked in order to share

resources (such as printers and CDs), exchange files, or allow electronic communications

Technology: This is referred as the application of scientific knowledge for practical purposes. It is a branch of knowledge that deals with engineering or applied sciences.

Routers: This is a device that forwards data packets to the appropriate parts of a computer network.

System: A system is a group of interacting or interrelated elements that act according to a set of rules to form a unified whole.

Server: A server is a computer program or device that provides a service to another computer program and its user, also known as the client.

DevOps: this is a combination of software developers (dev) and operations (ops). It is defined as a software engineering methodology which aims to integrate the work of software development and software operations teams by facilitating a culture of collaboration and responsibility.

2.0 REVIEW OF RELATED LITERATURE

Some reviews from previous literature shows that one of the most important part of MIS is the best practices in the business organization. Culnan, 2016 argues that few attempts have been made to present a systematic application of MIS in the service organization. Particularly, the banking sector in any developing countries like Nigeria needs the application Infrastructure monitoring system for the smooth running of its operation.

IT infrastructure is the shared IT resources consisting of a technical/physical base of hardware, software, communications technologies, data and core applications, and a human component of skills, expertise, competencies, commitments, values, norms and knowledge that combine to create IT services that are typically unique to an organization. These IT services provide a foundation for communications interchange across the entire organization and for the development and implementation of present and future business applications. Studies on the relationship between IT and organization describe the systems of organizational practices that complement IT. One theoretical perspective that convincingly addresses IT and organizational processes, practices routines and activities is the resource based theory of the firm. This theory argues that durable competitive advantage emerges from unique combinations of resources that are economically valuable, scarce and difficult to imitate (Barney, 2014).

According to H Maulana et al., (2021) the development of information and data communication technology field in our world has now increasingly led to the development of internet of the Internet of Things devices. The development of network technology in an organization/university has triggered the need for a system that can monitor computer networks and their devices in an organization/university environment that is quite extensive and complex to monitor manually. At this time, network monitoring becomes quite difficult to do if the computer network in a corporate environment has become very broad and complex. The wider the network and the complex network and multimedia topology that is built, the more difficult it is for network administrators to monitor the network. It was reiterated that the purpose of having a monitoring system is to anticipate network risks in the form of physical and logical threats, either directly or indirectly that can interfere with ongoing activities in the network.

Raspberry-Pi and Open Source Icinga Software is what was used to design this system. Raspberry Pi is a capable small computer that can be used for electronic projects and can do many things like your desktop PC or computer. It is used in running in running an office program to make reports, create documents, browse the internet and can also be used to play games.

Rodrigo I et al., (2022) stated that today's networks are dynamic, and therefore numerous transactions are performed each second between different clients, applications, sensors, and devices are needed to deploy new services, which consumes the information generated throughout the network ecosystem. The traditional communication between network devices (Core and End Users) generates transactions in traffic control. In most cases, the Simple Network Monitoring Protocol (SNMP) is used to analyze traffic, with the purpose of allowing the administrators to change and monitor the state of devices that support the protocol, for instance, by shutting down an interface, checking the users network activity, counting the users sessions e.t.c. The SNMP protocol uses a hierarchical structure called Management Information Base (MIB). The structure is a database of managed objects containing information about the devices and the network.

A multi-agent system with some mobility characteristics was used to determine the number of users on the campus network and the density in specific buildings, which therefore reduces the data collection time by one third of the normal time.

Brattstorm and Morrreale (2017) designed a model that uses metrics to collect, store, present, give alerts to notify the system or device administrator or central control process of abnormal system or device behavior, which will then prompt the device administrator to give recommendations on what to do to such systems or devices for smooth operations.

Majumbar et al. (2019) audit cloud-based IT Infrastructure for security purposes and propose a solution that is able to identify topology inconsistencies that might occur between multiple control layers in the cloud. The system gathers data from cloud management system, cloud infrastructure system, data centre infrastructure components. The data collection is performed in batch mode. Authors use a Constraint Satisfaction Problem Solver for validating the compliance of the cloud infrastructure.

Another approach is proposed by Affandi et al., (2015) with a network mapping tool that sends early warnings via Short Message Service (SMS). The process starts with network mapping using the SNMP agent on all network interfaces. The information contained in the agents is retrieved and processed as Transport Control Protocol (TCP) traffic.

3.0 RESEARCH METHODOLOGY

Analysis of the Proposed System

The process of monitoring technology devices in the proposed system is that each IP address device can be scanned using remote procedure call and the non-network devices are monitored by users sending the devices allocated to him/her daily or weekly and the system compares the sent details with the stored details. When a new device is procured, the system administrator logs the details into the system which serve as the input to the system. Then those assets are assigned to different employee using a unique identification number for employee and unique identification number. The new system is designed to stay informed about the state of servers, applications, workstations and to generate service level with

performance reports to help analyze the operating status of the information system.

Methodology Adopted

The approach used here is Structured Systems Analysis and Design Method, SSADM. This is a system approach to the analysis and design of information systems. The incremental approach is also put into use in the course of developing the program module. The incremental model is the one that works best for this project since it enables the division of requirements into different builds. Each build consists of several development cycles, each of which is broken down into a smaller, more manageable module. Each module in this paradigm goes through the processes of requirements, design, implementation, and testing. With this strategy, the initial module creates the working software, and each succeeding module release updates the working program with additional features (H, Maulana, 2021).

Choice of Programming Language

The Development of Centralized Information Technology Infrastructure Monitoring System is developed using HTML, CSS, JavaScripts where the code is done and various data input forms, windows, tags and menu object were created. The following technologies were used to implement the system's backend design: The system was developed using the MySQLi relational database, PHP (Scripting programming Language), apache local host and Xampp.

System Analysis

System analysis is the process of determining user expectations for a software application. The components that comprises up this system are the network, host server, people and computer devices and procedures.

System Requirements

i. Minimum version of Windows, Linux and MAC operating systems
ii. A processor with minimum processing speed of 1 gigahertz (GHz)
iii. 500 Mb RAM or above and 128 Gb hard disk capacity.
iv. Visual display 700 x 400 and Keyboard and mouse for input

Database Design

MySQL is chosen for this project work because of its many underlined advantages over other – easy compatibility with PHP, support multi transaction, which is used to develop this project and because it is fully relational database management system.

System Design

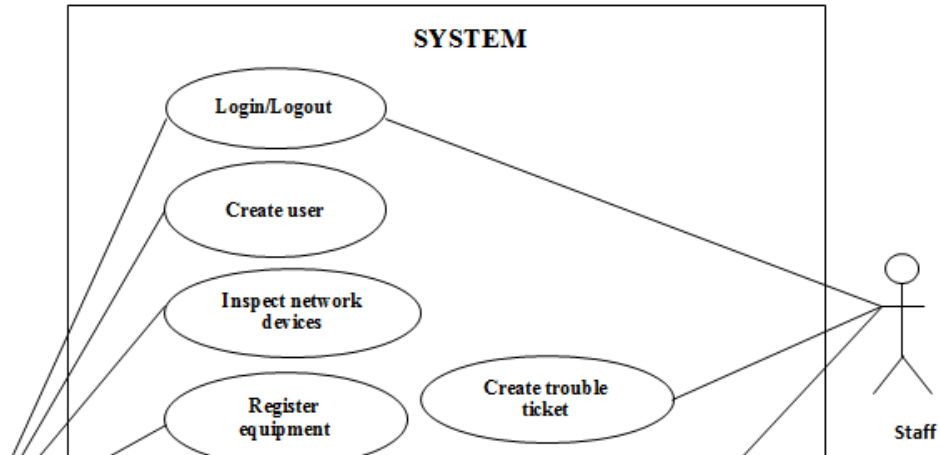


Fig 1: System Use Case Diagram

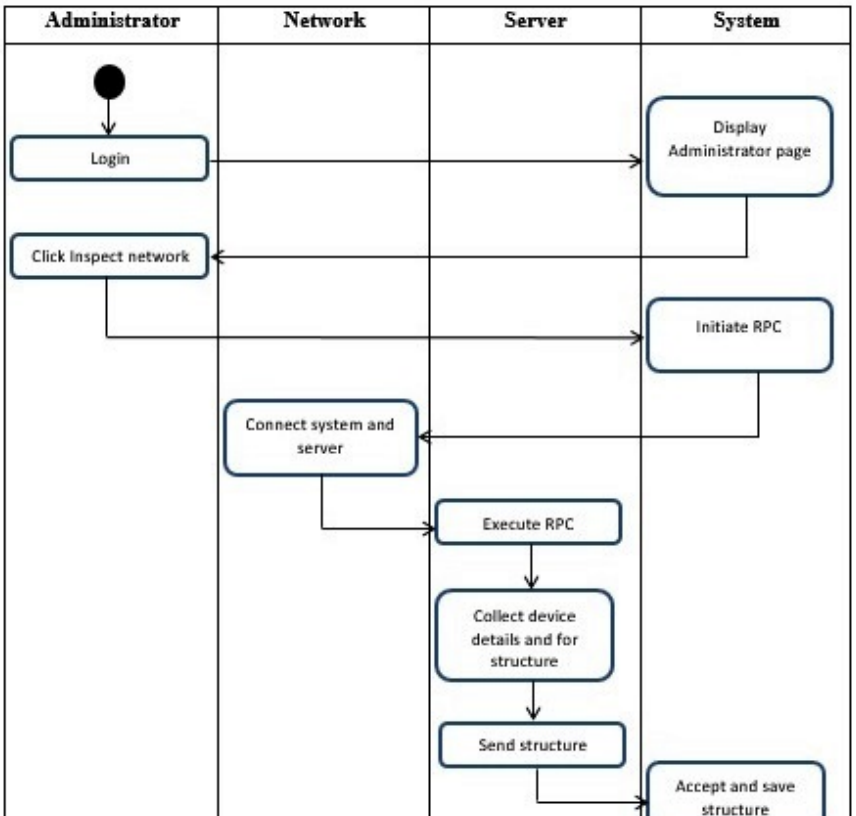


Fig 2: Inspect Network Devices Activity Diagram

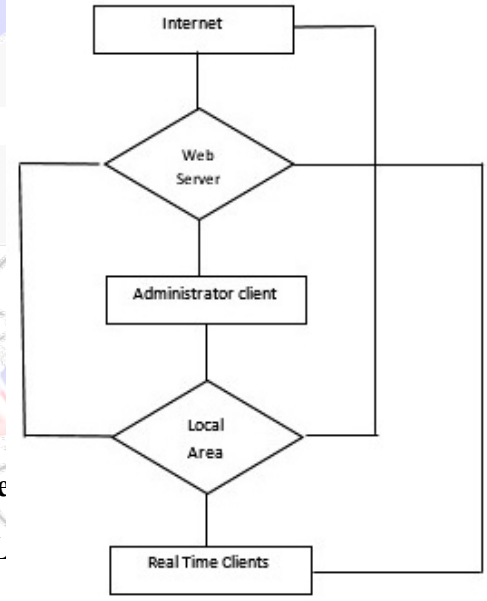


Fig 3: Administrator Archite

4.0 DISCUSSION OF ANAL

System Implementation and Testing

Implementation and testing as the next stage after design is one of the most important stages in this project. The software program code is developed using a text editor (notepad ++) using incremental model of system development where the application was developed in increments. The execution of code and testing is done in Xampp platform using the Apache as local host server and a browser (Mozilla Firefox) as web browser. The testing techniques used were unit testing for testing different code segments and integration testing for testing components interaction.

System Interface

The purpose of the user interface is to provide users with a comfortable and convenient means of accessing and using the application. In this project work, the menu - driven interface was used. Command buttons were also used in the application which the user can click for appropriate action to take place. Also, internal consistency was maintained in the application to help user learn the system easily. However, in some cases two or more different kinds of interface may be combined.

System Screen Shot

Following the successful development of the software application, the system was executed and tested with sample data.

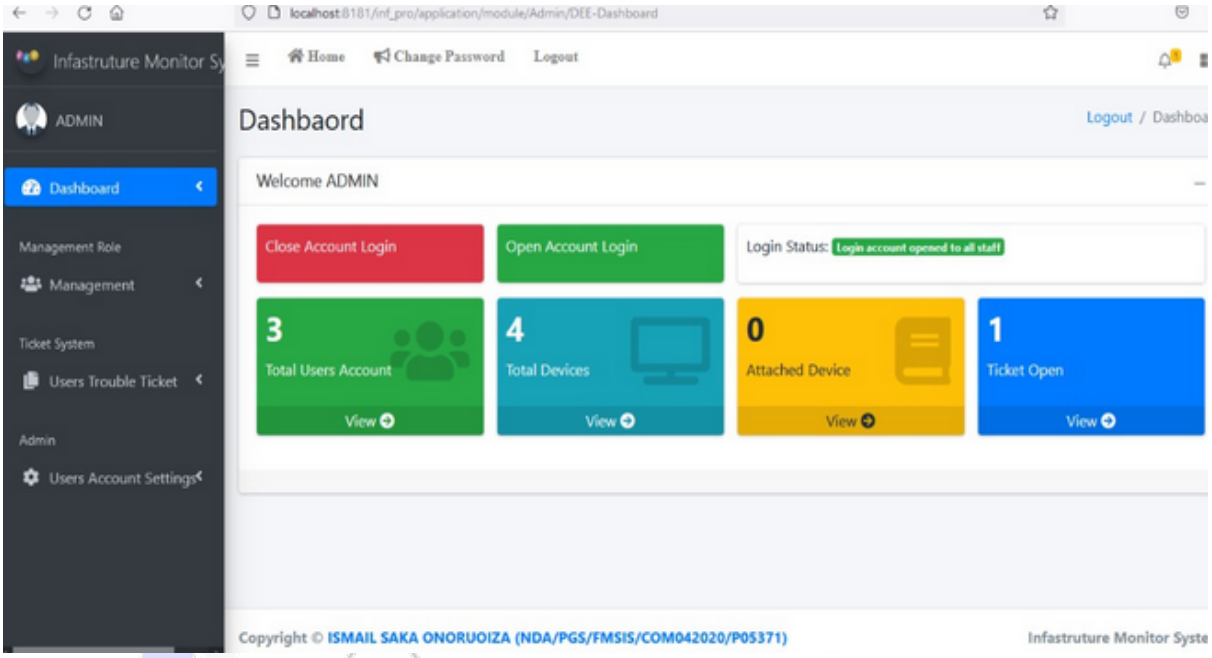


Fig 4: Index Page

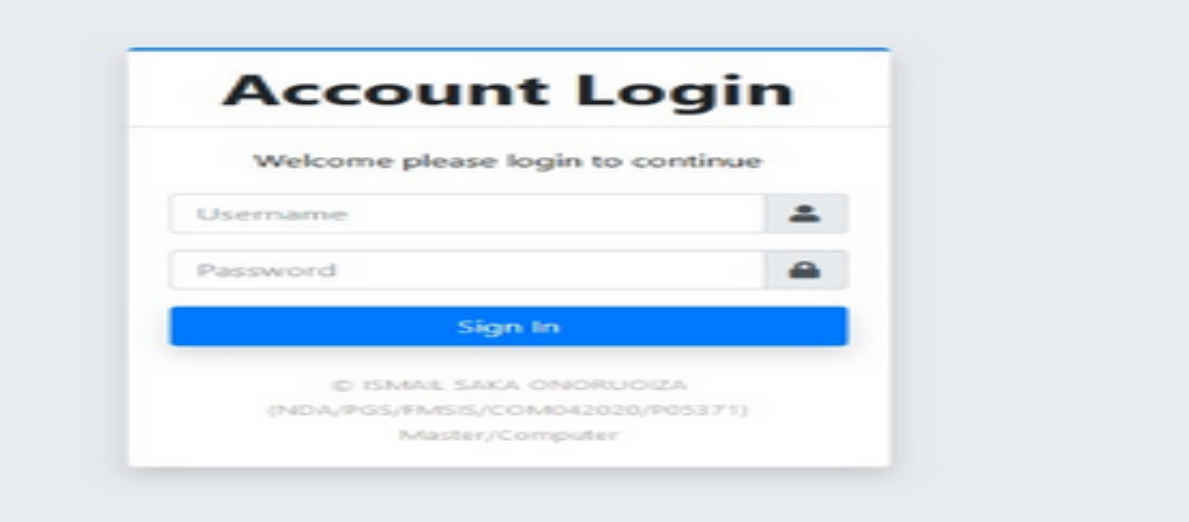


Fig 5: Login Page

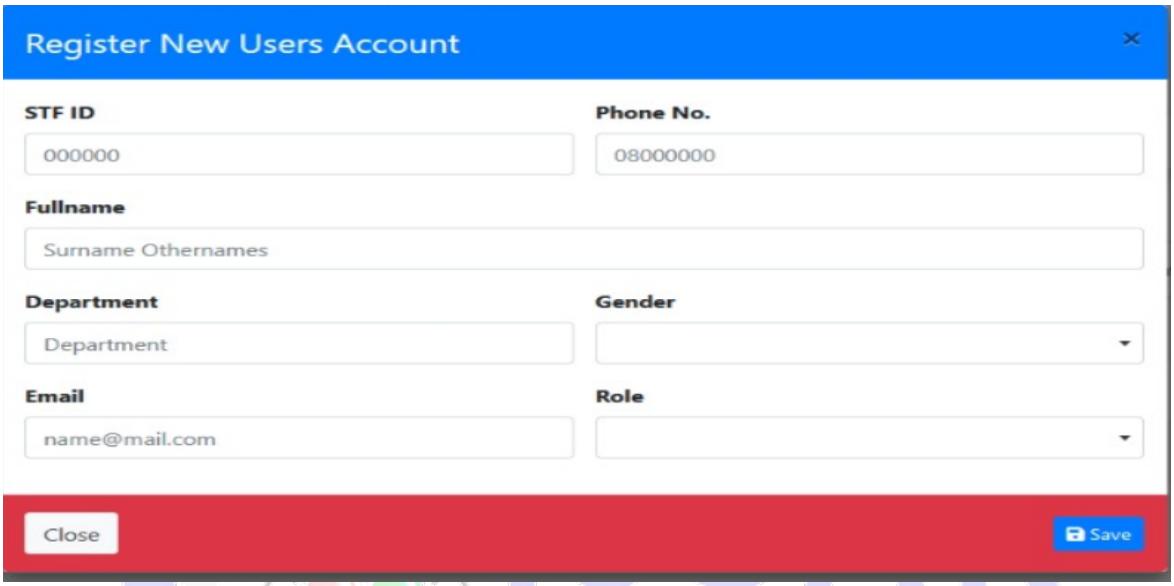


Fig 6: Registration Home Page

Fig 7: Register Standard Alone Page

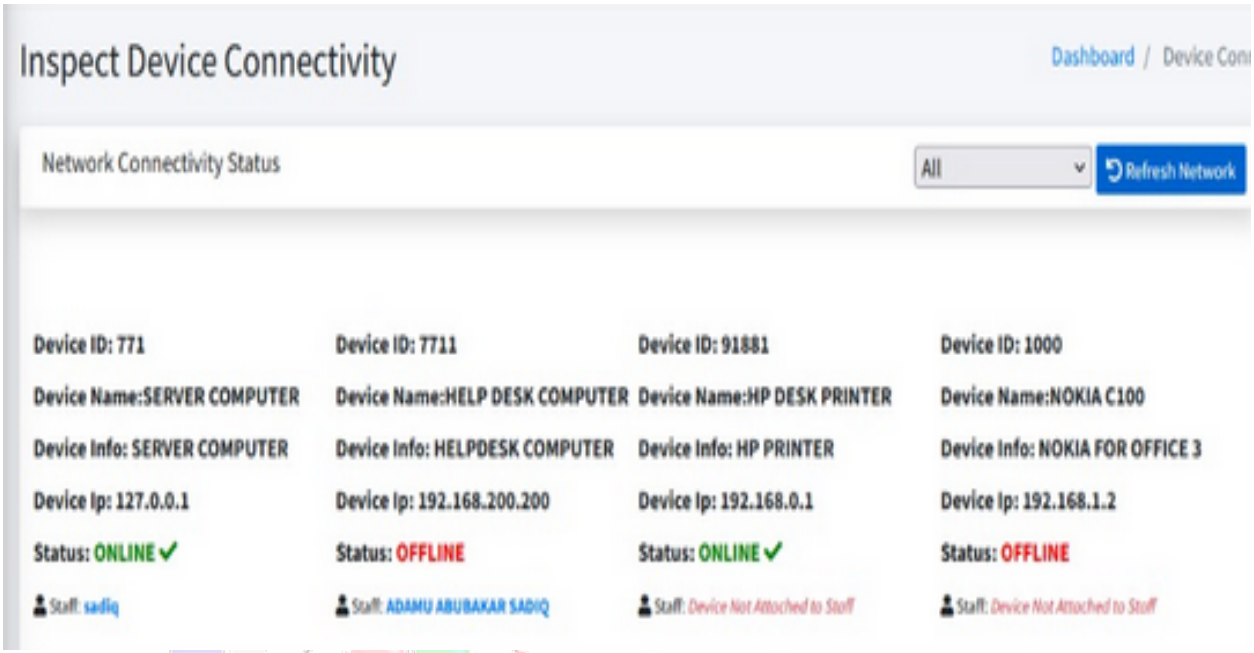


Fig 8: Inspect Network Page

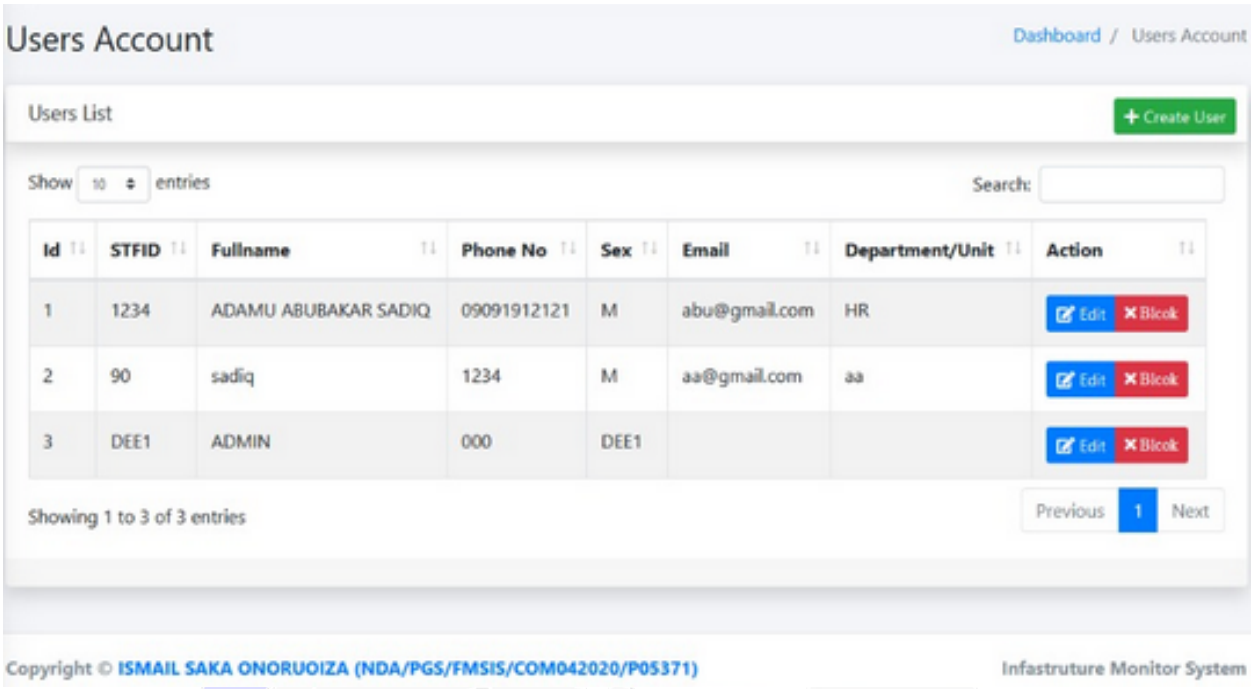
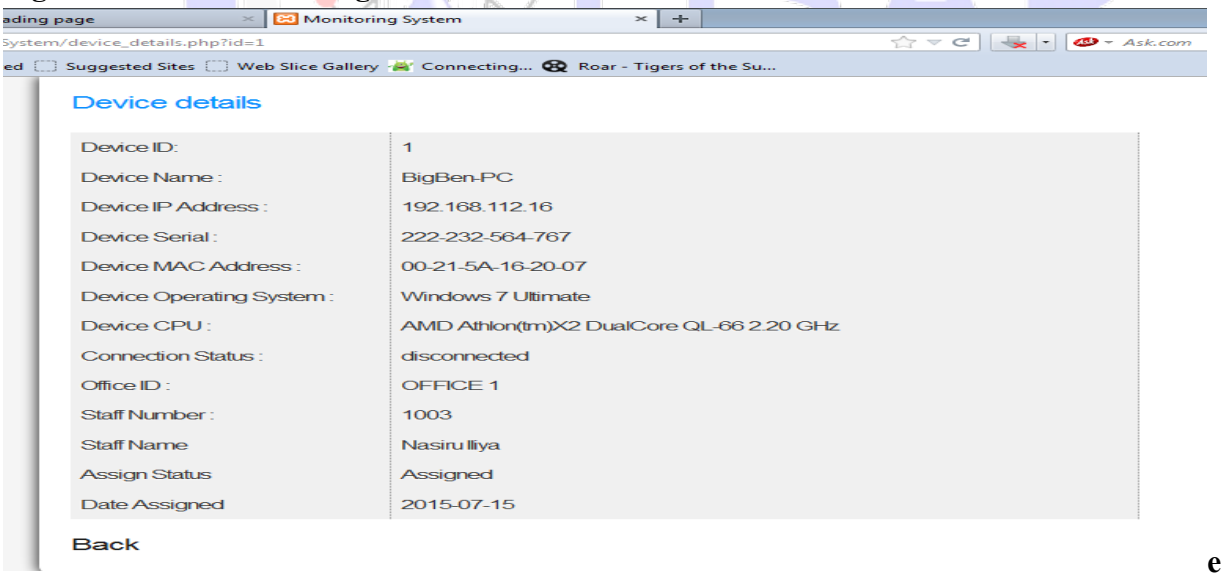


Fig 9: Users Account Page

Fig 10: Trouble Ticket Pag



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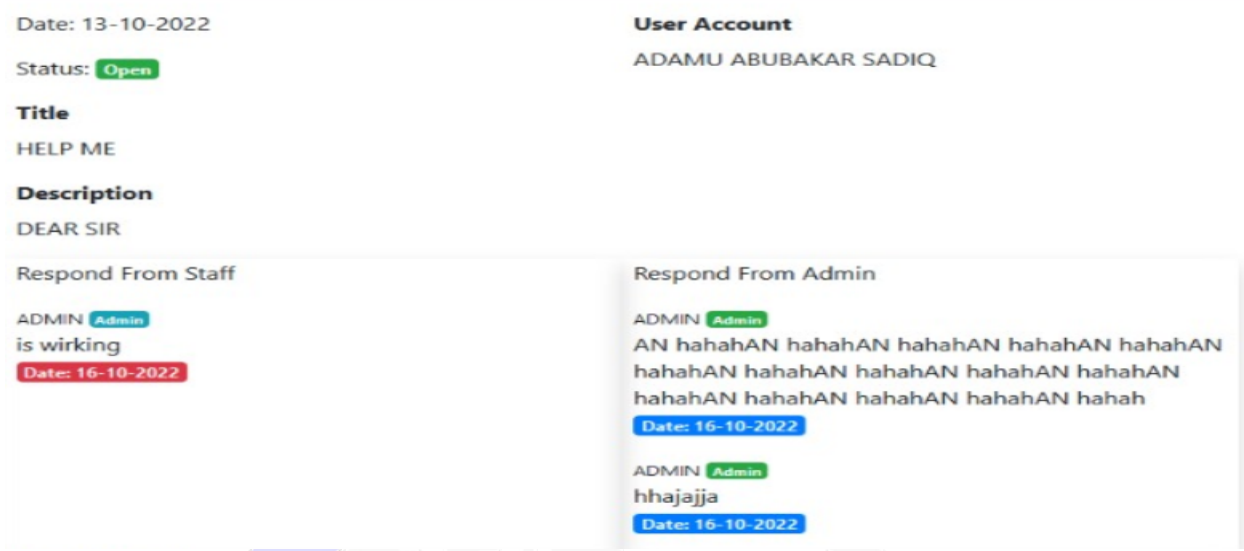

Fig 11: Staff Page

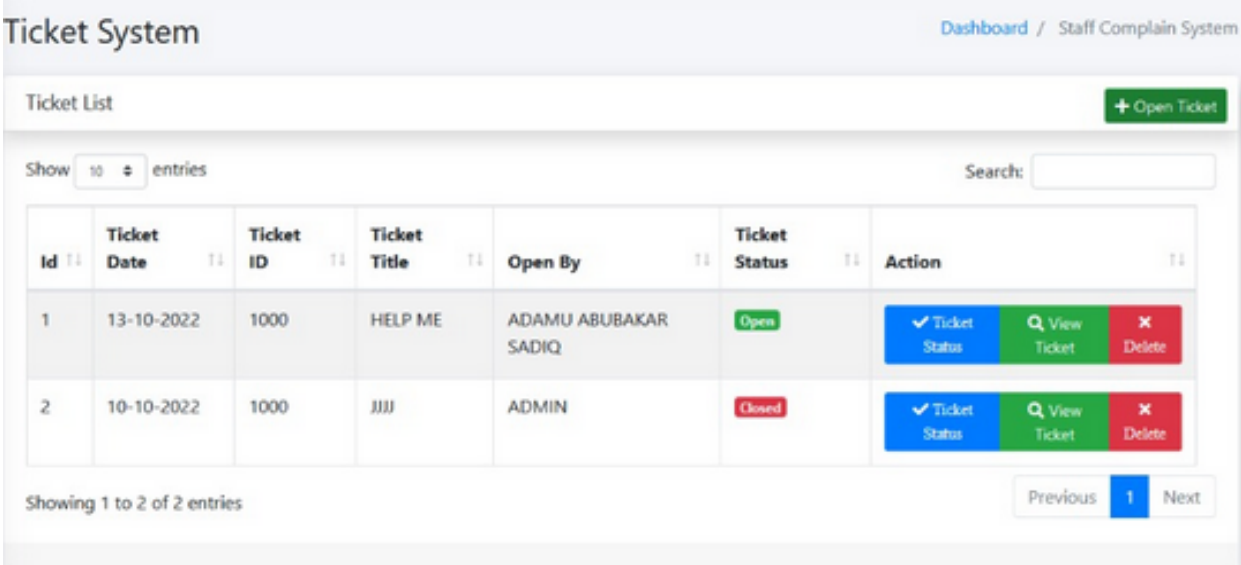

Fig 12: Report Device Page

Web Application Hosting

Web Hosting is the service providing space on the Internet for websites and web application by publishing (or uploading) it with a web hosting service and allowing people to have access via the World Wide Web. Web hosts are companies that provide space on a server owned or leased for use by clients, as well as providing Internet connectivity, typically in a data center. Single page hosting is generally sufficient for personal web pages. A complex site calls for a more comprehensive package that provides database support and application development platforms (e.g. PHP, Java, Ruby on Rails, ColdFusion, or ASP.NET). These facilities allow customers to write or install scripts for applications like forums and content management. Also, Transport layer Security (TLS) and Secure Sockets Layer (SSL) is typically used for e-commerce and other intranet application like the IT-Infrastructure Monitoring System developed.

System Maintenance

The model developed for this project work can further be extended to enhance its capability and to accept further changes such as redesign considerations that are within the scope of the functions of the application and users requirement. However, for now, the maintenance of this application is minimal. For the extension, one will need to install PHP integrated development environment (IDE), MySQL database and Apache local host server or can install Xampp to include all these together for application redevelopment and then finally host it.

System Documentation

This is one of the important aspects of software development. It comprises of the details required to define the proposed system to the level where it can be designed, implemented/ programmed and tested. The system design and other specifications covered up to this chapter is what make the documentation for this system.

5.0 CONCLUSION AND RECOMMENDATIONS

In this project work, the development of a Centralized Information Technology Infrastructure Monitoring System was aimed at improving the overall IT administration's operational efficiency of each department and performance as well as cutting down the overhead expenses of managing technical infrastructure. The system will efficiently replace the traditional excel process which has long been adopted by not only the departmental system administrators but by many IT Managers of the world. Without good infrastructure monitoring system for clear visibility into all networks and non-network asset, the organization will waste time and resources managing inventory, buying unnecessary equipment and software. But with a functioning system the organization's expenses will be reduced and the staff strength and weakness will be made known.

It is recommended that every School or organizations should consider implementing and using the project to support and monitor their technical environment. Students use offices and computer laboratories that are equipped with a lot of IT infrastructure which exposes these devices to stealing, overusing and spoiling. The availability of LAN network present warrants the implementation of the project. The project may be extended to include intelligent system such as network –based intelligent troubleshooter to explore

solution and sometimes solve problems of most computing devices.

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