ESTABLISHING A SMART ERROR DETECTION MECHANISM FOR FIBER CABLE NETWORK

(A Case Study of Gamtel)

FINAL PROJECT

Compiled to Fulfill the Requirements for Obtaining a BSc Information Technology Program at the University of Muhammadiyah Yogyakarta

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January 202

DECLARATION

I, Sait Ceesay hereby declare that I have written and researched the paper entitled ***Establishing A Smart Error Detection Mechanism For Fiber Cable Network.*** I confirm that all sources used in this research have been properly cited and acknowledged. I understand the importance of academic integrity in the research community and declare that the information provided in this paper is accurate to the best of my knowledge. By signing this declaration, I acknowledge my responsibility for the content of this paper and affirm that I am the sole author of this work.

Name: Sait Ceesay

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Signature:

Date: 19th January 2024

APPRECIATION

Alhamdoulillahi Rabil Aalamin (Grateful to Allah) for the existence and vigor provided, enabling me to delve into this intellectual project. Heartfelt gratitude to the Information Technology Department's management of University of Muhammadiyah Yogyakarta for their invaluable support throughout my academic journey. with special appreciation for ***Dr. Ir. Dwijoko Purbohadi, M.T. and Aprilia Kurnianti, ST. M. Eng***. Their exceptional care and support throughout my academic journey have been truly valuable. I would like to acknowledge my project ***supervisors Mr. Asroni, Ir., S.T., M.Eng & Mr. Cahya Damarjati, S.T. M. Eng., Ph.D*** for guiding and supporting me throughout the research project.

I would also acknowledge ***Mr. Dodou Joof*** and the entire ***GAMTEL/GAMCEL Engineers*** for their wonderful support throughout the research work.

DEDICATION

To my late sister Maimuna Sowe, I miss you more than words can express. You were not just my sister, but my best friend, my confidant, and my source of inspiration. Losing you has left a void in my heart that can never be filled. But even though you're no longer with us, I will never forget the memories we shared together. From our childhood adventures to our adult conversations, you were always there for me, and I am so grateful for the time we had together. You were a kind and loving soul who touched the hearts of everyone who knew you. Your smile could light up a room, and your infectious laughter was music to my ears. You had a heart of gold, and you always put others before yourself. I will always cherish the moments we shared, and I promise to keep your memory alive. You may no longer be with us, but you will forever hold a special place in my heart. I love you more than words can express, and I will always miss you.

Rest in peace, my dear sister. May Allah (SWT) grant you Jannah Firdaws, and may your soul be at peace.

With love and eternal devotion,

Your Brother, Sait Ceesay

Amen.

ABSTRACT

The use of fiber Optic cable has enabled telecommunication links to be made over longer distances and with much lower levels of loss compared to other transmission media. As a result of the frequent interruptions on the GAMTEL fiber network and the delays encountered in locating and restoring a fault, in essence, the analysis of the research was to find a resolution.

At the core of the project lie goals to create, build, and implement a smart error-detecting tool in an Fiber Network. This tool is intended to rectify delays in fault identification and probe the frequency of faults on the fiber. We used a modular design to organize a set of distinct components connected together to build the smart fault detection tool. The hardware components to be used as illustrated in the design are: Arduino microcontroller, GSM, GPS and Optical power meter. The system will monitor the received power of the fiber cable and compare it to a base power corresponding voltage of 3.1V. If the voltage is lower than 3.1V, the system will automatically detect the point on the network where the signal drops using a GPS module and trigger an SMS message using the GSM module containing the fault location and time to the field engineers. The proposed fault detection tool design can be integrated with the iManager U2000, which isthe current network management system used by GAMTEL for more efficiency and accuracy in the fault detection process after implementation.

Table of Contents

LIST OF ABBREVIATIONS

GAMTEL: Gambia Telecommunications Company Limited

ECOWAN: ECOWAS Wide Area Network

GBA: Greater Banjul Area

TDM: Time-division multiplexing

SMS: Short Message Service

LDR: Light Dependent Resistor

IP: Internet Protocol

ODF: Optical Distribution Frame

TIA: Time Interval Analyzer

SNSPD: Superconducting Nanowire Single Photon Detector

IoT: Internet of Things

SNR: signal to noise ratio

OSN: Optical Service Network

NMS: Network Management System

LIST OF FIGURES