**DEVELOPMENT OF GOCASHLESS: A CASHLESS PAYMENT SYSTEM FOR ZAMBIAN BUSES**

**BY**

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**DECLARATION**

I, LUPANDU MASUMBA do hereby declare that this report is my own original work and has not been submitted to any other college, institution or university other than the University of Zambia.

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**APPROVAL**

This report, by LUPANDU MASUMBA has been approved as partial fulfilment of the requirements for the award of Bachelor of Computer Science Degree by the University of Zambia.

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**ABSTRACT**

Public transportation in Zambia still relies predominantly on cash transactions, resulting in operational inefficiencies, revenue leakages, and security risks for passengers, conductors, and bus companies. The *GoCashless* system aims to address these challenges by introducing a secure, scalable, and user-friendly cashless payment platform tailored for Zambia’s public transport sector. Built on a microservices architecture using Spring Boot, the system supports seamless fare payments and efficient transaction management. It consists of two React Native mobile applications one for passengers to scan QR codes and make payments, and another for conductors to generate fares and receive confirmations as well as a Next.js web dashboard that enables bus companies to manage conductors and monitor transaction data. Core components include user management, route and fare handling, QR code generation, payment processing, transaction history, and real-time notifications. By leveraging RESTful APIs, secure data encryption, and token-based authentication, GoCashless ensures reliable and efficient payment workflows. The resulting system improves fare collection, enhances accountability, supports better revenue tracking, and contributes to the modernization of Zambia’s public transportation infrastructure through a fully digital ecosystem.

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**1. INTRODUCTION**

1.1 Background and Motivation

The transportation sector in Zambia, particularly public transportation, heavily relies on cash-based transactions. This traditional payment method presents several challenges, including the risk of cash handling, revenue leakages for bus operators, and inconvenience for passengers who may not always have the exact change. The need for a modernized, cashless payment system is evident to enhance efficiency, transparency, and user experience. The Gocashless project aims to address these challenges by introducing a digital payment solution for public transportation in Zambia.

1.2 Problem Statement

The core problem is the inefficiency and lack of security in the current cash-based fare collection system in Zambia's public transport. This leads to revenue losses for bus companies, security risks for conductors, and a suboptimal experience for passengers. A digital payment system can mitigate these issues, but its implementation requires careful consideration of the local context, such as the prevalence of mobile money and the specific needs of the stakeholders (passengers, conductors, and bus companies).

1.3 Aim and Objectives

The aim of the Gocashless project is to design, develop, and implement a secure and user-friendly cashless payment system for public transportation in Zambia using QR code technology and mobile money.

The objectives of the project are:

* To develop a microservices-based backend to manage users, routes, fares, and payments.
* To create a web-based dashboard for admins to manage their fares, routes, and conductors.
* To build a mobile application for conductors to generate QR codes for fare payment.
* To design a mobile application for passengers to scan QR codes and make payments using their mobile money accounts.
* To integrate the system with a mobile money provider (Airtel Money) to process transactions.

1.4 Significance of the Project

The Gocashless system offers significant benefits to all stakeholders. For bus companies, it provides better revenue tracking and reduces leakages. For conductors, it enhances safety by minimizing the amount of cash they handle. For passengers, it offers a convenient and secure payment method. The project also contributes to the broader goal of financial inclusion and digitalization in Zambia.

1.5 Scope and Limitations

The scope of this project encompasses the design and development of the backend microservices, the web-based administrative dashboard, and the mobile applications for both conductors and passengers. The system will provide essential functionalities such as user registration and authentication, route and fare management, QR code generation, and the handling of payment transactions. Since access to a real mobile money payment API is not available, the payment component will be implemented as a simulated service to demonstrate the payment workflow and its integration within the system. This simulation will mimic the behavior of a real payment service to validate the system’s functionality and interactions. The project is limited to a controlled environment for demonstration and testing purposes and does not include a live deployment or integration with actual bus companies. As such, while the system architecture and core features are designed to support real-world deployment in Zambia’s public transportation sector, full-scale implementation and testing in a production environment remain beyond the scope of this project.

1.6 Report Organization

This report is organized into seven chapters. Chapter 1 introduces the project. Chapter 2 reviews related literature. Chapter 3 discusses system analysis and design. Chapter 4 details the implementation. Chapter 5 covers testing and evaluation. Chapter 6 provides the conclusion and recommendations, and Chapter 7 lists the references.