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Dr. M. S. Sheshgiri Campus, Belagavi

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Embedded Linux Report

on

ATM Machine Simulation

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Semester: VII, 2023-2024

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2023-2024

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ACKNOWLEDGMENT

We would like to express my sincere gratitude to Prof . Anita Sirur maam, our esteemed project guide, for their invaluable support and guidance throughout the duration of this project. Their expertise, dedication, and insightful feedback played a pivotal role in shaping the project's direction and achieving its objectives. Sir provided unwavering support, offering constructive criticism and valuable suggestions that significantly enhanced the quality of our work. Their mentorship not only facilitated a deeper understanding of the subject matter but also inspired us to strive for excellence. We extend our heartfelt thanks to for their patience, encouragement, and commitment to our academic and professional growth. Their mentorship has been instrumental in our successful completion of this project, and we are truly grateful for the opportunity to learn under their guidance.

-The project team

ABSTRACT

The ATM Machine Simulation Project is designed to provide an interactive and educational representation of the core functions of an Automated Teller Machine (ATM) using embedded Linux. The objective of this project is to simulate the experience of a real-world ATM system, enabling users to interact with a simulated environment that replicates key features such as balance checking, money withdrawal, and fund transfers. This simulation focuses on the integration of hardware components (keypads, displays, card readers) with software on an embedded Linux platform, thus creating a self-contained ATM system that operates efficiently in an embedded environment.

In addition to replicating basic ATM operations, the project emphasizes the importance of security measures, such as PIN authentication and transaction validation, which are fundamental aspects of real ATM systems. The project allows for understanding the different layers of system interaction, from user input via the keypad to transaction execution based on secure database management.

The embedded Linux platform is chosen for this simulation due to its lightweight, stable, and versatile nature, which is ideal for real-time systems like ATMs. Linux provides the necessary tools and flexibility to develop, deploy, and maintain embedded applications with features like multi-threading and efficient resource management, which are critical in simulating high-availability financial services.

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Chapter 1

Introduction

Automated Teller Machines (ATMs) have revolutionized the banking industry by providing 24/7 access to financial services such as cash withdrawals, balance inquiries, and fund transfers. These machines combine hardware (card readers, keypads, and screens) with sophisticated software to provide a seamless user experience.

This project explores the implementation of an ATM simulation system on an embedded Linux platform. The goal is to design a cost-effective, scalable, and flexible system that mimics real ATM functionalities. By using embedded Linux, the project leverages its open-source nature, stability, and versatility in handling real-time tasks required by the ATM system.

The simulation aims to provide hands-on experience in interfacing hardware components with Linux, developing secure transaction mechanisms, and managing user inputs. The project will also address aspects such as user authentication through PINs, transaction history, and database management, offering a complete overview of how ATM systems operate at a basic level.

Chapter 2

Need of our project in real time

The ATM Machine Simulation Project is highly relevant in today's world, as ATMs are essential components of modern banking infrastructure. The project addresses several key aspects that are critical in both educational and real-time applications, especially in the context of embedded systems, security, and banking technology. Here are the main reasons why this project is needed in real-time:

- **Security and Authentication in Financial Transactions**: ATMs handle sensitive financial data and transactions, making security a top priority. The ATM simulation project focuses on user authentication mechanisms, such as PIN verification, which is crucial for preventing unauthorized access to banking services. In real-world applications, ensuring robust security protocols like encryption and multi-factor authentication is essential. By simulating these functions, the project highlights the importance of secure communication and transaction validation in the banking system, contributing to better understanding of how security can be implemented in embedded systems.
- **Educational Purpose and Skill Development**: Embedded systems and Linux-based programming are rapidly growing fields with applications in various industries, including banking, healthcare, automotive, and consumer electronics. This project offers students, developers, and engineers a practical, hands-on experience in working with embedded Linux systems. Real-time simulation of ATM functionalities provides valuable learning about the integration of hardware (keypads, card readers, screens) and software (transaction processing, database management), enhancing both theoretical and practical knowledge. It can serve as an ideal learning platform for understanding the fundamentals of real-time systems, security mechanisms, and system integration.

- **Banking System Optimization:** ATM systems are heavily relied upon by banks and financial institutions for day-to-day operations. Real-time data processing and transaction handling are core features of such systems. By simulating ATM transactions, the project helps in understanding the optimization of these processes in embedded systems. It addresses how data flows through systems, how user inputs are processed efficiently, and how financial information is securely handled and transmitted. This knowledge is essential for improving the performance, scalability, and reliability of real-world ATM systems, especially as banks evolve to provide more integrated digital financial services.
- **Testing and Prototyping of ATM Systems**: With the growing demand for financial automation, banks continuously innovate and deploy new ATM functionalities such as contactless transactions, multi-currency handling, and even biometric authentication. The ATM simulation project provides a low-cost platform to test and prototype these advanced features before deployment in real systems. This can help financial institutions prototype new systems in a secure and controlled environment, reducing the risk of errors or vulnerabilities when new systems are rolled out to the public.

2.1 Features

- **User Authentication**: Users must authenticate with a unique ID and password.
- **Initial Balance Setup**: Upon successful login, users are prompted to set up an initial balance.
- **Deposit Functionality**: Users can deposit money into their account.
- **Cash Withdrawal**: Users can withdraw money from their account.
- Interactive Command-Line Interface
- **A simple and interactive command-line interface provides the user with a menu of options**:
- withdrawal

1. Deposit
2. Balance inquiry
3. Transfer to another account or external bank
4. Exit

2.2 Functional block diagram

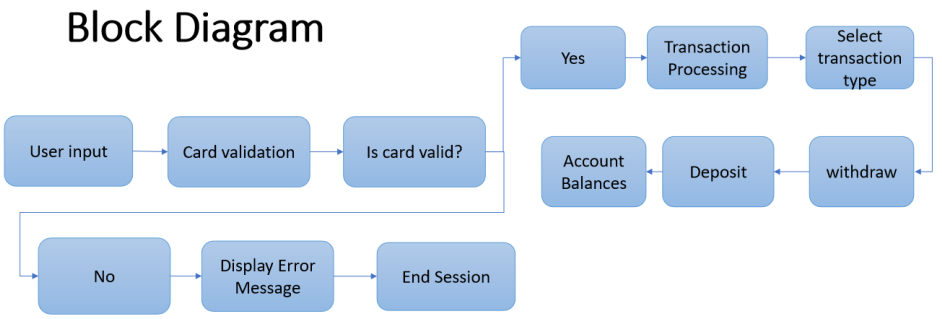

Figure 2.1: Functional Block Diagram

2.3 Results

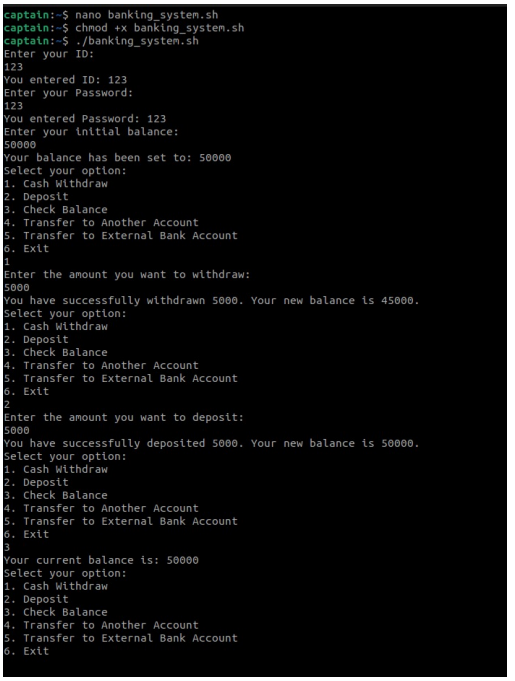

Figure 2.2: Results

2.4 Conclusion

In conclusion, The ATM Machine Simulation Project in Embedded Linux successfully demonstrates the application of embedded systems in simulating real-world financial transactions. By utilizing the Embedded Linux environment, the project ensures secure user authentication, transaction management, and system performance under constrained resources. It features secure PIN-based login, real-time transaction processing for balance checking, cash withdrawals, and deposits, while ensuring system stability and responsiveness. The use of Embedded Linux provided flexibility and optimization capabilities, allowing for seamless integration with hardware components such as keypads and displays. Moreover, the project emphasizes efficient memory management and fault handling, such as preventing invalid PIN attempts and insufficient funds for withdrawals. This simulation serves as a solid foundation for real-world ATM systems, showcasing how embedded Linux can be leveraged for secure, user-friendly, and efficient financial applications, while offering room for scalability and future improvements.