

# Automatic Teller Machine

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## Introduction

The aims of this project were to develop an automated banking system using software tools such as Qt Creator for the frontend application, Node.js with Express for backend API and MySQL as the database (Figure 1), together with improving technical, analytical and communication skills required to implement such an application.

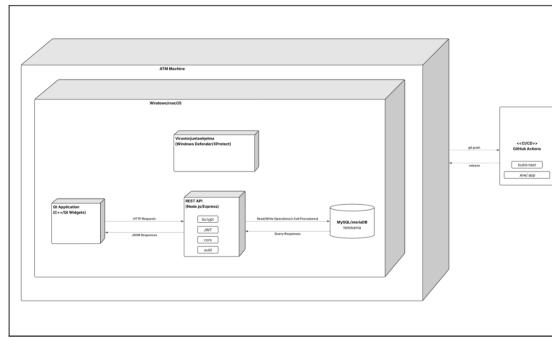


FIGURE 1. System Architecture

## Objectives

The objectives of this project were to provide card-based authentication with a JWT Token for secure communication, automatic card blocking after three incorrect attempts, balance inquiry, fund transfers, cash withdrawals, an inactivity timer, support for dual cards and transaction history tracking. In addition, the application includes extended features such as cash deposit, currency exchange rate checking, digital receipt generation, GitHub Actions-based CI/CD integration, support for both macOS and Windows platforms and user profile information display.

## Methods

The project used a REST API (Representational State Transfer Application Programming Interface).

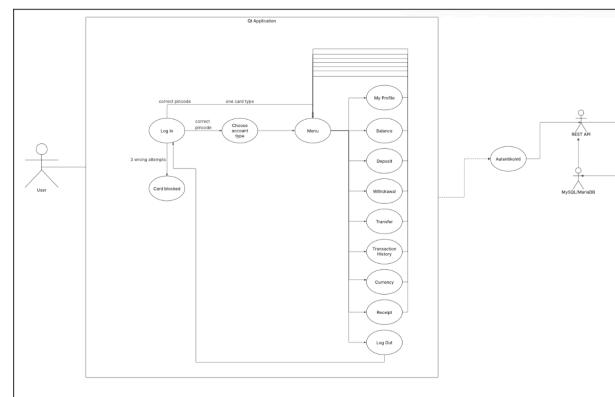


FIGURE 2. ATM System

It was developed with using Node.js with Express and JavaScript, in addition with MySQL and MariaDB database systems. The user interface was developed using Qt Creator and C++. Version control was managed using Git and GitHub. Project documentation consisted of a project document, technical specifications and a README.md file. (See Figure 2).

## Results

The application was developed according to the original plan. First, the database was designed and all possible client scenarios were considered. The backend was then implemented and tested using Postman so that it was ready for further development. Once basic functionalities were completed, additional features were planned and implemented.

Throughout the development process, various challenges were faced, such as making sure the app worked correctly and looked consistent on different platforms with different databases. In conclusion, a fully functional application was successfully developed. (Figure 3).

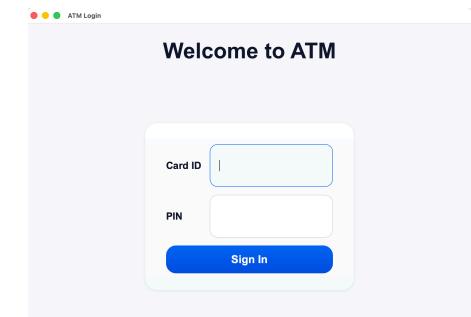


FIGURE 3. Main Screen of Application

## Conclusions

The project provided an opportunity to learn the entire application development process and gain valuable practical experience. During this process, important skills such as teamwork in a multicultural environment, planning and problem-solving were developed and strengthened.

## References

- Course Guide URL: <https://ohjelmistokehityksen-sovellusprojekti-monimuoto.oulu.net/>
- Qt Creator IDE Documentation URL: <https://doc.qt.io/>
- MySQL Documentation URL: <https://dev.mysql.com/doc/>
- MariaDB Documentation URL: <https://mariadb.com/docs>
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