NFC and QR Code Supported Laboratory Access System

1. Introduction

Project Name: NFC and QR Code Supported Laboratory Access System

Purpose: The purpose of our project is to facilitate and secure access to university laboratories. Students will be able to request access to laboratories via a mobile application. After receiving administrator approval, students will be able to unlock the doors using NFC or QR code technology.

2. Problem Definition

Current laboratory access processes are generally manual, which causes time loss and poses security risks. The aim of the project is to digitize this process and create a more secure and efficient access system. Communication between students and administrators will be provided through digital platforms, ensuring a faster and more organized process.

3. General Structure of the Project

Mobile Application (to be developed with Flutter): The application will allow students to request access to laboratories. Users will be able to view laboratory occupancy and select appropriate times to make a reservation. The unlocking of doors using NFC or QR code will also be managed through the mobile application.

Server (to be developed with Node.js): The server side will process requests from the mobile application and communicate with the database. Student reservation processes and administrator approval/rejection processes will be managed through the server.

Database (MySQL): User information, laboratory details, reservations, and door access information will be stored in a MySQL database.

4. Technical Details

Mobile Application (To be Developed with Flutter)

The application will read NFC Tag or QR code information from users and send it to the server. The UI/UX design will be simple and user-friendly. Photos of each building will be listed on the reservation page, and laboratories and occupancy information will be shown based on the selected building. The user login system will include functions such as students making reservations and administrators approving requests.

Server Side (Node.js)

The server will be developed with Node.js. Data will cover users, laboratories, and reservations.
API Structure: Requests sent to the server will be processed using a RESTful API.
Real-Time Occupancy Control: The occupancy status of each laboratory will be tracked in real-time, and updates will be sent to the mobile application instantly.

5. Workflow

1. User Login: Students log into the system via the application to request access to laboratories.
2. Making a Reservation: Users view the occupancy status of the laboratory and request a reservation at suitable times.
3. Administrator Approval: The administrator approves or rejects incoming requests. A notification is sent to the student when the reservation is approved.
4. Access with NFC/QR Code: When the student arrives at the laboratory door, they unlock the door using the NFC reader or QR code reader.
5. Locking System and Security: The system checks if the door is locked using sensors, and the occupancy information is continuously updated.

6. User Interface (UI)

Student Login Page: Students will be able to see the occupancy status of the laboratory and the available reservation times.

Administrator Page: Administrators will be able to view laboratory occupancy and approve or reject reservation requests.

7. DevOps and System Optimization

To ensure the project operates stably and optimally, it will be containerized (Docker). Load balancing will be achieved by creating different clone servers. Performance improvements will be made on the server side, and scaling processes will be carried out to ensure efficient operation under high load.

8. Conclusion

The project aims to provide digital access to university laboratories, creating a secure and user-friendly system. Students will be able to access laboratories securely with administrator approval.

Future Improvements: To further develop the system, sensors will be optimized to provide more detailed data, and the user interface will be simplified.