Republic of the Philippines
DAVAO ORIENTAL STATE UNIVERSITY
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Faculty of Computing, Data Sciences, Engineering and Technology
Information Technology Program

ITC 130 – Applications Development in Emerging Technologies

PROJECT X: Automated Attendance Tracking System: High Level Design

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Overview

The High-Level Design (HLD) of the Automated Attendance Tracking System outlines the system's major components, architecture, and technologies used. It serves as a blueprint that guides the development process by detailing how various modules interact, ensuring the system is reliable, scalable, and secure.

System Architecture

The system follows a **client-server model** and is designed as a **web and mobile-based application**. It consists of the following layers:

- **Frontend (Client Side)**: Developed using React Native for mobile devices, providing a responsive interface for students, instructors, and admins.
- **Backend (Server Side)**: Built using Node.js and Express.js, responsible for handling logic, user requests, attendance processing, and security.
- **Database Layer**: Uses MongoDB (MongoDB Atlas) for storing all structured data such as user records, attendance logs, course details, and device information.
- **Cloud Hosting**: The system is hosted on a **cloud-based server** to ensure availability, scalability, and remote access.

Major Components

a. User Management

- Admins can register and manage students and instructors.
- Role-based access is implemented to define what each user can do.
- Multi-Factor Authentication (MFA) is included for added security.

b. Attendance Tracking Module

- Instructors log in via a registered device to scan QR codes generated by students.
- The system captures attendance data (Student ID, Course ID, Time, Date).
- Barcode/QR scanning is supported and only works on verified devices.

c. Course and Enrollment Management

- Admins register courses and assign instructors.
- Students are enrolled in courses, linking them to attendance logs.
- Instructors can view, manage, or postpone classes.

d. Device Management

- Each instructor can register one or more devices.
- Admins can track lost devices or unregister them if needed.
- Only authorized devices can perform attendance scans.

e. Report Generation

- Detailed reports can be generated based on course, date range, or student.
- Reports are downloadable by instructors and admins.

Security Design

Security is a key part of the HLD. The system integrates:

- **HTTPS encryption** for secure data transmission.
- **Multi-Factor Authentication (MFA)** to prevent unauthorized access.
- **Role-Based Access Control (RBAC)** to restrict functionalities based on user roles.
- **Device authorization** to ensure only trusted devices are used for attendance.

Technology Stack

Layer	**Technology Used**
Frontend	React Native (Mobile App)
Backend	Node.js with Express.js
Database	MongoDB Atlas (NoSQL DB)

Hosting	Cloud-based (e.g., Heroku or Vercel)
Authentication	JWT, MFA
QR/Barcode	ZXing or similar libraries

Data Flow Summary

1. **Login** → User logs in securely via MFA.
2. **QR Code** → Student generates QR on their device.
3. **Scan** → Instructor scans the QR using their registered device.
4. **Validation** → System verifies identity and course.
5. **Log** → Attendance is stored with timestamp and linked IDs.
6. **View/Report** → Instructors/Admins access and download reports.

Conclusion

This High-Level Design ensures that the Automated Attendance Tracking System is robust, user-friendly, and secure. It clearly separates concerns into modules, supports mobile and web usage, and uses modern security protocols. This structured architecture will serve as a strong foundation for building and scaling the system efficiently.