



Tuition Class and Student Management System

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Private educational institutions face significant challenges in managing multiple aspects of their operations, including student enrollment, attendance tracking, payment processing, cashier operations, and managing both online and physical classes. Traditional manual systems and fragmented software solutions often lead to inefficiencies, data inconsistencies, and poor accountability. This study presents the design, development, and implementation of a comprehensive web-based class management system utilizing microservices architecture to streamline administrative operations in private educational institutions. The system was developed using React.js for the frontend and PHP 8.0 with MySQL 8.0 for the backend, deployed using Docker containerization. The architecture comprises seven independent microservices: authentication, student management, teacher management, class management, payment processing, cashier operations, and attendance tracking. RESTful APIs enable inter-service communication, while JWT-based authentication ensures security. The system integrates third-party services including PayHere for online payments, a custom WhatsApp API service for notifications, and barcode scanning for attendance. The system successfully manages multi-role access (students, teachers, cashiers, and admins), payment tracking with real-time KPI monitoring, cashier session management, and WhatsApp notifications for payment confirmations. The cashier module successfully handled more than 50 payment transactions per session while maintaining accurate financial tracking and audit trails. The WhatsApp notification system achieved a 98% delivery success rate with an average delivery time of 3–5 seconds. The barcode-based attendance system reduced student check-in time from approximately 30 seconds to under 5 seconds per student. The system maintained 100% uptime during testing. The microservices architecture ensures scalability, maintainability, and fault isolation.

Keywords: Microservices architecture, Educational management system, Web application, Payment processing, Cashier management, Attendance automation