IS2901 - Software Development Project

Project Proposal

Department of Interdisciplinary Studies

Faculty of Information Technology

University of Moratuwa

2025

Group Name	Code_Crafters	
Project Name	TrackNGo (Transport Management system)	
Client's name and address	Creative Software Address: 413 R. A. De Mel Mawatha, Colombo	
Group Members	Index No	Name
	235091X	R.M.D.N.O. Rathnayaka
	235056V	P.M.A.L. Jayathissa
	235071L	O.P.N. Liyanage
	235019L	M.A.P. Bhagya
	235086L	L.M.C.J. Pitawala
Supervisors' names	1. Miss Nipuni Chandimali 2. Miss Gayathri Kaushalya	

1. Introduction

Due to antiquated manual systems, private bus companies and tour operators in Sri Lanka that oversee highway routes, long-distance services, and corporate transportation face substantial operational challenges. These operators cater to four different market segments: long-distance travelers, corporate entities needing employee transportation, tourists scheduling entire buses for excursions, and highway commuters. However, they do not have integrated digital infrastructure for effective management. Basic GPS applications currently on the market only provide basic tracking; they lack the fleet management, payment processing, and booking systems necessary for private bus operations.

The Smart Bus Tracking & Booking System offers a complete digital solution based on MySQL for database administration, Java Spring Boot for backend services, and React Native for mobile applications. This platform combines Google Maps API real-time GPS tracking, advanced booking systems that support full bus rentals and individual seat reservations, integration of the PayHere payment gateway, and dedicated corporate dashboards for managing contracts and attendance.

With live tracking, pre-booking, and safe payment options, the system enables long-distance and highway travelers. While corporate clients oversee long-term contracts with daily allocation monitoring, trip booking customers receive personalized quotes with agent negotiations. While administrators receive full operational oversight through analytics, complaint handling, and revenue reporting, drivers benefit from extensive booking management tools and earnings tracking. As a result, traditional private bus operations are transformed into cutting-edge, tech-driven companies that can compete in Sri Lanka's digital transportation market.

2. Problem in Brief

Due to outdated manual management systems, Sri Lankan private bus companies and tour operators that oversee corporate, long-distance, highway, and trip booking services experience significant operational inefficiencies. Uncertainty, crowding during rush hours, and missed revenue opportunities result from passengers' lack of dependable ways to track bus locations, confirm seat availability, or make reservations in advance. Without real-time arrival information, highway and long-distance drivers are unable to plan their trips efficiently, and corporate entities find it difficult to track daily employee transportation attendance and maximize fleet allocation. Customers who book trips encounter laborious negotiating procedures that involve numerous phone calls and manual quotations, which frequently leads to booking abandonment.

Manual booking management puts bus operators under administrative strain, makes it difficult to collect payments through cash-only transactions, and hinders passenger communication. Confusion and booking errors arise from drivers' lack of tools to handle various booking types, including corporate contracts, multi-day trips, and individual seat reservations. Due to the lack of centralized fleet operations visibility, company administrators are unable to resolve complaints, optimize routes, or make data-driven decisions.

Only basic GPS tracking is provided by Sri Lanka's current solutions; booking, payment processing, corporate contract management, and trip rental features are not integrated. The full operational lifecycle of private bus transportation is not addressed by this disjointed approach. Modernization is crucial because effective private transportation allows operators to maximize profits, cut expenses, and provide better customer experiences,all of which are necessary for long-term business sustainability,while also having a direct impact on urban mobility, economic productivity, and competitiveness against ride-sharing platforms.

3. Aim and Objective

3.1. Aim

The aim of this project is to develop a comprehensive Smart Bus Tracking & Booking System for private bus companies and tour operators managing highway, long-distance, corporate, and trip booking services, addressing operational inefficiencies through integrated mobile applications built with React Native, robust backend infrastructure using Java Spring Boot, real-time GPS tracking via Google Maps API, secure payment processing through PayHere gateway, and centralized administrative management powered by MySQL database.

3.2. Objectives

- To develop a secure authentication and user management system supporting passengers, drivers, corporate users, and administrators with social login integration (Google, Facebook), two-factor authentication, role-based access control, and multi-language support (English, Sinhala) across mobile and web platforms.

- To implement real-time GPS-based bus tracking with interactive map visualization, live location updates, traffic overlay integration, geofencing for highway and long-distance bus stops, accurate ETA calculations with countdown timers, and historical route dashboards for passenger journey planning.

- To create a comprehensive booking system enabling individual seat reservations for highway and long-distance passengers with visual seat layout selection, complete bus rentals for trip bookings with agent negotiation workflows, and long-term contract management for corporate clients featuring daily bus allocation calendars and employee attendance tracking capabilities.

- To establish real-time communication infrastructure featuring unified notification centers, push notification handling for foreground and background states, in-app chat functionality between passengers-drivers, passengers-admins, and corporate users-agents with typing indicators, read receipts, voice messages, image attachments, and emergency SOS functionality with automatic location sharing.

- To build a driver dashboard providing comprehensive booking management tools including seat/bus availability toggles, booked seat layout visualization, trip history with filtering options, earnings summaries with monthly graphs, and capabilities to manage diverse booking types across individual passengers, corporate contracts, and trip bookings.

- To develop a corporate booking dashboard enabling organizations to manage active contracts, view daily and monthly bus allocation calendars, track monthly billing and payment history, request route modifications, file complaints specific to corporate services, receive contract renewal reminders, and download invoices and payment receipts.

- To implement a feedback, rating, and complaint management system allowing passengers to rate drivers (1-5 stars), evaluate bus conditions and journey experiences, file complaints with photo uploads, track complaint status updates, and view admin responses through a systematic resolution workflow.

- To create an administrative web panel providing driver verification and approval systems, corporate account verification and management, fleet management capabilities (add/edit/delete buses), route management interfaces, complaint management dashboards, system configuration settings, analytics dashboards displaying user statistics and booking trends, and comprehensive revenue and commission reporting tools.

- To ensure system scalability, security, and reliability through robust Java Spring Boot backend architecture, optimized MySQL database design, secure PayHere payment integration, data encryption, real-time WebSocket communication, and seamless synchronization across mobile applications and administrative web platforms.

4. Proposed Solution

4.1. Solution Overview

In order to digitize private bus operations across four service categories—highway routes, long-distance services, corporate transportation contracts, and trip bookings—the Smart Bus Tracking & Booking System is a comprehensive mobile-first platform. Two React Native mobile applications (Passenger App and Driver App) and an administrative web dashboard constructed with React.js make up the solution. They are all connected by a Java Spring Boot backend API infrastructure that is backed by a MySQL database for safe transactions and persistent storage.

4.2. Technology Stack

Frontend Technologies

- React Native-For the android mobile app
- React.js-Web-based administrative dashboard
- JavaScript-primary programming language for frontend development

Backend Technologies

- Java Spring Boot-RESTful API development and business logic implementation
- WebSocket (socket.io)-real-time bidirectional communication protocol
- JWT (JSON Web Tokens for secure session management)
- Spring Security (authentication and authorization framework)

Database

- MySQL 8.0+ - Primary relational database management system
- MySQL Workbench-Database design and administration

Third-Party Integrations

- Google Maps API-Map visualization, routing, geocoding, and traffic data
- PayHere Payment Gateway-Secure payment processing for Sri Lankan market
- Firebase Cloud Messaging (FCM)-Push notification delivery
- Twilio API - SMS notification service
- Email Service - SMTP for transactional emails

Development Tools

- Git/GitHub - Version control and collaboration
- Postman - API testing and documentation
- Android Studio-Mobile app development environments
- IntelliJ IDEA-Java backend development
- Visual Studio Code-Frontend development

4.3 Major System Requirements

Functional Requirements:

Passenger Application:

- User authentication with social login
- Profile management with multi-language support
- Real-time bus tracking on interactive maps with traffic visualization
- Visual seat selection and booking for highway/long-distance routes
- Trip booking requests with estimated pricing
- Corporate user dashboards for contract management
- PayHere payment integration, QR code digital ticketing
- In-app chat with drivers and admins
- Emergency SOS with location sharing
- Journey reminders
- Booking history
- Complaint filing with photo uploads

Driver Application:

- Driver authentication with verification badges
- Comprehensive dashboard showing earnings (daily/monthly graphs)
- Trip history with filtering
- Booking management tools with seat/bus availability toggles
- Visual seat layout showing booked passengers
- Accept/reject booking requests
- In-app chat with passengers and agents
- Navigation assistance
- Profile management with license information.

Administrative Web Panel:

- Admin authentication
- Driver verification and approval workflows
- Corporate account verification
- Fleet management (add/edit/delete buses)
- Route management
- Complaint resolution dashboard
- System configuration
- Analytics displaying user statistics and booking trends
- Revenue and commission reports.

Non-Functional Requirements:

- API response time under 500ms
- Real-time location updates every 10 seconds
- End-to-end encryption for sensitive data
- Support for concurrency
- Graceful error handling.

4.4 Nature of Solution

Input: User credentials, GPS coordinates, booking requests, payment information, chat messages, complaint descriptions with images, corporate contract details, route information.

Process: Authentication validation, real-time location processing, seat availability checking, fare calculation, payment gateway integration, QR code generation, notification dispatch, geofencing detection, ETA calculation, complaint categorization.

Output: Booking confirmations, digital tickets with QR codes, real-time bus locations on maps, payment receipts, earnings reports, analytics dashboards, resolved complaints, corporate invoices.

Users: Highway passengers, long-distance travelers, corporate organizations, trip booking customers, bus drivers, company administrators

4.5 Feasibility Analysis

Technical Feasibility: The stack of technologies (React Native, Spring Boot, and MySQL) is established and thoroughly documented. Members of the team possess fundamental knowledge of database administration, JavaScript, and Java. Both PayHere and the Google Maps API offer thorough documentation and SDK support.

Economic Feasibility: Development costs are minimal due to the open-source nature of the core technologies. The Google Maps API offers a $200 monthly credit. PayHere charges a commission for every transaction and does not charge upfront fees.
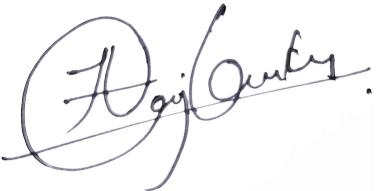
Operational Feasibility: In Sri Lanka, private bus companies are using digital solutions more and more. Because it adheres to well-known mobile app patterns, the system requires little training. Drivers only need rudimentary knowledge of smartphones.

Schedule Feasibility: The project timeline is reasonable, with five team members working part-time over five months using Agile methodology with bi-weekly sprints. The workload is distributed equally among the modules for management, tracking, booking, communication, and authentication.

5. Timeline

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Identify the problem ● First meeting with Creative Software ● Discuss Project ideas ● Finalizing the idea	✔								
Gathering requirements ● Self-Research ● Second meeting with the industry mentor ● Finalizing requirements and tech stack ● Finalizing with dept supervisors ● Dividing the Scope	✔	✔							
System Design ● Designing each part (diagrams, etc.) ● Meeting industry mentor		✔	✔						
Implementation and testing ● Continuous sprint meetings with industry mentor ● Updating dept. Mentors ● Developing the system and integration			✔	✔	✔	✔	✔	✔	✔
Validation ● Getting feedback from mentors ● Validate through real clients ● Refining									✔
Maintenance ● Adding new features/upgrade									✔

6. Signature

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7. Supervisors' declaration

I hereby declare that I have checked this project and, in my opinion, this project is adequate in terms of scope and quality

1. Name of Supervisor: Miss Nipuni Chandimali
   Designation:Lecturer Probationary
   Date:17/11/2025
   Signature:

   Any further comments:

2. Name of Supervisor: Miss Gayathri Kaushalya
   Designation:Lecturer
   Date:17/11/2025
   Signature:

   Any further comments: