UBus
Your Route. Your Time

Internship Project Report

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Table of Contents

Introduction

This project aims to develop UBus, a user-friendly web application designed to streamline short-distance bus travel for passengers using the Kerala State Road Transport Corporation (KSRTC) services. Unlike traditional booking systems that mimic intercity travel platforms, UBus focuses on simplicity and quick bookings, eliminating seat selection, and is tailored specifically for high-frequency, non-reserved routes. The application offers modules for user registration, route information, ticket booking, feedback submission, and administrative management of timetables. By leveraging modern web technologies and Firebase Authentication, UBus enhances the overall commuting experience through real-time updates, secure access, and efficient service management.

Acknowledgement

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Problem Statements

Short-distance bus services are an essential lifeline for daily movement in many areas, serving local commuters, students, office workers, and tourists who depend on regular and reasonably priced transit. Despite this crucial function, the current system for overseeing short-distance bus travel is mainly ineffective, disjointed, and not designed with simplicity or speed in mind. Consequently, it presents a number of operational and experiential difficulties for conductors, passengers, and operators.

- ## Insufficient Awareness of Bus Availability

The number and availability of buses running on a specific route within a specified time window are often difficult for passengers to ascertain. They are forced to rely on guesswork, word-of-mouth updates, or in-person presence at bus terminals due to the lack of a centralised, real-time mechanism to access this information, which results in uncertainty, lengthy wait times.

- <u>Outdated Booking Experience for Short-Distance Travel</u>

Many current apps treat short-distance buses like intercity ones, requiring users to select specific buses and seats. This doesn't suit high-frequency, non-reserved services, leading to longer booking times and a poor user experience, especially for last-minute travellers.

- <u>Inability to Communicate Easily with Conductors</u>

Bus conductors frequently do not have access to real-time passenger data and are not included in computerised booking operations. During boarding, this separation causes a number of inefficiencies, including the requirement to manually check paper manifests, mediate disputes, and verify tickets. These problems slow down operations during busy times, raise the possibility of mistakes, and occasionally lead to revenue loss via undiscovered fare evasion.

- <u>Unable to Monitor Arrival Times or Delays</u>

There is currently no trustworthy way for passengers to determine whether a planned bus is on time, delayed, or has already left. Without real-time tracking, consumers are left in the dark and

frequently make pointless journeys to the bus stop or wait for extended periods of time, which is particularly troublesome in rural or semi-urban regions with inadequate infrastructure.

- ## <u>Absence of Booking Options Based on Aggregated Time Slots</u>

Convenience and punctuality are typically more important to passengers when travelling short distances than choosing a particular bus or seat. The majority of current systems, however, do not provide a convenient booking option that lets customers select a preferred time slot and location, with the system automatically allocating the next bus that becomes available. Due to the lack of time-based booking flexibility, accessibility is diminished, decision fatigue is increased, and available transportation capacity is underutilised.

These limitations reflect a significant gap in the current transportation technology landscape for short-distance travel. There is a clear need for a user-centric, lightweight, and automated ticketing solution that simplifies the booking experience, allowing users to quickly select their destination and preferred time slot, while providing conductors with real-time passenger insights and operational support. Addressing these gaps can lead to

improved user satisfaction, increased ridership, and more efficient fleet utilisation.

Solution

To resolve the inefficiencies in short-distance bus travel booking and operations, we propose the Ubus application that simplifies the user experience and improves operational transparency for conductors and service providers. The core idea is to enable passengers to book tickets by selecting only the destination and a preferred time slot, without the need to choose a specific bus or seat, thereby streamlining planning, booking, and boarding.

Key Features and Functional Components :

- Time-Slot–Based Booking Interface

Users can easily book a bus ticket by selecting a destination and a preferred time slot. The system automatically assigns them to the next available bus, removing the need to browse and compare multiple schedules.

- Real-Time Bus Availability Dashboard

A live interface shows users the number of available buses for selected routes and time slots. This feature helps passengers make faster and better-informed decisions, especially in time-sensitive scenarios.

- <u>Digital Ticket Generation with QR Code or Unique ID</u>

After booking, a digital ticket with a QR code or unique identifier is generated. This allows for fast, contactless boarding and efficient verification by conductors.

- <u>Bus Delay & Status Notifications</u>

The system provides users with real-time notifications regarding bus delays, cancellations, or changes. This ensures better communication, improves rider trust, and enhances overall user experience.

This time-slot–based, bus-agnostic booking system offers a modern and scalable solution for short-distance bus networks. It simplifies the ticketing process for passengers, enhances boarding efficiency for conductors, and provides a foundation for digital transformation in public transit, especially in areas where speed, simplicity, and accessibility are essential.

<u>Technologies Used:</u>

<u>Frontend Development</u>

- <u>HTML, CSS, JavaScript</u>**:** Core web technologies used to build a responsive and user-friendly interface for the application.

<u>Backend and Database</u>

- <u>Firebase Authentication</u>: Enables secure email-based login for users.
- <u>JSON Files on Local Server;</u> Used to store and retrieve data such as user details and bus routes. These files are accessed during runtime to simulate persistent storage, enabling data-driven functionality for demonstration and testing purposes.

<u>Hosting and Deployment</u>

- <u>Firebase Hosting</u>: Provides fast and secure hosting of the web application with support for continuous deployment.

Other Tools

- <u>GitHub</u>: Used for version control, code management, and collaborative development.

Target Users:

- <u>Passengers</u>: General users of the platform, including daily commuters, students, and casual travellers. They use the application to view real-time bus routes, book short-distance tickets, check schedules, and provide feedback. The system is designed to offer them a quick and hassle-free booking experience without requiring the selection of specific seats or buses.

- <u>KSRTC Staff</u>: Authorised employees of the Kerala State Road Transport Corporation who manage the backend through the Admin Module. Their responsibilities include uploading and updating bus timetables, modifying routes and stops, monitoring bookings, and reviewing passenger feedback to improve service delivery.

Modules:

- <u>User Account & Authentication Module</u>: Allows passengers to register and log in using their email(via Firebase Authentication). Provides secure access and enables personalised services like booking tickets.
- <u>Route & Bus Information Module</u>: Displays all active bus routes, stops, and bus numbers managed by the government transport system. Users can search by stop name or destination.
- <u>Ticket Booking Module</u>: This module allows users to book general travel tickets for short-distance trips. Users select source, destination, and time, then confirm and receive a ticket PDF.
- <u>Feedback & Support Module</u>: Enables passengers to rate trips and submit complaints or suggestions. Helps improve service and user satisfaction.
- <u>Admin Module</u>: Allows KSRTC staff to upload and manage bus timetables, update routes and stops, and monitor bookings and passenger feedback. Ensures accurate, real-time data and smooth system operation.
- <u>Chatbot Support Module</u>: Offers real-time assistance to users by answering common queries about booking, routes, registration, and feedback. Guides passengers through key

features, helps resolve issues quickly, and collects user input for service improvement. Enhances user experience and reduces the need for manual support.

Challenges & Limitations

During the development of UBus, several challenges were encountered:

- <u>Backend Data Management</u>: Attempts to integrate cloud databases such as Firebase Realtime Database and Supabase, as well as backend frameworks like Python, were unsuccessful due to technical and compatibility issues. As a result, data is currently managed using JSON files within the frontend, limiting scalability.

- <u>Authentication Constraints</u>: While Firebase Authentication was successfully integrated for OTP-based login, the absence of a full backend restricts advanced user management features.

- <u>Limited Offline Functionality</u>: Since the application relies on real-time data hosted on the frontend and Firebase Hosting, offline use is not supported.

Despite these limitations, the current implementation serves as a functional prototype demonstrating the core features of the system.

Future Enhancements

To improve and expand the UBus platform, the following enhancements are planned:

- Backend Integration: Implement a robust backend using Firebase Realtime Database or Supabase to enable persistent data storage, scalability, and better data security.

- Expanded Authentication: Introduce additional authentication methods, such as email/password login, social media sign-in, and enhanced user profile management.

- Mobile Application: Develop native or hybrid mobile apps to increase accessibility and convenience for users on the go.

- Real-Time Bus Tracking: Integrate GPS-based tracking for live bus locations to provide accurate arrival times and route updates.

- Conductor and Staff Interfaces: Develop dedicated interfaces for conductors and KSRTC staff for ticket verification, reporting, and operational management.

Conclusion

The UBus project successfully delivers a streamlined platform tailored to the unique needs of short-distance bus travellers in Kerala. By focusing on ease of use and efficient ticket booking without unnecessary complexity, it addresses the gaps present in conventional systems. Although certain backend limitations exist in the current version, the project lays a solid foundation for future development and integration of advanced features. Overall, UBus demonstrates how technology can improve public transportation experiences and supports KSRTC's mission to provide better service to its passengers.