

# System Design Document

## Pakistan Smart Bus Assistant

Final System Design Document

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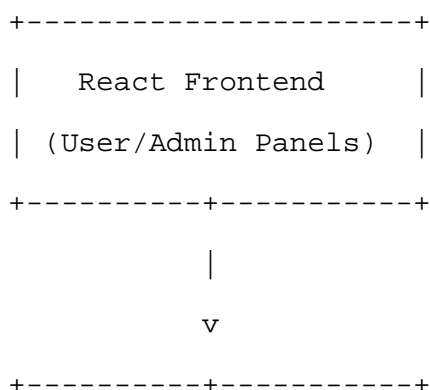
Semester: 4th Semester, 2nd Year

### 1. Introduction

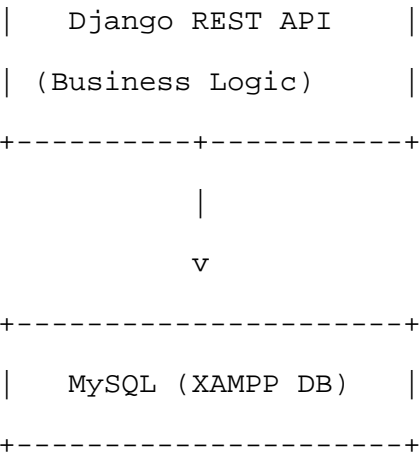
The Pakistan Smart Bus Assistant is a smart public transport management platform for intra-city bus systems. It provides users with tools to search routes, check schedules, and view bus occupancy status without using GPS. Admins can manage buses, routes, schedules, fares, and complaints.

The system follows a layered architecture and is built using React.js (frontend), Django REST Framework (backend), and MySQL (database). Authentication is handled using JWT.

### 2. System Architecture



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## 3. Core Modules

- Authentication (JWT-based)
- Route Search
- Capacity Status (Empty / Medium / Full)
- Fare Display
- Notifications (via Cron Jobs)
- Complaint Submission
- Admin Panel: Routes, Buses, Schedules, Fares, Complaints

## 4. Database Table Summary

Table	Fields
Users	id, name, email, phone, password, is_admin
Routes	id, name, start_point, end_point, total_distance_km, estimated_time_min
Buses	id, bus_number, plate_number, capacity, current_occupancy, is_active
Schedules	id, bus_id (FK), route_id (FK), departure_time, weekdays
Fares	id, route_id (FK), fare_amount
Complaints	id, user_id (FK), bus_id (FK), description, status, created_at
Notifications	id, message, created_at

## 5. API Endpoints Overview

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- POST /api/register/
- POST /api/login/
- GET /api/routes/
- GET /api/routes/search/?source=&destination=
- POST /api/routes/ (admin)
- GET /api/buses/
- PATCH /api/buses/:id/occupancy/ (admin)
- GET /api/schedules/
- GET /api/fares/
- POST /api/complaints/
- GET /api/notifications/

## 6. Security Measures

- JWT Authentication for secure login.
- Role-based access control (Admin/User).
- Input validation on frontend and backend.
- CORS policy for cross-origin communication.

## 7. Scalability and Future Scope

- Designed with RESTful modularity for easy maintenance and upgrades.
- Future support for GPS tracking, driver apps, ETA prediction.
- Expansion to multiple cities and languages.
- Admin analytics and review system.