Bus Ticketing System — Functional Requirements Document

1. Project Overview

The Bus Ticketing System is a centralized platform that allows Super Admins to manage bus companies, routes, and users. The platform streamlines operations for bus companies (ticketing staff, drivers), enables passengers to book tickets seamlessly, and incorporates multiple payment options like QR, bus card, credit/debit cards, and NFTs.

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2. User Roles and Permissions

2.1. Super Admin

- Has full system access.
- Oversees all admins, companies, buses, routes, passengers, and staff.
- Can:
    - Add/Manage platform Admins.
    - Set registration charges for companies.
    - Set monthly service subscription fees.
    - Monitor system analytics (passenger counts, revenues, routes).
    - View system logs and reports.
    - Ban/suspend any user or company.
    - View all transactions across the system.
    - Set global discount codes or promotional offers.
    - Approve new payment integrations (e.g. third-party(khalti , ime, esewa, paypal, stripe, payoneer)).

2.2. Admin

- Manages and approves registered bus companies.
- Sets:
    - Number of bus companies that can register.
    - Company registration charges.
    - Monthly service fees.
- Can:
    - Approve/Reject company registrations.
    - View reports on company activity.
    - Notify companies about compliance or payments.
    - Set terms and policies.

2.3. Bus Company

- Represents a transportation provider.
- Can:

- o Create and manage buses (model, capacity, number plate).
- o Assign drivers and ticketing staff.
- o Create and manage routes (origin, destination, stops, time, frequency).
- o Set ticket prices (based on distance, time of day, or promotions).
- o View passenger bookings.
- o Manage real-time seat availability.
- o Upload documents (business registration, driver license, insurance).
- o Cancel or reschedule buses.
- o Receive reports on revenue, occupancy, ratings.
- o Handle customer complaints or lost & found.
- o Notify passengers of delays via SMS or email.

2.3.1. Ticketing Staff (Company Sub-role)

- Assigned to a specific bus or terminal.
- Can:
  - o Check in passengers via QR or bus card.
  - o Validate tickets.
  - o Assist passengers with offline ticket generation.
  - o Report incidents to the company.

2.3.2. Driver (Company Sub-role)

- Assigned to specific routes.
- Can:
  - o View their route schedule.
  - o Report delays or issues.
  - o Update trip completion status.
  - o Track their own performance rating.

2.4. Passenger

- Regular user who can:
  - o Register/Login.
  - o Search and compare bus companies/routes.
  - o Filter by fare, amenities, rating, timings.
  - o View seat layout and choose preferred seats.
  - o Book/cancel tickets.
  - o Store payment methods (Card, QR wallet, Bus card, NFT wallet).
  - o Receive notifications (confirmation, delay, arrival).
  - o Rate trip, driver, and service.
  - o View trip history.
  - o Subscribe to trip alerts.
  - o Apply promo codes and loyalty points.
  - o Top up bus card or digital wallet.

3. ☐ Route and Bus Management

3.1. Route Features

- Create route (origin, destination, stopovers).
- Schedule (recurring, fixed date).
- Estimated arrival/departure.
- Route fare calculator (based on distance, dynamic pricing).
- Amenities associated (WiFi, A/C, charging).

3.2. Bus Features

- Register bus with capacity, type, plate number.
- Assign route.
- Track real-time location (GPS enabled).
- Seat layout configuration (2x2, 2x1, sleeper).
- Maintenance and inspection log.
- Bus availability calendar.

4. ☐ Ticketing Features

4.1. Ticket Generation

- Dynamic pricing rules (weekend, demand-based).
- Assign seat number.
- Auto-cancellation if not paid within time frame.
- Allow bulk ticket purchase (group).
- Ticket QR generation (scannable).
- Real-time seat locking while in payment process.

4.2. Ticket Types

- One-way, Round-trip.
- Standard, Sleeper, Deluxe.
- Child, Senior citizen discount options.

5. ☐ Payment Services

5.1. Available Methods

- Credit/Debit Card (VISA, Mastercard)
- Digital Wallet (eSewa, Khalti, PayPal)
- QR Code Payment
- **Bus Smart Card** (prepaid balance)

- **NFT-based Ticket** (blockchain-enabled identity/token)

5.2. Payment Features

- Multi-currency support.
- In-app wallet for passengers.
- Top-up functionality (online or via agent).
- Payment confirmation with receipt.
- Refunds (partial/full) for cancellations.
- Split payments among multiple passengers.

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6. ☐ Notification System

- SMS/Email/Push notifications for:
    - Booking confirmation
    - Trip reminder
    - Trip delay or cancellation
    - Refund processing
    - Feedback request

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7. ☐ Smart Features

- AI-based route recommendation (based on history, preferences).
- Predictive pricing (suggest cheaper travel time).
- Crowd prediction on buses.
- Auto-upgrade (if seats available).
- Bus occupancy heat map.

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8. ☐ Analytics & Reports

8.1. Super Admin

- Total bookings, revenue, company-wise stats.
- Top routes and companies.
- Most used payment methods.

8.2. Admin

- Registered companies and their performance.
- Monthly dues, registration compliance.

8.3. Company

- Daily/weekly/monthly booking and revenue.
- Feedback reports.

- Staff performance dashboard.

9. ☐ Security & Access

- Role-based authentication and access control.
- OTP and email verification.
- Encrypted payment handling.
- Blockchain ledger for NFT ticket authenticity.
- Logs and audit trails.

10. ☐ API & Integration

- RESTful API for mobile/web frontend.
- Integration with:
  - GPS tracking systems.
  - Payment gateways (e.g., Stripe, Khalti, eSewa).
  - Notification services (Twilio, Firebase).
  - Government transport APIs (if applicable).

11. ☐ Optional Advanced Features

- Offline ticket booking (for rural areas).
- Emergency contact and panic button for passengers.
- Cross-country bus route support.
- Franchise model support for large companies.
- Loyalty program and gamification for frequent users.