

.1 Functional and Non-functional Requirements

Functional Requirements

Functional requirements describe the key operations the system must perform.

Each requirement is mapped to the specific user roles: **Passenger**, **Bus Depot**, and **Administrator**.

1. User Authentication (Passenger / Depot / Administrator)

- Sign up/log in using secure Firebase Authentication.
 - Password reset functionality.
 - Role-based access control to restrict access according to user level.
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2. Bus Information and Route Management (Passenger / Administrator)

- Display bus routes, stops, and detailed timetables. *(Passenger)*
 - Search buses by selecting origin and destination. *(Passenger)*
 - Add, edit, or update route and timetable information. *(Admin)*
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3. Fare Estimation (Passenger / Administrator)

- Auto-calculate fares based on distance and route. *(Passenger)*
 - Depot can update fare rules and pricing details. *(Admin)*
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4. Seat Booking System (Optional) (Passenger / Depot / Administrator)

- Passengers can reserve seats online with confirmation. *(Passenger)*
 - View booked passengers and reserved seats. *(Depot)*
 - Manage booking settings and enable/disable booking features. *(Admin)*
 - Integrate online payment gateways such as Stripe or PayHere. *(System-Level)*
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5. Notifications (Passenger / Depot / Administrator)

- Passengers receive alerts for bus arrival, delays, cancellations, and route changes. *(Passenger)*
 - System triggers notifications based on depot updates. *(Depot)*
 - Admins can send important system-wide announcements. *(Admin)*
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6. Feedback and Ratings (Passenger / Administrator)

- Passengers can submit ratings and report issues. *(Passenger)*
 - Admins review feedback and take corrective actions. *(Admin)*
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7. Depot Dashboard (Bus Depot / Administrator)

- Start/stop bus shift operations. *(Depot)*
 - Update bus status: On Route, Delayed, Completed. *(Depot)*
 - View booked passengers and upcoming stops. *(Depot)*
 - Admin monitors depot activities and ensures accuracy. *(Admin)*
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8. Admin Dashboard (Administrator Only)

- Manage all users: passengers, drivers, and depot staff.
 - Add, edit, or remove buses, routes, fares, and schedules.
 - Access analytics for trips, passenger feedback, and overall performance.
 - Generate system usage and performance reports.
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Non-Functional Requirements

Non-functional requirements define the quality attributes and constraints that ensure effective, secure, and reliable system performance.

1. Performance

- System should respond within **5 seconds** for standard operations.
 - Ensure smooth navigation with minimal latency even during peak usage.
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2. Scalability

- Support increased numbers of buses, routes, and users over time.
 - System should expand to additional districts without performance loss.
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3. Security

- Encrypt all user data, including personal information and payments.
 - Use HTTPS for secure communication.
 - Enforce role-based access control to prevent unauthorized system actions.
 - Secure authentication via Firebase Auth.
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4. Reliability and Availability

- Maintain **99% system uptime** under normal operating conditions.
 - Provide automated data backups to prevent data loss.
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5. Usability

- Provide a clean and intuitive interface suitable for all ages.
- Support accessibility features for visually or physically impaired users.
- Ensure compatibility with desktops, tablets, and mobile devices.

6. Maintainability

- Use modular, well-documented code for easier updates.
- Implement version control using GitHub for collaborative development.
- Allow efficient debugging and feature enhancements.