Software Requirements Specification

for

Nexa

Version 1.0

Prepared by

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Course: CS455
Institute: IIT Kanpur
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Contents

1. Revisions

Version	Primary Author(s)	Description of Version	Date Completed
v1.0	Likith Sai Jonna Rohit Verma Kollamoram Karthik K S U Rithwin Ritesh Hans Gottupulla Venkata Aman	First version of the Software Requirement Specification (SRS) Document	04/09/2025

2. Introduction

2.1 Product Scope

In today's fast-paced world, efficient and reliable transportation is essential for users, be this for inter-city or intra-city commute. However, finding suitable travel options, booking tickets and managing reservations can be cumbersome due to a lack of unified services, real-time updates and inconsistent pricing. Welcome, Nexa, which is developed to address these challenges by providing a comprehensive online platform for ticket booking and management across various modes, be it for trains, flights, buses etc.
Our platform connects customers with verified transportation service providers, enabling a wide variety of options, seamless bookings and post-booking managements. It provides a one-stop consumer experience for the users which includes:
a. various routes from source to destination
b. real-time updates
c. filters to suit the consumer requirements
d. integrated payment gateways to book tickets seamlessly. etc
Nexa also uses AI and ML features for personalized recommendations, dynamic pricing and itenary planning (of commute only), elevating the user experience. Additionally, it has a loyalty program, rewarding customers for each booking made on this platform. It also applies locks at certain areas, to prevent errors like overbooking, double booking etc.
In short, Nexa aims to simplify travel planning for all our users, making transportation less cumbersome and more efficient, contributing to a positive UX.

2.2 Intended Audience and Document Overview

2.2.1 Intended Audience

Software Developers who will design the software as per the requirements given in the document, in this case, the group members. **Project Managers** who will supervise the planning and execution of the software development procedure, in this case, the TAs and the course instructor. **Testers and approvers** who will perform a quality check of the designed software and give their feedback on the interface, areas of improvement, etc. which include the developers. **Users** will be the customers of the software.

2.2.2 Document Overview

1. **Revisions**: This section contains information about the various versions that this document has gone through.
2. **Introduction**: In this section, we provide some basic information that would be useful in reading the SRS, such as document conventions, abbreviations, etc. The reader may choose to skip the section if they are familiar with the basic terminologies. In any case, this section will serve as a helpful collection of information to clarify any confusion that may occur while reading the document.
3. **Overall Description**: This section offers an overall view of the software system and its functionalities, assumptions, and dependencies. This will be a useful read for those seeking to familiarize themselves with the system at a quick glance. A reader is encouraged to read this part as it provides a good basis for understanding the next section of the SRS.

4. **Specific Requirements**: This section contains detailed information about the software and explains its functions in detail through the use of numerous tree diagrams. This proves indispensable for end-users, clients, and developers alike, serving as a roadmap during the development phase and a user manual for end-users.

5. **Other Non-Functional Requirements**: Important non-functional requirements are expounded here. This is of special importance to the developers of the software.

2.3 Definitions, Acronyms, and Abbreviations

SRS	Software Requirements Specification
UI	User Interface
API	Application Programming Interface
UX	User Experience
SQL	Structured Query Language
OTP	One Time Password
FAQ	Frequently Asked Questions
AI	Artifical Intelligence
ML	Machine Learning
JSON	JavaScript Object Notation
OAuth	Open Authorization
Service Providers	Entities offering transportation services (e.g., bus operators, airlines, railways)
Dynamic Pricing	Real-time adjustment of ticket prices based on demand, time, and other factors
Overbooking	Situation where more tickets are sold than available seats/slots
Double Booking	Situation where the a user books a seat twice
Nexa	BookYourTrip

2.4 Document Conventions

- The document is written using LaTeX (LaTeX) to ensure the consistency of the document and to make it easier to maintain.
- The document is written with the **Arial** font of size 11 with single spacing and 1-inch margins
- Important keywords are highlighted in bold font and comments are italicized

2.5 References and Acknowledgments

- The fundamental principles of our system design were established through the lecture notes and guidance provided by Professor Priyanka Bagade.

3. Overall Description

3.1 Product Overview

Our product, Nexa, is designed to revolutionize the travel booking experience by providing a comprehensive online platform for ticket booking and management across various transportation modes, including buses, trains, and flights. Ideal for daily commuters, tourists, and business travelers, Nexa serves as a centralized system that connects customers with verified service providers, allowing seamless searches, bookings, and real-time updates. The platform addresses common pain points such as fragmented services, unreliable availability information, and complex management of reservations. The software streamlines user interactions by enabling customers to search for routes, view dynamic pricing, book tickets for multiple passengers, and manage post-booking activities like cancellations or rescheduling with penalties for last-minute changes. Service providers can onboard, manage their routes and schedules, monitor bookings, and access analytics. Nexa incorporates AI/ML features for personalized recommendations, itinerary planning, and demand forecasting. It also includes a dummy payment system for simulations, loyalty programs, notifications, and community forums to enhance user engagement and retention. Overall, the platform optimizes the travel planning process, ensuring efficiency, transparency, and user satisfaction.

3.2 Product Functionality

- Separate dashboards for customers and service providers, with **administrative access** using designated usernames and passwords.
- Provision for customers to **register**, **log in**, and manage profiles, with options for subscribed users to access enhanced features like loyalty programs.
- Advanced search and filtering for travel options by route, date, time, category (bus, train, flight), price, rating, duration, and departure time.
- **Real-time visibility** of seat/slot availability, with interactive seat maps where applicable.
- Booking system allowing multiple passengers per transaction, application of discounts or promotions, and secure payment simulations (cards, UPI, wallets, net banking).
- Post-booking management including cancellations, rescheduling (with penalties), refund tracking, and viewing booking/payment history.
- Onboarding and management for new service providers, including verification, profile editing, and discontinuation/deletion of accounts.
- **Dynamic pricing** adjustments based on demand, time, and other factors.
- AI-based features for trip planning via chatbot, personalized recommendations, and integration of agentic AI for strategic enhancements like demand forecasting.
- **Notification system** for booking confirmations, updates (delays, cancellations), promotions, and loyalty reminders.
- **Customer feedback** mechanisms, including ratings, reviews, issue reporting, and community forums for discussions.

- Analytics for providers and admins, including occupancy rates, revenue trends, and system health metrics.

3.3 Design and Implementation Constraints

- As the user and booking database grows, the system must efficiently manage and store data related to bookings, user profiles, schedules, and payments.
- To ensure real-time information about seat availability and tracking, the implementation of efficient communication protocols between the server, providers' systems, and user devices is crucial.
- The platform, as of now, is available only in English, with potential for multilingual support in future iterations.
- With a large user base, the system must handle simultaneous booking requests, prevent overbooking/double booking, and support at least 100 daily active users and 250+ bookings per day during peak usage.
- Deployment on cloud services (e.g., AWS, GCP) with constraints on not exhausting free-tier limits.

3.4 Assumptions and Dependencies

- The platform seamlessly integrates with external APIs for real-time tracking (e.g., FlightRadar, Indian Railways, bus GPS) and payment simulations.
- Users are held accountable for their bookings; in cases of disputes or fraud, providers and admins manage resolutions effectively.
- Service providers supply accurate schedule and availability data, and the system depends on their timely updates to avoid discrepancies.
- The admins manage any changes, additions, or verifications for providers and platform policies.
- The system assumes stable internet connectivity for users and providers, with dependencies on secure protocols like HTTPS for data transmission.

4. Specific Requirements

4.1 External Interface Requirements

4.1.1 User Interfaces

The Nexa system will be delivered as a responsive web application accessible on desktops, laptops, tablets, and smartphones. The frontend will be built using EXT.js, TailwindCSS, providing a clean layout and adaptive design across all screen sizes.

For **customers**, the interface will include a search bar for entering route, date, and travel type. Search results will support filtering (price, amenities, rating, departure time) and sorting (price, duration, rating). Real-time seat availability will be displayed, with interactive seat maps available where providers define layouts. The customer dashboard will include Profile, My Bookings, Payment History, Loyalty Points, Notifications, and Community Forums. Customers will also access travel blogs, FAQs, and AI-based itinerary planning.

For **providers**, the interface will feature a dashboard for managing services, schedules, pricing, and policies. It will also present bookings, occupancy rates, and revenue trends. Providers can respond to reviews, flag issues, and broadcast updates to passengers.

For **administrators**, the interface will provide system-wide control tools. Admins will be able to verify providers, moderate content, resolve disputes, and oversee flagged reports. Analytics dashboards will present system health (active users, bookings per minute), financial summaries, and usage trends. Administrators will also configure platform policies and issue announcements or maintenance notices.

All interfaces will follow accessibility guidelines (WCAG 2.1) and support usability features such as keyboard navigation, high-contrast mode, and optional multilingual support.

4.1.2 Software Interfaces

The backend will be implemented using Django in a microservices style. RESTful APIs (JSON) will connect frontend and backend, as well as enable external integrations. Redis will be used for caching and lightweight queues.

Operating Environment:

- Backend services and the primary PostgreSQL database will run on a Linux-based cloud or local server.
- The client-side web app will support all modern browsers (Chrome, Safari, Firefox, Edge, Brave).

Databases (/Domains) : PostgreSQL will serve as the relational database. Related features will be grouped into logical tables with JSONB fields for flexibility. The main domains include:

- **Users:** Stores all user accounts information (customers, providers, and administrators) along with authentication and role information.
- **Services & Schedules:** Stores travel services (bus, train, flight) and their associated schedules, routes, live location, and basic service details.
- **Bookings:** Stores booking records, passenger details, payment status (mock), cancellations, and reschedules.

- **Reviews & Reports:** Stores customer ratings, feedback, and issue reports related to services or providers.
- **Forums:** Stores discussion threads, replies, and votes for community interactions.
- **Notifications:** Stores alerts, confirmations, and promotional messages sent to users.
- **Loyalty & Referrals:** Stores loyalty point transactions and referral program records.
- **AI Features:** Stores previous customer interactions, generated itineraries, and chat history to support AI-driven features.

External Services:

- **Payment Simulation:** A mock module will simulate card/UPI transactions to test booking workflows without real payments.
- **Notification Simulation:** Email/SMS alerts will be tested using console outputs, local mail servers, or free-tier services (e.g., Mailtrap, Gmail API).
- **Tracking APIs:** Free-tier or open APIs (e.g., FlightRadar, Indian Railways) or mock GPS feeds will provide live tracking data.
- **Authentication:** Social login via OAuth 2.0 may be enabled using free-tier API keys (Google, GitHub).
- **AI/ML Modules:** Itinerary planning, demand forecasting, and recommendation services will be provided by internal microservices. Where necessary, free-tier LLM APIs (e.g., Google Gemini or OpenAI free credits) may be leveraged for chatbot-style trip planning and contextual guidance.

4.2 Functional Requirements

User Role : Customer

4.2.1 Authentication & Profile

- FR-C1: Customer shall be able to register (email, phone, or social login).
- FR-C2: Customer shall be able to log in/out, reset passwords, and manage profile (CRUD).

4.2.2 Service Discovery & Search

- FR-C3: Customer shall be able to search for services by route, date, time, or category (bus, train, flight).
- FR-C4: Customer shall be able to filter (price, rating, duration, departure time) and sort (price, earliest, duration, rating) results.
- FR-C5: Customer shall be able to view provider details (profile, rating, past reviews).
- FR-C6: Customer shall be able to see real-time seat/slot availability.

4.2.3 Booking & Ticketing

- FR-C7: Customer shall be able to book multiple passengers in one transaction.
- FR-C8: Customer shall be able to apply discounts, loyalty points, or promotions.
- FR-C9: Customer shall be able to confirm and pay securely (cards, UPI, wallets, net banking).
- FR-C10: Customer shall receive digital tickets/confirmations (SMS, email, in-app).
- FR-C11: Customer shall be able to view, download, and save booking history.

4.2.4 Post-Booking Management

- FR-C12: Customer shall be able to cancel, reschedule (if allowed), and track refund status.
- FR-C13: Customer shall be able to view upcoming and past bookings.
- FR-C14: Customer shall be able to view transaction/payment history.

4.2.5 Ratings & Feedback

- FR-C15: Customer shall be able to rate and review providers.
- FR-C16: Customer shall be able to report issues (safety, poor service, fraud).
- FR-C17: Customer shall be able to flag suspicious/fake providers.

4.2.6 Notifications

- FR-C18: Customer shall receive booking confirmations, real-time updates (delays, cancellations), promotions, refund updates, and loyalty reminders.

4.2.7 AI/ML Features

- FR-C19: Customer shall be able to use AI trip planning via chatbot (multi-leg journeys combining train, cab, flight, etc.).
- FR-C20: Customer shall receive personalized recommendations and dynamic pricing suggestions.

4.2.8 Loyalty & Referral

- FR-C21: Customer shall be enrolled in a loyalty program with cryptocurrency-based reward points.
- FR-C22: Customer shall earn/redeem loyalty points for bookings at an admin-controlled conversion ratio.
- FR-C23: Customer shall be able to participate in a referral program with a multi-level reward structure.

4.2.9 Travel Guidance & Tracking

- FR-C24: Customer shall be able to access platform-hosted travel blogs, guides, and FAQs (airports, cities, routes, safety tips).
- FR-C25: Customer shall be able to track booked journeys in real-time via integrated APIs (FlightRadar, Indian Railways, bus GPS).
- FR-C26: Customer shall receive automated travel tips, AI-generated support, and context-aware FAQs within the platform.
- FR-C27: Customer shall be able to participate in community forums for discussions, queries, and peer-to-peer support.

User Role : Travel Service Provider

4.2.10 Authentication & Profile

- FR-P1: Provider shall be able to sign up with company details (name, contact, license info).
- FR-P2: Provider shall be able to log in securely and reset passwords via email/OTP.
- FR-P3: Provider shall be able to manage company profile (CRUD operations).
- FR-P4: Provider shall be able to delete/deactivate their account if discontinuing services.

4.2.11 Service & Route Management

- FR-P5: Provider shall be able to manage (CRUD) routes/services including:
  - Source, destination, timings, and type (bus/train/flight).
  - Vehicle/transportation details (ID, seating capacity, amenities).
  - Seat layouts (economy, premium, sleeper).
  - Pricing (static and dynamic based on demand, time, offers).
  - Cancellation/rescheduling policies and penalties.
  - Blocking seats for internal use/maintenance.
- FR-P6: Provider shall be able to suspend or resume specific services (maintenance, disruptions).

4.2.12 Booking Management

- FR-P7: Provider shall be able to view all bookings for their services.
- FR-P8: Provider shall be able to search/filter bookings by passenger name, date, route, or booking ID.
- FR-P9: Provider shall be able to send notifications (delays, cancellations, updates).
- FR-P10: Provider shall be able to reassign/cancel bookings in special cases.

4.2.13 Financial Management

- FR-P11: Provider shall be able to view transaction history (payments received, refunds issued).
- FR-P12: Monthly settlements shall be processed by the platform (payments collected from customers → settled with providers).

4.2.14 Analytics & Insights

- FR-P13: Provider shall have a dashboard showing:
  - Bookings, revenue, occupancy trends.
  - Daily/weekly/monthly performance reports.
  - Least-performing routes/assets (last 7 days).
  - Demand forecasting (via ARIMA/SARIMA).
  - No-show prediction/overbooking suggestion (via Random Forest).

4.2.15 Customer Interaction & Feedback

- FR-P14: Provider shall be able to view customer reviews and ratings for their services.
- FR-P15: Provider shall be able to respond to reviews publicly or flag inappropriate ones.

User Role : Admin

4.2.16 Authentication & Security

- FR-A1: Admin shall be able to log in securely with multi-factor authentication.
- FR-A2: Admin shall be able to view logs of all login attempts by providers and customers.

4.2.17 User & Provider Management

- FR-A3: Admin shall be able to view, search, and filter all users (customers and providers).
- FR-A4: Admin shall be able to create, update, suspend, block, or reset credentials for users.
- FR-A5: Admin shall be able to verify provider details (licenses, documents) before on-boarding.
- FR-A6: Admin shall be able to approve or reject provider applications.

4.2.18 Booking & Data Access

- FR-A7: Admin shall have full entitlement access to the database and be able to run queries using a query runner on their dashboard.
- FR-A8: Admin shall be able to search and filter bookings by customer, provider, date, or route.

4.2.19 Financial Oversight

- FR-A9: Admin shall be able to view global transaction history.
- FR-A10: Admin shall be able to generate financial reports (daily, weekly, monthly).

4.2.20 Analytics & Monitoring

- FR-A11: Admin shall be able to monitor system load (active users, bookings per minute).
- FR-A12: Admin shall be able to analyze provider performance (on-time %, cancellations, customer ratings).

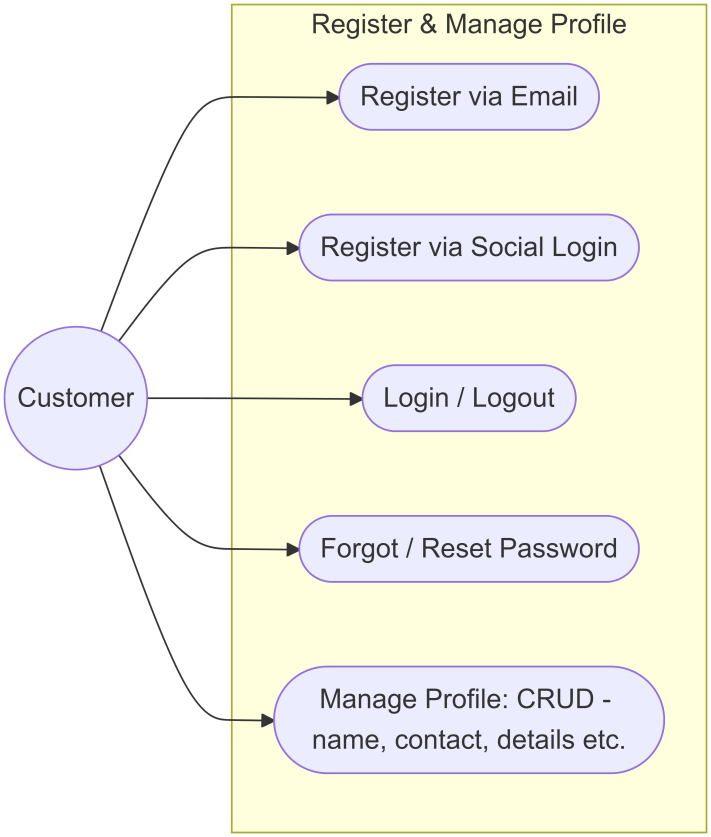
4.2.21 Communication

- FR-A13: Admin shall be able to send targeted notifications to customers or providers.

4.3 Use Case Model

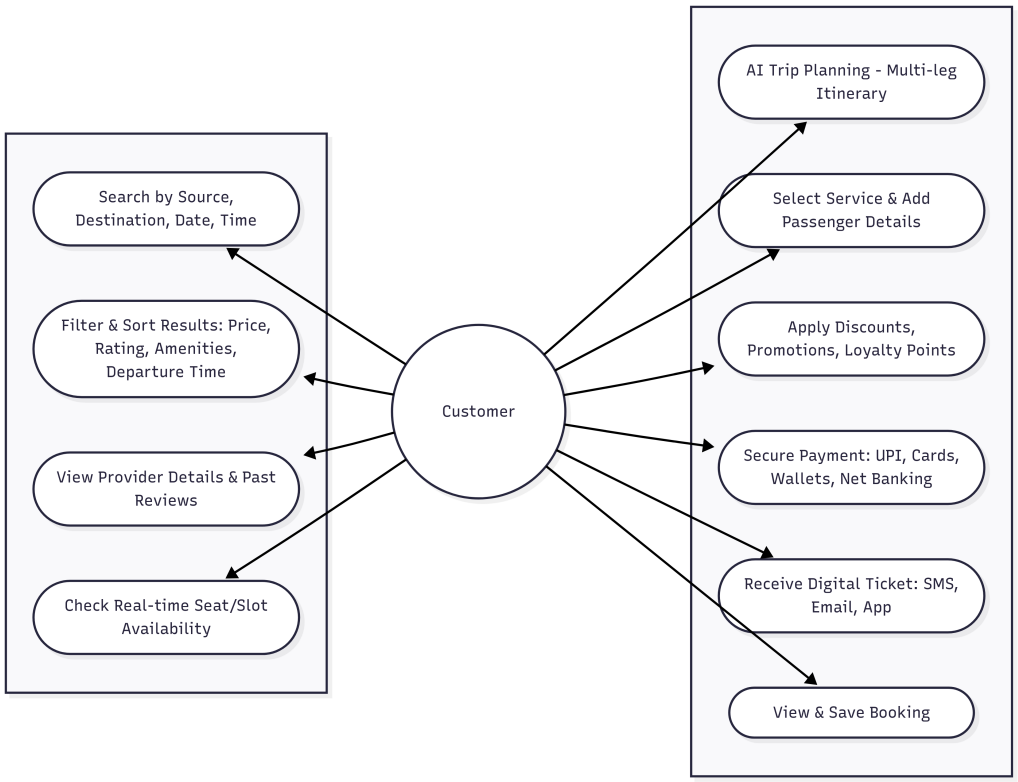
User Role : Customer

4.3.1 Use Case 1



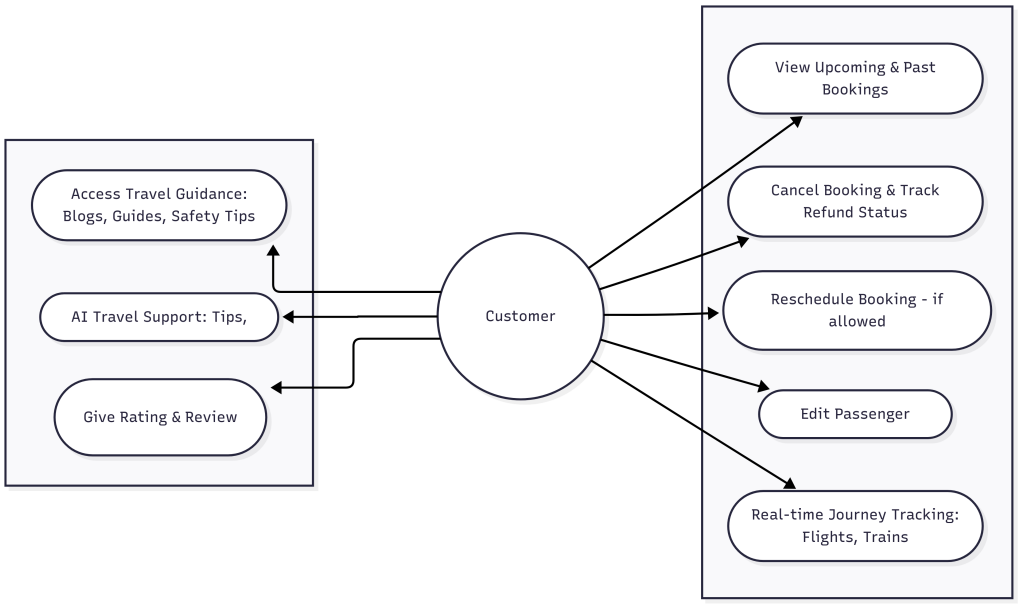
Purpose	To allow the customer to register an account, log in or log out, reset password, and manage personal profile details such as name and contact information.
Requirements Traceability	The system must support multiple registration options (email, social login), provide secure login and logout, implement password recovery/reset mechanisms, and allow CRUD operations for managing profile information.
Priority	High, since account creation, authentication, and profile management are core entry points for system access.
Pre Conditions	The customer must have access to the registration interface (email or social login). For login, valid credentials must already exist.
Post Conditions	The customer successfully registers or logs in, can manage their profile, and any updates are saved securely in the system database. All authentication-related activities are logged.

4.3.2 Use Case 2



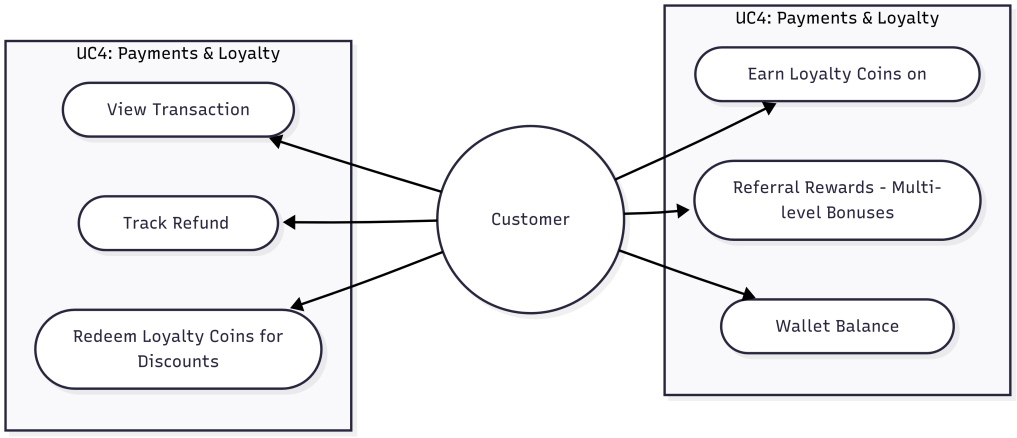
Purpose	To allow the customer to search for travel options, filter and view results, check availability, select services, apply discounts, make secure payments, and receive digital tickets for their bookings.
Requirements Traceability	The system must support search by source, destination, date, and time; provide filtering and sorting options; display provider details and reviews; check real-time seat/slot availability; support AI-based trip planning; allow service selection and passenger detail entry; apply discounts and loyalty points; enable secure payments (UPI, cards, wallets, net banking); and issue digital tickets with booking records.
Priority	High, as this workflow forms the core functionality of the system, enabling customers to complete end-to-end bookings.
Pre Conditions	The customer must have a valid account, be logged into the system, and have internet access to search and book services.
Post Conditions	The customer successfully searches, books, pays securely, and receives a digital ticket with booking confirmation. All booking and payment activities are logged in the system.

4.3.3 Use Case 3



Purpose	To allow the customer to manage bookings and access travel-related support. This includes viewing and managing bookings, tracking refunds, rescheduling (if permitted), editing passenger details, accessing travel guidance, receiving AI-based travel support, and giving ratings and reviews.
Requirements Traceability	The system must provide functionalities for booking management (view, cancel, reschedule), refund tracking, passenger detail editing, real-time journey tracking, travel guidance content, AI-based travel assistance, and customer feedback submission.
Priority	High, as booking management and real-time support are essential for customer satisfaction and system usability.
Pre Conditions	The customer must have a valid account, be logged into the system, and have existing or new bookings.
Post Conditions	The customer can successfully manage bookings, track journeys, receive travel guidance, get AI-based support, and provide feedback, with all activities recorded in the system.

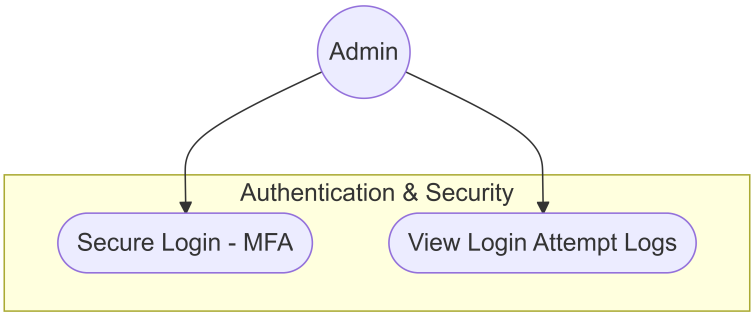
4.3.4 Use Case 4



Purpose	To allow the customer to manage payments and loyalty features such as viewing transactions, tracking refunds, redeeming loyalty coins for discounts, earning loyalty coins, referral rewards, and checking wallet balance.
Requirements Traceability	The system must support loyalty points accrual, redemption, and tracking, provide wallet balance visibility, and enable referral-based multi-level reward distribution.
Priority	High, since managing loyalty programs and payments directly impacts customer engagement, retention, and satisfaction.
Pre Conditions	The customer must have a valid account and be logged into the system with access to payments and loyalty features.
Post Conditions	The customer can successfully view and manage transactions, refunds, loyalty coins, referral rewards, and wallet balance, with all activities recorded in the system.

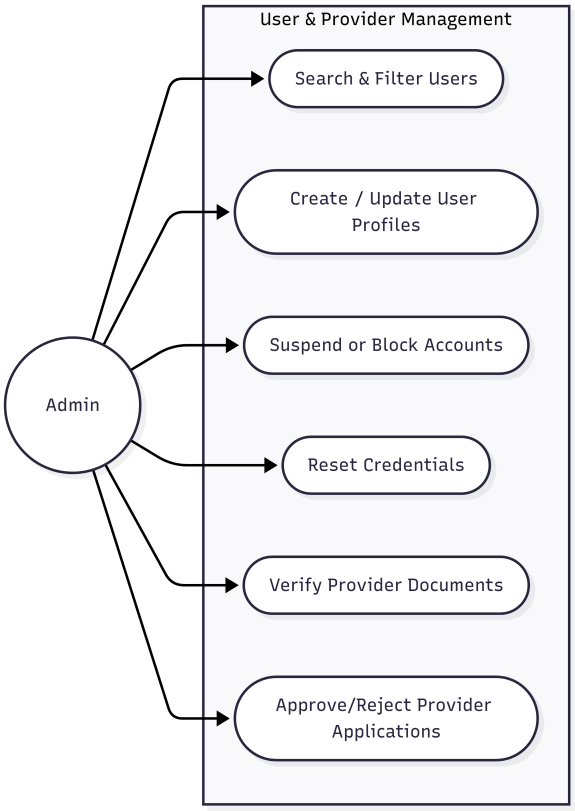
User Role : Admin

4.3.5 Use Case 5



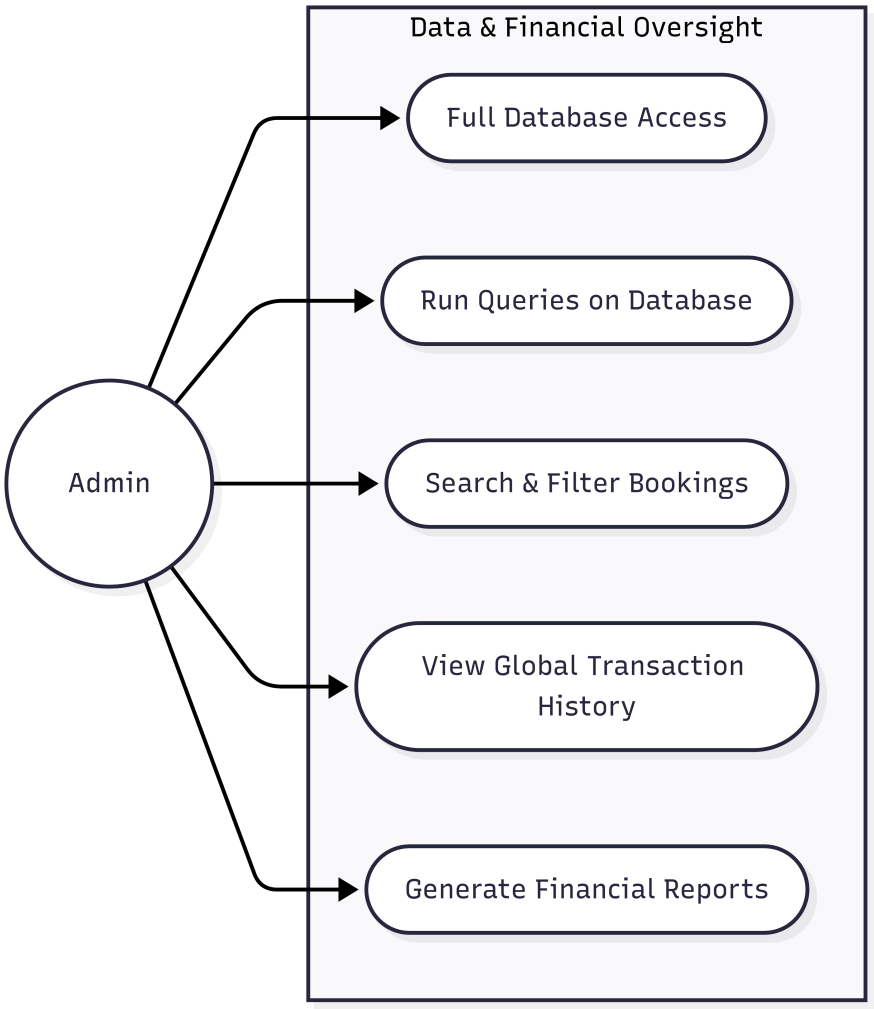
Purpose	To allow the admin to securely log in with Multi-Factor Authentication (MFA) and review login attempt logs for security monitoring
Requirements Traceability	The system must support MFA for admin login and maintain detailed logs of all login attempts
Priority	High, since ensuring secure access to the admin panel and monitoring login activities is critical for system protection
Pre Conditions	The admin must have valid login credentials and MFA setup enabled in the system
Post Conditions	The admin successfully logs in with MFA, and all login attempts are recorded in the system logs

4.3.6 Use Case 6



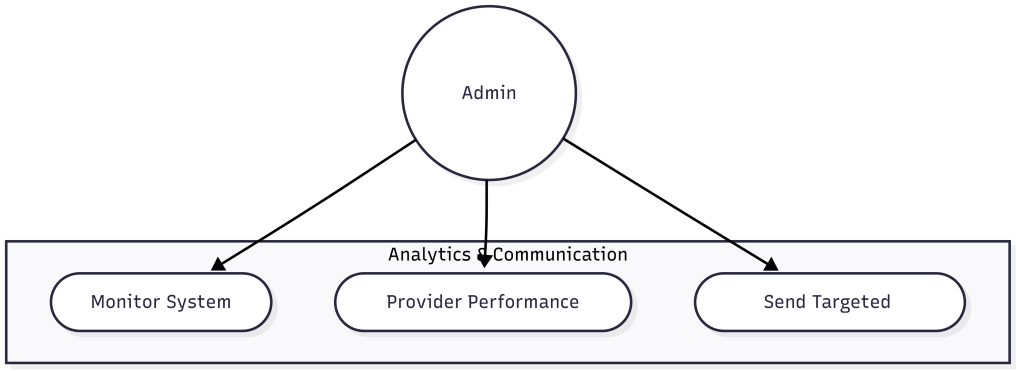
Purpose	To allow the admin to manage users and providers by creating or updating profiles, suspending accounts, resetting credentials, and verifying provider documents
Requirements Traceability	The system must support user search, profile updates, account suspension, credential resets, and provider application approvals/rejections
Priority	High, as this functionality ensures smooth management of both users and providers
Pre Conditions	The admin must have authenticated access to the system with the required management permissions
Post Conditions	Users and providers are managed as per admin actions; system updates profiles, account statuses, and provider verification records
Actors	Admin

4.3.7 Use Case 7



Purpose	To enable the admin to access the database, run queries, filter bookings, view transaction history, and generate financial reports
Requirements Traceability	The system must provide database access, booking filters, financial data visibility, and reporting tools for the admin
Priority	High, as financial and booking oversight is crucial for maintaining system transparency and financial health
Pre Conditions	The admin must be logged in with permissions to access financial and booking data
Post Conditions	The admin can view and analyze bookings and transactions, and generate reports for financial review
Actors	Admin

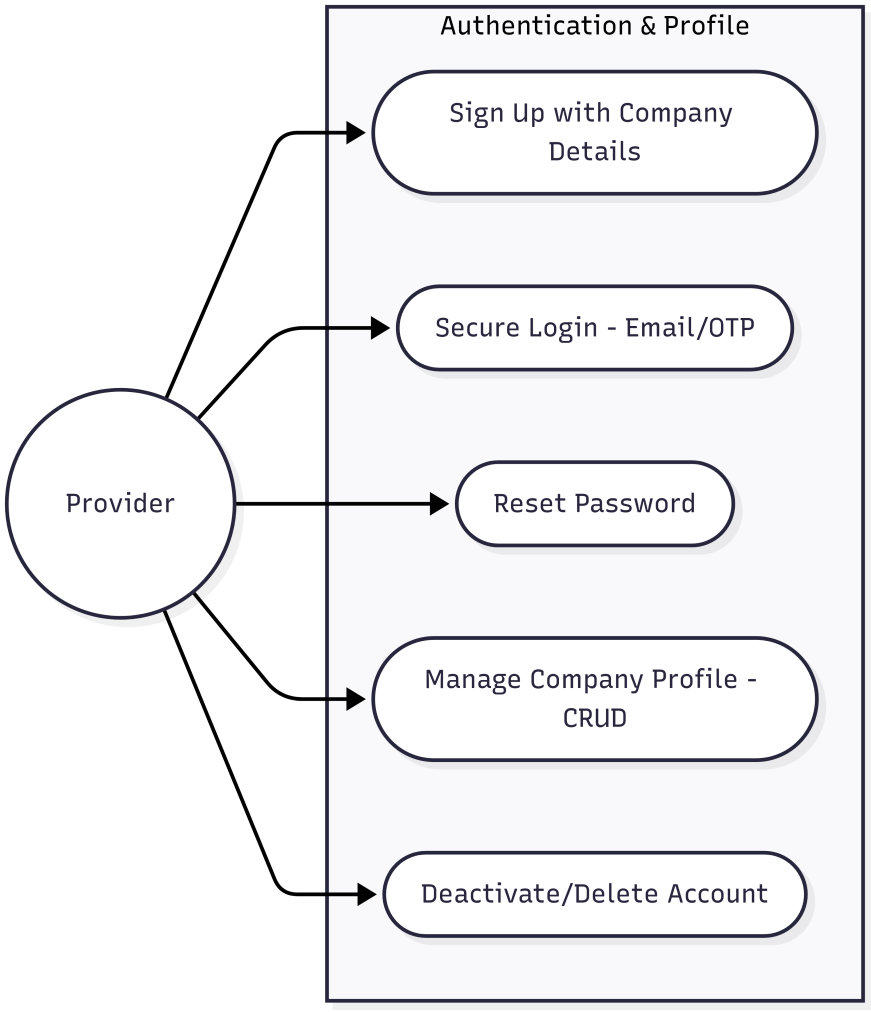
4.3.8 Use Case 8



Purpose	To allow the admin to monitor the system, analyze provider performance, and send targeted communications
Requirements Traceability	The system must support real-time monitoring, provider performance tracking, and communication tools for targeted messaging
Priority	Medium, as analytics and communication enhance efficiency but are not as critical as security or financial oversight
Pre Conditions	The admin must be logged into the system with access rights for analytics and communication tools
Post Conditions	The admin successfully monitors the system, evaluates provider performance, and communicates with relevant users or providers
Actors	Admin

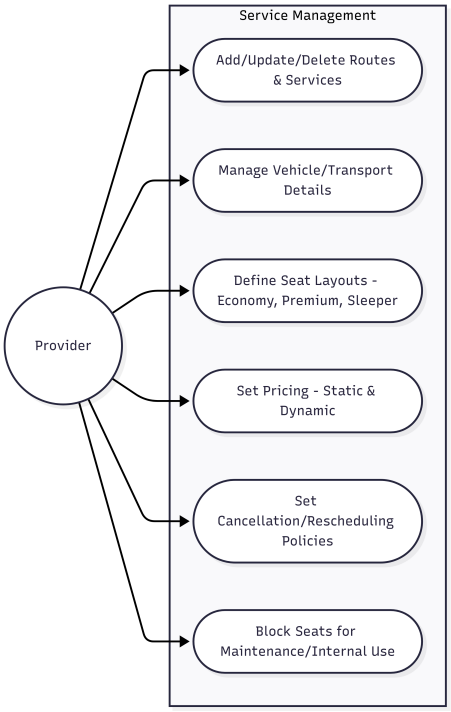
User Role : Travel Service Provider

4.3.9 Use Case 9



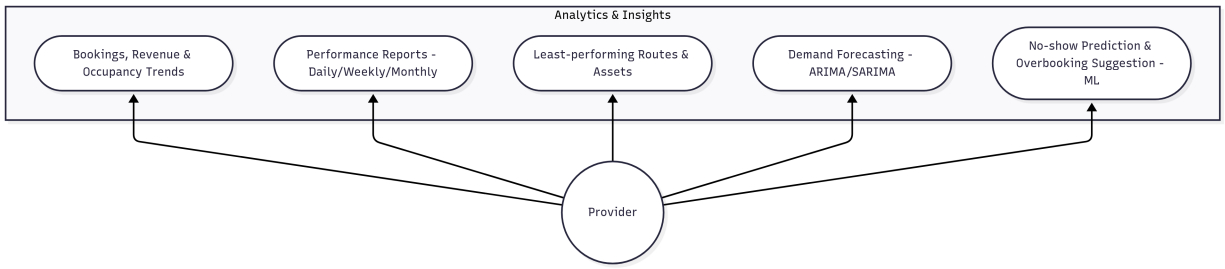
Purpose	To allow the provider to register with company details, securely log in, reset passwords, manage company profile information, and deactivate or delete their account when required.
Requirements Traceability	The system must support provider onboarding with company details, secure login via email/OTP, password reset functionality, CRUD operations for company profile management, and account deactivation or deletion.
Priority	High, as provider authentication and profile management are essential for maintaining verified and secure provider participation in the platform.
Pre Conditions	The provider must have access to the registration module and provide valid company details. For login, valid credentials or OTP must be available.
Post Conditions	The provider successfully registers, logs in securely, manages company profile data, or deactivates their account. All activities are stored in the system for audit and compliance.

4.3.10 Use Case 10



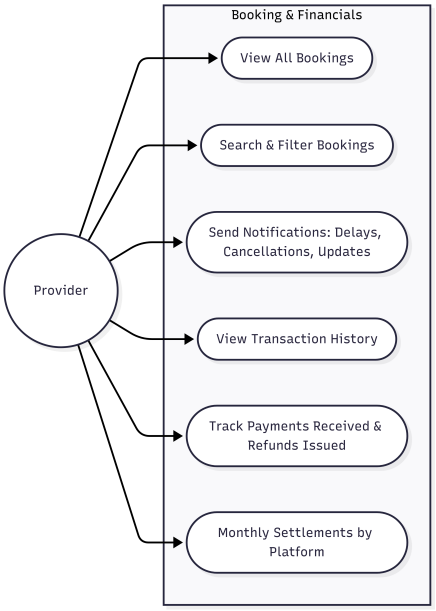
Purpose	To allow the provider to manage transportation services by adding, updating, or deleting routes, managing vehicle details, defining seat layouts, setting pricing, managing cancellation/rescheduling policies, and blocking seats for internal use or maintenance.
Requirements Traceability	The system must support service CRUD (create, read, update, delete) operations, vehicle and transport details management, flexible seat layout definitions (economy, premium, sleeper), static and dynamic pricing mechanisms, policy configuration for cancellations and rescheduling, and seat blocking functionality.
Priority	High, as effective service management ensures smooth operations, accurate availability, and customer satisfaction.
Pre Conditions	The provider must have a valid account, be logged into the system, and have authentication rights to access service management features.
Post Conditions	Services are successfully added, updated, or removed; vehicle and seat layout information is stored; pricing and policies are updated; and blocked seats are reflected in the availability shown to customers. All actions are logged in the system.

4.3.11 Use Case 11



Purpose	To allow the provider to manage bookings and financial records by viewing all bookings, searching and filtering them, sending notifications to customers, reviewing transaction history, tracking payments and refunds, and receiving monthly settlements from the platform.
Requirements Traceability	The system must support provider access to booking lists with filtering and searching options, notification services (delays, cancellations, updates), transaction history logs, payment and refund tracking, and automated monthly settlements with financial reporting.
Priority	High, as booking visibility, financial management, and timely settlements are critical for provider operations and trust in the platform.
Pre Conditions	The provider must have a valid account, be logged into the platform, and have active bookings or financial transactions.
Post Conditions	The provider successfully views and manages booking data, tracks financial records, and receives settlements. All booking and financial activities are logged by the system.
Actors	Travel Service Provider

4.3.12 Use Case 12



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Post Conditions	The provider successfully views and manages booking data, tracks financial records, and receives settlements. All booking and financial activities are logged by the system.

5. Other Non-Functional Requirements

5.1 Performance Requirements

The software should maintain **99.5% uptime**, ensuring that customers and service providers can access ticket booking and management services with minimal disruptions, excluding scheduled maintenance windows. The system must support at least **250 ticket bookings per day** and **100 concurrent users**, scalable seamlessly during peak usage periods (e.g. festival seasons, flash sales).

The response time for booking, cancelation, or modification requests should be $\leq$ **3 seconds** under normal conditions. The platform must implement **load balancing and autoscaling** when deployed on cloud infrastructure (AWS/GCP/Azure) to handle sudden spikes in traffic.

Furthermore, the system should include **fault tolerance and automated recovery mechanisms**, ensuring minimal downtime in the event of hardware, network, or software failures.

5.2 Safety and Security Requirements

The system must ensure robust safety and security across all operations:

- **User Authentication & Role Management:** Secure authentication with role-based access (provider vs. customer) must be implemented. Multifactor authentication (MFA) should be available for providers.
- **Data Encryption:** All sensitive information (personal data, reservation details, and payment information) must be encrypted both in transit (TLS/HTTPS) and at rest. Passwords must be securely stored using salting and hashing.
- **Secure Transactions:** Even dummy payments must go through a secure payment API. Transactions should be validated, duplication prevented, and users are notified of the results.
- **Fraud Prevention:** Booking validation must prevent double booking and overbooking. AI-based anomaly detection can be used to identify suspicious activity (for example, bots that spam the bookings).
- **Cloud & Physical Security:** Since the system is deployed in the cloud, strict IAM policies and firewall protections must be applied. Only authorized personnel may access server instances.

5.3 Software Quality Attributes

5.3.1 Usability

The system should provide **separate dashboards** for customers and providers, with intuitive workflows for booking, cancellations, modifications, and provider onboarding. It must comply with **WCAG accessibility standards** to ensure access for all users. Additionally, **AI-powered assistance** (e.g., chatbot support) should be integrated to help users navigate the platform.

5.3.2 Availability

In case of a cloud service crash, the system should restore services within **1 hour** using automated recovery scripts and snapshots. The platform must scale dynamically to handle **high demand (e.g., 10$\times$ normal load during peak travel seasons)**.

5.3.3 Reliability

The **Mean Time to Failure (MTTF)** must be at least one week under production load. The system shall undergo **unit, integration, load, and regression testing** before deployment. Booking operations must consistently return correct results (e.g., no duplicate seats assigned).

5.3.4 Portability

The application will be developed using **Django (backend)** and **Bootstrap + EXT JS (frontend)** with cloud deployment. It should run smoothly on **desktop, tablet, and mobile browsers**. The platform must also support **migration across cloud providers** (AWS, GCP, Azure) with minimal reconfiguration.

6. Other Requirements

6.1 Legal Requirements and Copyright

User data collected should be stored in the country's regional data center. This is to comply with data protection and privacy rules that may be enforced by the Government of the nation. Copyright of the source code and the documents must be retained by the developers of the system.

6.2 Authentication

Permission will be required for utilising OTPs for the authentication process as this will require sending automated emails to the user's email id.