InsurAI: Online Corporate Insurance using AI

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ABSTRACT

InsurAI is a corporate insurance automation and intelligent assistance platform integrating AI-powered voice recognition, policy automation, appointment scheduling, and agent–customer interaction.

This report documents the architecture, modules, system design, workflows, data flow diagrams, sequence
diagrams for User, Agent, and Admin, and implementation details following enterprise Java development Standards.

TABLE OF CONTENTS

1. INTRODUCTION

InsurAI is an intelligent corporate insurance automation platform developed to modernize and simplify policy management processes. The system leverages automation, AI-driven voice assistance, and real-time interaction features to address inefficiencies commonly found in manual insurance operations.

InsurAI introduces:

- AI-assisted voice query system for fast information access
- Automated policy workflows that reduce manual intervention
- Real-time appointment scheduling and agent availability tracking
- Role-based dashboards for User, Agent, and Admin
- Secure authentication and authorization using JWT

This system enhances operational efficiency, accelerates service delivery, and improves the overall

customer experience in corporate insurance management.

2. PROBLEM STATEMENT

Corporate insurance processes currently face multiple operational difficulties that impact both customers and insurance providers:

- **Manual policy handling** leads to delays, higher workload, and increased chances of human error.
- **Limited communication channels** between customers and agents often result in missed follow-ups and ineffective customer service.
- **No AI-driven support**, causing customers to wait longer for answers to policy or claim queries.
- **Lack of automation** in appointment booking and plan management creates scheduling conflicts and delays in service delivery.
- **Poor visibility of policy and agent availability** makes tracking status and renewals difficult.

Solution Highlights

InsurAI addresses the above challenges by introducing automation and intelligent assistance into the insurance workflow:

- **AI Voice Recognition**
  Provides instant answers to user queries regarding policies, claims, and renewals.
- **Automated Policy & Appointment Handling**
  Reduces manual effort by digitizing and streamlining workflow processes.
- **Real-time Agent Availability**
  Ensures customers can schedule appointments smoothly without conflicts.
- **Role-based Dashboards**
  Dedicated feature views for Customers, Agents, and Admins to track their actions, performance, and data efficiently.

3. OBJECTIVES

The primary objective of **InsurAI** is to automate and enhance corporate insurance operations using intelligent technologies. The solution aims to:

- **Automate the entire workflow of policy management**, from policy creation to renewal and tracking.

- **Provide seamless appointment scheduling** with real-time visibility of agent availability.

- **Enable policy tracking and status monitoring** for customers and agents.

- **Integrate AI-powered voice recognition** for fast, interactive, and efficient customer query handling.

- **Ensure secure authentication and authorized access** using JWT-based security mechanisms.

- **Deliver role-specific dashboards** for Admin, Agent, and Customer to improve usability and operational efficiency.

4. TECHNOLOGY STACK

InsurAI is built using modern and scalable technologies that support secure, high-performance insurance automation and AI-driven interaction.

Backend Technologies

- Java 17
- Spring Boot Framework
- Spring MVC – Web Layer and REST API
- Spring Data JPA – ORM for database operations
- Spring Security + JWT – Authentication & Authorization
- MySQL – Relational Database Management

Frontend Technologies

- React (with Vite for optimized build & performance)

- Axios – API communication

- Tailwind CSS – Responsive UI design

AI / Voice System

- Gemini API (Google AI) – Intelligent query processing
- Speech-to-Text integration – Voice assistance support

Tools & Build System

- Maven – Dependency management & build automation

- Postman – API testing

- VS Code, Eclipse / IntelliJ IDEA – Development IDEs

5. SYSTEM ARCHITECTURE

The **InsurAI** platform is designed using a structured and scalable layered architecture to ensure security, performance, and easy maintainability. Each layer is responsible for a specific set of operations, enabling seamless flow of data and business logic throughout the system.

Layered Architecture Overview

1. Client Layer (React Frontend UI)

- Provides interactive user interfaces for Customer, Agent, and Admin dashboards
- Utilizes Axios for secure communication with backend APIs

2. REST API Layer (Spring Boot Controller Layer)

- Exposes RESTful endpoints for all user operations
- Handles incoming requests and responses

3. Service Layer

- Contains core business logic
- Processes validation, transformation, and decision rules

4. Repository Layer (Spring Data JPA)

- Manages data persistence and database operations
- Implements ORM for entity mapping

5. Database Layer (MySQL)

- Stores all policy, user, appointment, and notification data
- Ensures relational consistency and secure data access

### 6. AI Integration Layer (Gemini Voice System)

- Converts speech to text for intelligent query handling
- Uses Gemini API to respond to user queries with relevant insurance details

6. UML DIAGRAMS

6.1 User Sequence Diagram

[]The User Sequence Diagram represents the step-by-step interaction between the user and the InsurAI system. It describes how a user performs operations such as authentication, viewing policy details, booking appointments, and accessing AI-based assistance. The sequence clearly shows the communication flow among the User Interface, Controller, Service Layer, and Database to complete each action smoothly.
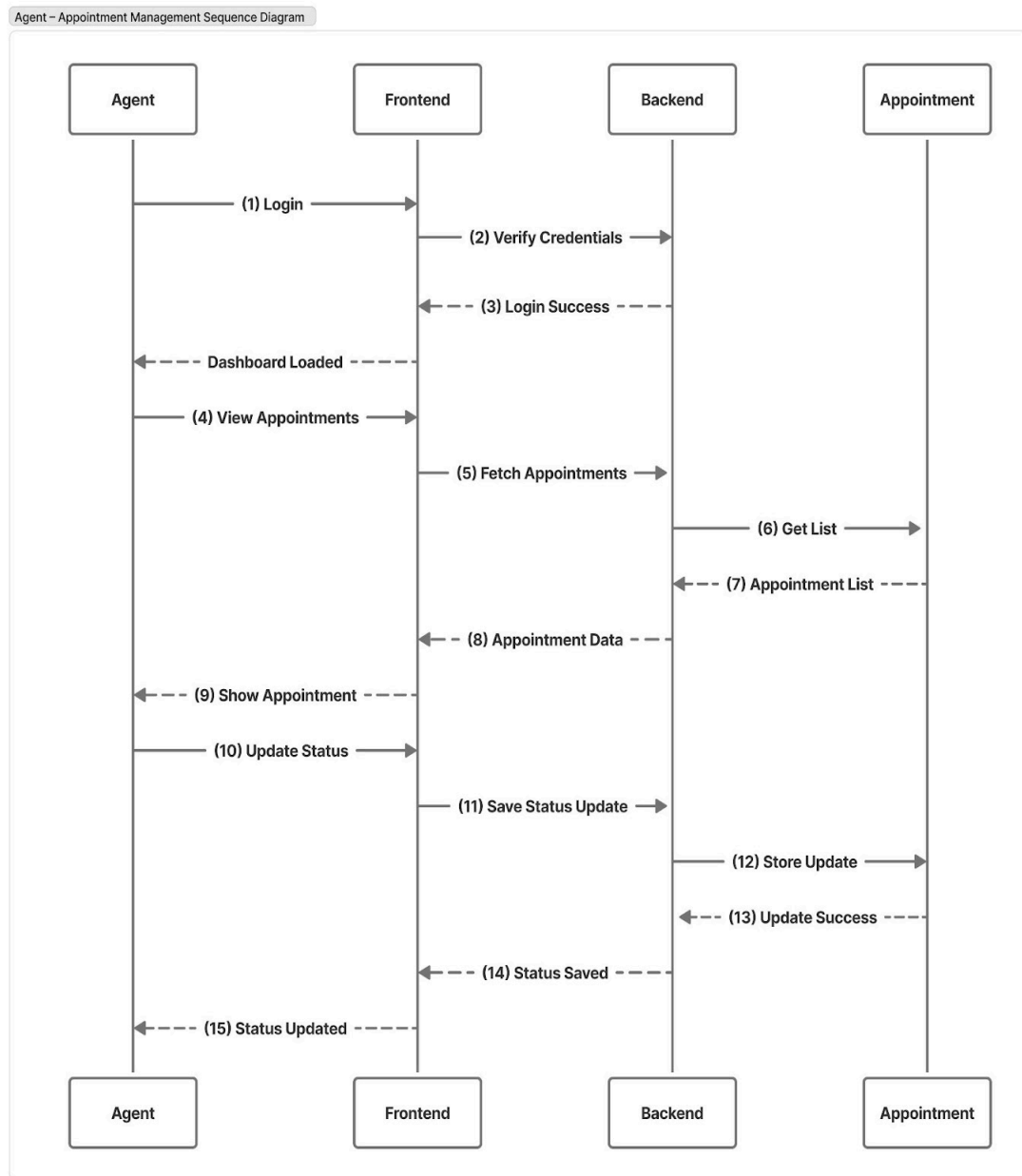
 User Sequence Diagram – Login, Query AI, Book Appointment

User Appointment Booking – Sequence Diagram
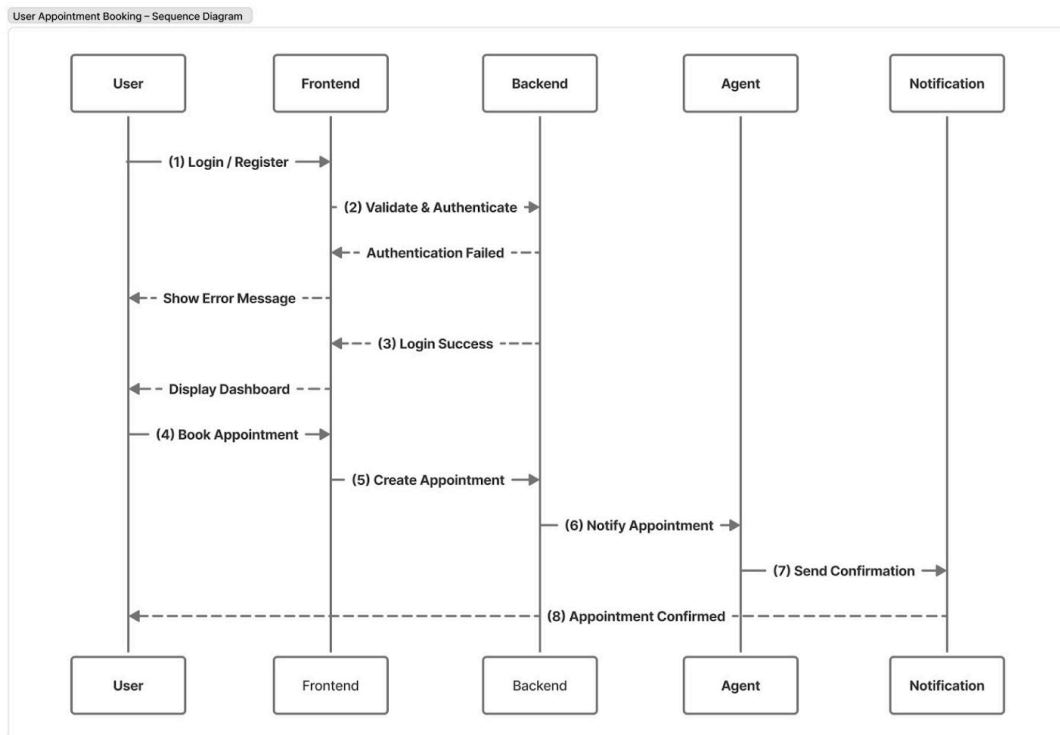
6.2 Agent Sequence Diagram

The Agent Sequence Diagram illustrates the interactions between the agent and InsurAI during appointment and policy-related operations. It shows how agents manage appointment requests, update availability, and respond to customer actions through the system. The backend services and database layers work together to ensure accurate status updates and seamless communication with the users.

Agent Sequence Diagram – Manage Availability, Accept/Reject Appointment

Agent – Appointment Management Sequence Diagram

| Agent | Frontend | Backend | Appointment |

(1) Login
(2) Verify Credentials
(3) Login Success
Dashboard Loaded
(4) View Appointments
(5) Fetch Appointments
(6) Get List
(7) Appointment List
(8) Appointment Data
(9) Show Appointment
(10) Update Status
(11) Save Status Update
(12) Store Update
(13) Update Success
(14) Status Saved
(15) Status Updated

6.3 Admin Sequence Diagram

The Admin Sequence Diagram demonstrates how an admin interacts with InsurAI to handle system-wide operations. It includes managing users, agents, and policies through monitoring and control dashboards. The diagram clearly depicts how the admin triggers actions that pass through controllers and services to update the database securely and efficiently.

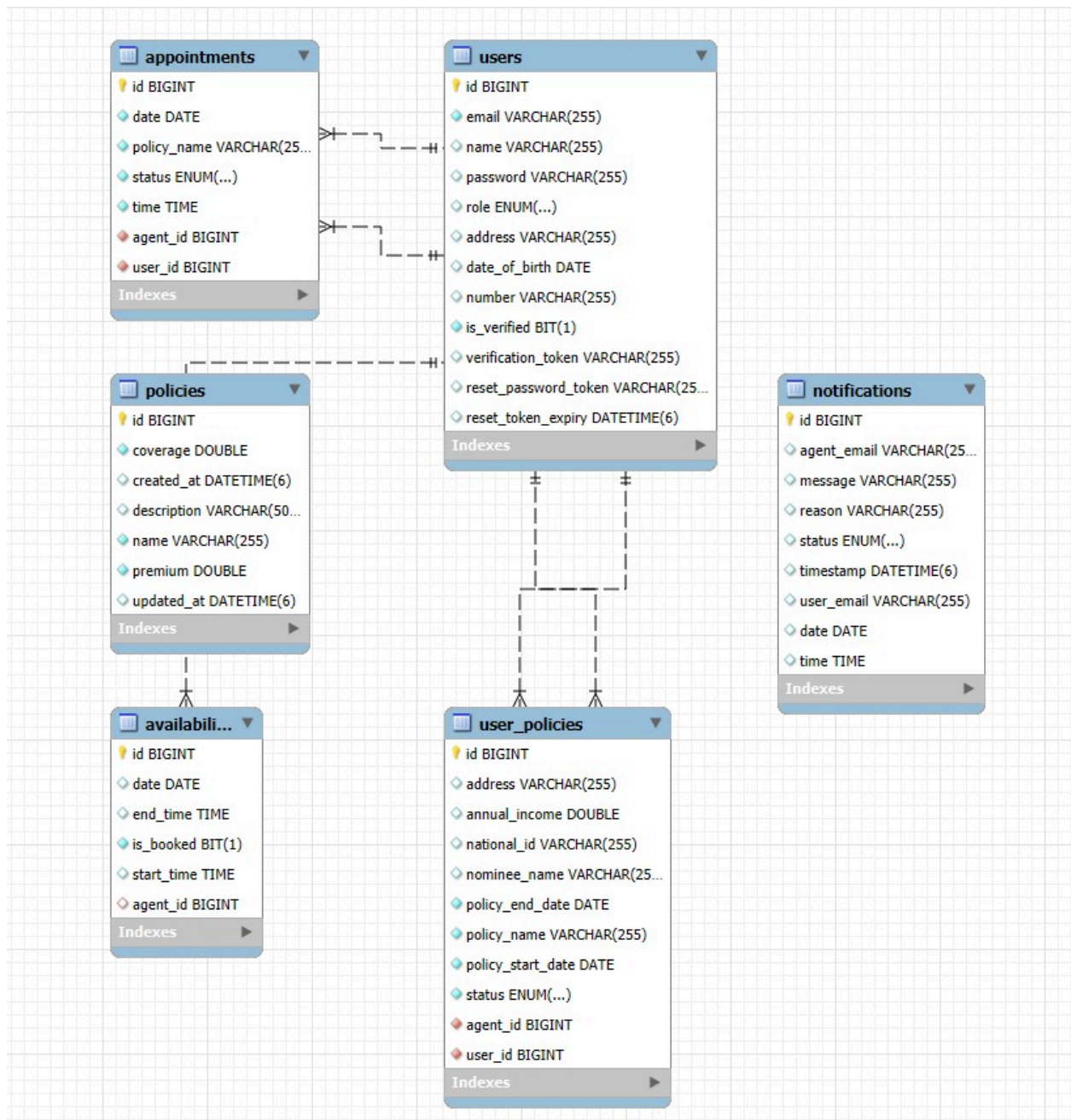 Admin Sequence Diagram – Manage Users, Agents, Policies
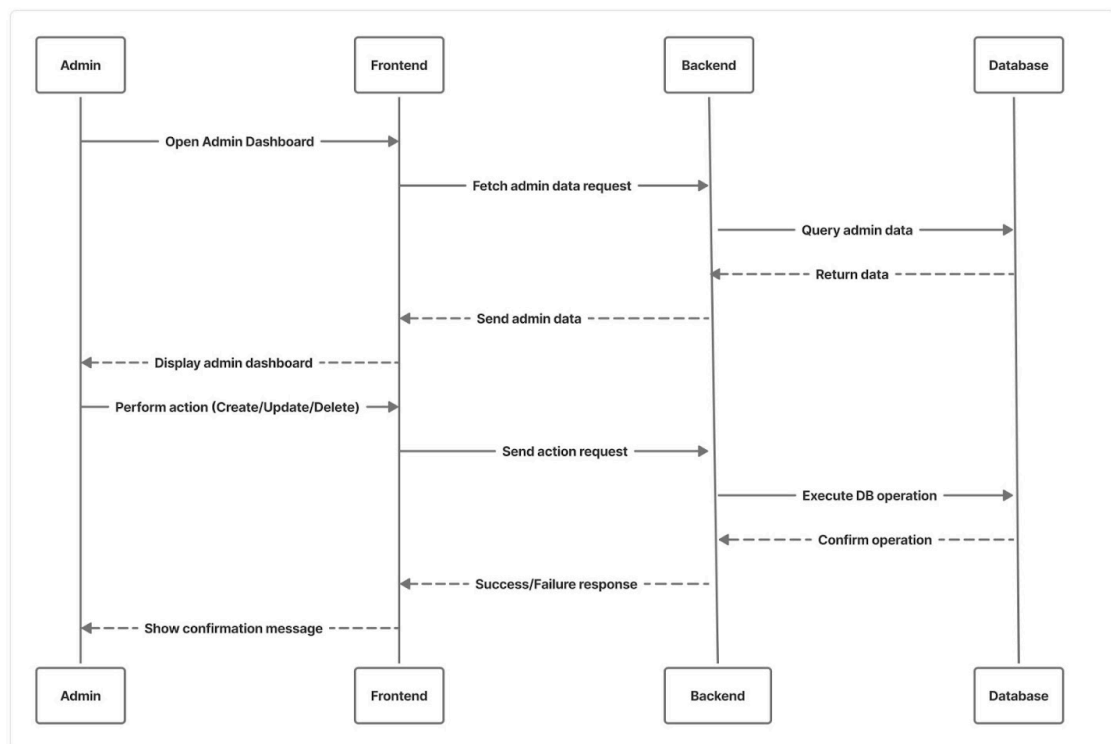
6.4 Data Flow Diagram
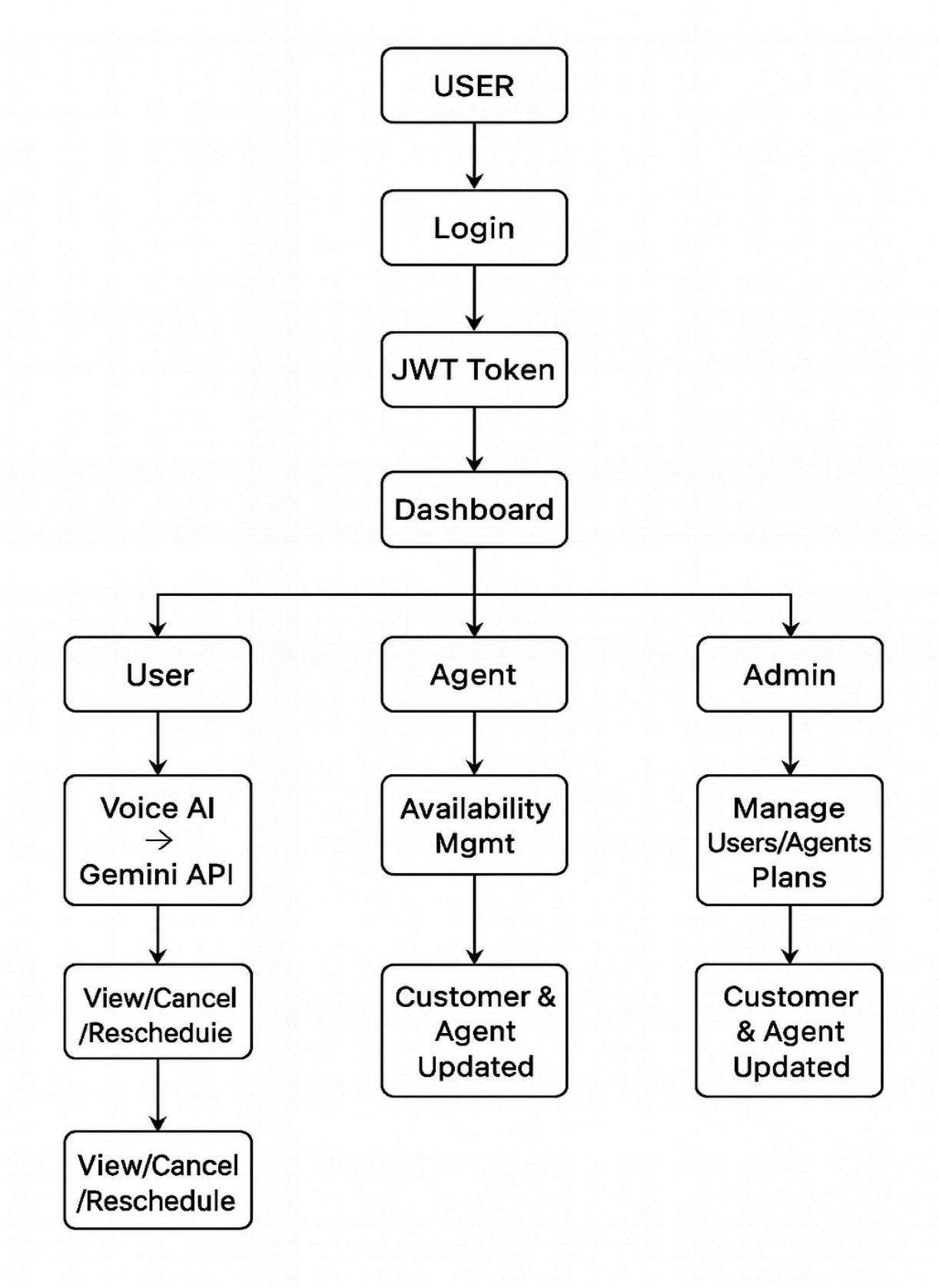
6.5 Class Diagram

[Diagram Placeholder – Entities: User, Agent, Appointment, PolicyPlan, Notification, Availability]

7. MODULE OVERVIEW

The InsurAI Corporate Policy Application consists of the following key modules:

1. User Authentication (JWT)
2. Voice Recognition (AI Query System)
3. Agent Availability Management
4. Appointment Scheduling Interface
5. Appointment Management
6. Plan Information Management (Purchased Policies)
7. Notification System
8. Admin Dashboard

8. IMPLEMENTATION

Module 1: User Authentication & Authorization (JWT)

- Handles user login, registration, and secure access using JSON Web Tokens.

- Includes workflow and UI screenshots demonstrating implementation.

Key Features:

- **User Registration** (role-based: User / Agent / Admin)
- **User Login** with JWT Token Generation
- **Refresh Token Mechanism** for session continuity
- **Role-Based Access Control (RBAC)**
- **Password Reset** functionality
- **Email Verification** to prevent unauthorized access

Package Structure

- Com.insurai.controller
- Com.insurai.service
- Com.insurai.config
- Com.insurai.entity
- Com.insurai.repository
- Com.insurai.dto

Backend Files:

- controller/AuthController.java
- service/AuthService.java
- config/JwtAuthenticationFilter.java
- config/SecurityConfig.java
- entity/User.java
- repository/UserRepository.java

Module 2: Voice Recognition – AI Customer Query System

This module enables users to interact with the InsurAI system using voice commands. It converts speech to text and processes the request using **Gemini AI**, which responds with relevant insurance information. The module improves accessibility and enhances the overall user experience with real-time intelligent assistance.

Key Features

- **Speech-to-Text Conversion** for natural communication
- Queries sent to **Gemini AI Model**
- Provides instant **policy details**
- Guides users with **claim procedures**
- AI-based answers to **FAQs**
- Integrated **voice assistant UI button** for interactive usage

Backend Files

- service/GeminiService.java
- controller/AiController.java

Role in System

- Makes customer support faster and automated
- Reduces dependency on manual agent responses
- Enhances accessibility for users facing digital interaction barriers

Module 3: Agent Availability Management

This module manages the working schedules of insurance agents within the InsurAI system. Agents can define and update their availability, ensuring that customers can view only valid time slots while booking appointments. This improves efficiency and eliminates scheduling conflicts.

Key Features

- Agents can add, update, or delete their availability schedule (CRUD operations)
- Availability includes date, time slot, and agent ID
- Customers can view available agents in real time during appointment booking
- Ensures conflict-free scheduling and prevents double bookings
- Admin can monitor agent activity and availability status

Purpose in System

- Helps agents manage workload efficiently
- Improves customer convenience by showing real-time slots
- Forms a core dependency for the Appointment Scheduling module

Module 4: Appointment Scheduling Interface

Features:

1. **User Selection**
   - Choose an **Agent** from the available list.
   - Pick an **Available Time Slot**.
   - Specify **Reason for Appointment**.

2. **Backend Validations**

   - Check for **time slot conflicts** with existing appointments.
   - Save appointments if the slot is free.
   - **Trigger notifications** to relevant parties (agent/user).

   Frontend

- **Framework:** React

- **HTTP Requests:** Axios

- **UI Components:**

  - Calendar component for date selection.
  - Slot selector for choosing available times.
  - Form input for appointment reasons.

  Backend

- **REST API Endpoints:**

  - `GET /agents` → Fetch available agents.
  - `GET /agents/{id}/availability` → Fetch available time slots for selected agents.
  - `POST /appointments` → Create new appointments (with conflict check).

- **Business Logic:**

  - Validate slot availability.
  - Save appointment details in the database.
  - Send notification (email, SMS, or in-app).

Module 5: Appointment Management

Purpose:

Facilitates seamless scheduling, updating, and tracking of appointments between customers and agents. Ensures conflict-free booking, real-time status updates, and efficient coordination.

Features:

- View Appointments: Customers and agents can view upcoming and past appointments.
- Auto Conflict Resolution: Prevents overlapping bookings and ensures smooth scheduling.
- Dynamic Status Updates: Appointment statuses change in real-time based on actions by customers or agents.

Appointment Statuses:

- PENDING: Appointment requested but not yet confirmed.
- CONFIRMED: Appointment successfully scheduled and confirmed.

Entities:

1. Appointment
   Attributes: `id, customer_id, agent_id, date, start_time, end_time, status, notes`

2. Agent
   Attributes: `id, name, specialization, availability`

3. Customer
   Attributes: `id, name, contact_info, preferences`

Module 6: Plan Information Management
 Manages customer policy and plan information, enabling updates, tracking, and administrative access to client data.

Features:

- **Customer Profile Management:** Customers can update their profile details (e.g., contact info, preferences).
- **Admin Access:** Admins can fetch and view client details for management or reporting purposes.
- **Policy Renewal Tracking:** Tracks policy start/end dates and renewal status to ensure timely actions.

Module 7: Notification System

Triggers

- **Appointment Confirmation**
    - Triggered when an appointment is successfully booked.
    - Sends a confirmation notification to the customer (and optionally the agent).

- **Appointment Reminder**
    - Triggered before the appointment date/time (configurable, e.g., 24 hours prior).
    - Send a reminder to ensure the customer does not miss the appointment.

- **Policy Renewal Reminder**
    - Triggered when a policy is nearing its end date (configurable, e.g., 7–15 days before expiry).
    - Send a renewal notification to the customer to avoid lapse.

Technologies Used

- **Spring Email Service**
    - Handles automated email notifications for all triggers.

- **Optional SMS Gateway**
    - Can be integrated to send SMS reminders in addition to emails.

Module 8: Admin Dashboard

Purpose:
Provides administrators with a centralized interface to monitor and manage users, agents, appointments, and policies efficiently.

Features:

- **View Total Users:** Quickly see the total number of customers registered.
- **Add/Edit/Delete Agents:** Manage agent records, including availability and contact info.
- **Manage Appointments:** View, confirm, cancel, or reschedule appointments.
- **Manage Policies:** Monitor policy status, renewals, and updates.
- **Notification Panel:** Centralized alerts for appointments, policy renewals, and other important updates.

Modules Inside Dashboard:

1. **User Management** – Manage customer profiles and data.
2. **Agent Management** – Add, edit, or remove agents and track their availability.
3. **Appointment Summary** – Overview of upcoming, past, and pending appointments.
4. **Plan Overview** – Summary of all policies, premiums, and renewal statuses.

9. TESTING & OUTPUT

• API testing using Postman
• UI testing with React DevTools
• Test scenarios: Login, Appointment Booking, Policy Fetching, Notifications
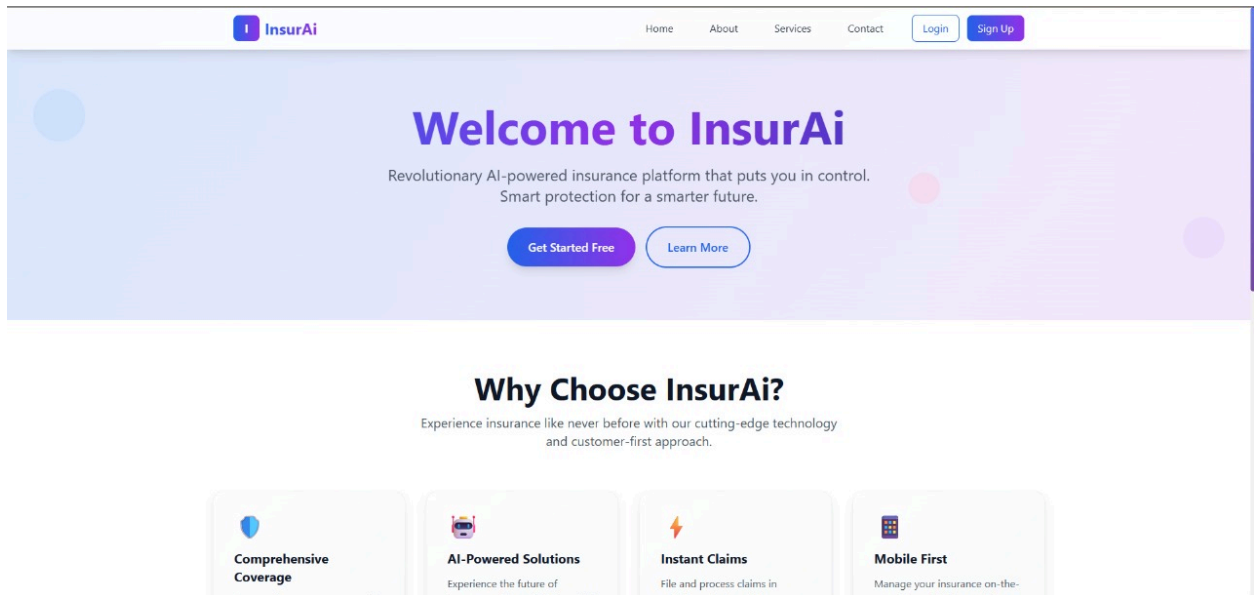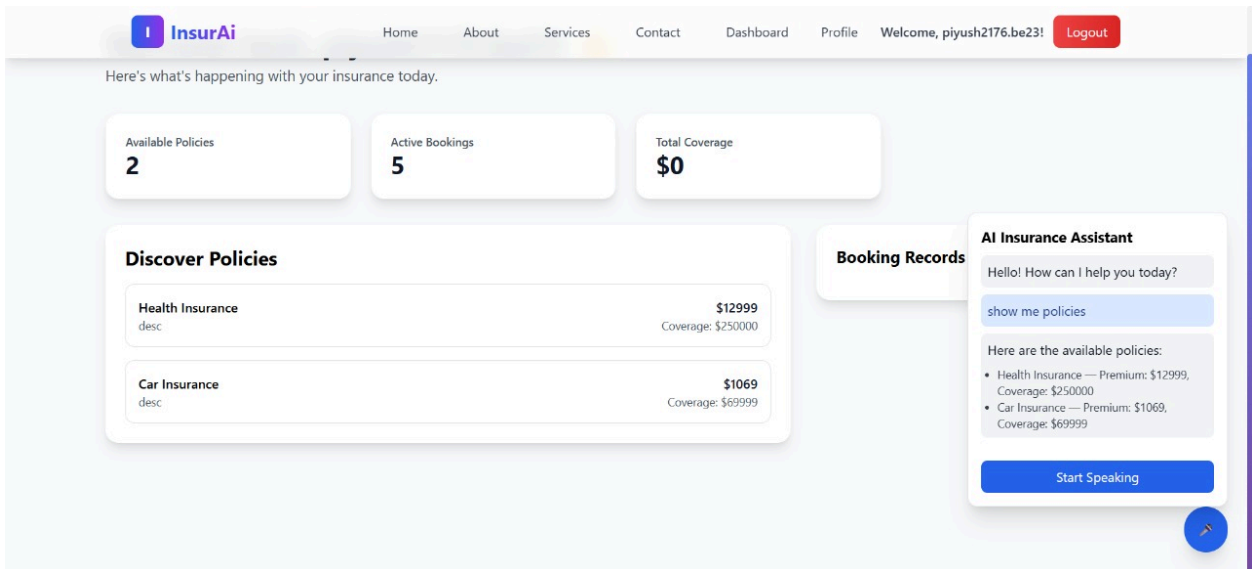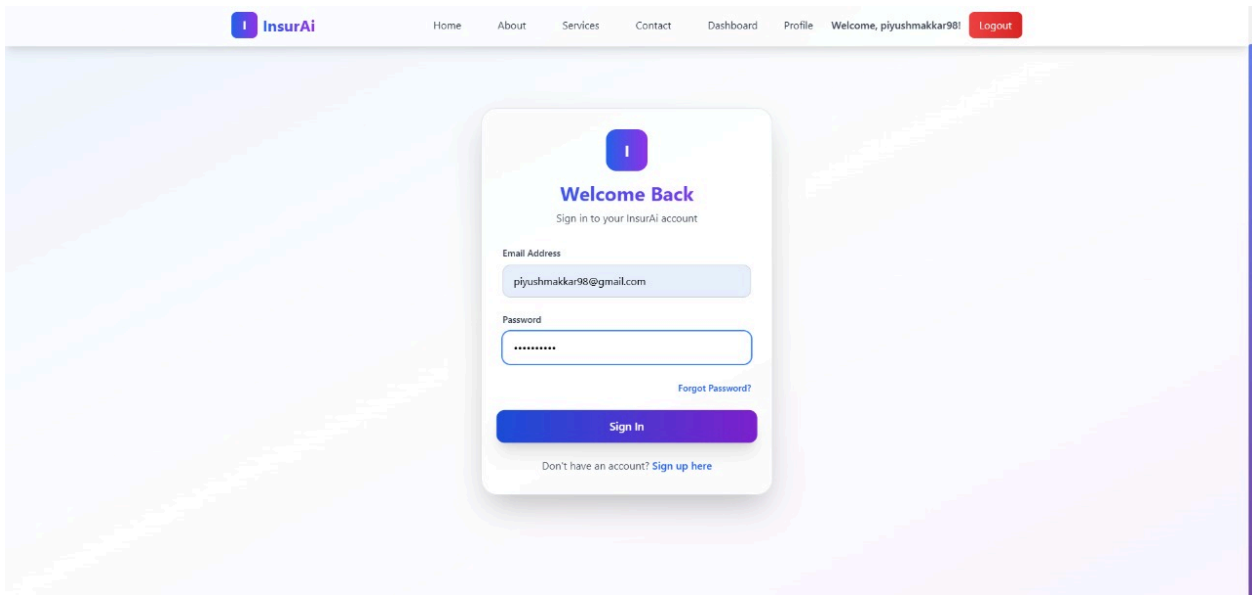
Add Availability

Date
05-11-2025

Start Time
07:15 PM

End Time
08:15 PM

Add Slot

Upcoming Appointments

No upcoming appointments.

My Availability Slots

2025-11-04 from 20:15:00 to 21:15:00   Free

2025-11-04 from 21:17:00 to 22:17:00   Free

2025-11-04 from 23:17:00 to 23:22:00   Free

Manage your account information and your policy details

Piyush
piyush2176.be23@chitkara.edu.in
Member since October 2022

Edit Profile

Full Name
Piyush

Email
piyush2176.be23@chitkara.edu.in

Phone Number

Date of Birth
dd-mm-yyyy

Address

My Policies

Car Insurance
Provided By: Piyush
Policy Ending On: 2026-11-04

ACTIVE   Update Details

Profile Stats

Active Policies   1

Years with us   2

Savings $2,400

Quick Actions

Change Password

Download Policies

Notification Settings

Logout

Recent Activity

Policy Renewal   Completed
2024-10-01

Claim Filed   Processing

10. CONCLUSION

InsurAI successfully automates corporate insurance workflows by integrating AI-driven solutions, secure authentication, and a scalable system architecture. The platform enhances customer experience through efficient appointment scheduling, policy management, and real-time notifications, while significantly reducing manual effort for agents and administrators. Its modular design ensures flexibility, maintainability, and the ability to scale with growing business needs.

12. FUTURE ENHANCEMENTS

• Real-time WebSocket notifications
• Policy recommendation using ML
• Multi-language AI voice support
• Admin analytics dashboard improvements

13. REFERENCES

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2. ReactJS Official Documentation – https://react.dev/
3. MySQL Reference Manual – https://dev.mysql.com/doc/
4. Java Persistence API (JPA) Guide – https://jakarta.ee/specifications/persistence/
5. Spring Email Service – https://spring.io/guides/gs/sending-email/
6. AI & Voice Recognition Overview – Relevant whitepapers or documentation of chosen AI service (e.g., Gemini API)