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Building a Sustainable Commute: A Carpooling Web Application

In an industrial complex, private passenger cars are a prevalent form of transport, often carrying only one occupant. This leads to various issues such as pollution, traffic congestion, limited parking space, and wasted time. Carpooling presents a solution by reducing individual travel costs, including fuel and tolls, and alleviating the stress of driving. It is a simple yet effective method that can address several urban challenges, from energy consumption and traffic congestion to environmental pollution. Authorities frequently advocate for carpooling, particularly during periods of high pollution and fuel prices.

To address these issues, we propose a web-based application that facilitates carpooling by connecting individuals seeking rides along similar routes. The platform will provide real-time information on available vehicles, estimated travel times, and optimal routes for efficient pooling. It will utilize GPS tracking for real-time vehicle monitoring and ensure safety, particularly for women users. By promoting a safe carpooling culture and reducing traffic congestion, carpooling not only saves costs but also offers social and environmental benefits by reducing vehicle emissions and the need for extensive infrastructure development.

Tech Stack

Frontend: React.js for building the user interfaceReact Router for client-side routingBootstrap or Material-UI for UI components and styling.

Backend: Node.js with Express.js for building the API and server-side logicMongoDB for the database using Mongoose.js for object modeling.

Authentication and Security: JSON Web Tokens (JWT) for authentication, BCRYPT for password hashing and encryption and HTTPS for secure communication.

Mapping and Geolocation: Leaflet.js for mapping and displaying locationsGeolocation API for getting user's current location if needed.

Communication: Axios or Fetch API for making HTTP requests between frontend and backend.

Features:

1.User Registration and Authentication:

Users register with the application using their email or social media accounts.

Implement authentication using JWT (JSON Web Tokens) for secure access to the application.

2.User Profile Creation:

Users create a profile including details such as name, contact information, and preferred routes.

Allow users to specify their car details if they're offering rides.

3.Ride Posting:

Users offering rides can create a ride posting specifying the starting point, destination, departure time, and any preferences (e.g., smoking or non-smoking, pet-friendly).

Implement a form for users to input these details.

4.Ride Search and Booking:

Users seeking rides can search for available rides based on their desired route and departure time.

Display search results with relevant ride information.

Implement a booking system where users can request to join a ride.

5.Real-Time GPS Tracking:

Integrate GPS tracking to monitor the real-time location of vehicles.

Display the location of vehicles on a map interface for users to track their rides.

6.Optimal Routing and Allocation:

Use routing algorithms to calculate optimal routes for rides based on the starting point, destination, and traffic conditions.

Implement an algorithm to allocate users to rides efficiently, considering factors such as proximity and capacity.

7.Notifications:

Send notifications to users for ride requests, approvals, and updates on ride status.

Implement email or push notifications using services like SendGrid or Firebase Cloud Messaging.

8.Safety Features:

Implement safety features such as user verification, emergency contact information, and reporting mechanisms for inappropriate behavior.

Enable users to share their trip details with trusted contacts for added security.

9.Payment Integration:

Integrate payment processing for users to handle ride payments securely within the application.

Utilize third-party payment gateways such as Stripe or PayPal for seamless transactions.

10.Admin Dashboard:

Create an admin dashboard for managing users, rides, and resolving disputes.

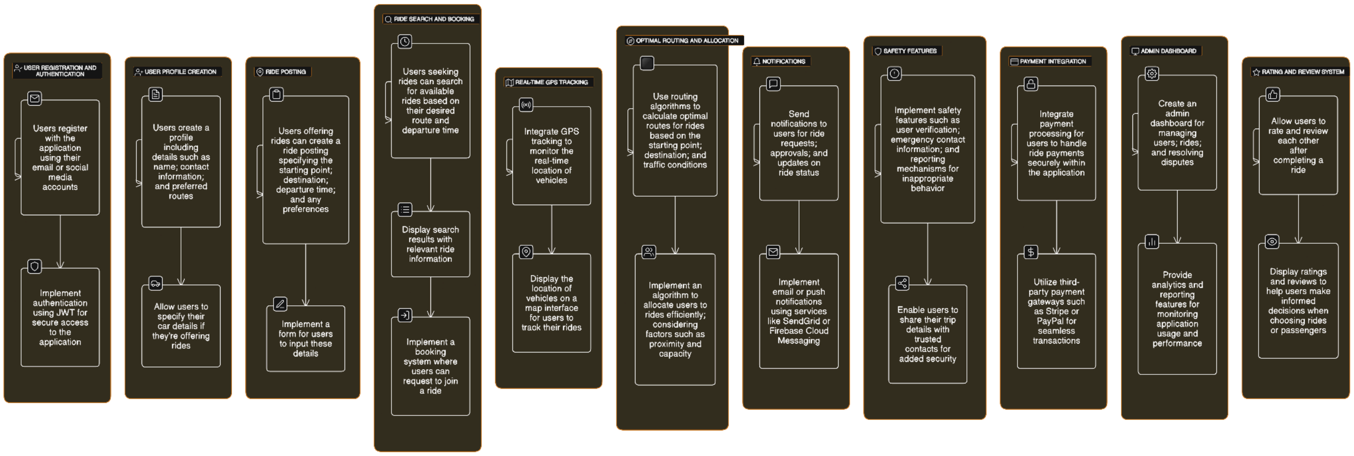
Provide analytics and reporting features for monitoring application usage and performance.

11.Rating and Review System (Optional):

Allow users to rate and review each other after completing a ride.

Display ratings and reviews to help users make informed decisions when choosing rides or passengers.

Blueprint of Carpooling Web Application



USER REGISTRATION AND AUTHENTICATION

Users register with the application using their email or social media accounts

Implement authentication using JWT for secure access to the application

USER PROFILE CREATION

Users create a profile including details such as name; contact information; and preferred routes

Allow users to specify their car details if they're offering rides

RIDE POSTING

Users offering rides can create a ride posting specifying the starting point; destination; departure time; and any preferences

Implement a form for users to input these details

RIDE SEARCH AND BOOKING

Users seeking rides can search for available rides based on their desired route and departure time

Display search results with relevant ride information

Implement a booking system where users can request to join a ride

REAL-TIME GPS TRACKING

Integrate GPS tracking to monitor the real-time location of vehicles

Display the location of vehicles on a map interface for users to track their rides

OPTIMAL ROUTING AND ALLOCATION

Use routing algorithms to calculate optimal routes for rides based on the starting point; destination; and traffic conditions

Implement an algorithm to allocate users to rides efficiently; considering factors such as proximity and capacity

NOTIFICATIONS

Send notifications to users for ride requests; approvals; and updates on ride status

Implement email or push notifications using services like SendGrid or Firebase Cloud Messaging

SAFETY FEATURES

Implement safety features such as user verification; emergency contact information; and reporting mechanisms for inappropriate behavior

Enable users to share their trip details with trusted contacts for added security

PAYMENT INTEGRATION

Integrate payment processing for users to handle ride payments securely within the application

Utilize third-party payment gateways such as Stripe or PayPal for seamless transactions

ADMIN DASHBOARD

Create an admin dashboard for managing users; rides; and resolving disputes

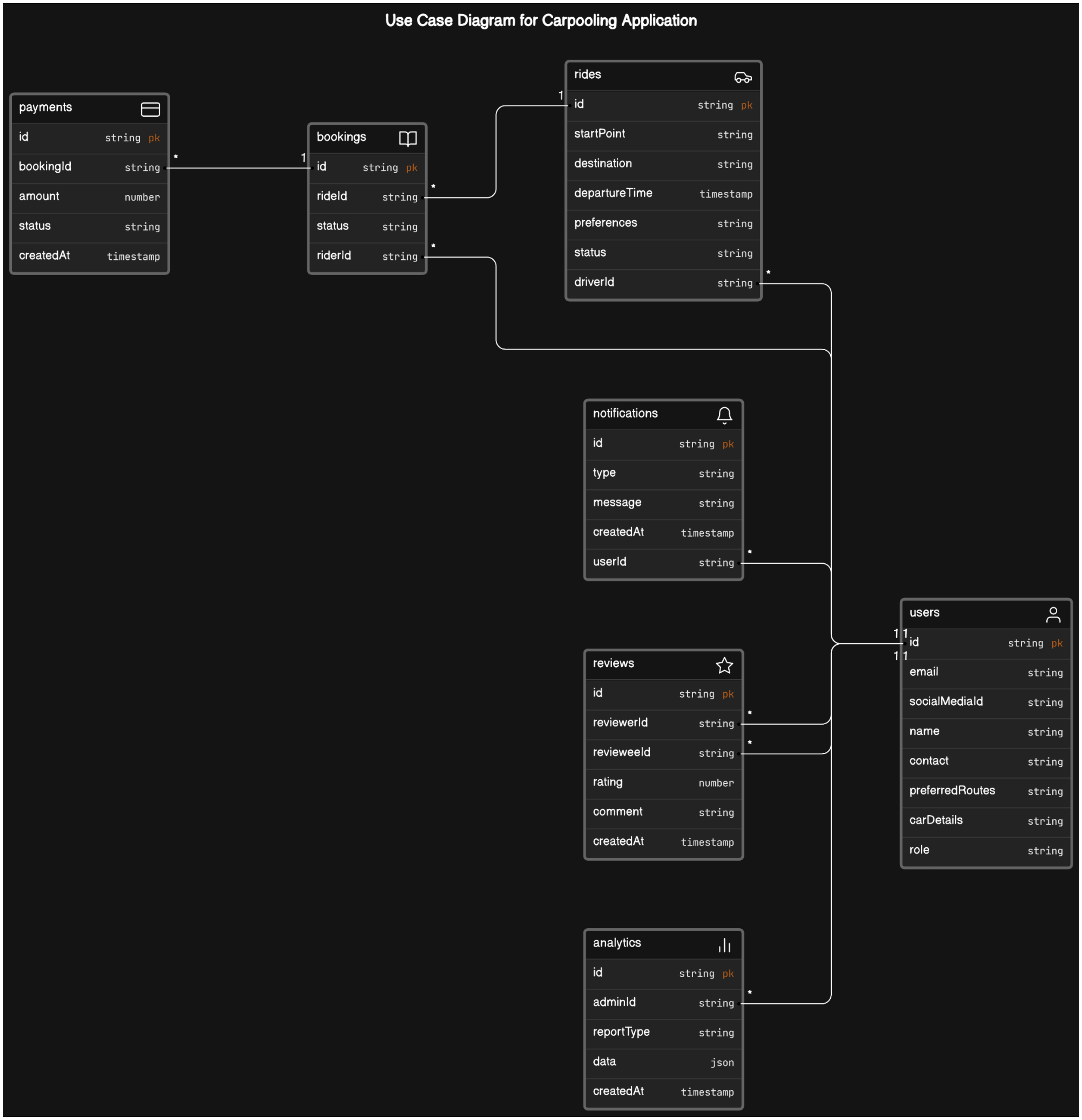
Provide analytics and reporting features for monitoring application usage and performance

RATING AND REVIEW SYSTEM

Allow users to rate and review each other after completing a ride

Display ratings and reviews to help users make informed decisions when choosing rides or passengers

Use-Case Diagram



Use Case Diagram for Carpooling Application

payments		
id	string	pk
bookingId	string	
amount	number	
status	string	
createdAt	timestamp	

bookings		
id	string	pk
rideId	string	
status	string	
riderId	string	

rides		
id	string	pk
startPoint	string	
destination	string	
departureTime	timestamp	
preferences	string	
status	string	
driverId	string	

notifications		
id	string	pk
type	string	
message	string	
createdAt	timestamp	
userId	string	

reviews		
id	string	pk
reviewerId	string	
revieweeId	string	
rating	number	
comment	string	
createdAt	timestamp	

analytics		
id	string	pk
adminId	string	
reportType	string	
data	json	
createdAt	timestamp	

users		
id	string	pk
email	string	
socialMediaId	string	
name	string	
contact	string	
preferredRoutes	string	
carDetails	string	
role	string	