

Vehicle Rental System

Project submitted to the

SRM University – AP, Andhra Pradesh

for the partial fulfilment of the requirements to award the degree of

Bachelor of Technology

in

Computer Science and Engineering

(Software Engineering)

Submitted by

Gopichand Medisetty (AP21110010167)

Vaishnavi Ratnam Movva (AP21110010169)

Vaishnavi Devineni (AP21110010170)

Arjun Promod (AP21110010192)



SRM University–AP

Neerukonda, Mangalagiri, Guntur

Andhra Pradesh – 522 240

[May, 2024]

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Abstract

In today's fast-paced world, the demand for efficient and convenient transportation solutions is ever-growing. The Online Vehicle Rental System (OVRs) addresses this need by providing a seamless platform for users to rent vehicles of their choice with ease and flexibility. OVRs offers a diverse range of vehicles, including cars, motorcycles, and even specialized vehicles like vans and trucks, catering to various transportation needs. Through a user-friendly interface and advanced booking features, OVRs ensures a hassle-free experience for both customers and vehicle owners.

Key features of OVRs include real-time vehicle availability, secure online payments, GPS tracking for enhanced security, and personalized user profiles for quick bookings. The system also incorporates feedback mechanisms to continually improve service quality and user satisfaction. By leveraging the power of technology and innovation, OVRs revolutionizes the way people access transportation services, saving time and effort while promoting sustainable mobility practices. Whether for daily commutes, leisure travel, or business purposes, OVRs stands as a reliable partner in fulfilling transportation needs.

Join our OVRs community today and experience the convenience, reliability, and affordability of modern vehicle rental services at your fingertips.

Introduction

In the digital age of rapid advancements and evolving lifestyles, the Online Vehicle Rental System (OVRs) emerges as a transformative solution, redefining how individuals and businesses access transportation services. With OVRs, the boundaries of convenience and flexibility are pushed, offering a seamless platform where users can effortlessly rent vehicles of their choice, tailored to their unique needs and preferences.

OVRs is not just a rental platform; it's a gateway to a world of possibilities. From compact cars for urban explorations to rugged trucks for commercial endeavors, OVRs boasts a diverse fleet that caters to a wide range of preferences and purposes. This versatility, coupled with intuitive browsing and booking features, makes OVRs a one-stop destination for all transportation requirements.

At the heart of OVRs is a commitment to user-centric design and technological innovation. The platform's intuitive interface guides users through a streamlined booking process, where real-time vehicle availability updates and secure payment gateways ensure a smooth and hassle-free experience. Users can rest assured that their transactions are safe, their bookings are accurate, and their journeys are seamless.

OVRs goes beyond mere rentals; it fosters a sense of community and connectivity. Through personalized user profiles, feedback mechanisms, and loyalty programs, OVRs builds lasting relationships with its users, understanding their preferences, anticipating their needs, and continuously enhancing their overall experience. This human-centric approach sets OVRs apart in an increasingly digital landscape.

The adaptability of OVRs is another hallmark of its success. Whether users need a vehicle for a few hours, a weekend getaway, or an extended road trip, OVRs offers flexible rental periods and customizable packages to suit every scenario. This adaptability, combined with transparent pricing and no hidden costs, makes OVRs a transparent and trustworthy choice for discerning users.

OVRs doesn't just facilitate rentals; it promotes responsible and sustainable mobility practices. By optimizing fleet management, encouraging shared vehicle usage, and integrating eco-friendly options, OVRs contributes to reducing carbon footprints and promoting environmental stewardship. Users can embark on their journeys with the confidence that OVRs is committed to a greener future.

The journey of OVRs is a testament to innovation and resilience. From its inception as a vision for modernizing transportation services to its realization as a robust and reliable platform, OVRs has overcome challenges, embraced opportunities, and emerged as a leader in the online vehicle rental industry. Its success story is a reflection of its dedication to excellence and its unwavering focus on user satisfaction.

As we delve deeper into the intricacies of OVRs in the following sections, we unravel the layers of its architecture, explore its array of features and functionalities, analyze its market impact, and envision its future trajectory. OVRs isn't just a rental system; it's a driving force behind a paradigm shift in how we perceive and engage with transportation services in the digital age.

Overview:

- The Vehicle Rental App is a comprehensive platform designed to facilitate vehicle rental services.
- Users can easily search, book, and manage vehicle rentals through the application.

Importance of Car Rental Management Systems:

- Car rental management systems streamline the rental process, making it efficient and convenient for both customers and rental companies.
- Features such as online booking, inventory management, and payment processing enhance the overall rental experience.
- Such systems improve operational efficiency, increase revenue, and provide valuable insights for business growth.

Existing System/ Literature Survey

Overview of ZoomCar:

Zoomcar is a leading player in the vehicle rental industry, offering self-drive car rental services across various cities in India. The Zoomcar website provides users with a convenient platform to book vehicles, manage reservations, and access a wide range of rental options, including hatchbacks, sedans, SUVs, and luxury cars.

Advantages of Zoomcar Website:

- **Wide Range of Vehicles:** Zoomcar boasts a diverse fleet of vehicles, catering to different preferences, budgets, and travel needs. Users can choose from economy cars for daily commutes to premium vehicles for special occasions, ensuring flexibility and variety.
- **Self-Drive Convenience:** One of the key advantages of Zoomcar is its self-drive model, empowering users to drive vehicles at their own pace and schedule. This flexibility appeals to customers seeking independence and control over their travel experiences.
- **Online Booking:** The Zoomcar website offers a seamless booking process, allowing users to search for available vehicles based on location, date, and duration. The online reservation system streamlines the booking process, eliminating the need for manual inquiries or reservations.
- **Transparent Pricing:** Zoomcar adopts transparent pricing policies, displaying rental rates, taxes, and additional charges upfront during the booking process. This transparency enables users to make informed decisions and budget effectively for their rentals.
- **User-Friendly Interface:** The Zoomcar website features a user-friendly interface with intuitive navigation, vehicle categorization, and filtering options. Users can easily compare vehicle features, view rental inclusions, and select add-on services like GPS navigation or insurance coverage.

- **Mobile App Integration:** Zoomcar offers a mobile app that complements the website, providing users with on-the-go access to bookings, trip details, navigation assistance, and customer support. The app enhances convenience and accessibility for users across devices.

Limitations of Zoomcar Website:

- **Availability Constraints:** While Zoomcar operates in multiple cities, availability may vary based on demand, location, and seasonal factors. Users may encounter challenges in securing desired vehicles during peak periods or in certain locations.
- **Vehicle Condition:** As Zoomcar relies on a self-drive model, vehicle condition and cleanliness can vary based on user usage and maintenance standards. Occasional discrepancies in vehicle cleanliness or minor damages may impact the overall user experience.
- **Booking Flexibility:** Zoomcar's booking policies include predefined rental periods (e.g., hourly, daily, weekly), limiting spontaneous or last-minute booking options. Users may find it challenging to secure immediate rentals during peak hours or short notice.
- **Insurance Coverage:** While Zoomcar offers insurance coverage options for rentals, users may encounter complexities or limitations in understanding insurance terms, coverage exclusions, claim procedures, and liability responsibilities.

Literature Survey:

In addition to Zoomcar, several research studies and comparative analyses in the vehicle rental domain provide insights into industry trends, customer preferences, technological advancements, and best practices. These studies explore topics such as:

- **Optimizing Fleet Management:** Research projects focus on optimizing fleet operations, vehicle allocation algorithms, predictive maintenance, and route optimization to enhance efficiency and reduce operational costs.
- **User Experience and Satisfaction:** Literature surveys examine user experiences, satisfaction levels, feedback mechanisms, and customer loyalty strategies implemented by leading rental services to improve service quality and retention rates.
- **Technology Integration:** Comparative analyses evaluate the integration of technology, including AI/ML algorithms, IoT devices, mobile apps, and data analytics, in enhancing rental services' capabilities, improving decision-making, and personalizing user experiences.

By incorporating insights from existing systems like Zoomcar and relevant literature surveys, OVRS can gain valuable insights into industry best practices, user expectations, technological innovations, and potential areas for improvement and differentiation within the vehicle rental sector.

System Requirements

Software Requirements:

- Web Browser: Users should have access to modern web browsers such as Google Chrome, Mozilla Firefox, Safari, or Microsoft Edge. Ensure that the website is compatible with the latest versions of these browsers for optimal performance and functionality.
- Operating System: The website should be accessible across major operating systems including Windows, macOS, Linux, iOS, and Android to cater to a diverse user base.
- Internet Connectivity: Users must have a stable and reliable internet connection to access the website, browse vehicle listings, make bookings, and interact with the rental system seamlessly.
- Plug-ins or Extensions: If your website utilizes any plug-ins or browser extensions for enhanced functionality (e.g., Google Maps integration for location services), inform users to have these plug-ins installed and updated.

Hardware Requirements:

- Computing Device: Users should have access to a computing device such as a desktop computer, laptop, tablet, or smartphone with sufficient processing power and memory to run the web browser and render the website effectively.
- Input Devices: Users should have input devices such as a keyboard, mouse, touchpad, or touchscreen depending on the device they are using to navigate and interact with the website. Ensure that the website supports touch gestures for mobile devices if applicable.
- Graphics and Display: The website should be visually appealing and optimized for graphics rendering. Users should have a display device capable of displaying colors accurately for an enhanced user experience.
- RAM And Processor: A modern multi-core processor such as Intel Core i3 , i5 or AMD Ryzen 5 is sufficient for our applications. A minimum of 8GB RAM is recommended to run our application.

Proposed System

TECHNOLOGIES USED

Frontend

- React: A JavaScript library for building user interfaces.
- Ant Design: A React UI library with a set of high-quality components and styles.
- Next.js: A React framework for server-rendered React applications.

Backend

- Node.js: A JavaScript runtime environment for executing JavaScript code server-side.
- Express.js: A web application framework for Node.js.
- MongoDB: A NoSQL database for storing application data.

Other Technologies:

- Redux Toolkit: A state management library for React applications.
- Axios: A promise-based HTTP client for making API requests.
- JWT: JSON Web Tokens for user authentication and authorization

PROJECT STRUCTURE

- Components: React components for different sections (e.g., profile, layout).
- Config: Setup files like database configuration.
- Helpers: Useful functions like token validation and form validation.
- Models: Definitions for database schemas using Mongoose (e.g., bookings, cars, users).
- Redux: State management setup with slices for users and loaders.
- Stylesheets: CSS files for styling, including common and custom classes.
- Middleware: Logic for authentication and routing.
- Other: Entry points, API routes, and environment configuration.

AUTHENTICATION AND AUTHORIZATION

- User Registration and Login: Users can register and log in to access the system.
- Token-Based Authentication: Implemented using JSON Web Tokens (JWT) for secure authentication.
- Authorization: Different levels of access based on user roles (e.g., admin, regular user).
- Middleware for Route Protection: Middleware ensures that protected routes are only accessible to authenticated users.

DATABASE INTERACTION

- MongoDB Database: Utilized MongoDB as the database management system. Schema-based modeling for structured data storage.
- Mongoose Library: Interacted with MongoDB using Mongoose, an Object Data Modeling (ODM) library for Node.js and MongoDB. Defined schemas for user, car, and booking data models.
- CRUD Operations: Implemented CRUD (Create, Read, Update, Delete) operations for managing users, cars, and bookings. Ensured data integrity and consistency through database transactions.

FRONTEND COMPONENTS

- React Framework: Built the frontend using React, a JavaScript library for building user interfaces.
- Ant Design Library: Utilized Ant Design, a React UI library with a set of high-quality components and layouts. Streamlined the development process with pre-built UI components like forms, tables, and modals.
- Redux State Management: Implemented Redux for state management, providing a centralized store for application-wide data. Separated UI state from server data, enhancing scalability and maintainability.

- Custom Components: Developed custom components for specific application requirements, such as spinners, form fields, and layouts.

REDUX STATE MANAGEMENT

- Centralized Store: Redux manages the application's state in a single store. Ensures a single source of truth, enhancing predictability and debugging.
- Reducers and Actions: Reducers specify how the state changes in response to actions. Actions trigger state changes across the application.
- Slice Creation: Redux Toolkit simplifies state management with slices. Slices encapsulate reducers and action creators for concise code.
- Async Operations: Redux Thunk handles asynchronous tasks like API requests. Ensures consistent state management during data fetching and updating.

MIDDLEWARE

- Route Protection:

Middleware ensures secure access to routes.

Validates user authentication before rendering protected routes.

Redirects unauthorized users to login page.

- Implementation Details:

Utilizes Next.js middleware for server-side route protection.

Checks user authentication status using tokens stored in cookies.

Redirection to appropriate routes based on user authentication status.

CONFIGURATION AND ENVIRONMENT

Connection to MongoDB Atlas using Mongoose.

Environmental variable for MongoDB URL.

- JWT Secret:

Environmental variable for JWT secret key.

Used for token generation and validation.

- Domain Configuration:

Environmental variable for application domain.

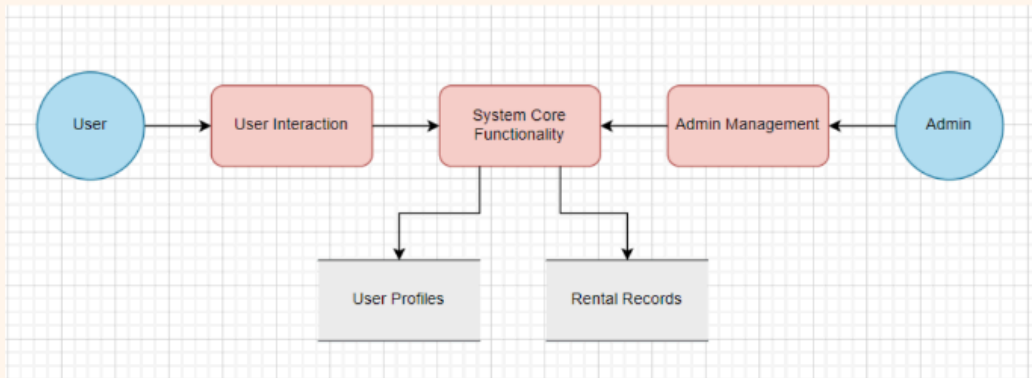
Ensures consistency across deployment environments.

- Stripe Integration:

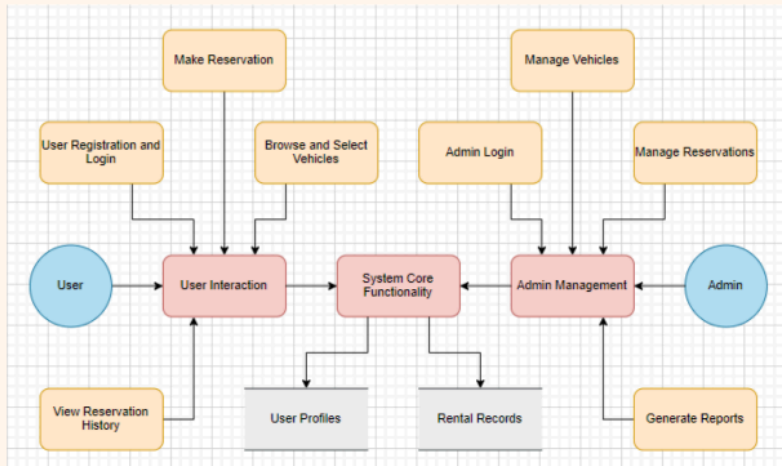
Environmental variables for Stripe publishable and secret keys.

Facilitates secure payment processing.

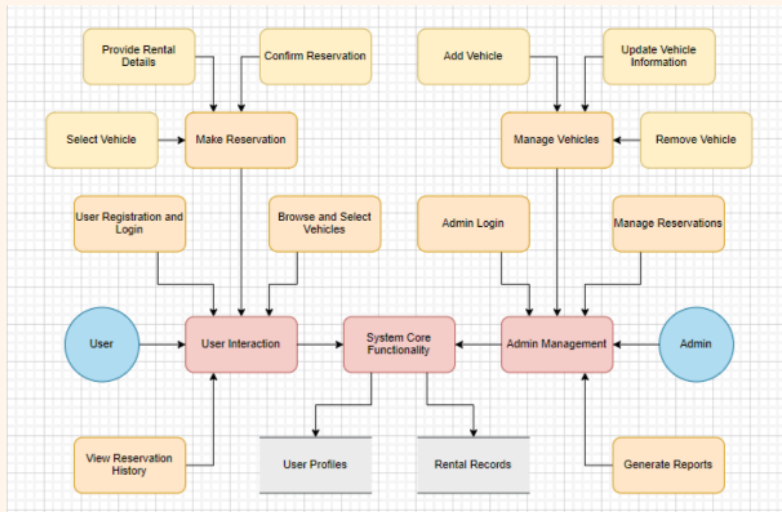
DFD Level 0



DFD Level 1



DFD Level 2



Modules:

- Authentication and Authorization Module:
 1. User registration (UserModel.js).
 2. User authentication (LayoutProvider.jsx, middleware.js).
 3. Token validation (tokenValidation.js).
 4. Validation helpers (validationHelpers.js).
 5. Redux slices for managing users and loaders (usersSlice.js, loadersSlice.js).

6. package.json for dependencies related to authentication and authorization.
- Database Interaction Module:
 1. MongoDB configuration (dbConfig.js).
 2. Mongoose schemas for users, cars, and bookings (userModel.js, carModel.js, bookingModel.js).
 3. package.json for dependencies related to database interaction (e.g., mongoose).
 - API Routes Module:
 1. Routes for user-related APIs (/api/users, /api/users/currentuser, /api/users/logout).
 2. Routes for booking-related APIs (possibly not included in the provided code snippets).

Frontend Components Module:

- React components for user interface:
 1. LayoutProvider.jsx: Manages layout and navigation.
 2. Spinner.jsx: Displays loading spinner.
 3. Users.jsx: Manages user management interface.
 4. CSS stylesheets for styling components (commonClasses.css, customClasses.css).
- Redux Store Module:
 1. Redux store configuration (store.js).
 2. Redux slices for managing users and loaders (usersSlice.js, loadersSlice.js).
- Middleware Module: Middleware for route protection and redirection (middleware.js).
- Configuration Module: Environment variables configuration (.env).
Stripe configuration for payment integration (stripe_publishable_key, stripe_secret_key).

Functionalities which we implemented in this project :

- User Authentication and Authorization:
 - I. Users can register and log in using their email and password.
 - II. Upon successful authentication, users are provided with a JWT token stored in cookies.
 - III. Middleware ensures that authenticated users have access to protected routes while redirecting unauthorized users to the login page.
- Profile Management:
 - I. Authenticated users can view and update their profiles.
 - II. The LayoutProvider component displays the user's name and provides a logout option.
- User Management (Admin Functionality):
 - I. Administrators have access to a user management interface (Users component) where they can view all users and toggle their active status.
 - II. User data is fetched from the backend API and displayed in a table format using Ant Design components.
 - III. Admins can update user status (active/inactive) using dropdown selections.
- Car Management (Admin Functionality):
 - I. There's likely functionality for managing cars, although it's not explicitly provided in the code snippets shared.
 - II. Similar to user management, admins would be able to view and possibly update car information.
- Booking System:
 - I. Users can book cars for specific time slots.
 - II. The booking process involves selecting a car, specifying the booking duration, and making payment (Stripe integration).
 - III. Bookings are stored in the database with details such as the car, user, time slots, and payment information.

IV. Statuses for bookings include pending, approved, and rejected.

- Loading Indicators:
 - I. Loading indicators are displayed using a spinner component (Spinner.jsx) during asynchronous actions like data fetching and API requests.
 - II. Redux is used to manage loading state across the application, with actions dispatched to set loading status.
- Database Interaction:
 - I. MongoDB is used as the database backend, with Mongoose schemas defining the structure for user, car, and booking models.
 - II. Models are defined in the src/models directory, facilitating interactions with the database.
- Front End Styling:
 - I. Styling is applied using CSS classes defined in src/stylesheets/commonClasses.css and src/stylesheets/customClasses.css.
 - II. Ant Design components are utilized for UI elements such as tables and forms.

Results

Here is sample demo of our project for the end user

Step 1: Register for our website.

NEXTRIDE- REGISTER

✖ Name

Mike

✖ Email

Mike123@gmail.com

✖ Password

.....|

Register

Already have an account? [Login](#)

Step 2: If Already registered then go for login

NEXTRIDE- LOGIN

✖ Email

arjunpramod509@gmail.com

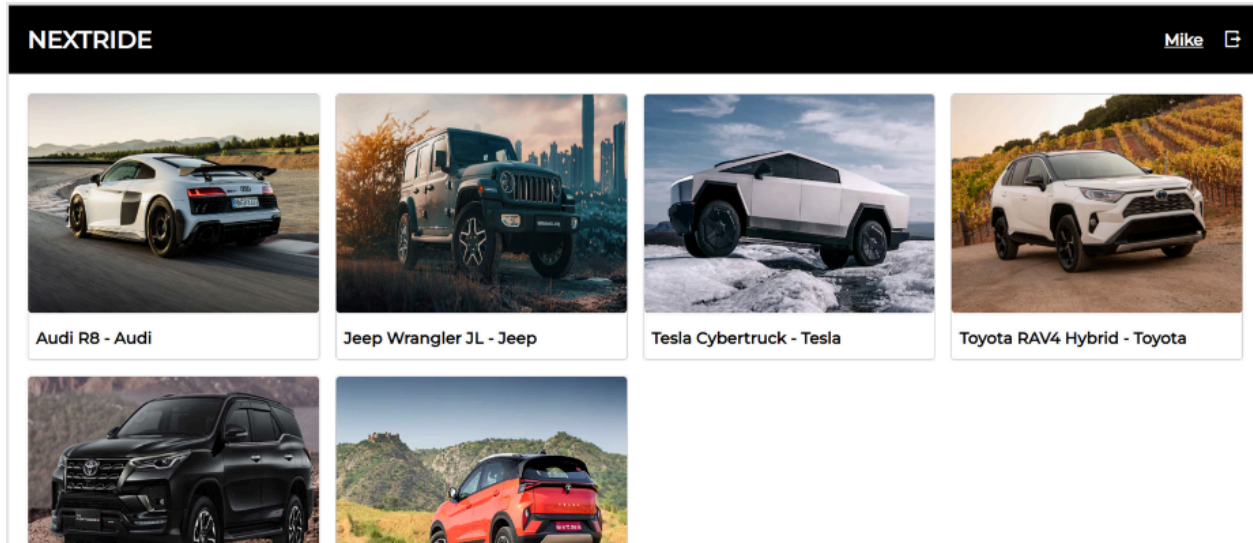
✖ Password

.....|

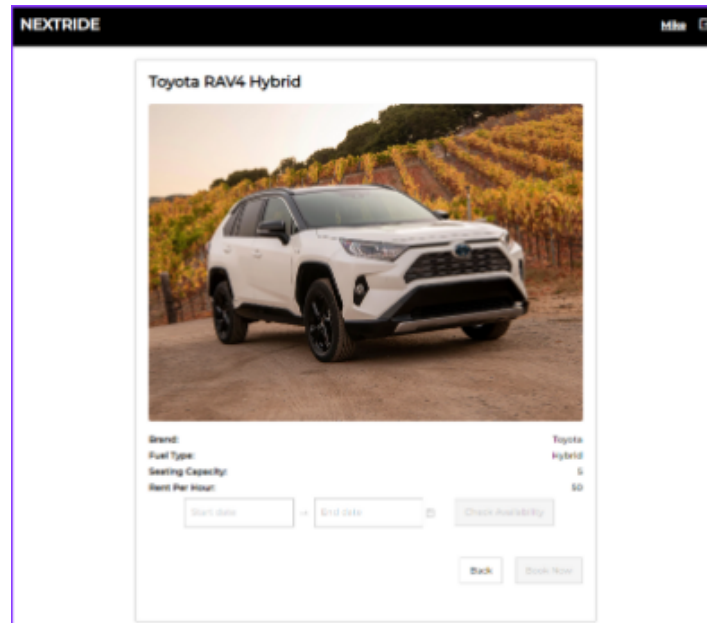
Login

Don't have an account? [Register](#)

Step 3: Then User will navigate to the user dashboard where he/she can see the available cars .



Step 4: Now Select a vehicle which you want to book and proceed in the future for booking .




Step 5: Select the time slots on which time you want to book and check for availability if availability is there you can book else have to choose another vehicle. After vehicle selection and slot availability and time selection it will show the price in terms of hours.

NEXTRIDE

Miles

Toyota RAV4 Hybrid



May 2024

01:00

| | | | | | | |
|----|----|----|----|----|----|----|
| Su | Mo | Tu | We | Th | Fr | Sa |
| 28 | 29 | 30 | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | 31 | |

| | |
|----|----|
| 01 | 01 |
| 02 | 02 |
| 03 | 03 |
| 04 | 04 |
| 05 | 05 |
| 06 | 06 |
| 07 | 07 |
| 08 | 08 |
| 09 | 09 |
| 10 | 09 |

OK

Brand: Toyota

Fuel Type: Hybrid

Seating Capacity: 5

Rent Per Hour: 50

2024-05-10 00:00

2024-05-10 01:00

Check Availability

Back


Book Now

NEXTRIDE

Slot Available

Miles

Toyota RAV4 Hybrid



Brand: Toyota

Fuel Type: Hybrid

Seating Capacity: 5

Rent Per Hour: 50

2024-05-10 00:00

2024-05-10 02:00

Check Availability

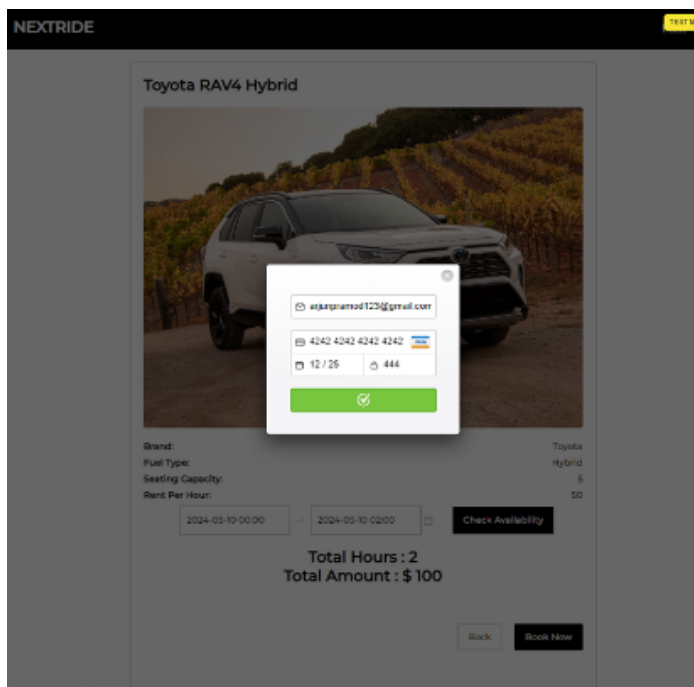
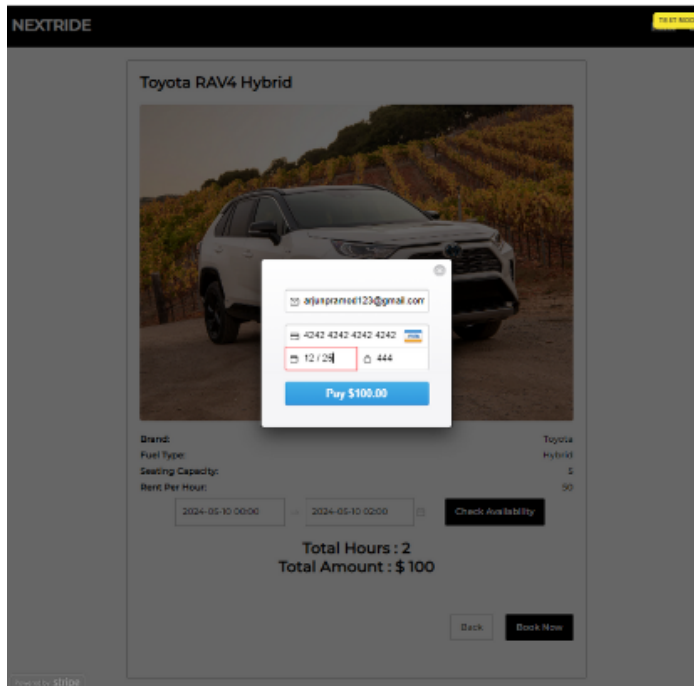
Total Hours : 2

Total Amount : \$ 100

Back

Book Now

Step 6: After that you will navigate to the payment page and after payment it will reflect to the user current bookings where he can see that his/her vehicle was successfully booked.



NEXTRIDE

General Bookings

* Name

Mike

* Email


Mike123@gmail.com

* New Password

* Confirm Password

Update Profile

NEXTRIDE

Mike 

General Bookings

| Booking Id | User | Car | Total Hours | Total Amount | Status | From Slot | To Slot | Action |
|------------|------|-----|-------------|--------------|--------|-----------|---------|--------|
|------------|------|-----|-------------|--------------|--------|-----------|---------|--------|



No data

Here are some of functionalities in terms of admin side

NEXTRIDE

Arjun Pramod



















General

Cars

Users

Bookings

Add Car

| Car Image | Car Name | Brand | Fuel Type | Rent Per Hour | Seating Capacity | Action |
|--|--------------------|--------|-----------|---------------|------------------|---|
|  | Audi R8 | Audi | Petrol | 200 | 2 |   |
|  | Jeep Wrangler JL | Jeep | Petrol | 50 | 5 |   |
|  | Tesla Cybertruck | Tesla | Electric | 150 | 6 |   |
|  | Toyota RAV4 Hybrid | Toyota | Hybrid | 50 | 5 |   |
|  | Toyota Fortuner | Toyota | Diesel | 20 | 4 |   |
|  | Tata Nexon | Tata | Petrol | 50 | 4 |   |

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NEXTRIDE

Arjun Pramod



















General

Cars

Users

Bookings

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|  | Toyota Fortuner | Toyota | Diesel | 20 | 4 |   |
|  | Tata Nexon | Tata | Petrol | 50 | 4 |   |

< 1 >

ADD CAR

Car Name

Jeep Wrangler JL

Brand

Jeep

Fuel Type

Petrol

Rent Per Hour

20

Seating Capacity

5

Car Image

https://images.frstpost.com/uploads/2023/12/Elon-Musk-made-the-Cybertruck-so-strong-that-it-may-be-illeg

Cancel

Save

NEXTRIDE

Arjun Pramod



















General

Cars

Users

Bookings

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|  | Toyota Fortuner | Toyota | Diesel | 20 | 4 |   |
|  | Tata Nexon | Tata | Petrol | 50 | 4 |   |

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EDIT CAR

Car Name

Audi R8

Brand

Audi

Fuel Type

Petrol

Rent Per Hour

200

Seating Capacity

2




Car Image

https://hips.hearstapps.com/hmg-prod/images/2023-audi-r8-rear-three-quarters-motion-1664827983.jpg?h

Cancel

Save

[General](#) [Cars](#) [Users](#) [Bookings](#)

| Name | Email | Created At | Updated At | Status |
|--------------|--------------------------|---------------------|---------------------|--|
| Arjun Pramod | arjunpramod509@gmail.com | 04/05/2024 08:21 PM | 04/05/2024 08:21 PM | Active  |
| Mike | mike123@gmail.com | 04/05/2024 09:34 PM | 04/05/2024 09:34 PM | Active  |
| Mike | Mike123@gmail.com | 09/05/2024 03:49 AM | 09/05/2024 04:13 AM | Inactive  |

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nextride-cluster....

My Queries

Performance

Databases

Search

admin

local

nextride

bookings

cars

users

samplo_mflix

My Queries cars

nextride-cluster:nextride > cars

Documents 5 Aggregations Schema Indexes 1 Validation

Type a query: { field: 'value' } or [Generate query](#)

Explain Reset Find Options

ADD DATA EXPORT DATA UPDATE DELETE

1 - 5 of 5

```
{
  "_id": ObjectId("662ddf938f89f927d9340141"),
  "name": "Audi R8",
  "brand": "Audi",
  "fuelType": "Petrol",
  "rentPerHour": 200,
  "seatingCapacity": 2,
  "carImage": "https://hips.hearstapps.com/hmg-prod/images/2023-audi-r8-gt-rear-three...",
  "isActive": true,
  "addedBy": ObjectId("662d583ea1a957557095afc6"),
  "createdAt": 2024-04-28T05:33:07.015+00:00,
  "updatedAt": 2024-04-28T05:33:07.015+00:00,
  "__v": 0
}
```

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{
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Conclusion

The Online Vehicle Rental System (OVRs) represents a paradigm shift in the transportation industry, offering a seamless and efficient solution for individuals and businesses alike. Throughout this report, we have delved into the intricacies of OVRs, exploring its innovative features, user-centric design, and impact on the way people access and utilize vehicles.

One of the key strengths of OVRs lies in its versatility and adaptability. Whether it's a leisurely weekend trip, a business travel arrangement, or a long-term rental requirement, OVRs caters to a diverse range of needs with its extensive fleet of vehicles and flexible rental options. This versatility not only enhances convenience for users but also opens up new opportunities for businesses to optimize their transportation strategies.

Moreover, OVRs prioritizes safety and reliability, implementing rigorous maintenance standards and safety protocols to ensure that every vehicle in its fleet meets the highest industry standards. This commitment to safety is further complemented by round-the-clock customer support, enabling users to seek assistance and resolve queries promptly.

As we look towards the future, the potential of OVRs to reshape the transportation landscape is undeniable. With ongoing advancements in technology, such as the integration of autonomous vehicles and smart mobility solutions, OVRs is poised to evolve and adapt, offering even greater convenience, efficiency, and sustainability in the years to come.

In conclusion, OVRs embodies the convergence of innovation, convenience, and customer-centricity in the realm of vehicle rentals. It is not just a platform but a catalyst for change, empowering individuals and businesses to navigate the world of transportation with ease and confidence. As we embrace this transformative journey, let us continue to explore new horizons and unlock the full potential of OVRs in shaping a smarter, more connected future in transportation.

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