1. Project Planning & Management
2. • Project Proposal –

Car rental management system

The **Car Rental Project** is a platform that connects **car owners** who want to rent out their vehicles with **customers** looking to rent a car. The project aims to **help car owners benefit from their unused vehicles** by earning extra income, while also **providing customers with an affordable and convenient transportation option** for a specific period without the need to buy a car.
In this way, the project creates a **mutually beneficial solution**, enabling owners to make use of their cars and allowing customers to easily rent a vehicle at a reasonable price to meet their daily or personal needs.

• Project Plan :

Timeline (Gantt chart)

Task Name	Start Date	End date	Duration
Project document Requirements(Files)	1-9-2025	10-10-2025	________40______
Frontend development	11-10-2025	22-10-2025	12
Backend development	23-10-2025	8-11-2025	17
Integration &Testing	9-11-2025	13-11-2025	5
Final Review &Deployment	14-11-2025	18-11-2025	5
Project Completion	19-11-2025	20-11-2025	2

Milestones

Project documentation completion	10-10-2025
Frontend development completion	22-10-2025
Backend development completion	8-11-2025
Integration &Testing completion	13-11-2025
Final Review &Deployment completion	18-11-2025
Project Completion	20-11-2025

Deliverables:

Project documentation, Project presentation, Full project source code, Testing reports.

- **Task Assignment & Roles :**

Team member	Role
Asmaa Ibrahim	Backend developer
Bassam Saeed	Integration&Testing
Kareem Mohammed	Backend developer
Hager Ramadan	Frontend developer
Mona Hassan	Frontend developer

3. **• Risk Assessment & Mitigation Plan :**

Risk	Impact	Solution Plan
Delay in task delivery by some team members	medium	Create a clear timeline for each task + hold weekly follow-up meetings
Errors may occur when connecting the frontend with the backend	high	Conduct early testing using Postman
Database connection issues	high	Use a backup version of the database
Adding overly complex features	high	Before implementing any new feature, it must be well analyzed and understood through reliable sources such as YouTube tutorials and official documentation. If the feature seems too complex, it should be simplified.

- **KPIs**

KPI	**Target Value**
Response Time	≤ 2 seconds
System Uptime	≥ 99%
Booking Success Rate	≥ 95%

Customer Satisfaction	≥ 85%

2. Literature Review

Feedback & Evaluation

Evaluation Summary

During the evaluation phase, it was noted that the current project concept mainly focuses on displaying and renting cars. However, it would be more beneficial if the system aimed to **connect car owners who wish to rent out their vehicles with potential renters**.

It was also observed that the project could be made more realistic by considering users' actual needs and enhancing the system's reliability and accuracy in managing rental operations.

Suggested Improvements

Based on the feedback provided during the evaluation, the following improvements were proposed to further develop the project:

- Develop the project idea into a **platform that connects car owners and renters**, rather than functioning solely as a car exhibition.
- Add a **user identity verification system** (for both owners and renters) to ensure safety and credibility.
- **Classify cars** based on their types and customer needs to make searching and selection easier.
- Clearly **define the target audience** to ensure services meet user requirements effectively.
- Add a feature to **display images of the car before and after the rental process** to maintain and document the car's condition.
- Establish a **precise booking system** to organize rental operations and prevent conflicts between requests.

Final Grading Criteria

The final evaluation of the project is based on the following criteria and weight distribution:

- **Documentation:** 20%

- **Implementation:** 50%
- **Testing:** 10%
- **Presentation:** 20%

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3. Requirements Gathering

01: Stakeholder Analysis – Identifying Key Stakeholders and Their Needs

1. Admin

The admin manages the entire system including users, cars, bookings, and payments.

Needs: Full access to manage data, generate reports, ensure system security, and monitor transactions efficiently.

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2. Employee

The employee assists the admin with limited management permissions.

Needs: Access to perform specific administrative tasks such as managing bookings and updating car or user information, but without full control privileges.

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3. Car Owner

The car owner lists their vehicles for rent on the platform.

Needs: A secure process to list cars, verify their identity, track rental history, and receive payments safely.

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4. Customer (Renter)

The customer uses the platform to rent cars.

Needs: A simple registration and login process, easy car search and booking options, secure payment methods, and accurate rental information.

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5. System (Platform)

The system acts as a bridge between car owners and renters.

Needs: To maintain data consistency, ensure information security, and provide smooth interaction between all users.

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02 :Functional Requirements

1) User Management Requirements

001: User Registration

Users shall register using their name, phone number, and email.

002: User Login

Users shall log in using username and password.

003: Profile Management

Users shall be able to edit/add:

- Verified ID
- Phone number
- Driving license
- Location
- Date of birth
- Role
- Image
- Gender

004: Booking History

Users shall view their booking history.

---

2) Car Management Requirements

001: Car Display

System shall display all available cars with:

- Car number
- Model
- Color
- Features
- Description
- Image
- Status (available/rented/under maintenance)

002: Search & Filter

Users shall search and filter cars based on specific criteria.

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3) Admin Management Requirements

001: Admin Access

Each admin shall have a personal ID and designation.

002: Car Management

Admins shall add, remove, and edit car information.

003: User Management

Admins shall manage user permissions and view/edit user profiles.

004: Booking Management

Admins shall accept, deny, or cancel rental bookings.

005: Reporting

Admins shall generate reports and perform data analysis.

006: Employee Privileges

Admins may assign limited administrative permissions to employees, allowing them to perform selected admin tasks such as:

- Managing bookings
- Assisting users
- Updating car or user information as permitted

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4) Rental Management Requirements

001: Car Selection

Users shall select an available car and preferred time slot.

002: Status Check

Users shall check the status of selected car.

003: Price Calculation

System shall calculate total rental price automatically.

004: Rental Confirmation

Users shall confirm rental booking.

005: Rental Report

System shall generate a report with a unique rental ID for each reservation.

---

5) Payment Requirements

001: Payment Methods

System shall support multiple payment methods including:

- Credit card
- Digital wallet
- Bank transfer

002: Payment Tracking

Each payment shall include:

- Payment ID
- Date
- Method
- Status

---

6) Optional Features

001: Customer Feedback

Customers shall be able to provide feedback and reviews for rented cars.

002: Customer Support

Customer service support shall be available via chat or message system.

---

7) Pricing Plan Requirements

001: Price Generation

System shall generate pricing based on:

- Car type
- Model
- Rental duration
- Customer request
- Location

002: Plan Details

Each plan shall include:

- Plan type
- Description
- Rate

---

8) Rental Process Requirements

001: Pickup Location

Customers shall select a location to receive the car.

002: Contract Generation

System shall automatically generate a contract between the customer and admin.

003: Return Process

Car condition shall be checked and updated upon return.

---

03 :Non-Functional Requirements

1) Usability Requirements

001: System shall be easy to use with a smooth interface.

002: System shall be simple for all customers to learn and navigate.

---

2) Performance Requirements

001: System shall handle multiple users simultaneously without lag.

002: Page load time shall be under 3 seconds.

---

3) Security Requirements

001: Customer information and payment data shall be securely stored and protected.

002: System shall undergo regular vulnerability testing.

---

4) Scalability Requirements

001: System shall support increasing numbers of cars, users, and transactions without performance degradation.

5) Compatibility Requirements

001: Web application shall be accessible from any device and screen size (desktop, tablet, mobile).

User Stories & Use Cases

1. Customer View

Use Case 1: User Registration and Login

Description: The customer can create an account or log in to access rental services.

Actors:Customer, System

Precondition: The user has access to the website.

Main Flow:

1. The user registers by entering their name, email, and phone number.
2. Alternatively, the user can log in using Gmail or Facebook.
3. If an account already exists, the user logs in using their username and password.
4. The system verifies credentials and grants access.

Postcondition: The user's account is created or logged in successfully.

User Story:As a customer, I want to register or log in easily so that I can rent cars and manage my account.

Use Case 2: Managing Profile Information

Description: The user can view and update their personal details.

1. The user clicks the Account icon and selects Personal Information.
2. A form appears, allowing the user to upload personal documents (driving license, personal ID).
3. The user can edit or update their profile information and save changes.

Postcondition: Updated personal information is saved and verified.

User Story: As a customer, I want to manage my personal information and documents so that I can complete rental requirements easily.

Use Case 3: Browsing and Searching Cars

Description: The user can browse all available cars and use filters to find specific models.

1. From the homepage, the user views the list of available cars.
2. The user can search or filter by car type, model, price, or availability.

Postcondition: The system displays the matching results.

User Story: As a customer, I want to search and filter cars so that I can quickly find the one that fits my needs.

Use Case 4: Booking a Car

Description: The user can rent a car for a specific period.

1. The user selects a car to rent.
2. Chooses start and end dates and a pickup location.
3. Confirms the rental and proceeds to the payment page.
4. Enters payment information and confirms the transaction.
5. Waits for admin approval of the rental request.

Postcondition:Booking request is submitted and pending admin approval.

User Story: As a customer, I want to rent a car and pay securely so that I can use it for my trip.

Use Case 5: Viewing Booking History

Description:The user can view past bookings.

1. From the profile page, the user selects Booking History.
2. The system displays all previous reservations with details.

Postcondition: Booking history is displayed correctly.

User Story:As a customer, I want to view my past rentals so that I can track my booking records.

Use Case 6: Submitting Reviews

Description:After returning the car, the user can add a review.

1. The user navigates to the rented car's details page.
2. Submits a rating and feedback.

Postcondition:Review is saved and displayed under the car details.

User Story: As a customer, I want to review my rental experience so that others can make informed choices.

2. Admin View

Use Case 1: Admin Login

Description:Admin logs in using credentials to access administrative features.

User Story: As an admin, I want to log in securely so that I can manage users and cars.

Use Case 2: Managing Users and Bookings

Description: Admin can view, approve, or reject booking requests.

1. Admin reviews rental requests.
2. Approves or denies based on completeness of information.
3. Updates booking status accordingly.

Postcondition: The booking status is updated, and the user is notified.

User Story:As an admin, I want to manage bookings and user requests so that only valid rentals are processed.

Use Case 3: Managing Cars

Description: Admin or car owner can add, edit, or remove cars from the system.

1. Admin accesses the car management panel.
2. Adds a new car or edits/removes an existing one.

3. If a car is unavailable, the system automatically hides it from listings.
Postcondition: Car list is updated accordingly.
User Story: As an admin, I want to manage cars easily so that the system always displays accurate availability.

Use Case 4: Generating Reports

Description: Admin can generate rental and performance reports.
1. Admin opens the report menu.
2. Selects date range or category (e.g., total income, most rented cars).
3. System generates the report.

Postcondition: Reports are displayed or downloaded.
User Story: As an admin, I want to generate analytical reports so that I can monitor business performance

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Problem Statement & Objectives :

Car Rental Project is a platform that connects **car owners** who want to rent out their vehicles with **customers** looking to rent a car. The project aims to **help car owners benefit from their unused vehicles** by earning extra income, while also **providing customers with an affordable and convenient transportation option** for a specific period without the need to buy a car.
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Software Architecture – High-level design outlining system components, interactions, and architecture style MVC & WebApi

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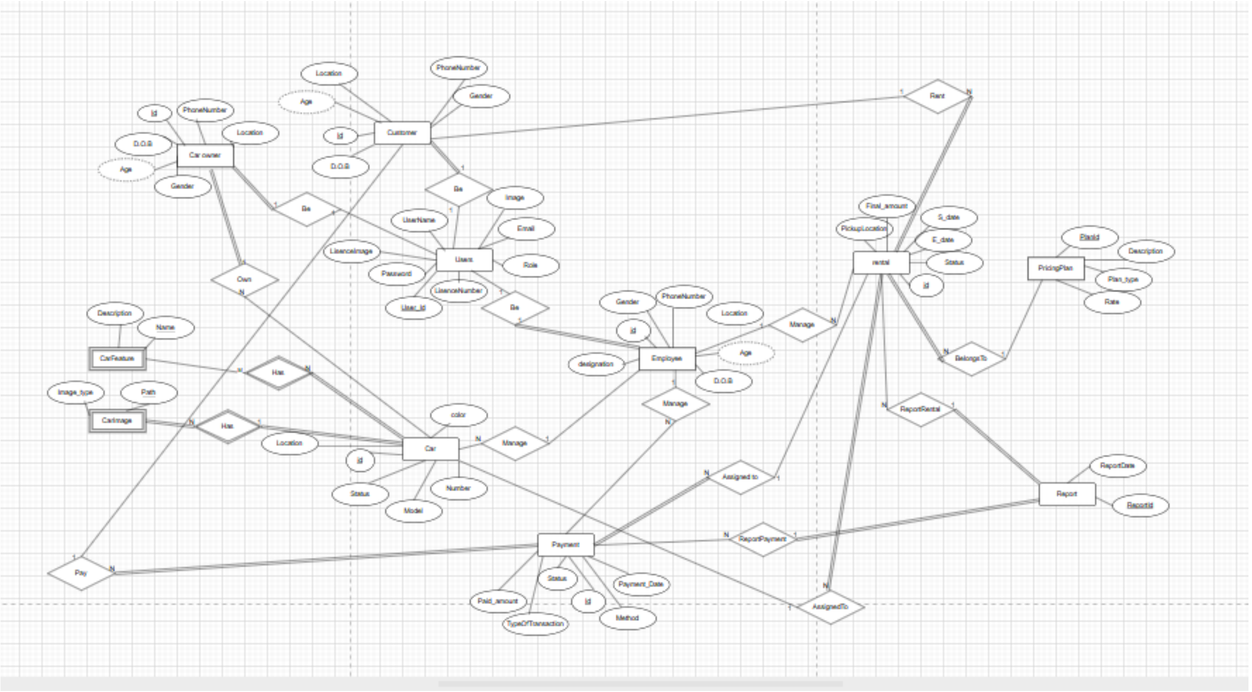
Database Design & Data Modeling



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https://drive.google.com/file/d/1bzigvUDP_kTjyH-LUgrIa5tSh_lrUQu5/view?usp=sharing

Physical Schema

Data Flow & System Behavior:

Data Flow Diagram (DFD)

Context-Level (Level 0):

At this level, the system interacts with external entities such as:

Customer: Searches available cars, makes rental requests, and completes payments.

Car Owner: Adds and manages cars, views rental requests.

System: Acts as a mediator handling data processing and information exchange between the customer and the car owner.

Level 1 (Detailed Level):

This level breaks down the internal processes and data flow:

User Registration/Login: Handles user account creation and authentication.

Car Management: Allows car owners to add, edit, and manage car information.

Rental Process: Customers request rentals, and the system verifies availability and confirms the rental.

Payment Processing: Manages all payments, updates transaction status, and records payment history.

Report Generation: Automatically creates rental and payment reports for system tracking.

System Behavior (UML Diagrams)

1. Sequence Diagram

Illustrates the order of communication between system components:

Customer logs in.

Customer requests a car rental.

System checks car availability.

Car owner receives a rental request notification.

Owner confirms the request.

System processes the payment and confirms the rental.

2. Activity Diagram

Shows the main workflow of the system:

User login.

Browse available cars.

Select car and rental duration.

Confirm rental.

Make payment.

Generate and view rental report.

3. State Diagram

Represents different states of a car during the rental process:

Available → Rented → Returned → Under Maintenance → Available again

4. Class Diagram

Defines the main structural components of the system, including classes, attributes, and relationships:

User: Manages login and account information (UserName, Password, Role, Email).

Customer: Represents users who rent cars (Name, Age, Gender, Phone, Location).

CarOwner: Represents users who list cars for rent.

Car: Stores car details (Model, Color, Number, Status, Location).

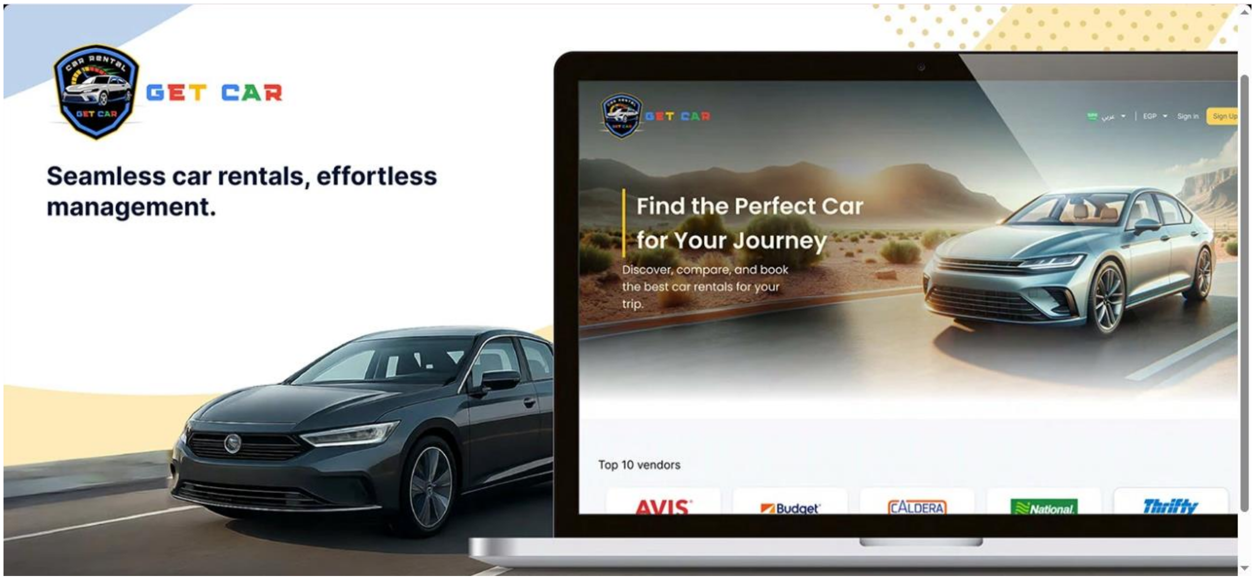
Rental: Tracks rental transactions (StartDate, EndDate, FinalAmount, Status).

Payment: Handles financial transactions (PaymentDate, Amount, Method, Status).

Report: Generates summaries of rentals and payments

UI/UX Design & Prototyping:

Wireframes & Mockups – Screens and visual representations of the user interface.


GET CAR
Seamless car rentals, effortless management.
GET CAR
Sign In
Sign Up
Find the Perfect Car for Your Journey
Discover, compare, and book the best car rentals for your trip.
Top 10 vendors
AVIS
Budget
CALDERA
National
Thrifty

- **UI/UX Guidelines :**

UI/UX Requirements

1. Design Principles

The design of the Car Rental System will follow modern UI/UX best practices to ensure an intuitive and engaging user experience.

Simplicity: The interface will remain clean and easy to navigate, focusing on essential actions such as browsing cars, checking availability, and making bookings.

Consistency: Colors, buttons, and layout patterns will be consistent across all pages to provide a smooth user journey.

Visual Hierarchy: Important elements such as car names, prices, and “Book Now” buttons will be highlighted through size, color, and placement to draw the user’s attention.

Feedback: The system will give clear visual and textual feedback for user actions, such as success messages when a booking is completed or error alerts for invalid input.

Responsiveness: The design will be fully responsive and optimized for desktop, tablet, and mobile screens.

User-Centered Design: Every screen and element is designed with the user in mind — prioritizing ease of use, clarity, and quick access to key features.

Color Scheme

The color palette for the Car Rental System is designed to create a modern, professional, and trustworthy interface.

It combines energetic tones for interactive elements with clean neutrals for background and readability.

Additional color indicators are defined for the Admin and User Dashboards to help users easily distinguish system statuses.

Main Website Colors

Purpose	Color	Description
Primary Color	#FFA726 (Light Orange)	Used for main buttons, links, and key highlights such as “Book Now”. Represents friendliness and energy.
Secondary Color	#0D47A1 (Dark Blue)	Used for secondary buttons and navigation bars to convey trust and professionalism.
Background Color	#F5F5F5 (Light Gray)	Clean, neutral background for forms, cards, and pages.
Text Color	#333333 (Dark Gray)	Ensures high readability and contrast against light backgrounds.
Accent Colors	#29B6F6 (Sky Blue), #43A047 (Green), #E53935 (Red)	Used for hover effects, icons, and section highlights.
Status Colors	Success: #28A745 (Green), Error: #DC3545 (Red)	Used in alert messages and feedback notifications.

Admin Dashboard Colors

Purpose	Color	Description
Dashboard Background	#E3F2FD (Light Blue)	Soft background to keep focus on data elements.
Cards / Widgets	#FFFFFF (White)	Clean layout for clarity of data visualization.
Active / Selected Items	#0D47A1 (Dark Blue)	Highlights selected sections or tabs.
Total Count Indicator	#2196F3 (Blue)	Represents total values or overall data summaries.
Pending Status	#FFA726 (Orange)	Used for pending or under-review records.

Canceled Status	#E53935 (Red)	Indicates canceled or rejected actions.
Completed Status	#43A047 (Green)	Represents completed transactions or approved records.

User Dashboard Colors

Purpose	Color	Description
In Progress Status	#2196F3 (Blue)	Used for ongoing bookings or active rentals.
Completed Status	#43A047 (Green)	Shows successfully completed rentals or actions.
Pending Status	#FFA726 (Orange)	Indicates reservations awaiting confirmation.
Canceled Status	#E53935 (Red)	Used for canceled or expired bookings.

Summary

The chosen color scheme creates a clear visual hierarchy and improves usability across all sections of the system.

Orange and blue tones highlight important actions and statuses.

Green and red provide clear feedback for completed or failed actions.

Light blue and gray backgrounds ensure a calm, modern interface.

2. Typography

Typography plays a key role in maintaining clarity and readability across the interface.

Element	Font Family	Style / Size	Purpose
Headings (H1–H3)	Poppins, sans-serif	Bold, 24–32px	For section titles like “Available Cars” or “Booking Details.”
Subheadings (H4–H6)	Poppins, sans-serif	Medium, 18–22px	For labels and smaller titles.
Body Text	Open Sans, sans-serif	Regular, 14–16px	For descriptions, details, and paragraphs.
Buttons	Poppins, sans-serif	Bold, 14px, Uppercase	For clarity and emphasis on actions.

This combination of Poppins and Open Sans provides a modern, clean, and readable visual style suitable for both desktop and mobile devices.

3. Accessibility Considerations

The design will ensure that the system is usable and accessible for all users, following WCAG (Web Content Accessibility Guidelines).

Color Contrast: Text and backgrounds maintain a contrast ratio of at least 4.5:1 for readability.

Alt Text: All images (such as car photos) include descriptive alt text for screen readers.

Keyboard Navigation: Users can navigate the entire system using a keyboard without requiring a mouse.

Form Accessibility: All input fields have clear labels and error messages to guide users.

Responsive Design: The layout automatically adjusts for mobile, tablet, and desktop screens.

These measures ensure that the system is inclusive and easy to use for people with different abilities and devices

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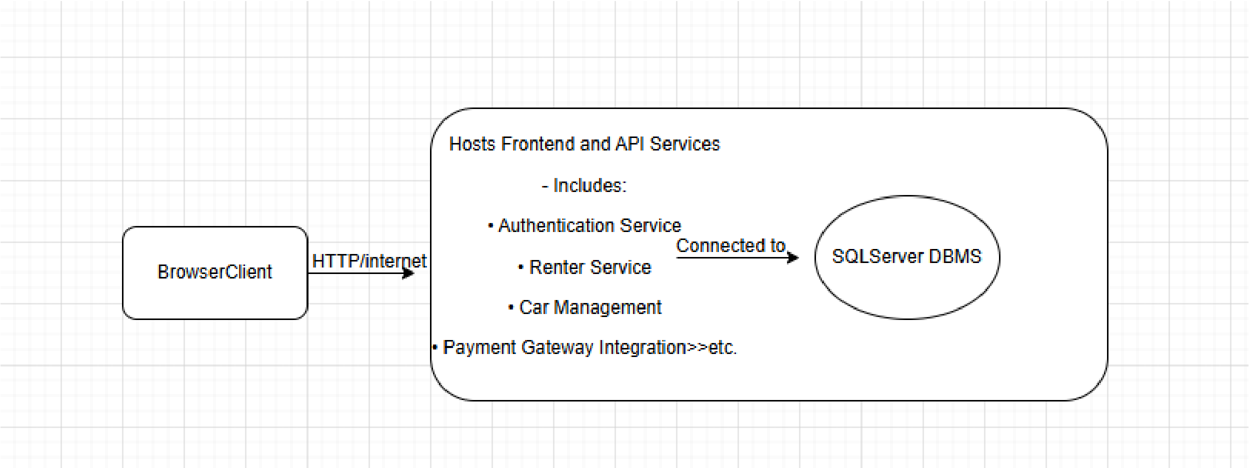
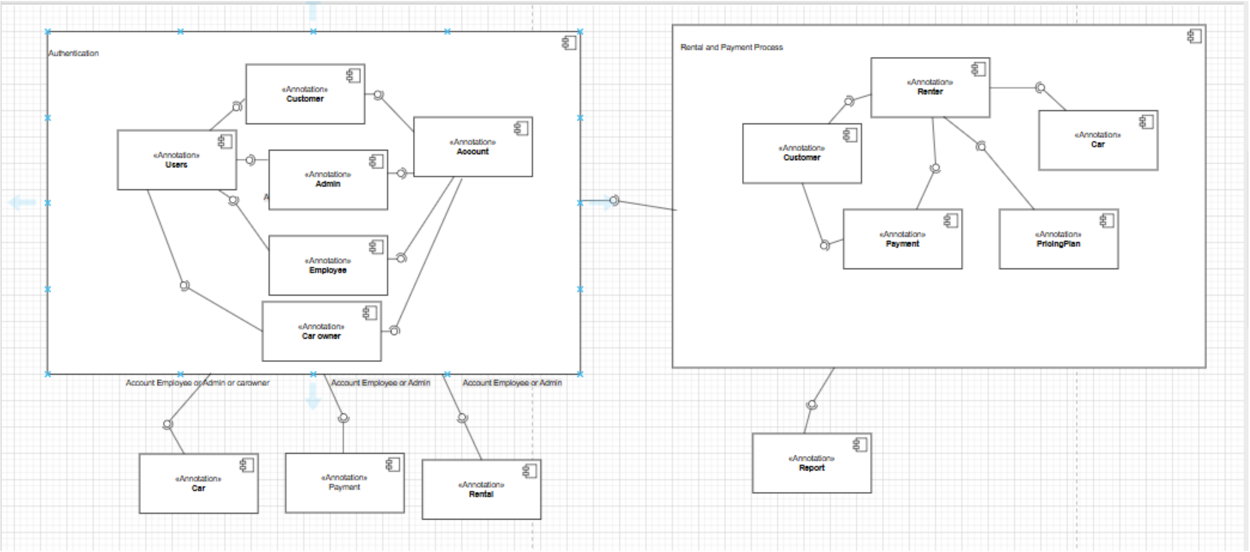
• **Technology Stack** – Backend(MVC,WebApi), frontend(HTML,CSS,JavaScript,Bootstrap,Jquery), and database technologies(SQL Server).

Deployment Diagram :



• **Component Diagram:**


Authentication
«Annotation»
Customer
«Annotation»
Users
«Annotation»
Admin
«Annotation»
Account
«Annotation»
Employee
«Annotation»
Car owner
Account Employee or Admin or carowner
Account Employee or Admin
Account Employee or Admin
«Annotation»
Car
«Annotation»
Payment
«Annotation»
Rental
Rental and Payment Process
«Annotation»
Renter
«Annotation»
Customer
«Annotation»
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«Annotation»
Payment
«Annotation»
PricingPlan
«Annotation»
Report