



# **COMP9900 Information**

## **Technology Project Car**

### **Space Renting System Proposal**

#### **Group 9900-F17A-Let's quit**

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## 1. Background

### 1.1.Problem Statement

As urban populations continue to grow rapidly, the demand for parking spaces has become a common problem of society, leading to an imbalance between supply and demand. This disparity has resulted in various problems for both car owners and parking lot providers. So, the current parking situation in urban areas presents several key challenges that require urgent attention.

To address this issue, an available solution is to create a web-based car parking system to maximize the availability of unused parking space. Providers of these car parking spaces can list

their spaces for rent and manage them to some extent. After listing, consumers can search and book car space on the web.

## **1.2.Existing Systems**

For now, there are already existing some car space renting systems that are designed to solve this problem and the following links are 3 existing work:

1. Park Hound(<https://www.parkhound.com.au/>): Parkhound makes it easy to browse, book & pay for the best parking space possible — no matter where you are.
2. Share With Oscar(<https://www.sharewithoscar.com.au/>): Share With Oscar is mainly used to find parking in seconds in Sydney, Melbourne and Brisbane. in: Sydney, Brisbane, Melbourne.
3. Parking Made Easy(<https://www.parkingmadeeasy.com.au/>): Make money sharing your driveway or garage with drivers for parking.It's free and effortless to list your car space. Drivers find a space to park - next door.

For each of them, there exist some drawbacks for themselves, and the drawbacks are listed as below:

### **1.Park Hound:**

- High Commission Fee:

Park Hound web charges a lot, even up to 15%, on commission fee to car space providers. And that may result in providers being unwilling to rent car spaces through this web, because they are already struggling to make their profit.

### **2.Share With Oscar:**

- Geographical restrictions:

Share With Oscar is only available in a few cities of Australia.

### **3.Parking Made Easy:**

- Geographical restrictions:

Parking Made Easy is only available in a few cities of Australia.

- Lack of real-time update:

This web does not offer real-time updates for car space, and this may lead to frustration and inconvenience for users.

After evaluating the limitations of each web, our project team reached the conclusion that there are several areas in which the system could be enhanced. These areas encompass, but are not limited to, user account management, parking space management, platform branding, cost and fees, and customer services.

## **2. User Stories and Sprints**

### **2.1.Project Objectives(PO):**

- 1) Registration and logging in/out function of providers and consumers.
- 2) Providers are able to register new parking spaces and set parking space information, including price, address, size, type and remarks.
- 3) Providers can update the information of listed car space.
- 4) Administrators have the ability to view, update, and delete information for all registered parking spaces.
- 5) The system is able to calculate the total price of an order and send the order confirmation to the consumers.

- 6) Consumers can make the payments online.
- 7) Consumers can find a parking space from the list of registered parking spaces within the system.
- 8) Consumers can view detailed information about the selected parking space, such as address, availability, and hourly/daily rates.
- 9) Consumers can book an available parking space and specify the desired duration of the reservation.
- 10) Consumers have the option to cancel the reserved parking space free of charge within a specified timeframe. **Novel:**
- 11) Existing users can invite new users, and upon successful invitation, both the new and existing accounts will receive a cash reward.
- 12) After the completion of an order, consumers can provide feedback and rate the parking space.

## 2.2. User Stories

### 2.2.1. User Stories Table

Our team divides our users into three groups, car park providers, consumers and administrators. With the exception of the administrator status, users can be both providers and consumers.<sup>[3]</sup>

Code	User Story	Acceptance Criteria	Relation to Project Objectives
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YP9900-1	<ul style="list-style-type: none"> <li>As a provider and consumer, I want to create my own account so that I can manage my account and edit my profile.</li> </ul>	<ul style="list-style-type: none"> <li>A user needs to submit his email address, password and account name</li> <li>If the information entered by the user is valid and correct, the user can successfully register and log in to the account.</li> <li>The user's email cannot be a registered email address, and the user's password must be 8 characters or more, and there must be at least one capital letter.</li> <li>Users can optionally enter an invite code.</li> <li>Users can edit his/her own profile.</li> </ul>	PO1
YP9900-2	<ul style="list-style-type: none"> <li>As a provider and consumer, I want to securely log in to my account and do what I need on the website.</li> </ul>	<ul style="list-style-type: none"> <li>To successfully log in to the account, users are required to provide a valid email address and enter the correct password on the login page.</li> <li>If users input an incorrect email address or password, an error message will be displayed, preventing successful login.</li> </ul>	PO1, PO11

YP9900-3	<ul style="list-style-type: none"> <li>As a provider and consumer, I want to be able to successfully logout my account.</li> </ul>	<ul style="list-style-type: none"> <li>Once the user clicks the logout button, the account logged out.</li> <li>The page returned to the initial log in page.</li> </ul>	PO1
YP9900-4	<ul style="list-style-type: none"> <li>As a provider, I want to register a new car space, provide related details so that I can lease my car space.</li> </ul>	<ul style="list-style-type: none"> <li>Providers can register new parking spaces with information including but not limited to: price, address, lease term, lease requirements, etc.</li> <li>Providers can view or delete their rented parking spaces on their personal account page.</li> <li>Providers can edit their rented parking spaces on their personal account page.</li> </ul>	PO2
YP9900-5	<ul style="list-style-type: none"> <li>As a provider, I want to edit the information on my existing parking spaces so that I can provide the specific information of the parking space.</li> </ul>	<ul style="list-style-type: none"> <li>The provider can edit parking space information in: <ol style="list-style-type: none"> <li>1. Address of the parking space.</li> <li>2. Edit and update the price.</li> <li>3. Edit and update the length of time the space is available.</li> <li>4. Edit and update the information of the car space such as the type of</li> </ol> </li> </ul>	PO3

		garage, the size of the parking space, the height limit, and the maximum number of vehicles that can be parked.	
YP9900-6	<ul style="list-style-type: none"> <li>As a website owner I hope my website can be used by more people and recommended to their friends by more users, which can bring me more profit and reputation.</li> </ul>	<ul style="list-style-type: none"> <li>We can make a reward mechanism for inviting friends, all users can invite friends via their own Invitation code which is their email address.</li> <li>During the registration process of invited friends, they can enter the email address of their inviter to prove who their invited friend is.</li> <li>When the friend you invite successfully registers and enters his/her email address as an invitation code, the user can get 5\$ bonus.</li> </ul>	PO5, PO11
YP9900-7	<ul style="list-style-type: none"> <li>As an admin, I want to view all valid car spaces so that I can supervise all parking spaces.</li> </ul>	<ul style="list-style-type: none"> <li>Admin can view all information of all parking spaces.</li> </ul>	PO4
YP9900-8	<ul style="list-style-type: none"> <li>As an admin, I want to be able to update the information of all parking spaces so that complete incomplete information.</li> </ul>	<ul style="list-style-type: none"> <li>Admin can update all information of all parking spaces.</li> </ul>	PO4

YP9900-9	<ul style="list-style-type: none"> <li>As an admin, I hope I can delete parking spaces to manage invaded and inaccurate/wrong information so users won't see useless information.</li> </ul>	<ul style="list-style-type: none"> <li>Admin can delete all the information of any parking space</li> </ul>	PO7
YP9900-10	<ul style="list-style-type: none"> <li>As a user I can top up my wallet so I can pay when I rent a car space.</li> </ul>	<ul style="list-style-type: none"> <li>Users can find their wallet on their personal information page and top up their wallets</li> <li>When users pay, their wallets are automatically debited.</li> </ul>	PO6
YP9900-11	<ul style="list-style-type: none"> <li>As a customer I hope I can reserve a parking space so that my car can be parked in the parking space within the predetermined time period.</li> </ul>	<ul style="list-style-type: none"> <li>The user can choose a valid parking space, and choose a time period in the available time period of this parking space to rent.</li> <li>Users can terminate an already booked order before the order expiration date.</li> <li>Users receive a bill and can make rent payments directly from their online wallet balance.</li> </ul>	PO8,PO9
YP9900-12	<ul style="list-style-type: none"> <li>As a consumer, I want to set filter criteria so that it will be more convenient for me to search for parking spaces and narrow down my search to save time.</li> </ul>	<ul style="list-style-type: none"> <li>Users can search for parking spaces based on the following criteria: suburbs, price.</li> </ul>	PO7



YP9900-13	<ul style="list-style-type: none"> <li>As a user, I hope I could rate and comment on the parking spaces I have rented, and check the ratings and comments of other people on the parking space, so that I can provide reference for future users, and refer to other people's opinions to decide which parking space I rent.</li> </ul>	<ul style="list-style-type: none"> <li>Users can choose to rate the parking space from 0 to 5 stars</li> <li>Users can add text comments to parking spaces</li> <li>Users can view the interface of the parking space and view the comments and ratings of all users who have seen the parking space</li> </ul>	PO12
YP9900-14	<ul style="list-style-type: none"> <li>As a consumer, I hope to sort all the filtered parking spaces so that I can find the parking spaces I am most looking forward to.</li> </ul>	<ul style="list-style-type: none"> <li>Users can sort all the parking spaces that appear according to the rating and prices of the car space.</li> </ul>	PO7
YP9900-15	<ul style="list-style-type: none"> <li>As a consumer, I want to cancel my booking if I booked the wrong space or I no longer need this car space.</li> </ul>	<ul style="list-style-type: none"> <li>Users can cancel an unstarted order, but it must be more than 7 days from the start time of the order.</li> </ul>	PO10

### 2.2.2. Jira Screenshot

LC9900-2	As a provider and consumer, I want to create my own account so that I can manage my account.	10:00
LC9900-3	As a provider and consumer, I want to securely log in to my account and do what I need on the website.	10:00
LC9900-4	As a provider and consumer, I want to be able to successfully logout my account.	10:00
LC9900-5	As a provider, I want to register a new car space, provide related details so that I can lease my car space.	10:00
LC9900-6	As a provider, I want to edit the information on my existing parking spaces so that I can provide the specific information of the parking space.	10:00
LC9900-7	As a website owner I hope my website can be used by more people and recommended to their friends by more users, which can bring me more profit and reputation.	10:00
LC9900-8	As an admin, I want to view all valid car spaces so that I can supervise all parking spaces.	10:00
LC9900-9	As an admin, I want to be able to update the information of all parking spaces so that complete incomplete information.	10:00
LC9900-10	As an admin, I hope I can delete parking spaces to manage invaded and inaccurate/wrong information so users won't see useless information.	10:00
LC9900-11	As a user I can top up my wallet so I can pay when I rent a car space.	10:00
LC9900-12	As a customer I hope I can reserve a parking space so that my car can be parked in the parking space within the predetermined time period.	10:00
LC9900-13	As a consumer, I want to set filter criteria so that it will be more convenient for me to search for parking spaces and narrow down my search to save time.	10:00
LC9900-14	As a user, I hope I could rate and comment on the parking spaces I have rented, and check the ratings and comments of other people on the parking space, so that I can decide which parking space I rent.	10:00
LC9900-15	As a consumer, I hope to sort all the filtered parking spaces so that I can find the parking spaces I am most looking forward to.	10:00
LC9900-16	As a consumer, I want to cancel my booking if I booked the wrong space or I no longer need this car space.	10:00

### 2.3.Sprints:

#### 2.3.1. Duration of all sprints

- Sprint1: 3 Mar - 17 Mar
- Sprint2: 17 Mar - 7 Apr
- Sprint3: 7 Apr - 20 Apr

### 2.3.2. Scope of Sprint1:

▼ LQ9900 Sprint 1	✎ Add dates	(3 issues)	0 0 0	Start sprint	...
■ LQ9900-2	As a provider and consumer, I want to create my own account so that I can manage my...		TO DO ▼	👤	
■ LQ9900-3	As a provider and consumer, I want to securely log in to my account and do what I need...		TO DO ▼	👤	
■ LQ9900-4	As a provider and consumer, I want to be able to successfully logout my account.		TO DO ▼	👤	

## 2.4. Novel Functionalities

- Invitation and Rewards

In order to attract more customers to use our parking space rental website, we can implement an invitation mechanism. This mechanism allows existing users to invite new users and provide incentives for both parties. Here's how it can work:

Existing users can make invitations to others, and if others register successfully and start using our car space renting web, both existing user and new user will get cash reward. The cash rewards will be added into their balance automatically.

This will help expedite the development of our website.

Related user story:

- ❖ YP9900-6. As a website owner I hope my website can be used by more people and recommended to their friends by more users, which can bring me more profit and reputation.

- Rating system

In currently available systems, the classification criteria are based only on price and location. We would like to incorporate a rating system into the parking space rental system. After the completion of an order, consumers will have the option to provide feedback and rate the parking space. Over time, as the system operates, each registered parking space will accumulate its average rating. These ratings and reviews will assist future consumers in making informed decisions when selecting a parking space.

Related user story:

- ❖ YP9900-13 As a user, I hope I could rate and comment on the parking spaces I have rented, and check the ratings and comments of other people on the parking space, so that I can provide reference for future users, and refer to other people's opinions to decide which parking space I rent.

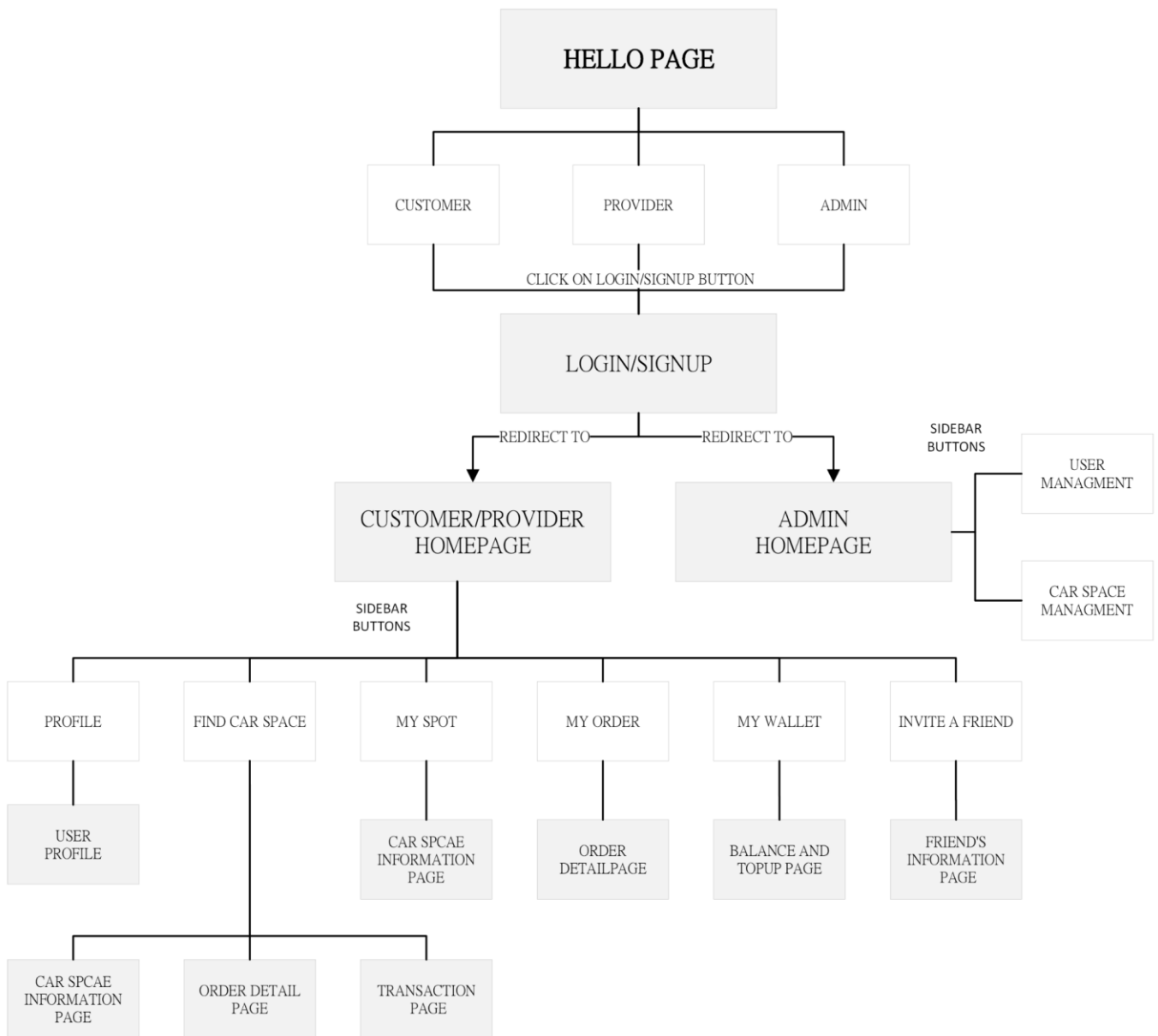
## 3. Interface and Flow Diagrams

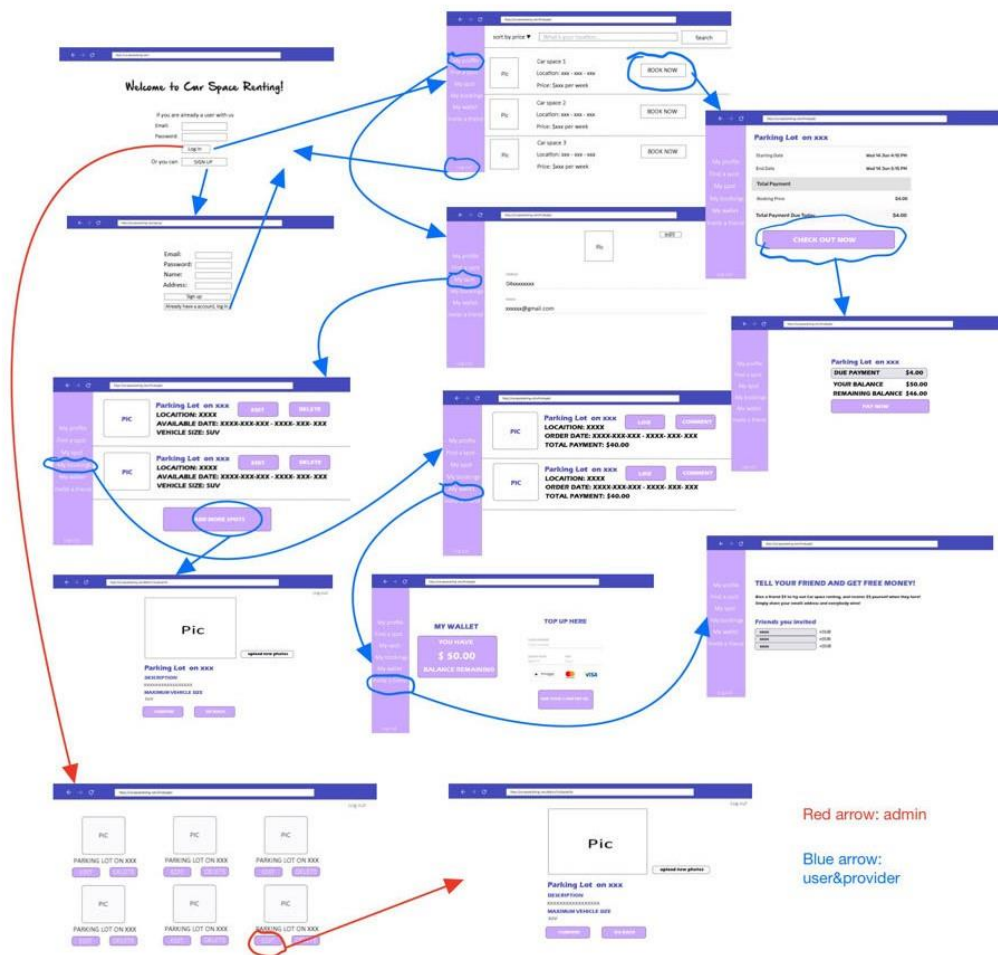
### 3.1. User Flow Overview

The following is a simple and intuitive description of the car parking system after entering the welcome page, customer and provider share the same interface and admin is using a different interface, and the system will redirect to the corresponding page according to the user's operation. This figure clearly shows the complete life cycle of user operations of different roles and different operations..

### 3.2.low-fidelity prototype style

The following low-fidelity prototype diagram shows the jump interactive process between the pages of the car space renting system.





### 3.3.Prototype

#### •Hello Page

All users can log in the system here, and new customers can go to the sign up page here



## Welcome to Car Space Renting!

If you are already a user with us

Email:

Password:

Or you can

#### •Sign up page

○Sign up or go back to log in

← → ↻ <https://carparking.com/signup/>

Email:

Password:

Name:

Address:

## ●Customer and provider

### ○ Profile page

User can view or update the personal profile here.

← → ↻ <https://carparking.com/findspot/>

My profile  
Find a spot  
My spot  
My bookings  
My wallet  
Invite a friend  
Log out

Pic

MOBILE  
04xxxxxxxx

EMAIL  
xxxxxx@gmail.com

### ○ Transaction page

It shows the detail of each of the transaction.

← → ↻ <https://carparking.com/findspot/>

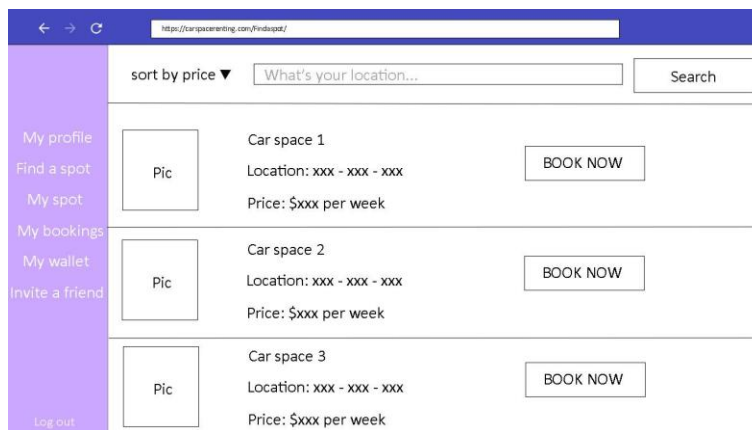
My profile  
Find a spot  
My spot  
My bookings  
My wallet  
Invite a friend  
Log out

**Parking Lot on xxx**

<b>DUE PAYMENT</b>	<b>\$4.00</b>
<b>YOUR BALANCE</b>	<b>\$50.00</b>
<b>REMAINING BALANCE</b>	<b>\$46.00</b>

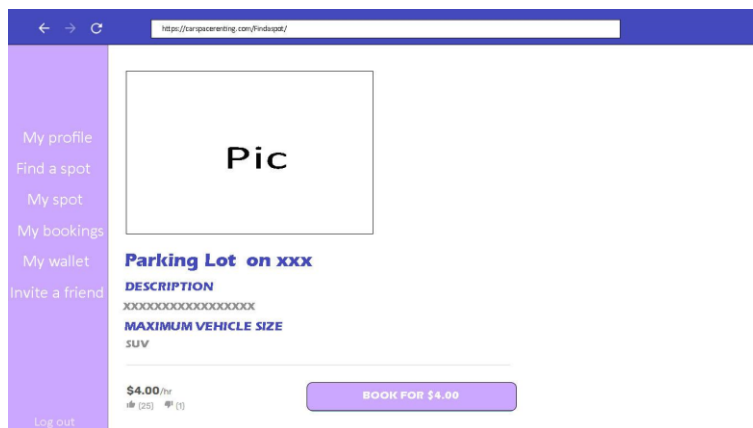
### ○ Find a spot page

User can browsing around the existing car space on the website and search for car space here.



### ○ Car space information page

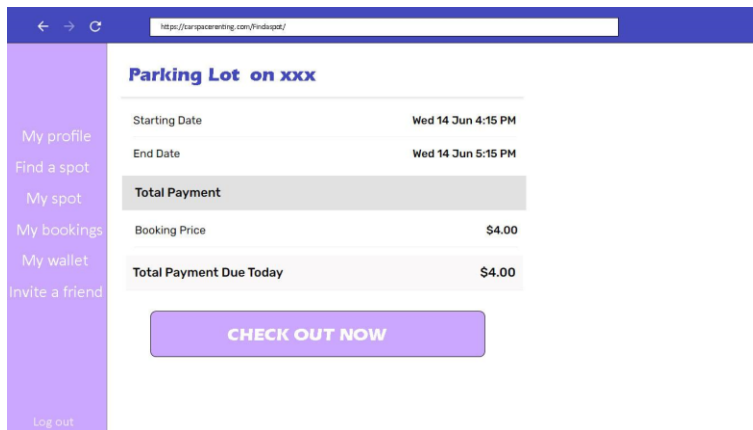
User can check the detailed information of a specific car space here.



○

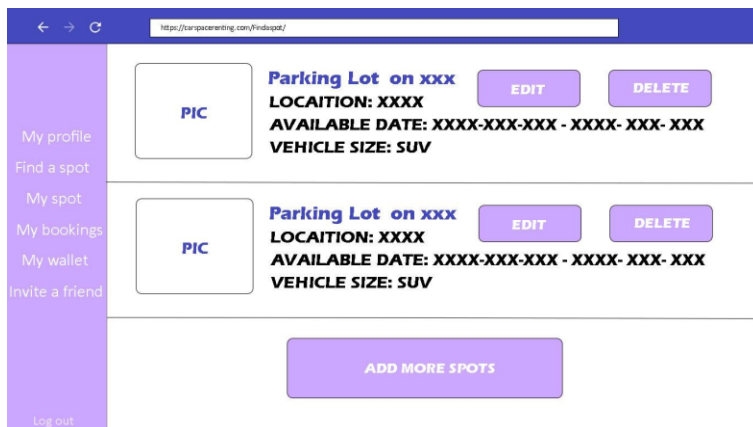
### ○ **Booking detail page**

once the user decided to book this car space, the detail of this booking will show here.



### ○ **My spot page**

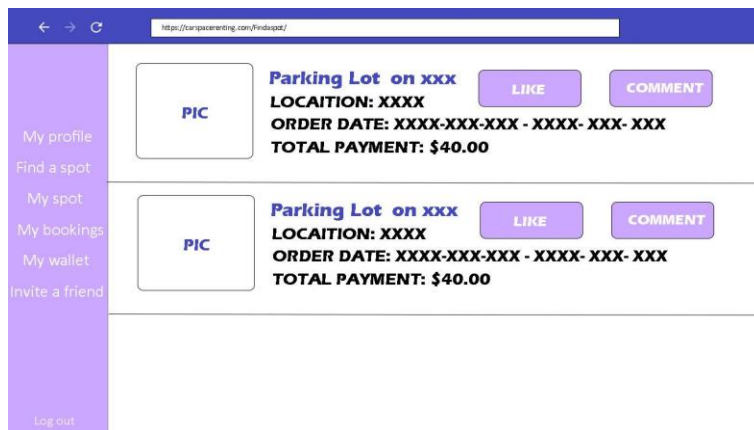
Users can view, edit, and add their own car space here.



### ○ **My bookings page**

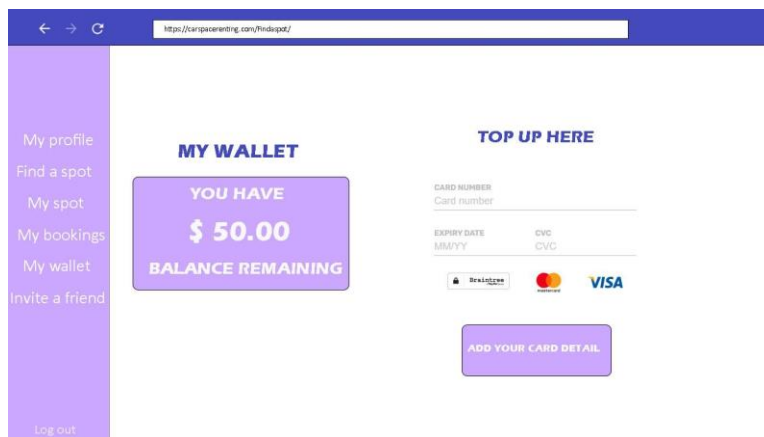
User can check the previous booking here, and also leave a like or comment for the bookings.

○



### ○ My wallet page

User can check the balance in their wallet can top up

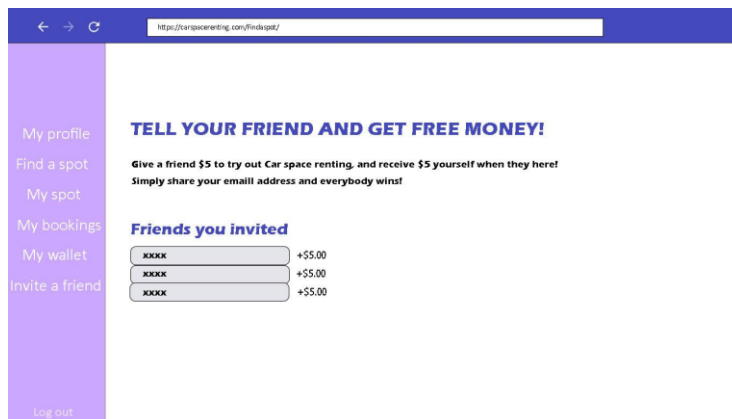


### ○ Invite a friend page

It shows users how to invite their friends and they can check how many friends they have invited successfully.



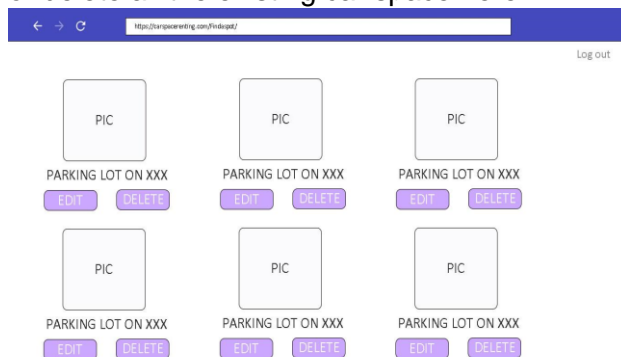
○



## ● Admin

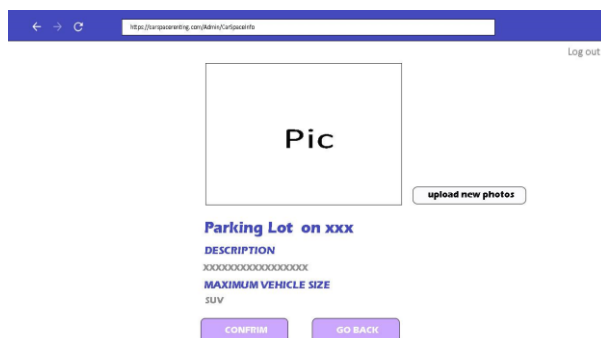
### ○Admin home page

Once admin log in the system, admin can view, edit or delete all the existing car space here.

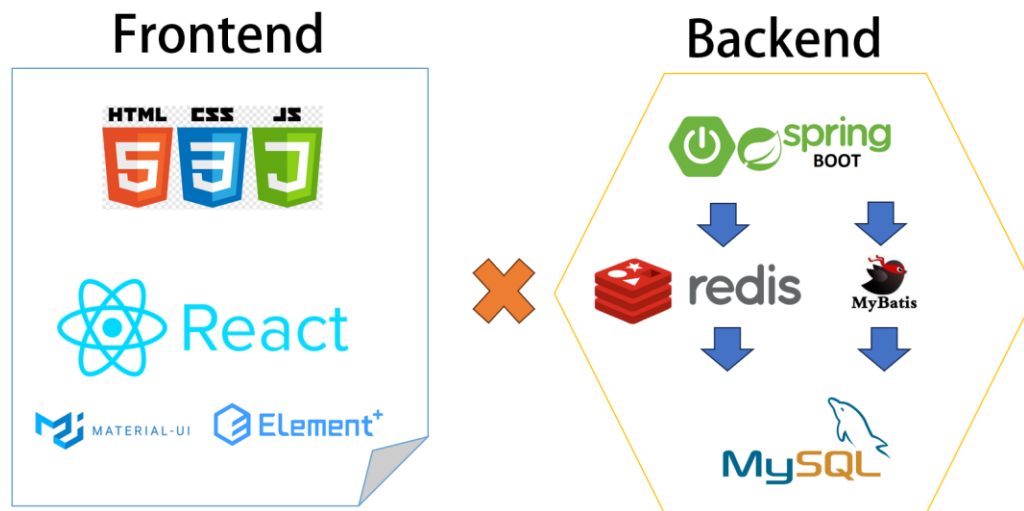


### ○Admin car space information page

Once admin choose to edit a car space, admin can update the detail of this car space.



### 3.4. Software Architecture:



#### 3.4.1 Frontend Design

We will utilize HTML and CSS on the frontend to define the layout and appearance of the web page. Additionally, we will incorporate Ant Design 5.0, MUI and Element UI for UI design, along with React.js to construct our user interface.

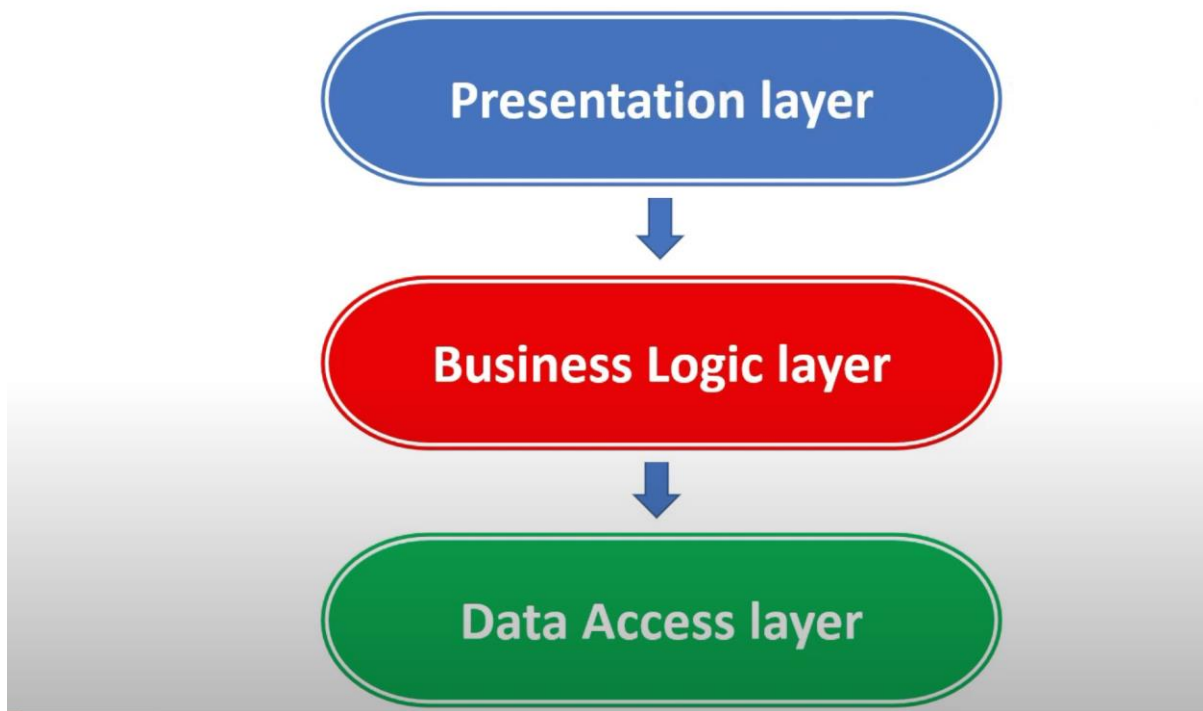
#### 3.4.2 Backend Design

We primarily use Java as our backend programming language because it offers a rich ecosystem of frameworks that enhance development efficiency and content management. We start by using the SpringBoot framework to quickly build the overall project structure. For database management, we utilize the MyBatis framework to handle data access and control. Additionally, we employ Redis caching technology to improve query efficiency and reduce development costs.

Our backend data structure consists of three components: Presentation Layer, Business Logic Layer, and Data Access Layer.

# Three-Tier (or Three-Layer) Architecture

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## A. Data Access Layer

This layer facilitates database access. In the Data Access Layer, we perform operations such as inserting, deleting, updating, and querying to interact with the database.

## B. Business Logic Layer

This layer handles the logic processing of data received from the Data Access Layer. It further optimizes the processing results and passes them to the Presentation Layer.

## C. Presentation Layer

The Presentation Layer is responsible for presenting the processing results to users. It receives the results from the Business Logic Layer and processes user requests through controllers. The results are then passed to the appropriate views for display. Controllers use annotations or configurations for routing and mapping, directing requests to the corresponding methods for processing.

### 3.4.3 Database System

For the Parking Reservation System project, we utilize the MySQL database system. MySQL is a widely used open-source relational database management system (RDBMS) that is extensively employed in various web applications and enterprise solutions. It offers support for complex data relationships, scalability, high performance, and multi-platform compatibility.

Based on the project requirements, we divide the database into three parts: User Information, Parking Space Information, and Order Information.

### **References**

[1] ABC News. (2018). Parking crisis: One space for every six drivers.

<https://www.abc.net.au/news>

[2] Saritas, O., & Aydin, C. (2016). A literature review on parking space optimization. *Transport Reviews*, 36(1), 73-93.

[3] Edman, J., & Lilliecreutz, J. (2019). An investigation of the targeted customers of a peerto-peer car sharing company and how the company's value proposition should be developed accordingly.

[4] Eddelbuettel, Dirk. "A Brief Introduction to Redis." (2022).