1 Project Background

The project is to develop a property rental platform to address the evolving needs of the housing rental market in Singapore, ensuring its relevance and effectiveness not only in the present but also in the foreseeable future.

Location significantly influences the choices of potential tenants, and yet, many existing property rental applications fail to provide an intuitive and efficient geographical location search feature.

A Map-based Property Search is introduced to complement the above situation. By integrating a map-based search feature into our rental platform, we intend to enhance the user experience, providing a visual and interactive tool for users to explore properties in their preferred locations.

At the same time, it's essential to consider safeguarding our unique solution from potential copycats. To protect our innovation, we plan to implement comprehensive terms of service and user agreements on our platform. These agreements will incorporate clauses that explicitly prohibit users from copying, reverse engineering, or using our platform for unauthorized purposes. Additionally, we recognize the importance of consulting with intellectual property attorneys who specialize in technology and software. They will offer invaluable guidance on the most suitable legal protections for our project, including patent filings, copyright registrations, and trademark applications.

2 System design

2.1 Use-Cases

2.1.1 Use Case 1: Tenant Authentication

Description

The entrance of the tenant Log In and Sign Up. Using Email to check whether the user is already registered.

Actors:

Unregistered tenants, registered tenants

Flow:

1. In the "Tenant Welcome" mode, tenants input their email addresses for authentication.
2. The system validates the email address, ensuring it is a valid email format.
3. Tenants submit the form.
4. The system checks if the entered email is associated with an existing tenant account.
5. If the email is found, the system transitions to "Tenant Login" mode.
6. If the email is not found, the system transitions to "Register" mode for the tenant to create a new account.
7. Tenants can click "Log In as an Agent" to switch to the "Agent Welcome" mode.

2.1.2 Use Case 2: Agent Authentication

Description

The entrance of agent Log In. Using Email to check whether the user is already registered.

Actors:

Registered agents

Flow:

1. In the "Agent Welcome" mode, agents input their email addresses for authentication.

2. The system validates the email address, ensuring it is a valid email format.
3. Agents submit the form.
4. The system checks if the entered email is associated with an existing agent account.
5. If the email is found, the system transitions to "Agent Login" mode.
6. If the email is not found, the system alerts the agent to contact staff for registration.
7. Agents can click "Log In as a Tenant" to switch to the "Tenant Welcome" mode.

2.1.3 Use Case 3: Tenant Login

Description

Tenants can log in using their email address and password.

Actors:

Registered tenants

Flow:

1. In the "Tenant Login" mode, tenants input their password.
2. The system validates the password, ensuring it is not empty.
3. Tenants submit the form.
4. The system checks if the entered password matches the stored password for the email.
5. If the password is correct, the system logs the tenant in and navigates to the main application page.
6. If the password is incorrect, an alert is displayed.

2.1.4 Use Case 4: Agent Login

Description

Agents can log in using their email address and password.

Actors:

Registered agents

Flow:

1. In the "Agent Login" mode, agents input their password.
2. The system validates the password, ensuring it is not empty.
3. Agents submit the form.
4. The system checks if the entered password matches the stored password for the email.
5. If the password is correct, the system logs the agent in and navigates to the main application page.
6. If the password is incorrect, an alert is displayed.

2.1.5 Use Case 5: Tenant Sign Up

Description

Tenants can register for a new account using their email address and password.

Actors:

Unregistered tenants

Flow:

1. In the "Register" mode, tenants input a password and confirm it.
2. The system validates both passwords, ensuring the password length is not shorter than 4 and not longer than 10.
3. The system ensures that the passwords match.
4. Tenants submit the form.
5. The system creates a new tenant account with the provided email and password.

6. The system logs the tenant in and navigates to the main application page.

2.1.6 Use Case 6: User Log Out

Description

Users can log out of the system.

Actors:

Logged in tenants/ agents

Flow:

1. Tenants or Agents can select the “Log Out” option from the dropdown menu, whose entrance is the account email button.
2. The user is logged out and returned to the main application page.

2.1.7 Use Case 7: Navigating to Different Pages

Description

After the user log in, their account email will displayed instead of the log-in button. The account button also provides the entrance of the private links, which are “Favorites” and “History” for tenants, as well as “Post New” and “View All Posts” for agents. Users can navigate to different pages within the application by clicking on various options available within the account dropdown.

Actors:

Logged in tenants/ agents

Flow:

1. The system checks the user's login status.
2. If the user is authenticated, the system displays an account dropdown button.
3. If the user has not logged in yet, the system displays a "Log In" button.
4. Logged users can interact with the account dropdown to access features, while unlogged users can click "Log In" to navigate to the login page.
5. Users open the account dropdown.
6. They select from the available options based on their user type.
7. The system navigates the user to the selected page, providing access to features such as viewing favorites, history, all posts, or posting new content.

2.1.8 Use Case 8: Displaying Tenant Favorites List

Description

Tenants can view a list of housing data that they clicked “Like” before.

Actors:

Logged in tenants

Flow:

1. Tenants can enter this page by clicking the “Favorites” option in the dropdown menu.
2. The system fetches the tenant’s favorites list from the back-end database.
3. Tenant can view all available records on the page.
4. The rest of the page control is the same as house searching.

2.1.9 Use Case 9: Displaying Favorites in a Table

Description

Tenants can view a tabular representation of housing data that they clicked “Like” before. This function is designed to allow tenants to better compare different properties and help them to make a decision.

Actors:

Logged in tenants

Flow:

1. Open the toggle switch on the default “favorites” page to enter the tabular comparison mode.
2. The system fetches the tenant’s favorites list from the back-end database.
3. The data is rendered in a tabular format.
4. Tenants can view all available records on the page.
5. The system displays pagination controls, including the previous and next buttons. Users can click the previous and next buttons to navigate between pages of data.
6. Tenants can also specify a page number to jump to a specific page.
7. Tenants can adjust the number of items displayed per page.

2.1.10 Use Case 10: Displaying Viewed History

Description

Tenants can view a list of housing data that they checked for details before.

Actors:

Logged in tenants

Flow:

1. Tenants can enter this page by clicking the “History” option in the dropdown menu.
2. The system fetches the tenant’s viewed history list from the back-end database.
3. Tenants can view all available records on the page.
4. The rest of the page control is the same as house searching.

2.1.11 Use Case 11: Displaying All Posts

Description

Agents can view a list of housing data that they posted before.

Actors:

Logged in agents

Flow:

1. Agents can enter this page by clicking the “View All Posts” option in the dropdown menu.
2. The system fetches the agent’s posted list from the back-end database.
3. Agents can view all available records on the page.
4. The rest of the page control is the same as house searching.

2.1.12 Use Case 12: Post New

Description

Agents can post a new property, by submitting a new housing listing.

Actors:

Logged in agents

Flow:

1. Agents can enter this page by clicking the “Post New” option in the dropdown menu.
2. Agents input details in the form fields, including the type, bedroom count, bathroom count, price, area, address, and postal code.
3. The system validates the input, ensuring that the data meets the specified requirements, error message will display if the input field does not meet the validation criteria.
4. Users submit the form.
5. The system collects the form data and prepares it for an API call.

6. The system sends the new listing data, including the agent's email, to the server to add the listing to the database.

2.1.13 Use Case 13: Map-Based Search: Show All Properties

Description

The filter button “All Properties” on the left side can show users all properties list.

Actors:

All users

Flow:

1. Users can click on the filter button “All Properties” on the left side.
2. The middle part of the page shows all properties' brief information list.
3. The map shows all properties’ markers.

2.1.14 Use Case 14: Map-Based Search: Show Favorite Properties

Description

The filter button “Favorite Properties” on the left side can show users their favorite properties list.

Actors:

All users

Flow:

1. Users can click on the filter button “My Favorite” on the left side.
2. The middle part of the page shows all their favorite properties' brief information list.
3. The map shows all their favorite properties’ markers in pink color.

2.1.15 Use Case 15: Map-Based Search: Show Viewed Properties

Description

The filter button “Viewed List” on the left side can show users their view history list.

Actors:

All user

Flow:

1. Users can click on the filter button “View List” on the left side.
2. The middle part of the page shows all the viewed history properties' brief information list.
3. The map shows all the viewed history properties’ markers.

2.1.16 Use Case 16: Map-Based Search: Like the Property

Description

Users can add property to their favorite properties list.

Actors:

All users

Flow:

1. Users can click on the like button shown in the house’s brief or detailed information.
2. The house’s marker color on the map will turn pink.
3. The system will add this property to users’ favorite list.

2.1.17 Use Case 17: Map-Based Search: Share the Property

Description

Users can share the property’s information on social media platforms.

Actors:

All users

Flow:

1. Users can click on the share button shown in the house's brief or detailed information.
2. The popout window lets users choose which social media platforms they want to post.
3. Based on the selection, the app redirects users to the platform and paste all the property's information to the post description.

2.1.18 Use Case 18: Map-Based Search: View Detail Information

Description

Users can view detailed information about the properties.

Actors:

All users

Flow:

1. Users can click on the "Show Detail Information" button shown in the house's brief information.
2. The middle part of the website displays detailed information about the house.

2.1.19 Use Case 19: Map-Based Search: Show Property on the Map

Description

Users can view the exact place of the housing list on the map.

Actors:

All users

Flow:

1. Users can click on the "Show on Map" button shown in the house's brief information.
2. The map points out the location of the house by using orange markers on the map.

2.1.20 Use Case 20: Map-Based Search: Mouseover the Marker

Description

Users can get an overview of the property intuitively.

Actors:

All users

Flow:

1. Users can put their mouse on the markers that are shown on the map.
2. There is a popup window displaying the title, house type, price, and bedrooms number of the house.

2.1.21 Use Case 21: Map-Based Search: Click the Marker

Description

Users can get detailed information about the property intuitively.

Actors:

All users

Flow:

1. Users can click on the markers that are shown on the map.

2. The middle part of the website displays all the detailed information about the house.

2.2 Database Design

2.2.1 House Data

- _listing_id: Primary key of the housing dataset, unique identifier.
- display_address: Display the address of the housing property.
- price: Price of the property.
- type: Type of the property (e.g., HDB, Condo).
- bedrooms: Number of bedrooms in the property.
- bathrooms: Number of bathrooms in the property.
- area: Total area of the property.
- postal_code: Postal code of the property.
- agent: The agent who is responsible for this property

2.2.2 User Data

- _listing_id: Primary key of the user dataset, unique identifier.
- user_email: The email address of the user.
- password: The password of the user.
- favorites_list: The id of the properties that the user clicked the “Like” button.
- viewed_history_list: The id of the properties that the user clicked to view details.

2.2.3 Authentication Data (Private, only used in authentication code, not stored)

- email: The email address of the user.
- password: The password of the user.
- asTenant: A Boolean flag indicating whether the user is a tenant.
- isAuthenticated: A Boolean flag indicating the user’s authentication status.

2.3 User Interface Design

2.3.1 Log In/ Sign Up Welcome Interface

Actors:

Unregistered tenants, registered tenants and registered agents

Description:

- The entrance of Log In and Sign Up for tenant users, and Log In for existing agent users.
- An input field to receive their email to identify whether they are registered or not.
- After the “Continue” button is clicked, error messages are displayed if there are input field validation issues.
- They can click “Log In as an Agent” or “Log In as a Tenant” to switch between tenant mode and agent mode.
- The sketch figure of the interface design is shown in Figure 2-1.

Figure 2-1 Log In/ Sign Up Welcome Interface

2.3.2 Log In Interface

Actors:

Registered tenants and registered agents

Description:

- An input field to receive the password input to match with the database.
- After the “Log In” button is clicked, error messages are displayed if there are input field validation issues.
- Users can navigate back to the email input stage.
- Users will be navigated to the homepage after successful login.
- The sketch figure of the interface design is shown in Figure 2-2.

Figure 2-2 Log In Interface

2.3.3 Register Interface

Actors:

Unregistered tenants.

Description:

- Tenants can register for a new account by setting a password.
- Two input fields to receive the password and confirm the password.
- After clicking the "Register and Login" button, if there is an input field validation problem (including password length, empty password field, and input field match), an error message will be displayed.
- Users can navigate back to the email input stage.
- Users will be navigated to the homepage after successful registration.
- The sketch figure of the interface design is shown in Figure 2-3.

Figure 2-3 Register Interface

2.3.4 Navigation Dropdown

Actors:

Logged in tenants and agents

Description:

- For authenticated users, the account button displays an account dropdown.
- For unauthenticated users, the account button displays a "Log In" button, which directs users to the login page.
- The account dropdown appears when an authenticated user clicks the account button. The dropdown displays the user's email as a button.
- The dropdown menu offers different options based on the user's type. For tenants, options include "My Favorites" and "History." For agents, options include "View All Posts" and "Post New."
- A "Log Out" option is available for both user types within the dropdown.
- The sketch figure of the tenant and agent interface design are shown in Figure 2-5 and Figure 2-8 respectively.

2.3.5 Favorites Display Interface

Actors:

Logged in tenants

Description:

- Logged-in tenants can enter this page by clicking the corresponding option in the account dropdown menu.
- A toggle switch is designed to switch between default listing mode and tabular comparison mode.
- The housing data is presented in a way that is similar to the house searching page.
- The sketch figure of the interface design is shown in Figure 2-4.

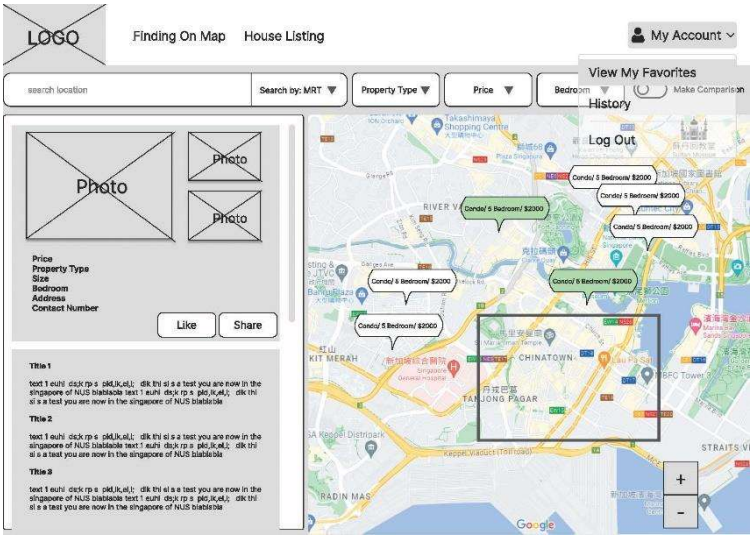


Figure 2-4 Favorites Display Interface

2.3.6 Favorites Comparison Interface

Actors:

Logged in tenants

Description:

- Logged-in tenants can enter this page by clicking the corresponding option in the account dropdown menu.
- A toggle switch is designed to switch between default listing mode and tabular comparison mode.
- The housing data is presented in a tabular format.
- Users can navigate between pages of data using pagination controls:
  - > "Previous" and "Next" buttons allow users to move to the previous or next page.
  - > A page number input field lets users jump to a specific page.
  - > A dropdown allows users to change the number of items displayed per page.
- The sketch figure of the interface design is shown in Figure 2-5.

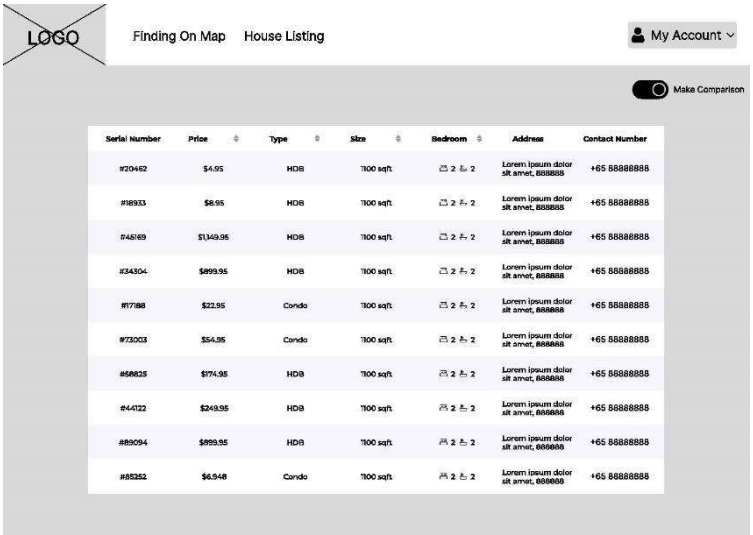


Figure 2-5 Favorites Comparison Interface

2.3.7 View History Interface

Actors:

Logged in tenants

Description:

- Logged-in tenants can enter this page by clicking the corresponding option in the account dropdown menu.
- The housing data is presented in a way that is similar to the house searching page.
- The sketch figure of the interface design is shown in Figure 2-6.

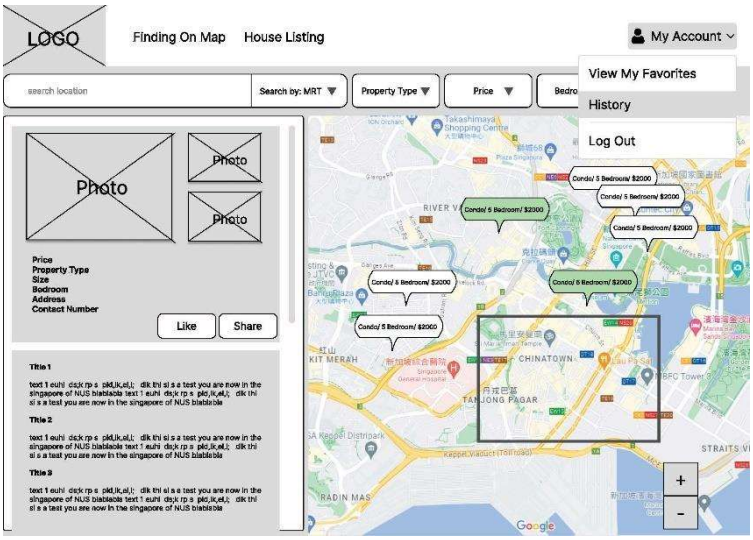


Figure 2-6 View History Interface

2.3.8 View All Posts Interface

Actors:

Logged in agents

Description:

- Logged-in agents can enter this page by clicking the corresponding option in the account dropdown menu.
- The housing data is presented in a way that is similar to the house searching page.
- The sketch figure of the interface design is shown in Figure 2-7.

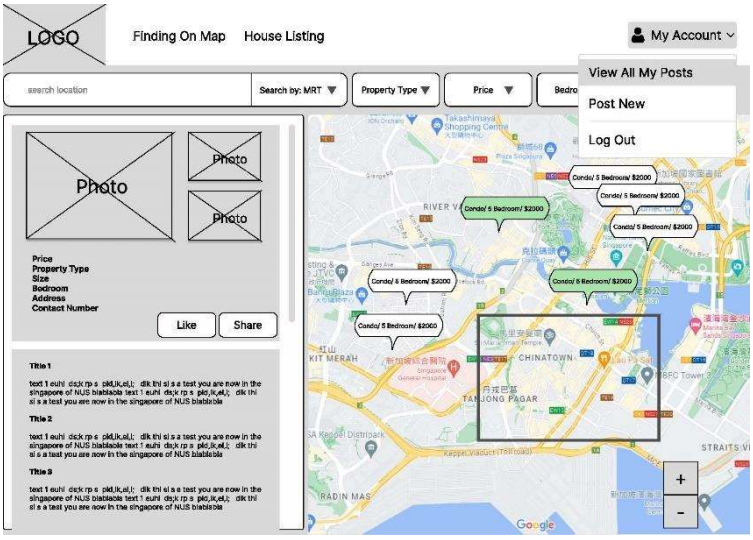


Figure 2-7 View All Posts Interface

2.3.9 Post New Property Interface

Actors:

Logged in agents

Description:

- Logged-in agents can enter this page by clicking the corresponding option in the account dropdown menu.
- Agents can input various details related to the housing listing.
- Placeholders offer guidance on the expected data format.
- A dropdown menu is provided for selecting the type of property. Users can choose from "HDB" or "Condo."
- Error messages are displayed below each input field if the user's input doesn't meet the specified validation criteria.
- A "Submit" button allows users to submit the form after inputting the required details.
- The sketch figure of the interface design is shown in Figure 2-8.

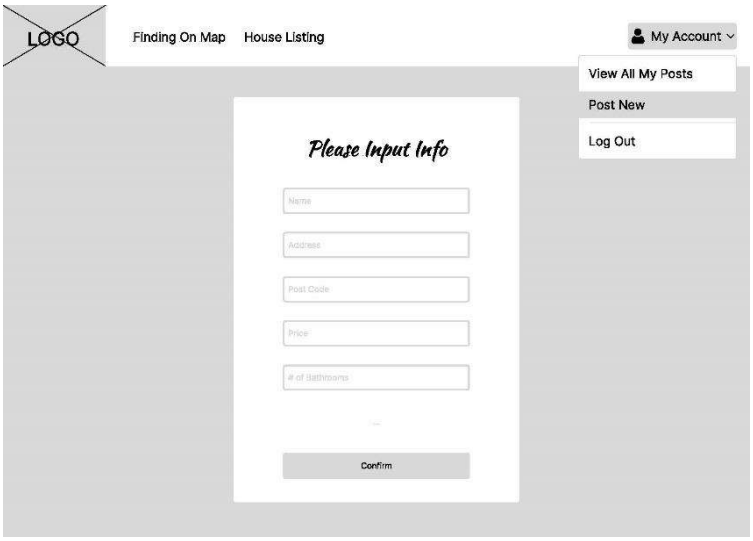


Figure 2-8 Post New Property Interface

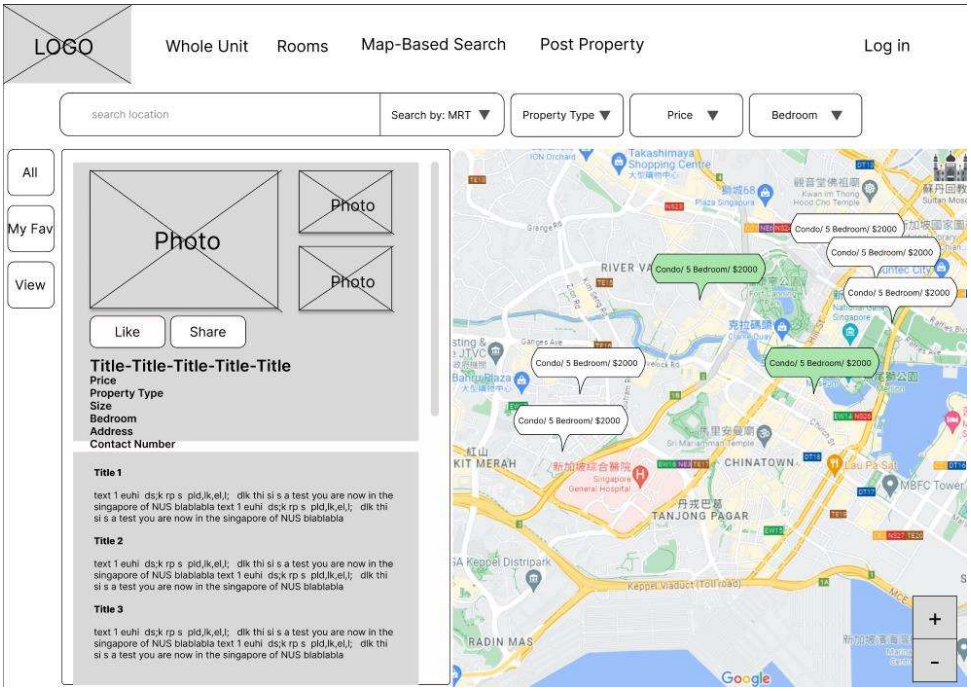
2.3.10 Map-Based Search: House Brief Information

Actors:

All users

Description:

- The sketch figure of the interface design is shown in Figure Figure 2-8.



2.3.11 Map-Based Search: House Detail Information

Actors:

All users

Description:

- The sketch figure of the interface design is shown in Figure Figure 2-80.