Use Case Model

Diagram

A diagram of a company

Description automatically generated

Use Case Specifications

Notations

**Alternative Flow Origin**

We will indicate the exact step of the Normal Flow from which the Alternative Flow originated from, using the following notation:

AF-Sx

Where **AF** denotes Alternative Flow, and **Sx** denotes that it came from **Step X** of the Normal Flow. For instance, **AF-S1** will denote that the Alternative Flow **originated** from **Step 1** of the Normal Flow.

**Use Case ID**

We will label each use case using the following notation:

**UC-xx**

Where UC denotes Use Case and xx denotes the use case number

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| --- | --- | --- | --- |
| Use Case ID: | UC-01 | | |
| Use Case Name: | Login | | |
| Created By: | Guang | Last Updated By: | Guang |
| Date Created: | 05/09/2023 | Date Last Updated: | 09/09/2023 |

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| --- | --- |
| Actor: | User |
| Description: | Authenticate the User |
| Preconditions: | 1. The User must have an account registered in the system |
| Postconditions: | The User will be authenticated |
| Priority: | High |
| Frequency of Use: | High |
| Flow of Events: | 1. User provides authentication information such as email address and password 2. User clicks on login 3. The system authenticates User 4. User is brought to the dashboard |
| Alternative Flows: | AF-S1: Password is incorrect   1. The system displays an error message indicating an incorrect password 2. Flow resets to Step 1 of normal flow   AF-S1: User clicks on forgot password   1. The system redirects User to UC-03 Forgot Password, and User changes to a new password 2. The system brings User back to current flow 3. Flow resets to Step 1 of normal flow |
| Exceptions: | EX1: The system fails to authenticate User   1. The system displays and error message indicating the reason of failure 2. Use case ends |
| Includes: | (Extends) UC-03 Forgot Password |
| Special Requirements: | - |
| Assumptions: | - |
| Notes and Issues: | - |

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| Use Case ID: | UC-02 | | |
| Use Case Name: | Register | | |
| Created By: | Guang | Last Updated By: | Guang |
| Date Created: | 05/09/2023 | Date Last Updated: | 09/09/2023 |

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| Actor: | User |
| Description: | Register a User account in the system |
| Preconditions: | 1. The User must not have an account already registered in the system with the same credentials |
| Postconditions: | A new User account will be created in the system |
| Priority: | High |
| Frequency of Use: | Low |
| Flow of Events: | 1. User provides a valid email address 2. User provides a password and confirms the password in the confirm password field 3. The system validates the provided information and registers a new account for User 4. User is redirected to the home page |
| Alternative Flows: | AF-S1: User provides invalid email address   1. The system displays an error alert 2. Flow resets to Step 1 of normal flow   AF-S2: Password and confirm password fields do not match   1. The system displays and error and prompts User to re-enter password 2. Flow resets to Step 1   AF-S2: Entered password does not conform to password policy   1. The system will prompt the User to re-enter a new password, specifying which condition policy has not been satisfied   Flow resets to Step 2 |
| Exceptions: | EX1: User provides an email address that is already registered   1. The system will alert User 2. The system will prompt the User to utilise the Use Case UC-03 Forgot Password, which allows the user to recover their existing account. 3. Use case ends   EX2: System is unable to register a new account   1. The system displays an error message with an error code 2. Use case ends |
| Includes: | (Extends) UC-03 Forgot Password |
| Special Requirements: | For security, passwords must conform to a specific requirement:   1. Minimum length of 8 characters 2. At least 1 uppercase character 3. At least 1 lowercase character 4. At least 1 special character |
| Assumptions: | - |
| Notes and Issues: | - |

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| Use Case ID: | UC-03 | | |
| Use Case Name: | Forgot Password | | |
| Created By: | Guang | Last Updated By: | Guang |
| Date Created: | 05/09/2023 | Date Last Updated: | 09/09/2023 |

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| Actor: | User |
| Description: | Reset the password of the User |
| Preconditions: | 1. The User must have an account registered in the system |
| Postconditions: | The User account’s password will be changed to a new password |
| Priority: | High |
| Frequency of Use: | Low |
| Flow of Events: | 1. User provides their email address 2. The system sends an OTP to the User’s email 3. User enters the OTP into the page 4. The system prompts the User for a new password with a password and confirm password field 5. User clicks on change password 6. The system successfully changes User’s password and redirects to the Login use case |
| Alternative Flows: | AF-S1: User provides an invalid email address   1. The system shows an error message and prompts User for a valid email address 2. Flow returns to Step 1 of normal flow   AF-S3: OTP is incorrect or expired   1. The system will prevent the User from changing their password. 2. User can request for a new OTP after a cooldown of 60 seconds, up to 3 times total 3. Flow returns to Step 3 of normal flow   AF-S4: Password and confirm password fields do not match   1. The system displays and error and prompts User to re-enter password 2. User enters the password correctly 3. Flow moves to Step 5 of normal flow   AF-S4: Entered password does not conform to password policy   1. The system will prompt the User to re-enter a new password, specifying which condition policy has not been satisfied 2. Flow returns to Step 4 of normal flow |
| Exceptions: | EX1: OTP entered incorrectly for 3 times   1. The system displays an error message 2. Use case ends |
| Includes: | - |
| Special Requirements: | For security, passwords must conform to a specific requirement:   1. Minimum length of 8 characters 2. At least 1 uppercase character 3. At least 1 lowercase character 4. At least 1 special character   OTPs will expire after 5 minutes |
| Assumptions: | - |
| Notes and Issues: | - |

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| Use Case ID: | UC-04 | | |
| Use Case Name: | Visualise on Map | | |
| Created By: | Aaron | Last Updated By: | Aaron |
| Date Created: | 05/09/2023 | Date Last Updated: | 05/09/2023 |

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| Actor: | User |
| Description: | * Facilities Users to visually interact with a dynamic map, spotting real-time traffic conditions, traffic cameras, and road incidents. * The map offers an intuitive overlay, giving users a holistic view of the traffic ecosystem, ensuring a seamless navigation experience. |
| Preconditions: | 1. User is authenticated and has access rights. 2. Stable and consistent Internet connection. |
| Postconditions: | 1. Users get a graphical representation of the traffic landscape with key highlights. 2. Relevant traffic markers, including cameras and incidents, are visible to users. |
| Priority: | Essential |
| Frequency of Use: | Regular (before and during commuting.) |
| Flow of Events: | 1. User selects the “Visualise on Map” feature. 2. Application loads a real-time map of the user’s current location or specified area.  * Traffic conditions are color-coded: green for light, orange for medium, and red for heavy. * Icons for traffic cameras and incidents are plotted on the map.  1. User can zoom, pan, and click on individual icons for more detailed information. 2. System provides a side-panel with a summary of all incidents and camera feeds when selected. 3. System does steps 1 to 3 in the flow of events of UC-11 to display the general traffic trends. |
| Alternative Flows: | AF-S2: If the map fails to load due to weak connection or API issue:   1. The application advises the user: “Unable to load the map. 2. Please check your connection or try again later”. 3. Return to Step 2 in normal flow.   AF-S2: If the user seeks a region with restricted data:   1. The map displays, but with limited or no data, and notifies: "Information for this area is limited or restricted." 2. Return to Step 2 in normal flow. |
| Exceptions: | EX1: If there's a malfunction with real-time data updating:   1. The system sends an alert: “Some data might be outdated. Proceed with caution.”   EX2: When the application encounters a crash or unexpected failure:   1. User is prompted with: “Sorry for the inconvenience. We’re experiencing technical difficulties. Please retry shortly.” |
| Includes: | UC-11 View Traffic Trends |
| Special Requirements: | * Data must be as real-time as possible with refresh intervals not exceeding a few minutes. * The application must handle high-resolution camera feeds without lag. |
| Assumptions: | * The database is constantly updated with fresh traffic, camera, and incident data. * Users have basic knowledge of map interfaces and can understand common traffic symbols. |
| Notes and Issues: | * Ensure consistent uptime for the service to be useful during critical times. * Periodically review and update the map interface to include new roads, landmarks, and traffic management tools. |

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| Use Case ID: | UC-05 | | |
| Use Case Name: | Search Results | | |
| Created By: | Aaron | Last Updated By: | Aaron |
| Date Created: | 05/09/2023 | Date Last Updated: | 05/09/2023 |

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| Actor: | User |
| Description: | Allows users to search traffic conditions.   * The feature allows users to search for specific roads, locations, or traffic cameras within the website. The system provides summary of the traffic conditions using a classification of light, medium or heavy traffic. * Additionally, the system displays statistics related to the number of the incidents reported and number of active traffic cameras available for the searched location. * Data aims to give users a comprehensive understanding of the traffic conditions, easing their efforts in making informed decisions about their desired routes. |
| Preconditions: | * User must be registered and logged into the system. * Internet connectivity is available. |
| Postconditions: | * User is presented with accurate traffic conditions and related statistics for the chosen location or route. * User’s search queries are saved in their search history for future reference. |
| Priority: | High |
| Frequency of Use: | High(High usage during peak commuting hours.) |
| Flow of Events: | **Traffic Search:**   1. User accessing “Traffic Search” feature. 2. System prompts the user to put a specific road, landmark, or search for a traffic camera. 3. User input the desired location or criteria. 4. System fetches data and provides a summary of traffic conditions. 5. System displays statistics about reported incidents and number of active traffic cameras. 6. User can choose to save the search or initiate another search. |
| Alternative Flows: | AF-S2: If the user’s input does not match any existing roads or landmarks:   1. The system suggests similar or nearby locations. 2. User can select a suggested location or re-enter their search. 3. User Return to Step 2 in Normal Flow.   AF-S2: If the system cannot retrieve live data to any external issues:   1. The user is notified of the temporary unavailability of data. 2. The system may provide the most recent cached data with a timestamp, if available. 3. User Return to Step 2 in Normal Flow. |
| Exceptions: | EX1: If the user searches for a restricted or private area:   1. The system notifies them: “Data for the selected location is restricted or not available.”   EX2: If the system faces an unexpected internal error:   1. The user is alerted: “An unexpected error occurred. Please try again later.” |
| Includes: |  |
| Special Requirements: | * System ensure data accuracy and update traffic conditions in real-time. * Ensure privacy and security of user search history. |
| Assumptions: | * Traffic data provided is sourced from reliable channels or databases. * Registered users understand basic traffic terms and classifications. |
| Notes and Issues: | * Regularly update the system’s database to include new roads or landmarks. * Monitor for any discrepancies or inconsistencies in traffic data sourced from multiple channels. |

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| Use Case ID: | UC-06 | | |
| Use Case Name: | Filter Results | | |
| Created By: | Aaron | Last Updated By: | Aaron |
| Date Created: | 05/09/2023 | Date Last Updated: | 05/09/2023 |

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| Actor: | User |
| Description: | Allows users to filter traffic conditions.   * Allows users to filter traffic conditions. By eliminating unwanted incidents and cameras, users can make informed decisions within the system more effectively. |
| Preconditions: | * User must be registered and logged into the system. * Internet connectivity is available. |
| Postconditions: | Traffic conditions on the map are updated to reflect the user’s selected filters.  Users can save filter preferences for future use. |
| Priority: | High |
| Frequency of Use: | High(High usage during peak commuting hours.) |
| Flow of Events: | 1. Accessing Filter Options:  * Once the search results are displayed on the map, a filter icon or button appears on the top or side of the screen. * The user can click on this icon to access filter options.  1. Display of Filter Options:  * A dropdown or slide-out panel appears displaying various filter criteria. * Filters are primarily categorized as "Traffic Cameras" and "Road Incidents." * Under "Traffic Cameras," options like "All," "Highway Cameras," "City Cameras," and "Accident Prone Zones" are available. * Under "Road Incidents," options like "All," "Accidents," "Roadwork," "Closures," and "Slow Traffic" are presented.  1. Selecting Filters:  * Users can choose to select multiple filters or deselect them based on their preferences. For example, they might want to see only "Accidents" and "Roadwork" but not other incidents. * Once the desired filters are selected, there's an "Apply" or "Update" button at the bottom of the filter panel.  1. Applying Filters to Map View:  * Clicking Apply, map updates to display the traffic cameras and incidents that match the user’s selected filters. * All irrelevant data points are removed temporarily.  1. Clearing and Resetting Filters:  * Option to “Reset” is provided within the panel. * If selected, it restores the map view to the original state, displaying all cameras and incidents.  1. Saving Filter Preferences:  * Option to “save filter preferences” is included so user doesn’t have to reset the filters every time they access the platform.  1. Close the Filter Panel:  * Once user set preferences, they can click outside the filter panel or click on the “close or X” icon to return to the map view with their filter settings applied. |
| Alternative Flows: | AF-S1: If system faces a delay in updating the map view:   * User is shown a loading indicator with a message “Updating your view, please wait” * System returns to Step 1 in the normal flow. |
| Exceptions: |  |
| Includes: |  |
| Special Requirements: | * System must have an updated database of traffic database and camera locations. * System should be responsive and adaptive to different screen sizes and electronics gadgets. |
| Assumptions: | * Traffic data is frequently updated in the background for the most accurate representation. |
| Notes and Issues: | * Short tutorial would be consider for first-time users being unfamiliar with the filter process. |

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| Use Case ID: | UC-07 | | |
| Use Case Name: | Routes | | |
| Created By: | Cheng Yao | Last Updated By: | Cheng Yao |
| Date Created: | 05/09/2023 | Date Last Updated: | 05/09/23 |

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| Actor: | User |
| Description: | Allows users to check traffic conditions. |
| Preconditions: | * User is logged in * User clicks on “Routes” under Map |
| Postconditions: | 1. User exits the app OR 2. User moves to another screen/page |
| Priority: | High |
| Frequency of Use: | High |
| Flow of Events: | 1. User clicks on routes under Map screen 2. System displays the user’s favourite routes. 3. System prompts the user to select a route from their favourited route list or search for a route using Origin and Destination 4. User selects a route from their favourited list 5. System will retrieve route information from Maps API through the Map feature. System will display the traffic conditions along the route and save the searched route in user’s search history 6. If the route has not been favourited, user can click on the unlit favourite icon to save the route 7. If user favourites the route, the system will store it into the user’s favourites list 8. Users can search for another route or click on previously searched routes 9. If user clicks on the exit button, return them to the map page and end the flow |
| Alternative Flows: | AF-S6: If the user’s route is already favourited   1. The System will display a lit up favourite icon 2. Clicking on the favourite icon will unfavourite the route, removing it from their favourites list 3. The System returns to Step 5 in Normal Flow   AF-S3: If the user searches for another route   1. User enters the origin and destination in the map 2. The system verifies the validity of the origin and destination 3. If the origin and destination are valid, the system returns the user to Step 5 in the normal flow 4. If the user searches for a location that has restricted data or is a private data(e.g. SAF restricted zone), system alerts the user: “Information is restricted or not available.” and returns the user to Step 3 in the normal flow |
| Exceptions: | EX1: If there temporary issue or outage with the Maps API:   1. System notifies the user: “There seems to be a temporary issue retrieving data. Please try again in a moment.” 2. Use case ends and the user is returned to UC-04 Visualise on Map |
| Includes: | (Extends) UC-04 Visualise on Map |
| Special Requirements: | Requires real-time syncing with the Maps API |
| Assumptions: | Traffic conditions will change frequently, requiring continuous updates.  Users could input multiple favourite routes. |
| Notes and Issues: | Possibility in minor delays upon fetching real-time data during peak server loads.  Camera data only covers specific locations in a fixed angle, might not be available for all locations. |

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| Use Case ID: | UC-08 | | |
| Use Case Name: | Report Incidents | | |
| Created By: | Zi Qin | Last Updated By: | Zi Qin |
| Date Created: | 05/09/23 | Date Last Updated: | 10/09/23 |

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| Actor: | User |
| Description: | This use case allows the user to alert other users of incidents that occur on the driving roads. |
| Preconditions: | User has logged into the system and is viewing the Traffic Incident page |
| Postconditions: | User is returned to the Traffic Incident page |
| Priority: | Medium |
| Frequency of Use: | Low |
| Flow of Events: | 1. The user selects “Report Incident” in the Traffic Incident page. 2. The system requests the user to select an incident type. 3. The user selects an incident type. 4. The system verifies that the user has selected an incident type. 5. The system displays the “Next” button. 6. The user clicks on the “Next” button. 7. The system checks if the user has granted access for the system to access the user's location. 8. If the user has not granted access, the system requests to access the user’s location. 9. The user accepts the system's request to access the user's current location. 10. The system displays the current location detected. 11. The system verifies that the incident location is on a driving road. 12. The system displays the “Next” button. 13. The user clicks on the “Next” button. 14. The system requests the user to enter the incident description. 15. The user enters the incident description. 16. The system displays a “Submit” button 17. The user clicks on the “Submit button” 18. The system saves a record of the user who reported the incident, time of report submission, incident type, incident location and incident description. 19. The system displays a message on the submission status. 20. The system returns the user to the Traffic Incident page. |
| Alternative Flows: | AF-S7: If the user has granted access   1. The system goes to Step 10 of normal flow   AF-S11: If the location detected is not on a driving road   1. The system displays a message “Current location is not on a driving road.” 2. The system displays a “Detect new current location” button 3. User clicks on the “Detect new current location” button 4. The system goes back to Step 10 of normal flow |
| Exceptions: | - |
| Includes: | - |
| Special Requirements: | - |
| Assumptions: | - |
| Notes and Issues: | - |

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| --- | --- | --- | --- |
| Use Case ID: | UC-09 | | |
| Use Case Name: | View Reported Incidents | | |
| Created By: | Zi Qin | Last Updated By: | Zi Qin |
| Date Created: | 05/09/23 | Date Last Updated: | 10/09/23 |

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| Actor: | User |
| Description: | This use case informs users about the incidents reported by other users. |
| Preconditions: | User has logged into the system |
| Postconditions: | User is viewing the Traffic Incident page |
| Priority: | Medium |
| Frequency of Use: | Medium |
| Flow of Events: | 1. The user selects “Incidents” in the main menu of the user interface. 2. The system retrieves records of all incidents reported on the day. 3. The system displays all the information on the reported incidents:  * Incident Type * Reported Time * Incident Location * Incident Description  1. The system displays the message “There are no incidents reported today” if no records are found |
| Alternative Flows: | - |
| Exceptions: | - |
| Includes: | - |
| Special Requirements: | - |
| Assumptions: | - |
| Notes and Issues: | - |

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| Use Case ID: | UC-10 | | |
| Use Case Name: | View Traffic Camera Images | | |
| Created By: | Hamka | Last Updated By: | Hamka |
| Date Created: | 05/09/2023 | Date Last Updated: | 05/09/2023 |

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| Actor: | User |
| Description: | This use case allows users to look at the live image from a specific camera |
| Preconditions: | The user has selected a specific camera location |
| Postconditions: | System allows users to view traffic photos of the specific camera location. |
| Priority: | High |
| Frequency of Use: | High |
| Flow of Events: | 1. User clicks on View Traffic Camera Images in the specific camera page 2. System displays the following information of the camera    * Location    * Camera ID    * Timestamp    * Current Road Incidents    * Traffic Density Level      1. Low      2. Medium      3. High 3. System does step 1 in the alternative flow of events, followed by steps 2 to 3 in the normal flow of events of UC-11 to display the traffic trends of the camera location |
| Alternative Flows: | - |
| Exceptions: | - |
| Includes: | UC-11 View Traffic Trends |
| Special Requirements: | - |
| Assumptions: | - |
| Notes and Issues: | - |

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| --- | --- | --- | --- |
| Use Case ID: | UC-11 | | |
| Use Case Name: | Show Traffic Trends | | |
| Created By: | Hamka | Last Updated By: | Hamka |
| Date Created: | 05/09/2023 | Date Last Updated: | 05/09/2023 |

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| Actor: | User |
| Description: | This use case allows users to view overall traffic trends. |
| Preconditions: | The user is either on the specific camera page or at the overall Road Conditions page |
| Postconditions: | System allows users to view traffic trends of either the specific camera or overall trends of the whole of Singapore |
| Priority: | High |
| Frequency of Use: | Low |
| Flow of Events: | 1. The system prompts a slide-out panel that shows a histogram of the overall traffic trends for Singapore 2. User can filter by    * Minute (Last Hour)    * Hour (Last Day)    * Day (Last Week) 3. The system would display the histogram based on the filter |
| Alternative Flows: | AF-S1: If the user chooses to view the traffic trend of a specific camera on the traffic camera page   1. The system prompts a slide-out panel that shows a histogram of the traffic trend of the specific camera 2. Flow returns to Step 2 of normal flow |
| Exceptions: | - |
| Includes: | - |
| Special Requirements: | - |
| Assumptions: | - |
| Notes and Issues: | - |