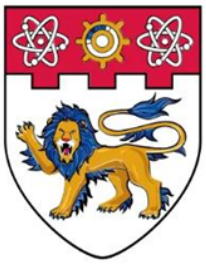

NANYANG TECHNOLOGICAL UNIVERSITY
SINGAPORE

SC2006 - Software Engineering

Lab 2 Deliverables

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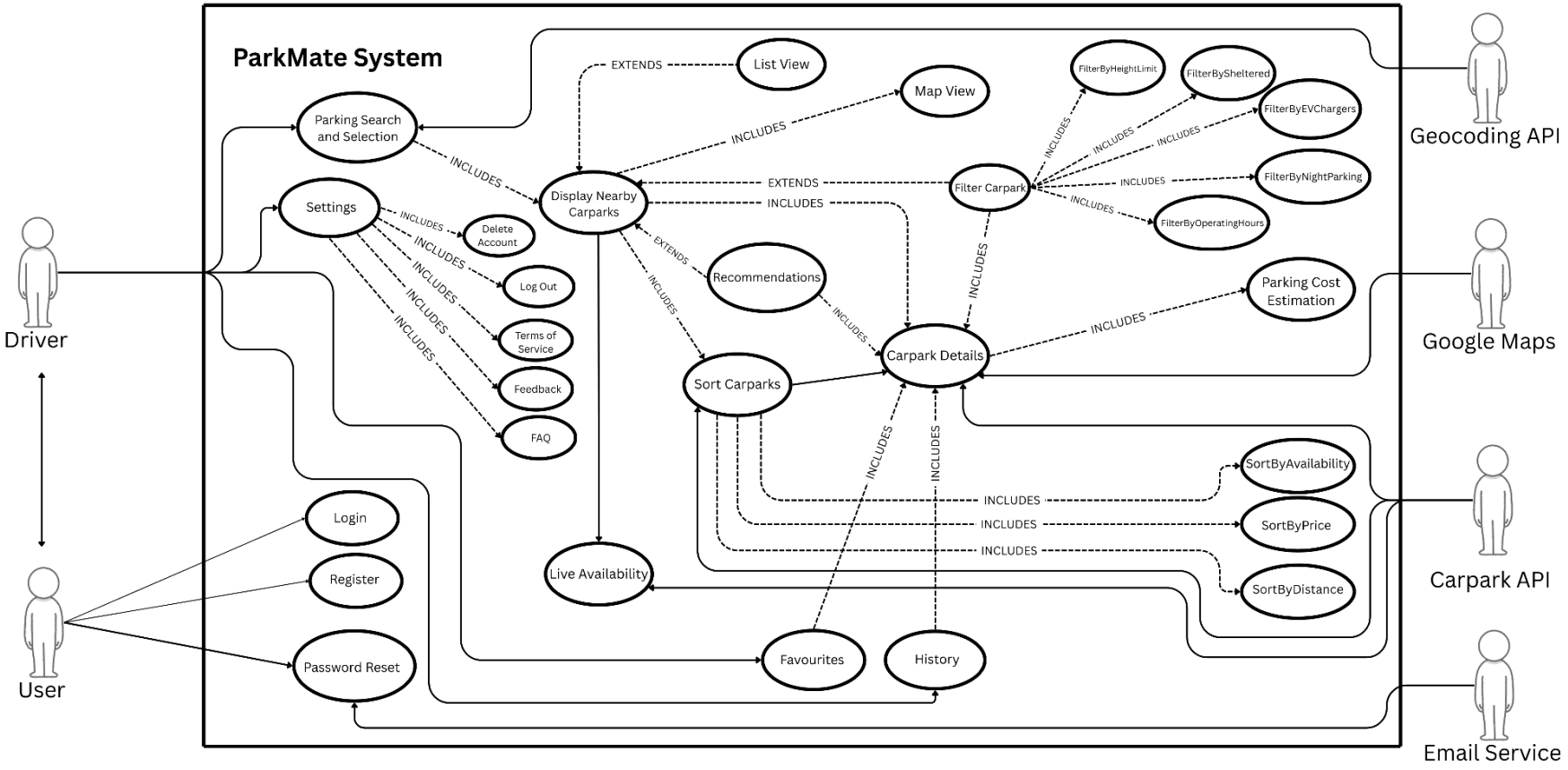
1. Use Case Diagram



2. Use Case Descriptions

I. For Functional Requirement #1

a. Parking Search & Selection

Use Case ID:	#1-1		
Use Case Name:	Parking Search & Selection		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	06 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System, Geocoding API
Description:	Searches for nearby carparks by entering the destination. ParkMate provides geocoding suggestions based on the query, and when a suggestion is selected, the system sets the location as the search destination in google maps.
Preconditions:	● User account exists (#4-1) ● User logged in (#4-2) ● Parkmate has access to a geocoding service and a carpark database.
Postconditions:	Success: ● Destination is set as the search location ● List of nearby carparks is retrieved and displayed Failure: ● No location set
Priority:	High
Frequency of Use:	High
Flow of Events:	1. User navigates to Search Carpark 2. Parkmate prompts users to input addresses with the “Current Location” option. 3. User input address 4. Parkmate retrieve location data from geocoding API 5. Parkmate displays displays list of locations suggestions based on query 6. User selects a location from list 7. Parkmate sets selection as search destination in google maps
Alternative Flows:	AF-S3: No location suggestions 1. Display message: No matching locations found. 2. Goes to Step 2
Exceptions:	EX-01: Geocoding API unavailable 1. Parkmate unable to connect to API 2. Display message: Unable to retrieve location data. Please try again later.

Actor:	Driver(user), Parkmate System, Geocoding API
Description:	Searches for nearby carparks by entering the destination. ParkMate provides geocoding suggestions based on the query, and when a suggestion is selected, the system sets the location as the search destination in google maps.
Preconditions:	● User account exists (#4-1) ● User logged in (#4-2) ● Parkmate has access to a geocoding service and a carpark database.
Postconditions:	Success: ● Destination is set as the search location ● List of nearby carparks is retrieved and displayed Failure: ● No location set
Priority:	High
Frequency of Use:	High
Flow of Events:	1. User navigates to Search Carpark 2. Parkmate prompts users to input addresses with the “Current Location” option. 3. User input address 4. Parkmate retrieve location data from geocoding API 5. Parkmate displays displays list of locations suggestions based on query 6. User selects a location from list 7. Parkmate sets selection as search destination in google maps
Alternative Flows:	AF-S3: No location suggestions 1. Display message: No matching locations found. 2. Goes to Step 2
	EX-02: Invalid address format 1. User enters gibberish, special characters, or unsupported language. 2. Display message: Invalid input. Please enter a valid address. EX-03: Carpark database not reachable 1. Parkmate cannot connect ti the backend database storing the carpark information. EX-04: Permission denied for current location 1. User selects “current location” but denies location-sharing permissions. 2. Display message: Location acces denied. Please enable permissions.
Includes:	None
Special Requirements:	None
Assumptions:	None
Notes and Issues:	None

b. Display Nearby Carparks

Use Case ID:	#1-2		
Use Case Name:	Display Nearby Carparks		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	06 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System
Description:	ParkMate displays nearby carparks around the selected destination. The user can toggle between map view and list view.
Preconditions:	● Destination selected (#1-1: Parking search and selection) ● Parkmate has access to the carpark data
Postconditions:	Success: ● Parkmate displays nearby carparks Failure: ● No carpark display
Priority:	High
Frequency of Use:	High
Flow of Events:	1. Parkmate displays a toggle for user to choose list or map based view while showing map view on default 2. Parkmate displays markers on the map each representing a car park 3. User selects a marker. 4. Selected carpark will be saved to history. 5. Displays each carpark with following details(map view)(#1-8): - Name - Distance - Live availability of carpark slots - Price - Height limit - Last updated time
Alternative Flows:	AF-S1: List view 1. Displays each carpark as a list with the same details in Step 2 2. Clicking on any list will be save to history.
Exceptions:	EX-01: Carpark data service unavailable 1. Parkmate cannot fetch carpark details due to database outage. 2. Display: Carpark information unavailable. Please try again later EX-02: Map Rendering Failure 1. Map view cannot load 2. Default list view with available carparks
Includes:	#1-1 (destination selected), #1-8 (display carpark details)

Actor:	Driver(user), Parkmate System
Description:	ParkMate displays nearby carparks around the selected destination. The user can toggle between map view and list view.
Preconditions:	● Destination selected (#1-1: Parking search and selection) ● Parkmate has access to the carpark data
Postconditions:	Success: ● Parkmate displays nearby carparks Failure: ● No carpark display
Priority:	High
Frequency of Use:	High
Flow of Events:	1. Parkmate displays a toggle for user to choose list or map based view while showing map view on default 2. Parkmate displays markers on the map each representing a car park 3. User selects a marker. 4. Selected carpark will be saved to history. 5. Displays each carpark with following details(map view)(#1-8): - Name - Distance - Live availability of carpark slots - Price - Height limit - Last updated time
Alternative Flows:	AF-S1: List view 1. Displays each carpark as a list with the same details in Step 2 2. Clicking on any list will be save to history.
Special Requirements:	None
Assumptions:	AS-01: User has selected a destination
Notes and Issues:	None

c. Live Availability

Use Case ID:	#1-3		
Use Case Name:	Live Availability		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	06 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System, Carpark API
Description:	ParkMate fetches and refreshes live carpark availability data at fixed intervals. The system ensures users always see up-to-date information and flags outdated data when necessary.
Preconditions:	● Nearby carparks displayed(#1-2)
Postconditions:	Success: ● Displays updated availability for all visible carparks Failure: ● Timestamp of the last updated information
Priority:	High
Frequency of Use:	High
Flow of Events:	1. Parkmate fetch availability from Carpark API for all visible carparks 2. Parkmate displays the latest updated availability
Alternative Flows:	AF-S1: unable to fetch availability 1. Display last updated availability
Exceptions:	EX-01: Carpark API unavailable 1. Parkmate cannot connect to Carpark API 2. DIsplay: “Live availability temporarily unavailable.” and shows last known data with timestamp. EX-02: API rate limit exceeded 1. Too many requests within a short period, API reject calls. 2. Parkmate pauses auto-refresh and displays: Service busy. Retrying shortly. EX-03: Timeout on data fetch 1. API does not response within timeframe 2. Parkmate shows last availability, display: Data not refreshed.
Includes:	#1-2 (carparks displayed)
Special Requirements:	SR-1: Auto-refresh every 60s (tentative to API constraints)
Assumptions:	AS-1: User logged in (#4-2) AS-2: User selected a destination (#1-1)
Notes and Issues:	None

d. Filter Carparks

Use Case ID:	#1-4		
Use Case Name:	Filter Carparks		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	06 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System
Description:	Users can apply filters to refine the list and map of nearby carparks in ParkMate. Users can enable or disable filters such as height limit, EV chargers, sheltered parking, night parking and operating hours.
Preconditions:	● Nearby carparks are displayed (#1-2).
Postconditions:	Success: ● Filtered results are displayed instantly on both map view and list view
Priority:	Medium
Frequency of Use:	High
Flow of Events:	1. User clicks on filter button 2. Parkmate displays available filters (e.g. height limit, EV chargers, sheltered parking, night parking, carpark type.) 3. User chooses filter options 4. Parkmate updates the result on current view(map / list)
Alternative Flows:	AF-S3: User reset filter 1. User click on reset button 2. Clear all filter selected 3. Parkmate displays non-filtered results. (#1-2) AF-S4: No matching filters for carpark 1. Users filter options unable to display a matching carpark 2. Prompts (“No carparks matched”) 3. Goes to Step 2
Exceptions:	EX-01: Filter data missing 1. Carpark database has missing or inconsistent data for a chosen filter. 2. Parkmate shows partial data, display message: Some carparks may have missing information.
Includes:	#1-1 (destination selected), #1-2 (carparks displayed)
Special Requirements:	None
Assumptions:	AS-1: User logged in (#4-2) AS-2: User selected a destination (#1-1)

Actor:	Driver(user), Parkmate System
Description:	Users can apply filters to refine the list and map of nearby carparks in ParkMate. Users can enable or disable filters such as height limit, EV chargers, sheltered parking, night parking and operating hours.
Preconditions:	● Nearby carparks are displayed (#1-2).
Postconditions:	Success: ● Filtered results are displayed instantly on both map view and list view
Priority:	Medium
Frequency of Use:	High
Flow of Events:	1. User clicks on filter button 2. Parkmate displays available filters (e.g. height limit, EV chargers, sheltered parking, night parking, carpark type.) 3. User chooses filter options 4. Parkmate updates the result on current view(map / list)
Alternative Flows:	AF-S3: User reset filter 1. User click on reset button 2. Clear all filter selected 3. Parkmate displays non-filtered results. (#1-2) AF-S4: No matching filters for carpark 1. Users filter options unable to display a matching carpark 2. Prompts (“No carparks matched”) 3. Goes to Step 2
Notes and Issues:	None

1. Filter Height

Use Case ID:	#1-4-1-1		
Use Case Name:	Filter Height		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	08 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System
Description:	Users can enable or disable height filters
Preconditions:	● Nearby carparks are displayed (#1-2).
Postconditions:	Success: ● Filtered results are displayed instantly on both map view and list view
Priority:	Medium
Frequency of Use:	High
Flow of Events:	1. User clicks on “height” filter button 2. Parkmate updates the result on the current view(map/list)
Alternative Flows:	AF-S3: No matching filters for carpark 1. Users filter options unable to display a matching carpark 2. Prompts (“No carparks matched”) 3. Goes to #1-4 Step 3 (choosing filter)
Exceptions:	EX-01: Height data missing 1. Some carparks do not have height limit informations 2. Parkmate display with message: Height data unavailable EX-02: Timeout on filter execution 1. Filtering takes too long >5 minutes 2. Displays: FItlering timed out, displaying previous results.
Includes:	#1-1 (destination selected), #1-2 (carparks displayed)
Special Requirements:	None
Assumptions:	AS-1: User logged in (#4-2) AS-2: User selected a destination (#1-1) AS-3: User on filter interface(#1-4 Step 2)
Notes and Issues:	None

2. Filter EV Charger

Use Case ID:	#1-4-1-2		
Use Case Name:	Filter EV Charger		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	08 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System
Description:	Users can enable or disable “EV Charger” filters
Preconditions:	● Nearby carparks are displayed (#1-2).
Postconditions:	Success: ● Filtered results are displayed instantly on both map view and list view
Priority:	Medium
Frequency of Use:	High
Flow of Events:	1. User clicks on “EV Charger” filter button 2. User chooses filter options 3. Parkmate updates the result on the current view(map/list)
Alternative Flows:	AF-S3: No matching filters for carpark 1. Users filter options unable to display a matching carpark 2. Prompts (“No carparks matched”) 3. Goes to #1-4 Step 3 (choosing filter)
Exceptions:	EX-01: EV Charger information missing 1. Some carparks do not have EV information 2. Parkamates display: EV information unavailable. EX-02: Timeout on filter execution 1. Filtering takes too long >5 minutes 2. Displays: FItlering timed out, displaying previous results.
Includes:	#1-1 (destination selected), #1-2 (carparks displayed)
Special Requirements:	None
Assumptions:	AS-1: User logged in (#4-2) AS-2: User selected a destination (#1-1) AS-3: User on filter interface(#1-4 Step 2)
Notes and Issues:	None

3. Filter Sheltered Parking

Use Case ID:	#1-4-1-3		
Use Case Name:	Filter Sheltered Parking		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	08 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System
Description:	Users can enable or disable “Sheltered Parking” filters
Preconditions:	● Nearby carparks are displayed (#1-2).
Postconditions:	Success: ● Filtered results are displayed instantly on both map view and list view
Priority:	Medium
Frequency of Use:	High
Flow of Events:	1. User clicks on “Sheltered Parking” filter button 2. Parkmate updates the result on the current view(map/list)
Alternative Flows:	AF-S3: No matching filters for carpark 1. Users filter options unable to display a matching carpark 2. Prompts (“No carparks matched”) 3. Goes to #1-4 Step 3 (choosing filter)
Exceptions:	EX-01: Shelter information missing 1. Some carparks do not have shelter information 2. Parkamates display: shelter information unavailable. EX-02: Timeout on filter execution 1. Filtering takes too long >5 minutes 2. Displays: FItlering timed out, displaying previous results.
Includes:	#1-1 (destination selected), #1-2 (carparks displayed)
Special Requirements:	None
Assumptions:	AS-1: User logged in (#4-2) AS-2: User selected a destination (#1-1) AS-3: User on filter interface(#1-4 Step 2)
Notes and Issues:	None

4. Filter Night Parking

Use Case ID:	#1-4-1-4		
Use Case Name:	Filter Night Parking		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	08 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System
Description:	Users can enable or disable “Night Parking” filters
Preconditions:	● Nearby carparks are displayed (#1-2).
Postconditions:	Success: ● Filtered results are displayed instantly on both map view and list view
Priority:	Medium
Frequency of Use:	High
Flow of Events:	1. User clicks on “Night Parking” filter button 2. Parkmate updates the result on the current view(map/list)
Alternative Flows:	AF-S3: No matching filters for carpark 1. Users filter options unable to display a matching carpark 2. Prompts (“No carparks matched”) 3. Goes to #1-4 Step 3 (choosing filter)
Exceptions:	EX-01: Night Parking information missing 1. Some carparks do not have night parking information 2. Parkamates display: Night Parking information unavailable. EX-02: Timeout on filter execution 1. Filtering takes too long >5 minutes 2. Displays: FItlering timed out, displaying previous results
Includes:	#1-1 (destination selected), #1-2 (carparks displayed)
Special Requirements:	None
Assumptions:	AS-1: User logged in (#4-2) AS-2: User selected a destination (#1-1) AS-3: User on filter interface(#1-4 Step 2)
Notes and Issues:	None

5. Filter Operating Hours

Use Case ID:	#1-4-1-5		
Use Case Name:	Filter Operating Hours		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	08 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System
Description:	Users can enable or disable “Operating Hours” filters
Preconditions:	● Nearby carparks are displayed (#1-2).
Postconditions:	Success: ● Filtered results are displayed instantly on both map view and list view
Priority:	Medium
Frequency of Use:	High
Flow of Events:	1. User clicks on “Operating Hours” filter button 2. Parkmate updates the result on the current view(map/list)
Alternative Flows:	AF-S3: No matching filters for carpark 1. Users filter options unable to display a matching carpark 2. Prompts (“No carparks matched”) 3. Goes to #1-4 Step 3 (choosing filter)
Exceptions:	EX-01: Operating Hours information missing 1. Some carparks do not have operating hours information 2. Parkamates display: Operating Hours information unavailable. EX-02: Timeout on filter execution 1. Filtering takes too long >5 minutes 2. Displays: FItlering timed out, displaying previous results
Includes:	#1-1 (destination selected), #1-2 (carparks displayed)
Special Requirements:	None
Assumptions:	AS-1: User logged in (#4-2) AS-2: User selected a destination (#1-1) AS-3: User on filter interface(#1-4 Step 2)
Notes and Issues:	None

e. Sort Carparks

Use Case ID:	#1-5		
Use Case Name:	Sort Carparks		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	06 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System, Carpark API
Description:	Sort the displayed carparks based on different criteria such as availability, price, and distance. ParkMate updates the carpark list and map view accordingly in real time.
Preconditions:	● Nearby carparks displayed (#1-2)
Postconditions:	Success: ● Carparks sorted based on criteria
Priority:	Medium
Frequency of Use:	Medium
Flow of Events:	1. Parkmate displays sorting options (Availability, Price, Distance) 2. User selects a sorting criteria 3. Parkmate reorders the result on current view (map & list) 4. If two or more carparks are tied, Parkmate resolves by shortest walking distance
Alternative Flows:	AF-S2: User selects or deselects criteria 1. Goes to Step 3
Exceptions:	EX-01: Missing data for sorting criteria 1. Some carpark do not have values for chosen criteria (e.g. missing prices, no availability data) 2. Parkmate places them at bottom, displays: Data unavailable EX-02: Sorting Logic Failure 1. Internal error when reordering results (e.g. null values or calculation errors) 2. Parkmate displays previous unsorted results with message: Sorting failed, showing default values.
Includes:	#1-2 (carparks displayed)
Special Requirements:	None
Assumptions:	AS-1: User logged in (#4-2) AS-2: User selected a destination (#1-1)
Notes and Issues:	None

f. Parking Cost Estimation

Use Case ID:	#1-6		
Use Case Name:	Parking Cost Estimation		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	06 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System, Carpark API
Description:	Estimate their parking cost by entering a start and end time. ParkMate calculates the cost based on the carpark's tariff rules and informs the user if cost estimation is not available due to missing data
Preconditions:	● User has selected a destination (#1-1) ● Nearby carparks displayed (#1-2)
Postconditions:	Success: ● Parkmate displays an estimated cost based on the time window Failure: ● Parkmate displays "Cost estimate unavailable."
Priority:	Medium
Frequency of Use:	Medium
Flow of Events:	1. User opens a specific carpark's detail 2. User selects "Estimate Parking Cost" 3. Parkmate prompts user for start and end time 4. User enters desired start and end time 5. Parkmate retrieves carpark's fees from Carpark API 6. Parkmate calculates estimated cost based on time window 7. Parkmate displays estimated cost
Alternative Flows:	AF-S5: No available date on carpark's fee 1. Display "Cost estimate unavailable"
Exceptions:	EX-01: Invalid time window 1. Start time is later than end time, or end time is in the past 2. Display: Invalid time range. Please enter a valid range. EX-02: Carpark Tariff data missing 1. Carpark API does not return tariff rules, or rules are incomplete (e.g. weekend rates missing) 2. Display: Cost estimation failed due to missing data. EX-03: API timeout 1. Parkmate cannot fetch information due to slow response or API downtime. 2. Display: Unable to retrieve information. Please try again later.
Includes:	#1-2 (carparks displayed)
Special	None

Actor:	Driver(user), Parkmate System, Carpark API
Description:	Estimate their parking cost by entering a start and end time. ParkMate calculates the cost based on the carpark's tariff rules and informs the user if cost estimation is not available due to missing data
Preconditions:	● User has selected a destination (#1-1) ● Nearby carparks displayed (#1-2)
Postconditions:	Success: ● Parkmate displays an estimated cost based on the time window Failure: ● Parkmate displays "Cost estimate unavailable."
Priority:	Medium
Frequency of Use:	Medium
Flow of Events:	1. User opens a specific carpark's detail 2. User selects "Estimate Parking Cost" 3. Parkmate prompts user for start and end time 4. User enters desired start and end time 5. Parkmate retrieves carpark's fees from Carpark API 6. Parkmate calculates estimated cost based on time window 7. Parkmate displays estimated cost
Alternative Flows:	AF-S5: No available date on carpark's fee 1. Display "Cost estimate unavailable"
Requirements:	
Assumptions:	AS-1: User logged in (#4-2) AS-2: User selected a destination (#1-1) AS-3: User provides a valid time window
Notes and Issues:	None

g. Recommendations

Use Case ID:	#1-7		
Use Case Name:	Recommendations		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	06 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System
Description:	Recommends up to three carparks based on key factors such as price, walking distance, and availability. Recommended carparks are displayed with badges for quick identification
Preconditions:	● Nearby carparks are displayed (#1-2).
Postconditions:	Success: ● ParkMate displays up to three recommended carparks with labels. Failure: ● If ranking fails, ParkMate displays the carparks without recommendations.
Priority:	Low
Frequency of Use:	High
Flow of Events:	1. Parkmate ranks carparks based on metrics (cheapest, closest walk, most available) 2. Parkmate displays recommendations (up to three) with metrics label 3. User selects a carpark 4. Parkmate opens selected carpark's details (#1-8)
Alternative Flows:	AF-S2: Ranking Algorithm Failure 1. Display carparks without recommendations.
Exceptions:	EX-01: Missing/Incomplete carpark data 1. Exclude affected entries from ranking. 2. Message: "Some carpark details are unavailable; recommendations shown from available data." EX-02: Offline/Network Loss 1. Connection lost during ranking or label fetch 2. Use last available cached recommendations. 3. Message: "Offline – showing cached data (if available)."
Includes:	#1-2 (carparks displayed), #1-8 (display carpark details)
Special Requirements:	None
Assumptions:	AS-1: User logged in (#4-2) AS-2: User selected a destination (#1-1)

Actor:	Driver(user), Parkmate System
Description:	Recommends up to three carparks based on key factors such as price, walking distance, and availability. Recommended carparks are displayed with badges for quick identification
Preconditions:	● Nearby carparks are displayed (#1-2).
Postconditions:	Success: ● ParkMate displays up to three recommended carparks with labels. Failure: ● If ranking fails, ParkMate displays the carparks without recommendations.
Priority:	Low
Frequency of Use:	High
Flow of Events:	1. Parkmate ranks carparks based on metrics (cheapest, closest walk, most available) 2. Parkmate displays recommendations (up to three) with metrics label 3. User selects a carpark 4. Parkmate opens selected carpark's details (#1-8)
Alternative Flows:	AF-S2: Ranking Algorithm Failure 1. Display carparks without recommendations.
Notes and Issues:	None

h. Carpark Details

Use Case ID:	#1-8		
Use Case Name:	Carpark Details		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	06 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System, Carpark API
Description:	Displays detailed information for a selected carpark, including pricing, lot availability, height limits, and operating hours.
Preconditions:	● User has selected a carpark
Postconditions:	Success: ● Parkmate displays complete carpark information Failure: ● Data retrieval fails, shows warning message
Priority:	High
Frequency of Use:	High
Flow of Events:	1. Parkmate retrieves carpark details from Carpark API 2. Parkmate displays carpark details: - Name - Distance - Live availability of carpark slots - Price - Carpark type - Height limit - Last updated time
Alternative Flows:	AF-S1: Retrieval Failure 1. Shows warning message “Fail to retrieve data.”
Exceptions:	EX-01: API timeout 1. Parkmate cannot fetch information due to slow response or API downtime. 2. Display: Unable to retrieve information. Please try again later. EX-02: Network Timeout / Connectivity Loss 1. Request to Carpark API takes too long or fails due to poor internet. 2. Show cached details (if available) 3. Message: “Offline – showing cached data (if available).”
Includes:	#1-2 (carparks displayed), #1-8 (display carpark details)
Special Requirements:	None
Assumptions:	AS-1: User logged in (#4-2)

Actor:	Driver(user), Parkmate System, Carpark API
Description:	Displays detailed information for a selected carpark, including pricing, lot availability, height limits, and operating hours.
Preconditions:	● User has selected a carpark
Postconditions:	Success: ● Parkmate displays complete carpark information Failure: ● Data retrieval fails, shows warning message
Priority:	High
Frequency of Use:	High
Flow of Events:	1. Parkmate retrieves carpark details from Carpark API 2. Parkmate displays carpark details: - Name - Distance - Live availability of carpark slots - Price - Carpark type - Height limit - Last updated time
Alternative Flows:	AF-S1: Retrieval Failure 1. Shows warning message “Fail to retrieve data.”
	AS-2: User selected a destination (#1-1)
Notes and Issues:	None

II. For Functional Requirement #2

a. Add Favourites

Use Case ID:	#2-1		
Use Case Name:	Add Favourites		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	07 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System
Description:	Allows users to add a carpark to their favourites list from the list view, map pop-up, or carpark details page.
Preconditions:	● Carparks are already displayed(#1-2)
Postconditions:	Success: ● Selected carpark is added to favourites Failure: ● Upon failure to add to favourites, shows error message.
Priority:	High
Frequency of Use:	High
Flow of Events:	1. User selects a carpark from the list, map, or details view. 2. User taps the “Favourite” icon. 3. ParkMate marks the carpark as favourited. 4. Carpark is stored in the user’s Favourites list. 5. ParkMate updates the UI with a filled favourite icon.
Alternative Flows:	AF-S2: Already Favourite 1. User already added to favourites. 2. Remove selected carpark from favourites. 3. Parkmate updates the icon to unfilled
Exceptions:	EX-01: Database/Storage Failure 1. ParkMate cannot write to the database or local storage (e.g., storage full, server error) 2. Display message: “Unable to add to favourites. Please try again later.” EX-02: Invalid Carpark ID 1. Selected carpark reference is missing, expired, or corrupted in the database. 2. Prevent add action; show: “Carpark not found. Cannot add to favourites.” EX-03: Network/Connectivity Loss 1. Action requires server confirmation but network is down 2. Message: No internet connection. Please try again later.
Includes:	#1-2 (carpark displayed)

Actor:	Driver(user), Parkmate System
Description:	Allows users to add a carpark to their favourites list from the list view, map pop-up, or carpark details page.
Preconditions:	● Carparks are already displayed(#1-2)
Postconditions:	Success: ● Selected carpark is added to favourites Failure: ● Upon failure to add to favourites, shows error message.
Priority:	High
Frequency of Use:	High
Flow of Events:	1. User selects a carpark from the list, map, or details view. 2. User taps the “Favourite” icon. 3. ParkMate marks the carpark as favourited. 4. Carpark is stored in the user’s Favourites list. 5. ParkMate updates the UI with a filled favourite icon.
Alternative Flows:	AF-S2: Already Favourite 1. User already added to favourites. 2. Remove selected carpark from favourites. 3. Parkmate updates the icon to unfilled
Special Requirements:	None
Assumptions:	AS-1: User already logged in.(#4-2) AS-2: User already entered a destination.(#1-1)
Notes and Issues:	None

III. For Functional Requirement #3

a. Feedback

Use Case ID:	#3-1		
Use Case Name:	Feedback		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	07 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System
Description:	Users can report incorrect carpark data or app-related issues using a feedback form accessible from the Profile Page and Carpark Details page.
Preconditions:	● User logged in. (#4-2)
Postconditions:	Success: ● Feedback is submitted successfully and the user sees a confirmation message.
Priority:	Low
Frequency of Use:	Low
Flow of Events:	1. User opens the Feedback Form via the Profile or Carpark Details page 2. User selects a feedback type (e.g., availability incorrect, entrance closed, height mismatch, other) 3. User optionally attaches photos and enters a free-text description 4. User taps Submit. 5. ParkMate validates and sends feedback to the server. 6. ParkMate displays a success message.
Alternative Flows:	AF-S2: Type not selected 1. User submits feedback without selecting a type. 2. Parkmate prompts user to complete required fields.
Exceptions:	None
Includes:	None
Special Requirements:	None
Assumptions:	AS-1: User already logged in.(#4-2)
Notes and Issues:	None

b. Network Error or Database Failure for Feedback

Use Case ID:	#3-2		
Use Case Name:	Network Error or Database Failure for Feedback		
Created By:	Preetham	Last Updated By:	Preetham
Date Created:	23 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver(user), Parkmate System
Description:	User is unable to send Feedback successfully due to network or database issues.
Preconditions:	● User logged in. (#4-2)
Postconditions:	Success: ● Feedback is not submitted successfully and the user sees an error message.
Priority:	Low
Frequency of Use:	Low
Flow of Events:	1. User fills in required fields. 2. User taps Submit. 3. ParkMate fails to validate and sends feedback to the server. 4. ParkMate displays an error message.
Alternative Flows:	None
Exceptions:	None
Includes:	None
Special Requirements:	None
Assumptions:	AS-1: User already logged in.(#4-2)
Notes and Issues:	None

IV. For Functional Requirement #4

a. Create Account

Use Case ID:	#4-1		
Use Case Name:	Create Account		
Created By:	Abdillah	Last Updated By:	Abdillah
Date Created:	08 Sept 2025	Date Last Updated:	08 Sept 2025

Actor:	Driver (User), ParkMate System
Description:	User creates a ParkMate account using email and password, with validation and duplicate account checks.
Preconditions:	● User does not already have an account with that email. ● Internet connection is available.
Postconditions:	● Success: New account created, user directed to login page. ● Failure: No account created, error message shown.
Priority:	High
Frequency of Use:	Occasional (first-time use).

Flow of Events:	1. User selects “Sign Up”
	2. User enters email & password.
	  a. System validates email format
	  b. System checks for password requirement (ideally more than 12 characters, and use a combination of uppercase letters, lowercase letters, numbers, and symbols)
	3. If valid -> Account created
	4. If invalid -> System shows error message
	5. If email already registered -> System shows “Email already in use”
	6. If passwords do not match -> System shows “Password do not match”

Alternative Flows:	Weak password -> “Password must meet the requirements”
Exceptions:	Network/server error -> “Service unavailable”
Includes:	Validation Service
Special Requirements:	Secure password storage (hashed)
Assumptions:	User owns email provided
Notes and Issues:	Login via social may be added later.

b. Login

Use Case ID:	#4-2		
Use Case Name:	Login		
Created By:	Abdillah	Last Updated By:	Yibin
Date Created:	08 Sept 2025	Date Last Updated:	09 Sept 2025

Actor:	Driver (User), ParkMate System
Description:	User logs into the system with registered credentials.
Preconditions:	• User has a registered account.
Postconditions:	• On login: User navigates to Home screen.
Priority:	High
Frequency of Use:	Frequent
Flow of Events:	1. User enters email and password 2. System verifies credentials. 3. If valid -> Navigate to Home screen 4. If invalid -> “Email and password do not match” 5. Logout -> User session cleared, redirected to login screen
Alternative Flows:	Account not found → “Email not registered.”
Exceptions:	Server down → “Unable to connect.”
Includes:	Authentication Service
Special Requirements:	• Secure session management.
Assumptions:	User inputs correct credentials.
Notes and Issues:	

c. Password Reset

Use Case ID:	#4-3		
Use Case Name:	Password Reset		
Created By:	Abdillah	Last Updated By:	Abdillah
Date Created:	08 Sept 2025	Date Last Updated:	08 Sept 2025

Actor:	Driver (User), ParkMate System, Email Service
Description:	User resets forgotten password or changes password after login
Preconditions:	● Registered email. ● Internet connection.
Postconditions:	User has new valid password.
Priority:	Medium
Frequency of Use:	Seldom
Flow of Events:	1. User selects “Forgot Password” 2. System sends reset email. 3. User clicks reset link and sets new password 4. Authenticated Users can also change password after verifying current password
Alternative Flows:	Reset email not delivered → System shows “Unable to send reset email. Please try again.”
Exceptions:	Invalid reset link expired.
Includes:	Email Service
Special Requirements:	● Token expiration for reset link.
Assumptions:	User can access registered email.
Notes and Issues:	

d. Delete Account

Use Case ID:	#4-4		
Use Case Name:	Delete Account		
Created By:	Abdillah	Last Updated By:	Abdillah
Date Created:	08 Sept 2025	Date Last Updated:	08 Sept 2025

Actor:	Driver (User), ParkMate System
Description:	User deletes account permanently.
Preconditions:	User is logged in.
Postconditions:	Account and preferences removed.
Priority:	Medium
Frequency of Use:	Rare
Flow of Events:	1. User selects “Delete Account.” 2. System prompts confirmation 3. If confirmed -> Account deleted, favourites/preferences erased.
Alternative Flows:	User cancels deletion → Return to Profile page.
Exceptions:	Server error prevents deletion → “Unable to delete account at this time.”
Includes:	Confirmation Service
Special Requirements:	● Irreversible deletion.
Assumptions:	User intends permanent removal.
Notes and Issues:	

e. View Terms of Service and FAQ

Use Case ID:	#4-5		
Use Case Name:	View Terms of Service and FAQ		
Created By:	Abdillah	Last Updated By:	Abdillah
Date Created:	08 Sept 2025	Date Last Updated:	08 Sept 2025

Actor:	Driver (User), ParkMate System
Description:	User views TOS and FAQ from Profile page.
Preconditions:	User is logged in.
Postconditions:	Content displayed with version/date.
Priority:	Low
Frequency of Use:	Occasional
Flow of Events:	1. User navigates to Profile Page. 2. User selects TOS or FAQ 3. System displays content with version/date
Alternative Flows:	None
Exceptions:	Content unavailable → “Unable to load content.”
Includes:	Content Display Service
Special Requirements:	● Must show content version/date.
Assumptions:	TOS/FAQ content is updated in system backend.
Notes and Issues:	Consider multilingual support.

f. Log Out

Use Case ID:	#4-6		
Use Case Name:	Log Out		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	09 Sept 2025	Date Last Updated:	09 Sept 2025

Actor:	Driver(user), Parkmate System
Description:	Logged-in user logs out of the ParkMate application via the Settings page.
Preconditions:	● User logged in
Postconditions:	Success: ● Upon successful logout, the user is redirected to the Login page.
Priority:	High
Frequency of Use:	Medium
Flow of Events:	1. User navigates to the Settings page. 2. User taps the “Logout” button. 3. ParkMate invalidates the current user session. 4. ParkMate clears cached data related to the logged-in user. 5. ParkMate redirects the user to the Login page.
Alternative Flows:	None
Exceptions:	None
Includes:	#4-2 (logged in)
Special Requirements:	None
Assumptions:	None
Notes and Issues:	None

g. Failed Login Attempts & Account Lockout

Use Case ID:	#4-7		
Use Case Name:	Failed Login Attempts & Account Lockout		
Created By:	Harshil	Last Updated By:	Harshil
Date Created:	22 Sept 2025	Date Last Updated:	22 Sept 2025

Actor:	Driver(user), Parkmate System
Description:	Ensures that repeated failed login attempts are tracked, and the account is locked after reaching the retry limit to protect against brute-force attacks.
Preconditions:	● User has an existing registered account ● User attempts to log in with invalid credentials
Postconditions:	Success: ● User account remains active if below the retry limit. Failure: ● User account locked after exceeding retry limit.
Priority:	High
Frequency of Use:	Occasional
Flow of Events:	1. User enters incorrect email or password. 2. System verifies credentials. 3. System increments failed login counter. 4. If failed attempts < 5, show error “Invalid email or password.” 5. If failed attempts > 5, lock account and show “Too many failed attempts. Your account has been locked.” 6. System logs the lockout event
Alternative Flows:	● Admin manually unlocks account upon request. ● User resets password to unlock account (#4-3)
Exceptions:	● Network/server error shows "Unable to verify credentials at this time.”
Includes:	● Authentication Service
Special Requirements:	● Retry limit shall be configurable (default: 5 attempts) ● Locked accounts shall remain blocked until reset by user or admin
Assumptions:	● Users remember their credentials but may occasionally mistype
Notes and Issues:	● Consider adding captcha for suspicious activity.

h. Session Timeout & Auto-Logout

Use Case ID:	#4-8		
Use Case Name:	Session Timeout & Auto-Logout		
Created By:	Harshil	Last Updated By:	Harshil
Date Created:	22 Sept 2025	Date Last Updated:	22 Sept 2025

Actor:	Driver(user), Parkmate System
Description:	Ensures inactive user sessions are automatically logged out after a defined period for security.
Preconditions:	● User is logged in successfully
Postconditions:	Success: ● User stays logged in with activity Failure: ● User session automatically ends after timeout
Priority:	Medium
Frequency of Use:	Regular (background security feature)
Flow of Events:	1. User logs in successfully (#4-2) 2. Systems starts inactivity timer (e.g., 15 minutes) 3. If user performs an action, time resets 4. If no activity within timeout, session expires 5. System logs the user out automatically and redirects to login screen 6. System displays “Your session has expired due to inactivity. Please log in again.”
Alternative Flows:	● User manually logs out before timeout (#4-6)
Exceptions:	● Network failure during session refresh, System logs out immediately
Includes:	● Authentication Service. Secure Session Management
Special Requirements:	● Timeout value shall be configurable (default: 15minutes) ● All cached sensitive data must be cleared upon logout
Assumptions:	● Users may forget to log out manually
Notes and Issues:	● Could allow user option to “Stay logged in” on trusted devices

V. For Functional Requirement #5

a. Handle External API Failure

Use Case ID:	#5-1 (possible edge case to look out for)		
Use Case Name:	Handle External API Failure		
Created By:	Abdillah	Last Updated By:	Abdillah
Date Created:	07 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver (User), ParkMate System, External API
Description:	When live availability data cannot be retrieved due to API issues, ParkMate displays a visible banner and continues showing last-known data
Preconditions:	User has searched for carparks (#1-1, #1-2)
Postconditions:	Banner displayed with timestamp, last-known data shown with “Stale” tag
Priority:	High
Frequency of Use:	High
Flow of Events:	1. ParkMate requests live carpark data from API 2. API call fails (unreachable or error) 3. ParkMate displays banner: “Live data temporarily unavailable - showing last update at HH:MM” 4. ParkMate shows cached availability with “Stale” tag 5. System retries in background 6. If the system successfully calls API, ParkMate refreshes data and removes banner.
Alternative Flows:	1. If the API recovers, ParkMate updates results 2. If the API is unavailable for more than 15 minutes, ParkMate displays, “Live data unavailable for extended period, please try again later or check offline options.” . Suggests user to retry after some time or contact support if persistent. 3. If local cached data is missing or corrupted, ParkMate displays, “Carpark availability information cannot be retrieved. We are working to restore service.”
Exceptions:	1. If there is a Database/network error when accessing cached data, ParkMate displays, “Carpark availability information cannot be retrieved. We are working to restore service.”
Includes:	#1-3 (Live Availability)
Special Requirements:	None
Assumptions:	Internet connection available

Actor:	Driver (User), ParkMate System, External API
Description:	When live availability data cannot be retrieved due to API issues, ParkMate displays a visible banner and continues showing last-known data
Preconditions:	User has searched for carparks (#1-1, #1-2)
Postconditions:	Banner displayed with timestamp, last-known data shown with “Stale” tag
Priority:	High
Frequency of Use:	High
Flow of Events:	1. ParkMate requests live carpark data from API 2. API call fails (unreachable or error) 3. ParkMate displays banner: “Live data temporarily unavailable - showing last update at HH:MM” 4. ParkMate shows cached availability with “Stale” tag 5. System retries in background 6. If the system successfully calls API, ParkMate refreshes data and removes banner.
Alternative Flows:	1. If the API recovers, ParkMate updates results 2. If the API is unavailable for more than 15 minutes, ParkMate displays, “Live data unavailable for extended period, please try again later or check offline options.” . Suggests user to retry after some time or contact support if persistent. 3. If local cached data is missing or corrupted, ParkMate displays, “Carpark availability information cannot be retrieved. We are working to restore service.”
Notes and Issues:	none

b. Location Permission disabled

Use Case ID:	#5-2		
Use Case Name:	Location Permission disabled		
Created By:	Abdillah	Last Updated By:	Abdillah
Date Created:	07 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver (User), ParkMate System, Geocoding api
Description:	If location access is not enabled, ParkMate still allows destination-based search and adjusts distance labels accordingly.
Preconditions:	User had denied location access
Postconditions:	Success: Carparks are displayed relative to chosen destination Failure: None (search still works)
Priority:	Medium
Frequency of Use:	Medium
Flow of Events:	1. User launches ParkMate and denies location permission when prompted. 2. User initiates a search by entering a destination address or postal code. 3. ParkMate queries the external API using the provided destination. 4. ParkMate calculates distances from the chosen destination to nearby carparks. 5. ParkMate displays the carpark list, with distances clearly labeled as **“from destination”** instead of **“from current location.”**
Alternative Flows:	1. If Geocoding API is unreachable or times out, ParkMate displays, “Location service temporarily unavailable, search results may be incomplete or inaccurate.”
Exceptions:	1. If Geocoding API returns an error or invalid data, System displays, “Could not process the destination address. Please check the input and try again.”
Includes:	#1-1 (Search Destination), #1-2 (Display Carparks).
Special Requirements:	None
Assumptions:	User manually inputs destination
Notes and Issues:	none

c. Throttling Manual refresh

Use Case ID:	#5-3		
Use Case Name:	Throttling Manual refresh		
Created By:	Abdillah	Last Updated By:	Abdillah
Date Created:	07 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver (User), ParkMate System
Description:	ParkMate limits excessive manual refresh requests to avoid API overload.
Preconditions:	Carparks displayed (#1-2).
Postconditions:	Success: Requests are queued/throttled Failure: User notified refresh not possible
Priority:	Low
Frequency of Use:	Low
Flow of Events:	1. User attempts manual refresh. 2. ParkMate checks rate limit (<=1 request/second) 3. If allowed, refresh executes. 4. If exceeded, requests are queued.
Alternative Flows:	1. If refresh rate exceeds limit, System will lockout, ParkMate displays, “Too many refresh attempts. Please wait before trying again.”
Exceptions:	1. If there is a Failure in queueing refresh requests due to internal error, User is notified: “Unable to refresh carpark list at this time. Try again later.”
Includes:	none
Special Requirements:	None
Assumptions:	None
Notes and Issues:	none

d. Display Refresh Loading State

Use Case ID:	#5-4		
Use Case Name:	Display Refresh Loading State		
Created By:	Abdillah	Last Updated By:	Abdillah
Date Created:	07 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver (User), ParkMate System
Description:	Show user a visible loading indicator when data refresh is in progress
Preconditions:	Carparks displayed (#1-2)
Postconditions:	User sees updated results after refresh OR error message if refresh fails
Priority:	Medium
Frequency of Use:	High (whenever user refreshes or data auto-updates)
Flow of Events:	1. User initiates refresh (manual or auto) 2. ParkMate displays loading state 3. Once data retrieved, loading indicator disappears. 4. Updated results shown to user
Alternative Flows:	1. If User switches away during refresh, loading state is paused and resumes once app returns to foreground.
Exceptions:	API failure (fallback to #5-1)
Includes:	#1-2 (Display Carparks)
Special Requirements:	None
Assumptions:	None
Notes and Issues:	none

VI. For Functional Requirement #6

a. Open in Maps

Use Case ID:	#6-1		
Use Case Name:	Open in Maps		
Created By:	Abdillah	Last Updated By:	Abdillah
Date Created:	07 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver (User), ParkMate System, google maps
Description:	ParkMate allows users to open a carpark location in their device's google maps application.
Preconditions:	User has selected a carpark from the list or map view.
Postconditions:	Either: maps app opens at correct location , or error displayed + address shown
Priority:	Medium
Frequency of Use:	Medium
Flow of Events:	1. User selects "Open in google Maps" 2. ParkMate checks if google maps app is installed 3. If maps app available -> ParkMate opens location. 4. If no maps app -> ParkMate displays error + copyable address
Alternative Flows:	1. If unable to open in Google Maps due to OS restrictions, ParkMate displays, "Unable to launch maps application, Please install Google Maps. Address is copied to clipboard for manual pasting."
Exceptions:	1. Maps app installed but lacks required permissions, ParkMate displays, "Please allow our app to have permissions to access Google Maps". 2. If Google Maps returns an error for invalid or incomplete address, ParkMate displays, "Address not found in maps. Please verify or enter manually."
Includes:	none
Special Requirements:	None
Assumptions:	Device has internet connectivity
Notes and Issues:	none

b. Attribution and Transparency

Use Case ID:	#6-2		
Use Case Name:	Attribution and Transparency		
Created By:	Abdillah	Last Updated By:	Abdillah
Date Created:	07 Sept 2025	Date Last Updated:	23 Sept 2025

Actor:	Driver (User), ParkMate System
Description:	ParkMate displays source attribution for all external data sources and explains assumptions behind derived values via tooltips.
Preconditions:	Carparks successfully fetched
Postconditions:	Data source attribution always visible on list and detail views, tooltips shown if available
Priority:	Low
Frequency of Use:	Constant
Flow of Events:	1. Park Mate fetches and displays data. 2. Data source attribution shown (e.g. HDB/URA). 3. For estimated values, tooltip displayed with calculation assumptions.
Alternative Flows:	1. If attribution data not supplied by external API, ParkMate displays, “Source data attribution unavailable.”
Exceptions:	1. If Tooltip explanation is broken or missing, Fallback to generic disclaimer: “Values estimated; see documentation for details.”
Includes:	none
Special Requirements:	None
Assumptions:	External APIs provide attribution requirements.
Notes and Issues:	none

VII. For Functional Requirement #7

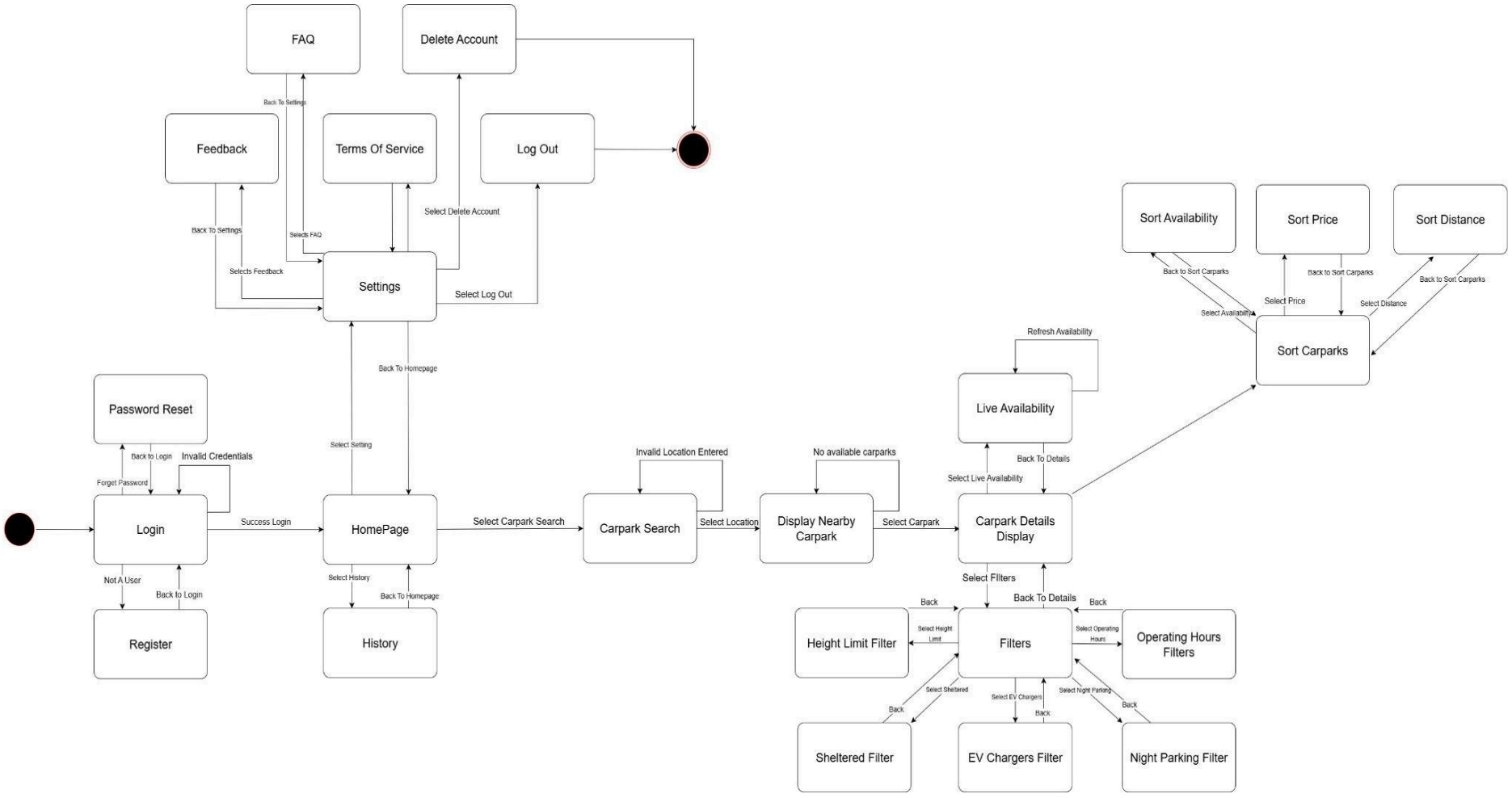
a. View & Manage Carpark Selection History

Use Case ID:	#7-1		
Use Case Name:	View & Manage Carpark Selection History		
Created By:	Yibin	Last Updated By:	Abdillah
Date Created:	09 Sept 2025	Date Last Updated:	23 Sept 2025

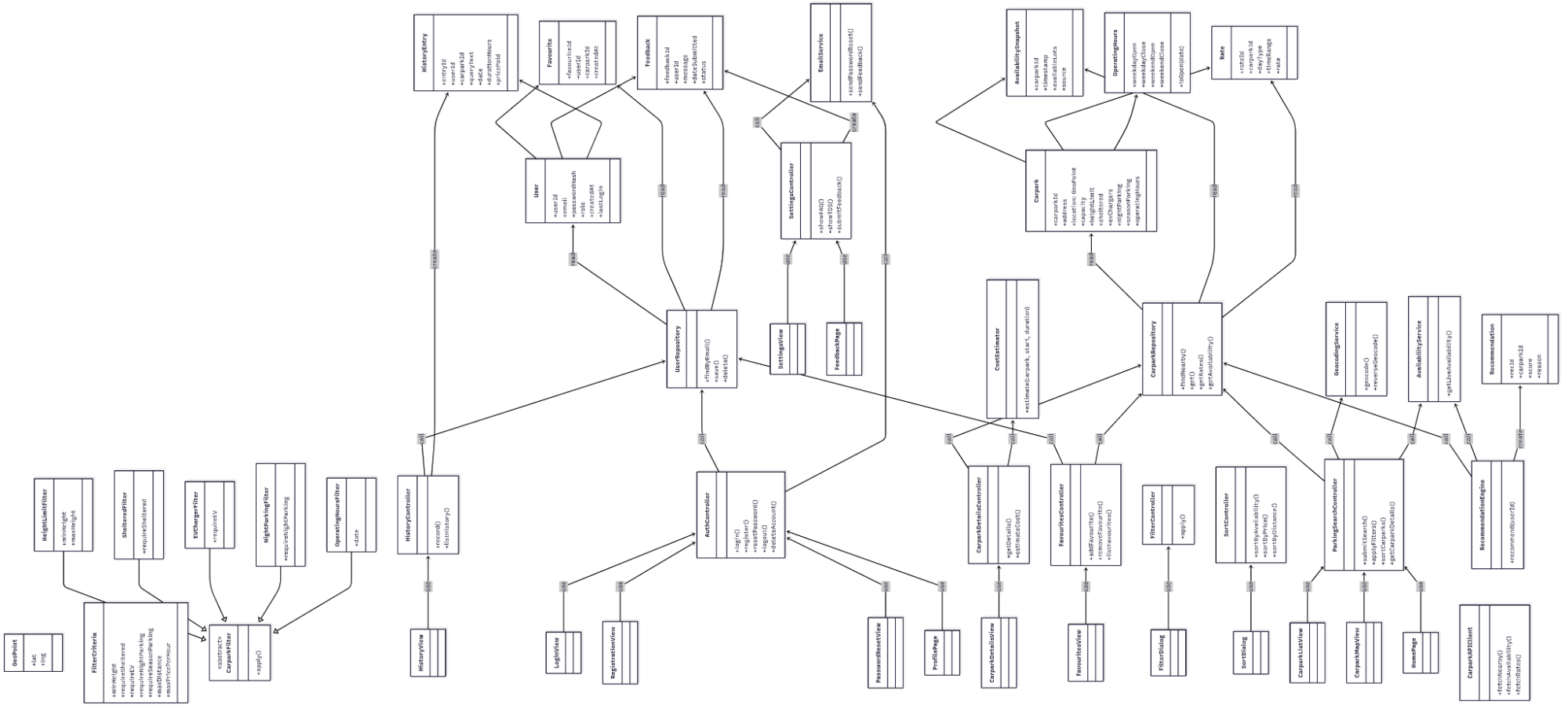
Actor:	Driver(user), Parkmate System
Description:	View and manage their Carpark Selection History in ParkMate. The system automatically records selected carparks and allows users to revisit them.
Preconditions:	● User must be logged in. ● User has previously selected at least one carpark to generate history entries.
Postconditions:	Success: ● User's history of selected carpark is displayed. Failure: ● ParkMate displays a non-blocking message and loads locally cached entries if available.
Priority:	Medium
Frequency of Use:	Medium
Flow of Events:	1. User navigates to the History Tab from the Profile Page or main navigation. 2. ParkMate retrieves and displays the list of previously selected carparks. 3. Each history row displays the carpark name and timestamp. 4. User taps a history entry to reopen the Carpark Details and set it as the current selection. 5. ParkMate updates the history list immediately and syncs the changes.
Alternative Flows:	1. If there is no carpark selection history exists for the user (first-time use or cleared data).e, ParkMate displays a message: “No history found. Start selecting carparks to build your history.” 2. If User is not logged in, ParkMate displays only local (on-device) selection history and a prompt: “Log in to sync your full carpark history across devices.”
Exceptions:	1. If History sync to the server fails due to network or API outage, ParkMate displays a message: “Unable to sync carpark history. Changes will be synced when you are online.” 2. If Corrupted or unreadable history data (local or server-side), ParkMate displays an error: “History data could not be loaded.

Actor:	Driver(user), Parkmate System
Description:	View and manage their Carpark Selection History in ParkMate. The system automatically records selected carparks and allows users to revisit them.
Preconditions:	● User must be logged in. ● User has previously selected at least one carpark to generate history entries.
Postconditions:	Success: ● User's history of selected carpark is displayed. Failure: ● ParkMate displays a non-blocking message and loads locally cached entries if available.
Priority:	Medium
Frequency of Use:	Medium
Flow of Events:	1. User navigates to the History Tab from the Profile Page or main navigation. 2. ParkMate retrieves and displays the list of previously selected carparks. 3. Each history row displays the carpark name and timestamp. 4. User taps a history entry to reopen the Carpark Details and set it as the current selection. 5. ParkMate updates the history list immediately and syncs the changes.
Alternative Flows:	1. If there is no carpark selection history exists for the user (first-time use or cleared data).e, ParkMate displays a message: “No history found. Start selecting carparks to build your history.” 2. If User is not logged in, ParkMate displays only local (on-device) selection history and a prompt: “Log in to sync your full carpark history across devices.”
Includes:	#1-8(to display selected carpark details)
Special Requirements:	None
Assumptions:	None
Notes and Issues:	None

3. Dialogue Map



4. Class Diagram



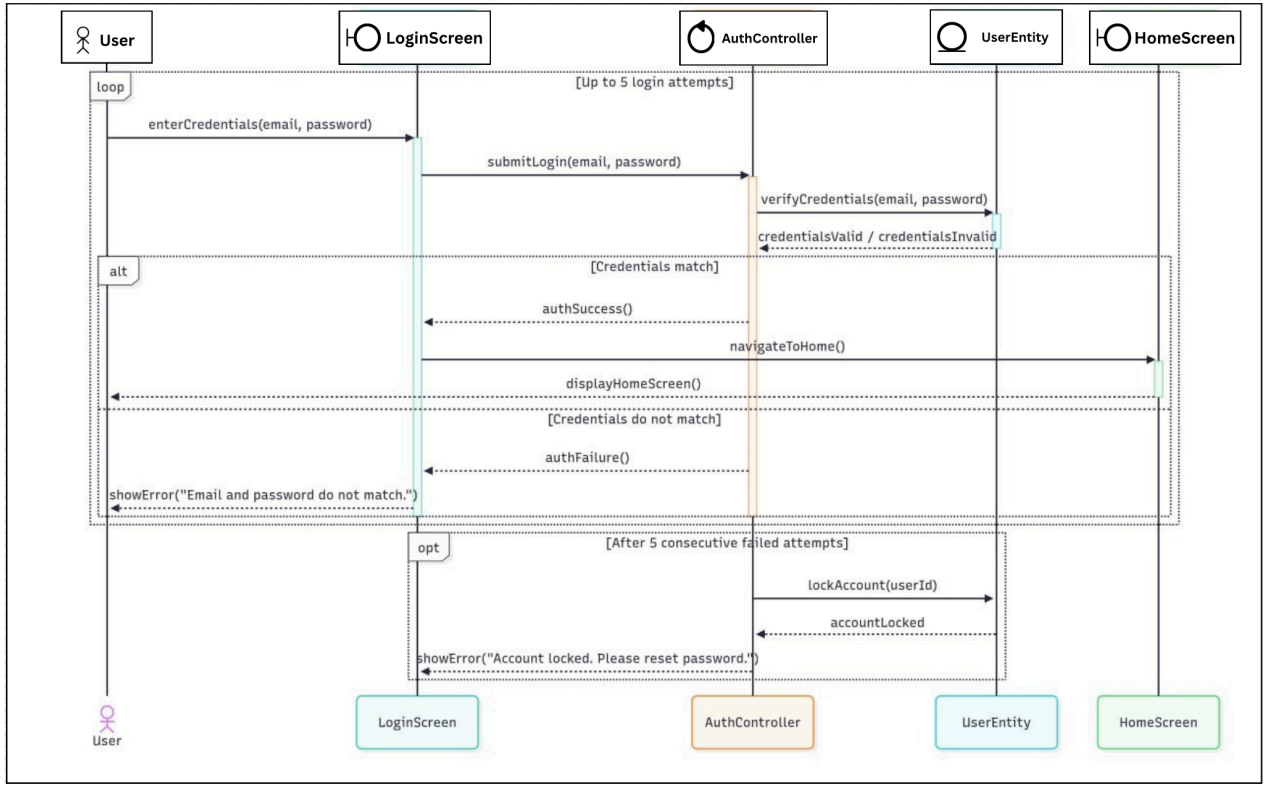
5. Sequence Diagrams

1. User Login (FR #4-1)

Actors: User → LoginScreen → AuthController → User Entity → HomeScreen

Steps:

1. User enters credentials (email + password).
2. LoginScreen sends credentials to AuthController.
3. AuthController checks User entity (DB).
4. If match → success → navigates to HomeScreen.
5. If not → error message “Email and password do not match.”

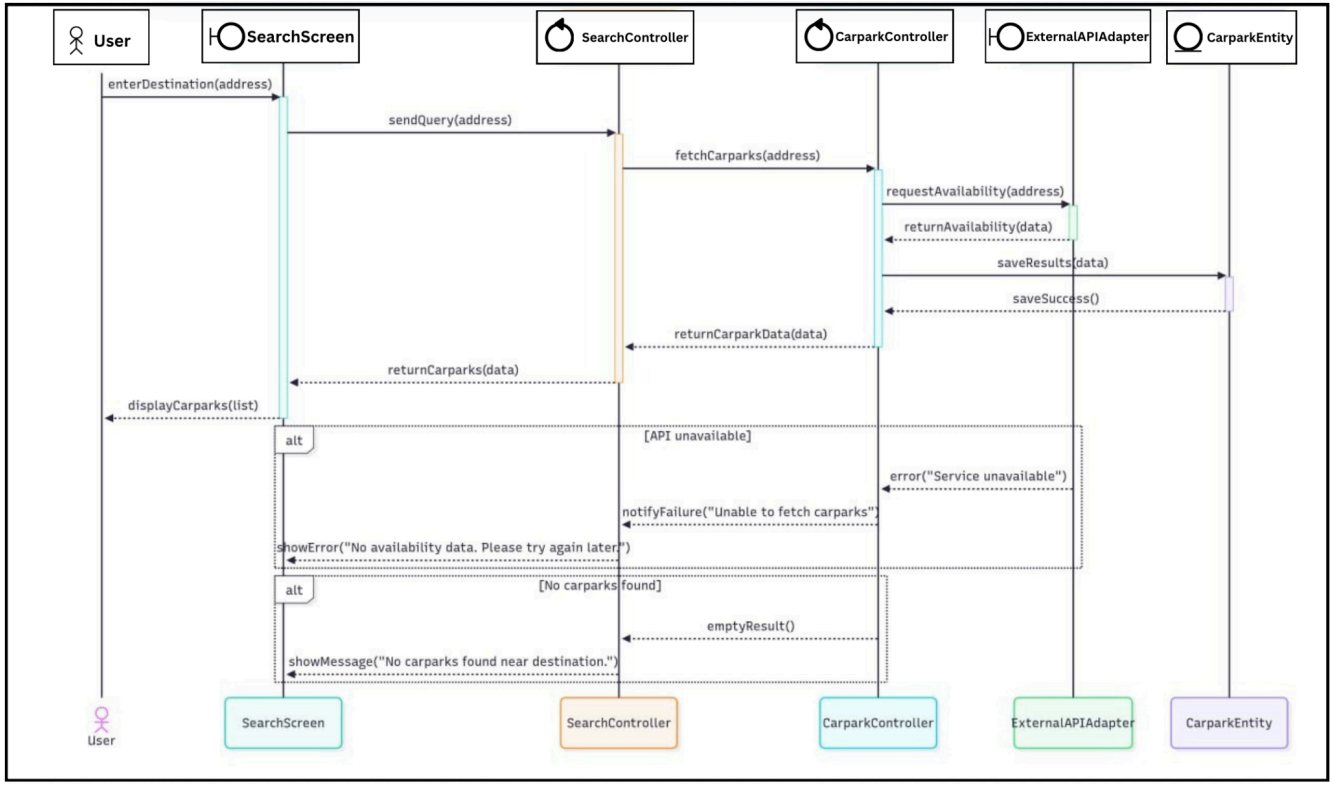


2. Search for Carparks by Destination (FR #1-1, #1-2)

Actors: User ⟶ SearchScreen ⟶ SearchController ⟶ CarparkController ⟶ ExternalAPIAdapter ⟶ Carpark Entity

Steps:

1. User enters destination.
2. SearchScreen sends query to SearchController.
3. SearchController fetches carparks via CarparkController.
4. CarparkController calls ExternalAPIAdapter for availability.
5. Results are saved into CarparkEntity.
6. Carparks returned and displayed on SearchScreen.

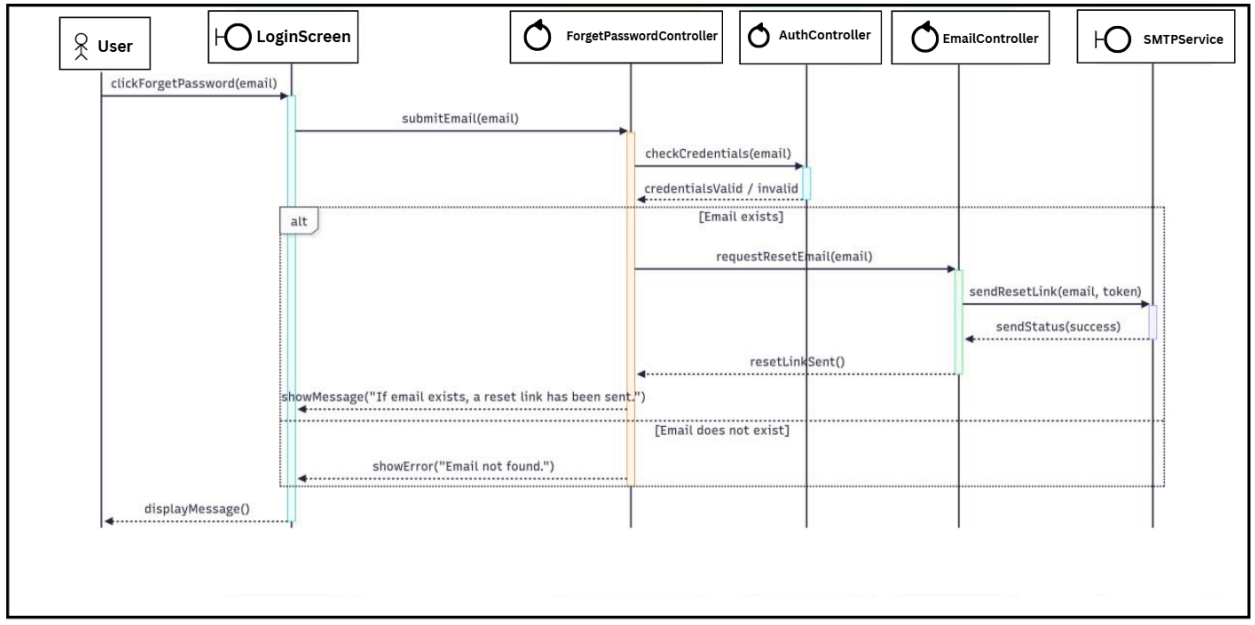


3. Password Reset (FR #4-3)

Actors: User → LoginScreen → ForgetPasswordController → AuthController → EmailController → SMTPService

Steps:

1. User enters Login Screen
2. User clicks Forget Password Button
3. ForgetPasswordController checks credential via AuthController
4. Successful Authentication would enable EmailController to request for SMTPService
5. AuthController returns a message to prompt user to check their email
6. Message is displayed on LoginScreen



4. Nearby Live Availability (FR #1-3)

Actors: User → MapViewScreen → MapController → Geocoding API → Carpark API → CarparkEntity

Steps:

1. User enters the MapViewScreen
2. MapViewScreen sends query to MapController
3. MapController fetches data from Geolocation API and Carpark API
4. Geolocation API and Carpark API returns Information to MapController
5. Information is displayed on MapViewScreen