

EzParking

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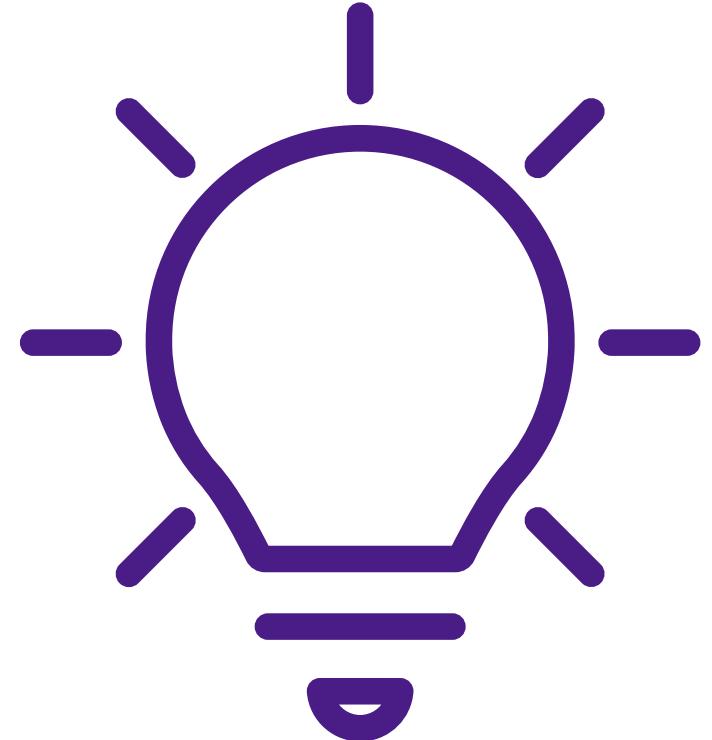
Federico De Lullo 1935510

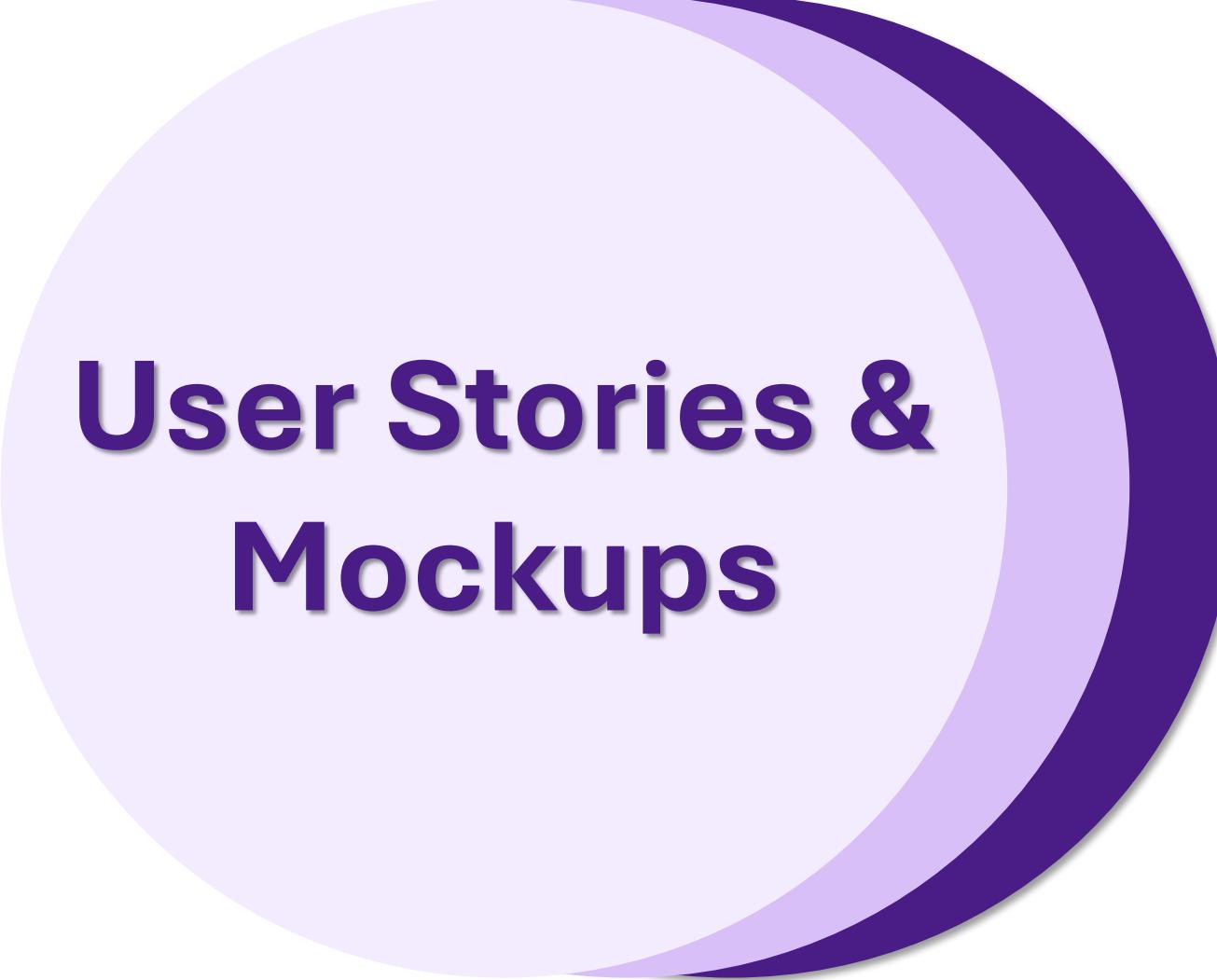


Initial Idea

The objective of this project is to create a distributed parking sharing application that enables users to find and share parking spaces in urban areas with minimal reliance on centralized servers. The system fosters a community-driven approach to solving the challenge of:

- **finding** available parking,
- **reducing** traffic congestion and environmental impact,
- **promoting** collaboration among users.

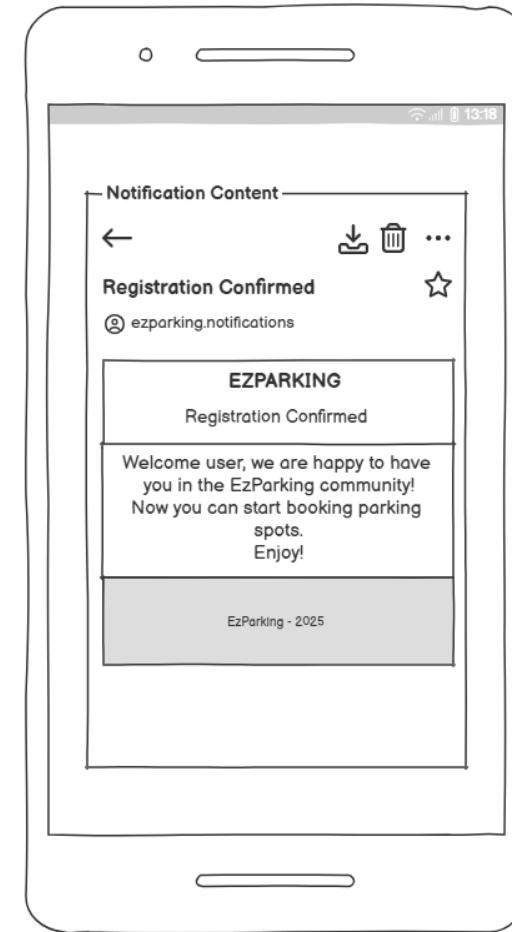
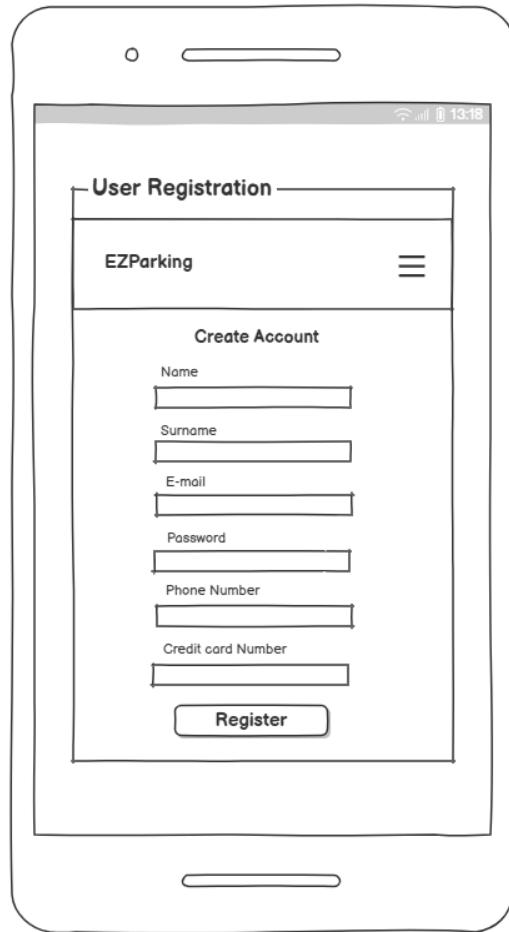




User Stories & Mockups

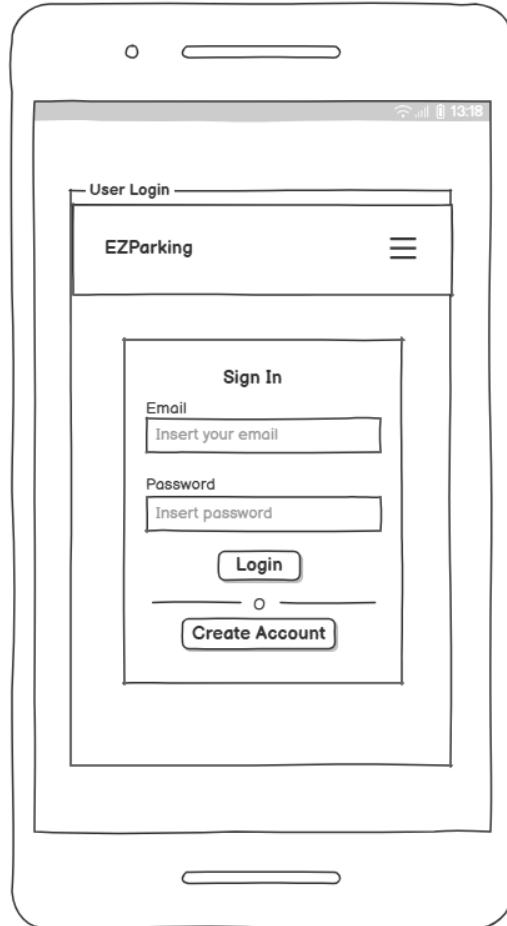
Registration and Login

As a user I want to register to the system so that I can access to the application.

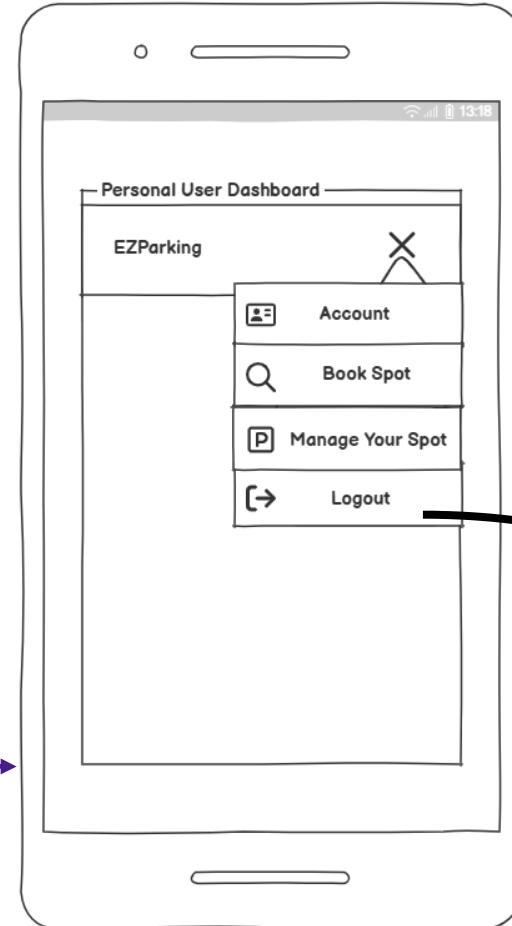


As a user I want to login into the system so that I can authenticate myself to the platform and use app's functionalities.

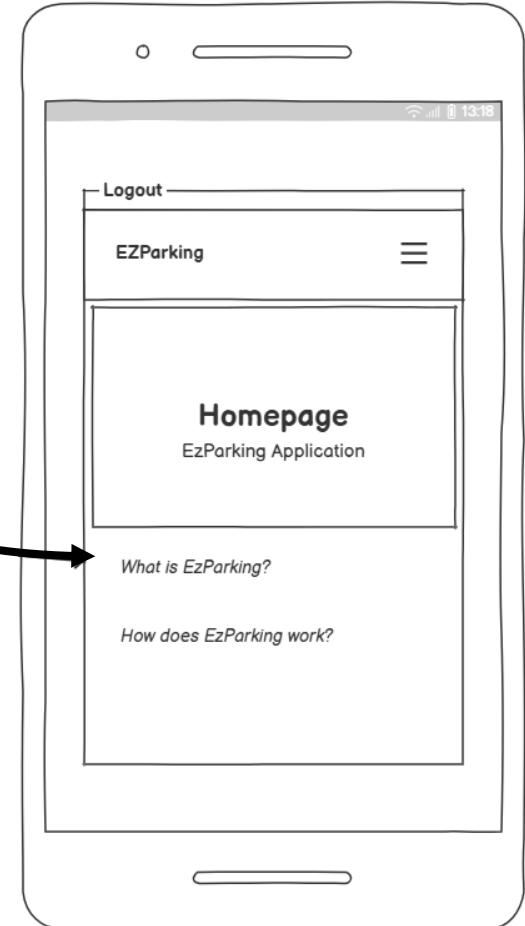
Registration and Login



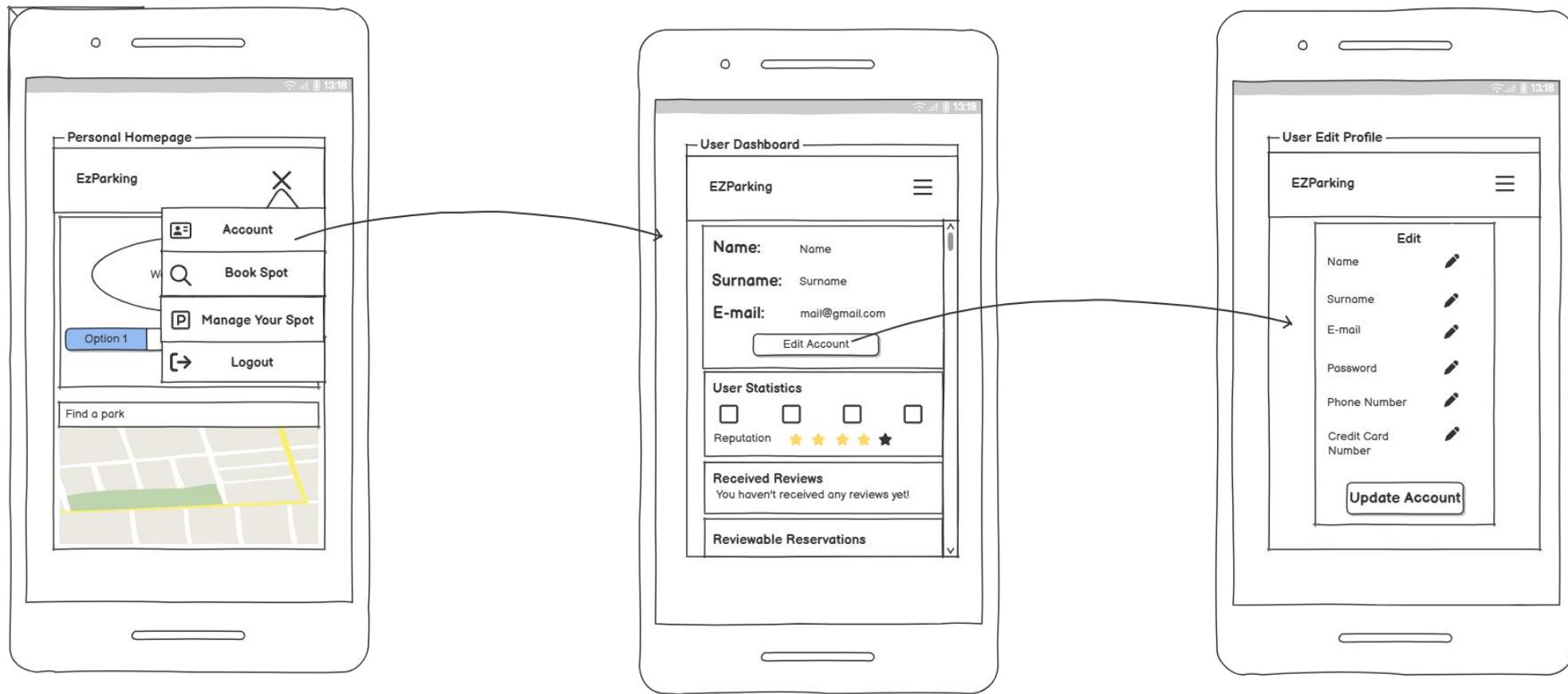
As a user I want to login into the system so that I can authenticate myself to the platform and use app's functionalities.



As a user I want to logout from the system so that I can exit from the platform while I don't use it.

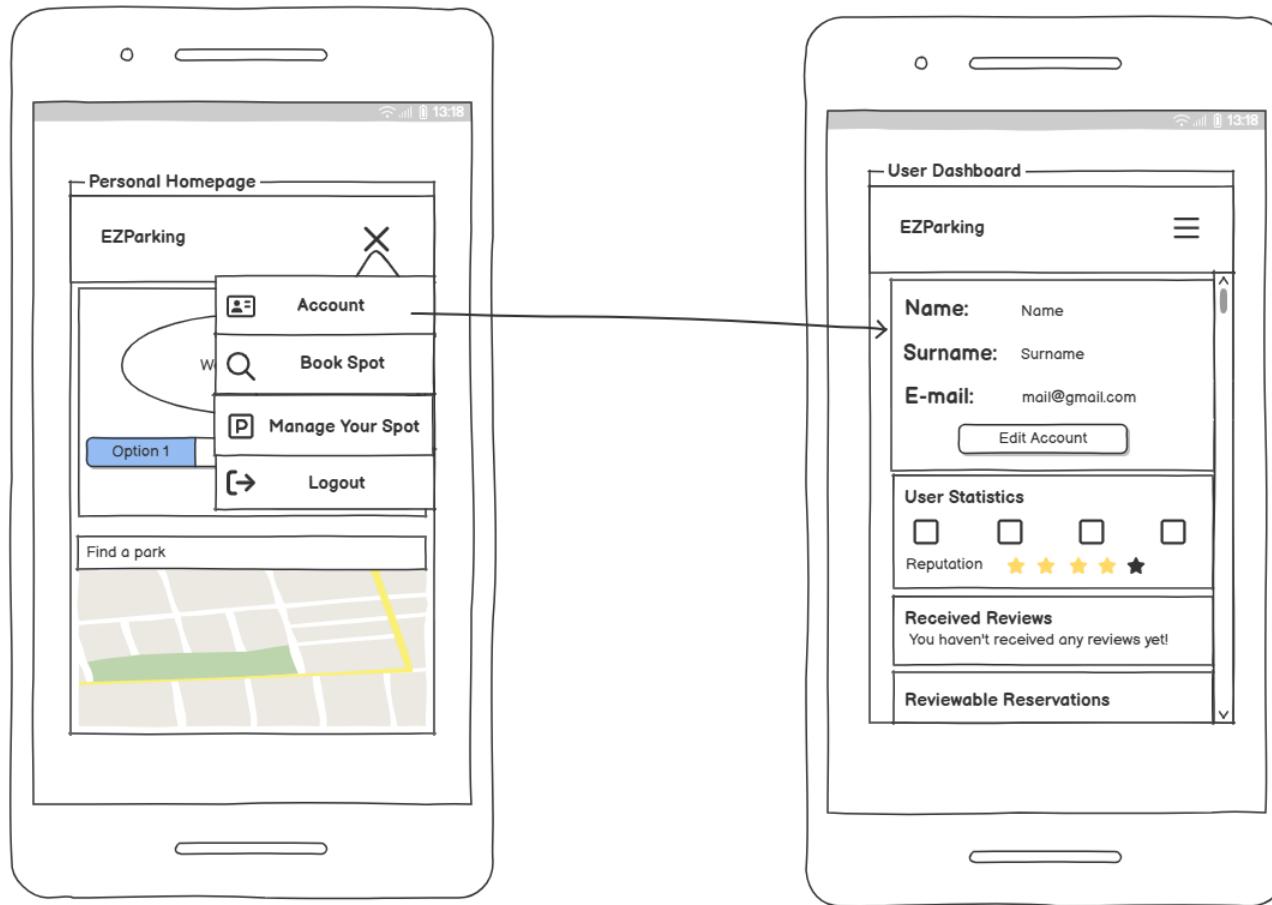


Edit Personal Profile



As a user I want to modify personal data so that I can keep updated my account.

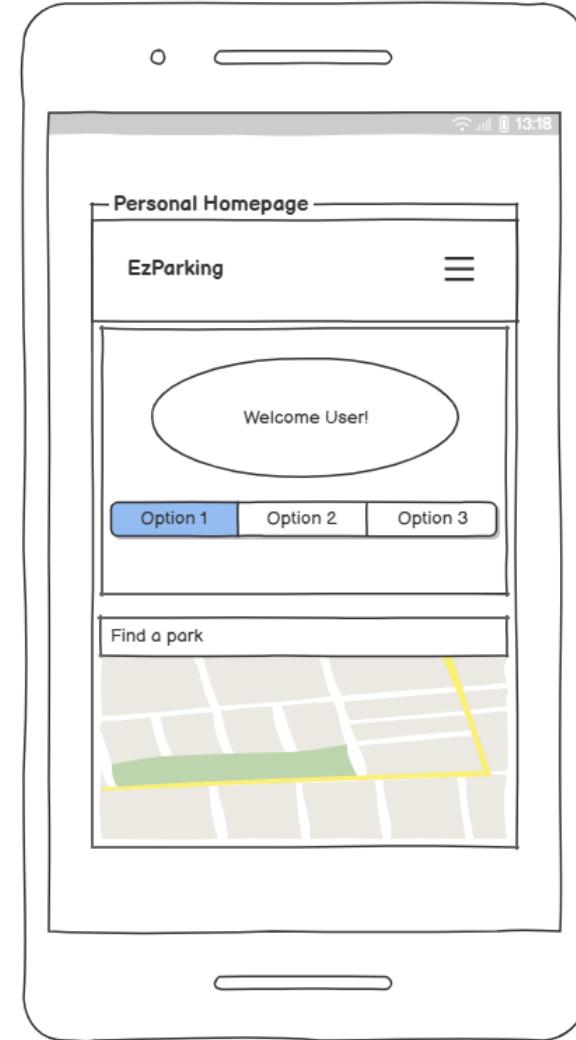
Personal Dashboard



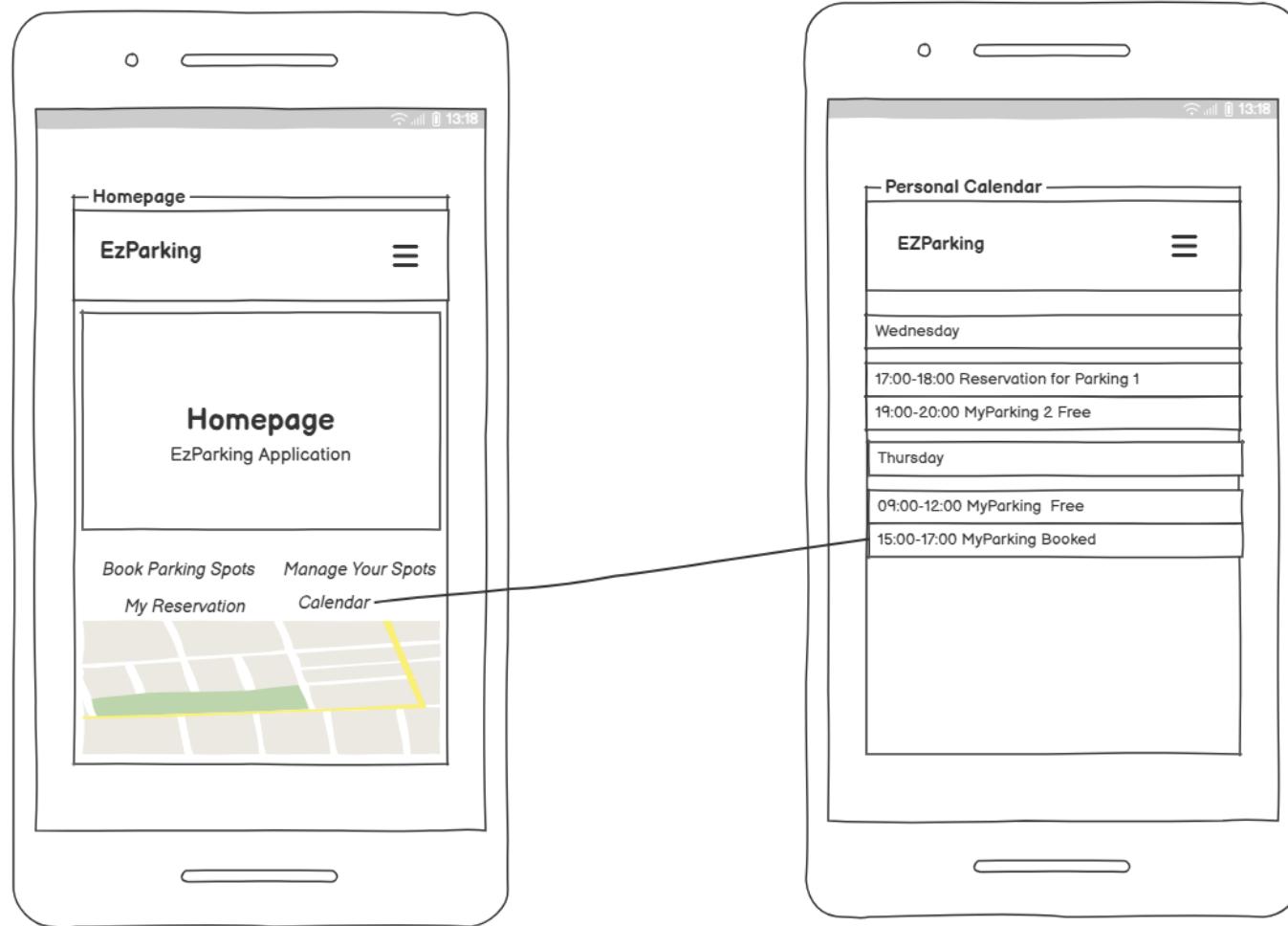
- ✓ As a user I want to have a personal dashboard so that I can check my personal data and history.
- ✓ As user I want to see my statistics in the personal dashboard, so I can know the number of my active reservations, my available parking spots and more.
- ✓ As a driver I want to access my reputation score on my dashboard so I can know which parking spaces I can book.
- ✓ As a driver I want to see all the reviews I have received from the residents so that I can evaluate my behaviour.

Personal Homepage

- ✓ As a user I want to see all the functionalities of the app in my homepage so that I can access easily to them.
- ✓ As a driver I want a map in the homepage that displays all the available parking spots so that I can precisely choose the parking spot position.

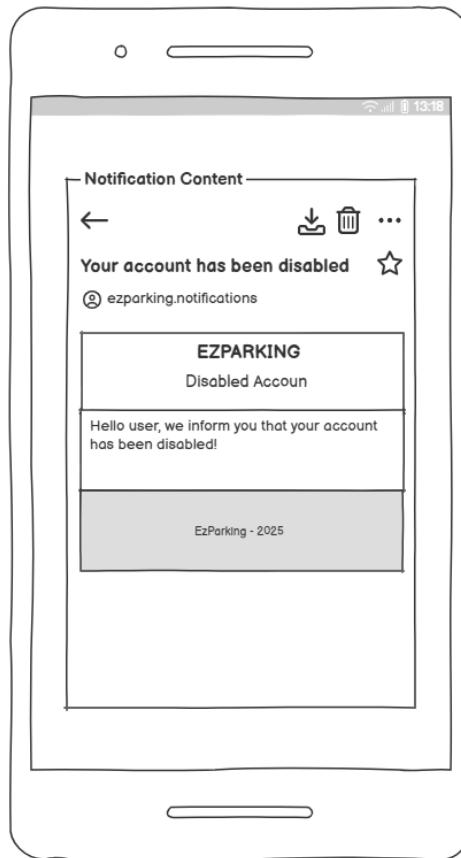
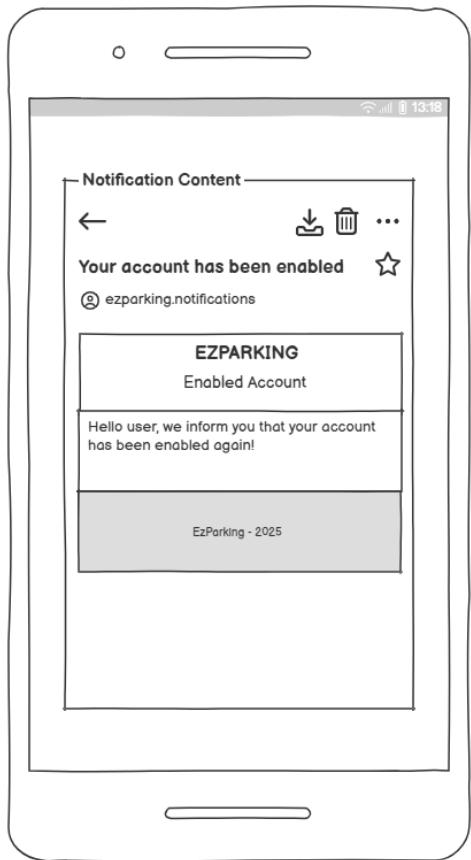


Calendar View



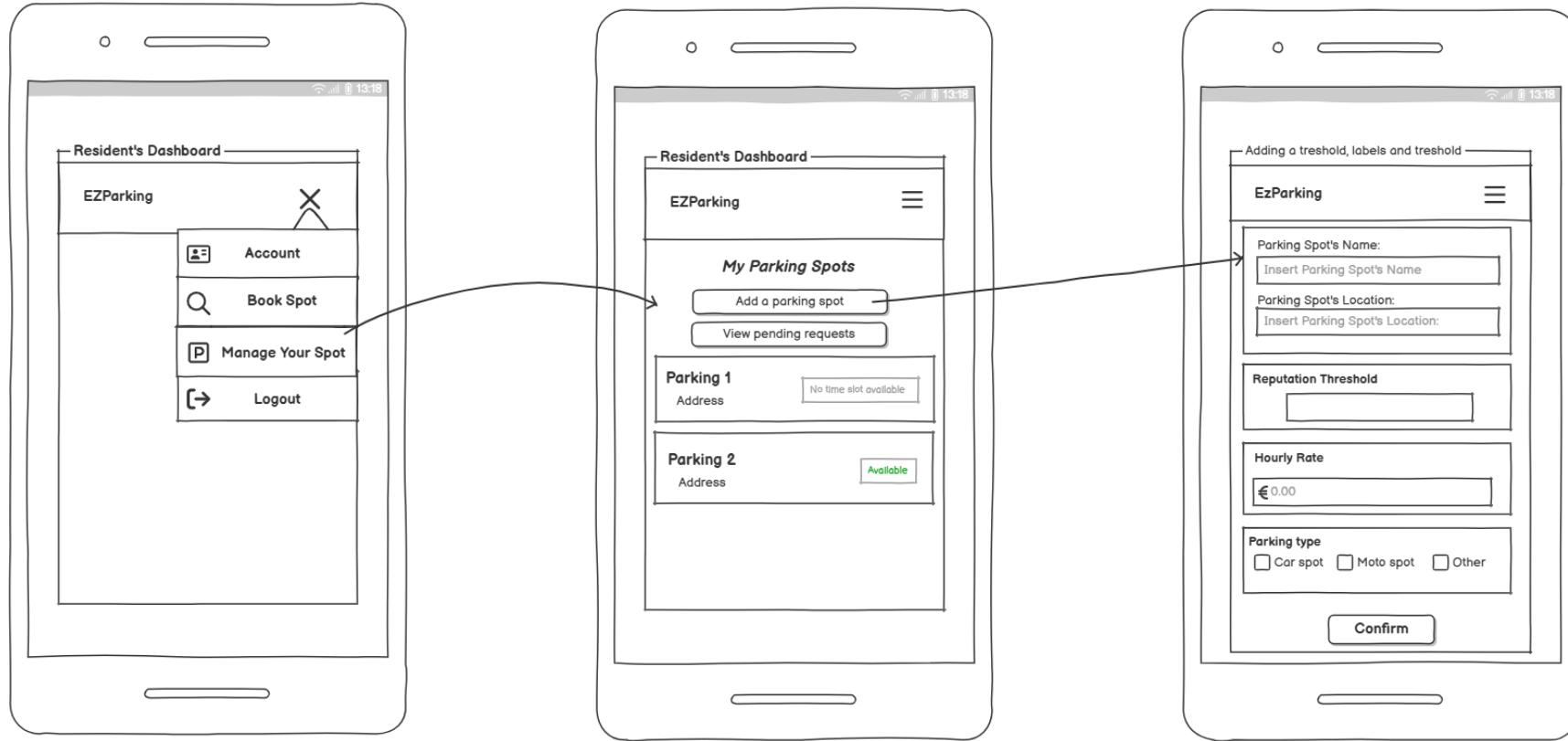
As a user I want to see all my bookings and/or my parking spots in a calendar view, so I can quickly understand my schedule and have a clear overview of my reservations.

Account Status Notification



As a user I want to receive a notification if my account has been disabled or enabled by administrators so that I know if I can use the app.

Adding a Parking Spot



- ✓ As a resident I want to insert into the system my parking space so that I can share it with other users and gain revenues.
- ✓ As a resident I want to assign labels to my parking spots so that drivers can easily search for them.
- ✓ As a resident I want to set a reputation threshold to reserve a parking spot, so that I can give priority to higher reputation users.

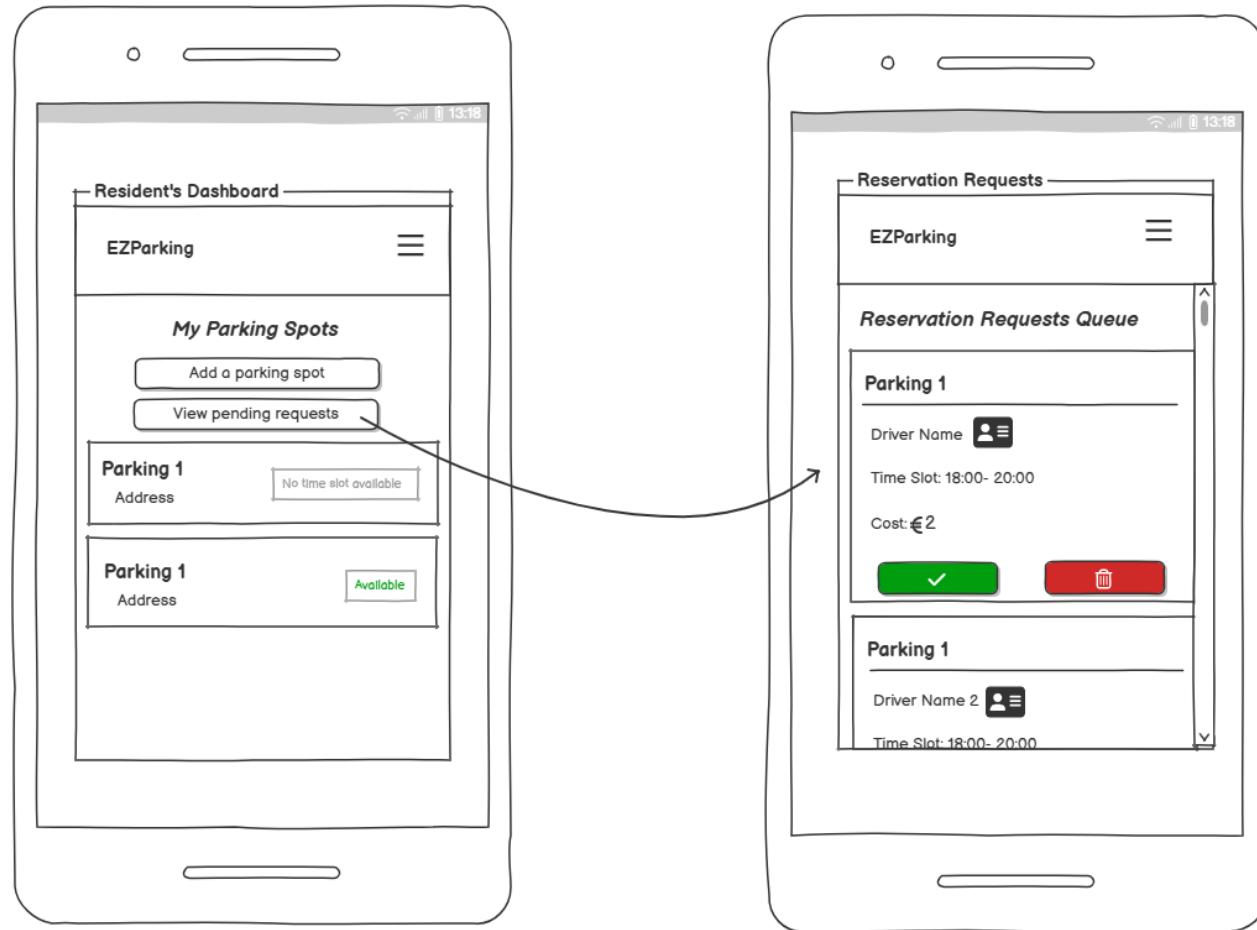
Adding a Time Slot

As a resident I want to view a list of all my parking spots and add availability time slots, so I can decide when each spot can be booked by the drivers.



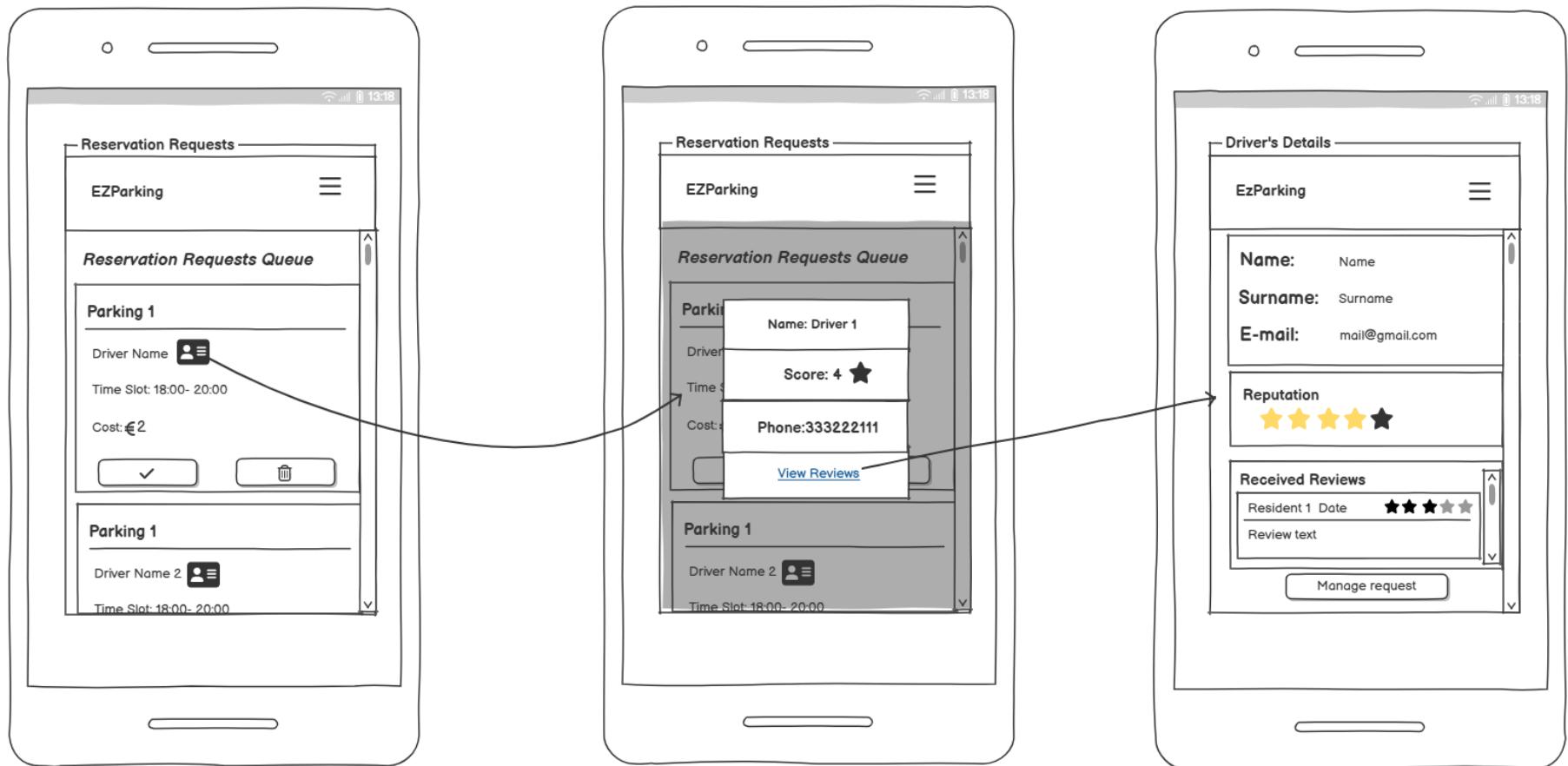
Manage Driver's Requests

- ✓ As a resident I want to view all booking requests for my parking spots so that I can choose which drivers to authorize for each specific spot and time slot.
- ✓ As a resident I want to reject a reservation request so that I can have the full control of my parking spaces.



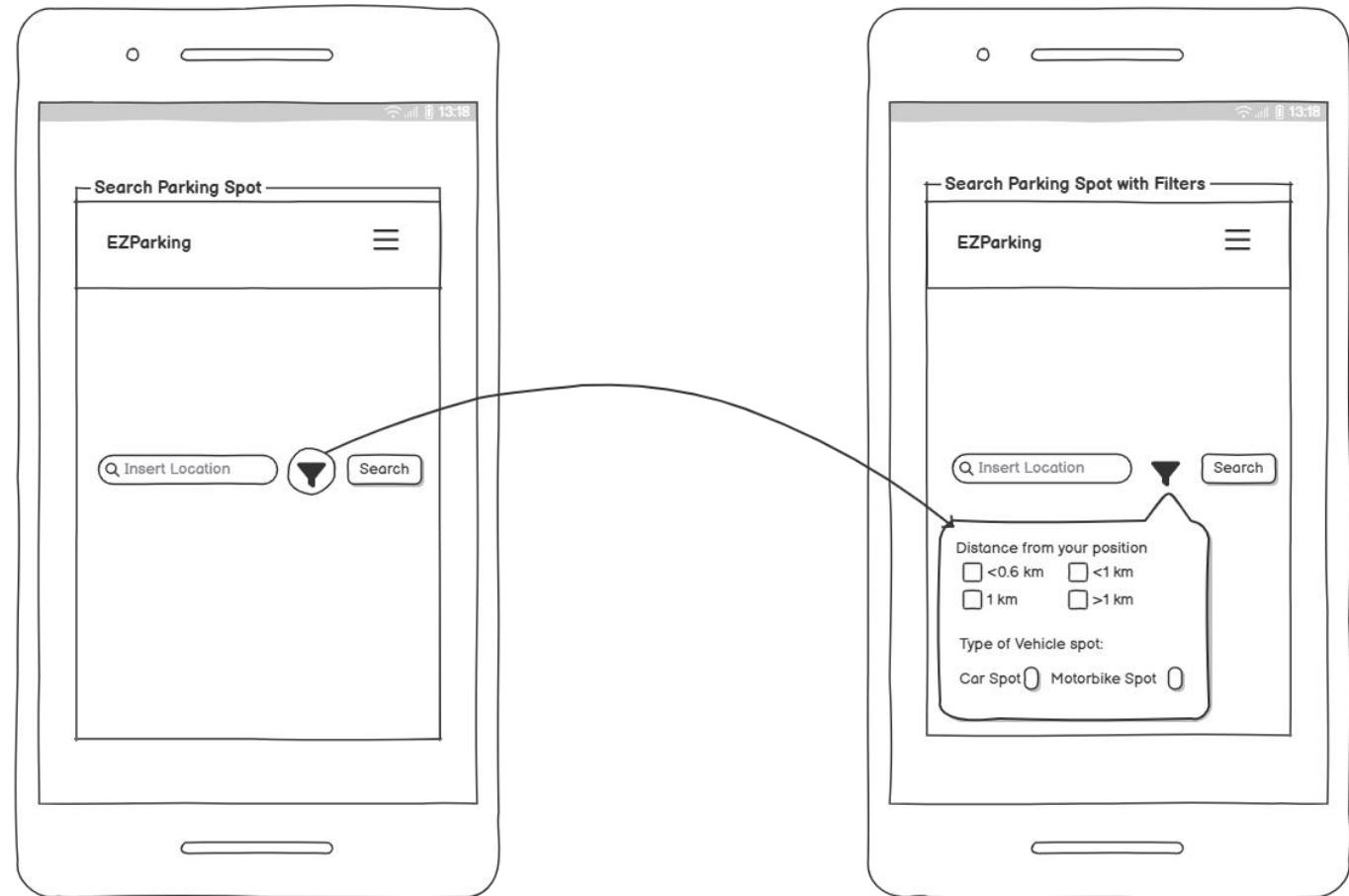
Manage Driver's Requests

As a resident I want to see driver's details and reviews in a request so that I can choose if accept the request.



Parking Spot Search

- ✓ As a driver I want to search for available parking spots so that I can book it.
- ✓ As a driver I want to be able to search parking spots through filters so that I can find the best parking for my needs.
- ✓ As a driver I want to search for a parking spot selecting a distance range so that I can find the parking space in the best possible position.

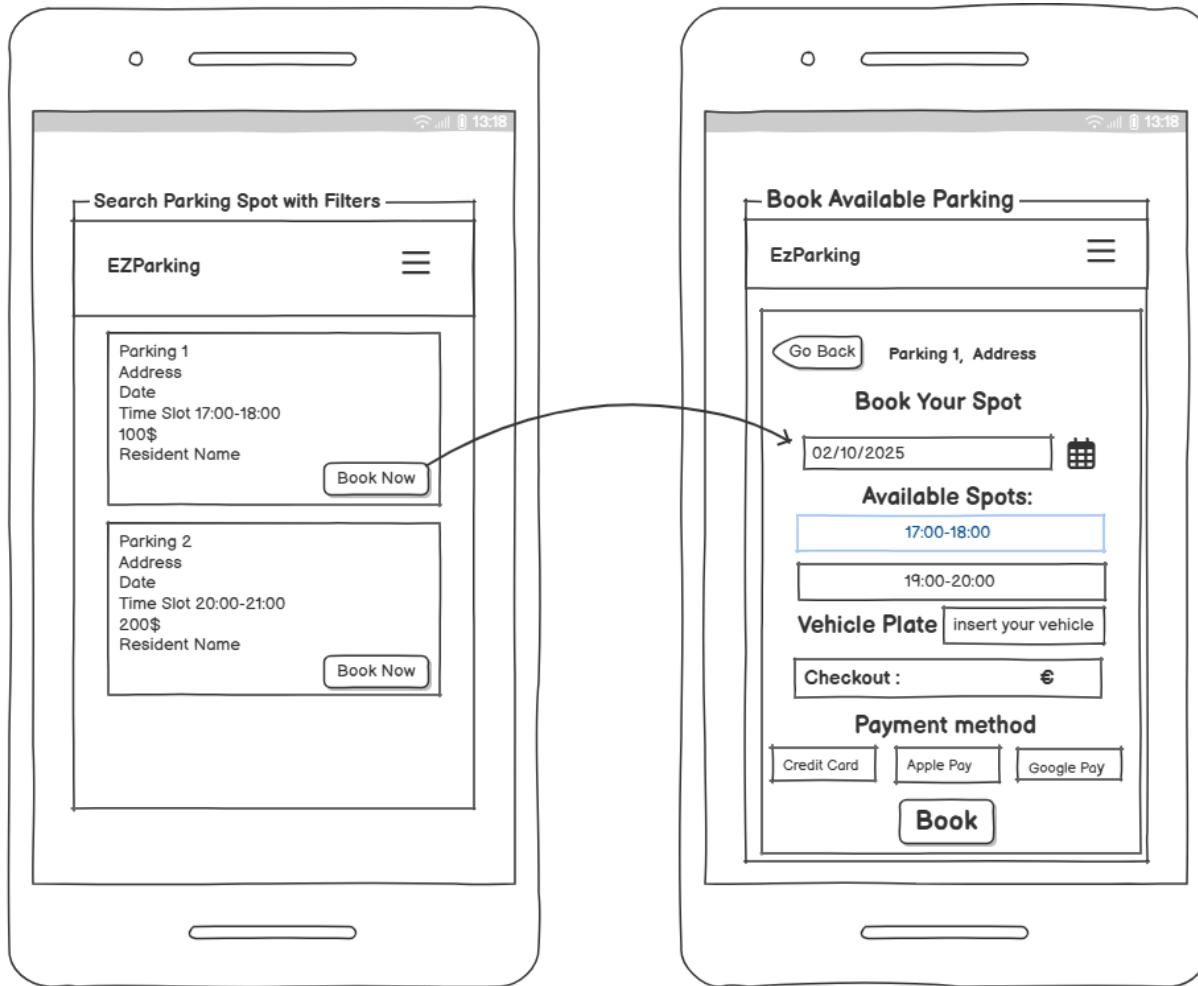


Parking Spot Search

As a driver I want to receive a notification when there is a free parking spot near my current position so I can book it if I need it



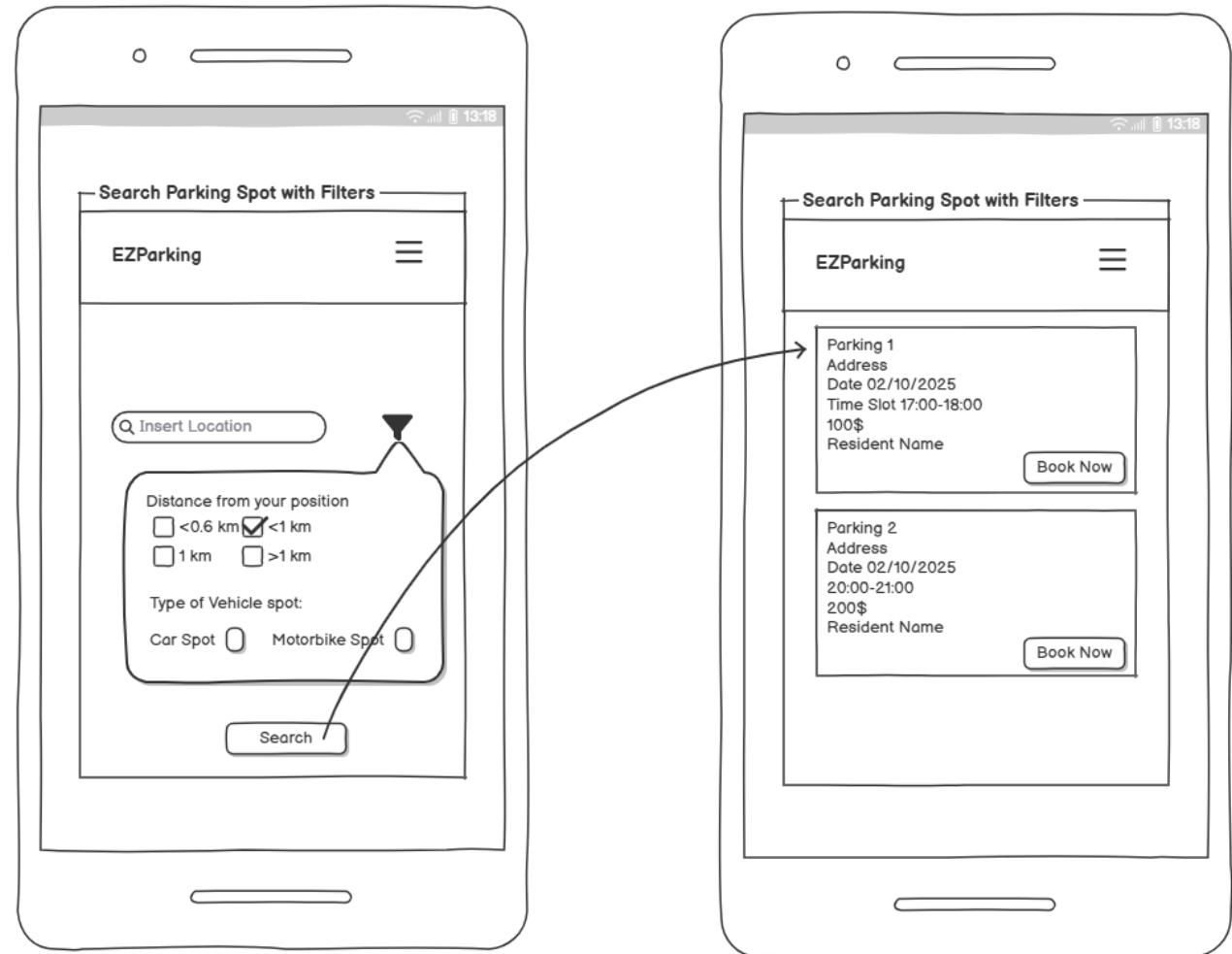
Book a Parking Spot



- ✓ As a driver I want to book a parking spot for a specific interval of time and pay for it so that I can easily park my car.
- ✓ As a driver I want to choose the payment method so that I can pay the parking spot in several digital ways.

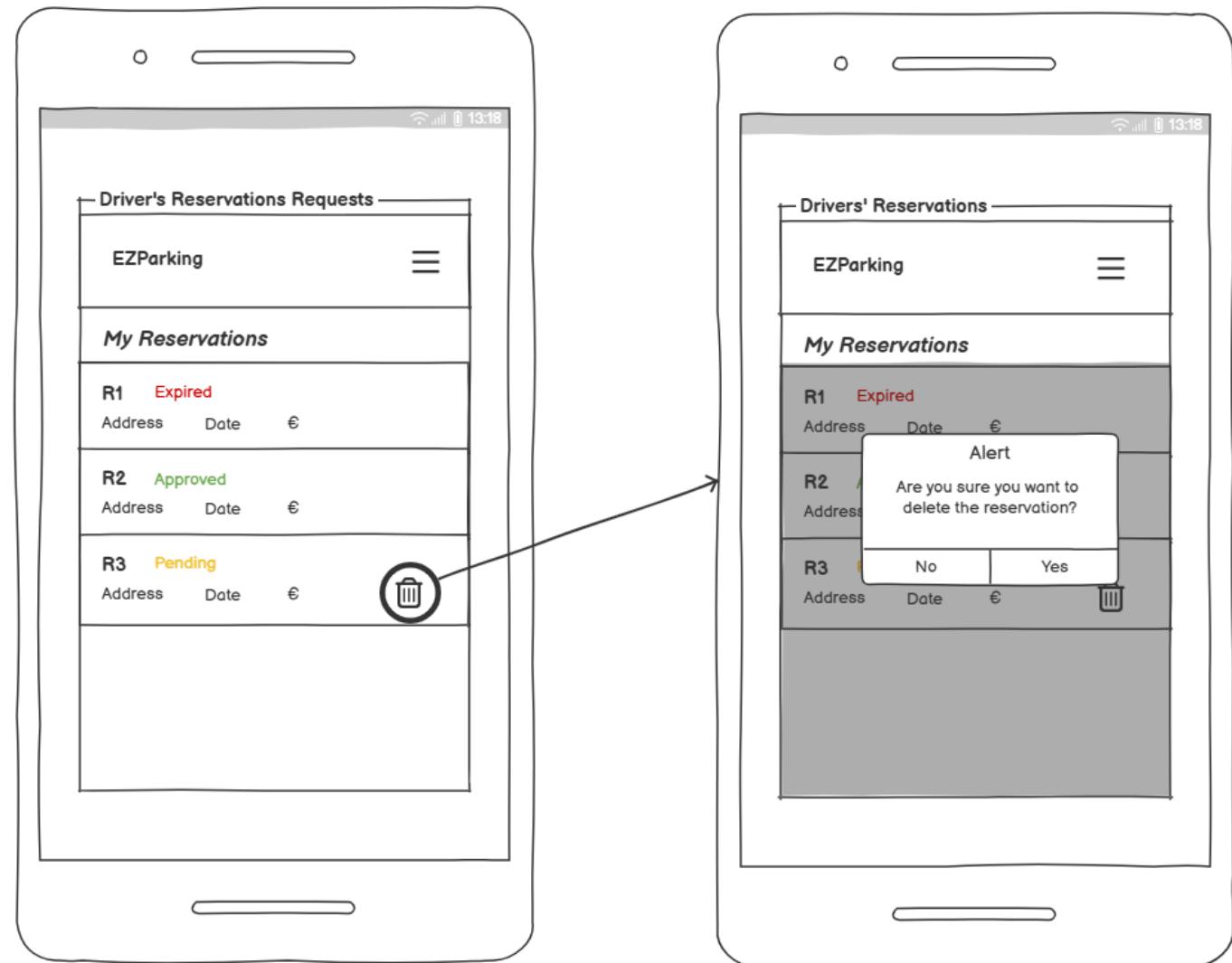
Book a Parking Spot

As a driver I want to see all parking spots available when I search for them, in order to decide myself which I want to book.

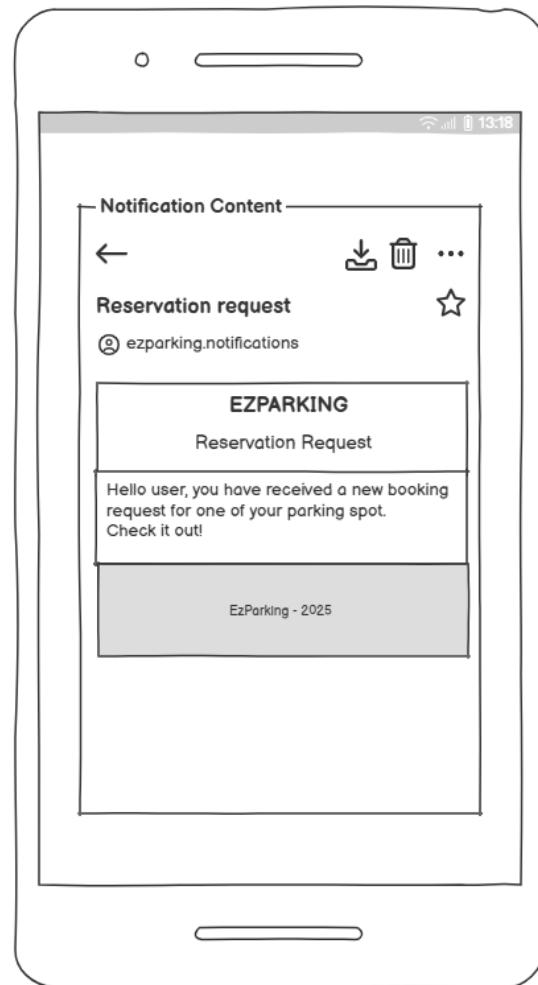


Driver's Requests

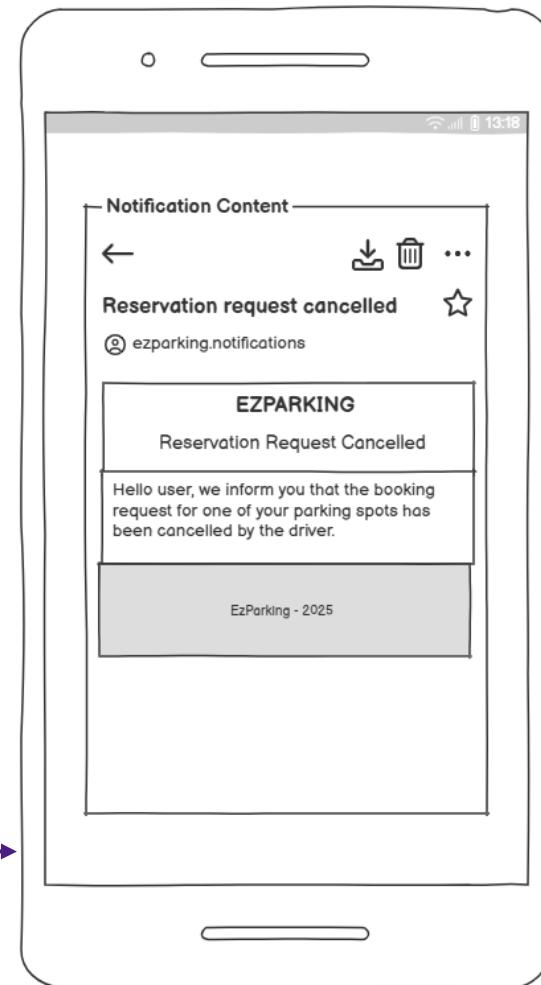
- ✓ As a driver I want to see the list of all my reservations requests, so that I can see which are still waiting to be accepted by the resident and which have been already accepted or rejected.
- ✓ As a driver I want to be able to delete a reservation request so that I can free a parking spot if I don't need it anymore.



Booking Requests Notifications

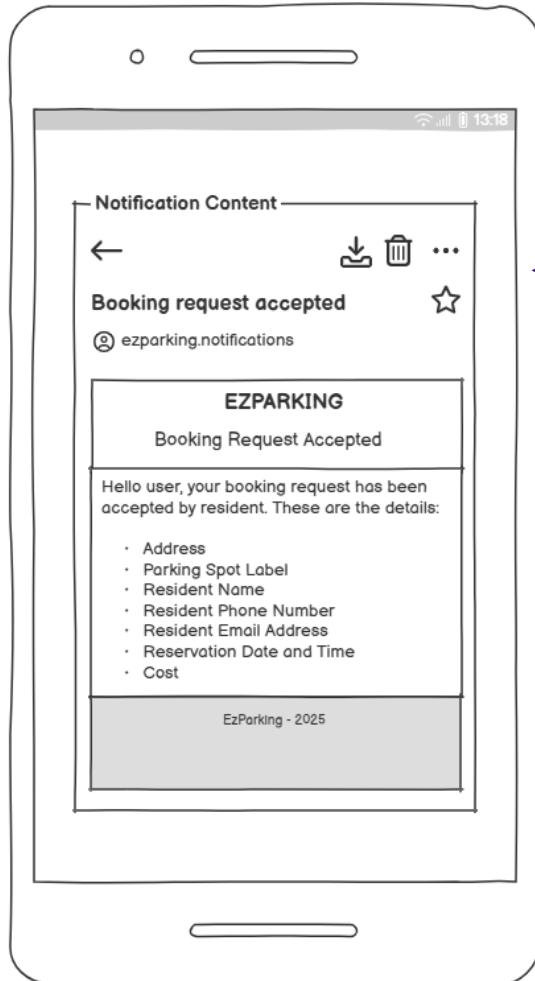


As a resident I want to receive notifications when a driver asks for a booking so that I'm informed about it.



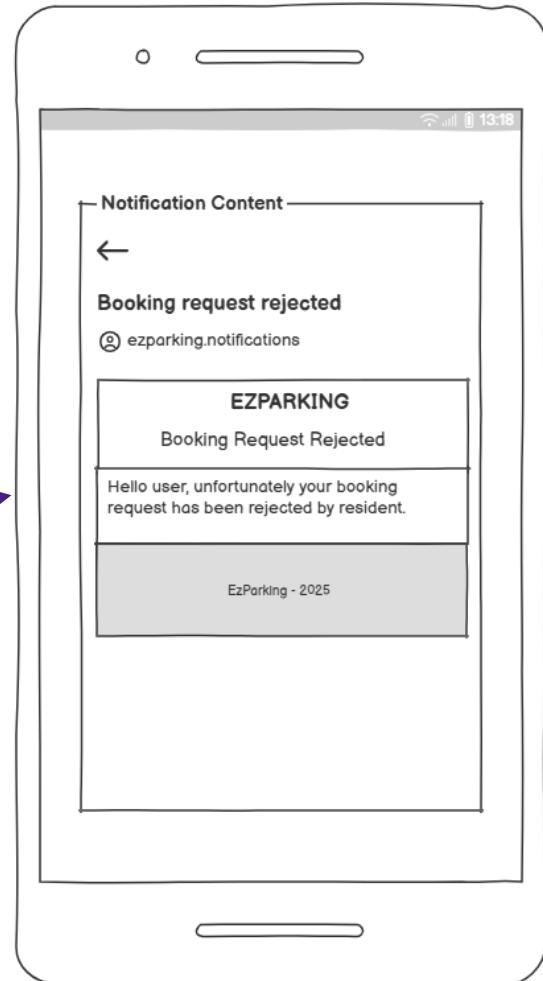
As a resident I want to receive a notification if a driver cancels their booking request on my parking spot, so I can be updated in real time about the demand for my parking spots.

Booking Requests Notifications

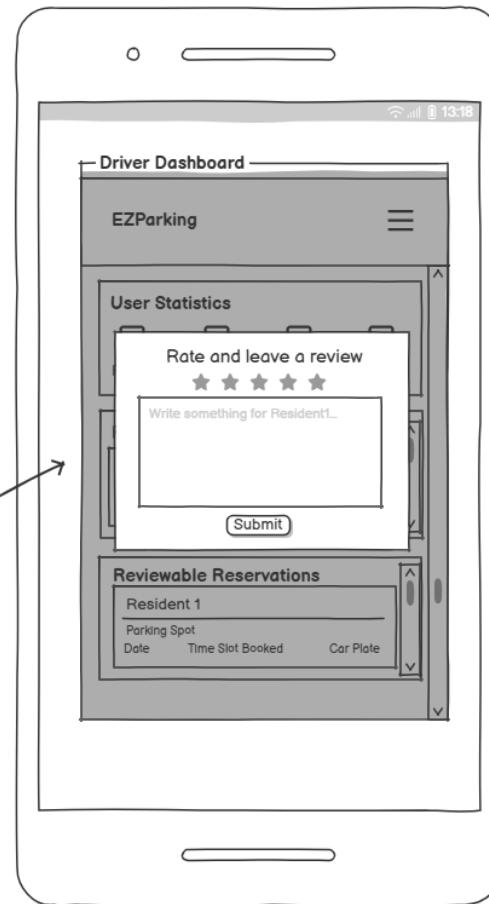
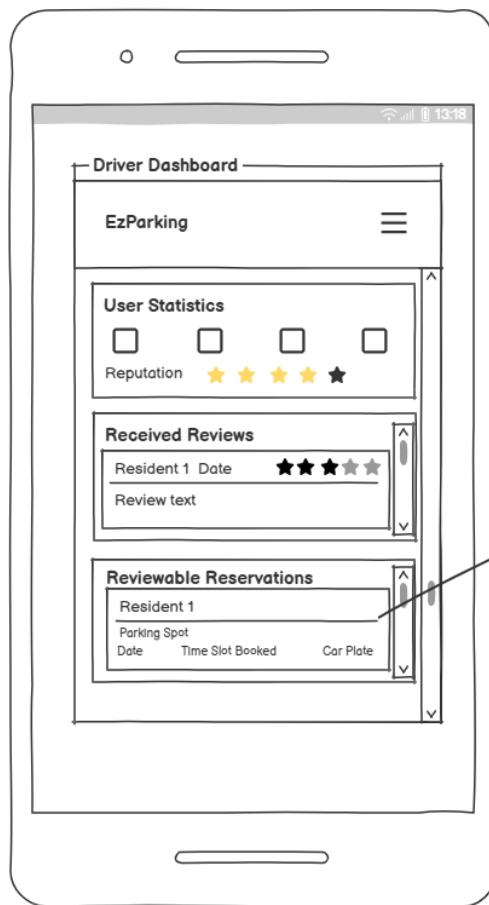
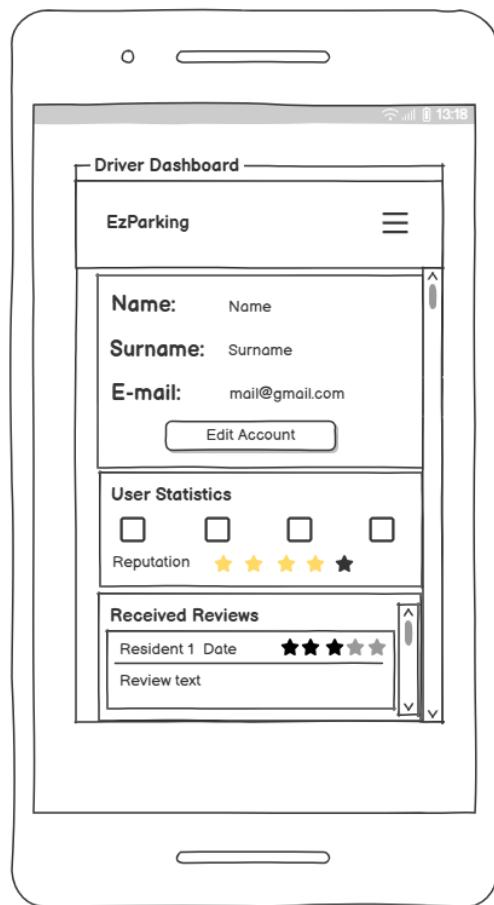


- ✓ As a driver I want to receive the booking confirmation by email when the resident accepts my request, so that I can check the reservation details.
- ✓ As a driver I want to receive the details of the resident after a booking so that I can contact them if needed.

As a driver I want to receive a notification when a resident rejects my request, so I can know whether I have to book another parking spot.

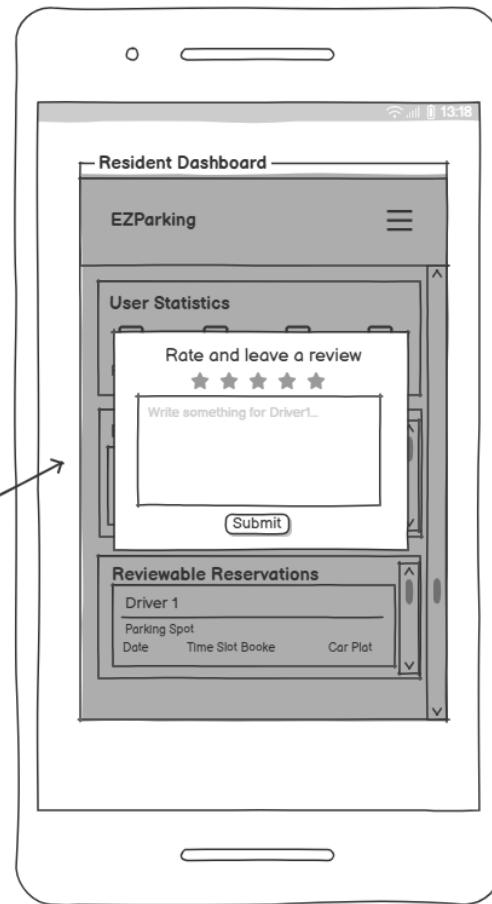
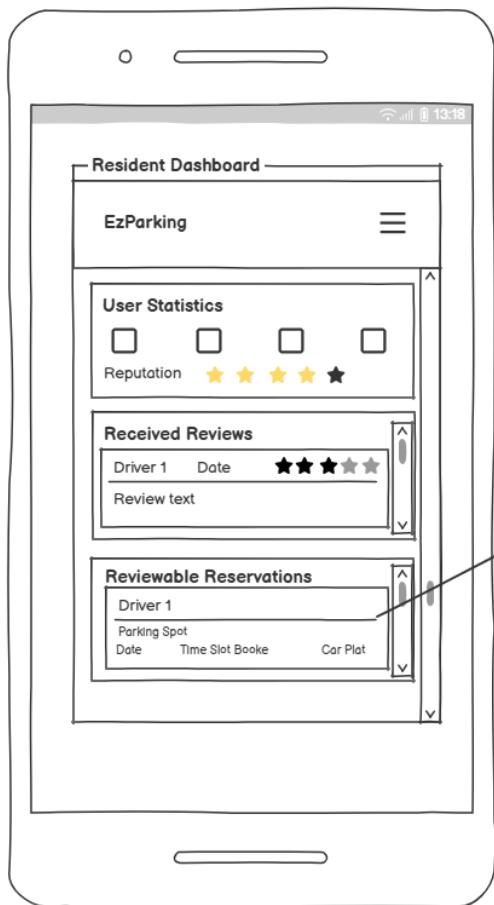
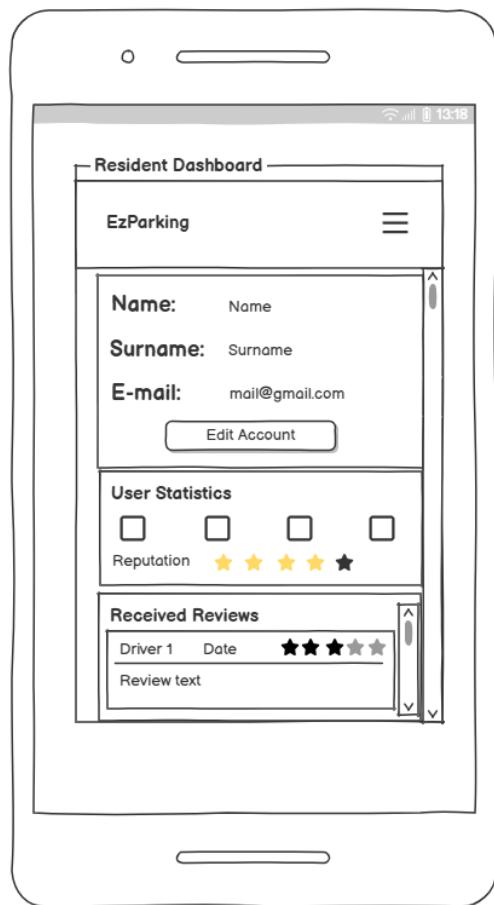


Ratings and Reviews System



- ✓ As a driver I want to rate and comment the parking service so that I can share my parking experience with other drivers.
- ✓ As a driver I want to rate the resident whose parking spot I booked, so that I can share my experience.

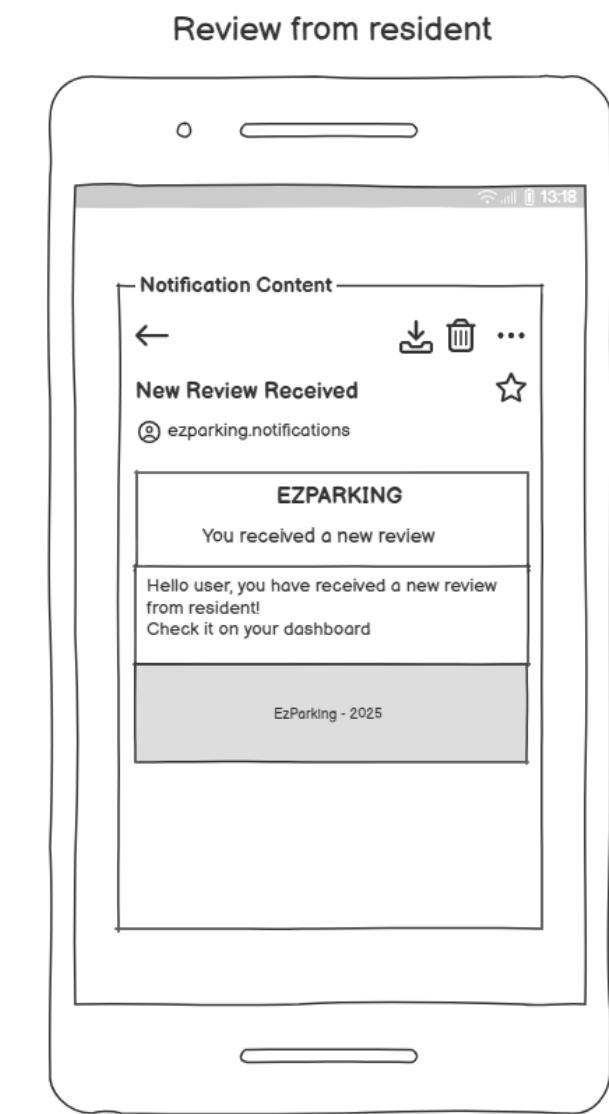
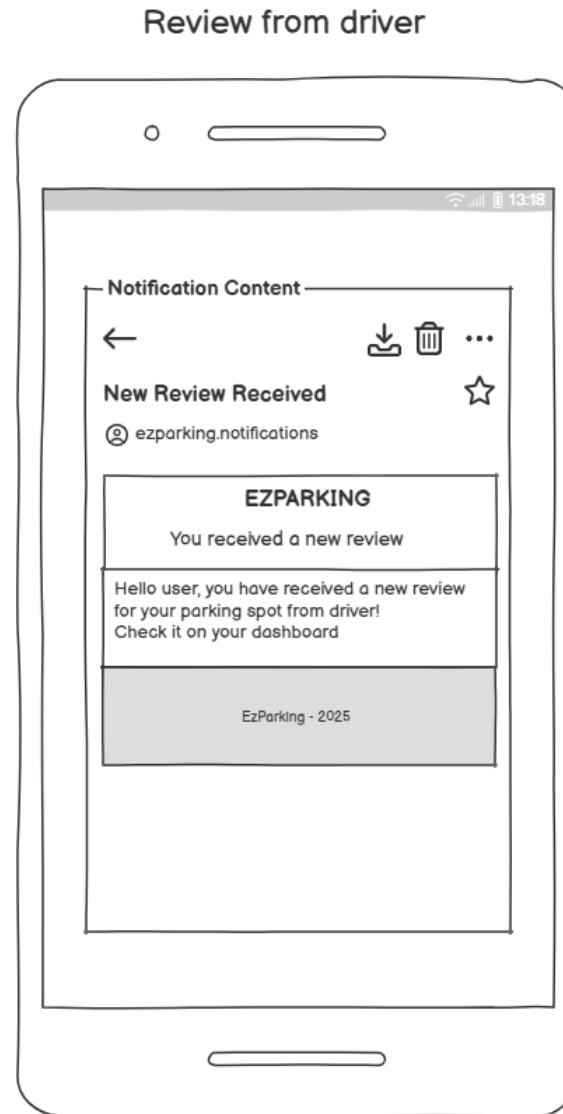
Ratings and Reviews System



- ✓ As a resident I want to rate a driver that used one of my parking spots, so that I can share the related experience.
- ✓ As a resident I want to see all the reviews I have received from the drivers so that I can evaluate my behaviour.

Ratings and Reviews System

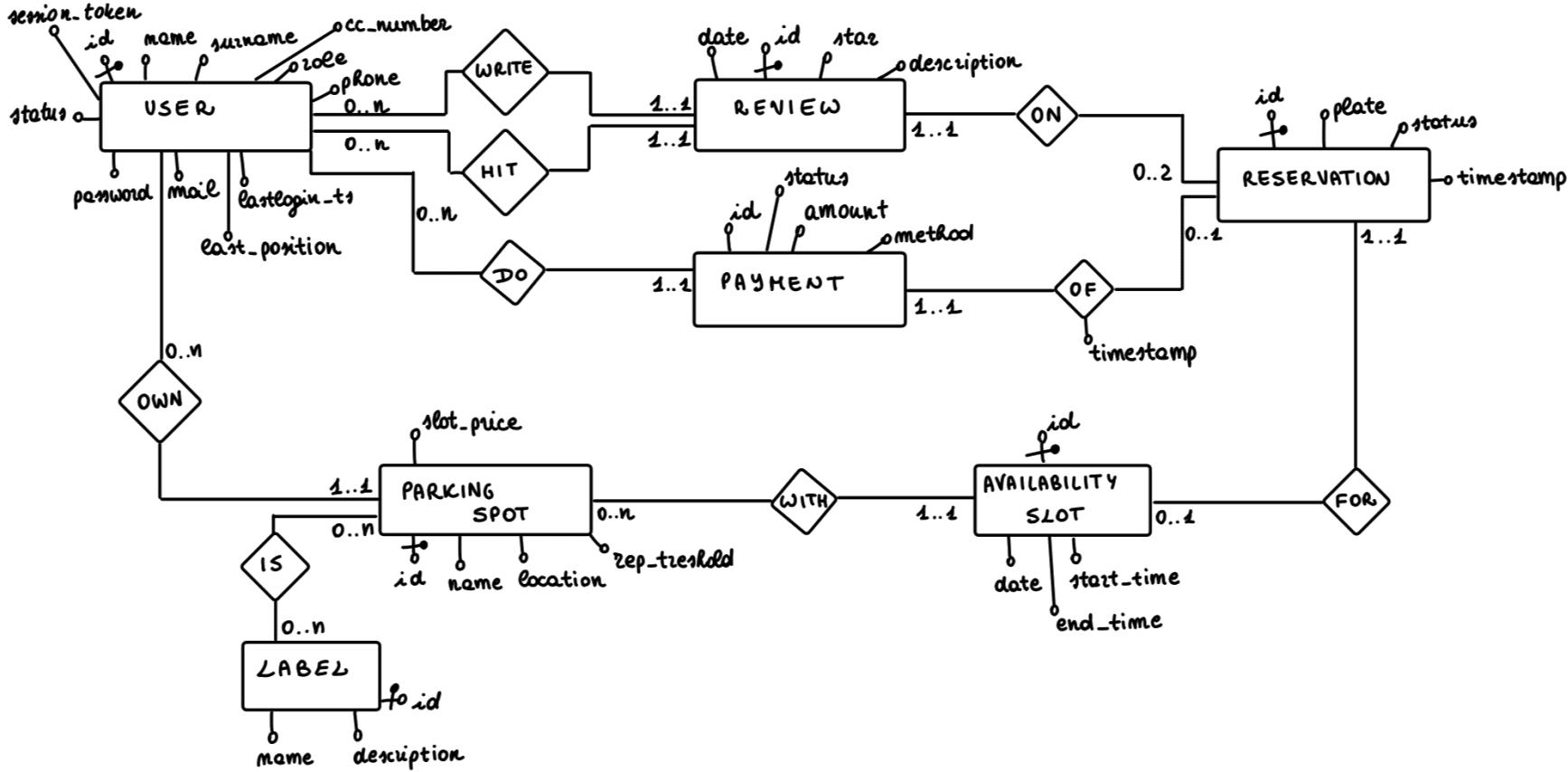
As a user I want to receive a notification when other users leave me reviews and ratings so I can check immediately how was their experience.





Software estimation

Sketch Diagram



Function Points

- 7 ILFs
- 26 Main Functions
- 140 UFP

Unadjusted FP	140
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No.	Module	Function Name	Description	Type	DET	RET / FTR	Complexity	FP	Adjust %	FP adjusted
1	Files	USER		ILF	13	1	Low	7		7
2	Files	PARKING_SPOT		ILF	6	1	Low	7		7
3	Files	RESERVATION		ILF	6	1	Low	7		7
4	Files	AVAILABILITY_SLOT		ILF	5	1	Low	7		7
5	Files	PAYMENT		ILF	7	1	Low	7		7
6	Files	REVIEW		ILF	7	1	Low	7		7
7	Files	LABEL		ILF	5	1	Low	7		7
8	Admin Functions	View User List		EQ	3	1	Low	3		3
9	Admin Functions	Search Users		EI	2	1	Low	3		3
10	Admin Functions	Access User Details		EQ	9	1	Low	3		3
11	Admin Functions	Enable/Disable Account		EI	2	1	Low	3		3
12	Admin Functions	Notification Enable/Disable		EQ	2	1	Low	3		3
13	Users Functions	User Registration		EI	6	1	Low	3		3
14	Users Functions	Notification Registration		EQ	2	1	Low	3		3
15	Users Functions	Login		EI	2	1	Low	3		3
16	Users Functions	Logout		EI	1	1	Low	3		3
17	Users Functions	Edit Personal Data		EI	8	1	Low	3		3
18	Users Functions	View User Dashboard (with reviews)		EO	17	4	High	7		7
19	Users Functions	Notification Account Change		EQ	2	1	Low	3		3
20	Users Functions	Rate a Resident/Driver		EI	2	1	Low	3		3
21	Users Functions	Calendar View of Events		EQ	10	3	Average	4		4
22	Drivers Functions	Notification New Near Spot Available		EQ	2	1	Low	3		3
23	Drivers Functions	Map/Search Available Spots		EO	7	4	High	7		7
24	Drivers Functions	Reserve Spot		EI	4	1	Low	3		3
25	Drivers Functions	Process Payment		EI	3	1	Low	3		3
26	Drivers Functions	Cancel Reservation Request		EI	1	1	Low	3		3
27	Drivers Functions	Receive Confirmation Email		EQ	2	1	Low	3		3
28	Drivers Functions	Access Resident Data		EQ	5	1	Low	3		3
29	Resident Functions	Insert New Parking Spot		EI	7	2	Average	4		4
30	Resident Functions	View Parking List		EQ	4	1	Low	3		3
31	Resident Functions	Add Availability Time Slots		EI	3	1	Low	3		3
32	Resident Functions	View Reservation Requests		EQ	13	4	High	6		6
33	Resident Functions	Accept/Reject Request		EI	1	1	Low	3		3

COCOMO II

- Early-Model
- Scale-Driver set to Nominal
- 140 UFP = 12 Months of work

Why have we been so fast?

- AI help
- Unexpected strong cohesion
- ...

Results

Software Development (Elaboration and Construction) Staffing Profile



Effort = 41.9 Person-months
Schedule = 12.0 Months
Cost = \$75412

Total Equivalent Size = 11200 SLOC
Effort Adjustment Factor (EAF) = 1.00

Acquisition Phase Distribution

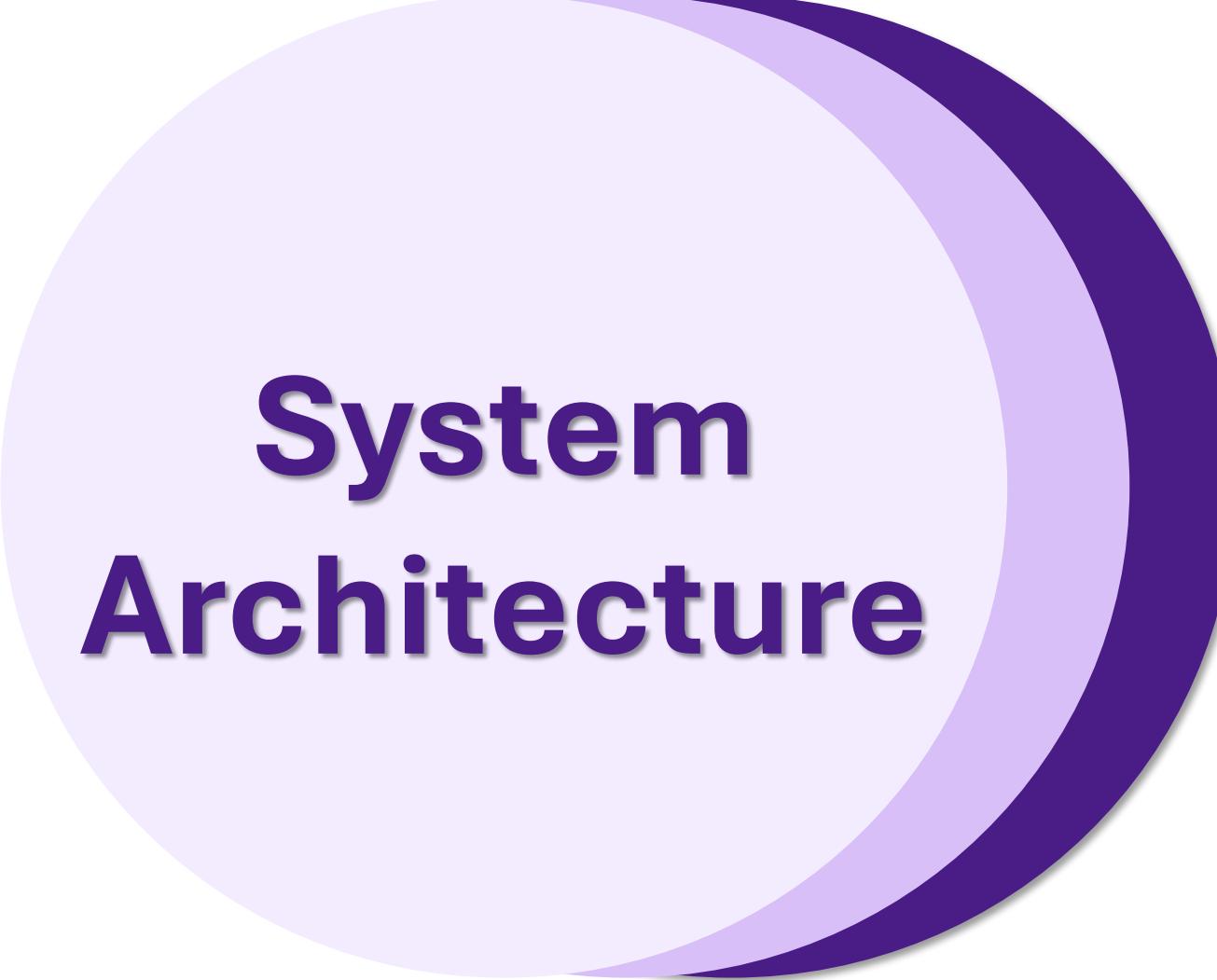
Phase	Effort (Person-months)	Schedule (Months)	Average Staff	Cost (Dollars)
Inception	2.5	1.5	1.7	\$4525
Elaboration	10.1	4.5	2.2	\$18099
Construction	31.8	7.5	4.2	\$57314
Transition	5.0	1.5	3.3	\$9050

Software Effort Distribution for RUP/MBASE (Person-Months)

Phase/Activity	Inception	Elaboration	Construction	Transition
Management	0.4	1.2	3.2	0.7
Environment/ CM	0.3	0.8	1.6	0.3
Requirements	1.0	1.8	2.5	0.2
Design	0.5	3.6	5.1	0.2
Implementation	0.2	1.3	10.8	1.0
Assessment	0.2	1.0	7.6	1.2
Deployment	0.1	0.3	1.0	1.5

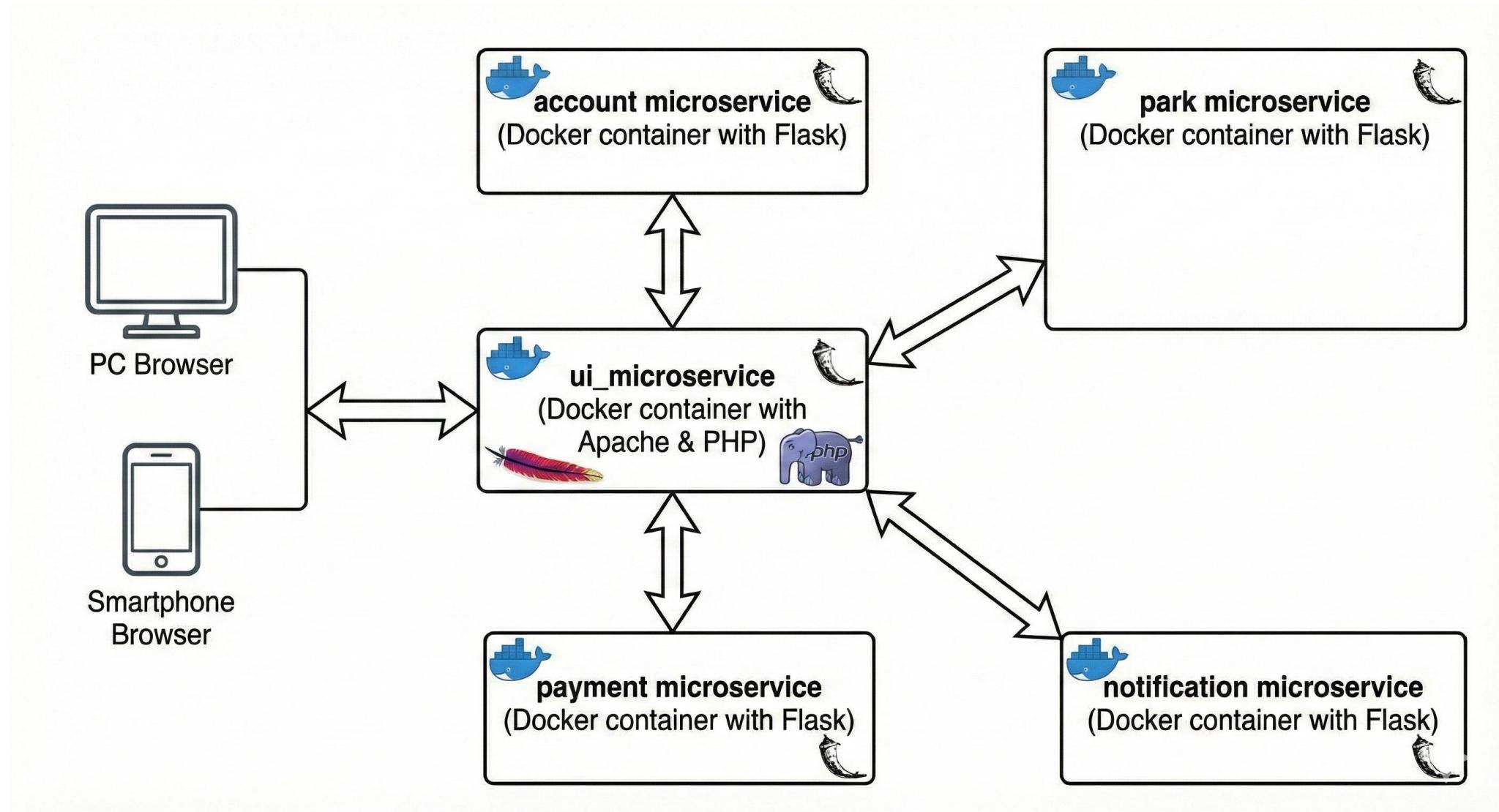
Your output file is at http://softwarecost.org/tools/COCOMO/data/COCOMO_December_4_2025_14_16_45_365284.txt

Created by Ray Madachy at the Naval Postgraduate School. For more information contact him at rjmadach@nps.edu.



System Architecture

Infrastructure Diagram



Technologies and framework



Architecture & Orchestration:

- Microservices-based architecture.
- Component orchestration via Docker Compose.

Database & Persistence:

- Ensures data persistence for Docker containers.
- Stores databases for all microservices components.

Technologies and framework



REST microservices:

- implements RESTful interfaces easily.
- handles HTTP requests/responses for microservices.

Database access:

- facilitates database access for Python microservices.
- maps Python objects to database tables efficiently.

External Services



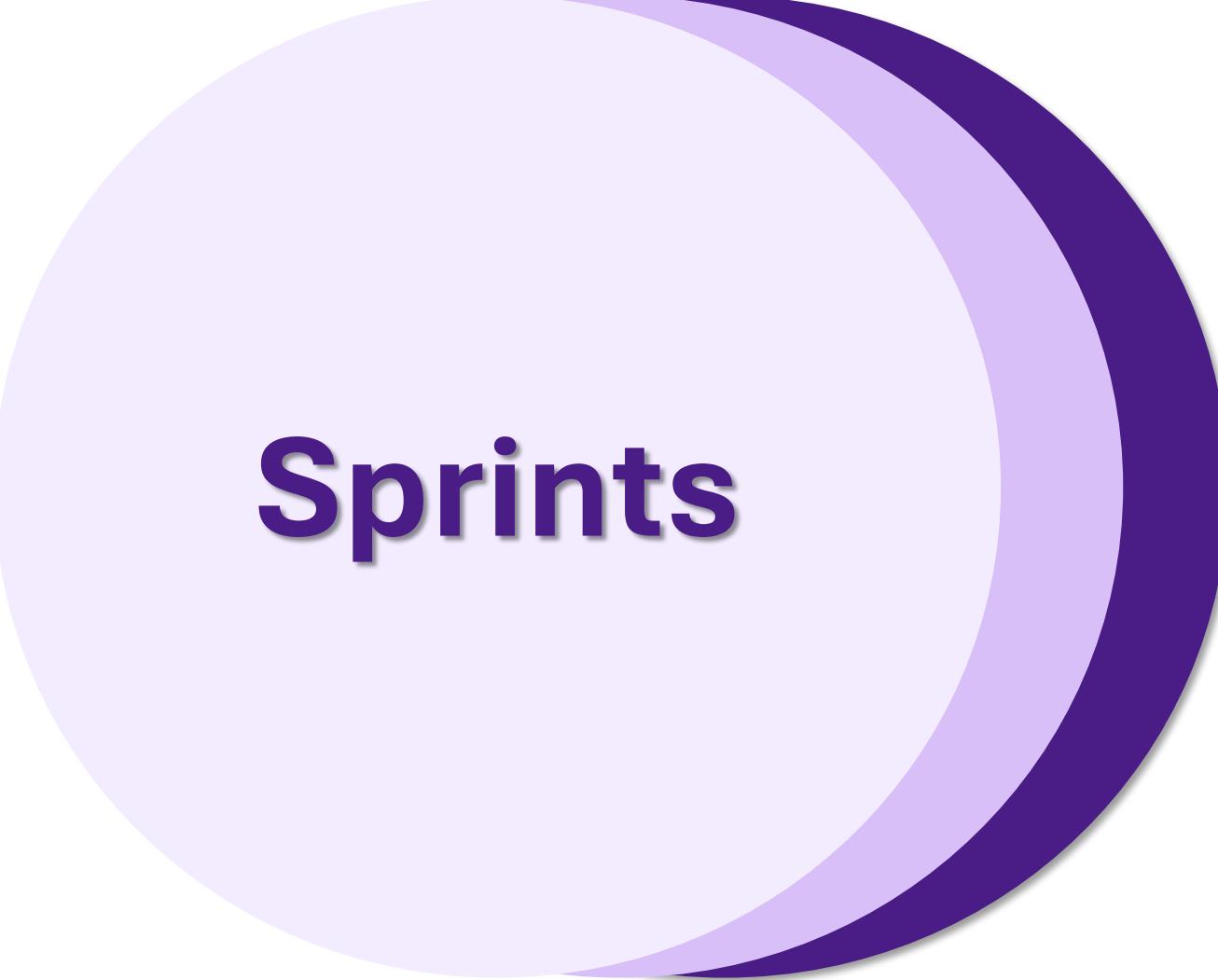
Maps and Geolocalization:

- Localization of users and parking spots based on GPS coordinates.
- Conversion coordinates-address.



Mail service:

- Send notification to users for various events.

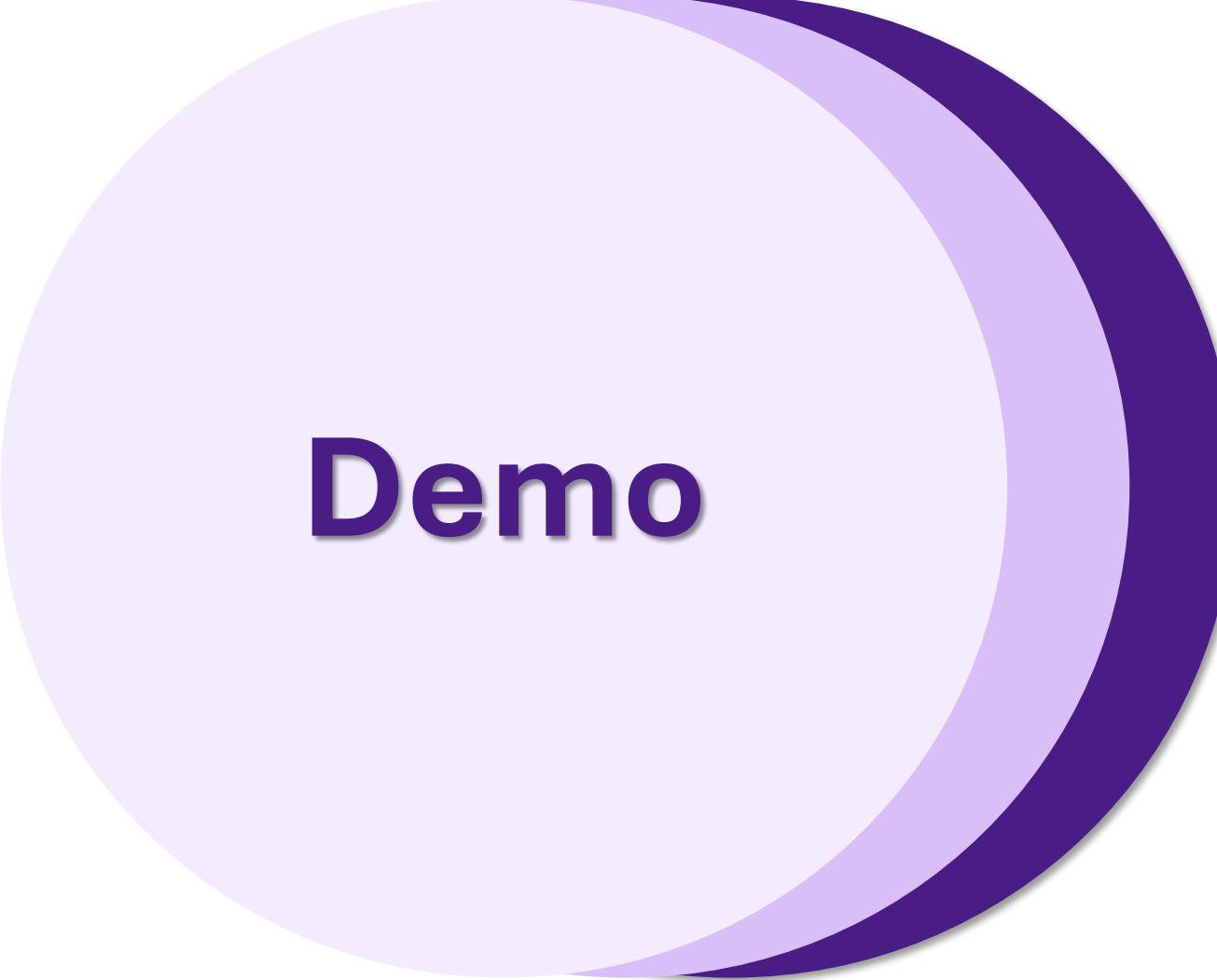


Sprints

External Services

The project was developed in the span of eight sprints, from October to December 2025.

Each sprint had an objective: the implementation of one of the microservices with the respective interface.



Demo