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Track My Ride

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B.SC. in information Technology
2017-2020

Track My Ride

Balance Team

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Youtube video: <https://www.youtube.com/watch?v=TqVG8L3iMYE&feature=youtu.be>

Track My Ride Web : <https://github.com/rodolfojc/trackmyrideweb>

Track My Ride Express API: <https://github.com/rodolfojc/trackmyrideserver>

AWS Cloud: <http://34.247.183.192:3005/>

ABSTRACT

Cycling has become more and more popular as a healthy activity and a transport option across many countries. This is not different in Ireland, a country where in April 2016, 56,837 people cycled to work; an increase of 43% since 2011 (Central statistics office, 2017).

Irish Government “committed to developing cycling as one of the most desirable modes of travel by 2020” as it plays an indispensable role in people’s lives (Sustainable transport division - department of transport, tourism and sport, 2009).

The “Balance” team managed to visualize that a strong cycling culture was becoming important in Ireland. Hence our team was seeking to develop a mobile application called “Track my Ride” to contribute to the cycling community whilst by answering a crucial question:

How can a cyclist manage and store its bike details?

Answering that question, we have intended provide tools where the cyclists could discard common concerns such as:

- Is this second-hand bike reported as missing?
- Is there any bike parking space near a specific location?
- How can I warn people if my bike goes missing?

Track My Ride is a bike management tool for bike-users, previous and/or future bike owners. Our main objective is to facilitate the way people manage and use their bikes, enhancing the cyclists experience while building an active online and collaborative cycling community.

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Chapter 1: Introduction

Introduction

Essentially, a cyclist has to deal with tons of information related to its bike and must keep tracking crucial details. The primary purpose of Track my Ride is to offer a digital mobile solution that allows the user to handle and store relevant information while improving the cyclist lifestyle and optimizing the bike use management, acquisition process and maintenance.

In the application the cyclist can create a bike profile and keep relevant information such as model details and serial number, as recommended by An Garda Síochana; that record can also be used as a proof of ownership. In addition, the user can input a Bike status specifying its bike status: Owned, Missing or For Sale. The aim of this feature is to create a database where other users could consult a bike serial number and check its status.

From this database, a consult feature is available to users who would like to consult the bike status submitting the serial number. It also creates an opportunity of reporting to Track My Ride a suspicion event regarding a Missing bike status, for example If a bike has been found for sale; this report will prevent the user from mistakenly buying a stolen bike. Recording those details could facilitate the report and recovering the missing bike.

Having a bike profile enables the opportunity of keeping a history record of its maintenance and repair, for future consultation in case of selling the bike.

Through the application we want to offer to the cyclists relevant information needed to make the cycling experience more efficient, productive and safer. To achieve that, we intend to provide information of places where biking racks are available and bike parking facilities in an easy and intuitive way. To improve the user organic participation in the app, we want to give the opportunity to any users to inform the existence of parking facilities in case they are not present in the app, being part of a non-public area (i.e. gym, shopping centre, estate).

Likewise, the user could report any incident as bike theft or damage and warn other cyclists of the occurrence details as “Where? When? and How? “ it has happened and from that, an incident hot-spot area could be created and displayed in a visual and clear way.

In order to guarantee that Track My Ride delivers its content in an efficient way, a structured model of development needs to be followed to ensure a stable client-server relationship. In terms of User Experience (UX) Design, a research was conducted to decide which path to follow to ensure accessibility in a user-friendly application. As location and personal data may be collected and processed through

Track My Ride in Dublin, we want to ensure that the app complies with the General Data Protection Regulation (GDPR) regulation.

Cycling is one of the most sustainable transport ways in the world and we are working to make the riding experience as enjoyable as possible!

Objectives

General

- Manage and Store bike details
- Create bike and user profile
- Create a register user and not-registered user environment

Specific

- Give a bike status statement: missing, stolen and for sale
- Report incidents in the city
- Display "hot" areas on a map
- Report racks availability around the city

Requirements

The mobile app presents two views, one for a registered user and another for a non-registered user providing different functionalities accordingly.

1. Register User View

- a. Users can create a bike profile with its details such as serial number, colour, photos, etc.
- b. Users can check the bike status. The status could be owned, stolen or for sale.
- c. Users can create and manage his own profile.
- d. Users could possibly consult a map in order to check parking places and report incidents

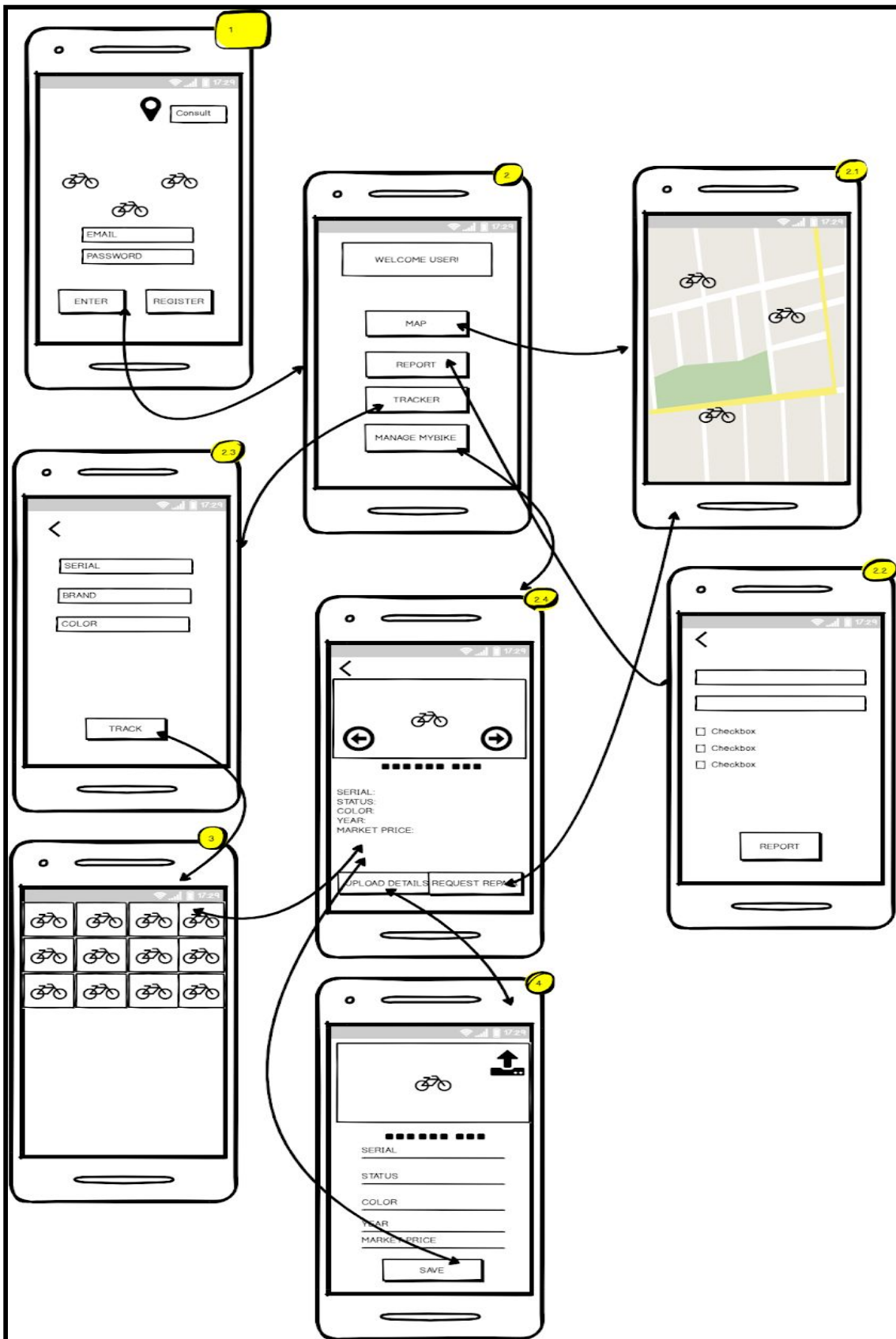


Figure 1. Register View Prototype.

2. Non-registered User View

- Users could navigate into the application to check a bike status.
- Users could report a theft incident related to bike or suspicious activity.
- Users could check a map to access information about bike theft and available parking facilities.

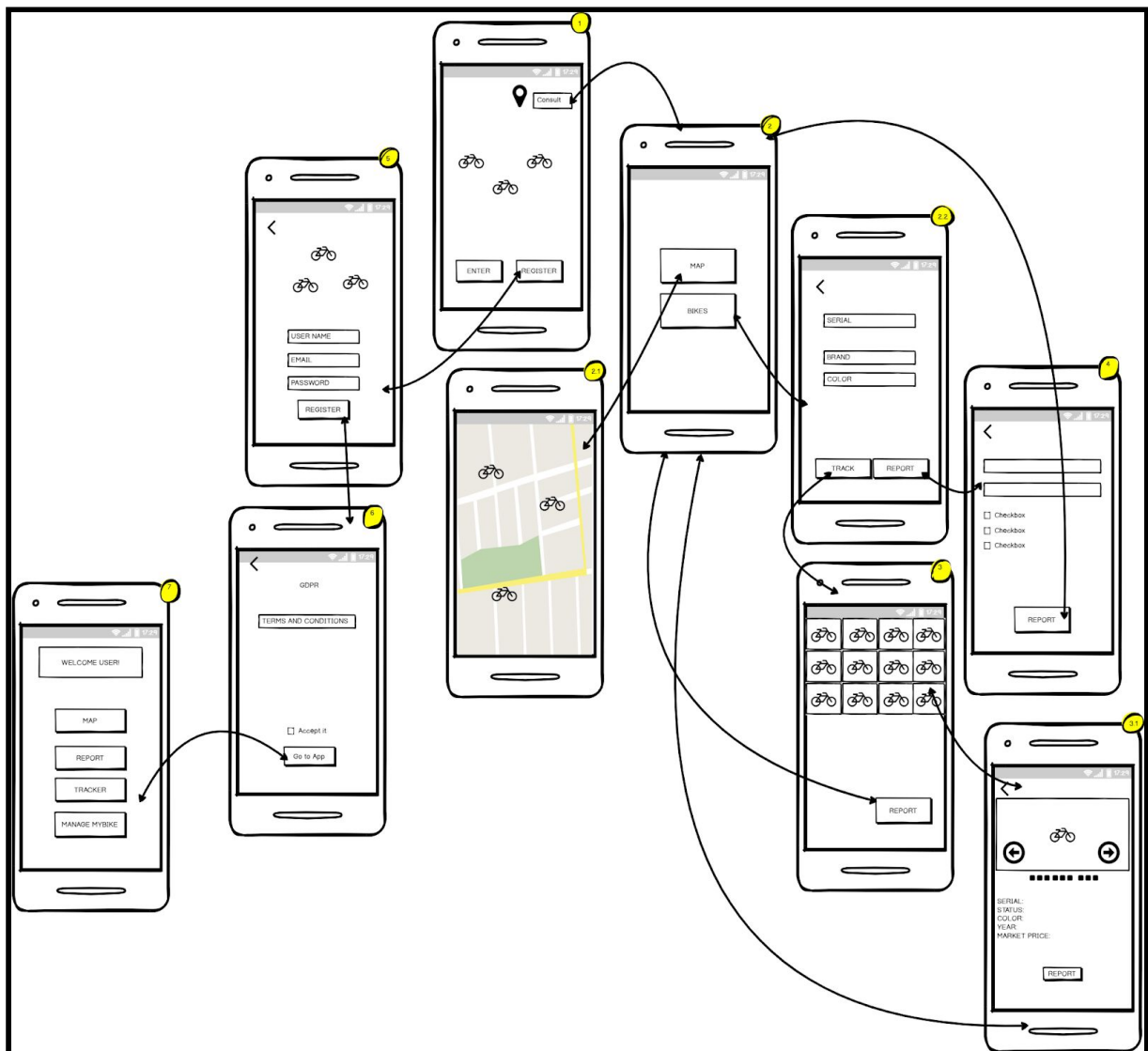


Figure 2. Non-registered user View Prototype.

Methodology

Project Management

We followed the Software Development Life Cycle (SDLC) process to design, develop and test the high quality of Track My Ride application. SDLC is a framework that helped us to define tasks performed at each step in the software development process. (Tutorials Point, 2019).

SDLC also contemplates ISO/IEC 12207 as an international standard for software life-cycle processes. It aims to be the standard that defines all the tasks required for developing and maintaining for the mobile app. (Tutorials Point, 2019)

In order to reduce the risk of failure we worked hard to follow Scrum project management methodology to reach the objectives of the application. We learnt along the way the great value of having a good project management to standardize processes in place to deal with all contingencies. Moreover, it helped us to put the project in action to measure progress and performance according to what we had planned (Watt, 2012).

Using and learning the benefits of Scrum method, we implemented its key points to our favour for example, we tried to interact as much as we could to increment product delivery using frequent feedback and collaborative decision making to run from design phase to testing and quality assurance (Sliger, 2011, Rouse, 2018 & Wrike, 2006)

Additionally, we used Gantt Chart to track the timeline of the project to help us with task management, project planning, scheduling, and progress tracking, as this chart is known to be good for (Stepanov, 2019). Also we decide to use this tool because it answers the following questions that are crucial for our project (Gantt, c2019)

- What the various activities are
- When each activity begins and ends
- How long each activity is scheduled to last
- Where activities overlap with other activities, and by how much
- The start and end date of the whole project

This detailed thinking helped us to ensure that the schedule was workable, that the right team member was assigned to each task, and find potential problems before you start a new task. (Mindtools, c1996). Updating the chart showed schedule changes and their implications, also we used it to communicate that key tasks had been completed. (Mindtools, c1996)

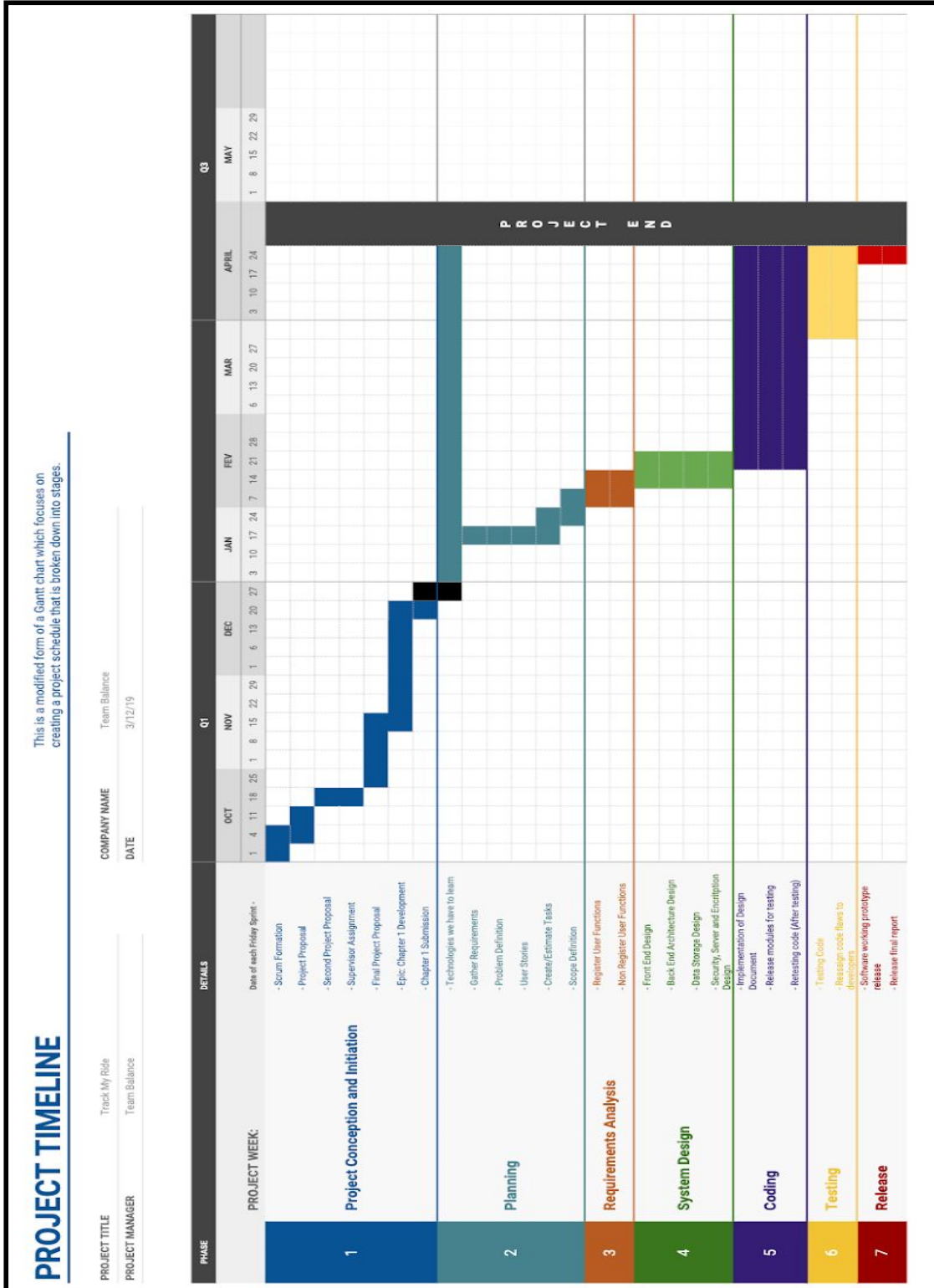


Figure 3. Track My Ride Gantt Chart

Chapter 2: System Analysis

The number of mobile users today is greater than the number of desktop users. Studies show that users prefer mobile apps more than mobile websites. This is a strong reason to create mobile apps for reaching out potential and existing users (Deshdeep, 2020).

Track My Ride application is:

“Digital solution to help users handling and storing bike information while improving the cycling experience”

It is about offering tailored communication to users based on their interest, location, usage behavior and more.

Functional Requirements

Splash Screen

A Splash Screen is also known as Launch or Loading Screen and it is the user's first access to the in-app experience. It serves as an improvement of the UX while the system is loading its configuration, making the onboarding experience more interactive.

As suggested in the Human Interface Guidelines from Apple Developers (Apple, c2020), as soon as the user opens the app the Splash Screen should:

1. Display the app logo and smoothly set the tone of what can be expected from the application in terms of visual identity. It should not draw attention to itself but instead leave an impression of fast responsiveness.
2. Not display disclaimers, advertising or extra information to the user in order to not disturb the UX.
3. Show an activity progress element (bar, spinner) to inform the user that the loading process is ongoing.
4. Be short and objective, redirecting the user to the app Main Screen as quick as possible

Login

Without a logging system, we would not be able to know how users interact with the application and how well it is performing. Proper full implementation of a logging system has to provide a way to manage and analyze those logs to audit activity and performance (Marsh, 2018).

Once we implemented the logging system, the next steps were to understand how events can be logged, what data needed to be recorded and where to store it. We could identify three main challenges to designing a good logging system (Marsh, 2018).

1. Events: What events need to be logged?. We knew that Developers and DevOps usually implement a backend error handler that presents a user-friendly way to provide feedback only in those scenarios when the application is expected to perform the logging task and if something goes wrong. Considering this action allows us to monitor and understand what to do if something goes wrong and fix it (Marsh, 2018).
2. Storage: Logs require big storage space after logging thousands of events for a period of time - several months, this information needs to be archived somewhere. The challenge requires a way to securely store logs when they do not fill the web server disk capacity (Marsh, 2018).
3. Excluding data: Not all events need to be tracked but excluding the wrong type of event can make analysis and research into difficult problems for developers. Excluding some unneeded data could save some storage space but also can leave a poor user experience and even revenue impacting application failures (Marsh, 2018).

Registration

The application will allow the user to create login credentials in order to access some of its specific features, prioritising a registration process that is GDPR compliant. With that in mind, the Track My Ride “Sign Up” process only holds and processes personal data that is strictly necessary to the interaction with the app features such as *Email* and *Password*, applying layers of encryption when data is in transit and at rest.

The Registration process also involves obtaining the user consent of collection and use of its personal data, as well as acceptance of Terms and conditions/Privacy settings.

Welcome (home) page

After a user registered or login into the application, a welcome home page is displayed with the following principal features to click.

1. Manage my bike.
2. Map incidents.
3. Consult bike (information by serial number).
4. My Profile.

Manage bike

When the registered user clicks the manage my bike button. The system will have a section to create records for his bikes with relevant information. Also, the user can update the bike details anytime.

1. Create a record: The user will create a record with the following information
 - a. Serial number of the bike
 - b. Brand
 - c. Color
 - d. Type (Electric, Road, Mountain, Hybrid, BMX/Dirt Jump, Kids)
 - e. Status (owned, missed, to sell)
 - f. Picture (upload) We need to discuss the dimensions of the picture (pixels)
 - g. Lock (Yes/No)* Point to discuss with the team
 - i. Lock Type (optional)*.
2. Create (another) record: The user can have more than one record with different status.
3. Update/Delete: The user can update or delete any of his bikes records any time.
4. Back home

Map incidents

A map can be defined as a visual representation of an area or part of a particular area. It illustrates specific and detailed features geographically (Mapsofindia.com., 2019).

The Maps JavaScript API is also customizing maps with content and imagery, to display on web pages or even mobile applications. (Google Developers, 2020).

Track My Ride implemented OpenStreetMap API (open data), licensed under the Open Data Commons Open Database License (ODbL) by the OpenStreetMap Foundation (OSMF) to provide users a roadmap with information about rack's availability and hotspots. Also data about incidents and how safe a specific area is in terms of parking or leaving a bike, this according to data gathered by other registered users in the web app as a part of a community application web service (ODbL, c2020).

1. Hotspots
2. Racks (parking)

In the feature the user can also create a *Report*. Any user will be able to write a report about any incident. We understand as incident:

- Bike's Thief:
- Available Parking Places

Consult bike

This feature is available for a non-registered and registered user to consult Bike's info, Any user is able to consult the specifications and status of any bike, previously registered from registered users using the serial number.

- Coming from Bike registration

User Profile

In this section, the user is allowed to manage its own account in the app. This feature is hidden under a hamburger type of icon so it allows the user for direct access to the options below:

1. *Edit Profile*: the user registers to the system using Email and Password credentials. The email should not be editable, but the password can be edited under this section.
2. *Terms and Conditions*: The user can have access to all the policies and privacy regarding its data at any time, through this section.
3. *Delete Account*: as we are seeking the development of a GDPR compliant application, the user can use this section to request the deletion of its data and exclusion from the Registered User features from the app.
4. *Logout*: this section allows the user to end the current login session.

Description (Scenarios)

The detailed description of the functionality of the proposed system should be comprehensive, break up the application into subsystems offering different functionality and should essentially serve as a checklist that can be referenced to at subsequent stages.

Splash Screen User Story

“As a user that launches the app, I want to see an introductory screen with the app identity so I have a great first impression of the application.”

1. Splash Screen should contain the logo and progress bar while the server is being initialized.
2. Splash Screen displayed for 3 seconds or until the progress bar is concluded.
3. If a connection is not successful, display a message “Failed to load. Try Again”.
4. Splash Screen should follow the correct orientation (portrait and landscape if possible).
5. Automatically redirect the user to Main Screen.

Login User Story

“As a register user, I would like to use my login credentials just one time and keep my session open on my phone until I desire to logout.”

1. A label login interface should be displayed.
2. Input fields for email and password should be displayed on the screen.
3. A submit button deactivated should be displayed until the two mandatory fields are filled up.
4. The user should submit valid credentials in order to retrieve a user ID.
5. The form is submitted and the Express API connects to the MongoDB cloud instance.
6. A response message is sent by the MongoDB cloud instance.
7. Express API processes the response and validates the user.

8. The Web App creates a session with the user ID until the user decides to logout.

The implementation of a login system in Track my Ride requires two types of data; A username that in this case is restricted to be the user email address, and the password that follows an algorithmic pattern for security manners.

Registration User Story

“As a user, I want to register my login credentials so I have access to the main features of the system.”

1. Users should be presented with an option that leads to the registration screen.
2. Users should be presented with data input fields in a form format with a hidden submit button at the very end of the page.
3. Users should have a checkbox to agree with terms and conditions within a link to the document.
4. If the user presses the documents link, a popup should display it.
5. Terms and conditions must be accepted in order for the Submit button to be functional.
6. Input fields should be Username, Password and Re-enter Password. Username must be a valid email and Password should follow the criteria: MIN 7 character, MAX 20 character, 1 numeric character, 1 uppercase letter, 1 lowercase letter, one special character.
7. If the username already exists in the database then the user should be prompted with an error message in red colour “Username already registered”.
8. Users should be able to see password criteria when clicking over the password field.
9. If password criteria are not met, display an error message in red colour “Password must meet complexity requirements”.
10. If passwords match, a checkmark in green colour should be displayed .
11. If passwords do not match, the user must be alerted with a message “Make sure the passwords match” in red colour and a new password must be inserted.
12. The user must fill up all the fields before Signing Up. If any field is left blank, a message should be displayed informing the user that the input is required.

13. The user should be allowed to continue ONLY IF they agree with the documents.
14. A message of successful registration should be displayed if all the fields are validated.
15. Successfully registered users should then be redirected to the main menu.
16. Users should have the option to go back to the Login page.

Welcome (home) page

“As a User I would like to see the main features of the app with no complications”

The homepage is very important for our application. It is the page that the user will see and work in. To have a successful application a good home page is necessary. The home page should be able to set-up the key element depending on what our primary and secondary objectives are. On the other hand, a poor homepage may destroy the chance of achieving our objectives (Ultimez, 2016).

The homepage should create feelings of quality, visual pleasing, effects and dialogue interactivity. Similarly, the homepage should be an easy zone that lets users make their own choices (Ultimez, 2016).

1. The user will see 4 options: Manage my bike, Map and Consult info and User Profile

Manage my bike

“As I registered user I would like to register my bike details to keep it in track”

2. The user (registered) will register the bike's details to create a record for a specific bike, with the following details:
 - a. Serial number
 - b. Color
 - c. Type (Electric, Road, Mountain, Hybrid, BMX/Dirt Jump, Kids)
 - d. Brand *
 - e. Status (owned, missed, to sell)
 - f. Picture (upload)
 - g. Lock (Yes/No)*
 - i. Lock Type (optional)*
3. The user can create a record with a minimum of 4 fields. The team is aware that some users will not have all their bike's details, therefore the application will ask the user to introduce at least 4 out the 7 fields that we consider it is important to create a reliable record.

4. The user will be able to register a second (or more) bike with different status. The purpose to have more than one record per user is to allow the user to have different status per bike. For example:
 - a. The user can have 2 bikes, one owned + 1 to sell.
 - b. User has 1 bike owned + 1 missed. The missed one will help other users to consult the status of the bike if they are looking to buy one.
5. The user can modify the details any time.

Map User Story

“As a registered user, I would like to know if it is safe to park my bike using my current location. Also I would like to help other users to identify suspicious incidents ”

1. The successfully login to the application and a profile view should be displayed with an option Map view.
2. A location permission request is handled by Express API.
3. Users agree with sharing the location accepting Terms and Condition policies.
4. Express API sends a request to retrieve the data “records collection incident” from MongoDB cloud instance.
5. A Map should be displayed on the main view with all hotspot provided by response message from database.
6. Users should be able to interact with the map dynamically; zoom, check incident notes, rank, and other.

Report

7. The user can report a theft incident, with the following details:
 - a. Username
 - i. In case of non-registered user - any contact detail
 - b. When
 - i. Date
 - ii. Hour
 - c. Where
 - i. Address
 - ii. PostCode
 - d. Was the bike lock
 - i. Yes
 - ii. No
 - e. Type (optional)*
 - f. Picture (optional)

8. The user can report available places for parking that are not displayed on other public platforms. This application is looking to display places that any biker can use without disturbing a business or house. Reporting the following details:
 - a. Address
 - b. Facility type
 - i. Rack
 - ii. Pilar
 - iii. Gate

The requests from Track My Ride provide longitude and latitude to retrieve the user's current location. Once the map is displayed, the availability of racks and hotspots will be shown.

The rack's availability will be provided by an external third-party API and data provided by registered users.

Registered users will be allowed to report a hotspot by sending a request to the backend server which will store the longitude, latitude, and a note of the incident. Track My Ride will need to have a collection of locations in MongoDB with records of all incidents provided by all users. This data will be used to tag areas and to show on the map the number of incidents and the level of security.

Consult Bike

“As a user I want to obtain trustable information about a bike and places around the city.”

The primary purpose of the page is to answer questions about bike's status and dangerous places and parking places. Visitors are coming to this page to gain confidence in our application.

1. Any user can access this page to get general information of a bike, report thief incidents and possible parking places.
2. The user will be able to consult the status of any bike that other users registered in the applications previously.

User Profile User Story

“As a user, I want to have access to my account details so I can update and modify my bike's profile.”

1. Users can access a section called “Settings”.
2. In the Settings section, the user can “Edit” its profile, access “Terms and Conditions”, “Delete Account” and “Logout” from the app.

Edit

3. The Edit section should allow the user to update the account password.
4. If the user modifies the password, a new box should pop up and the user must retype the previous and new password.
5. Old password must match.
6. The new password must meet the criteria.
7. The user must be alerted with a message in red colour “Are you sure you want to reset your password” and in order to proceed, it must press a “Yes” button.
8. If the password reset is successful, the user must be presented with the message in green colour “Your password has been reset”.

Terms and Conditions

9. If the user selects the “Terms and Conditions” section, a pop-up box should display the Terms and Condition the user has accepted when registered to the app.
10. The user can contact the Track My Ride administrators to ask how their data is being used through a “Contact Us” link.

Delete Account

If the user selects the “Delete Account” section, a pop-up box should present the user with the alert message “After deleting your account you will lose your profile, messages and photos permanently. Are you sure you want to delete your Account?” with the buttons “Delete Account” in red colour and “Back to Settings” in the system colour palette.

If the user confirms the account deletion, a pop-up box should display the message “Account deleted - your profile and all your information were successfully deleted”. Users should be unlogged from the app and redirected to the main screen.

Logout

If the user selects the option “Logout”, a pop-up box should present the user with the alert message “Are you sure you want to Logout” with the buttons “Logout” in red colour and “Back to Settings” in the system colour palette.

If the user confirms the Logout, it should then be unlogged from the app and redirected to the main screen.

Diagrams

Splash Screen

Use Case



Use case: Splash Screen

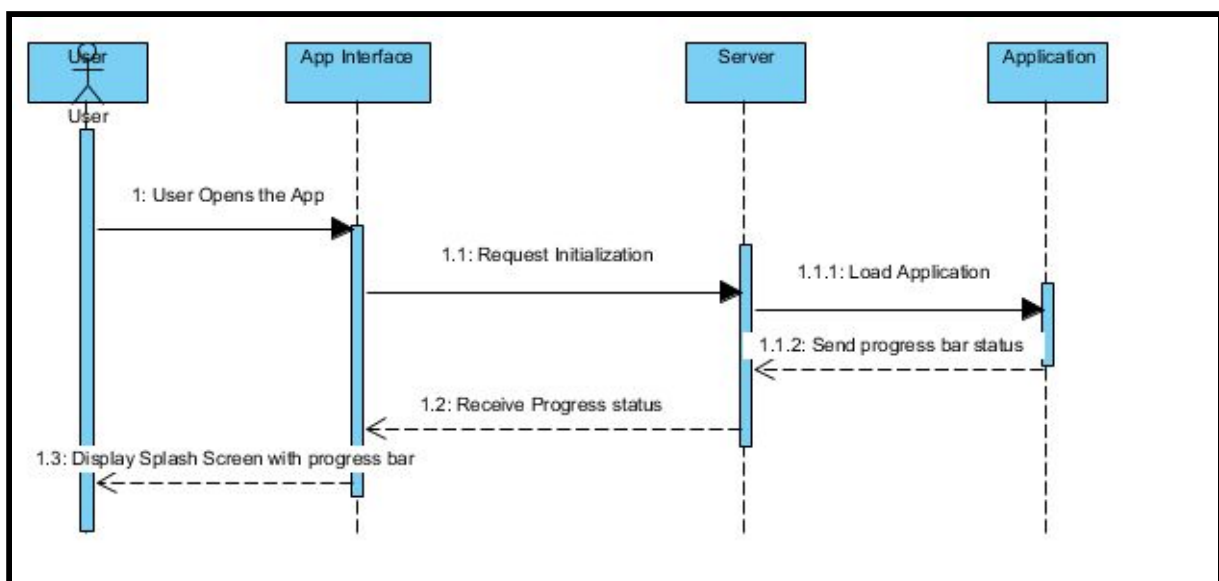
Actors: Any user

Goal: To open the app and be redirected to the main screen

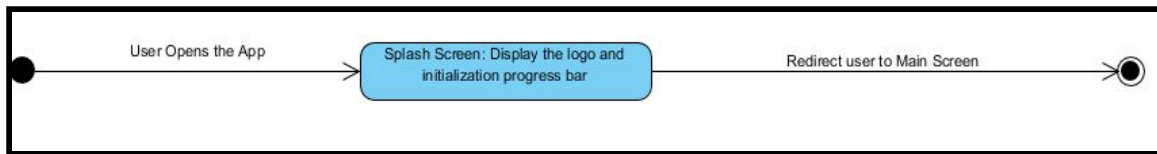
Description:

This is the first screen displayed after the user opens the app in order to welcome the user to the in-app experience while loading back-end configuration and eventually transitioning to the Main Screen.

Sequence Diagram

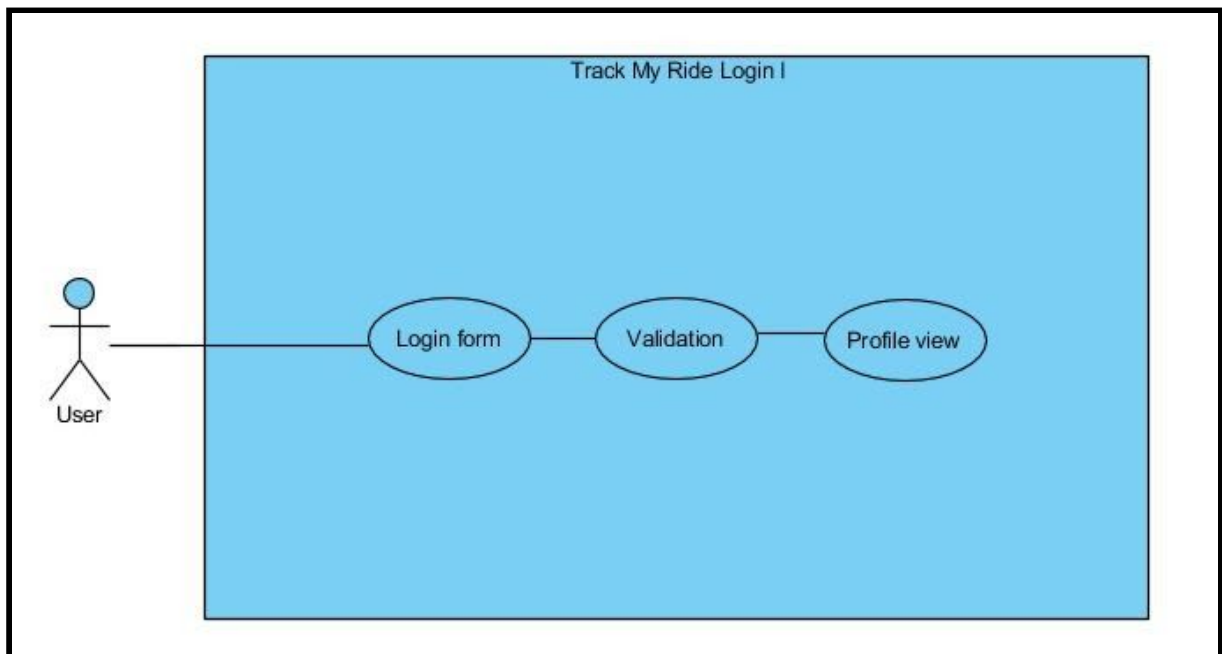


State Diagram



Login

Use Case



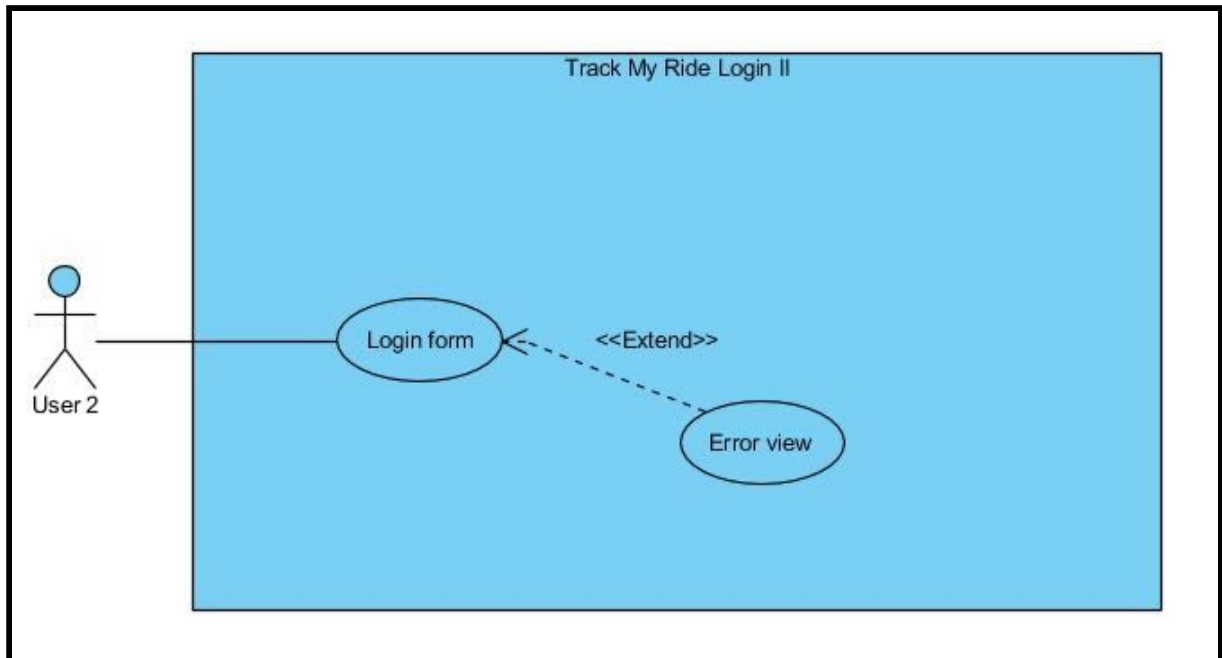
Use case: Login

Actors: Registered user

Goal: To login and show a profile view.

Description:

When the user opens the Track My Ride Web App. A login form is shown with two fields, email address, and password. The registered user introduces his details and the system validates it. The response message is valid and the user profile interface is shown.



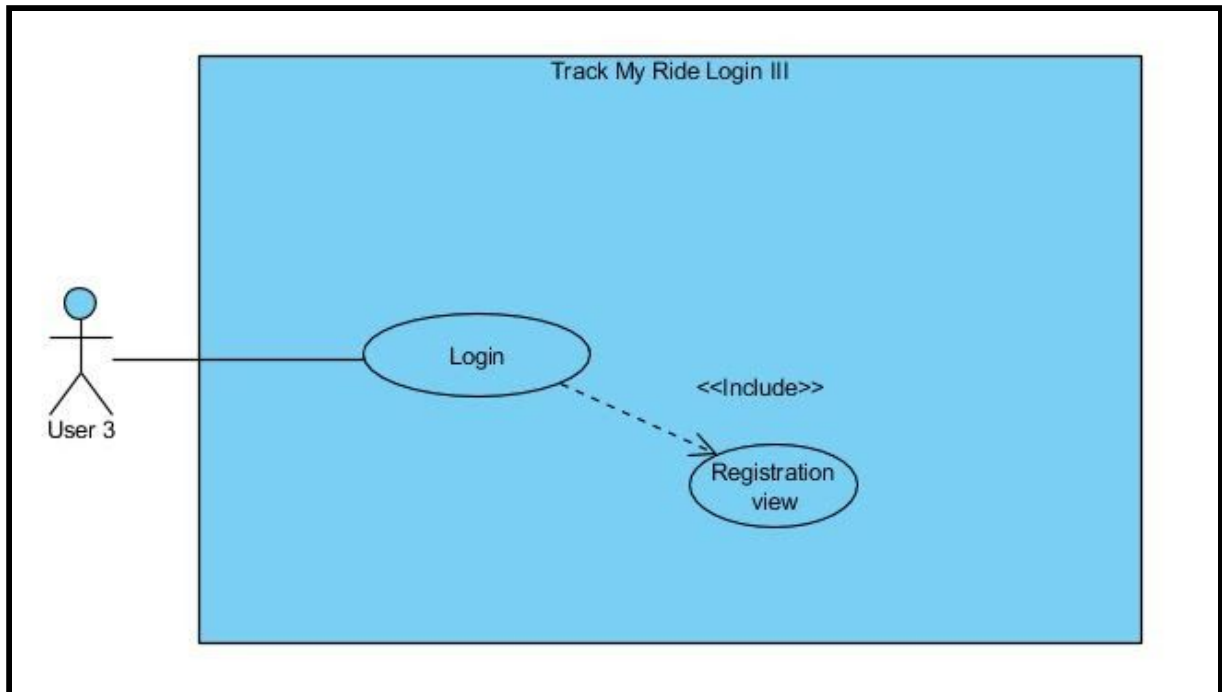
Use case: Login

Actors: Registered user

Goal: To show an error message view when logging.

Description:

When the user opens the Track My Ride Web App. A login form is shown with two fields, email address, and password. The registered user introduces his details and the system validates it. The response message is invalid and the system shows an error message and the login form is shown again.



Use case: Login

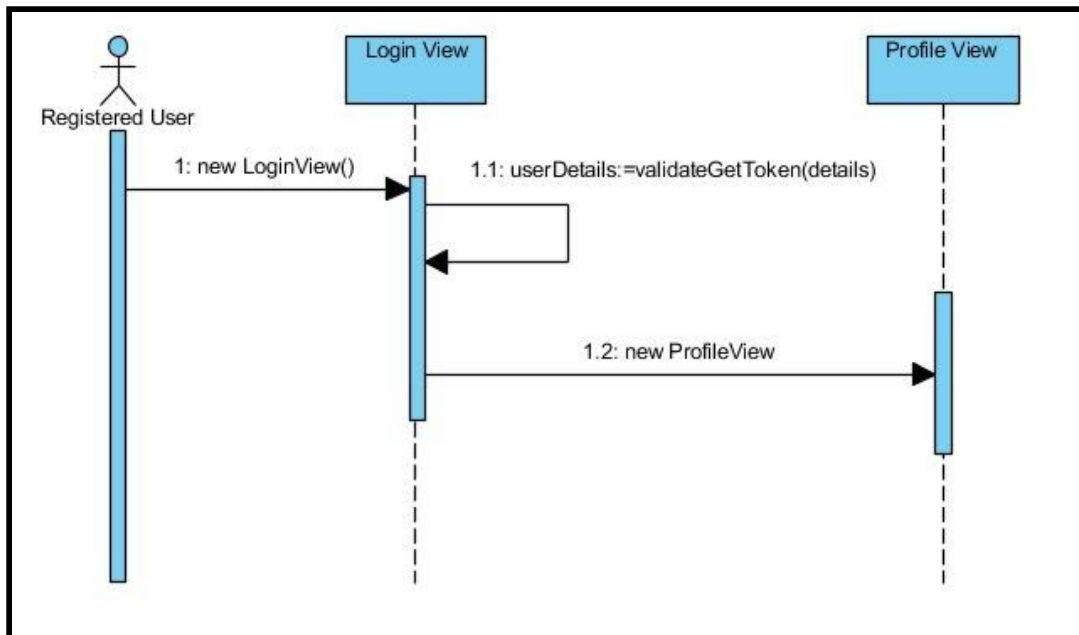
Actors: Unregistered user

Goal: To show a register message view when logging.

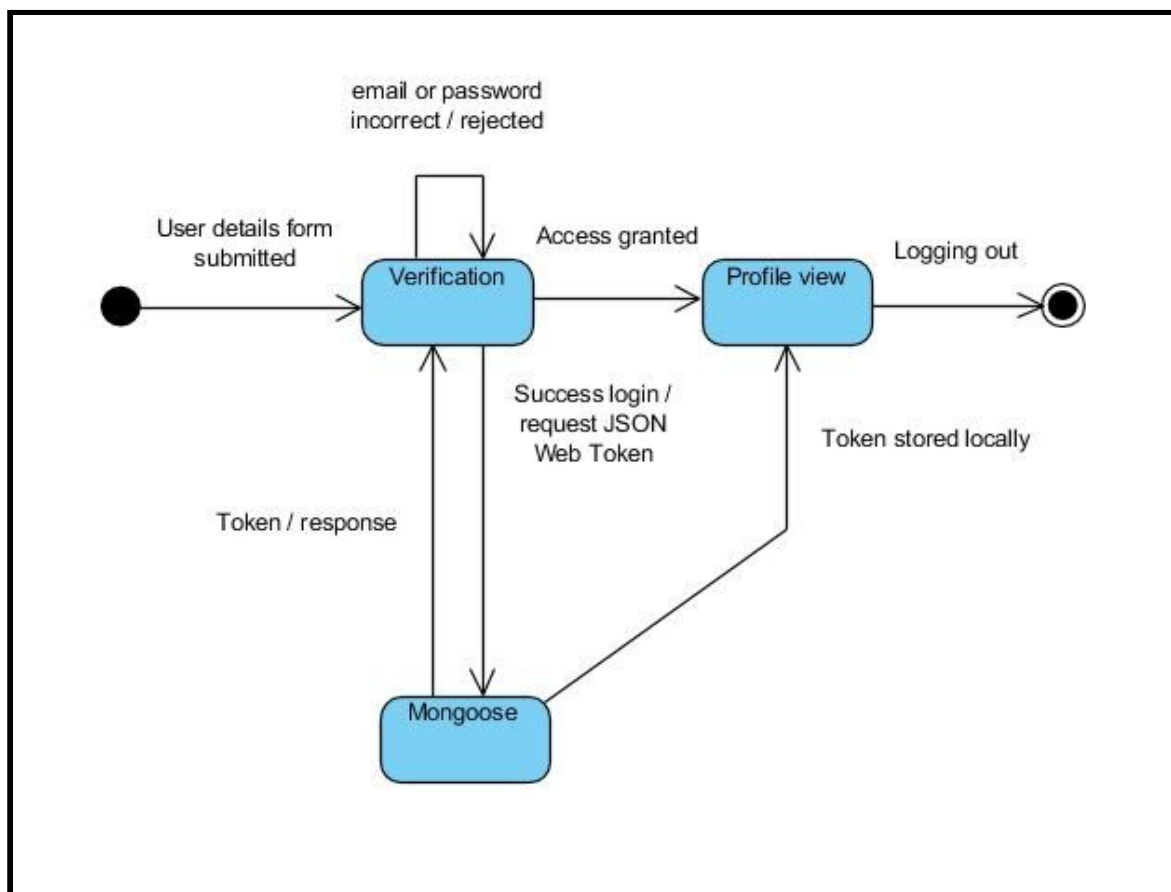
Description:

When the user opens the Track My Ride Web App. A login form is shown with two fields, email address, and password. The unregistered user introduces his details and the system validates it. The response message is invalid and the system shows a register message as the email is not registered. The system shows a registration form the user has to fill up.

Sequence Diagram

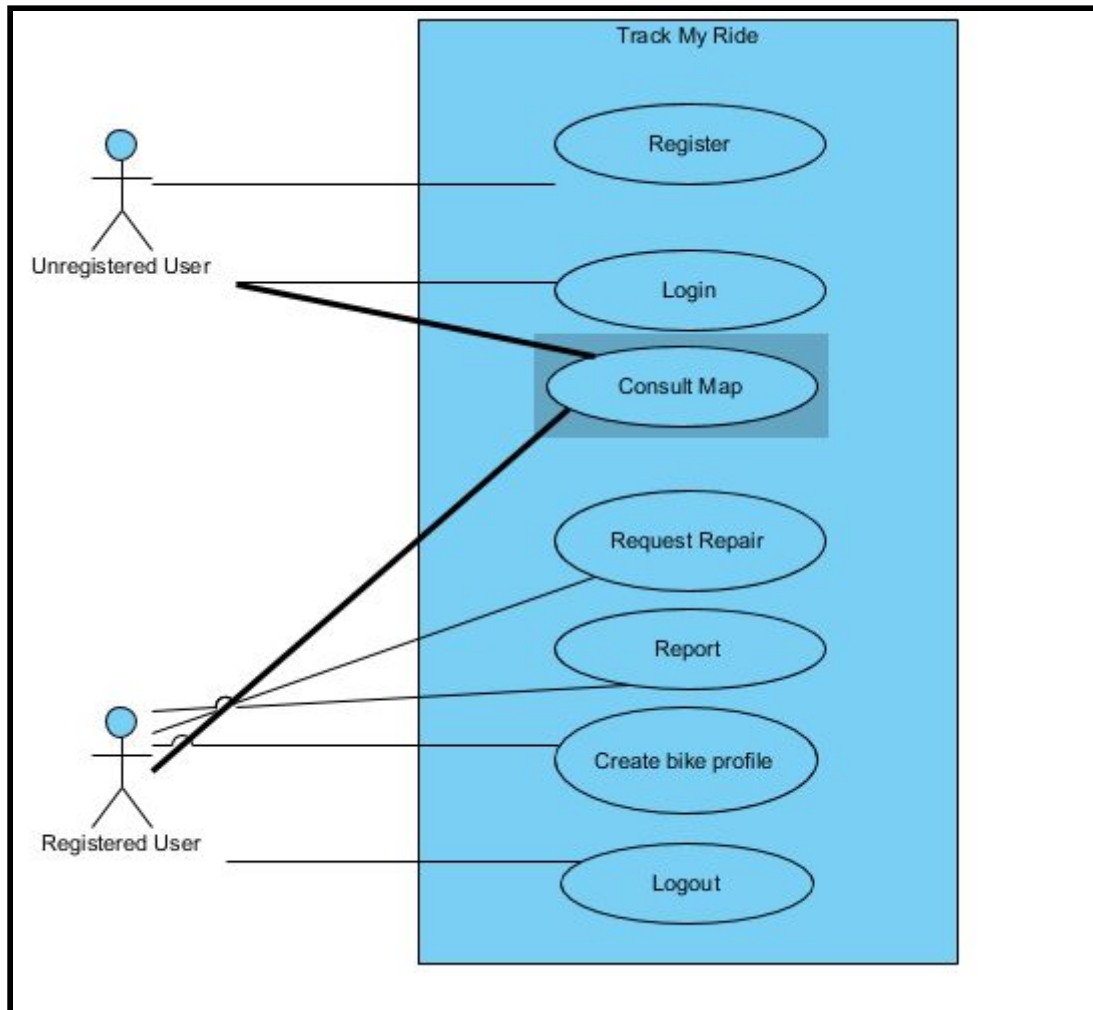


State Diagram



Registration

Use Case



Use case: Registration

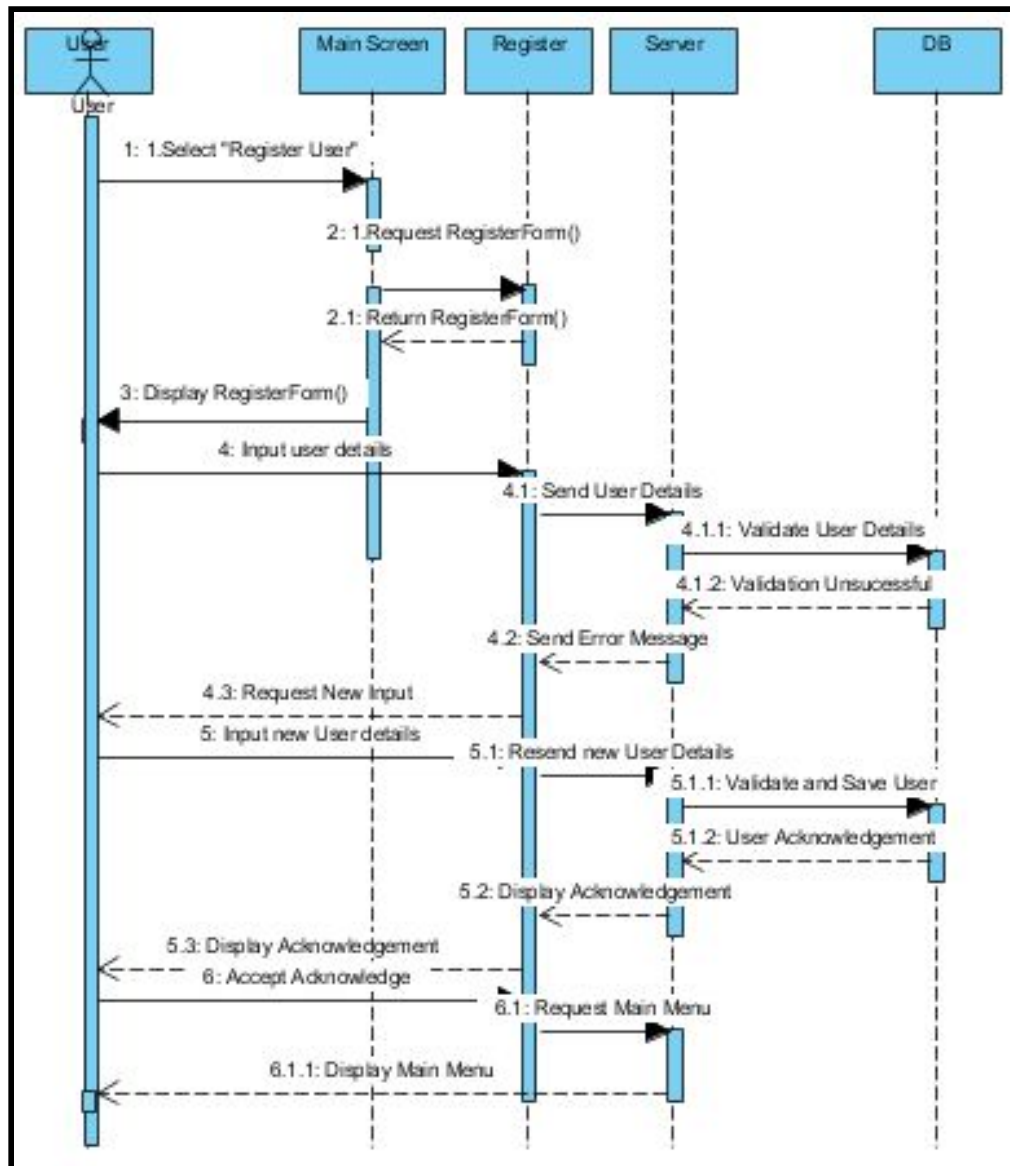
Actors: Unregistered User, Registered User

Goal: To determine the specific access a registered user can have

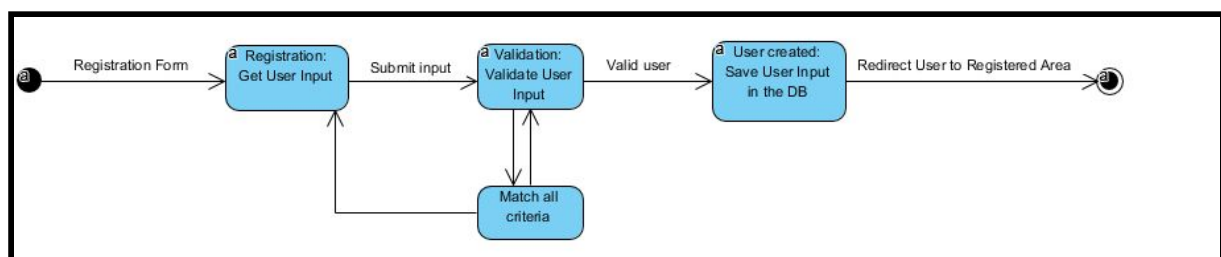
Description:

The unregistered user that accesses the app for the first time will be presented with the options to Login with its credentials, Register with new credentials or access the Map, being this last one available also to a Registered User. Only after a successful registration, the user can also Report an Event, Create a Bike Profile, Request a Repair on the Spot and Logout from the system.

Sequence Diagram

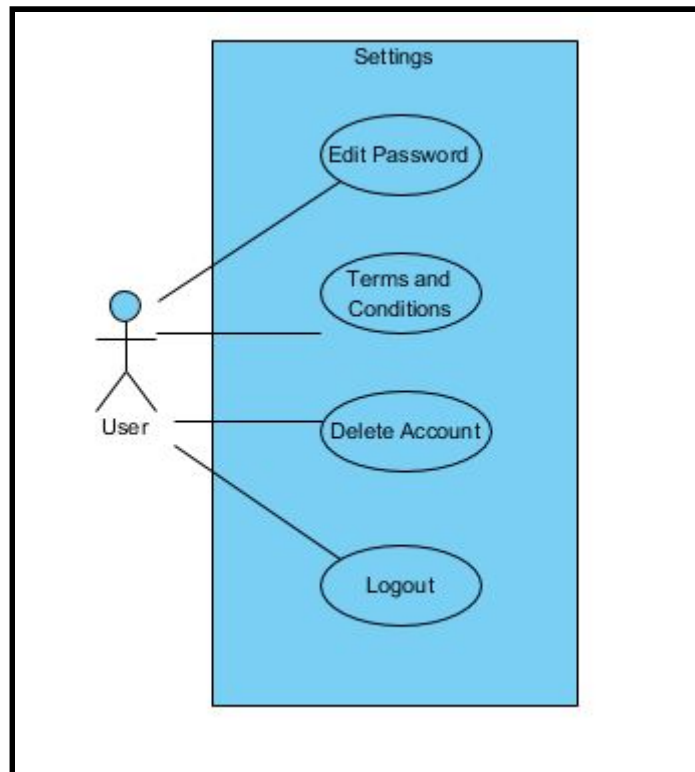


State Diagram



Settings

Use case



Use case: Settings

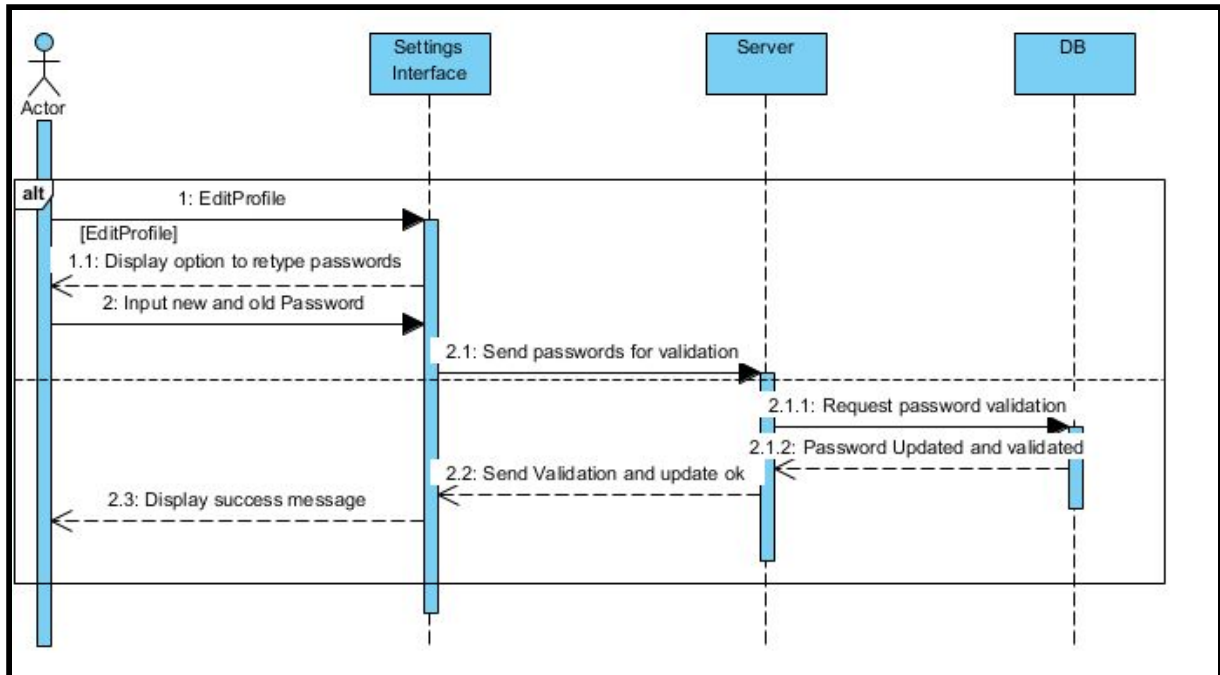
Actors: Registered User

Goal: To access the sections related to the user account

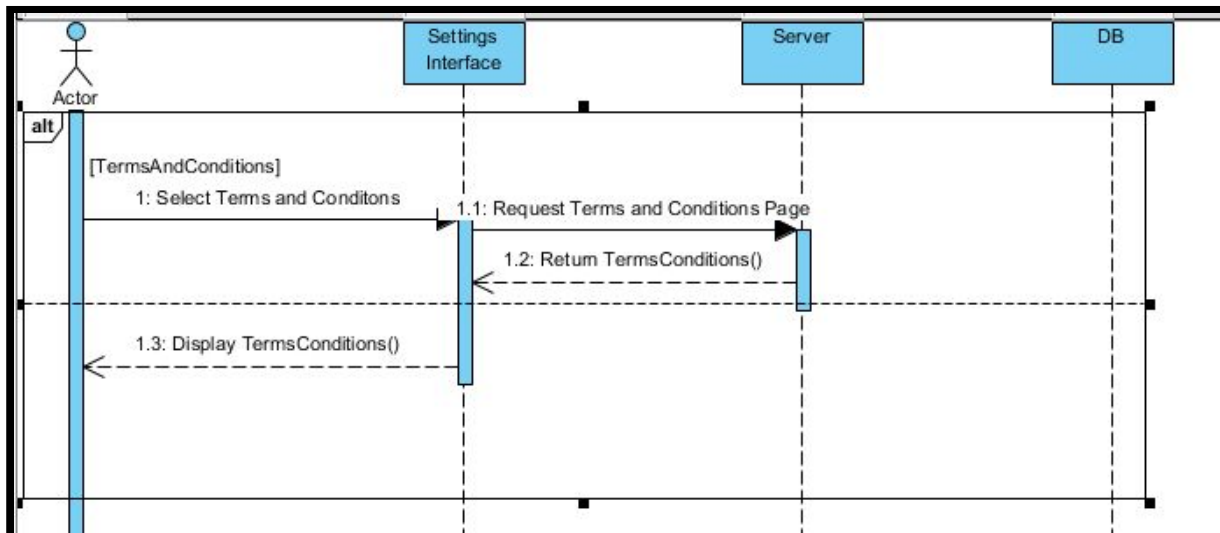
Description:

The registered user can access the Settings section as a direct access to Edit Password, Terms and Conditions, Delete Account and Logout sections.

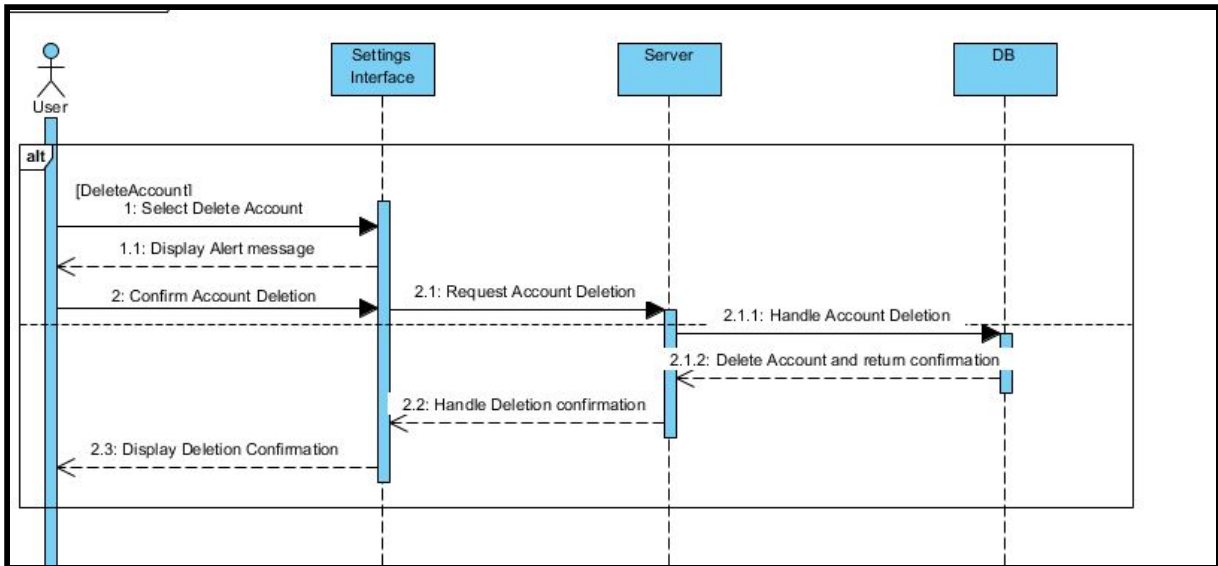
Settings - Edit Profile (Sequence Diagram)



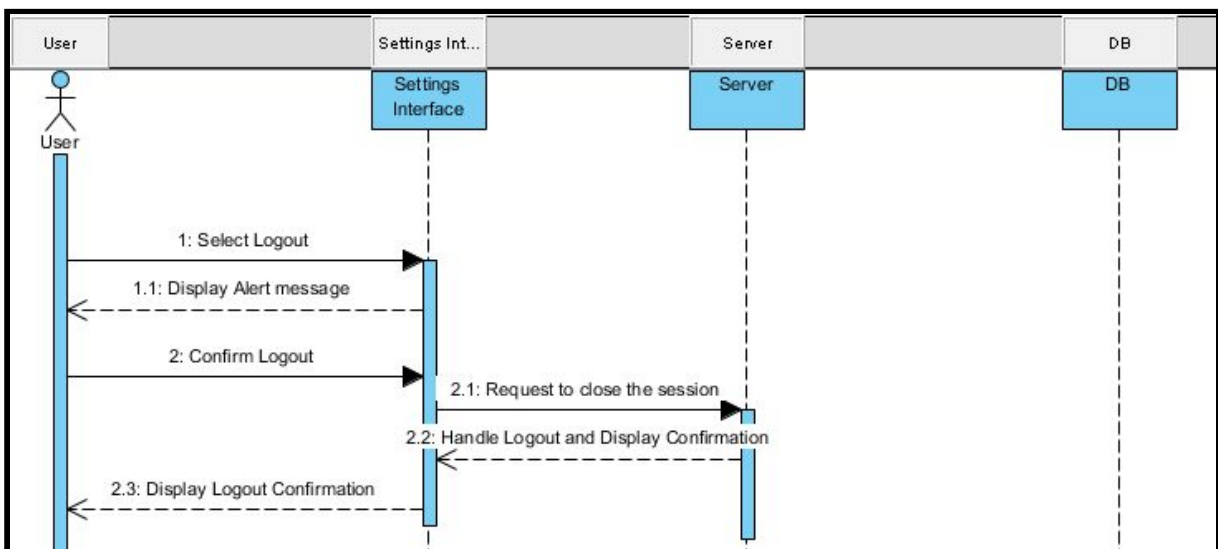
Settings - Terms and Conditions (Sequence Diagram)



Settings - Delete Account (Sequence Diagram)

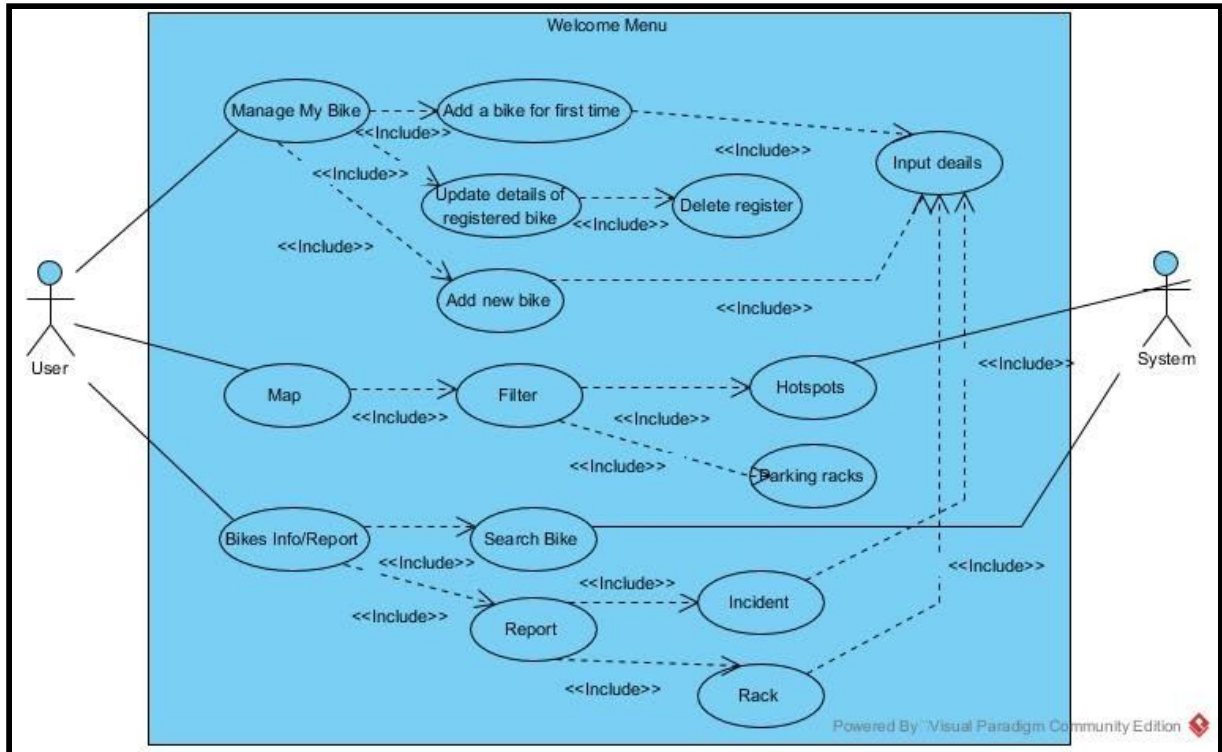


Settings - Logout (Sequence Diagram)



Welcome (home) page

Use Case



Use case: Welcome Menu

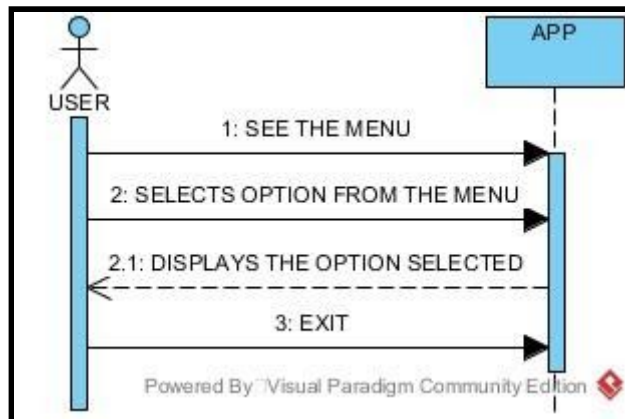
Actors: User, System

Goal: To show a menu option view when selected.

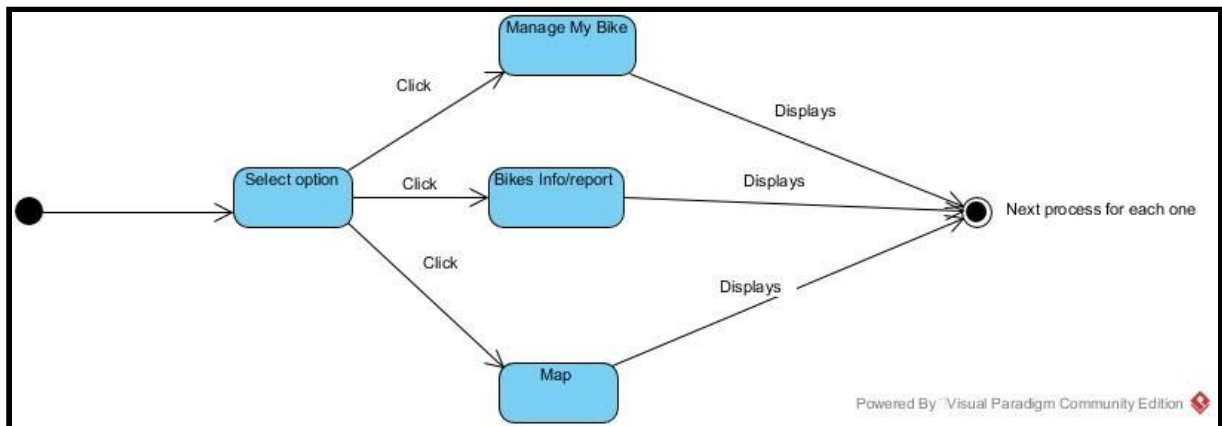
Description:

When the registered user successfully login the Track My Ride Web App. A Menu screen is shown with three options to be selected, Manage My Bike, Map and Info/Report. The response of the system shows a different screen depending on which of the options was selected by the User.

Sequence Diagram

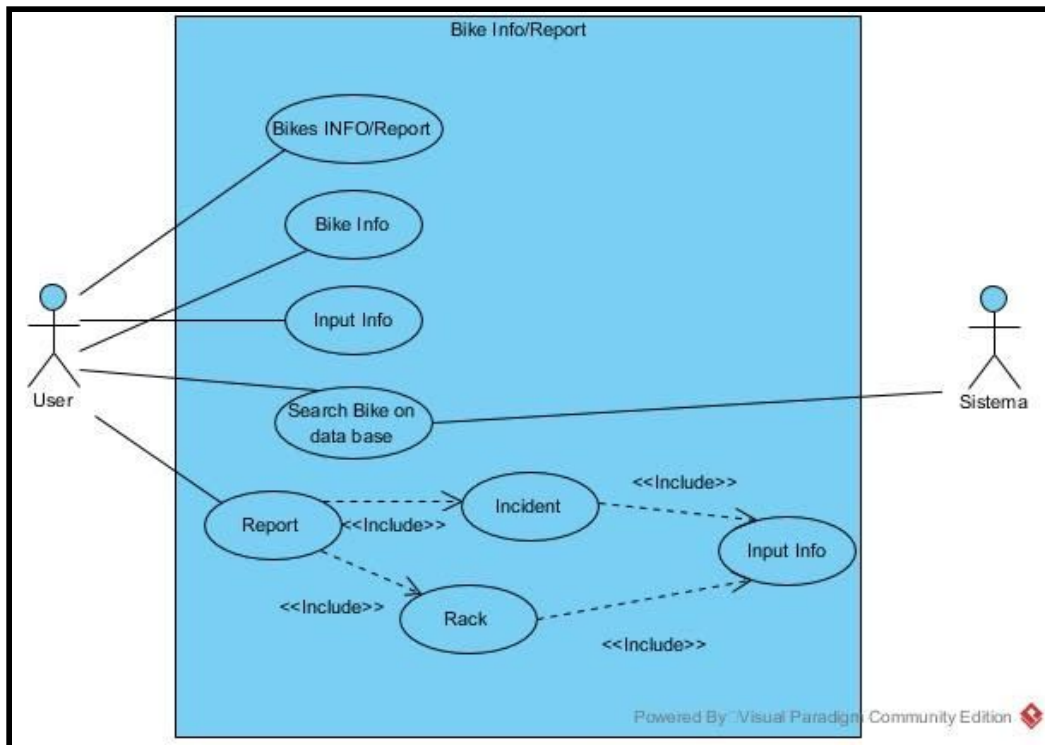


State Diagram



Info/Report

Use case



Use case: Info/Report

Actors: User, System

Goal: To show a register user the form to search for Bike Info and display the form to report an incident or Parking spot.

Description:

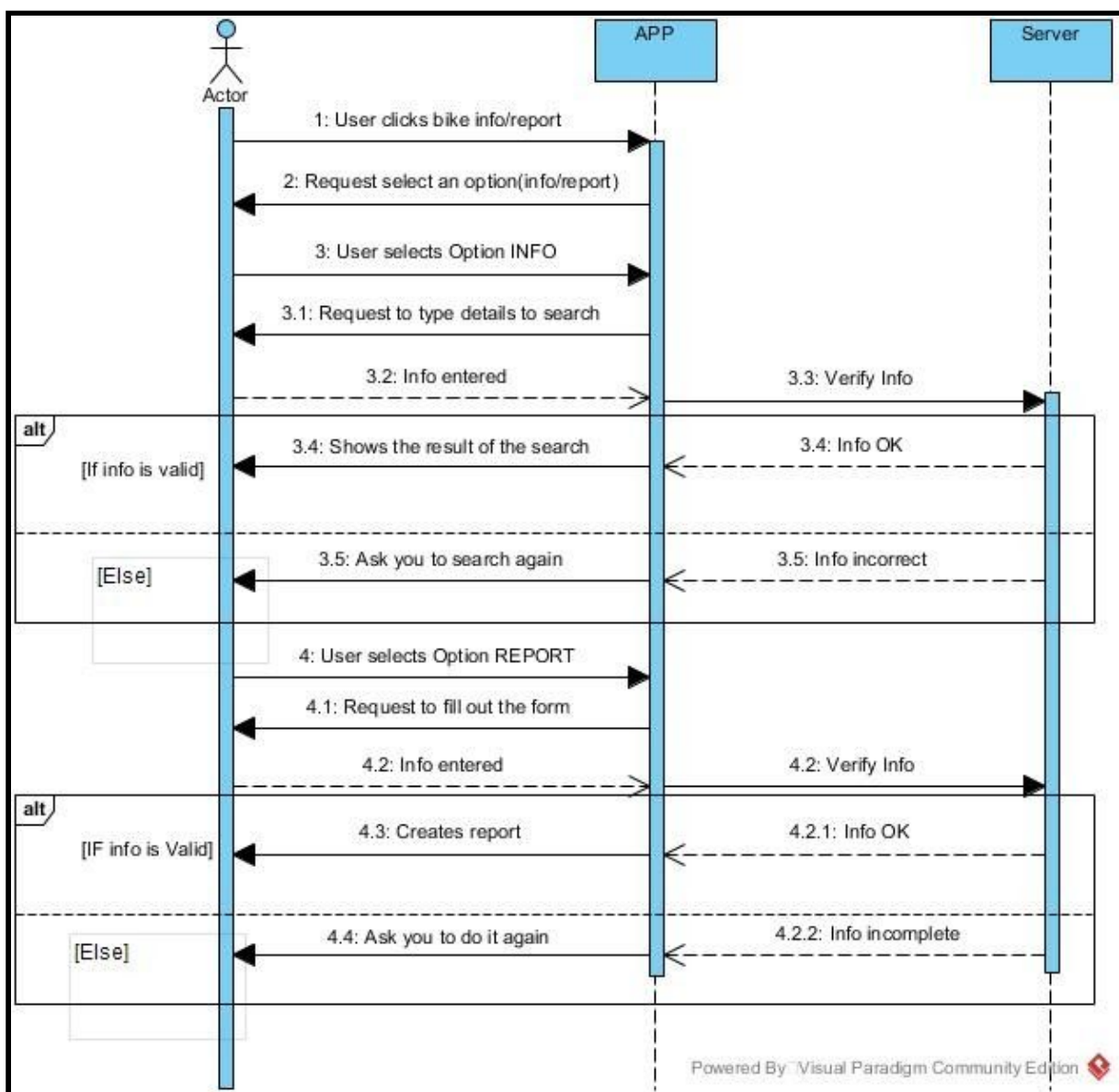
When the registered user selects the option Info/Report from the Home Menu. A Searching form is shown with three fields, Serial Number, Brand and Colour. The registered user introduces his details and the system validates it. In response the system will show the result of the search based on the data entered vs the database of the bikes registered. In the other case if the registered user selects Report the system displays an screen with two options, Incident Report or Parking Report, in the case of Incident report a Report form is shown with seven fields:

- Date
- Hour
- Address
- Lock
- Type
- Picture

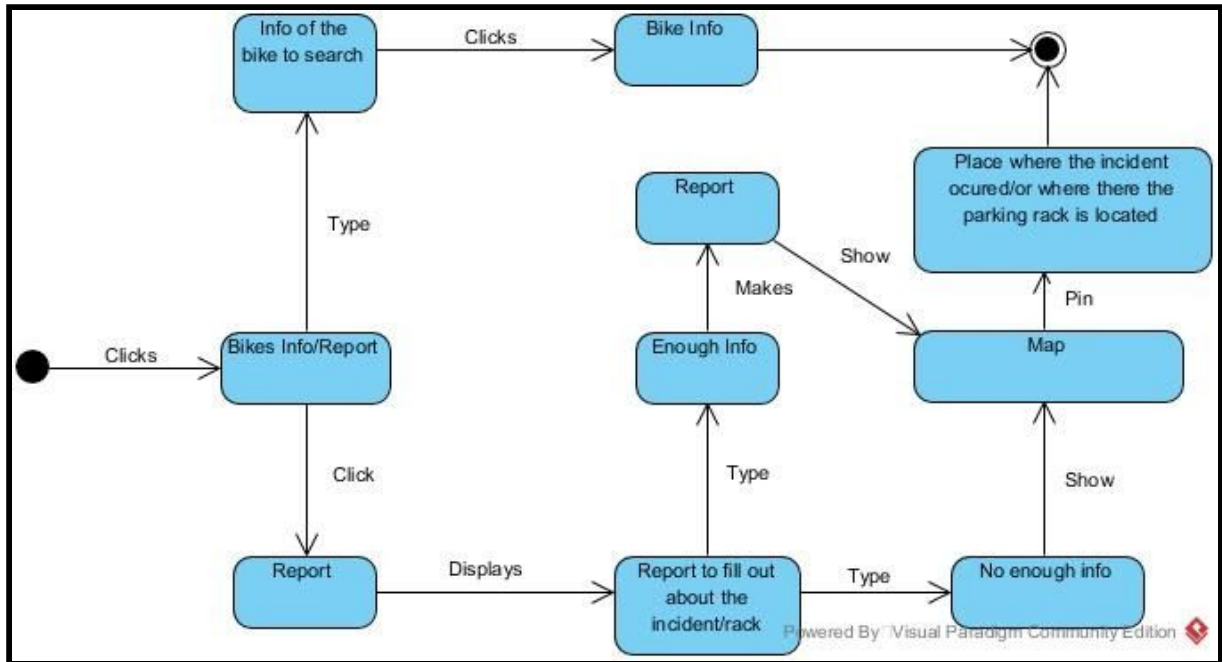
The registered user introduces the details of the incident and the system validates it. In response the system will create a report, then the system will show

the user a message to notify the report has been created, following that the system will store the inputs in the database of the system to create the hotspots, in the case of Parking Report a form is shown with two fields, Address and Facility Type, the registered user introduces the details of the parking spot and the system validates it. In response the system will show the user a message to notify the report has been created, following that the system will store the inputs in the database of the system to create the non registered Parking Spot.

Sequence Diagram

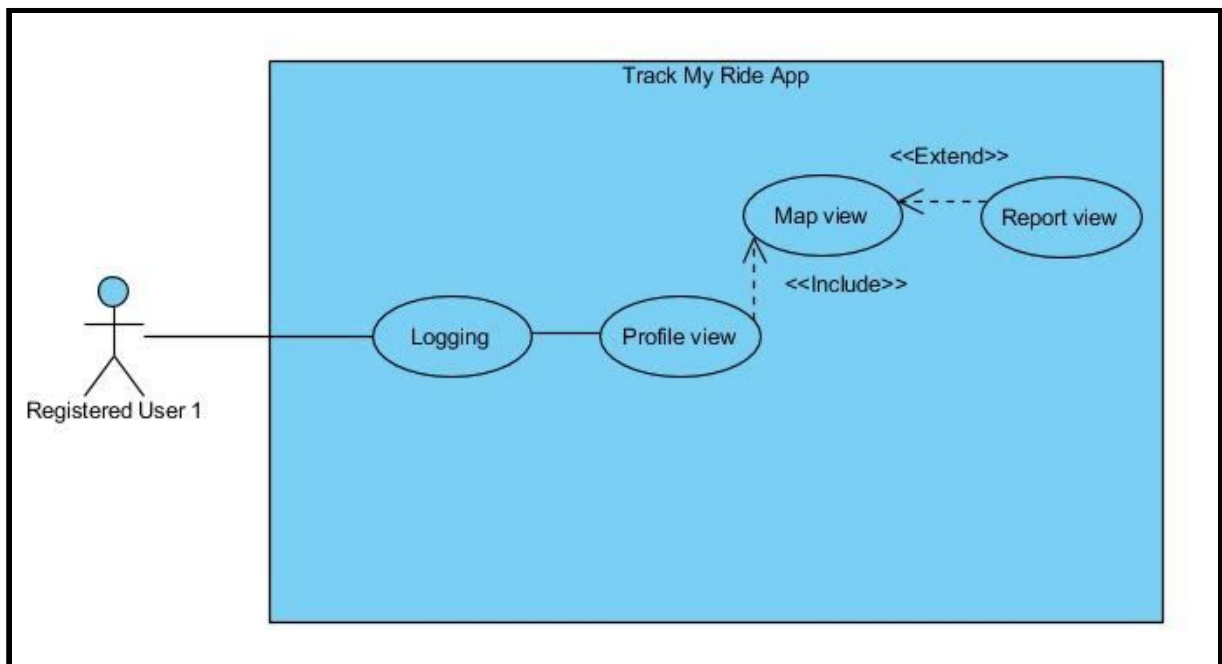


State Diagram



Map

Use Case



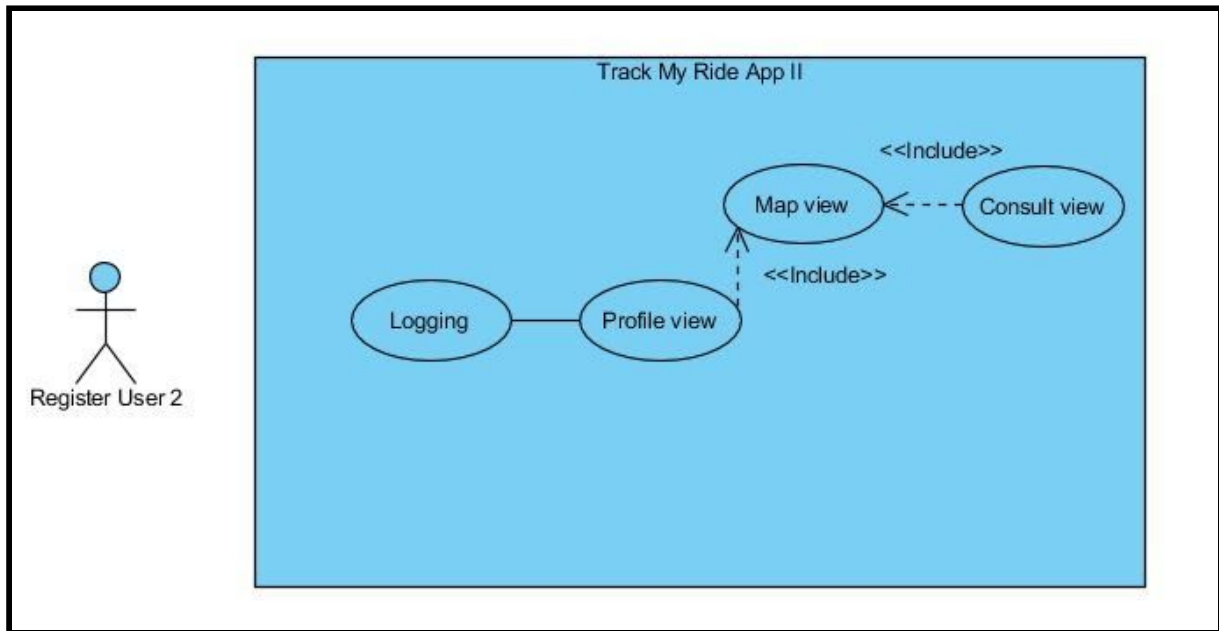
Use case: To report an incident

Actors: Registered user

Goal: To record and incident

Description:

When the registered user opens the Track My Ride Web App. A login form is shown with two fields, email address, and password. The user introduces his details and the system validates it. The profile view is shown and the user selects the Map option. A map is displayed with a button to report an incident. The user reports the incident and logout of the system.



Use case: To consult an area

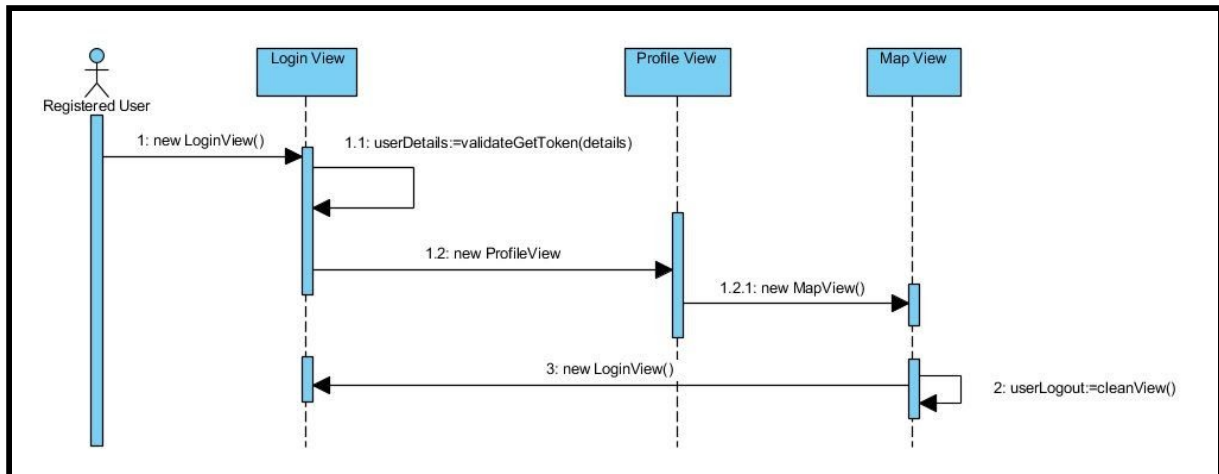
Actors: Registered user

Goal: To show the incident's record, security level, or racks availability.

Description:

When the registered user opens the Track My Ride Web App. A login form is shown with two fields, email address, and password. The user introduces his details and the system validates it. The profile view is shown and the user selects the Map option. A map is displayed with a button to consult. The system filters the information to show incident or rack availability. The user checks and logout of the system.

Sequence Diagram



State Diagram

No needed - no states changes

Data Requirements

Login and Registration

Email: String (a subset of ASCII characters) separated into two parts by @ symbol. a "personal_info" and a domain, that is personal_info@domain. The length of the personal_info part may be up to 64 characters long and domain name may be up to 253 characters”.

Password: Encrypted using bcrypt library.

Terms and conditions agreement: Result from the checkbox agreeing with terms and Conditions

Welcome (home) page

Manage my bike

The user (registered) will register the bike’s details.

- Serial
- Color
- Type (Electric, Road, Mountain, Hybrid, BMX/Dirt Jump, Kids)
- Brand *

- Status (owned, missed, to sell)
- Picture (upload)
- Lock (Yes/No)*
 - Lock Type (optional)*

We are looking to create one record for each bike that the user registers. This record will help to feed the Consult Bike info feature.

Map

- Hotspots
- Racks (parking)
- Report: registered and non-registered users will fill out a form reporting an event. This information will be displayed on the MAP

The information needed to feed this feature (Map) will come from the reports that the users create.

Hotpost: Object with data from MongoDB cloud instance. This collection is a set of data provided by registered users when having reported.

- User: string (hidden)
- Longitude: float
- Latitud: float
- Timestamp: timestamp.
- Incident notes: string

Incident Report

- Date: DATETIME data type to store the date and time.
- Hour: DATETIME data type to store the date and time
- Address: VARCHAR
- Lock: VARCHAR
- Type: VARCHAR
- Picture: VARBINARY(MAX)
- Description of the incident: VARCHAR

Parking Report

- Address: VARCHAR
- Facility Type: VARCHAR

Consult Bike Info

- Bike's info: this information will come from registered users when fill the form with their bike's details and be displayed for registered and non-registered users

When the User searches for the bike, the system will search only on the Database of the Bikes registered for the User.

- Serial Number: VARCHAR, Variable-size string data.
- Brand: VARCHAR, Variable-size string data.
- Colour: VARCHAR, Variable-size string data.

Overview of System (Table description)

An overview of the entities and data in the system, and what data needs to be stored.

Table	Description	Attributes	Type
User	Username is the unique e-mail	Email - PK	VARCHAR (320)
	Password must be encrypted	Password	VARCHAR (20)
	Stamp of the user registration date/time	CreatedAt	DATETIME
	If Password is updated, this fields holds the date/time it became active	PasswordActiveAt	DATETIME
	Terms and conditions acceptance default status is Y, once every registered user must accept them	Acceptance	VARCHAR (1), DEFAULT : "Y"
	The default status is ACTIVE for a registered user. If the user decides to delete its account, status changes to INACTIVE. If the	AccountStatus	VARCHAR(8), DEFAULT: "ACTIVE"

	user violates the terms and conditions or misbehave, the admin can change the status to BLOCKED		
--	---	--	--

Login

Collection	Name	Description	Attributes	Type
Users	email	Username is the unique e-mail	Email - PK	string
	password	Password must be encrypted	Password	string

Map

Collection	Name	Description	Attributes	Type
Incidents	user	Registered user reference	User ID	string
	incident_description	Brief description of incident	Description	string
	time_stamp	Datetime of the incident	Data/time	timestamp
	latitude	Latitude coordinate of the incident	Location	float
	longitude	Longitude coordinate of the incident	Location	float

Consult Bike Info

Users Collection			
Table Name	Description	Attributes	Type
SearchBike	Serial Number of the Bike	Serial Number	VARCHAR
	Brands of the Bike	Brand	VARCHAR
	Colour of the Bike	Colour	VARCHAR

Incident Report

Users Collection			
Table Name	Description	Attributes	Type
Incidentreport	Date of the incident	Date	DATETIME
	Hour of the incident	Hour	DATETIME
	The address where the incident happened	Add ress	VARCHAR
	If lock was used	Lock(yes/no)	VARCHAR
	Type of Bike	Type	VARCHAR
	Picture of the bike	Picture (upload)	VARBINARY(MAX)
	Extra details of the incident	Description of the incident	VARCHAR

Parking Report

Users Collection			
Table Name	Description	Attributes	Type
Parking report	Address of the parking place	Address	VARCHAR
	Type of rack	Facility Type	VARCHAR

Chapter 3: System Design

System design is the process of designing the elements of a system such as the architecture, module and components, the different interfaces of those components and the data that goes through that system (Odhiambo, 2018).

The purpose of the System Design process is to provide sufficient detailed data and information about the system and its system elements to enable the implementation consistent with architectural entities as defined in models and views of the system architecture (Odhiambo, 2018).

This is the ultimate goal of any project. Systems can be welcoming and reflect not only the tone of the product but the user's needs. A human should not feel like they are working for the technology. We need more systems that feel like they are working for us (Bailey, 2016).

This approach utilizes styles and scenarios (if/then interactions) based on web foundations. Some teams use a visual sheet with specifications and then use prototypes to animate examples that are recreated with real code. There isn't one thing that works for every team. Our team used the "*JustInMind*" application to visualize how the application should behave. "*JustInMind*" is an all-in-one prototyping tool for web and mobile applications (JustInmind, c2020).

Working in a team has allowed us to gain knowledge of systems that are essential to know what we should put together during the design (Bailey, 2016).

The aim of Track my Ride application is to assist users at the right places and get out of the way to empower people by designing an interface that helps all users to interact with the applications. We designed thys system to make the Track my Ride seamless, and technology more powerful and accessible (Bailey, 2016).

In this Chapter we are explaining how "*Track My Ride*" application is implemented

User Interface Design

User interface (UI) elements are the parts we use to build apps or websites. In this phase we add interactivity to a user interface. We used UI elements to create a visual language and ensure consistency across the application by making it user-friendly and easy to navigate without too much thought on the user's part (De la Riva, 2019).

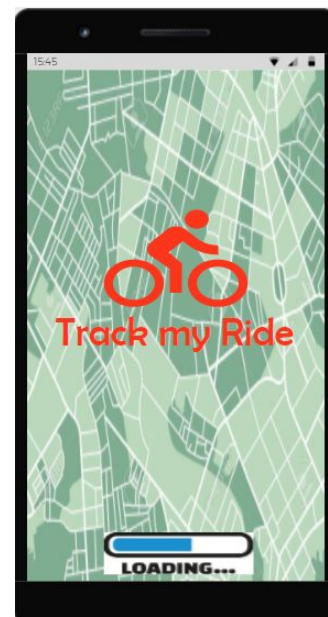
User interface (UI) design has grown substantially over the past few years, and has blossomed into one of the most creative, innovative and exciting fields in tech (Hannah, 2019). It is the point of human-computer interaction and communication in a device. It is also the way through which a user interacts with the application (Rouse, 2019).

Today, most businesses recognize that an excellent user interface is vital for building users loyalty. Users don't just enjoy well-designed products; they expect it. UI design, in a nutshell, can make or break the success of a product.(Hannah, 2019)

The following screens are the blueprint that help us to visualize and build our application. We provide touchpoints for the user as they navigate their way around; from buttons to scrollbars, to menu items and checkboxes.

Splash Screen:

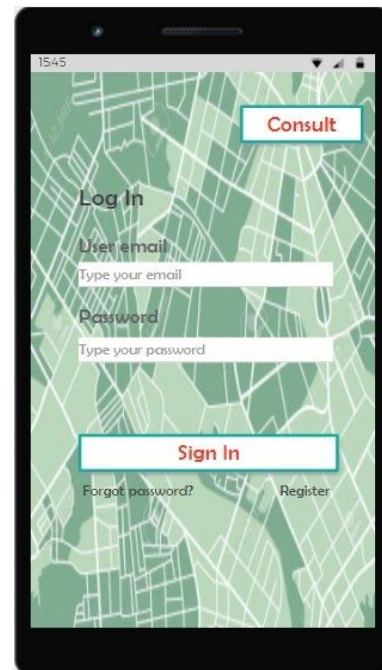
Splash screen is the first graphical notification when the user visits the app. It offers fantastic potential as valuable and memorable first impressions. This screen will automatically redirect the user to the main website after a few seconds. Every good app uses a splash screen that gives them a unique identity. Splash screen in a nutshell, is the first impression creators make. (Moyers, c2020)



Login

A login page is a door that users must open in order to get the best out of their experience with a website. It is the starting point of navigating a website in a personalized manner. By creating an account the user gets to customize some aspects of in the site and get access to membership benefits.(Amelia, 2019)

Since it is one of the common ways for users of a site to enter, we needed to make the form simple and straightforward (Eyerys. c2020)



Register User

Registering for websites is no fun. But it's part of doing business in the online world. Because most website users are quite used to the process, we tried to create a successful signup page focusing in eliminating distractions and reducing form fields by minimizing the steps involved in the registering process (Wainwright, 2018 & Vrontas, 2019)

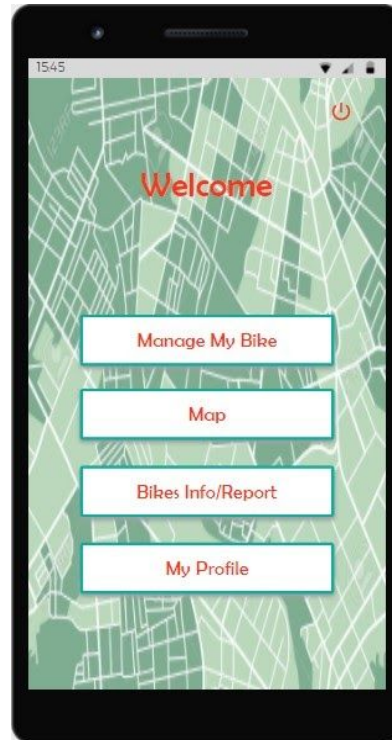


Welcome/Home Page

Welcome pages generally act as an introduction for new visitors, explaining the website and often prompt an action on the part of the user. (Ross, 2011).

There is just one catch, to convince users to give it a try. We could not assume that just because a user has landed on our homepage they are genuinely interested in what you have to offer and therefore need only a slight nudge to go further.

We wanted to keep the design simple but with a strong message. (Johnson, 2011)



Manage my bike > Register Bike

Once the registered user is on the home page, they can click into the "Manage my Bike" button and create a bike profile.



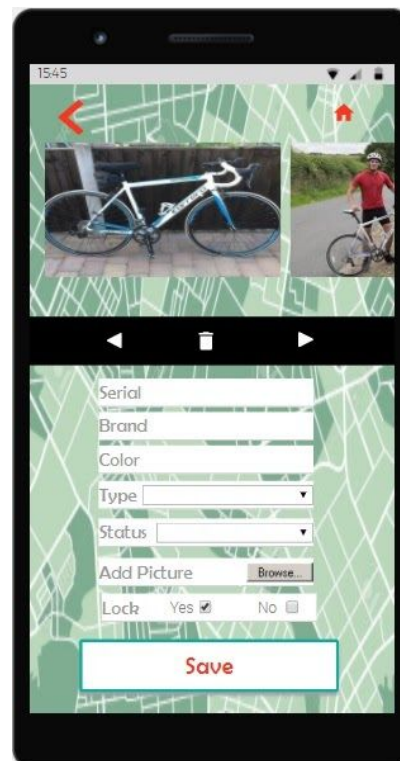
Manage My Bike > update + add new bike

This is the first feature that the application offers to the user. In the page, users can register the details of their bikes, upload pictures of the bike, modify the details and also add a new record if the user has more than 1 bike.



Manage My Bike > Update Bike Registered

After the user creates a bike record, the application offers the option to amend any details at any time by clicking the button Update.



Map

The second main feature of the application is to have a map where the user is. This interface was thought to display parking places and let the users report incidents

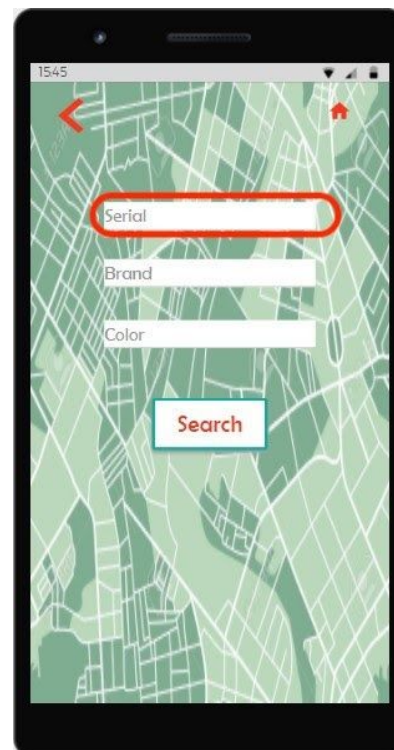


Map > Thief /Parking report

Any user can create a report by clicking a specific point from the Map and this would be the information required from the application to create a record and be displayed at the Map .

Consult Bike Info

The third main feature of Track my ride, is the option to consult bike information using the Serial number .



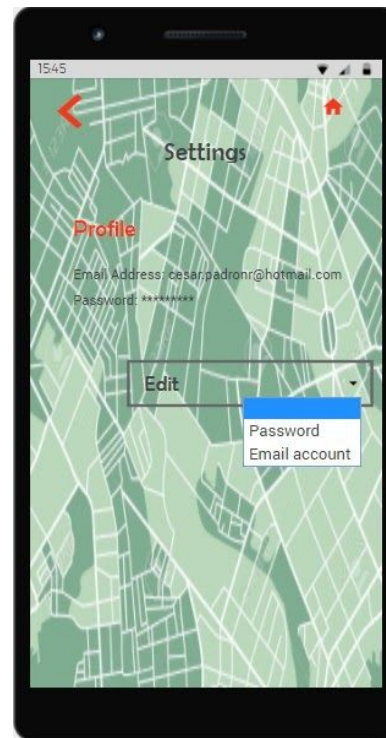
Bike Info > first result

Example of how the information will display



User Profile

We wanted to give to the users the freedom to update their details also allow them to delete their account any time



Functional Design

Most functions can be achieved in a variety of ways, but there are some basic elements that a good design needs to take into account to create a product that best fulfills its intended function(Wax, 2009).

Functional design is the process of responding to the needs of the users who will use our app in a way that allows their needs to be met. A functional design assures that every part of a device works. Functional design as an outcome describes features that work well to perform their assigned tasks; as a process, functional design is a set of practices guided by the principles that produce that positive outcome (Wax, 2009).

One of the main characteristics of the functional design is to show the purpose of the application. For example, we wanted to create a tool to help bikers to track their bikes. Therefore, it was very important to identify the type of users we want to use our application to picture the functionality of the application (Vnučec, c2020).

To design the functionality of the application we tried to answer some basic questions:

- What is the application's goal?

- Who will be using it?
- What users need from the application?
- Is it clear to use it?
- How does the user know if it is working?
- Is it engaging the user?
- How does it handle the mistakes?
- How much support will they need, and what form should it take?

Functional applications should fastly provide what visitors are looking for. A clever system, so visitors know what the site does or how to do it.(Vnučec, c2020).

We tried to give the user a simple and functional application to let/help the user to have an easy experience with using very small pieces of their time but at the same time to fulfill all their needs.

The functional design takes into account the possibility that users make mistakes. It accommodates and even anticipates mistakes as much as possible. (Vnučec, c2020) If the user make a mistake, the application provides a simple and clear way to fix it by sending a alert message

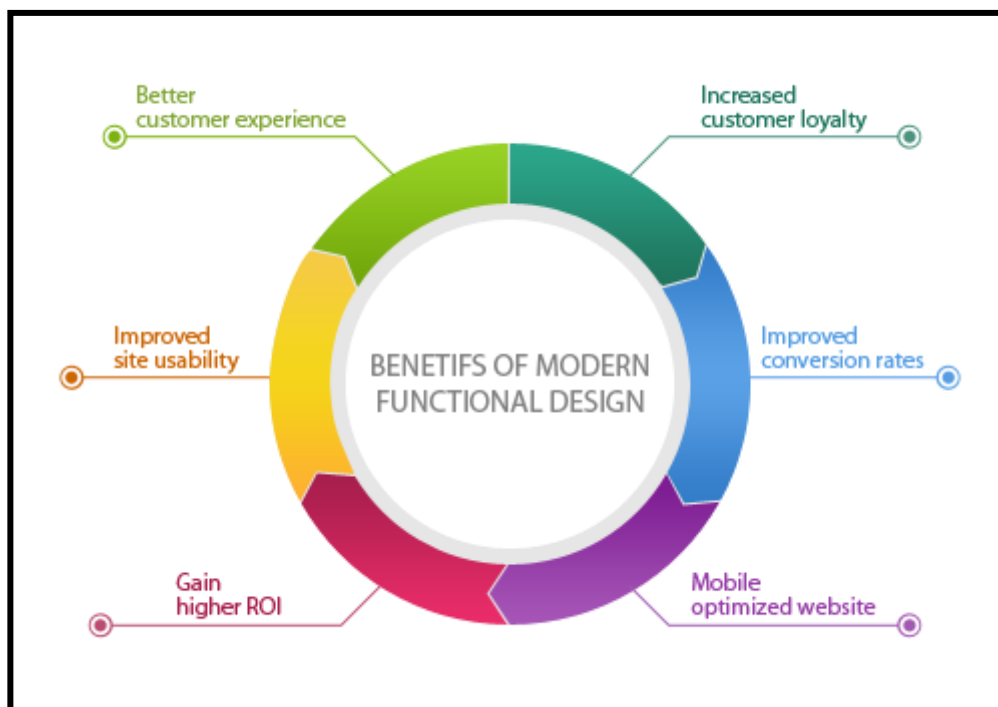


Figure 4. Benefits of modern and functional web design (Vnučec, c2020)

In the figure 5 and 6 , we show the logic that Sign in and Sign up follows

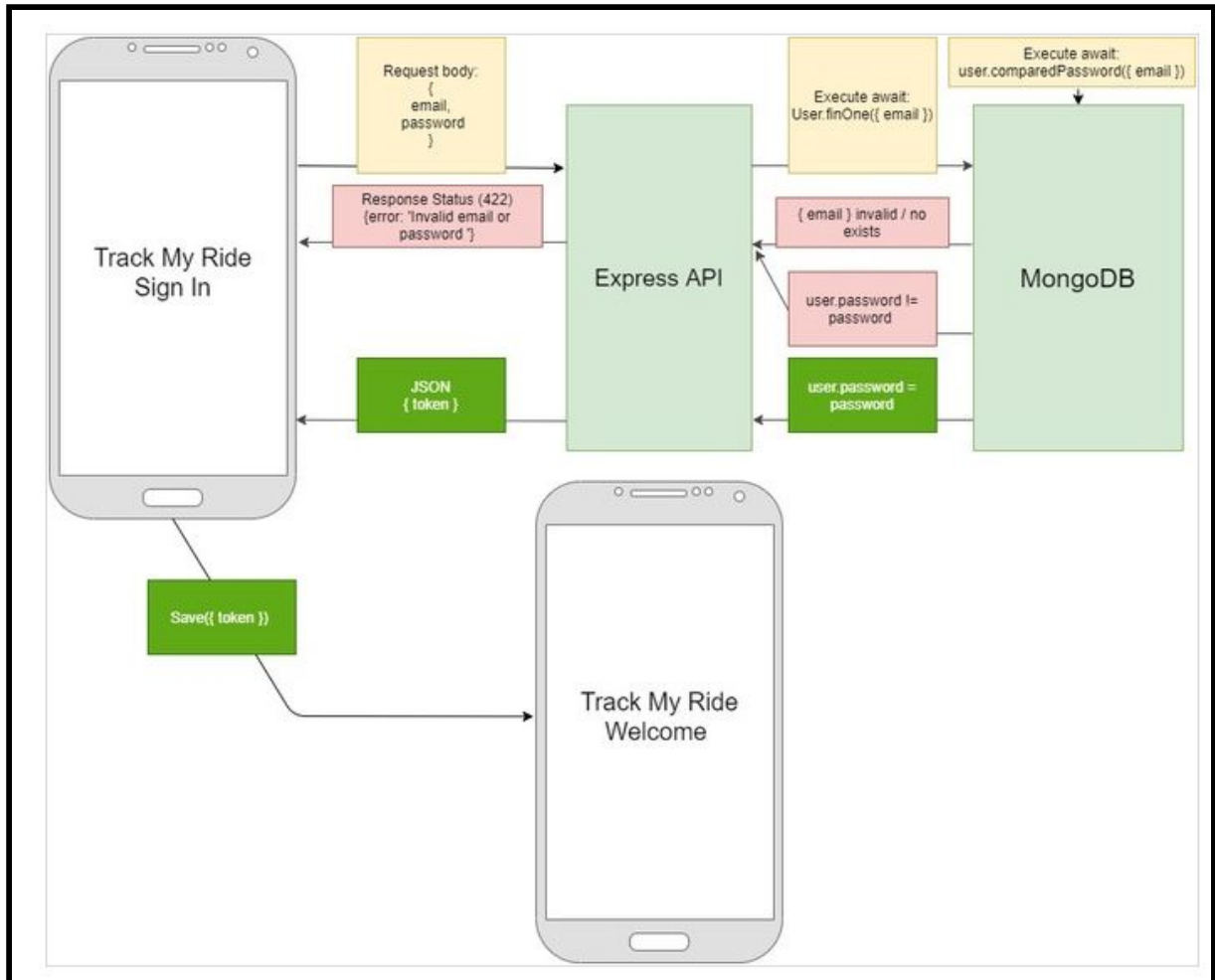


Figure 5. High-level logic implementation for Log in

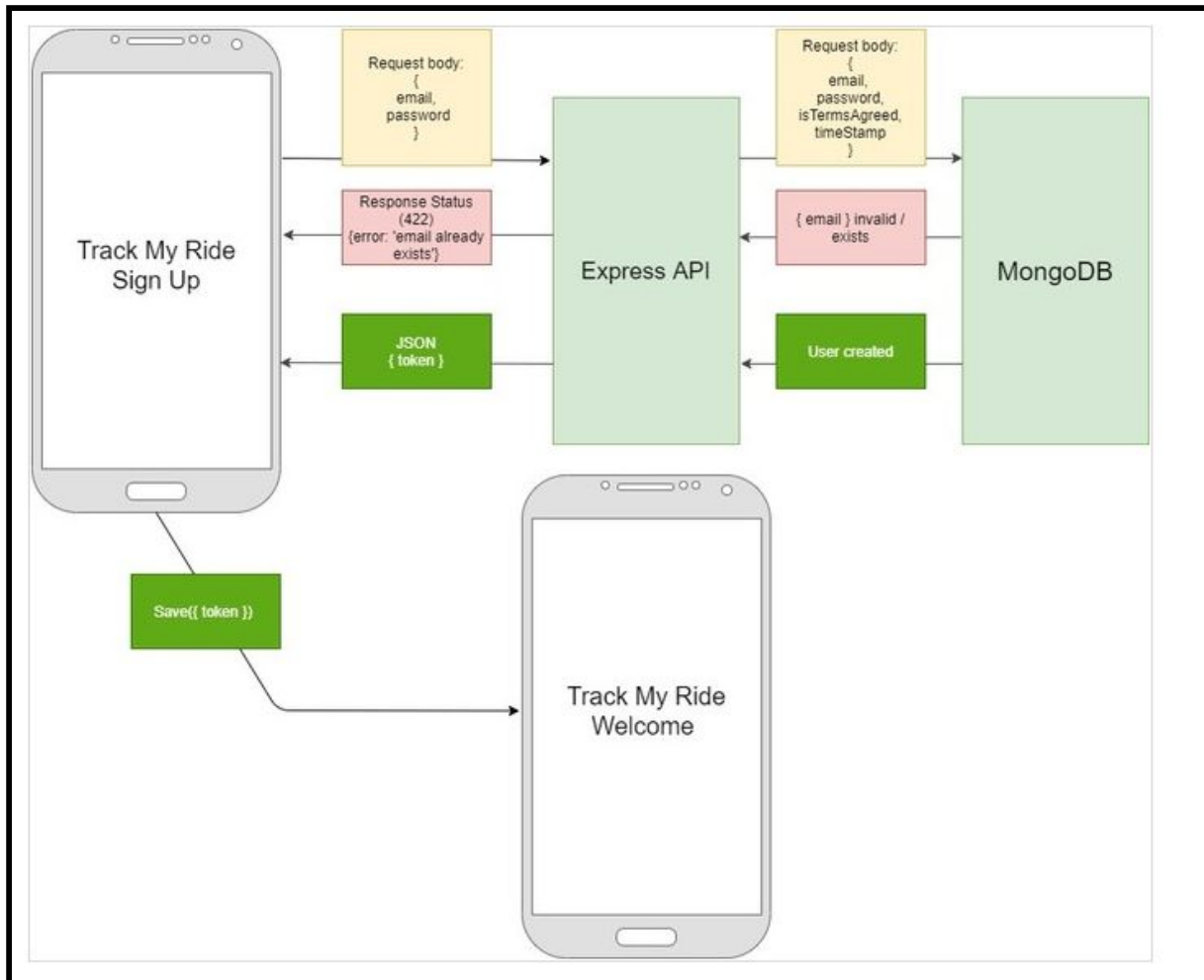


Figure 6. High-level logic implementation for Sign up

Data Design

Database Design is a collection of processes that facilitate the designing, development, implementation and maintenance of enterprise data management systems (Guru99, c2020).

We focused on designing a database easy to maintain, to improve data consistency and get cost effective in terms of disk storage space.

Database choice

The system was initially outlined to use a relational (SQL) model for data storage. However, with the progression of the System Analysis it became clear that a non relational (NoSQL) model would be more appropriate to attend the Track My Ride app needs and from the options available, MongoDB was selected due to “its ease of use, high performance, and rich features”(Dasadia & Nayak, 2016) along with:

- **Dynamic and flexible schema:** differently from relational databases where the schema must be defined before any data is added, MongoDB allow data insertion even when you do not have a schema designed, making room for changes in the structure without system disrapture (Dasadia & Nayak, 2016).
- **Horizontal scaling:** in case of large datasets or overloading transactions, MongoDB allows the load to be distributed over multiple servers with the purpose of capacity increase through Sharding (Dasadia & Nayak, 2016)

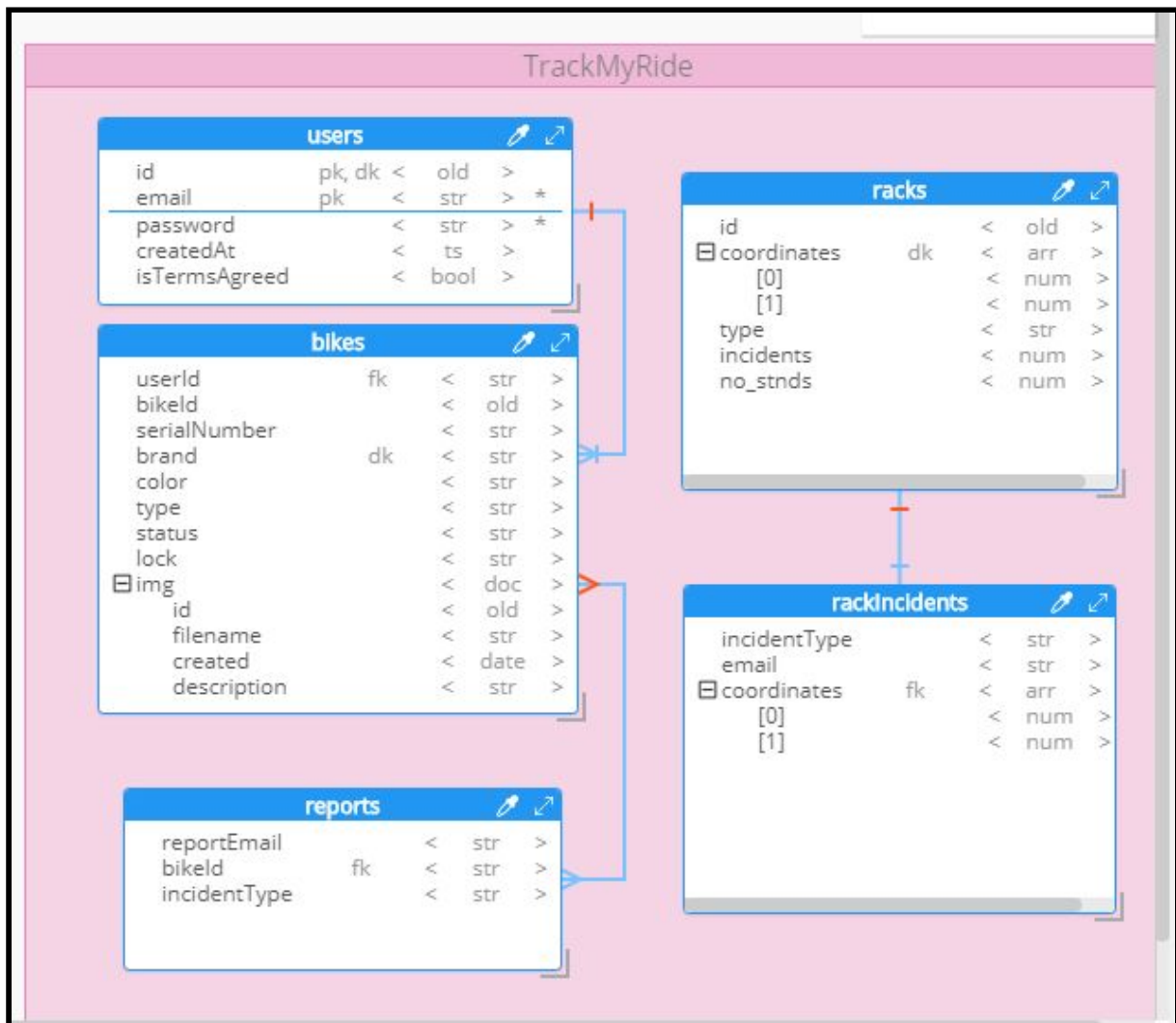


Figure 7. Track My Ride Database Design.

```

JSON Data
1  {
2    "id": ObjectId("507f1f77bcf86cd799439011"),
3    "email": "Lorem",
4    "password": "Lorem",
5    "createdAt": Timestamp(1460127718,1),
6    "isTermsAgreed": true
7  }

```

Figure 8. Users JSON data

```

JSON Data
1  {
2    "id": ObjectId("507f1f77bcf86cd799439011"),
3    "coordinates": [
4      92,
5      60
6    ],
7    "type": "Lorem",
8    "incidents": 12,
9    "no_stnds": 46
10 }

```

Figure 9. Racks JSON data

```

JSON Data
1  {
2    "userId": "Lorem",
3    "bikeId": ObjectId("507f1f77bcf86cd799439011"),
4    "serialNumber": "Lorem",
5    "brand": "Lorem",
6    "color": "Lorem",
7    "type": "Lorem",
8    "status": "Lorem",
9    "lock": "Lorem",
10   "img": {
11     "id": ObjectId("507f1f77bcf86cd799439011"),
12     "filename": "Lorem",
13     "created": ISODate("2016-04-08T15:06:21.595Z")
14     "description": "Lorem"
15   }
16 }

```

Figure 10. Bikes JSON data

```

JSON Data
1  {
2    "incidentType": "Lorem",
3    "email": "Lorem",
4    "coordinates": [
5      -57,
6      29
7    ]
8  }

```

Figure 11. Rack incidents JSON data

```

JSON Data
1  {
2    "reportEmail": "Lorem",
3    "bikeId": "Lorem",
4    "incidentType": "Lorem"
5  }

```

Figure 12. Reports JSON data

Chapter 4: Implementation of system

To implement the system we used the structure that we created during the system design and the result of system analysis to construct system elements that meet the stakeholder requirements and system requirements developed in the early life cycle phases (Snoderly J. and Faisandier A., 2020).

In order to guide our decision of a stack and also our implementation process, we used the book *Beginning Node.js, Express & MongoDB Development* by Greg Lim (Lim, 2019). We needed to accomplish many tasks during the process for the implementation to be successful, always having the end user in mind. (Rouse, 2015)

Architecture Considerations

The Track My Ride application was built using Node.js, as it is one of the most popular JavaScript open source runtime and includes many benefits from a server-side because its popularity, JavaScript offers Node.js access to many useful libraries that helped us to accomplish our project (Lim, 2019).

Some of the reasons for what we decided to go for Node.js were, the engine and the asynchronous coding style making for faster code to manage concurrency while avoiding multithreaded problems . Node.js has the benefits of a V8 JavaScript engine that can execute thousands of instructions in a very short time (Lim, 2019).

For our web application we created a similar MEAN stack, consisting of MongoDB (as our database controlled by JavaScript), Express, Angular (a front-end JavaScript framework) and Node.js but instead of Angular we implemented EJS template(Lim, 2019).

We used the Express middleware functions for the request and response process and a variety of third-party middleware modules in order to add functionality to Express: body-parser (to use the req.body), multer (handle multi-platform data), axios (for http requests), dotenv (to hold environment variables), express-session and express-flash-notification (create sessions and handle response to user), path (to interact with file path), mongoose (communication with MongoDB server) (Strongloop/ibm, c2017. Npm, 2020 & Axios Nuxt Js, c2020)

In order to respond to the user request we used EJS (Embedded JavaScript Template) as a template language that allowed us to generate HTML markup with plain Javascript. In the interest to create a smooth and responsive application we used Bootstrap 4 features as Forms, Flexbox, Modal, Cards, Carrousel, with some CSS and Jquery, in addition we implemented ScrollBar Jquery Plugin (Ondrej, 2019 & Bootstrap, c2020).

To obtain Json files we used some conversion tools as *Ogre*” to convert .csv files to Json and *Geojson.io*” to convert the Json to a valid GeoJson and *(MapBox,2013 & Patterson, J. c2020)*

Along with that we requested some API’s for the **Map** feature. For the parking spots, we used the data source Dublin City Bike Parking from Smart Dublin page (Smart Dublin, 2018) and *“Leaflet”*, an open-source JavaScript library for interactive maps, helped us to display the most important mapping features.

We chose those technologies because we believed that they would produce an application that looked good and worked better than using alternative technologies.

Technologies

Hardware

- MacBook Pro
- Acer Aspire
- HP Spectre
- Lenovo Ideapad 500
- Samsung Galaxy 10

Operating system

- macOS Catalina
- Windows 10
- Windows home 10

Programming language

- HTML
 - EJS
- JavaScript

Testing

- Postman
- Chrome Dev tools
- Browserstack Live

Cloud Deployment

- AWS

Software - Organizing Documentation

- Basecamp
- Google
 - Drive
 - Sheets
 - Doc
 - Slides
 - Hangouts

Software - Organizing Code.

- GitHub
- Visual Studio Code
 - Visual studio

- Live Share

Software - Others

- Node.js
- Express
- MongoDB
 - Mongoose
- Leaflet
- GeoJSON.io
- jQuery
- ScrollBar JQuery Plugin
- Bootstrap
- FontAwesome
- OGRE
- Smart Dublin
 - Dublin City Bike Parking Updated November 2018
- Just In Mind
- Screencastify

Implementation of the System.

In Chapter , we explain and provide blueprints of the functionality of the application..

The final product works very similar as we designed from the planning process. The figure 13 shows how to visualize the application functionality.

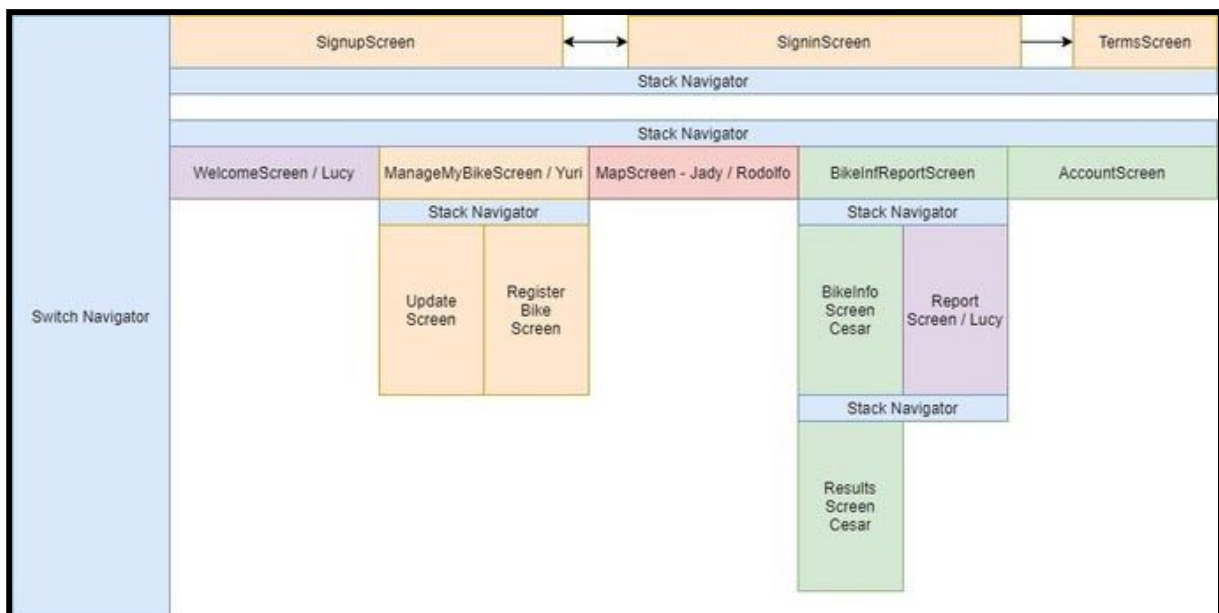


Figure 13. Web application plan

In Chapter 3, we designed a “splash” screen separately to the login page but we decided to go for one screen that included both as we considered it more convenient for the user.

Splash Screen + Login Page

It is acknowledged that people have become less patient and expect an immediate response from the site or app they are reaching. According to a Forrester Consulting research about E-Commerce Web Page Response Times (Akamai, 2009) “40 percent of consumers will wait no more than three seconds for a web page to render before abandoning the site”, which highlights the importance of developing a solid back-end architecture allied to a strong and interactive front-end launching experience for the user.

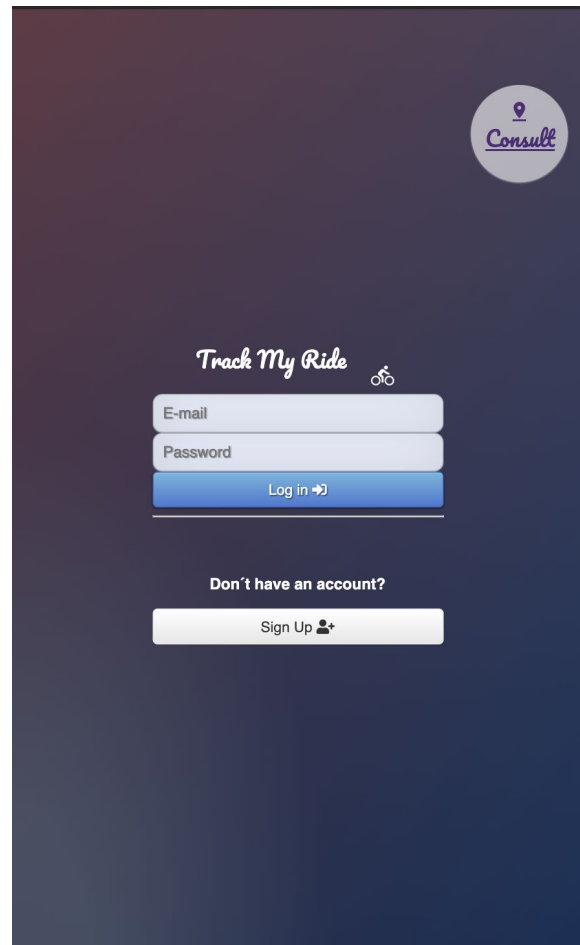


Figure 14. Splash + Login page

Register user

If the user decides to have an account, he needs to create an account following the basic security guidelines. The system implements alert flags to ensure that the user is introducing the right and complete information.

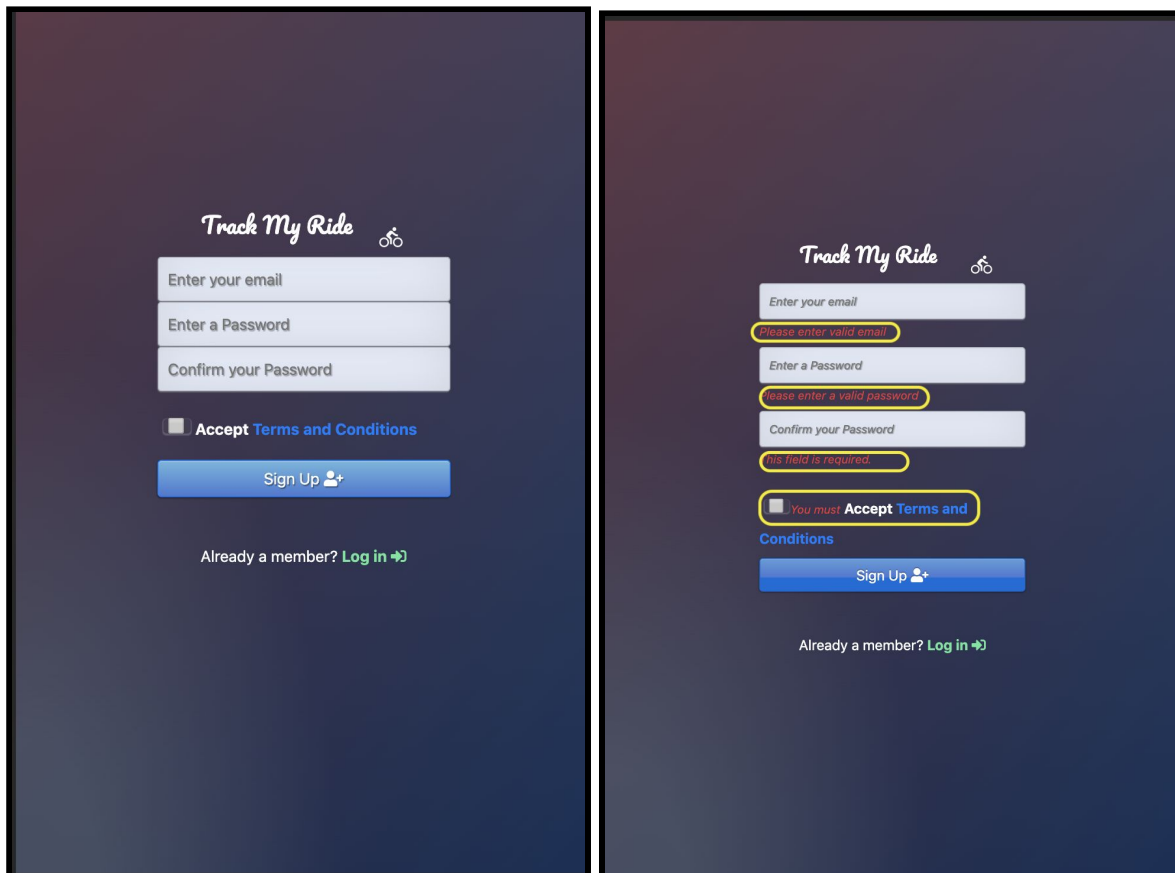


Figure 15. Create an Account - Alert messages.

```

ADD DATA VIEW
{ }

{
  "_id": ObjectId("5e94c93892b6e71f41d7e13e"),
  "email": "lais_alcarde@hotmail.com",
  "password": "$2b$10$RdbjXrW3650RXwxqf4EMG.EsOE05XhDGh.NrsEoiLhrM330NKJk.K",
  "isTermsAgreed": true,
  "timeStamp": 2020-04-13T20:19:04.475+00:00,
  "__v": 0
}

{
  "_id": ObjectId("5e963ea2b3dcff4e4783741f"),
  "email": "rodolfojcarvajal@gmail.com",
  "password": "$2b$10$Q8XSY880hc6.TIhBqtVha.t4MS06MLwV0f/mFC19jFvZ7ee09UImG",
  "isTermsAgreed": true,
  "timeStamp": 2020-04-14T22:52:18.520+00:00,
  "__v": 0
}

{
  "_id": ObjectId("5e96dd9cb3dcff4e47837425"),
  "email": "yuribraga@gmail.com",
  "password": "$2b$10$HmWkqxhp81e5UjaV20iNeF9DfYxbMDN9ggJUZF9zbhfb8rolz/6u",
  "isTermsAgreed": true,
  "timeStamp": 2020-04-15T10:10:36.262+00:00,
  "__v": 0
}

{
  "_id": ObjectId("5e96eb94b3dcff4e47837431"),
  "email": "Fernandot@gmail.com",
  "password": "$2b$10$aXZ8Heb7qTzaTsAyKmmNK0vaE8DcJTIegfkv41ujHn0WZoAg.0TnW",
  "isTermsAgreed": true,
  "timeStamp": 2020-04-15T11:10:12.923+00:00,
  "__v": 0
}

```

Figure 16. MongoDB Users collection data.

Welcome Page

We kept the Home page simple with strong introductions as we planned and designed. The messages on every button are easy and intuitive so the users do not find the application tedious.

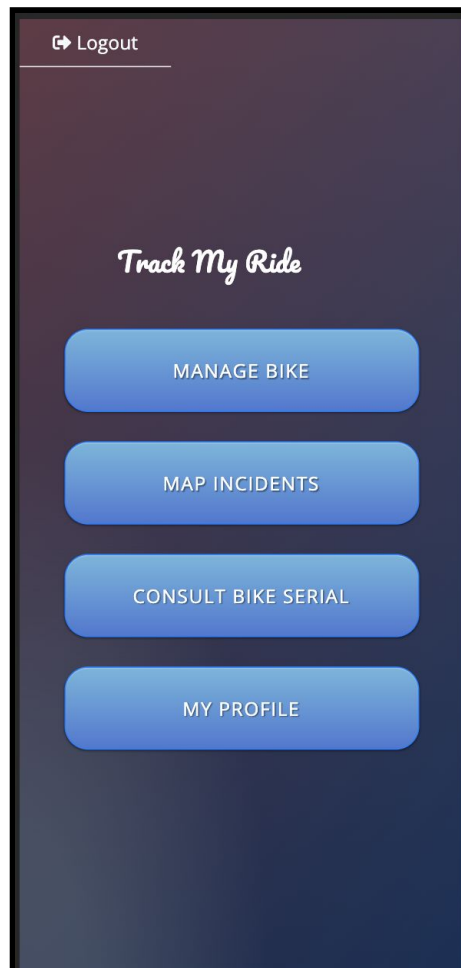


Figure 17. Home page.

Welcome page > Manage bike

The first feature of Track my Ride and one of the main objectives of the project is to be able to create a bike profile for users and control its status at any time. We are given to the user the basics but must import the characteristics of any bike to be recorded.

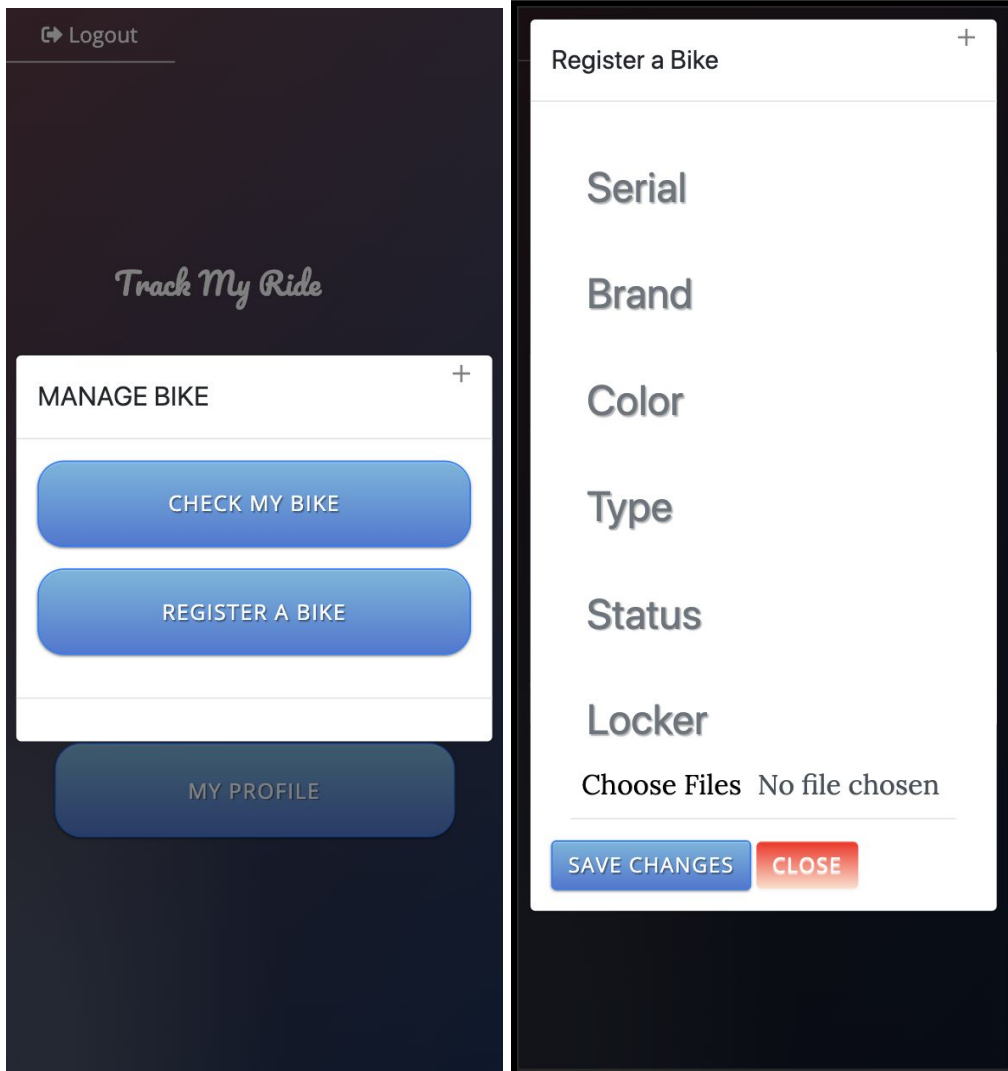


Figure 18. Register a Bike


```

_id: ObjectId("5ec336c753c45642468f1adc")
userId: ObjectId("5e9a0f1925eec11494824cc6")
serial: 36875
brand: "Merids"
color: "White"
type: "City"
status: "Owned"
> img: Array
  __v: 0

_id: ObjectId("5ec34384263b7949fcf6ef03")
userId: ObjectId("5ec342b4263b7949fcf6ef00")
serial: 123456
brand: "Shimano"
color: "yellow"
type: "speedo"
status: "owned"
> img: Array
  __v: 0
  lock: "Yes"

```

Figure 19. MongoDB Bike record saved collection data .

Map Incidents

The second main feature of Track My Ride App is displaying a map where users can consult an incident map. Also, users can report theft incidents and parking places available around the city and consult whether an area is safe parking according to previous reports.

By clicking into “map incidents” the user will get 4 options (Figure 20).

1. Display Parking spots - purple flags
2. Display incidents - Orange circles (Figure 21) .
3. Add Parking spot selecting a location on the map (Figure 22).
4. Report incident also by pinging a location on the map

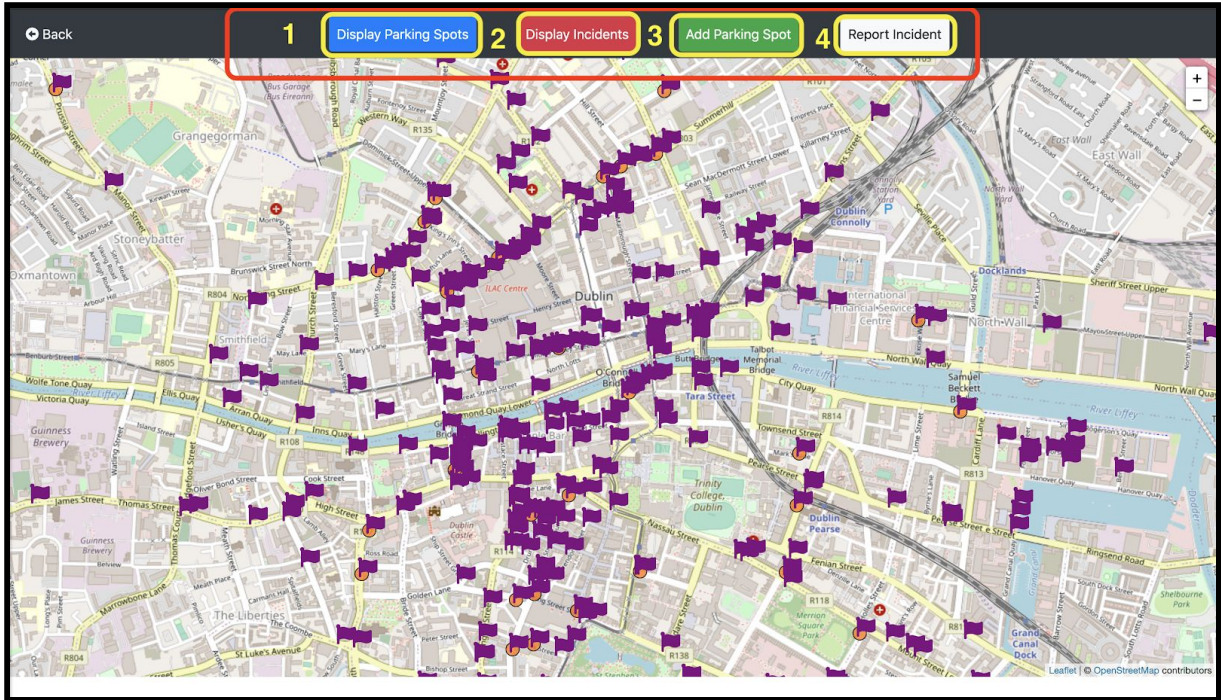


Figure 20. Interactive City Map

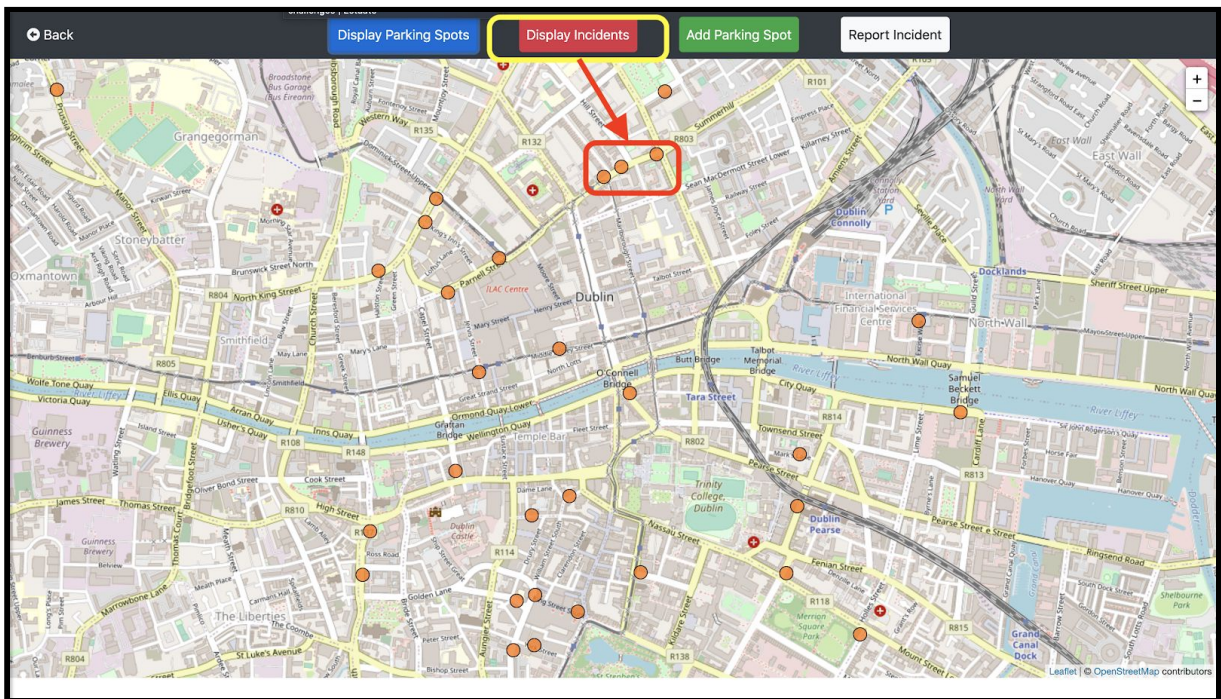


Figure 21. Incidents reported

For the user to be able to create a report, either for a parking place or theft incident he needs to select a point from the map. The Map interface guides the user through the process by sending messages.

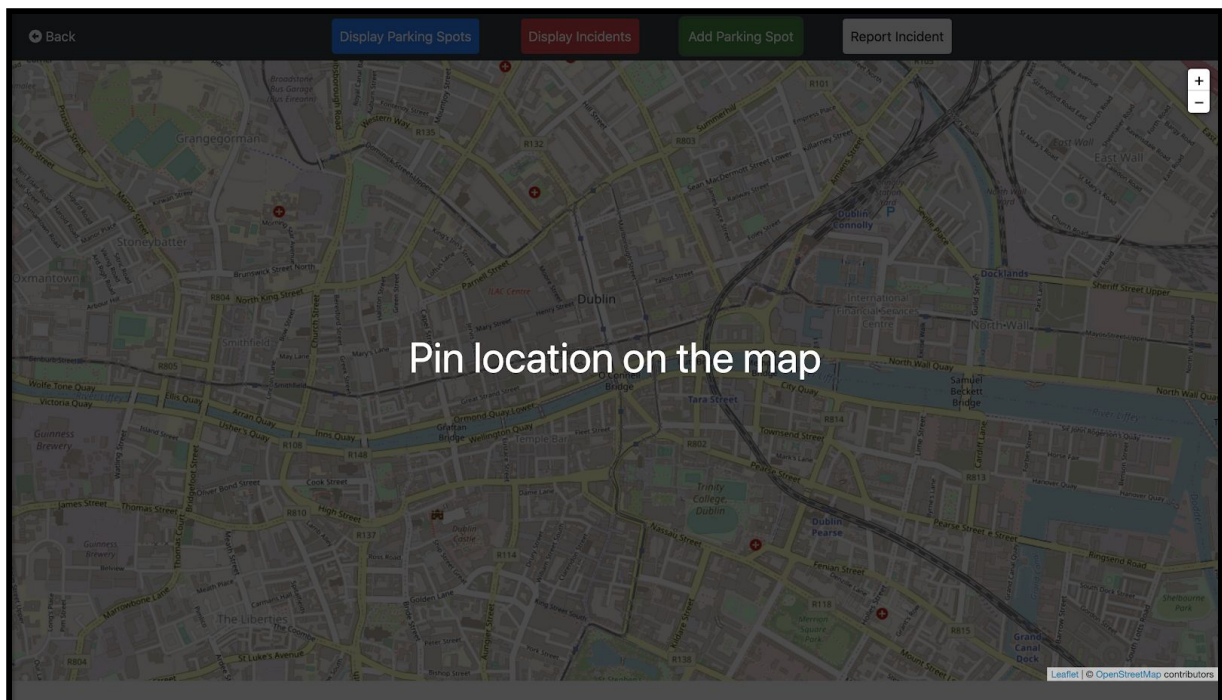


Figure 22. Select a point to create a report

The Report form is displayed after clicking a specific point with the purpose to collect the latitude and longitude of the place. Subsequently, the email, date, time and description of the event are recorded.

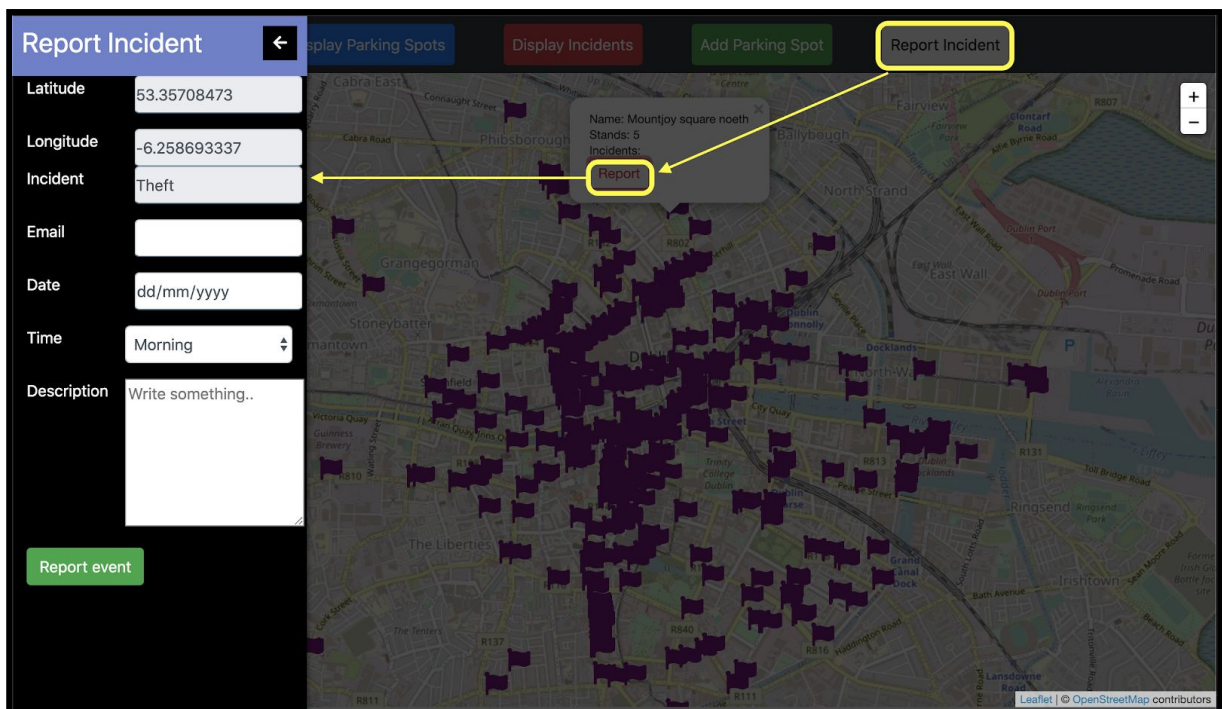


Figure 23. Report Form

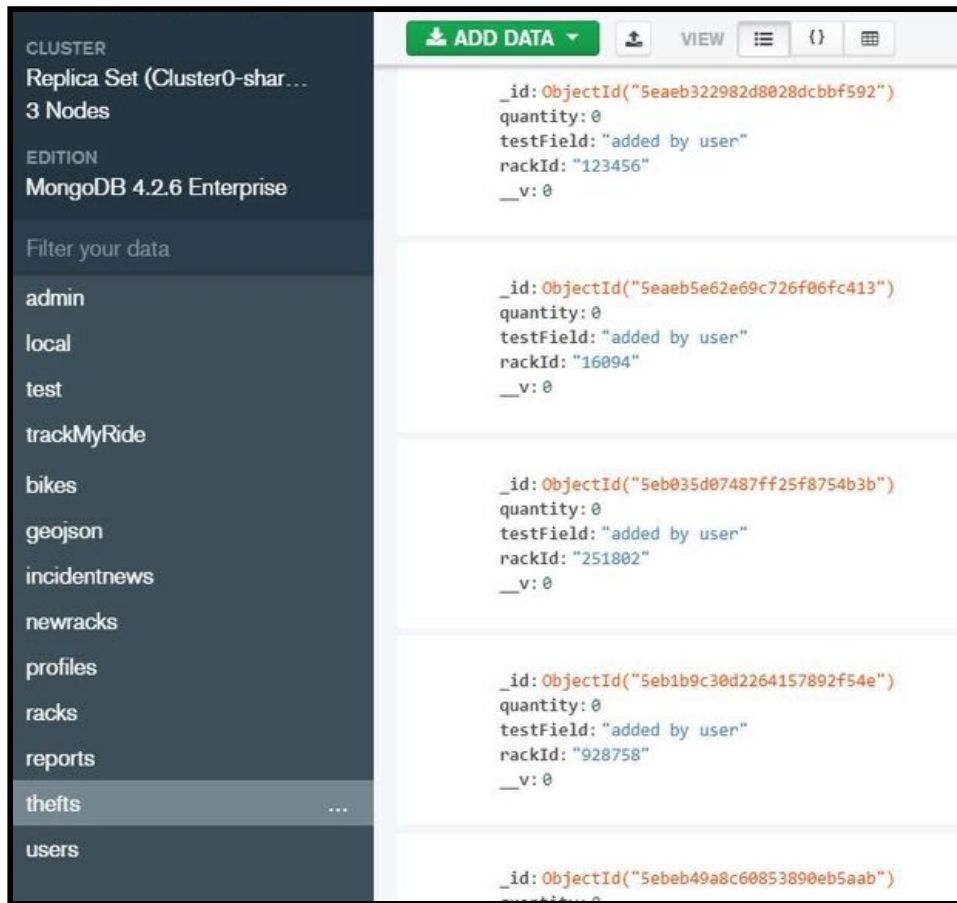


Figure 24. MongoDB Thefts data collection.

```

_id: ObjectId("5ebfbcf8274cd43e589c242c")
rackId: "100001"
quantity: 5
testField: "Official"

```

```

_id: ObjectId("5ebfbcf8274cd43e589c242d")
rackId: "100002"
quantity: 0
testField: "Official"

```

```

_id: ObjectId("5ebfbcf8274cd43e589c242e")
rackId: "100003"
quantity: 6
testField: "Official"

```

```

_id: ObjectId("5ebfbcf8274cd43e589c242f")
rackId: "100004"
quantity: 2
testField: "Official"

```

Figure 25. MongoDB collection Racks data.

```

_id: ObjectId("5eae9fc67a86692a5c453ee5")
newRackId: "123456"
latitude: "53.35012435813943"
longitude: "-6.315937042236329"
type: "stand"
quantity: null
email: ""
property: "stand"
newDescription: ""
__v: 0

_id: ObjectId("5eae9fd47a86692a5c453ee6")
newRackId: "123456"
latitude: "53.35834792403265"
longitude: "-6.2685585021972665"
type: "stand"
quantity: null
email: ""
property: "stand"
newDescription: ""
__v: 0

_id: ObjectId("5eaea436e6295d26e06b2413")
newRackId: "123456"
latitude: "53.364593714040105"
longitude: "-6.277828216552735"
type: "stand"
quantity: null
email: ""
property: "stand"
newDescription: ""
__v: 0

```

Figure 26. MongoDB collection New racks data.

When the user introduces the necessary information for the report and save it, a *Successful message* is display.

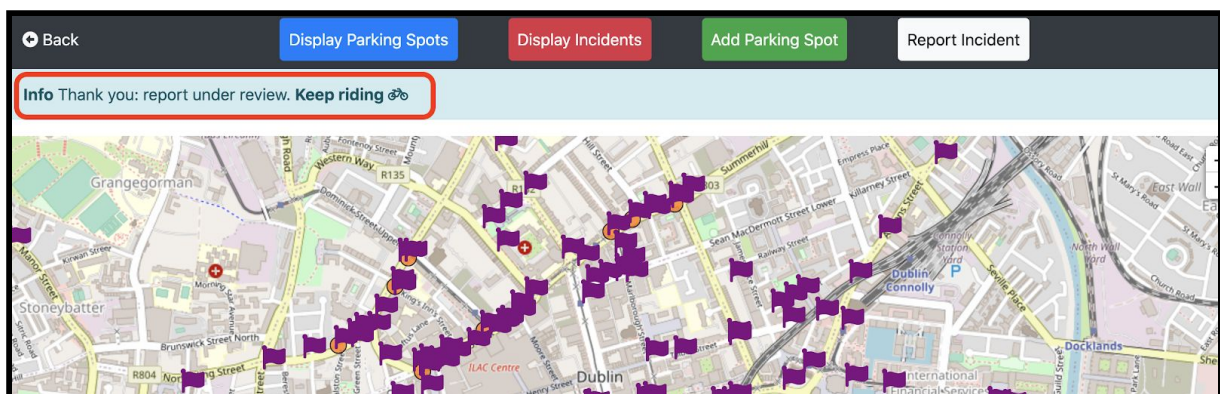


Figure 27. Successful message when report is created.

Consult Bike Serial

The third main feature of the app is to give to the registered user to search for a bike by serial number and gather the information available from it.

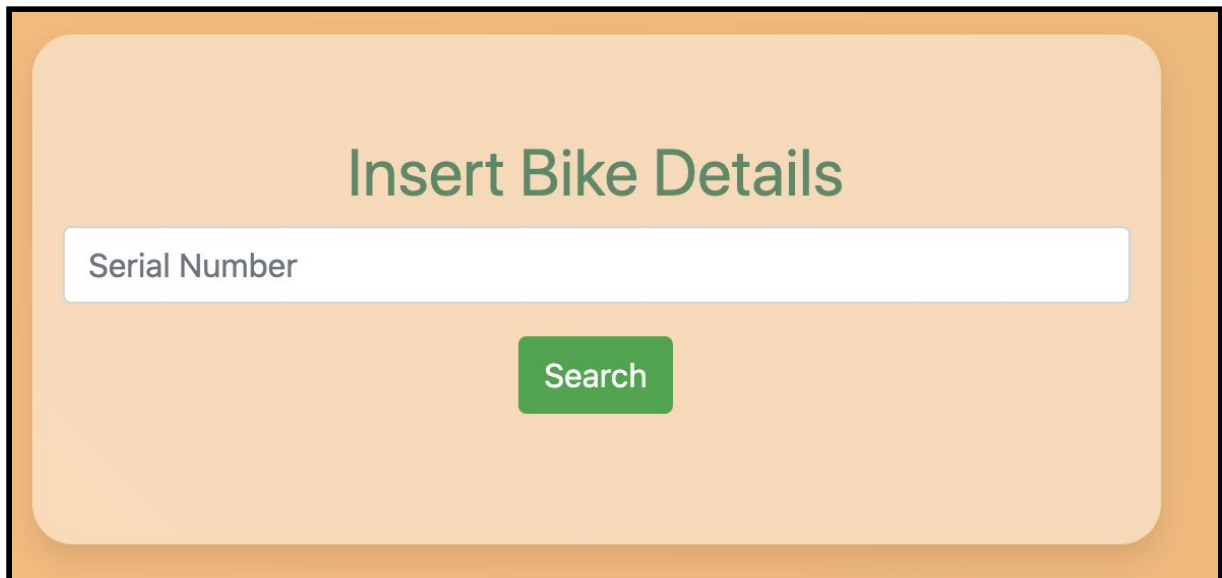


Figure 28. Search a bike by Serial Number

Once the user introduces the Serial number a screen will be present with the information. In addition the Report feature will be available on this screen to let the user su report if he feels dubious about the bike displayed.

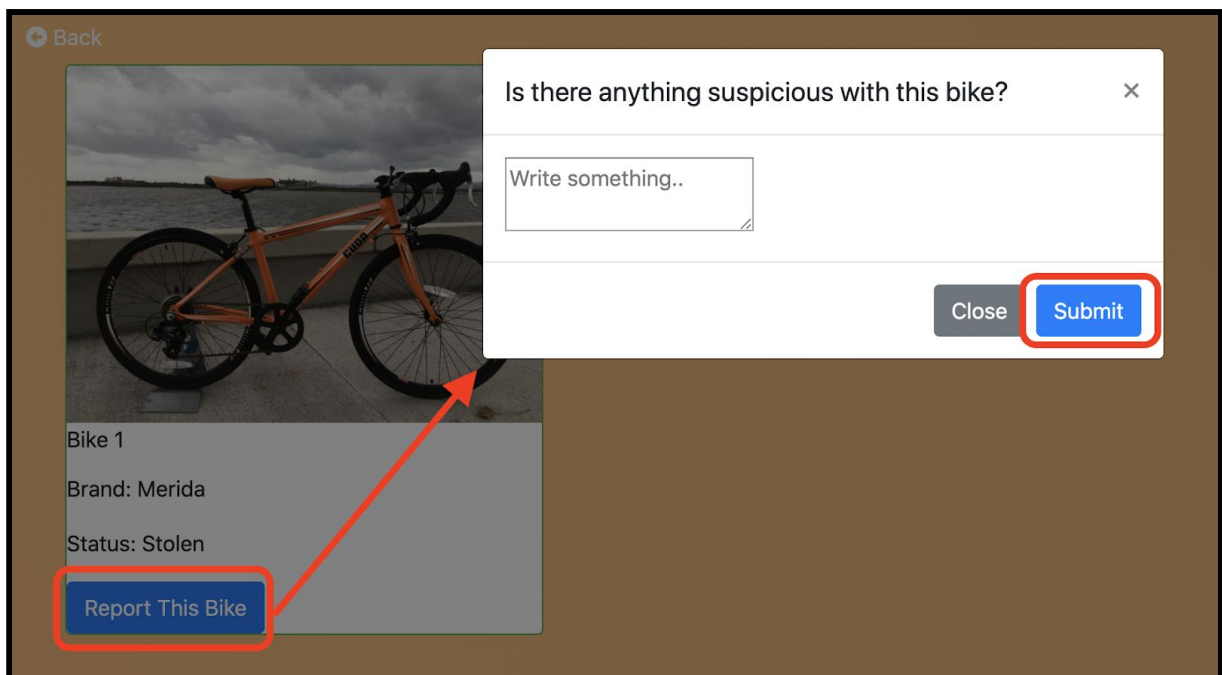


Figure 29. Reporting suspicious events regarding a bike.

A successful message will be display after the report is made

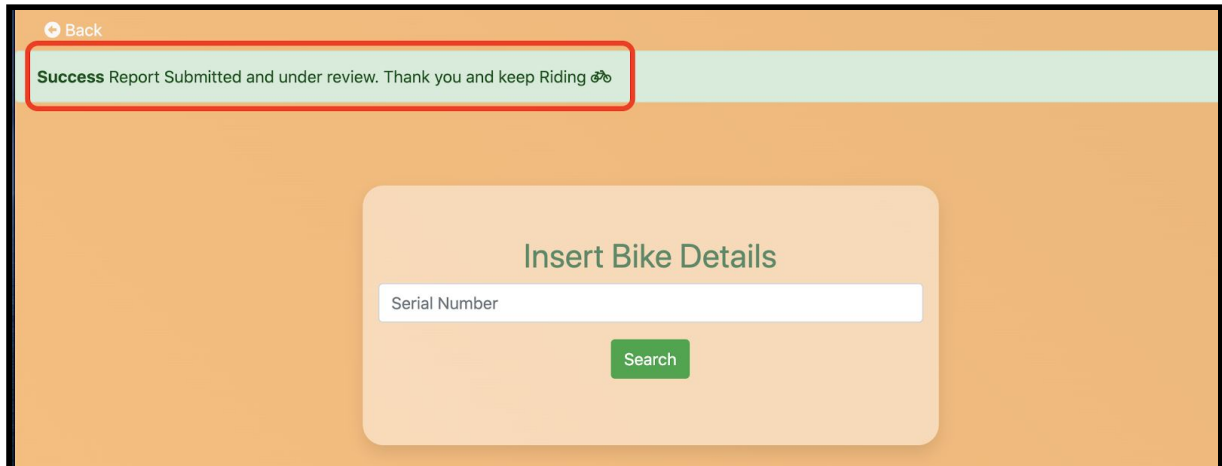


Figure 30. Successful Bike Report

My profile

The final feature is about the user, a section where a registered user can update, modify and/or delete its profile and all information introduced into the Track my Ride application, according with the government and security guidelines.

The User Profile screen is compound with the following:

1. Bike information
2. User information
3. Section to upload a user picture
4. Button to redirect to the bike profile to do some updates
5. A section where the user can see how many bike records he owns

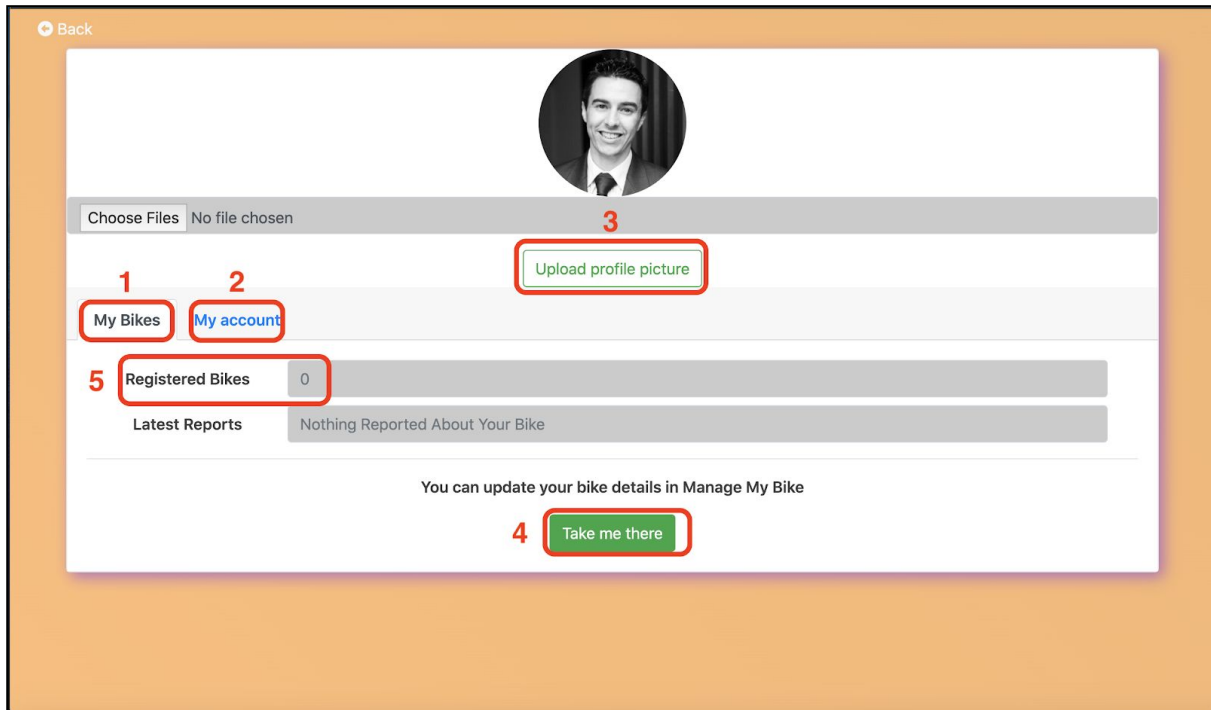


Figure 31. User Profile

```

_id: ObjectId("5ec2de032d002d3dd1b0973f")
userId: ObjectId("5e9a0f1925eec11494824cc6")
url: "http://34.247.183.192:3005/uploads/5e9a0f1925eec11494824cc6.jpg"
fieldname: "MyProfile-5e9a0f1925eec11494824cc6"
filename: "MyProfile-5e9a0f1925eec11494824cc6"
originalName: "Photo_1587808064285.jpg"
__v: 0

_id: ObjectId("5ec2e2eac37196043875017d")
userId: ObjectId("5e9a0f1925eec11494824cc6")
url: "http://localhost:3005/uploads/5e9a0f1925eec11494824cc6.jpg"
fieldname: "MyProfile-5e9a0f1925eec11494824cc6"
filename: "MyProfile-5e9a0f1925eec11494824cc6"
originalName: "Photo_1587808064285.jpg"
__v: 0

_id: ObjectId("5ec2ecf79a7d090a40989c0d")
userId: ObjectId("5e9a0f1925eec11494824cc6")
url: "http://localhost:3005/uploads/5e9a0f1925eec11494824cc6.jpg"
fieldname: "MyProfile-5e9a0f1925eec11494824cc6"
filename: "MyProfile-5e9a0f1925eec11494824cc6"
originalName: "PIA21421.0.jpg"
__v: 0

```

Figure 32 MongoDB Profile collection data.

Within the “My account” section the user can:

1. Check Terms and Conditions, following GDPR guidelines.
2. Update his password.
3. Log Out from the system.
4. Delete his account and all the data gathered.

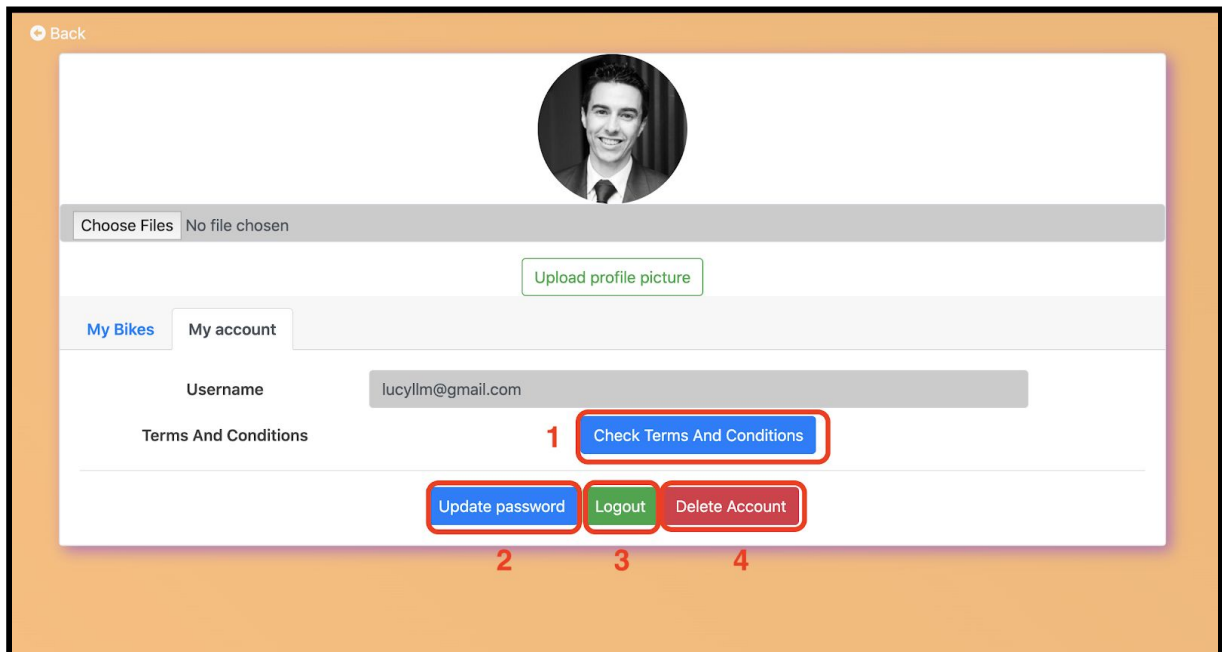


Figure 33. My account section

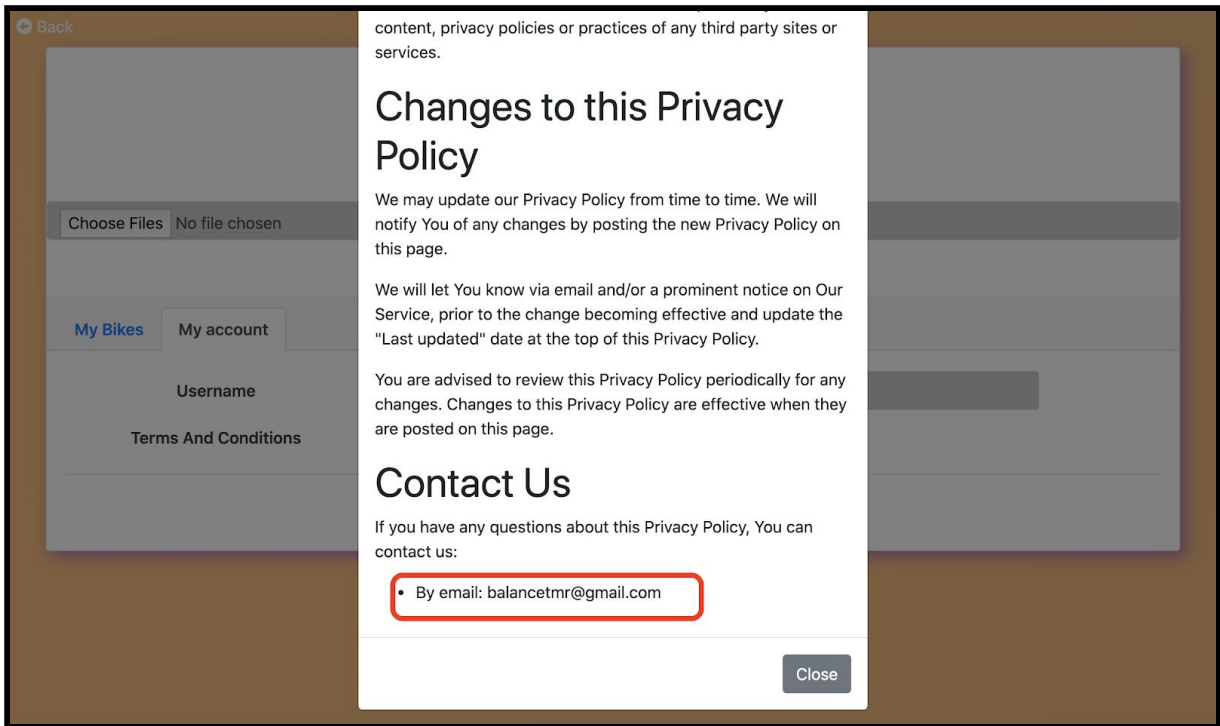


Figure 34. Terms & Conditions are applied

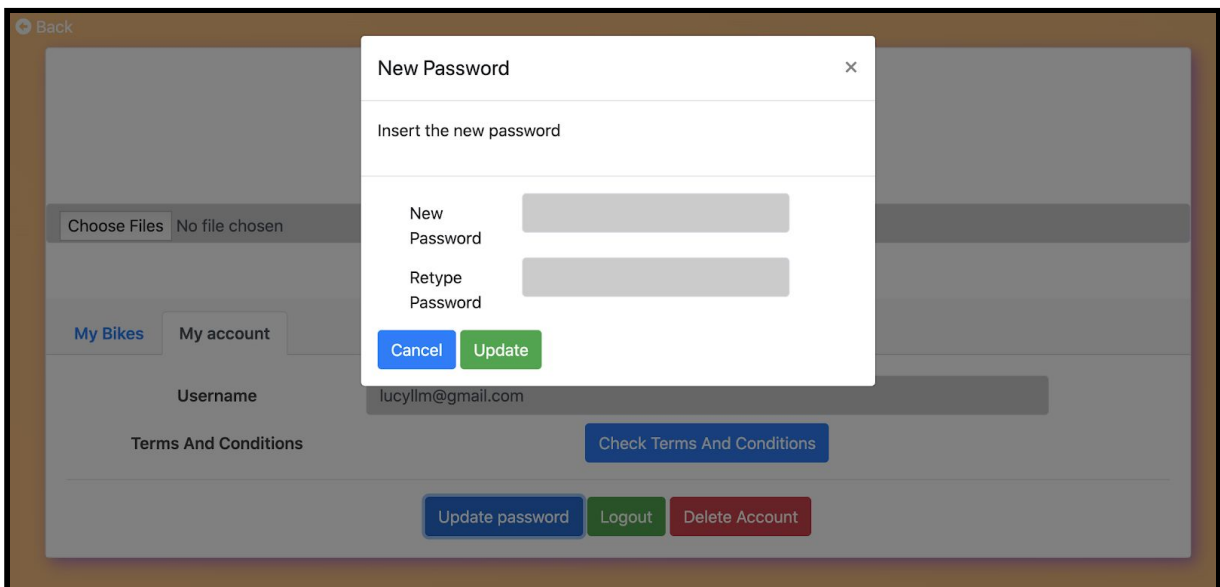


Figure 35. Update Password

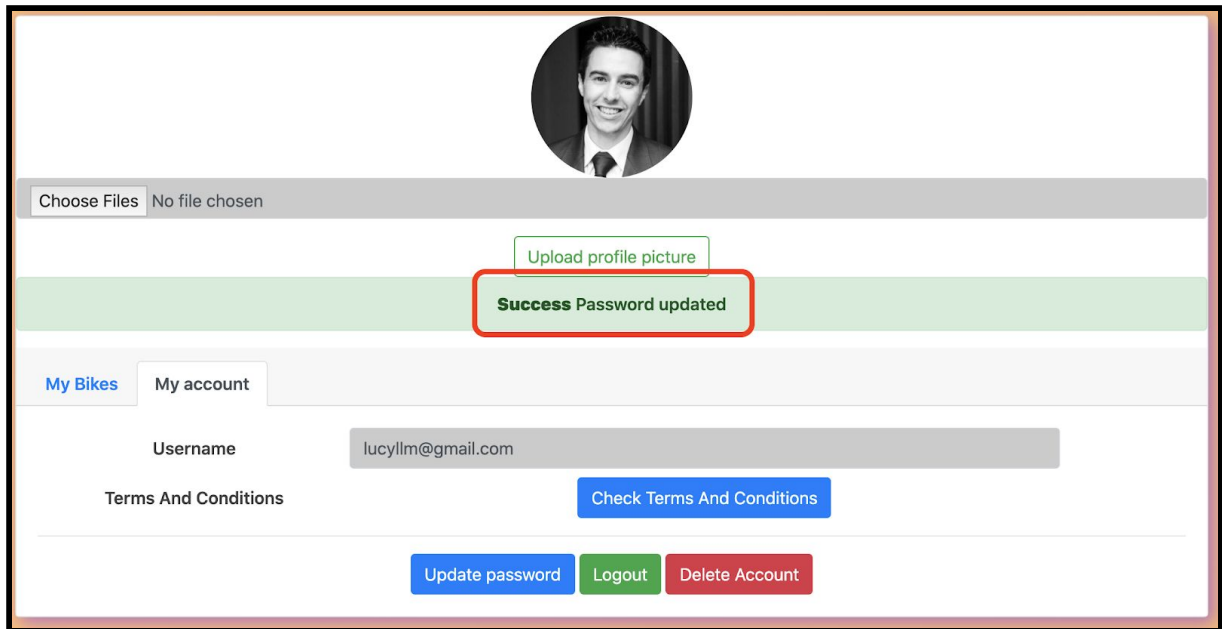


Figure 36. Password Updated successfully

Security

There are very harmful attacks such as DOS Attacks, XSS, SQL/NoSQL Injection Attacks and similar. Therefore we made our application secure as much as we could.

Preventing DOS attacks:

This attack can crash or shut down the network. As we are using Express, we limited the body payload using **body-parser**.

```
const express = require('express');
const app = express();
app.use(express.json({ limit: '10kb' })); // Body limit is 10
```

Also we used the feature, **express-rate-limit** dependency to set a rate limit for users. We basically set a maximum amount of requests for each user after the user uses all of his requests to lock him out for a certain amount of time (Andreas, 2019). First we installed **express-rate-limit**.

```
const limit = rateLimit({
  max: 100, // max requests
  windowMs: 60 * 60 * 1000, // 1 Hour
  message: 'Too many requests' // message to send
});
```

```
app.use('/routeName', limit); // Setting limiter on specific route
```

Preventing XSS attacks

This attack can inject malicious scripts and to prevent it we installed the **xss-clean** dependency to prevent users from inserting HTML and Scripts on input.

```
// Data Sanitization against XSS
app.use(xss());
```

Helmet dependency was installed and used to give special HTTP headers, this dependency is a collection of middleware functions.

```
app.use(helmet());
```

Preventing Brute Force Attacks

It is a method to obtain sensitive data and the most efficient way to deal with this attack that we found as to set limits to login attempts from the user. Also implementing **express-rate-limit** dependency as we used to prevent DOS attacks, **bcrypt** dependency to make it hard for attackers to get sensitive data (Andreas, 2019).

Preventing SQL/NoSQL Injection Attacks

It is another type of injection attack. For this attack we sanitize our data by using **express-mongo-sanitize** dependency.

```
app.use(mongoSanitize());
```

As we use MongoDB, we implement Object Data Modeling tool (ODM) **Mongoose** to define schemas and schema types for each one of our features to make it secure from the beginning (Andreas, 2019).

With those implementations we wanted to make all the data from the users secure and private.

Problems Encountered

The Information Technology industry is highly complex, vast and dynamic. To develop this application we were influenced by several factors, including growing

complexities, changing technology trends as well as increasing software development challenges (Estuate, 2019). We faced some challenges due to the lack of resources to execute our project effectively.

Find bike by color, model, type

We implemented the feature that allows the user to search for a bike and, in return, consult its status. However, we have also planned to include an advanced search by other bikes attributes as color, type and model, and it would return an array of bikes that would match that criteria.

The front-end interface was developed to display as many bikes as the server would send back as a response to this query, but the logic to execute the queries could not be implemented due to its complexity given the time of our deadline.

Map

We intended to use data from “*BleeperBike*” API which would return a collection of bike parking spots in Dublin in a format geoJson but we didn't get the authorization to use the API, therefore we had to use the original source from Dublin City Council. The data was available in CSV format and we converted to Json using “*GeoJson*” conversion to be eventually used by “*Leaflet*” Map in our web application.

Once we got a map API running, other complications emerged, for instance:

- We were not able to certify if the new reported rack was already in our database
- Users cannot point to a latitude and longitude of an existing parking spot, but can ping it very near to that.
- The user can also report a rack on a different country or in the middle of the ocean if he wants.

Another challenge faced was to get data from the users in real time update, a new parking spot is not shown immediately in the map, and an incident is not added to the hotspot either. This happens because we are loading the Parking Spots and Incidents from the Json data stored in our application, instead of storing it in our records.

Upload image to Express API with Axios

We used Axios module extension to send POST and GET requests to the Express API that we built to store and consume data. The majority of the models - database structures were created on the API. But unfortunately, when we intended to create the POST request with the middleware multer (to format the request), we could not manage to successfully upload any image to the MongoDB Cloud

Instance. Instead, we could store locally the image and save on MongoDB Images collection, a reference of the location path.

Chapter 5: Evaluation and Deployment

Deployment

We deployed Track My Ride web and Express API on a T2 Micro Instance type (EC2) Linux on AWS (Amazon Web Services). We adopted this option due to the subscription period we could use the services provided for one year along with it met our basic requirements; 1 CPU, 1 GB Memory (Processing/RAM). Further, the instance provides autoscaling services if there is an increase of users and requests.

Initially, we decided to create two different instances; one for the Web application and another one for the Express API - Server, but we agreed to deploy both on just one instance to handle the network connectivity more efficiently.

- The applications are running on <http://34.247.183.19>.
- The Web is on 3005 port.
- the server on 3000.

To access the instance, an RSA Key is provided by AWS that can be used in any SSH utility such as Putty or FileZilla.

Functional testing

For this initial testing phase we ensured that all the application functions simply operate. Some of the tests involved the process of getting data from the front end and successfully storing it in the database. For this stage we did manual tests without using any testing softwares. Some routes were tested by Postman prior to interface testing

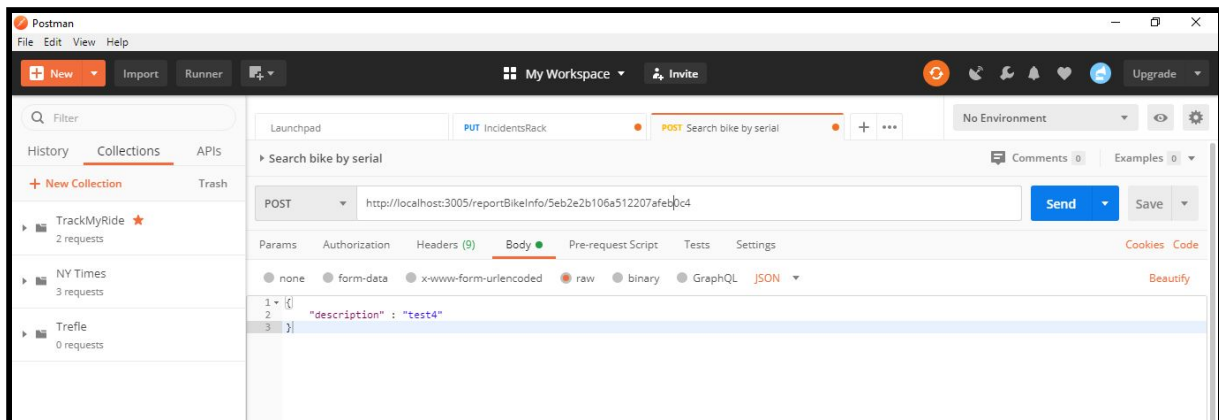


Figure 37. Testing using Postman

Some testing examples:



Figure 38. to ensure that the quantity field would be increasing by one only

- MongoDB TrackMyRide database - racks collection

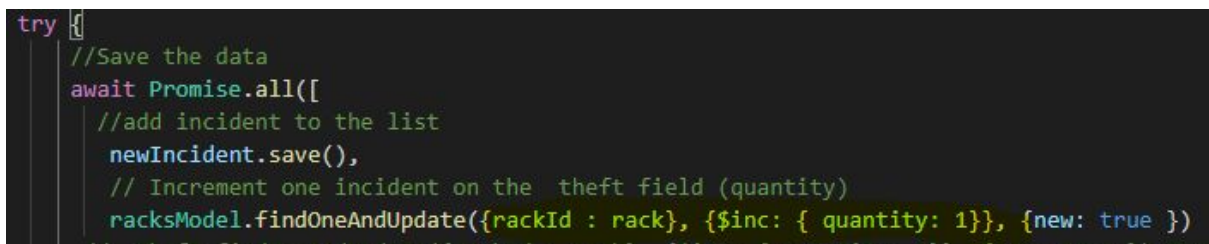


Figure 39. Mongoose query from the application

Usability testing

We periodically did a walk-through of the features developed via Google Hangouts in a group and individual screencasts. Doing this exercise we could focus on the user experience with our application.

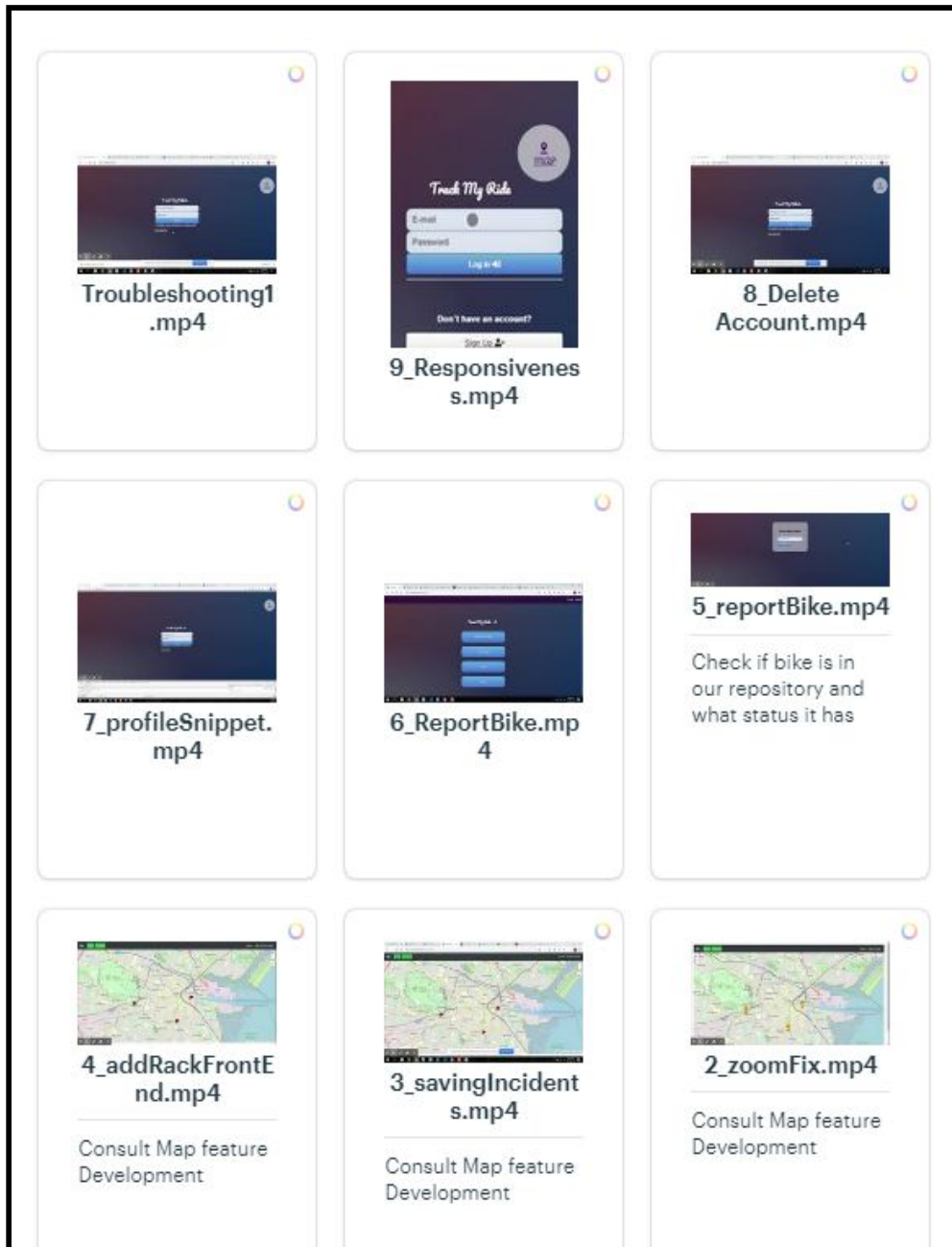


Figure 40. Basecamp screenshot with our usability tests



Figure 41. Zoom element moved to the right to make it user friendly

Interface Testing

To establish correct connection between the web server and the application, we display the server response back to the web app for functions as login, registration, deletion and updates

```

    _eventsCount: 2,
    _maxListeners: undefined,
    _options: [Object],
    _redirectCount: 0,
    _redirects: [],
    _requestBodyLength: 39,
    _requestBodyBuffers: [],
    _onNativeResponse: [Function],
    _currentRequest: [Circular],
    _currentUrl: 'http://34.247.183.192:3000/signin',
    [Symbol(kCapture)]: false
  },
  [Symbol(kCapture)]: false,
  [Symbol(kNeedDrain)]: false,
  [Symbol(corked)]: 0,
  [Symbol(kOutHeaders)]: [Object: null prototype] {
    accept: [Array],
    'content-type': [Array],
    'user-agent': [Array],
    'content-length': [Array],
    host: [Array]
  }
},
data: { userId: '5ec250d4ba92cc10b01b1579' }

```

Figure 42. Part of a response message from the server for the Login process, returning the userId

Cross Browser Testing

Using BrowserStack (Arora R. and Aggarwal N., 2011)

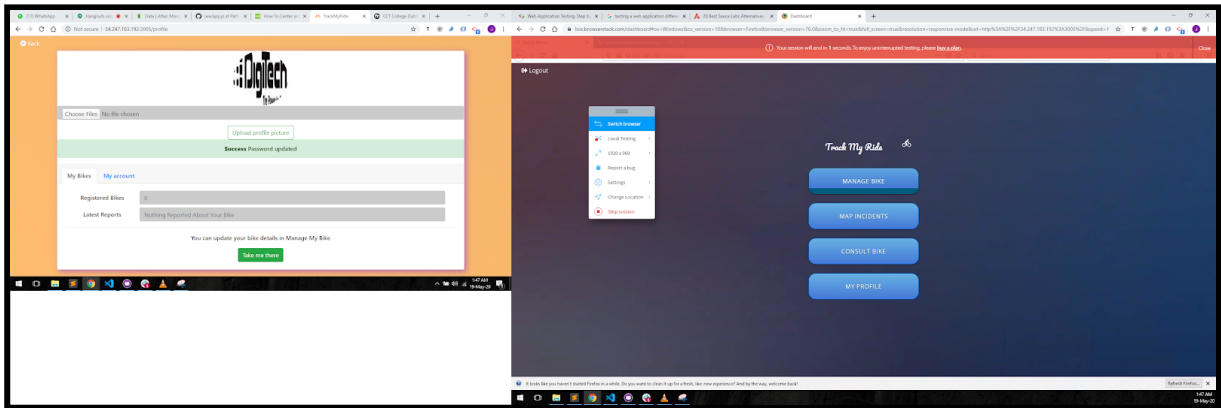


Figure 43. Testing in Mozilla Firefox

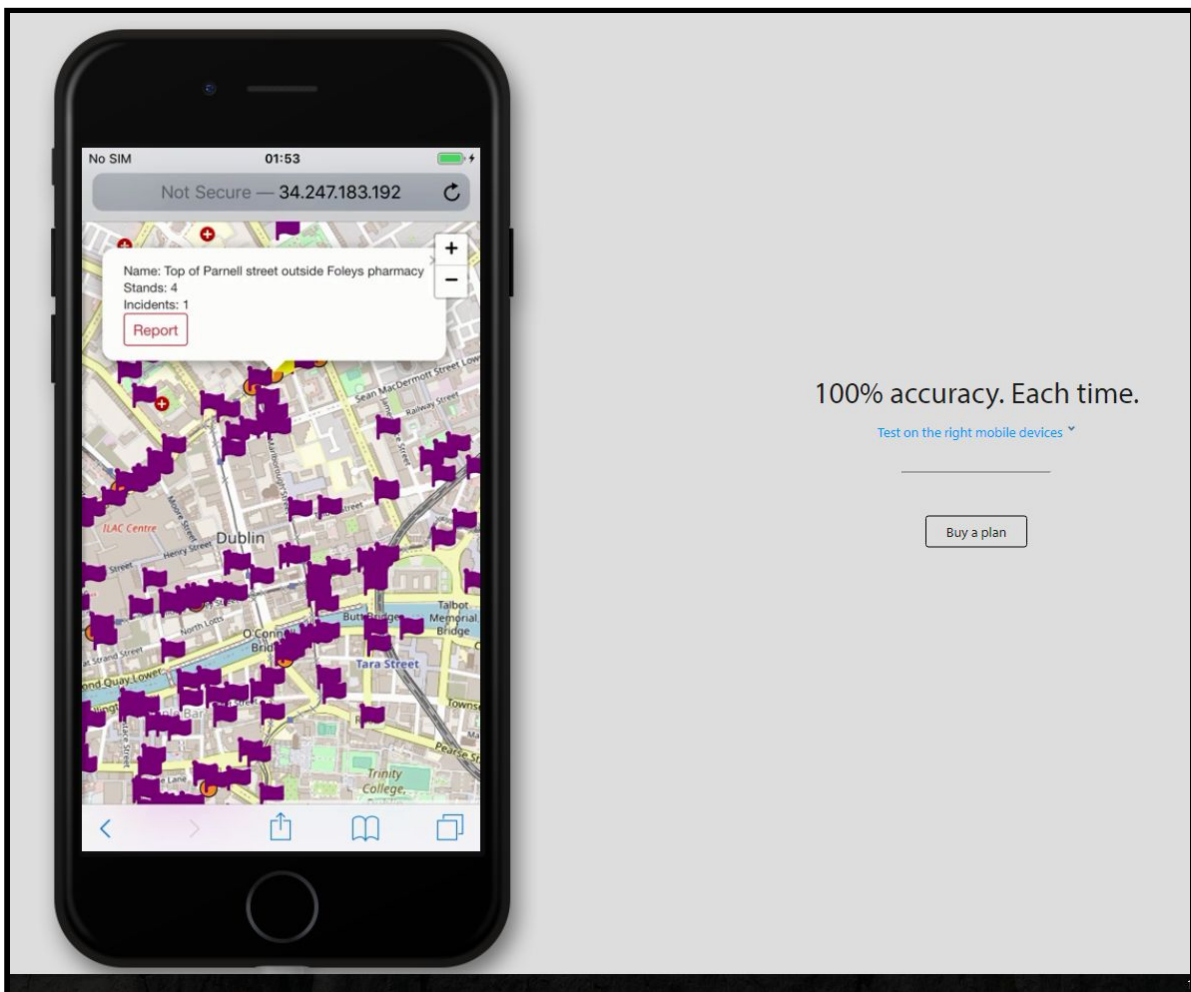


Figure 44 . Testing in Iphone 7 using Safari



Figure 45 . Testing in Samsung Galaxy S6 using Google Chrome

Chapter 6: Conclusions

The Balance team worked hard to combine all ideas to deliver great results. From the beginning of the project, the team agreed what would be the most important topics to focus for this project for example:

- To focus in developing a mobile application but being willing to go further if the main objective is met sooner than expected.
- Delivered 2 prototypes, one for a registered user and another for non-registered users.
- Implement Scrum methodology as a project management
- Use Gantt Chart to track the timeline of the project
- Follow the Software Development Life Cycle (SDLC) process for the application.
- Consider Human-Computer Interaction (HCI) and General Data Protection Regulation (GDPR)

We can happily say that we achieved 7 from 8 of our objectives, even though we did not achieve some of the features smoothly as we would have liked but we went further in some other features, such as creating a profile for the users as we did not consider it during the planning time.

Risk Assessments

All projects have risks and the team faced a lot of them. Therefore in the project management we had considered to develop and implement plans to mitigate those risks where we had to implement them as we could not use some of the API's that we were considering to use, such as Google Maps.

Some events happened during the life of the project that negatively affected the achievement of the Track my Ride application but we managed to implement other alternatives to achieve our goals, for example we chose the wrong technologies and we had lost some time, fortunately we adopted others with the guidance of our lectures.

We took advantage of each one of the members skills rather than focused in the weakness, not everybody has the same coding skills but has good writing and organizing skills

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Appendix A: Project Planning - Proposal

Project Timeline - Semester 1

Semester 1	
Week No.	
1	Group formation and preliminary ideas
2	Group formation and first sprints to define product backlog. Basecamp account created.
3	Group comes up with a Personal Trainer app and finish first project proposal. First idea approved by the College.
4	Group comes up with a new proposal. "Pet Life" proposed a tracker for missing pets and also a social media. Proposal was sent. First meeting with our supervisor. Both ideas were rejected.
5	Team comes up with a new proposal. Track my Ride is a mobile application which enables people to find a secure location to park a bike.. Proposal was sent.
6	Third idea rejected. Team decides to keep with the same Bike app reviewing main objectives. GDPR has been taken into consideration and the app becomes a Bike management tool.
7	Team requests brainstorming with supervisor. This sprint was essential in order to argue about the third idea. Supervisor agreed but with some alterations regarding data manipulation.
8	Sprint defines research topics suggested by the supervisor. Group comes up with a new proposal. Track my Ride is a mobile application which enables people to manage a bike. Proposal was sent.
9	Team discussed our first wireframing, technologies that could possibly be used and structure of the main document.
10	Team decided the Chapter one template. Defined structure such introduction, methodology, result and conclusion assigning individual contributions to each one.
11	Team has a final meeting with the supervisor to present an overview of Chapter One draft. Gantt chart and a risk analysis were requested by the supervisor.
12	Final project review. Chapter one submission.

Appendix B: Further Research

3 Tier Architecture, mobile app types.

Track My Ride App was thought to be developed by following a structured model as the three-tier architecture. In mobile computing development, there are three separate independent modules (Moussa 2018).

- **First-tier - User Interface or Presentation Tier:** Where the application runs on the device, extends all the interfaces and is responsible for presenting information to the end-user.
- **Second-tier - Application Tier:** Where all the business logic when processing input, obtaining data and making decisions - the engine of the application. It is independent of the application or database tier, controls transactions, asynchronous queuing and capable of accommodating a high volume of users.
- **Third-tier - Data tier:** Used to store data that is needed for running the application and acts as a container for temporary and permanent data information.

For the team to be able to develop the application we had to implement other structures already discussed in the chapters of the project

Human-Computer Interaction (HCI)

Towards the time technology is predicted to achieve limits beyond human intelligence, the main effort in Human-Computer Interaction (HCI) is now the detailed understanding in the involvement of cognitive, motor components, and perceptual interaction in the moment-by-moment a person encounters once interacting with a machine(Lazar, jinjuan & Hochheiser, 2017) .

HCI is about designing interfaces that fit into people's daily usage. Also the adaption to it and how often this will be included on a daily basis.HCI bases its research considering knowledge on human perspective and also machine perspective.

To summarize, engineering and design methods are utterly relevant. Since its origin, HCI expanded its initial studies on individual user behavior to include social and organizational computing. As a result, a wider spectrum of human experiences

and activities is now possible, englobing different groups with different needs bringing more accessibility to the field.

Accessibility that combined with simplicity and usefulness are the core keys when thinking about designing an application.

Nowadays HCI is approaching collaboration connections, communication and emotion. The research seeks to find whether people like an interface and if it will be useful and easy to use. Topics such as mobile, sensors, big data, collaborative computing, accessibility and other topics are also under research. (Liu,2014)

HCI is very important for the application that the team is developing. It would be desirable to achieve some of the topics described below:

Mental Model

Create two different views, one each for Registered Users and Non Registered users, with different symbols for each view to speed up information retrieval.

Add a Settings option to the main menu to allow customization regarding brightness level and font sizing (Ormandjieva, 2016).

Broad Shallow Trees

Apply Broad Shallow Trees when creating the Views. Displaying more options per level instead of several levels (Lazar, Jinjuan & Hochheiser, 2017)

Fit's Law

Display a menu bar with a good sizing on the main View.
Avoid using functional objects on the extremities of each View.(Whicary, 2005)

Affordance Principle

Create a menu bar displaying the main functions during all the navigation.
Keep the registered user logged once username and password are filled once.
Set an alert message if a selection of error occurs so that the user can recover from it immediately. (Ormandjieva, 2016)

Accessibility Principle

For each error that might occur during the navigation, such as incorrect login error, display not only the red marker but also a symbol such (!), in order to include the public with colour disabilities.

Create a first-time guide usage to inform how the app works and its main functionalities.

Set the colour palette to simple and minimum.

Avoid bad colour combo such: Green and Red. Green and Brown. Blue and Purple. Light Green and Yellow. Blue and Grey. Green and Grey. Green and Black. (Ormandjieva, 2016)

GDPR

Overview

The GDPR will have a significant impact on our project and the way of handling the data, because the GDPR directly impacts the storage, processing, access, transfer and disclosure of an individual's data records and affects any organization worldwide that processes personal data of people from the European Union.

But to get into context, What the GDPR is? The General Data Protection Regulation (GDPR) (Regulation 2016/679) is a regulation whereby the European Parliament, the Council of the European Union and the European Commission intend to strengthen and unify data protection for all individuals within the European Union (EU). It also deals with the export of personal data outside the EU.(AYALA 2019).

This regulation(GDPR) replaced the Data Protection Directive (officially directive 96/46 / EC) of 1995. And it was adopted on April 17, 2016, to become effective on May 25, 2018 after the passage of two years. (REDONDO 2018).

The main difference between the Regulations and Directives lies in their form of application(AYALA 2019). While the previous Directive 95/46 / EC regulating data protection in the member states left a lot of room for action to the different countries, the new Regulation does not impose on national governments to pass any enabling legislation which means that is directly applicable, without requiring any prior adaptation process (REDONDO 2018).

GDPR wants to give EU residents a greater knowledge in how, why, when and where their personal data is processed.

Based on this Regulation, the concept of personal data covers everything that can be used to identify a person in a larger group as is mentioned in the 4 Article of the GDPR (see the appendix) .

There are many factors that come into play with the new regulations which require a thorough review of all actions in the processing of personal data, which demands to our project the implementation of a process with the necessary measures (mentioned in the GDPR) that reinforce the fundamental right to privacy and protection of the personal data of our users.

This regulation also requires us a precise knowledge of what is listed in it since the law provides for strong sanctions in case of non-compliance that may put the future of any organization at risk. Therefore we have to admit that this regulation will have an impact on the development of our project, since we will have to adhere to the regulations dictated by the GDPR for data management.

Art. 4 GDPR

Art. 4 GDPR. Personal data' means any information relating to an identified or identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person.

Similar applications to our project.

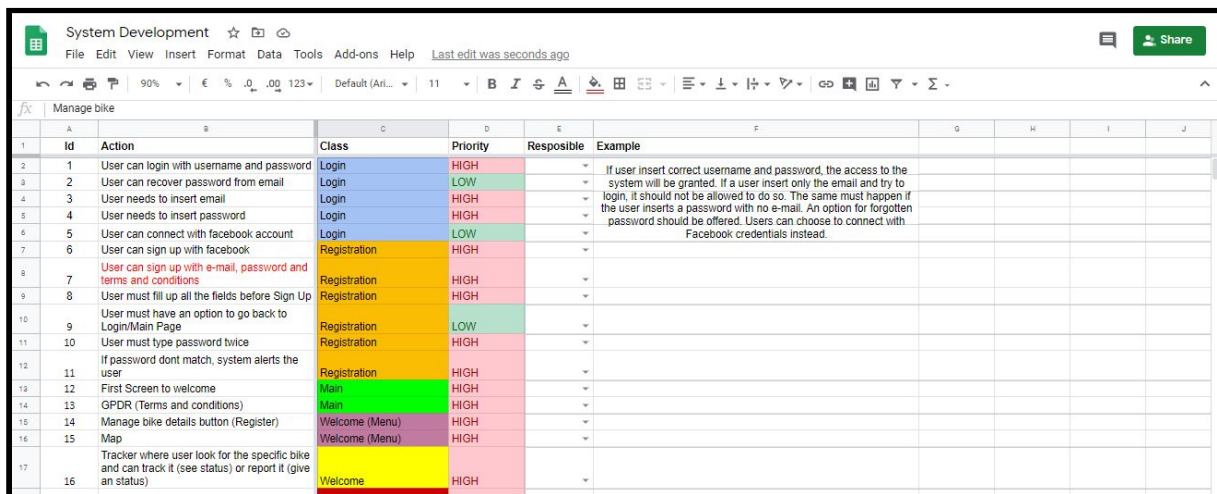
The team has done a bike apps research to confirm that the proposal could bring some innovations to the dublin society regarding this subject
Bike apps available for iOS

- **Foundrop:** Nationwide, police recover pieces of property that cannot be matched to the owner because the finder doesn't know you are the owner and you don't know they have it. This app includes all types of articles, including bikes.
- **Sherlockr:** If you find something somewhere and want to help the owner to find it.
- **BikeCheckUK:** Check bicycle frame number against UK based databases of stolen bicycles so you can ensure the bike you are about to buy is not stolen.
- **Find My Bike:** If you have ever forgotten where you left your bike (german app).
- **Swapfiets:** Service app where you can arrange an appointment or the person would go to your place (fee needs to be paid in advance - Dutch app).
- **FlatTire:** If your bike is broken or needs some maintenance. Someone will circle around to fix it (Dutch app).

- **The Sherlock:** Bicycle GPS tracker Hidden is a featured solution as it comes with both a cellular and GPS connection and is very discreet in the chance that your bike is stolen. This is a benefit to some of the other alternative bike locks and trackers where you would hide them on your bike.
- **BikeAlpha Bike Theft Reporting:** Store all details about your bike, including photos, so that if your bike gets stolen you can get all that information reported immediately. The reported theft map shows where bikes have previously been stolen, allowing you to avoid trouble blackspots.

Appendix C: Project Planning

Initial Stages of our System Analysis and Chapter 2 Development



Id	Action	Class	Priority	Responsible	Example
1	User can login with username and password	Login	HIGH		
2	User can recover password from email	Login	LOW		
3	User needs to insert email	Login	HIGH		
4	User needs to insert password	Login	HIGH		
5	User can connect with facebook account	Login	LOW		
6	User can sign up with facebook	Registration	HIGH		
7	User can sign up with e-mail, password and terms and conditions	Registration	HIGH		
8	User must fill up all the fields before Sign Up	Registration	HIGH		
9	User must have an option to go back to Login/Main Page	Registration	LOW		
10	User must type password twice	Registration	HIGH		
11	If password dont match, system alerts the user	Registration	HIGH		
12	First Screen to welcome	Main	HIGH		
13	GPDR (Terms and conditions)	Main	HIGH		
14	Manage bike details button (Register)	Welcome (Menu)	HIGH		
15	Map	Welcome (Menu)	HIGH		
16	Tracker where user look for the specific bike and can track it (see status) or report it (give an status)	Welcome	HIGH		

SEMESTER 2 - SDLC SCHEMA AND SCRUM PLANNING

PLANNING SCHEME								
Sprint	Month	February - Defining and Design						
	Week	SUN	MON	TUE	WED	THU	FRI	SAT
S1	1		-Stack Plan Skill Plan	Daily(Whatsapp)	Daily(Hangout)	Daily(Whatsapp)	Productivity Feedback(15min)	
S1	2		-Daily(15min) Whatsapp	Daily(5min) Whatsapp	Project ConfigPlan Demo(15min)	Daily(5min)	Sprint Presentation Next Sprint Plan	
S2	3		Skill Learning	Skill Learning	Project Config Plan		Productivity Feedback Google Hangout	
S2	4		Source Control Definition	Daily(Whatsapp)	Skill Learning Demo(10min)	Daily(5min)	Sprint Presentation Google Hangout	

March - System Requirements and Data Analysis								
	Month	SUN	MON	TUE	WED	THU	FRI	SAT
	Week							
S3	1		- Third Sprint -Stack Definition Skill Plan	Daily(Whatsapp)		Supervisor Meeting Stack change	Productivity Feedback(15min) System Analysis	
S3	2	COVID-19 call 1 hour(Hangout) Data Requirements		Daily Call (1hour)Hangout	Demo(meeting)	Project Config Plan	Sprint Presentation Server first Commit	
S4	3		- Fouth Sprint BANKHOLIDAY Coding cycle start	Skill Learning	Daily(5min)	COVID-19 call College closing	Productivity Feedback Initial Commit Startup Config Server config	Strategy Meeting(3 hours) New ProjectPlan
S4	4	Daily(5min)		Skill Learning			Sprint Presentation Daily(30min) Front-End Config	

April- Building								
	Month	SUN	MON	TUE	WED	THU	FRI	SAT
	Week							
S5	1		- Fifth Sprint Daily(30min) Hangout Front-End Dev	Daily(Whatsapp)	Daily(Hangout) First Front End commit Login Screen	Supervisor Meeting Stack aproach Stack decisions	Productivity Feedback(15min)	
S5	2		Server Config Daily(10min) Whatsapp		Demo(30min)		Login Frame Presentation Sprint Presentation Daily(30min)	
S6	3		BANKHOLIDAY Sixth Sprint Front End final dev	New Layout Plan Daily(15 min) Whatsapp	Chapter 3 Doc Review Chap 4 Doc Start	Daily(30min) Google Hangout Integration Backend		
S6	4		Server integration		Demo(30min)		Sprint Presentation Daily(30 min)	

Month								
May- Building Testing and Deploy-								
	Week	SUN	MON	TUE	WED	THU	FRI	SAT
S7	1		- First Sprint -Bug Fix -Front End Layout Change	Daily(Whatsapp)	Daily(Hangout) Chapter 5 Start	Supervisor Meeting Documentation Review	Productivity Feedback(15min)	
S7	2		daily(15min) Whatsapp		Demo(30min)		Sprint Presentation	
S8	3	Daily(1hr) Product Revision	- Seventh Sprint Improving Front End	Fix and Bugs	Front End fix	Front End fix		Daily(1hr) Fix and Bug
S8	4	Daily(1hr) Fixing and Bugs	VideoCasting	DEADLINE				

Project Management Scheme

Scrum methodology with 2 weeks Sprints for the managing process.

Important Meeting and Dates and Events

- **Daily meeting (5 to 15 minutes max)**
Daily meetings target the daily bases work and the tasks being worked and researched.
- **Grooming/Planning**
Happens on the second Friday of the Sprint.To discuss coding analysis and refactoring.
- **Demo Meeting**
Happens on Wednesdays prior the Sprint.Work presentation to elaborate issue cards.
- **Productivity/ FeedBack**

Happens on the first Friday of each Sprint.Feed back from each collaborator about project development.
- **Skill learning**

Skill learning was the necessary time framing to get the the set of knowledge to develop the project.

- **Stack Plan**

Planning meeting to discuss the stack and system architecture.

- **Skill Plan**

Target a skill to be focused in order to develop the next sprint.

- **Daily Whatsapp**

Texted updates about the project.

- **Daily Hangout**

Video conference to discuss project development.

- **Sprint Presentation**

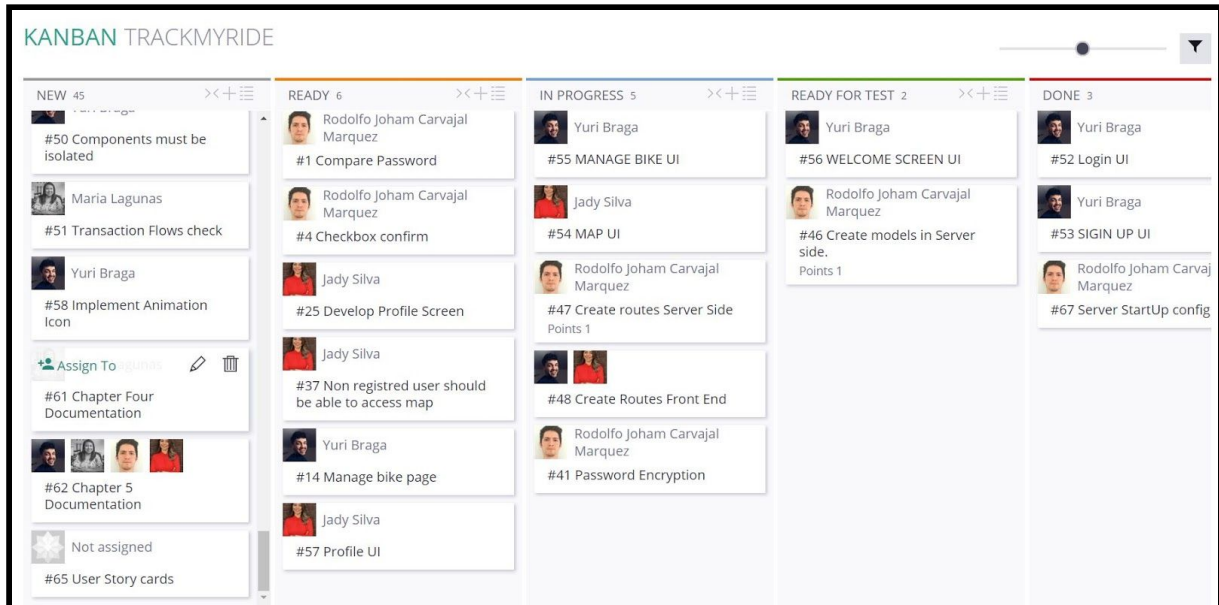
Display productivity and what will stage to the next Sprint.

- **Source Control Definition**

To discuss the Source Control standard.

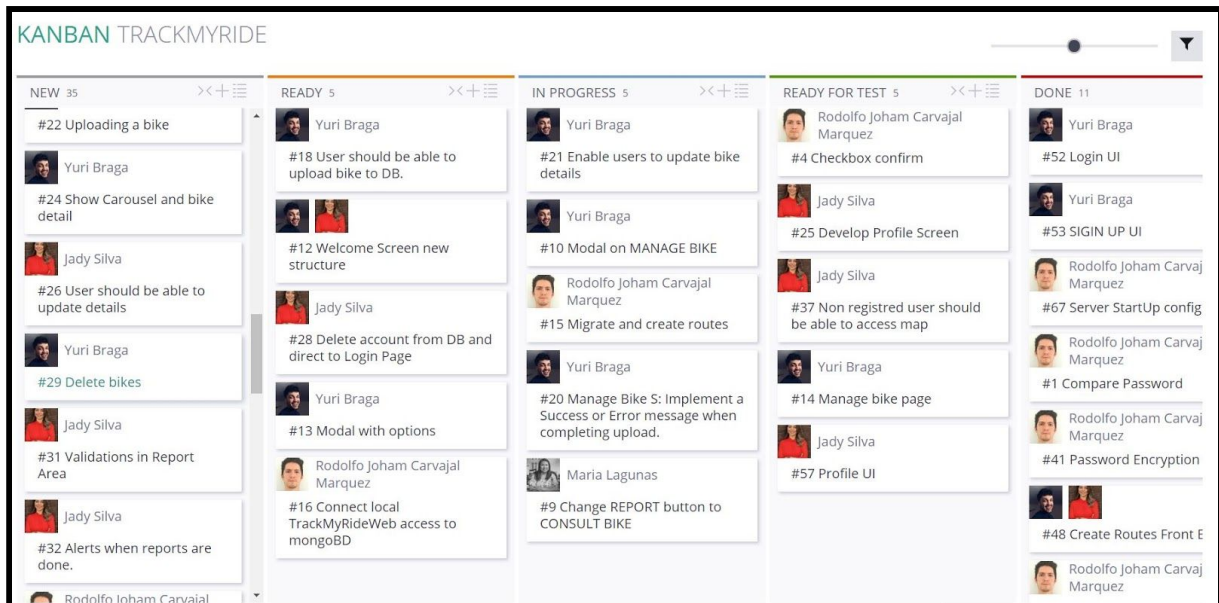
Building Phase

Sprint 4- Front End Development and System startup configuration.



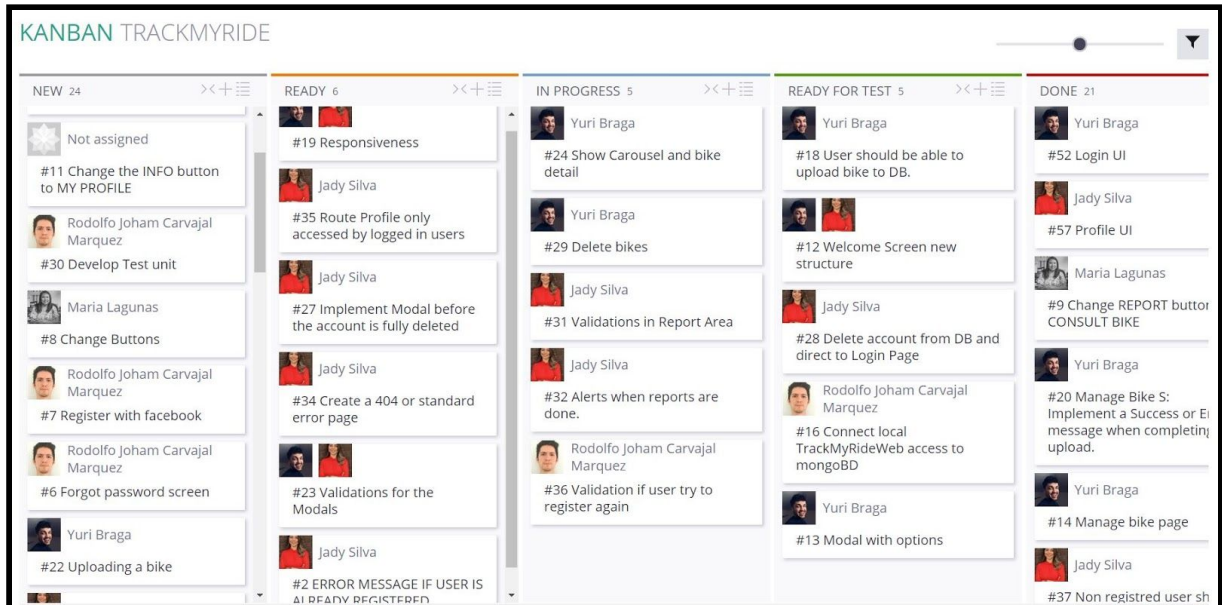
Cards developed using Taiga (Alonso, c2020)

Sprint 5- Front End Development and Server implementation



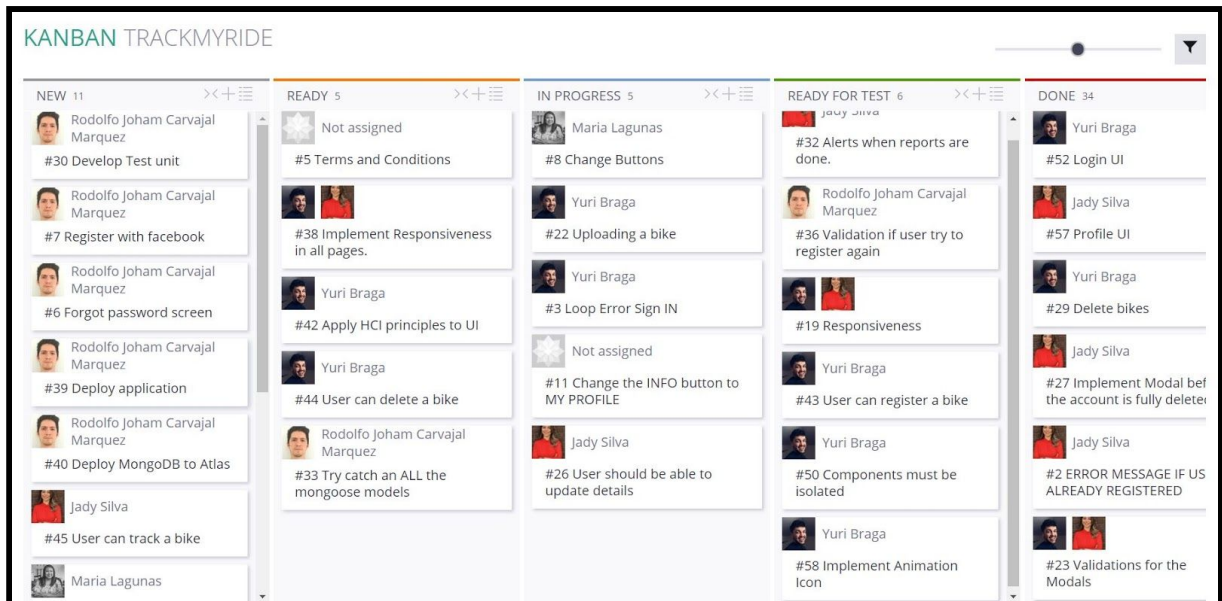
Cards developed using Taiga (Alonso, c2020)

Sprint 6 Front End integration with Remote Server



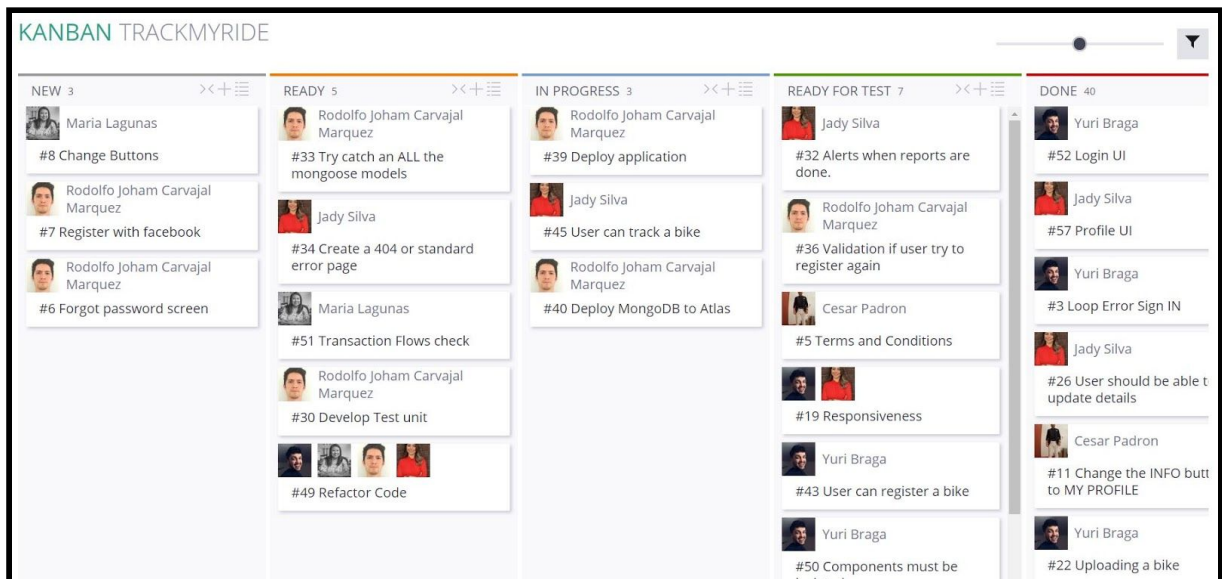
Cards developed using Taiga (Alonso, c2020)

Sprint 7 - Fix and Front-End styling



Cards developed using Taiga (Alonso, c2020)

Sprint 8 - Fix, Testing and Deploy



Cards developed using Taiga (Alonso, c2020)

Appendix D: Individual Contribution

Cesar Padron - 2017229

Learning from the development of the Application:

1. Continual assessment and feedback from my peer group was essential to a successful outcome
2. Ensuring that the application was developed in line with the scope- making sure that we did not deviate and waste time
3. Check for and correct errors in a timely manner
4. Be open and listen for new ideas and how we could improve the application
5. Plan, plan ,plan will lead to success - continually communicate and coordinate activities with my peers

Regarding the project document:

User Interface Design

- Developed the outline design using Justinmind software to create the user flow and interface
- Extensive research completed on which graphics, format which are most effective for user interaction (MVC)
- Developed the simulation of how the user interacts through the application implementation of design features

Development of Terms and Conditions

- Researched and ensure that the development of the application is GDPR compliant
- HTML redaction and integration to the application

Building, formatting and editing required documentation for project completion date

- Consolidation of multiple documents created by all team members
- Validated the drafting and ensured the content was fit for purpose reflected the requirements of the objectives of the project
- Completed the outstanding research for completeness of the documents

Front End

- Developed the first drafts for the "Report and Info Bike" Pages, html code
- Added additional design features to User Interface

Jady Martins Silva - 2017255

Track My Ride was born during a tough and turbulent moment of the Balance Team lives. Our previous ideas were not solid enough to stand upon ourselves - not the whole group believed in it, and upon our supervisor - who sensibly detected the wrong path we were heading to.

When we finally understood that the unity in our group could make this project work, Track My Ride finally commenced. I cannot start my individual contribution without highlighting how much I have learnt with the execution of this project: technically, yes, but also as an individual, constantly learning how to communicate, express ideas, listen to critics and above all of that, work as part of a team to achieve a common goal.

In such a manner, my contribution for the second phase of this project started with the system analysis - I believe I helped the team to focus on what the system was instead of how we were going to build it. As technology and knowledge were our

biggest concerns, it took us a while to finally walk through the whole system as a user and from there design the requirements, and I believe I helped the team to focus on that, researching about System Development and Design Methodologies.

I was responsible for the Registration, Splash Screen and User Profile Requirements document for Chapter 2. This process involved the research , design of diagrams, user stories and requirements list.

For Chapter 3, I contributed with the Data Design topic describing the reason why we decided to use MongoDB as our database source and a preview of the Collections we would use, based on the requirements.

I also Contributed to the final chapters explaining our evaluation and testing plans for Chapter 5, as well as addressing our biggest challenges with the Map feature and Search bikes by serial number.

In regards to the artifact contribution, I developed the Front-End Interface and its Logic, Database schema and managed their integration for:

- Map feature - the implementation of the Leaflet Map, the DataSource to feed it and the logic to do so, the side bar using jQuery Scrollbar plugin, the styling and Javascript functions to hide and display among others. This can be consulted in Consult Map by a register/not registered user;
- Profile feature - the user interface, the Bootstrap Card and Modal elements, the logic behind the buttons , integration with the database for uploading a password, delete the account, logout, displaying user and bike details as well as direct the user to Manage Bike feature. I also contributed to the upload photo implementation,;
- Bike consult - the feature that allow the user to find a bike by its serial number and also the return of the search, being either success or an alert message, using also express messages for this last one;
- Reports - the user can report a new parking spot, new incident on a parking spot and a suspicious activity with a bike found. And I was responsible for the interaction between the user and database as well, along with styling and responsiveness fixes in our application.

Maria de la Luz Lagunas Modesto - 2017050

As my peers, I was involved in the project from the beginning. I gave the idea of doing something related to track assistance in a gym, then we came up with the idea of doing a personal trainer management app but that idea was refused by our supervisor.

Once we got approval of this Track my ride applications, I focused to bring ideas down by writing down and materialising a plan. I created a framework that

helped to create the final one that is in this document and I suggested using Google Sheets for the document in case we could not meet and work on it anywhere.

Regarding the project document for Semester 1:

- I wrote and researched the management project section
 - SDLC
 - Agile project management
 - Scrum
 - Gantt Chart
- The objectives
 - General
 - Specific
- Risk assessments
- Preliminary conclusions
- I suggested the referencing system
 - Harvard
 - Page generator
- I formatted, edited, customized and gave a style to the whole document.

For semester 2.

As the previous semester I focused my time to write the document from the beginning as our supervisor David McQuid told us that the document seems to be written by many people, to reduce that sense I wrote the whole document from the cover page till the end.

Also I ensured that the document met the faculty requirements from font, size, style and content.

For this semester even I re-wrote the document, for chapter 2 I wrote the Functional requirements and description users for the Welcome page.

For Chapter 3, I wrote the research of the whole chapter and I helped to reproduce the screens from the design planning from Just in Mid.

For Chapter 4, I did also the research and writing following my team notes and results, took all the screenshots customized and added descriptions.

For chapter 5 I rewrite my peers findings

For the coding part, I helped to write the report environment, welcome page, add some markup features. I did some testing to improve the view of the applications

From my last and current job I have approached some good skills that are helping to develop this project.

Last Job - Researcher: I spent a couple of years doing research as a job and for this project I am using a research methodology that I used to work with

Current job - Operations Manager. Make quick decisions and try to find the best process or procedure to achieve a goal in a given date.

With this project I would like to achieve some personal interests as improving front-end environmental skills

Rodolfo Carvajal Marquez - 2017032

My main contribution to this project was to develop the back end (Express API - Server for Track My Ride App). I had to research different alternatives to provide a resource to manage and store data required to run the application. In order to achieve it, I had to learn and build an API following MVC architecture to point the routes for GET/POST requests, and to execute functions handled by controllers to process data and return results to the frontend. Also, to store data, I had to design the models to create collections on the MongoDB Cloud Instance for; Users, Bikes, Racks, Incidents, and Images.

As a group project, I was assigned the tasks to develop the login and registration logic, to secure user personal information; I had to learn about encrypting, hashing and salting for users' password using an effective algorithm, authentication, authorization, and establish sessions within the Web Application for different interfaces or views. I created the logic to generate JSON Web Token using JWT that we decided to deprecate as it was initially designed for a native mobile app implementation.

On the other hand, I did general support within the main features including Manage My Bike and Map interfaces. Also, security implementations for Denial-Of-Service (DOS) Attacks, Cross-Site Scripting (XSS) Attacks, Brute Force Attacks, and NoSQL Injection Attacks in the Web App and the Express API.

Finally, I established connections between frontend and backend; defined routes, which properties and dependencies were required, and protocols. I deployed, configured, and troubleshooted the final versions of both applications on AWS Cloud Instance.

Yuri Braga - 2017141

Being able to follow this idea becoming a product was a great experience.

Track My Ride has been a challenge since day one and improved a lot of more than just the technical skills I have got over the course. It taught me about not giving up when you face a problem. Eye to detail in every single task you do. Patience to understand that sometimes you also need rest to solve a problem and the most important is that there is no such problem that you can not solve if you break it into smaller pieces. I had to improve myself with a new set of front-end skills that included Javascript, NodeJS, EJS, and JQuery. Also being able to work with a team in a remote environment was good preparation for the industry.

Bringing some of my background skills I could contribute to different parts of this project.

This semester I have been working mainly focused on the building process but yet not being absent during the System Analysis and Design bringing strong research appliances in the HCI area for the final documentation and prototype as well as developing Diagrams to better understand the system.

I have also contributed with the planning schema applying Scrum methodology during the product formation; User Story cards; Task checklist; Stack definition; Front End development including the routes, login screen, sign up screen , welcome home page and manage bike interface;I also helped with the styling techniques using plain css and Bootstrap; HCI appliance to the UI; Backend integration with the Front End ; Source Platform revision; Code Refactoring; Source control; Team planning;

Overall, I am satisfied with the final result and also for being able to work with a very compromised team. Track my Ride was a project to end this course with a Golden Key.