POLITECNICO MILANO 1863

Computer Science and Engineering

"PowerEnJoy"

Requirements **A**nalysis and **S**pecification **D**ocument

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Todo list

Revision History

Revision	Date	Author(s)	Description
1.0	13/11/16	Piazzolla Millimaggi	First document issue

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1 Introduction

1.1 Purpose

This document is the RASD (Requirement Analysis and Specification Document). The goal of this document is to describe the functional and non-functional requirements of the system in order to show the constraints on the software that the developer has to take into account. This document can have a legal value and can be used as a contractual basis between the customers and the developers.

forse sbagliato, nelle slide c'è scritto di mettere qui i goals

1.2 Scope

The system the has to be developed is called *PowerEnJoy*. It is a digital system for the management of a car-sharing service that only employs electric cars. In particular the aim is to develop a mobile application that allows the user to pick up and use electric cars in the areas reached by the service.

1.3 Definitions, Acronyms, Abbreviations

1.3.1 Definitions

- User: is a general person who uses "PowerEnJoy".

- Registered User: a user that have completed the registration process.

- Guest: a visitor, not authenticated user.

- Driver: authenticated user that drive the requested car.

- Car reservation: allocation of a car for a defined amount of time.

- Safe area: area in which the User can find cars, pick them up and park them.

- Special parking area: area in which the user can park the car and also charge it plugging it into the power grid.

1.3.2 Acronyms

Copiati da controllare mentre stiliamo il documento

- RASD: Requirements Analysis and Specification Document.

- DB: Database.

- DBMS: Database management system.

- API: Application Programming Interface.

- OS: Operating System.
- JVM: Java Virtual Machine.
- J2EE: Java Enterprise Edition.

1.3.3 Abbreviations

- [Gn]: n-goal.
- [R-n]: n-requirement.

1.4 Reference documents

- IEEE Std 830-1998 IEEE Recommended Practice for Software Requirements Specifications.
- IEEE Std 1016 tm -2009 Standard for Information Technology-System Design-Software Design Descriptions.
- ISO/IEC/IEEE International Standard - Systems and software engineering – Life cycle processes –Requirements engineering

1.5 Document Overview

The structure of this document follows the IEEE standard for the editing of a RASD document. In particular the structure is:

- Introduction: it provides a general description of the document and the system that has to be developed
- Overall Description: it provides a general description of all the things that affects the work on the project and the elaboration of the requirements. So it gives information about hardware and software choices and availability, the main functions of the product, the description of the people at whom the product is addressed, the constraints that will limit the work of the developer, the assumptions done before the development and the dependencies that the use of the product will have from hardware and software entities
- Specific Requirements: it provides a detailed description of the requirements of the product

1.6 Given Problem

1.7 Proposed System

1.8 Stakeholders

Matteo: io qui la farei un po' discorsiva visto che sono solo i cittadini (magari anche i turisti)

• Citizens

1.9   Actors

The entities identified in the problem description are the following:

• GUEST: is a visitor, someone that isn't signed-up yet. He can visualize "PowerEnJoy" Web site and download the mobile app but he cannot access to any service.

• USER: is a client signed-up, via Web or mobile app. He accesses "Passenger Area" and, after being successfully logged in, he can see his personal section, modify his personal information. He can also access to all services,view a map of available cars, make car reservations, modify or cancel them.

1.10   Goals

• [G1]Allow guests to register to "PowerEnJoy" service through both website or mobile application.

In teoria la lista dei goal deve essere presente

• [G2]Allow registered users to login and logout.

• [G3]Allow authenticated users to modify their personal details and payment informations.

• [G4]Allow authenticated users to view a list of available cars in a configurable radius of distance from user position or specified address.

• [G5]Allow authenticated users to view available cars, safe areas and special parking areas on a map in the application.

[Andrea] Aggiunti Goal da 5 a 7

• [G6]Allow authenticated users to request for pick up an available car for a limited time and unlock it when the User is in proximity.

Forse meglio dividere G6 in 2 (una per la request e uno per lo sblocco

• [G7]Allow authenticated users to drive the unlocked car inside the border of the city.

• [G8]Allow driver to be constantly informed about the service through a screen on the car.

• [G9] Allow driver to be constantly informed about the the cost of the travel up to the current time.

• [G10]Allow driver to be constantly informed about the current position of the driven car.

[Andrea] Aggiunti G9 e G10, specificano meglio le informazioni riguardanti il servizio del G8–>forse di può togliere

- [G11] Allow driver to get discount in base of pick up/parking position of the ar, number of passengers and status of the battery.

- [G12] Allow the system to charge the user with an extra fee if he doesn't pick up a car reserved within an hour from the reservation.

- [G13] Allow the system to make a car available again after an hour from that car reservation.

- [G14] Allow the driver to conclude his travel and stop being charged after he turns off and exits the car.

- [G15] Allow the system to charge the user with an extra fee if he leaves the car at more than 3 km from the nearest power grid station.

- [G16] Allow the user to put the car in charge when he leaves it in a special parking area.

[Andrea] Riformulato il G15, tolta la posizione in cui si prende la macchina come dis-criminante per lo sconto perchè non è scritto nell'assignment

[Andrea] Aggiunti Goals da 13 a 17, non sicurissimo che siano giusti

2   Overall Description

2.1   Product perspective

(further details on the shared phenomena and a domain model–>class diagrams and statecharts)

The system that we are going to develop is made of several parts.

- A Mobile Application usable from every Tablet or Smartphone that has access to an internet connection. The application will be available on Android and iOS.

- A Website where a user can find information about the service.

- A Server backend to manage the service.

2.1.1   System interfaces

The system will depend on a device installed onboard every 'PowerEnJoy car. That onboard device will communicate with the user and via internet to the server.

2.1.2   User interfaces

The available interfaces will be:

- the mobile application

- the website

The website will be implemented with a responsive design to adapt to all most common screen aspect and resolution with clear and minimal UI to favorite accessibility. The mobilie application will be graphically similar to the website with a few views. The use of the website or the mobile application won't be necessary during driving.

2.1.3   Hardware interfaces

The main hardware interaction concerns the geolocalization feature, and in particular the GPS hardware on the smartphone device. The application need an internet connection so a smart device with a 3G or LTE connectivity is required.

2.1.4   Software interfaces

To provide the best use of the service through the website an HTML5 compliant browser is required and an up-to-date version of Android or iOS operating system for the mobile application.

2.2   User characteristics

Everyone who has a car license will be able to register to the car-sharing service and drive one of the electric car available. Because of the variety of people that will use the service, the mobile application must be simple and user-friendly, so that anyone can use it even if it has a little knowledge about the use of a mobile device.

2.3   Constraints

2.4   Assumptions

Da completare!

1. Cars can be parked in every area of the city where the parking is allowed, either it is free or chargeable. The company takes care of the payment for chargeable parkings.

2. Every car can be uniquely recognized by his plate number.

3. The position of the users are well-known thanks to GPS.

4. The user is the one and only who drives the cars he reserves.

5. Any user who reserves a car has enough money on his credit card to pay the travel.

6. Every car is periodically checked to ensure proper operation.

7. The travel of a driver is considered finished when the the engine is off and after a minute from the moment in which he closes the car doors.

2.5   Regulatory policies

It's user responsibility to ensure that the use of the system complies with the local laws and policies. If the user register to the service must allow for the permission to acquire, store and process personal data and web cookies. The system must offer to the user the possibility to delete the account and all the personal data.

2.5.1   Possible Future Implementations

Depending on the success that the developed system will have, it will be possible to extend the car-sharing to Scooters and Mini-Cars, in order to reach also younger customers.
Another possibility for the future is to allow users to get in touch with strangers and pick them up in the middle of the travel.

da sistemare la seconda frase

Another future improvement could be the possibility for the users share a trip with strangers and split the charge as other services like BlaBlaCar.

2.6   Product requirements

2.6.1   Functional Requirements

- User registration

- Login

- Check for cars availability using user's position

- Check for cars availability using address

- Reserve a car

- Cancel a reservation

- Check the amount paid for a travel

- Check the log of reservations done

- View the details of cars available (level of the charge)

3   Specific Requirements

3.1   Functional Requirement

With these requirements are defined features and functions with which the user will interact directly.

3.1.1   [G1]Allow guests to register to "PowerEnJoy" service through both website or mobile application.

- **[R-1]** The system shall allow registration only if the patent license number is provided.

- **[R-2]** The system shall provide a home page in which a guest user must be able to know what the service is.

- **[R-3]** The system shall demand the User to read and accept all term of use of the service.

- **[R-4]** The system shall provide a form in which a Guest can insert his personal data for the registration to the service.

- **[R-5]** The system shall provide a form in which a Guest can insert his payment information.

3.1.2   [G2]Allow registered users to login and logout.

- **[R-6]** The system shall show a sign-up page with a login form and a logout button if the User is already logged in.

- **[R-7]** The system shall validate any input in both client and server side.

- **[R-8]** The system shall prevent anyone from logging more than once at a time.

- **[R-9]** The system shall show and error message in case of wrong credential.

- **[R-10]** The system shall provide a password recovery procedure.

- **[R-11]** The system shall prevent bruteforce attack limiting the number of try per IP address.

- **[R-12]** The system shall redirect the User to the homepage as a guest after the logout.

3.1.3   [G3]Allow authenticated users to modify their personal details and payment informations.

- **[R-13]** The system shall show a an account page with all the information that the User sent during account registration.

- **[R-14]** The system shall ask for the password before saving the edited details.

- **[R-15]** The system shall send and email to notify the changes.

3.1.4   [G4]Allow authenticated users to view a list of available cars in a configurable radius of distance from user position or specified address.

- **[R-16]** The system shall show on a web page or a view in the application the position of the available car.

- **[R-17]** The system shall allow the User to set a search radius.

- **[R-18]** The system shall ask the User for the GPS position or to provide an address.

3.1.5   [G5]Allow authenticated users to view available cars, safe areas and special parking areas on a map in the application.

3.1.6   [G6]Allow authenticated users to request for pick up an available car for a limited time and unlock it when the User is in proximity.

- **[R-19]** The system shall not allow the User to request multiple cars at the same time.

- **[R-20]** The system shall check if the payment information are valid and show an error if not.

- **[R-21]** The system shall automatically cancel a car reservation if the User don't unlock the car in one hour without charging the User.

- **[R-22]** The system shall check for the User position and if the distance from the car is less than 50 meters allow to unlock the car.

3.1.7   [G7]Allow authenticated users to drive the unlocked car inside the border of the city.

R23=R25

- **[R-23]** The system shall inform the User if she is driving outside the city area.

- **[R-24]** In case of driving outside the city area the system shall charge a 100% more of the current charge.

3.1.8   [G8]Allow driver to be constantly informed about the service through a screen on the car.

- **[R-25]** The system shall inform the User if she is driving outside the city area.

- **[R-26]** The system shall inform the User of the amount that will be charged.

- **[R-27]** The system shall inform the User of the position of charging areas nearby the current car position.

- **[R-28]** The system shall show on a map the special parking area and the safe area nerby the current car position.

3.1.9   [G9] Allow driver to be constantly informed about the the cost of the travel up to the current time.

3.1.10   [G10]Allow driver to be constantly informed about the current position of the driven car.

3.1.11   [G11] Allow driver to get discount in base of pick up/parking position of the ar, number of passengers and status of the battery.

Sistemare, copiati dal file del progetto

- **[R-29]** The system shall detect the number of passengers on the car

- **[R-30]** The system shall apply a discount of 10% on the last ride if it detects the presence of two other passengers on the car in addition to the driver.

- **[R-31]** The system shall check the level of the battery when a car is left.

- **[R-32]** The system shall apply a discount of 20% on the last ride if it detects that the car was left with no more than 50% of the battery empty.

- **[R-33]** The system shall check if the user plugges the car into the power grid when he left the car in a special parking area.

- **[R-34]** The system shall apply a discount of 20% on the last ride if it detects that the user takes care of plugging the car into the power grid when he leaves the car in a special parking area.

3.1.12   [G12] Allow the system to charge the user with an extra fee if he doesn't pick up a car reserved within an hour from the reservation.

- **[R-35]** The system shall charge the user with a 1 euro fee if he doesn't pick up a requested car within an hour from the reservation

3.1.13   [G13] Allow the system to make a car available again after an hour from that car reservation.

3.1.14   [G14] Allow the driver to conclude his travel and stop being charged after he turns off and exits the car.

- **[R-36]** The system shall detect the car turning off and the closure of the doors and stop charging the driver after this two actions are accomplished

3.1.15   [G15] Allow the system to charge the user with an extra fee if he leaves the car at more than 3 km from the nearest power grid station.

- **[R-37]** The system shall calculate the distance from the parking position to the nearest power grid station and if that distance is more than 3 km, shall charge the 30% on the last ride.

3.1.16   [G16] Allow the user to put the car in charge when he leaves it in a special parking area.

3.2   Non-Functional Requirement

- PowerEnJoy has to be available 24h/7d.

- Both mobile application and website must be reactive and usable.

3.2.1   Reliability

The service has to guarantee an 24h/7d availability. Components of the project code will be tested after the implementation phase to ensure that they are functional. All the critical software bugs found must be patched in at least 48h. If a Backend API change must guarantee support for client that implement older API. All the system data must be constantly backed up to assure the data recovery in case of fault.

3.2.2   Performance

3.2.3   Usability

- The User must be able to use the system with mouse, keyboard and touchscreen.
- The User must be able to choose from several language.
- At the first login the system must provide a simple and skippable 3-views tutorial of the service.
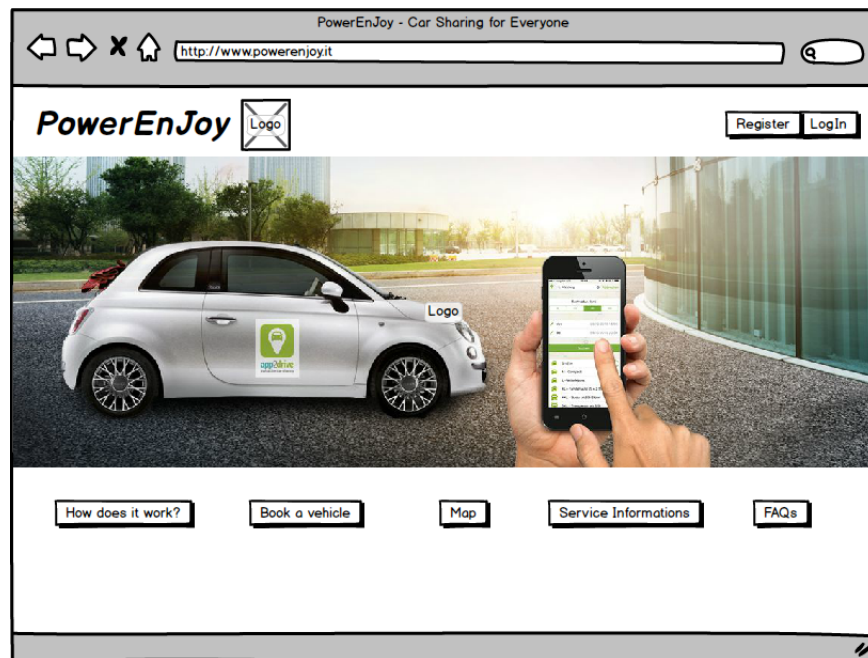
Figure 1: PowerEnJoy website homepage
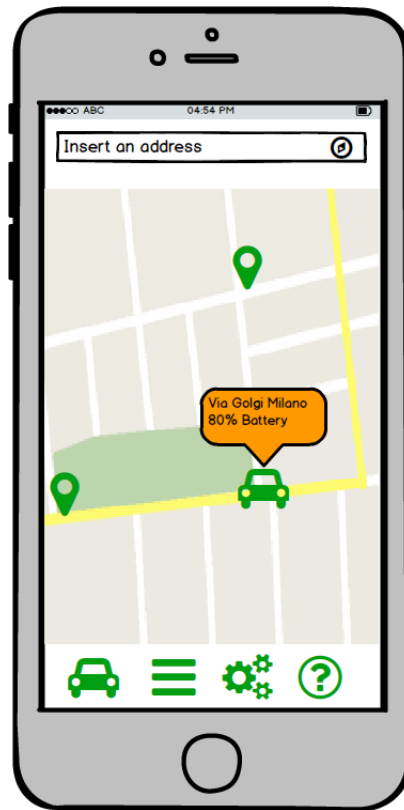
Figure 2: PowerEnJoy Mobile Application map view

3.2.4   Security

The system must ensure that all data is protected from unauthorized access. Password should be saved on a DB hashed and salted. Every input from the user and every request must be sanitized

3.2.5   Performance

3.2.6   Maintainability and Portability

3.2.7   Network connections

3.2.8   Cookies

3.2.9   Hardware requirement

Matteo: da togliere?

The communication between client and server is done using HTTPS REST

API encrypted with TLS connections. Nginx webserver and a large use of caching. Google Maps API.

3.2.10 Concurrent operations

3.3   Use Case

3.3.1   User Registration

Use Case Name	User Registration
Actors	Guest
Goal	[G1]Allow guests to register to "PowerEnJoy" service through both website or mobile application.
Preconditions	Guest hasn't registered to the webapp yet.
Postconditions	Guest is signed-up and promoted to "PowerEnJoy" User.
Normal Flow	1. Guest accesses to the webapp or the mobile application 2. Guest clicks on "Sign Up" button 3. Guest fill Sign-up form fields, entering -Name -Surname -Email address -Password -Telephone Number -Driving License number 4. Guest accepts the term of use 5. Guest clicks on "Confirm" button
Alternative Flows	-
Exceptions	1. At least one field is empty 2. At least one field is invalid 3. Entered email is already associated to another account

3.3.2 User Login

| Use Case Name	User Login
Actors	User
Goal	[G2]Allow registered users to login and logout.
Preconditions	User has signed-up as PowerEnJoy User.
Postconditions	User is redirected to personal area.
Normal Flow	1. User accesses to the webapp or the mobile application 2. User clicks on "Log-in' button 3. User fills username and password fields of Log-in form 4. User clicks on "Submit" button
Alternative Flows	-
Exceptions	1. Invalid username and/or password 2. At least one field is empty
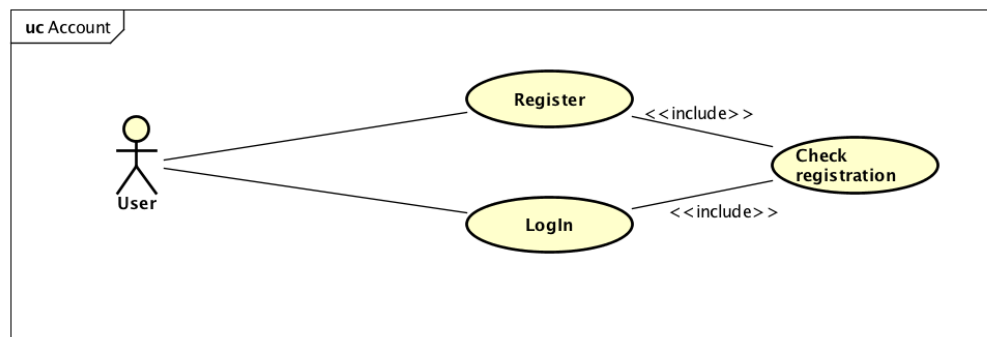
Figure 3: Use Case Login and Registration procedure. Refer to Goal 1 and 2

3.3.3   Modification of personal details and payment information

Use Case Name	Modification of personal details and payment information
Actors	User
Goal	[G3]Allow authenticated users to modify their personal details and payment informations.
Preconditions	User is logged in
Postconditions	User is redirected to the modifications area where he can modify his personal information
Normal Flow	1. User accesses to the webapp or the mobile application 2. User logs in 3. User clicks on "Personal Details'. A page with the personal data of the user is shown' 4. User clicks on "Modify Data" button. A form for modifications is shown 5. User fills fields he wants to modify 6. User clicks on "Confirm" button 7. User is redirected to his personal area
Alternative Flows	-
Exceptions	-

3.3.4   Search of available cars

Use Case Name	Search of available cars
Actors	User
Goal	[G4]Allow authenticated users to view a list of available cars in a configurable radius of distance from user position or specified address.
Preconditions	User is logged in
Postconditions	User is redirected to a page with the list of the available cars
Normal Flow	1. User accesses to the webapp or the mobile application 2. User logs in 3. User clicks on "Search a car" button. A form is shown 4. User select a distance from the "Distance from your position" field 5. User clicks on "Confirm" button 6. User is redirected to a page showing the available cars

Alternative Flows	• Different flow from step 4:
	
	    4 User write an address in the "Address" field
	    5 User clicks on "Confirm" button
	    6 User is redirected to a page showing the available cars

Exceptions	1. There aren't available cars within the distance set 2. There aren't available cars near the address set

3.3.5   Search of resources on a map

Use Case Name	Search of resources on a map
Actors	User
Goal	[G5]Allow authenticated users to view available cars, safe areas and special parking areas on a map in the application.
Preconditions	User is logged in
Postconditions	User is redirected to a page with a map where resources (available cars, safe areas, special parking areas) are shown
Normal Flow	1. User accesses to the webapp or the mobile application 2. User logs in 3. User clicks on "Search resources on the map" button. A form is shown 4. User select a distance from the "Distance from your position" field 5. User clicks on "Confirm" button 6. User is redirected to a page showing the resources on a map.

Alternative Flows	• Different flow from step 4:
	
	    4 User write an address in the "Address" field
	    5 User clicks on "Confirm" button
	    6 User is redirected to a page showing the resources on a map.

Exceptions	1. There aren't available cars within the distance set 2. There aren't available cars near the address set

3.3.6   Request

Use Case Name	Request
Actors	User
Goal	[G6]Allow authenticated users to request for pick up an available car for a limited time and unlock it when the User is in proximity.
Preconditions	User is logged in
Postconditions	The car requested is reserved for the user
Normal Flow	1. User accesses to the webapp or the mobile application 2. User logs in 3. User searches a car (use case 3.3.4) 4. User select a car from the list. 5. A page with information about the car (battery level, model) is shown 6. User clicks the "Request" Button" 7. The car is reserved for the user

Alternative Flows	• Steps 3 and 4 are different:
	
	    3 User searches a car (use case 3.3.5)
	    4 User select a car on the map.

Exceptions	1. The car selected has been requested by another user before the User has clicked on the "Request" button.

3.4   Class Diagram

3.4.1   PowerEnJoy server
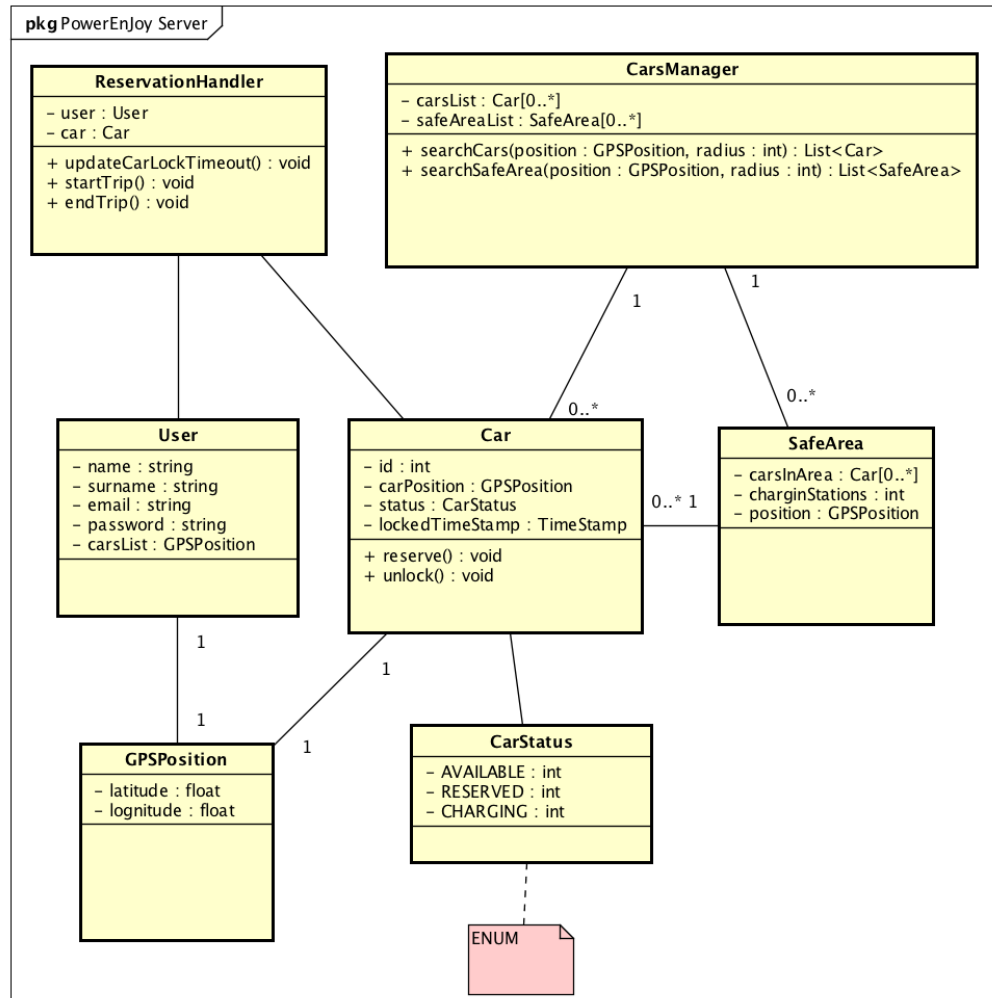
Figure 4: PowerEnJoy Server Class Diagram

4   ORE

23/10/16 Matteo 3h Andrea XX
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25/10/16 Matteo 1h
01/11/16 Matteo 1h
02/11/16 Matteo 4h