**R**equirements **A**nalysis and **S**pecifications **D**ocument



Version 1.0

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1. **Introduction**

**1.1 Description of the given problem**

We have to build a system for a car sharing service called PowerEnJoy, that permits a client to rent a car paying the service per minute.

The client can register to the system and get the access to it to use the services. After the access the client can locate the available car and can reserve a car for a limited time. Once the user arrives to the car, that he reserved before, he can unlock and use it. When the client finishes to use the car, he parks it in a safe park and exit the car. The car will lock automatically and the system will stop charge the client.

The system also provides a set of discounts and fees to improve the behavior of the clients.

To manage the cars, there are many technicians that can plug the car into the power grids.

**1.2 Goals**

**G1**. A person who has the right requirements1 must be able to register himself to the system.

**G2**. A registered person must be able to authenticate himself to the system.

**G3**. A user must be able to localize the positions of the available vehicles.

**G4**. A user must be able to reserve an available vehicle, for a limited time2.

**G5**. A user who has reserved a vehicle, must be able to use3 it.

**G6**. The system must properly charge4 for the user the cost of used services5.

**G7**. The system must properly manage6 the availability of vehicles.

**G8**. The system must simplify the organization7 of the technicians in their work.

**1.2.1 Note**

1. *Right requirements (for the registration):*

To register to the system, you must provide your name, your surname, your date of birth, your birth place, your tax code. You must also provide a valid driving license, and a valid payment method.

1. *Limited time (for the reservation):*

There is maximum 1 hour to reach the car until the reservation expires.

1. *Use a vehicle:*

It means that the user can unlock the doors, enter in the car, and drive to his destination.

1. *Properly charge the user:*

To properly charge the user means that If he can pay, the system will charge him the correct amount of money depending on the discounts and the rates established by the business rules.

If he can’t pay, he will be insert in the black list and he can’t use the service until he pays the last ride.

The current business rules provide to charge the user for an amount of money per minute, and to improve good behavior there are some discounts.

If the system detects the user took at least two other passengers onto the car, the system applies a discount of 10% on the last ride.

If a car is left with no more than 50% of the battery empty, the system applies a discount of 20% on the last ride.

If a car is left at special parking areas where they can be recharged and the user takes care of plugging the car into the power grid, the system applies a discount of 30% on the last ride.

If a car is left at more than 3 KM from the nearest power grid station or with more than 80% of the battery empty, the system charges 30% more on the last ride to compensate for the cost required to re-charge the car on-site.

1. *Services (that charges for the user):*

The services are the reservation and the rental of a car.

The user has to pay a fee for the reservation only if the when he reserves a car the reservation time expires. In this case the user has to pay 1€ with the current rules.

1. *Properly manage the availability of vehicles:*

If a vehicle is reserved or is in use it is not available. Also a vehicle with battery level lower than a certain minimum threshold is not available. In all the other cases the vehicle is available.

Then the system has to manage the vehicles states to guarantee these conditions.

1. *Simplify the organization of the technicians:*

It means that the technicians have to know what are the vehicles with low battery not in charge, and if another technician is already taking care of it.

**1.3 Domain assumption**

These are the conditions we suppose to hold in our world.

* GPS always indicates the right position.
* The GPS of all the vehicles is always working.
* Available vehicles are always working, especially during the whole ride.
* The battery level of a vehicle is always enough high to complete the ride of the user.
* The user who reserved the vehicle is the same who will use it.
* When a free technician notices a low battery vehicle, he takes care of it.
* A technician that has plugged a vehicle into a power grid changes the vehicle state from “In processing” to “available”
* A user parks always in a safe area

**1.4 Glossary**

These are some words that are used frequently in our descriptions, we explain the precise meaning to improve the expressive clearness.

* System: It’s the whole system that we have to plan to get working the system.
* Registration: It’s a system procedure that associates and stores people’s data to the system, and then provides to the user a password that has to be used to authenticate himself.
* Authentication: It’s a system procedure that allows to recognize a registered user by their credentials.
* Vehicles/Cars: The electric cars employed by PowerEnJoy for car-sharing.
* State of vehicles: (Available, Reserved, Not available, Low battery, In processing)
* Available: means that the vehicle is available for reservation and ready for the use, with the battery level more than a minimum threshold.
* Reserved: means that the vehicle is reserved by a user, that will reach the vehicle.
* In use: means that a user is actually using this vehicle.
* Not available: means that the vehicle is not available for the users, it is a generic state that can be useful in particular situations.
* Low battery: means that the vehicle is not available for the users because the battery level is lower than the minimum threshold, so a technician will take care of plugging it into the nearest power grid.
* In processing: means that a technician is taking care of make it available as soon as possible.
* Reserve a vehicle: A user can reserve a vehicle for at most one hours, after that, the reservation expires and the user have to pay a fee of 1€.
* Use a vehicle: A user that has reserved a car must be able to unlock the door, and to drive the car until he reaches his destination. When the user wants to end the ride, he has to park the car and get out of it.
* Technicians: They are PowerEnJoy employees, that take care of the operation of all the vehicles.
* User: A person who is registered to the system, and who is authenticated.
* Registered person: A person who is registered to the system but it isn’t still authenticated.
* Safe area: it is an area in which a user can park to end the ride.

1. **Actors identifying**

* **Guest**: it is a person who wants to join to the car-sharing services of PowerEnJoy, he can only register to the system, after that he can logging into the system
* **User**: It is a person authenticated, he can localize, reserve a car and use it.
* **Technician**: They are PowerEnJoy employees, they can check the state of the vehicles and they have to fix the problems by plugging the cars into the power grids.

1. **Requirements**

Supposed that the domain assumption made in the paragraph 1.3, from the goals, written in the paragraph 1.2, we can derive these requirements.

Below each goal we write the relative requirements

**G1**. A person who has the right requirements must be able to register himself to the system:

* The system must be able to verify the completeness and correctness of the data provided by the person who wants to register
* The system must provide a sign up functionality that gives a password to the user to access the system

**G2**. A registered person must be able to authenticate himself to the system:

* The system must be able to check the correctness of the user’s login credentials
* The system permits the access to the user only if the login credentials are correct

**G3**. A user must be able to localize the position of the available vehicles:

* The system must know the position of the vehicles
* The system must know the state of the vehicles
* The system must be able to receive the position communicated by the user
* The system must provide a functionality that shows the available vehicles to the user

**G4**. A user must be able to reserve an available vehicle:

* The system must provide a functionality that permits to the user to reserve a vehicle
* Only the vehicles shown to the user can be reserved
* The system must know if the user has a vehicle’s reservation
* The system doesn’t allow to reserve a car if the user is in the black list
* The system permits to reserve a vehicle only if the user hasn’t already reserved another vehicle

**G5**. A user who has reserved a vehicle, must be able to use it:

* The system must provide a functionality to unlock or lock the vehicle’s doors

**G6**. The system must properly charge customers the cost of used services:

* The system must know the number of passengers
* The system must know the level of charge of the vehicles
* The system must know if the car is ignited or not
* The system must know if the vehicle is in charge or not
* The system must provide a functionality that shows to the user, during the ride, the current charge
* The system must provide a functionality that calculates the amount that the user has to pay according to the discounts and rates established
* The system must be able to charging the amount calculated to the user
* The system inserts the user in the black list if it is not able to pay

**G7**. The system must properly manage the availability of vehicles:

* The system must be able to change the state of the vehicles
* The system must provide a functionality that manage the availability of the vehicles in the correct way

**G8**. The system must simplify the organization of the technicians in their work

* The system must provide a functionality that shows to the technicians all the vehicles with their state and if the car is in charge or not.
* The system must be able to change the state of the vehicles based on what the technicians want
* The system must be able to communicate with the technicians

**3.1 Functional Requirements**

Now that we have defined all the requirements, we will resume the functionality available to actors

Guest can:

* Sign up
* Log in

User can:

* Locate an available car
* Reserve an available car
* Unlocks the door of a Reserved car
* Use the car
* Check the current charges (obviously during the ride)
* Lock the door (after the ride)

Technician can:

* Locate all the cars
* Check the state of all the cars
* Check if a car plugged into a power grid
* Check if another technician is taking care of a car

1. **Scenario identifying**

Here are described many scenarios to explain how the system works, with practical examples.

**Scenario 1**

Luca wants to register to PowerEnJoy’s services. He is provided of a driving license that permits him to drive the electric cars of the car-sharing service. He is also provided by a payment method that is accepted by PowerEnJoy. So he opens the registration page of PowerEnJoy’s website and fills the registration form with his personal information. Once he has finished he receives a password that he has to use to log in the system.

Now Luca can log in the system and can use all the services that PowerEnJoy reserves to its users.

**Scenario 2**

After many hours of lecture, Marco wants to come back home from the university. Marco is lucky, because his university and his home are both covered by the safe area of the PowerEnJoy’s car-sharing. So Marco logs into the system and searches a car near his position. Now he reserves that car and reaches the position on foot before the reservation’s time expires, then he unlocks the car and drives the car.

During the path Marco can check his current charges. When he arrives at home he parks the car and get out of it, to end the ride and to stop the charging.

**Scenario 3**

John is in a conference and he is very tired, so he wants to go home quickly as soon as the conference over. The place where the conference is taken and John’s home are both located in the safe area of PowerEnJoy service, so when the conference is almost over John reserves a car. But when the conference is over John has to reach the position of the car, that isn’t very close to him. So before John can reach the car the reservation’s time expires and unfortunately John have to pay the fee and he has to looking for another car.

**Scenario 4**

Alice is a technician of PowerEnJoy and this morning has to go to work. When she arrives in the office, she can check the state of all the vehicles, so she finds many “low battery” cars not in charge. She chooses one and changes its state in “In processing”, then she takes the key of this car from the office and reaches the position of the car. She unlocks it and drives the car to a free power grid and plugs in the car. Now the car is in charge, Alice changes the state of the car in “Available” and the system automatically set the state in “low battery” until the battery level is upper than the minimum threshold. Alice can now return to the office to take care of another car.

**Scenario 5**

Matt and his two friends are in the city center and they want to go to the cinema. Matt is a user of PowerEnJoy and he notice that there is a car near their, so he decides to reserve it. They take that car and go to the cinema, when they arrive at cinema they find a power grid where they can plug in they car. Therefore, they park and plug in the car and the system grants their a discounts of 10% because the system has detected two passengers and a 30% of discount for have plugged the car into the power grid.

1. **UML Models**

**Hours of work**

**Luca Santini**

* 02/11/16: 4h
* 04/11/16: 4h
* 07/11/16: 5h
* 08/11/16: 4h

**Riccardo Remigio**

* 02/11/16: 4h
* 04/11/16: 4h
* 08/11/16: 4h