

SOFTWARE ENGINEERING 2 PROJECT  
REQUIREMENTS ANALYSIS AND SPECIFICATION DOCUMENT

# PowerEnJoy

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# Introduction

## 1.1 Description of the problem

We are to project and develop a car-sharing system, PowerEnJoy. This service only relies on electric cars, so more attention is paid to the driver behaviour to reduce infrastructure cost, minimizing the number of necessary charging stations. The system has to interact primarily with the users that want to rent the car, but also with "**workers**", employees of the company PowerEni, that are responsible for the management of cars themselves. All the cars in the system are connected to the internet through a mobile data receiver and are equipped with several sensor (GPS, speedometer). The system must also provide an **administration console**, accessible by few users inside PowerEni company. This console provides administration functionalities (e.g. registering new workers, log the state of all the vehicles) and business statistics (e.g. users per day, total driven km). The main users of the system are

**User** Users interact with the system primarily through a mobile application, given that users usually rent cars while they are on the move. The application allows users, or "**drivers**", to reserve a car by presenting a list or map of all the near-by available cars (using the user GPS position). The application allows the user to effectively use the car (find where it is parked, open the doors, find useful informations, e.g. near-by charging stations). The system also provides a web portal, where the user can manage all his informations (payment settings, license, birthdate, view payment history etcetera). Users can access the system only through a registration, that can be done both on the web portal and on the mobile application. During the registration, the user need to provide payment informations and a valid driving license.

**Workers** Workers interact with the system through a specific mobile

application, released only to them. Workers are paid by the company to execute "tasks", that include:

- Recharging on-site a car that was not left in a charging station
- Move cars to more popular places to maximize usage
- Pick up a car in the case of an accident or normal maintenance

**Administrator** Interact with the system through a web application.

Given that this is a main asset for the company, because it can effectively block the system, the security of this web application should be very high: possibly a web application accessible only inside PowerEni network with a 2 factor authentication. Once logged in, the administrator can perform these operations

- Register a new worker newly employed in the system, generating a username and a password (and unregister them)
- View the status of a single car (e.g. position, battery charge) and request exceptional tasks on it (not the ones generated automatically by the system)
- View statistics of the system to make better business decisions

## 1.2 Goals

### Drivers goals

- [GOAL1] Log in the system.
- [GOAL2] Allow drivers to reserve a car up to one hour before they pick it up
- [GOAL3] Allow drivers to open the reserved car
- [GOAL4] Allow drivers to pay correctly for the service
- [GOAL5] Allow drivers to cancel a reservation

### Workers goals

- [GOAL50] Log in the system
- [GOAL51] Dispatch tasks to workers
- [GOAL52] Allow workers to get informations about an assigned task

- [GOAL53] Allow workers to open and control the assigned car
- [GOAL54] Allow workers to keep track of the state of the task (assigned, in progress, done)

#### **Administrator goals**

- [GOAL100] Log in the administration console
- [GOAL101] Allow to register new workers
- [GOAL102] Allow to view the status of a specific vehicle
- [GOAL103] Allow to request an exceptional task on a specific vehicle

### **1.3 Domain assumptions**

- Every car is equipped with some wireless communication system to connect it the the internet.
- Every car is equipped with GPS, speedometer and engine state sensors, data is sent remotely to the system through the internet.
- Every car is equipped with a remotely controllable closure system.
- Every car is legally usable on public street (insurance, taxes, maintenance)
- Every time the user reserves a car, the payment is pre-authorized by an amount equal to the rent of a day [MAYBE SHOULD NOT BE WRITTEN HERE]
- Workers are registered in the system by the company itself. The worker application is only distributed to them not on public stores.
- Every user can reserve a car at a time.
- Every worker must have only one task assigned at a time.
- Drivers always respect the driving rules and are able to drive.
- Driver-provided license informations are assumed to be truthful

## 1.4 Glossary

**Driver** Client of the system, i.e. the one that uses the service, reserves and drives. Every driver must provide personal informations (name, surname, email, birthdate, (?phone?)), a valid license and payment informations

**Blocked driver** A driver that has an invalid license or invalid payment coordinates

**Worker** Employee of the company, perform physical actions (moving, charging etc) on cars

**Task** Piece of work assigned to a worker. Different type of tasks are described later. Every task assigns a single car to a single worker.

**Administrator** Employee of PowerEni that is in charge of the administration of the system through the administration console.

**Drop off** The act of leaving the car inside a safe area. This ends the service provided to the driver and effectively make the driver pay

## 1.5 Assumptions

## 1.6 Stakeholders

The stakeholder is the PowerEni company, who needs the system to provide the service itself.

## 1.7 References

## Actors

The principal actors involved in the system are

**Driver** Drivers are the main users, external to the PowerEni company, that want to use the PowerEnJoy service. They need to register to the service providing all the needed informations (payment settings and licenses to drive) through the application or the website.

**Worker** Employee of PowerEni, registered by the company itself through the administration console

**Administrator** Person inside PowerEni that has access to the administrator console.

# Requirements

## 3.1 Functional Requirements

Given all the assumptions, domain properties and constraints from (chapter), these functional requirements can be stated, listed by the goal they fulfill

- [GOAL1] Driver must log in the system
  - The system must check if the provided user exists and if the provided password matches
  - The system must provide further access only if the user is logged
- [GOAL2] Allow drivers to reserve a car up to one hour before they pick it up
  - The system must access driver GPS position or use a user-provided position to recommend the best vehicle to choose
  - The system must check if the user is logged in and if it is not a blocked driver
  - The system must check that the user has no other active reservation
  - The system must check payment service by pre-authorizing a payment of a fixed amount (to be defined)
  - The system must reserve the chosen vehicle, i.e. no other user is allowed to reserve the car until it is available again, once the payment is done. The vehicle is considered available again in case of: drop off, cancel registration, one hour passed from the reservation without any driver interaction
- [GOAL3] Allow drivers to open the reserved car



- The system must check if the user is nearby the reserved car to open it
  - The system must be able to open the car remotely, only if the user effectively reserved it and is nearby
- [GOAL4] Allow drivers to pay correctly for the service
  - The system must log the whole drive by the driver (elapsed time, driven km)
  - The system must compute the amount the driver must pay for the service
  - The system must request a payment of the correct amount
- [GOAL5] Allow drivers to cancel a reservation
  - The system must be able to cancel a reservation if the driver asks it, given that the reservation has not exceed the 1 hour limit, without making him pay
- [GOAL50] Worker must log in the system
  - The system must check if the provided worker id exists and if the password matches
  - The system must provide further access only to logged workers
- [GOAL51] Dispatch tasks to workers
  - The system must be able to create a new task. The new task can be created from the administration console or generated automatically by a set of pre-defined rules (e.g. maintenance, usage balance)
  - The system must select the nearest available worker and assign him the task
  - The system must notify to the selected user that a new task has been assigned to him
- [GOAL52] Allow workers to get informations about an assigned task
  - TOOODODODODO

## Scenario Identification

Here we list some possible scenarios of usage of this service:

### Scenario 1

It's about 9 in the morning and Ned, a well-known consultant, is leaving home to go to an important meeting. When he gets in his car and tries to start the engine the car refuses to turn on. Ned is very concerned because the meeting starts at 10 o'clock. Then he remembers of an advertising seen the day before, so he takes out his phone and looks for PowerEnJoy, a new, reliable car sharing service, on the App Store. He is in a hurry but he discovers that the registration mechanism is fast and intuitive. Since the system can recognise and extract information from pictures, he only needs to take a photo of his credit card and driving licence and that's it, few seconds later he is ready to make a reservation using the map of near-by available cars on the application. He is really lucky, the nearest car is only 100m away from his position. When he reaches it he can unlock it directly with his phone. Thanks to this new service Ned managed to arrive on time to the meeting.

### Scenario 2

Anna is a lawyer and every week she must attend some court hearings at the central court of her city. Unfortunately, the central zone of the town has been declared off-limits to traffic to reduce air pollution. Since she is always carrying with her some important documents she cannot use public transport services. Recently she discovered that PowerEnJoy cars, being electric, can enter the city center. Now she uses PowerEnJoy portal every week to find and reserve cars near her house whenever she needs to go to the court for a hearing. Moreover, when she needs to go back home she uses PowerEnJoy application on her Android smartphone.

### **Scenario 3**

Riccardo is an exchange student who wants to go and see the basketball match at the Arena tonight. Since he has no car he wants to use PowerEnJoy car sharing service to get there. In order to reduce the cost of the ride he decides to pick up some friends on his way. When the new passengers get into the car the seats automatically detect them and the system applies a 10% discount. When he arrives near the Arena the screen on the car notifies Riccardo the presence of a recharging station close to his position. Hence he decides to park at the station and plug the car to the power station. Then, with his phone, he terminates the rental and the application informs him that he obtained a 40% total discount. He is really happy with the service and decides to use it also to go back home.

### **Scenario 4**

Roman is the system administrator of PowerEni. Today, as usual, he is working at PowerEni Headquarter. During his workday he receives a request from the human resources department saying that a new worker, Karim, has been hired. Roman is required to register the new employee in the system. To do that he opens an ad hoc tool on his computer. The tool provides an intuitive user interface for the management of workers' accounts. After having processed the information of the new worker the system prints his new badge and writes a unique NFC signature on it. Few minutes later Karim arrives at the Headquarter and picks up his badge. Then he downloads PowerEniWorker application, creates an account, activates it using the NFC tag and finally registers his fingerprint for future usage. Karim is ready to start working for PowerEni

### **Scenario 5**

Karim is a worker at PowerEni. At the beginning of his workday he opens his PowerEniWorker application and logs in using either his fingerprint or the NFC signature of his identification badge. Automatically the system marks his status as "available" and starts computing a suitable personalised task for the worker. Meanwhile, not far away from Karim's position, Alan, a user, is reporting a flat tire on his car using the dedicated button on PowerEnJoy application. The system terminates Alan's rental and marks the car as "to be repaired". Since Karim is the nearest available worker, the server sends him a push notification with all the information

needed to reach and repair Alan's car. Therefore Karim accepts the task, changing his status to "busy", and gets in his electric van (provided by PowerEni). Once he reaches the faulty car he fixes the flat tire. Finally, always using PowerEniWorker application, he marks the task as "done". The system reacts assigning a new task to Karim and changing the status of the car to "available".