



POLITECNICO DI MILANO

SOFTWARE ENGINEERING 2

PowerEnjoy Design Document v1.0

Alessandro Caprarelli
Roberta Iero
Giorgio De Luca

874206
873513
875598

December 9, 2016

Contents

1	Introduction	2
1.1	Purpose	2
1.2	Actual system	2
1.3	Scope	2
1.4	Actors	3
1.5	Goals	3
1.6	Definition, acronyms, abbreviations	4
1.6.1	Definition	4
1.6.2	Acronyms	5
1.6.3	Abbreviations	5
1.7	Identify stakeholders	5
1.8	Reference documents	6
1.9	Document overview	6
2	Architectural design	7
2.1	Product perspective	7
2.2	User characteristic	7
2.3	Constraints	8
2.3.1	Regulatory policies	8
2.3.2	Hardware policies	8
2.3.3	Interfaces to other applications	8
2.3.4	Parallel operations	8
2.4	Assumptions and dependencies	9
2.4.1	Assumptions	9
2.4.2	Dependencies	10
2.5	Future possible implementations	10
3	Used tools and working hours	11
3.1	Used tools	11
3.2	Working hours	12

Chapter 1

Introduction

1.1 Purpose

This document represents the Requirement Analysis and Specification Document *RASD*. Its aim is to provide a first overview of the system that we want to develop and its main functionalities, in terms of functional requirements, nonfunctional requirements and constraints. We will integrate these specifications with several diagrams in order to highlight the constraints of our system and its boundaries.

This document is addressed to the developers and programmers, who have to implement it, and to the customers to let them have a first view of the system and the possibility to give us feedbacks according to their needs and opinions.

1.2 Actual system

The company is starting its business right now, so we assume that there is no system providing the requested service. All the functionalities have to be developed from the beginning. To develop some functionalities of PowerEnjoy we will rely on external services.

1.3 Scope

The aim of the project PowerEnjoy is to provide an automated service of car sharing. After a registration, a client can hire a car near him/her through the web or mobile

application and he/she can enjoy of all the extra services offered. The exact position of the client is determined by the GPS signal of the client's device or it's allowed to manually insert a specific address. So the system displays all the available cars in the client's close area. Then the client could make a reservation of a car, after which the system notifies the client with a message of confirmation with the car identifier. If the reservation procedure successfully ends the chosen car won't be available anymore for other clients. Moreover a client cannot hire more than one car at the same time. After the reservation the client has at most one hour to reach the car, when this time expires the system gives a penalty to the client and the car, previously hired, is available again for other clients. The system allows the client to cancel his/her reservation. When the client reaches the car, he/she can tell the system that is nearby through a specific button in the application and he/she starts to pay as soon as the engine ignites. During the travel the system supervises the current charge of the car and notifies it to the client through a screen located in the car. The system stops charging the amount of money that the client has to pay when he/she communicates through the application his/her decision to stop the rent. When the car is parked in a safe area and the client exits, the system locks the car automatically and starts the procedure of payment. The client is notified with the result of this procedure through an SMS, including the final fare.

1.4 Actors

- **Guest:** a person that is not already registered in the system or that has to log in. He/she can only display the home page, with the description of the provided services, and the registration page.
- **Registered Client:** a person who has valid access credentials to log in the system (username and password). Once logged in, he/she can request and hire an available car near him/her, cancel a reservation and he/she have access to all the customer area of the application.
- **System Administrators:** a certified user who, after login, has the responsibility to manage administration processes. He is also in charge of updating data about business logic.

1.5 Goals

G1) The Registered Client can hire a car through web/mobile application.

- G2) The Registered Client can hire a car through an SMS.
- G3) The Guest Client can register himself/herself into the system as Registered Client.
- G4) Registered Clients can login into the system.
- G5) The Logged Client can manage his/her sensible data.
- G6) The Registered Client can manage his/her requests of hiring.
- G7) Ensure the Registered Client the possibility to receive a discount on his/her last ride.
- G8) Ensure a uniform distribution of cars in the city.
- G9) Guarantee to have always a minimum number of cars in the system with enough charge to be hired.
- G10) Allow the system administrator to update and check data in the database of the system.
- G11) Guarantee a correct interoperability of the system with external services.
- G12) Ensure that a Registered Client's bad behaviour is punished with the application of some penalties.

1.6 Definition, acronyms, abbreviations

1.6.1 Definition

- **Guest client:** a person that is not already registered in the system or that has to log in.
- **Registered client:** a person who has valid access credentials to log in the system.
- **System administrator:** privileged user, in charge of managing administration processes and of updating business logic.
- **Reservation:** it is the action performed by a registered client that allow him/her to reserve an available car for maximum one hour.
- **Journey time = travel time:** time elapsed since the user starts the engine to the user parks the car and terminates the journey.

- **Available car:** a car that is not reserved by any user and has enough charge to be rented.
- **Unavailable car:** a car that is already reserved or damaged, so impossible to reserve.
- **Gps navigation:** it is the navigation system that is included in the car on board system. It could be used by the user to find direction to the final destination.
- **Final destination:** address where the user wants to go.
- **Safe area:** the region where is permitted to park and leave a car once the rent is terminated.
- **Power grid station:** the area where it's allowed users to park the cars, leaving them attached to the power grid.

1.6.2 Acronyms

- **RASD:** Requirements Analysis and Specification Document
- **API:** Application Programming Interface
- **UI:** User Interface

1.6.3 Abbrevetations

- **[Gn]:** n-goal
- **[Rn]:** n-functional requirement
- **[An]:** n-assumption

1.7 Identify stakeholders

Our main stakeholder is the owner of PowerEnjoy that wants a state-of-the-art application in order to let users to easily locate, reserve, use and pay a fleet of shared electric cars spread across the city.

1.8 Reference documents

- PowerEnjoy specification document (assignment).
- IEEE Std 830-1998 IEEE Recommended Practice for Software Requirements Specifications.

1.9 Document overview

The document is substantially divided in 4 sections:

- Introduction: it gives an high-level description of the software explaining the main purposes, goals and context;
- Overall description: it provides an overview of the main characteristics of the system to develop, pointing out in particular constraints and assumptions.
- Specific Requirements: this part contains all the system requirements, typical scenarios and different kind of diagrams useful to understand easily the functionalities.
- Alloy: the last part of the document contains the description of our model in Alloy, a possible result obtained using this software and the consequent generated world.

Chapter 2

Architectural design

2.1 Prodcut perspective

The PowerEnjoy application will consist of a mobile and a web application for clients, that offer the same functionalities, and an internal interface for the system administrator.

The system also relies on existing external services and their interactions will be described later in this document.

2.2 User characteristic

There are two main classes of users in our system: Clients and System Administrators.

The System Administrators are in charge of managing administration processes and of updating business logic. These users can analyze data in order to produce reports and statistics about the quality of service.

A Client is a person that wants to use this application is a person that wants to move across the city using a car without the responsibility of owning it.

2.3 Constraints

2.3.1 Regulatory policies

The system has to manage sensible data such as email addresses and phone numbers to communicate with users, GPS tracking to locate the clients and credit cards information for payments. Registered Clients must agree with the privacy legislation in force in the country in which the software is used.

2.3.2 Hardware policies

For the mobile application the system requests that the client's device has:

- active internet connection;
- enough space in the device memory;
- active GPS, if the client doesn't want to put manually the address of her/his position.

For the Web Application the system requires that the browser support at least websockets component. As a reference we use this tool: <http://caniuse.com/#feat=websockets>.

2.3.3 Interfaces to other applications

- Google maps: to provide to the user information about the position of the cars and how to reach them.
- Driving licences database: to check, during the registration step, whether a driving licence is valid or not.
- Payment interface service: to manage financial transactions related to PowerEnjoy service.
- SMS gateway provider: in order to send notifications to clients.
- GPS system: to locate clients.

2.3.4 Parallel operations

The server can handle parallel operations and requests related to different clients.

2.4 Assumptions and dependencies

2.4.1 Assumptions

- A1) The Clients can leave the rented cars only in one of the safe areas.[see Safe Area in Definitions]
- A2) There isn't an old system providing the same services.
- A3) Only registered clients can use the services of PowerEnjoy.
- A4) There's no car having the same plate.
- A5) Each car of PowerEnjoy is conformed to have at most 5 passengers, driver included.
- A6) The client that does a reservation can take with him/her in the car at most 4 passengers.
- A7) The car sharing service is operating 24 hours per day, 7 days a week, 365 days per year.
- A8) The position of each car is known using the GPS signal. Each car is provided of an autonomous GPS system reachable from our service.
- A9) In the cars there are sensors that provides the system information about the current number of passengers.
- A10) The cars can only be parked in a safe area.
- A11) A client can maintain his/her reservation of the car during a stop, parking the car temporary in a not safe area. This is allowed only if the client proclaim the intention to do that through the application. During this stop the client continues to pay with some reduction of the standard hiring cost.
- A12) The external services are not affected by downtimes or unavailability.
- A13) Users own skills to interact correctly with the system.
- A14) Users own at least one device to use the functionalities of the system.
- A15) External services provide to our system consistent and valid information.

2.4.2 Dependencies

2.5 Future possible implementations

- Extend the system in order to manage the rent of new kind of vehicle.
- Extend the system to let users filter cars by selecting their desired characteristics(such as number of possible passengers, dimension of the car, minimum desired charge).

Chapter 3

Used tools and working hours

3.1 Used tools

The tools used to create this document are the following:

- MikTex 2.9: to format the document using LaTeX.
- Pencilç to create mookups.
- Visual paradigm: to create sequence diagrams.
- LucidChart: to create use case, state chart and class diagrams.
- Alloy Analizer 4.2: to realize the model and to check its consistency

3.2 Working hours

	Alessandro	Roberta	Giorgio
28/10	1.5	1.5	1.5
29/10		0.5	
30/10	2		1
31/10	1.5	3	2.5
1/11	0.5	0.5	4
2/11	0.5	1	2.5
3/11	3	4	2
4/11	3	2	
5/11		3	3
6/11	1.5	3	
7/11	3.5	1.5	1.5
8/11	2	3	2
9/11	1.5		2
10/11	0.5		
11/11	3	3	3
12/11	3	3	3
13/11	1	1	1
Total	28	30	29