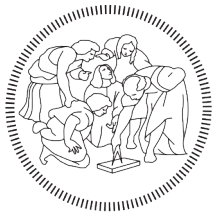

POLITECNICO
MILANO 1863

Requirements Analysis and Specification Document

Version: 0.1

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November 9, 2016

Content

1. Introduction

1. Description of the project

- This Project is based on mobile application.
- The target population is clients and drivers.
- This system is aimed to provide more efficient and reliable services for users to decrease their cost in daily travel. In addition, this system can offer more chances for drives to take more clients to get more profits.

- The complete using process of system is that:

first: Open the application(the user who first use this systemshould bind a credit card andwithout a complicated registration process).

second system uses GPS to get the position, you'll see the number and location of cars nearby.

third Book now or set time point to book cars in advance. Meanwhile, system offers Estimated arriving time and approximate price and driver information, and real-time view of the vehicle route through the APP.

Fourth when arrived the destination, a bound credit card will be charged automatically according to mileage and service time.

- Some other settings: The users who sharing cars will be given discounts. Drivers and passengers can evaluate each other via software. #### 3. Goals **Users**
- G[1] Allows users to login this system according to their phone number and do not need complex registration process.
- G[2] Allows users to modify their information.
- G[3] Allows users to see the cars around him or around an address on the application.
- G[4] Allows users to reserve cars immediately or in advance.
- G[5] Allows users to delete reservation, but if they delete near the booked time, they will be asked to pay for some money.
- G[6] Allows users to unlock and check-in the car when they reserve the car immediately or reserve the car in advance.
- G[7] Allows drivers to know the fees after they take cars and what miles they ride.
- G[8] Allows users to check their rides history after they finished their rides.
- G[9] Allows users to the user should be able to enable economy mode. Before they first use the services, they should bind the personal credit cards.

System - G[10] Allows systems to locate all the cars if the drives login the system. - G[11] Allows systems to retrieve the real-time car variables. - G[12]

System should calculate the price of the ride depending on the time, left charge in the battery and number of passengers.

Operator - G[13] When the drivers registered, driving license and drivers identities should be checked and verified. - G[14] The operator should verify the damaged and faulty cars and asked drivers to upload the certifications. - G[15] The operator can monitor the position of the cars.

3. Domain properties

Analysis of the world and of the shared phenomena. We suppose that these properties hold in the analyzed world :

- There are plenty of electric cars for users to use.
- Every car is equipped a GPS which allows the management system to locate its position accurately.
- The GPS of cars cannot be switched off by users.
- Every user paid a deposit before they use the car.
- Every user has a smartphone always connected to the Internet.
- The position of the user is calculated by his smartphone and is accurate enough to be able to say he is close to the car (Around 5m accuracy)
- Every user has a valid payment to use the cars.
- Every car is not damaged before users reserve it.
- Every user can only reserve/use one car at a time.

- The car is always connected to the management system.
- Every user registers their account with real identity information that is verified by the operator.
- Every user only registers one account.
- Users rent a car only for their personal use or for their friends, but the driver of the car can only be the user who rents the car.
- Cars will be serviced at least once a month. // why?
- Every car will automatically upload the log to the management system every day at 3 AM then the system will automatically analysis the current conditions of the car. // Why not real time?

4. Assumptions

- We assume that the city is fully covered with 3G/4G network.
- We assume that the car have a system that exposes an API to check the status of the car (location, battery level, is charging, number of passengers)
- We assume

  Brain storming for domain properties we will consider that ASSUMPTIONS are more user and car oriented (in the scope of our com-

pany)(How the user behaves how the connection of the car behaves… etc), where as the domain properties are more general (city specific …)

The city where PowerEnjoy operates is a medium to big size city. The city is equipped with charging stations everywhere …

Text assumptions: maybe what the text says and our way of understanding it <====

5. Glossary

- **Client**: The physical person that rents the electric car from PowerEnjoy using his smartphone.
- **Passengers**: One or many persons that may be with the client during the ride.

- **Operator**: The PowerEnjoy's employee that supervises the operations and validates driving licenses.
- **Car**: The electric car that is connected to the Internet through 3G/4G. The car has an onboard computer that senses the ignition, battery levels, number of passengers and location and sends them to the application server.
- **Ride**: A travel in the car by the clients and optionally passengers. A ride starts at the moment the client ignites the engine and stops one he leaves the car.
- **Battery level**: The amount of energy left in the car's batteries. 100% being a full capacity battery and 0% and empty battery. The battery level is increased while charging and decreased while the car is traveling.
- **Charging station**: Locations where the cars can be charged by plugging them to the power grid.
- **Safe areas**: Areas in the map defined by PowerEnjoy's management. The clients should take the cars back to these areas at the end of the ride.
- **Discount**: A reduction (expressed in percentages) removed from the total price of the ride.
- **Car availability**: The car have three availability statuses: Available (A), Booked(B), In a ride (R) or Out of service (O).
- **Available**: It is the status when the car is not booked by a user and it is ready to be used (Charged battery, no mechanical problems…).
- **Booked**: It is the status when the car is booked by a user. A car cannot be in the "Booked" status for more than one hour after the user has reserved it.

- **In a ride**: It is the status when the car is being driven by the user.
- **Out of service**: It the exceptional status of when a car has damage or needs maintenance, thus not available for the users.
- **Car status**: The set of variables that describes the status of the car, this

includes but is not limited to: battery level, position, mechanical problems, availability (Free, booked, in a ride), //TODO ADD MORE IF NEEDED

6. System architecture

Our system contains mobile application, WEB application and server. We will implement a client-server architecture based on common REST API and MVC pattern, so with just one server application we manage both web application and mobile application, as Fig.1.

Shows the different layers of our system (MVC Model). It is good as well to insert the external service such as Google Maps and others …

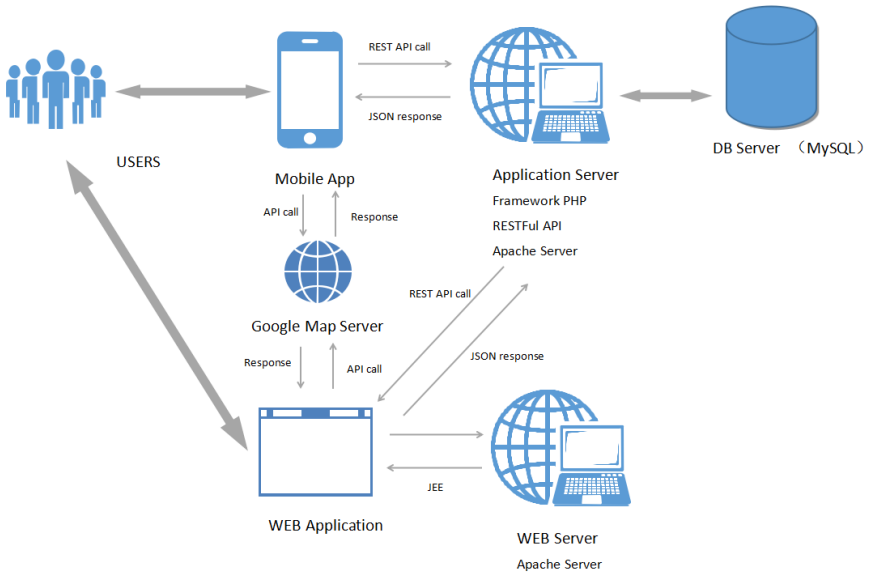


Figure 1: Application architecture

2. Actors

Three main actors to identify:

- *Visitor*: The person that visits the website or the mobile application without being registered. His access to the application is limited.
- *User* : The person that rents the electric cars using the application.The client has a smartphone connected to the Internet and has the mobile application installed in his device.
- *Operator* : The employee that supervises the operations and verifies the driving licenses.We consider that the employees of PowerEnjoy are all operators. This access grants the user the ability to manage (CRUD) the cars and users. They are the supervisors of the cars fleet. The operator is the agent that takes care if the maintenance of the cars. He can see all the cars variables.

3. Functional and Non-functional Requirements

1. Functional Requirements JX

//TODO Should relate each one to a goal

User requirements

- The user should be able to register in the system.
- The user should be able to enter his information into
- The user
- The user should be able to modify his information
- The user should see the cars around him or around an address.
- The user should be able to reserve a car.
- The user should be able to delete a reservation.
- The user should be able to unlock and check-in the car.
- The user should be able to see how much the ride cost him.
- The user should be able to check his rides history.
- Enable money saving option.
- See the station where to park the car to get a discount.
- Report issues to the operator.

System Requirements

- The system should be able to locate all the cars.
- Retrieve the real-time car variables.
- Calculate the price of the ride depending on the time, left charge in the battery and number of passengers.

Operator requirements

- Verify the driving license and identity of the drivers
- Verify the damaged and faulty cars.
- Monitor the position of the cars.

2. Non-functional Requirements

1. GUI Mock-ups LZ

Android GUI Mock-ups

Users in the android app

Web GUI Mock-ups

Users and operators

2. System Quality

- **Performance:** The users will rely on the application to get a car to move around. For this reason, we have to ensure that the application is very reactive and quick.
- **Scalability:** The application should respond properly to the increase of users, usually during commuting hours.
- **Extensibility:** The application should be easily extensible in order to support other platforms for example Windows phones or interface with other applications. For this reason, RESTful web services will be privileged for communication between the application nodes (User's phone, car, server).
- **Privacy and security:** Given the fact that the application holds sensitive information about the users, it should ensure the confidentiality of the information. This will be enforced by the use of SSL for network communications. In addition to that, the passwords should be encrypted using a high-security encryption.
- **Maintainability:** To facilitate the addition of features, the application should be easily maintainable. A well-written code and a complete documentation will be used in order to enforce this point.

3. Technology Enablers

As detailed in // TODO ADD REFERENCE TO ARCHITECTURE, our application will follow the 3-tier client-server application. The application will be composed in this way:

- *Presentation layer:* An Android mobile application and a web application should be used as a graphical user interface.
- *Application layer:* A JEE application running on a Glassfish server will take care of running the business logic of the application.
- *Data tier*: A MySQL server should be used in order to persist all the data that is needed for running the application.

4. Scenarios

Scenario 1

Maria discovers PowerEnjoy through her social media. She is really interested because she occasionally needs a car but she don't want to invest in one. Using the mobile PowerEnjoy application, she registers herself by entering her information and payment details. She went to one of the PowerEnjoy offices to get her account validated by showing her driving license. The account is validated instantly and she is now ready to take her first ride with a PowerEnjoy car.

Scenario 2

John want to go to a furniture and home appliances store to get some new furniture for his apartment. However, he wants to buy so many things that he can't take them with him in public transportation. He checks PowerEnjoy's website and finds a car right next to the store. He reserves it and he is now sure that he will take all his shopping home without trouble.

Scenario 3

Jessy and his friends like to play football during weekends to destress. The problem is that the football field is out of the reach of public transport. Since Jessy is a PowerEnjoy member, he can reserve a car and drive all his friends to the football field. He will even benefit from a discount because he had three passengers with him.

Scenario 4

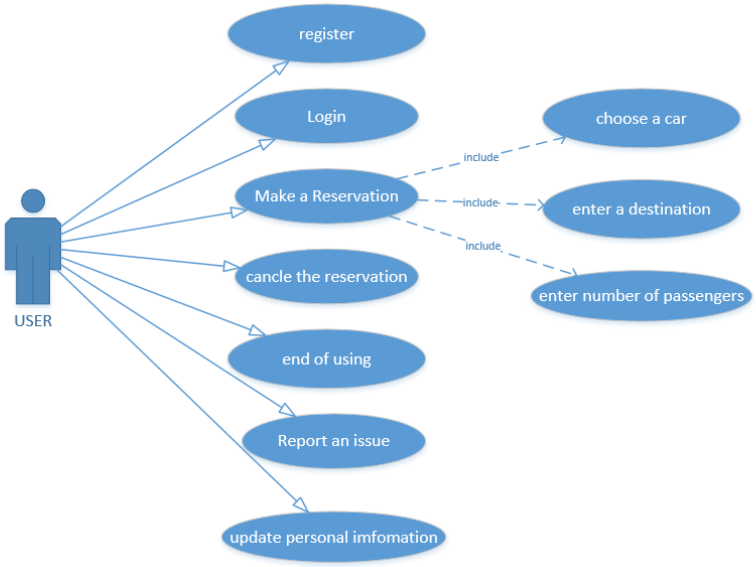
Maria is a very concerned about the environment and wants to adopt new habits to protect the environment. She knows that electric cars are very environment-friendly but she cannot afford an electric car. With PowerEnjoy she can easily lookup all the electric cars available on a map and reserve one using her smartphone. By using PowerEnjoy for all her commutes, Maria decreases her carbon footprint.

Scenario 5

5. UML Diagrams

1. Class diagram RA

2. Use case diagrams LZ



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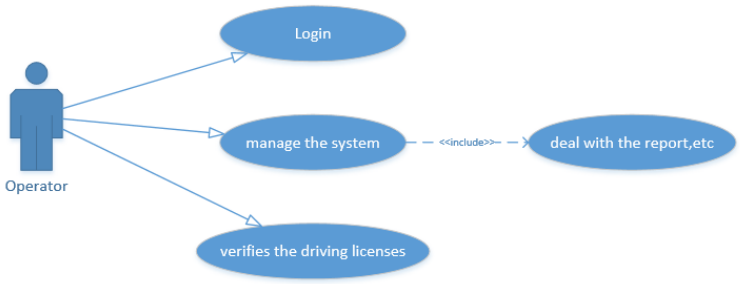

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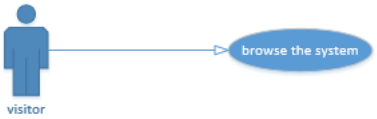

// TODO Description

6. Alloy Model and Checking

Hours worked