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Software Engineering 2 project:*PowerEnJoy*

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RASD

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

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1 Introduction

1.1 Purpose

ShareEnJoy is a new company that wants to enter the car sharing market and wants to provide a service based on electric vehicles only. The way they want to implement their service is classical and very common to other car sharing services: it will be available in a specific geographical area (called safe area) for each city in which the service will be activated. Users will be able to reserve and then rent a vehicle, use it for as much time as they desire and then be charged based on the rental time.

As the car sharing service is based on electric vehicles only, the system must provide some specific functionalities in order to handle electric vehicles specific behaviours. For example, the company owns some electric recharging stations spread in the safe area and users should be encouraged to terminate their rentals in these stations.

ShareEnJoy needs a digital management system in order to support all the activities for both their customers and their operators.

1.2 Scope

Following the "The World & Machine" approach by M. Jackson and P. Zave we can identify real word entities that interact with the system ("the Word"), system entities ("the Machine") and the intersection beetwen them ("the shared phenomena").

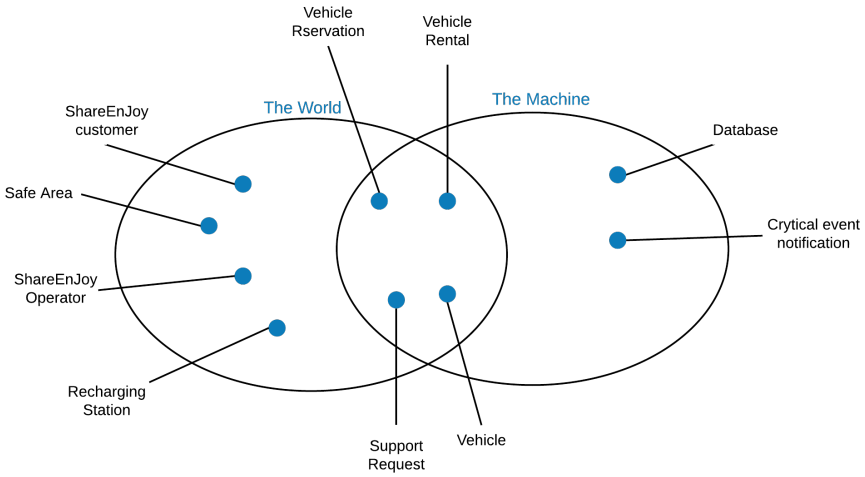

Figure 1: "The World & Machine" Venn diagram

The system will be composed of three main modules with different roles and purposes:

ShareEnJoy Mobile App This component is intended to be used by ShareEnJoy customers and will offer the functionality to see available vehicles in a specific geographical area, reserve and then rent a vehicle. It also allows users who have reserved a vehicle and who are nearby to it to unlock it. Through the app users can also send support requests to ShareEnJoy support staff.

ShareEnJoy Control Room This component is intended to be used by ShareEnJoy operators in order to have a real time blueprint of the system, handle support requests and be notified for some specific events (e.g. a customer payment failure, a car that runs out of battery).

ShareEnJoy Core This component is intended to contain all the system logic. It should work as a connection node between all the other components as well as connection point to vehicles. It should handle user's payments through a payment gateway and perform automated tasks.

A list of high level goals that the system should accomplish is the following:

|G1| The system should know vehicles position and information such as model, battery percentage, mechanical issues and damages.

|G2| The system should be able to show on a map the position of available vehicles together with some selected status information (e.g. battery percentage) and estimated information (e.g. kilometers authonomy).

|G3| Users should be able to reserve a vehicle, unlock it when they're close to it's position and start the rent.

|G4| The system should charge the users after each rent with fees based on company policies.

|G5| Users should be able to send a support request.

|G6| Company operators should be able to handle support requests forwarded by users.

|G7| Company operators should be able to see and handle notifications sent by the system as a reaction to some specific events.

1.3 Definitions, acronyms and abbreviations

In order to avoid ambiguity and possible misunderstanding here are formally listed some recurrent terms and acronyms used in this document.

The System	The digital management system to be developed.
ShareEnJoy	The company to develop the system for. Also referred as 'the company'.
Vehicle	A vehicle owned by the company that can be used in the car sharing service.

User	A person who wants to use the system and it's not a member of the company.
Logged-in user	A user who has completed the log-in process so that it can be associated with a real identity and payment information.
Customer	A user or a logged-in user.
Operator	A person who wants to use the system and it's authenticated as a member of the company.
Availabe vehicle	A vehicle that is not reserved by anywan and can be reserved by a logged-in user.
Reserved vehicle	A vehicle that has been reserved by a logged-in user.
Rented vehicle	A vehicle that is currently rented by a logged-in user.
Expired reservation	A reservation that has not been cancelled or transformed in a rental after a certain amount of time defined by company policies.
Safe Area	The geographical area in which a vehicle can be parket and rental terminated.
DBMS	Database Management System
TBD	To Be Determined

1.4 Reference documents

|REFD1| Assignments AA 2016-2017

|REFD2| ISO/IEC/IEEE 29148, first edition, 2011-12-01

|REFD3| Requirements Engineering Part III

|REFD4| IDC Research Inc analysis on mobile operating systems market share `http://www.idc.com/prodserv/smartphone-os-market-share.jsp`, 2016 Q2

|REFD5| Android distribution per version `https://developer.android.com/about/dashboards/index.html`, as of 2016-11-02

|REFD6| iOS distribution per version `https://david-smith.org/iosversionstats/`, as of 2016-11-02

1.5 Overwiew

TODO

2 Overall Description

2.1 Product perspective

The central component of the entire system is the ShareEnJoy Core module which is the component where all the logic is put. This piece of the system is in charge of providing an interface to vehicles on-board information system, of processing requests from the other modules of the system, of accessing system database and of interfacing with the payment gateway.

All the other modules of which the system is made of (i.e. ShareEnJoy Mobile App and ShareEnJoy Control Room) should interface with the core module in order to accomplish required tasks (e.g. user's registration and login, vehicle reservation request, etc).

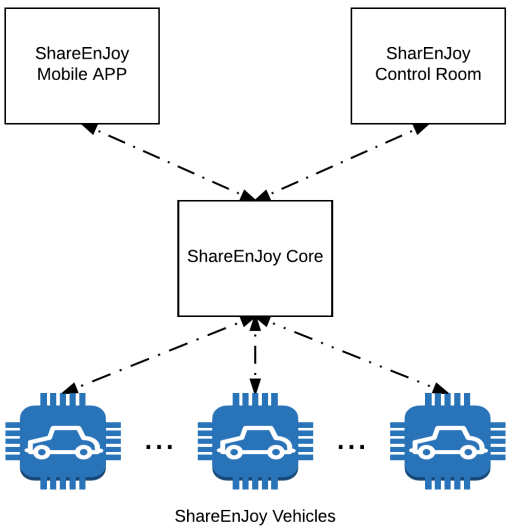

Figure 2: Block diagram of the system structure

2.1.1 User Interfaces

ShareEnJoy Mobile App This module will be implemented as a mobile application and it's intended for costumers. It's important that the most used commands are visibile and easy navigable. Secondary commands of less frequent usage can be organised in secondary less visible menus.In order to avoid mistakes between commands it's better

to not have too many selection on every page, text explainations should be clear and concise. Error windows should show short error descriptions together with an error identification code.The applica-

tion should follow the design guidelines of the different operating system it will be implemented for (i.e. Material design for Android, ModernUI for iOS) and support all screen resolutions between ldpi and xxdpi.

ShareEnJoy Control Room This module will be implemented as a web application and it is intended for operators. Functionalities should be well categorized and unambiguous. Most frequently used functions should be as easy and immediate as possibile in order to speed-up operators work and reduce customers wait time. Some macros could be present in order to reduce repetitve tasks. It should be accesible through a common internet connection and it should be well optimized for a single chosen browser and a screen resolution. Error windows should show a long error message in order to easily recover.

ShareEnJoy Core This module does not provide a direct user interface since it's intended to be managed and maintained by qualified and specialized staff. It should provide a very detailed activity logs.

2.1.2 Hardware interfaces

ShareEnJoy Mobile App This component should obtain device location by its operating system. If GPS position is unavailable or insufficiently precise, a localization through wifi network could be possibile. If both methods fail or can't provide the desired level of acuracy the application can't work properly.

ShareEnJoy Control Room This software does not have any hardware interfaces.

ShareEnJoy Core This software does not have any hardware interfaces.

2.1.3 Software interfaces

ShareEnJoy Mobile App Android and iOS together cover about the 99% of the mobile operating system market share[1] and are the systems we are going to focus on.
After analysing per operating system distribution and share, a good compatibility tradeoff could be the following.

Mobile device operating system	
Operating System	Min. version
Android	4.1 (API level 16)
iOS	9

With this minimal requirements we can support 97% of android devices[2] and 92% of iOS devices[3]

[1] REFD4
[2] REFD5
[3] REFD6

ShareEnJoy Control Room This software will require a Java EE application server. It should integrate a support ticket system in order to handle support requests forwarded by users.

Application server	
Name	Glassfish
Version	4.1.1

Support ticket system	
Name	osTicket
Version	OSE 1.10

ShareEnJoy Core This software has to interface with vehicles on-board information system, with the payment gateway and with a DBMS. It will require a Java EE application server.

Vehicles information system	
Name	ShareEnJoy Vehicle I.S.
Version	1.0

Payment Gateway	
Name	GESTPAY
Version	Professional

DBMS	
Name	MySql Community Edition
Version	5.7.6

Application server	
Name	Glassfish
Version	4.1.1

The module can properly work on every operating system as long as these components are installed and work properly.

2.1.4 Communication Interfaces

All modules should communicate with the core module in order to complete tasks, thus the core module can be seen as an internal API provider. All the communications between the modules are bidirectional and could be implemented through the internet HTTPs protocol using a REST approach. Responses could be in the JSON format.

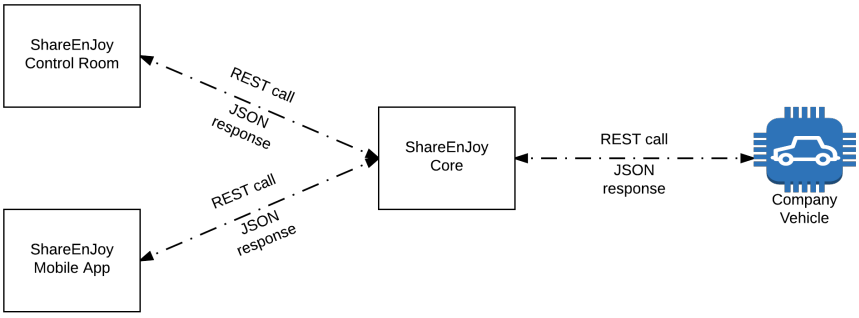

Figure 3: System modules communication scheme

Communication between the core and the DBMS works using the TCP protocol on port 3306.

Communication between the core and the payment gateway works using the TCP protocol on an arbitrary port.

The ShareEnJoy control room can be accessed using the HTTPs protocol on port 80.

2.1.5 Memory constraints

Users must have enough space to install ShareEnJoy Mobile App application on their own devices. The size of the application is still unknown but it can be estimated in less than 100MB.

The system on which the core module will be run requires enough primary memory space in order to install required softwares (Section 2.1.3). Other 5GB of primary memory space are required for the database and the software itself. A good amount of secondary memory (i.e. 32GB) will result in better performances for both the software itself and the DBMS.

2.1.6 Operations

TODO

2.2 Product functions

In this section are listed all the functionalities that the system-to-be is going to provide.

2.2.1 Functional requirements

Functional requirements are listed per system component:

ShareEnJoy Mobile App

- Registration
- Log-in
- See and edit logged-in user's own profile information and payment method
- Show available vehicles on map
- Search available vehicles based on GPS localization or specific address
- Show vehicle information (i.e. battery percentage, estimated kilometers authonomy)
- Make new or cancel existent vehicle reservation
- Unlock a reserved vehicle
- Guide the user to the reserved vehicle
- Send a support request

ShareEnJoy Control Room

- Login
- Show all vehicles position and information
- Show user account information, disable an user
- Show user last activities
- Show users support requests and allow operators to reply or close the requests
- Show system notifications and mark them has *handling*, *handled*, $not - handled$

ShareEnJoy Core

- Handle rent events (i.e. *RENT STARTED*, *RENT TERMINATED*)
- Send commands to vehicles (e.g. *UNLOCK DOORS*)
- Charge users after each rent applying company pricing policies
- Handle payment failure: disable the user'acount if it's payment information are nomore valid
- Access and edit the company database
- Notify users via SMS on their mobile phone number or via push notifications through the SharEnJoy Mobile App
- Generate monthly invoices and sent them to the users on their email address
- Detect expired reservation and charge the user for them

2.2.2 Non-functional requirements

- The system must be able to handle thousands of requests simultaneously.
- The system should work properly 24 hour a day, 7 days a week and should provide an high uptime score. Maintenance can be scheduled during the night, when traffic is lower.
- Users' information should be securely stored in the company database and not accessible to unhautorized people. Espacially passwords should be encryptet using efficient cryptography algorithms.

2.2.3 Company pricing policies

The company has defined some specific pricing policies to be applied in correspondence with some specific user behaviours

- Expired reservation has a cost of 1EUR.
- The rental starts as the user turns on vehicle engine.
- The rental stops as the user parks the vehicle within the safe area and all the passengers leave the vehicle.
- Rental fee is per minute.
- A 10% discount is applied on the total rental fee if there are at least 2 other passengers in the vehicle for more than the 50% of the rental time.
- A 20% discount is applied on the total rental fee if the vehicle is parked with more than 50% of battery capacity available.
- A 30% discount is applied on the total reantl fee if the vehicle is parked in a charging station and the user plugs-in the charging cable.
- A 30% extra fee is applied on the total rental fee if the vehicle is left more than 3KM away from a rechargin station or if the vehicle is left with less than 20% of battery capacity available.
- If more than a discount or an extra fee should be applied, extra fees are applied first in ascendant order, discounts are applied later in descendant order.

2.3 User characteristics

We distinguish beetwen two main categories of users

ShareEnJoy Customers Customers that want to use the service in order to rent a vehicle.

- Users: They can only see the position of available vehicles. Anyone that uses the app without logging-in.

- Logged-in users: They can access to all the functionalities of the service. They are associated with a real identity and a payment method. Logged-in users should possess a valid driving license, which should be indicated during the registration process. People with disabilities that doesn't allow the to drive a normal vehicle cannot register and use the service: this check is done validating drive license data during the registration process.

ShareEnJoy Operators They're workers of the company, thus they have a good knowledge about the service and will follow a training on how to use ShareEnJoy Control Room software.

2.4 Constraints

2.4.1 Regulatory policies

The system needs to store in the company database personal information of the customers (e.g. name, surname, address, email address, telephone number) as well as to access users' locations in order to track vehicles. These management of this kind of personal information should respect local laws beloning to each area in which the service will be available.

2.4.2 Safety and security considerations

Communications between system modules should be secure and use latest encryption protocol in order to avoid man-in-the middle or other kind of informatic attacks that could lead to data loss.
Communications towards vehicles should be secured in order to avoid illegal vehicles unlocks perfomerd by malicious users.

2.5 Assumptions and dependencies

The system is based on the following domain assumptions:

- Information provided by vehicles on-board information systems (i.e. vehicle location by GPS, battery percentage, mechanical damages) are always accurate and available.
- If a vehicle cannot obtain location by GPS or has not internet connection it's considered unavailable and not shown to users.
- Vehicles always unlock when the system tells them to unlock. This is true for each type of command.
- If a user has a valid driving license then he can access the service (this deals mainly with disabilities).