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Software Engineering 2 Requirements Analysis and Specification Document

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1 | Introduction

The EVs are eco-friendly vehicles that will be on our roads in the next future. In order to keep global warming below 1.5°C, Europe have decided to reduce greenhouse gas emissions of CO2 per person per year by 2030, and, by the same year, the IEA predicts that electric vehicles will have a market share of roughly 30 percent, with a total number of 23 million e-cars on the roads. EVs consumption is measured in kilowatt-hours per 100 kilometers, and most of the current electric cars can travel between 150 and 350 kilometers on a single charge, but premium-brand models can currently cover more than 500 kilometers.

In this context, when people use an electric vehicle, knowing where to charge it and carefully planning the charging process in such a way that it introduces minimal interference and constraints on our daily schedule is of great importance.

That's were `eMALL` operates: it can find charging stations owned by several Charging Point Operators - CPO - and, considering the activities in user's schedule, it can propose the best possible path of charging process in order to minimize the cost and the waisted time at the station.

1.1. Purpose

ID	Description
G1	The EVD can see charging stations nearby a specific location on the map
G2	The EVD can get the costs of charging stations
G3	The EVD can search for special offer provided by charging stations
G4	The EVD can book a charge for his EV at a charging station for a specified time frame
G5	The EVD can pay for the recharging service
G6	Given the destination inserted in an activity in his calendar application, the EVD receives suggestions to charge his EV

Table 1.1: The goals.

1.2. Scope

ID	Description
WP1	The DSO provides energy to the CPO
WP2	The EVD wants to charge his EV's battery
WP3	The EVD wants to know the prices of a specific charging station
WP4	The EVD wants to know if there are any special offer he can redeem
WP5	The EVD wants to know the position of a specific charging station
WP6	An eMSP actives a new offer for his customers
WP7	The CPO have deals with eMSP and offer them their charging station
WP8	The EVD pays for the service
WP9	The EVD inserts a new activity in his calendar

Table 1.2: World Phenomenas.

ID	Description	Controller	Observer
SP1	The EVD creates an account in eMALL system	EVD	eMALL
SP2	The EVD logs in eMALL	EVD	eMALL
SP3	eMALL notifies the EVD about the need of charging the EV	eMALL	EVD
SP4	eMALL gets EVD's current position	eMALL	EVD
SP5	eMALL gets the position of charging stations through eMSP's API	eMALL	eMSP
SP6	eMALL gets the costs of charging stations through eMSP's API	eMALL	eMSP
SP7	eMALL gets special offers active in close charging stations through eMSP's API	eMALL	eMSP
SP8	eMALL gets information about the availability of charging points in a charging station through eMSP's API	eMALL	eMSP
SP9	eMALL gets information about the plugs available in a charging station through eMSP's API	eMALL	eMSP
SP10	The EVD retrieves information about the availability of charging points in a charging station	EVD	eMALL
SP11	The EVD retrieves information about the availability of a specific plug in a charging station	EVD	eMALL
SP12	The EVD books a charging point for a specific plug through eMALL	EVD	eMALL
SP13	The EVD pays for a caution after booking a charge through eMALL	EVD	eMALL
SP14	The EVD starts the charge and waits until the battery reaches the desired level of power	EVD	eMALL

Table 1.4: Shared Phenomenas.

1.3. Definition, Acronyms, Abbreviations

Acronyms	Definition
eMSP	e-Mobility Service Provider
CPO	Charging Point Operator
CPMS	Charge Point Management System
DSO	Distribution System Operator
RASD	Requirements Analysis and Specification Document
WP	World Phenomena
SP	Shared Phenomena
GX	Goal Number X
EVD	Electric Vehicle Driver

Table 1.5: Acronyms used in the document.

1.4. Revision history

1.5. Reference Documents

The specification document `Assignment RDD AY 2022-2023.pdf`.

1.6. Document Structure

The document is structured in six sections, as described below.

First section introduce the goals of the project, purposes, and a brief analysis on world and shared phenomena; abbreviations and definitions useful to understand the problem are listed as well.

The following section, the second one, provides an overall description of the problem: here scenarios and further details on domain, and scenarios are included, aside from more product and user characteristics, assumptions, dependencies and constraints.

Later on, the third section focuses on the specific requirements and provides a more detailed analysis of external interface requirements, functional requirements and performance requirements.

Lastly, the fourth section provides a formal analysis, using alloy. This chapter is crucial to prove the correctness of the model described in the previous sections, and should focus

on reporting results of the checks performed and meaningful assertions.

Section five reports the effort spent by each group member in the redaction of this document, meanwhile the last section simply lists bibliography references and other resources used to redact this document.

2 | Overall Description

2.1. Product perspective

2.2. Product functions

2.3. User characteristics

2.4. Assumptions, dependencies and constraints

3 | Specific Requirements

3.1. External Interface Requirements

3.1.1. User Interfaces

3.1.2. Hardware Interfaces

3.1.3. Software Interfaces

3.1.4. Communication Interfaces

3.2. Functional Requirements

3.3. Performance Requirements

3.4. Design Constraints

3.4.1. Standards compliance

3.4.2. Hardware limitations

3.4.3. Any other constraint

3.5. Software System Attributes

3.5.1. Reliability

3.5.2. Availability

3.5.3. Security

3.5.4. Maintainability

3.5.5. Portability

4 | Formal Analysis Using Alloy

5 | Effort Spent

6 | References

A | Appendix A

If you need to include an appendix to support the research in your thesis, you can place it at the end of the manuscript. An appendix contains supplementary material (figures, tables, data, codes, mathematical proofs, surveys, ...) which supplement the main results contained in the previous chapters.

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