POLITECNICO
MILANO 1863

eMall

RASD

Requirement Analysis and Specification Document
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Contents

1 Introduction

This RASD aims to provide an overview of the project eMall. The following document will help the reader to understand the purpose of the project, namely in which environment the application operates and which services others to its users. In particular way, it will illustrate goals and how these may be reached by guaranteeing certain functional and nonfunctional requirements.

1.1 Purpose

The purpose of the eMall (e-Mobility for All) software application is to allow drivers to charge their electric vehicle easily, quickly and effectively, helping to: limit the carbon footprint caused by the urban and sub-urban mobility needs, know where to charge the vehicle and carefully plan the charging process in such a way that it introduces minimal interference and constraints on our daily schedule.
The eMall software application also offers to the CPOs (charging point operators) the ability to manage each charging station in the best way.

1.1.1 Goals

We may extract the following goals for the application:

- [$G.1$] - The system allows users (drivers or CPOs) to be recognized with two different forms of identification.
- [$G.2$] - The system allows drivers to visualize the charging stations closer to their position.
- [$G.3$] - The system allows drivers to reserve a seat in a selected charging station.
- [$G.4$] - The system allows drivers to charge their electric vehicle.
- [$G.5$] - The system allows drivers to pay for the service offered by the charging station.
- [$G.6$] - The system allows CPOs to visualize the options of any charging station.
- [$G.7$] - The system allows CPOs to decide how to charge electric vehicles at a selected charging station.
- [$G.8$] - The system allows CPOs to decide from which DSOs (Distribution System Operators) to buy electricity.
- [$G.9$] - The system allows CPOs to decide the price of the energy supplied, and any offers, of a selected charging station.
- [$G.10$] -

1.2 Scope

In this section we want to give a brief analysis of the world and of the shared phenomena.

- The Machine is the application software that we want to develop.
- The World is the external environment, namely the part of the real world that is affected by our system.

These two parts communicate and influence each other.

1.2.1 World phenomena

World phenomena are events that take place in the real world and taken by themselves do not have a direct impact on the System.
We identify the following world phenomena:

- A driver wants to charge his electric vehicle.
- A CPO needs to modify the options of a charging station.

1.2.2 Machine phenomena

Machine phenomena are events that entirely take place inside the System and cannot be observed in the real world.
We identified:

- Retrieving result data for a request.
- Storing collected data.

1.2.3 Phenomena controlled by the Machine and observed by the World

- The machine shows the options of a selected charging station.
- The machine blocks a seat in the charging station that a driver has requested to book.
- The machine shows the charge state of a EV.
- The machine shows the list of the DSOs asked by the CPOs.

1.2.4 Phenomena controlled by the World and observed by the Machine

- A user registers for use the application.
- A driver selects a closer charging station.
- A driver reserves a seat of a selected charging station.
- A driver inserts the code into the socket for unlock the reserved seat.
- A driver connects the EV to a socket of a charging station.
- A driver inserts datas of payment.
- A driver stops to charge the EV.
- A CPO selects a charging station.
- A CPO modifies the prices of a selected charging station.
- A CPO selects DSOs from which to buy energy.
- A CPO modifies the charging modalities of a charging station.

1.2.5 World and Machine Table

1.3 Definitions and abbreviations

1.3.1 Acronyms

- RASD : Requirement Analysis and Specification Document.
- eMSPs : e-Mobility Service Providers.
- CPOs : Charging Point Operators.
- CPMS : Charge Point Management System.
- DSOs : Distribution System Operators.
- UML: Unified Model Language.
- API: Application Programming Interface.
- EV : Electric Vehicle.
- CS : Charging station

1.3.2 Definitions

- User: is the generic person that uses the system. Can be referred to a driver or a CPO.
- Driver: person who driver an electric vehicle.
- Charging Point Operator: person who managed charging stations.
- e-Mobility Service Providers: the application used to the users.
- Distribution System Operators: entities from which the CPOs can buy energy.
- Charging station: station in which drivers can charge their electric vehicles.
- Charge Point Management System : IT infrastructure used by CPOs to administer charging stations.

1.3.3 Abbreviations

- $[G.n]$ = n-th Goal
- $[R.n]$ = n-th Requirement
- $[D.n]$ = n-th Domain assumption

1.4 Revision history

Version	Date	Details
...	...	...
...	...	...

1.5 Reference Documents

Title	Authors	Links
The World and the Machine	Michael Jackson	Online PDF
Alloy Official Documentation	MIT Software Design Group	Alloy documentation

1.6 Document Structure

The rest of the document is organized as follows:

Overall Description (Section 2) gives an overall description of the eMall application and services that it is going to offers, underlining its principle goals. Here we also given an introduction about the world in which the system will be collocated, highlighting the boundaries between the machine and the world.

Specific Requirements (Section 3) contains an in-depth description and explanation of the system that we want to develop. In particular we will provide a class diagram in order to give a general view of the application, some state diagrams to explain the evolution of some parts of the domain and finally an explanation about different users and domain assumptions.

Formal analysis using Alloy(Section 4) uses Alloy to generate a formal model of some critical parts of the domain. Some images of significant instances satisfying this model are provided.

2 Overall description

2.1 Product perspective

To better understand the peculiarities of the product, it is important to detail the domain for which it is intended. In this chapter a detailed analysis of the shared phenomena and a visual representation of the domain model will help to achieve the scope.

2.2 Product functions

In this section we will present in a descriptive form the main functionalities of the system. Starting from the involved scenarios, the most important requirements will be extrapolated with the purpose of conducting a more precise and formal analysis of them in the next chapter.

3.3 Performance requirements

3.4 Design constraints

3.4.1 Standards compliance

3.4.2 Hardware compliance

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 Efforts

Individual Work		
	Eutizi Claudio	***Perego Gabriele***
Task	**Hours**	**Hours**
Purpose and Goals	0	0
Scope	0	0
Definitions, Acronyms, Abbreviations	0	0
Revision history	0	0
Reference documents	0	0
Document structure	0	0
Product perspective Class diagram	0	0
Product functions	0	0
User characteristics	0	0
Assumption, Dependencies and Constraints	0	0
External interface requirements	0	0
User interfaces	0	0
HW, SW, Communication interfaces	0	0
Functional requirements	0	0
Scenarios	0	0
Use Case Diagrams and Analysis	0	0
Sequence Diagrams	0	0
Requirements, Domain Assumptions, Goal Matrix	0	0
Performance requirements	0	0
Design constraints	0	0
Standards and Hardware compliance	0	0
Software system attributes	0	0
Alloy model	0	0
TOTAL	**0**	**0**

6 References

- R&DD Assignment AY 2022-2023
- Alloy references: https://www.csail.mit.edu/research/alloy