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RASD&DD

1 Introduction

1.1 Purpose

Electric mobility (e-Mobility) is a way to limit the carbon footprint caused by our urban and sub-urban mobility needs. When using an electric vehicle, knowing where to charge the vehicle and carefully planning the charging process in such a way that it introduces minimal interference and constraints on our daily schedule is of paramount importance.

There are four main entities that need to interact in order to provide the mentioned service:

1. eMSP (e-Mobility Service Providers): an application that links together the final users (owners of electric vehicles) and the charging stations
2. CPOs (Charging Point Operators): they own and manage the charging station
3. DSOs (Distribution System Operators): energy providers

The purpose of this project is to develop e-Mall (e-Mobility For All), a set of applications that:

- will grant the user the possibility to book charges for its vehicles and pay for it, monitoring costs and special offers;
- allows CPOs to handle their own charging areas through CPMS (Charge Point Management System) that manages the charging columns and the energy acquisition for the single charging stations, automatically or manually by employees.

This document later will further expand on the goals and requirements put on the system to be with the purpose of guiding the development.

1.1.1 Goals

Goals	Description
1	Allow user to pay for a charge
2	Allow user to book a charge
3	Allow user to know about charging station location
4	Allow user to know about charging station prices and special offers
5	Allow user to start a charging process
6	Allow CPMS to notify eMPS when a charging process is finished
7	Allow CPMS to manage reservations
8	Allow CPMS to manage the power input of the charging station
9	Allow CPMS to manage the power output of the charging station

Scope

Our system focuses on the eMSP and CPMS subsystems with all the features listed in the specification document whithout making the eMSP smarter than it needs to for the end user.

World phenomena

Identifier	Description
	Energy cost shifts

	Car is low on battery
	User gets to the charging station

Shared phenomena

Identifier	Word controlled
	User makes a reservation
	User plugs the car to the carging station
	User registers an account
	User inserts his vehicle in to the eMSP app
	User validates it’s reservation through nfc on the charging column
	User unplugs the car from the charging station
	User searches for a specific charging station
	User is late to the reservation [MAYBE WORLD PHENOMENA]
	Chargin Station operator decides on which energy source to use
	Chargin Station operator decides on the price/offer for the energy
	Chargin Station operator decides whether to store energy in batteries or to use stored energy

Identifier	Machine controlled
	A payment is charged to the user
	CPMS allows charging column to charge vehicle
	System shows vehicle list to user
	System shows informations about charging stations
	System shown reservation list
	System sends “Charging done” notification
	System shows charging stations map
	CPMS asks for energy prices to the DSOs
	CPMS decides which energy source to use

Definitions, Acronyms, Abbreviations

Definition	Description
Charging column	A device with one ore more standard charging sockets equipped with a NFC reader
Charging station	A group of charging colums displaced in a nearby area owned by a CPO and managed through the CPMS
User	Person interested in using the system
Operator	Instructed personnel that manages a charging station

Acronyms	Description
eMSP	e-Mobility Service Providers application that links together the final users and the charging stations
CPOs	Charging Point Operators owners and managers of the charging station
DSOs	Distribution System Operators energy providers
CPMS	Charge Point Management System manages reservations and energy for charging stations
eMall	Electric Mobility for All

Abbrevations	Descrpition
RASD	Requirements Analysis and Specification Document

Revision history

Reference Documents

The specification document “Assignment
RDD AY 2022-2023_v3.pdf”

Document structure

Overall description

Product perspective

Scenarios

S1. User sign up

Elon want’s to sign up to the eMSP system because he just bought a Tesla Model S. He opens the previously downloaded app and selects the option to sign up. He inserts his data and the payment methods which will first need to be verified to be effectively registered to the service.

S2. Making a new reservation for the next week

Jeff will be on travel next week so he wants to make a reservation so that he will be able to have lunch while the car is charging. He opens the app and through the search bar he searches for the location he will be having lunch in. The map moves and shows the nearby charging station marked with different colors accordingly to their max charging rate. Jeff selects the nearest CS with ultra fast charging speed, views it’s cost and selects “Book a charge”. He now inputs the date and, from the available time-frames list with relative charging rates, he selects the most suitable for his time of arrival and expected permanence. A small booking fee is charged on Jeff’s payment method.

S3. Making a reservation for the immediate future

Bill’s car is signaling that is low on charge so he pulls over and opens the app. He selects “Charge NOW” and the map moves to his current location. Different SC with available slots for the current time are shown marked with colors accordingly to their max charging rate and with an exclamation mark in case there’s a ongoing offer. Bill notices that a nearby charging station is promoting a good offer so he clicks on it and the current price is shown. He selects the required duration and then “Go NOW” to confirm his booking and arrival. A small booking fee is charged on Bill’s payment method.

S4. Charging process

Mark arrived at the charging station right on time for his quick charge reservation. He identifies the right charging column for the requested charging speed and parks near

it. After getting out of the car and opening the app he places his NFC enabled phone on the reader marked on the charging column. The CPMS validates the reservation and unlocks the charging socket to which Mark plugs the car to before leaving for the bar. When the booked time-frame is up the eMSP app notifies Mark that his reservation ended and to go retrieve his car to which he goes. He unplugs it and get’s in to drive home; on his way the payment is processed and receives a notification with the total charging cost.

S5. Missed reservation

Requirements	Description
	Allow user to link a payment method to his account
	Allow user to sign in
	Allow user to register an electric vehicle NO
	Allow CPMS to automatically decide which DSO buy energy from NO
	Allow CPO to manually decide which DSO buy energy from NO
	Allow CPMS to automatically decide how to distribute its own battery and net energy NO
	Allow user to sign up to the eMPS service