Contents

1 Introduction

1.1 Purpose

Paragrafetto che spiega il progetto

G1 The eMSP shall help the user to select the station; [W1,W2] [S1,S5]

G2 The eMSP shall allow the user to book a charge; [W1,W2] [S4]

G3 The eMSP shall allow the user to perform a charge; [W1,W2,W3] [S2,S6]

G4 CPMSs shall handle the car charging cycles; [W1,W5,W6] [S7]

G5 CPMSs shall manage the car charging stations; [W4,W5,W6] [S3, S7]

1.2 Scope

W1 People charge electric cars;

W2 People use web calendar;

W3 People pay for the charging service;

W4 Distribution System Operatorss (DSOs) supply energy to Charging Point Operatorss (CPOs);

W5 Some CPOs own batteries;

W6 CPOs decide whether to use batteries or DSO supplied energy;

S1 The eMSP suggests the user to charge the vehicle;

S2 The eMSP notifies the user when the charging process is finished;

S3 CPMSs acquire information about energy prizes from DSOs;

S4 The user books a charge using the eMSP;

S5 The user asks the eMSP for suggestions about charging station;

S6 The user pays for the service using the eMSP;

S7 CPOs gather the energy source through the CPMS;

1.3 Definitions, Acronyms, Abbreviations

eMSP e-Mobility Service Providers

CPO Charging Point Operators

CPMS Charge Point Management System

DSO Distribution System Operators

API Application Programming Interface

1.4 Revision history

1.5 Reference Documents

1.6 Document Structure

2 Overall Description

2.1 Product perspective

Domande utili per UML:

1. C'è una relazione 1:1 tra CPO e CPMS oppure un CPO è una compagnia che gestisce tante stazioni di ricarica?
   Per ogni CPO c'è un CPMS che amministra PIÙ stazioni di ricarica
2. Mi immagino il CPMS come una periferica che ha ogni stazione a disposizione, l'UML mostra la struttura dati / funzionale del sistema eMSP, quindi non ha la facoltà di aggiornare attivamente i componenti come CPMS e socket. Vogliamo includere un'interfaccia che permetta a questi componenti di fare una richiesta al server per aggiornare i dati?
   Per quanto riguarda l'utilizzare un'altra interfaccia pensavo di inserire un'interfaccia che permettesse di interfacciarsi con il CPMS e con i vari sockets del modello centralizzato. In questo modo non si intaccherebbe l'interfaccia utente e ci sarebbe modo di avere un "filo" di ragionamento coerente con il modello e con la rappresentazione fisica.
3. Il pattern più comodo per il sistema sarebbe partire sempre da una richiesta del client e poi rispondere. Mi chiedo quindi se è possibile seguire questo profilo in tutto il progetto. Per il calendario pensavo che il client (leggermente fat) potesse chiedere ogni tot al server se sarebbe un buon momento per fare rifornimento ed il server risponde.

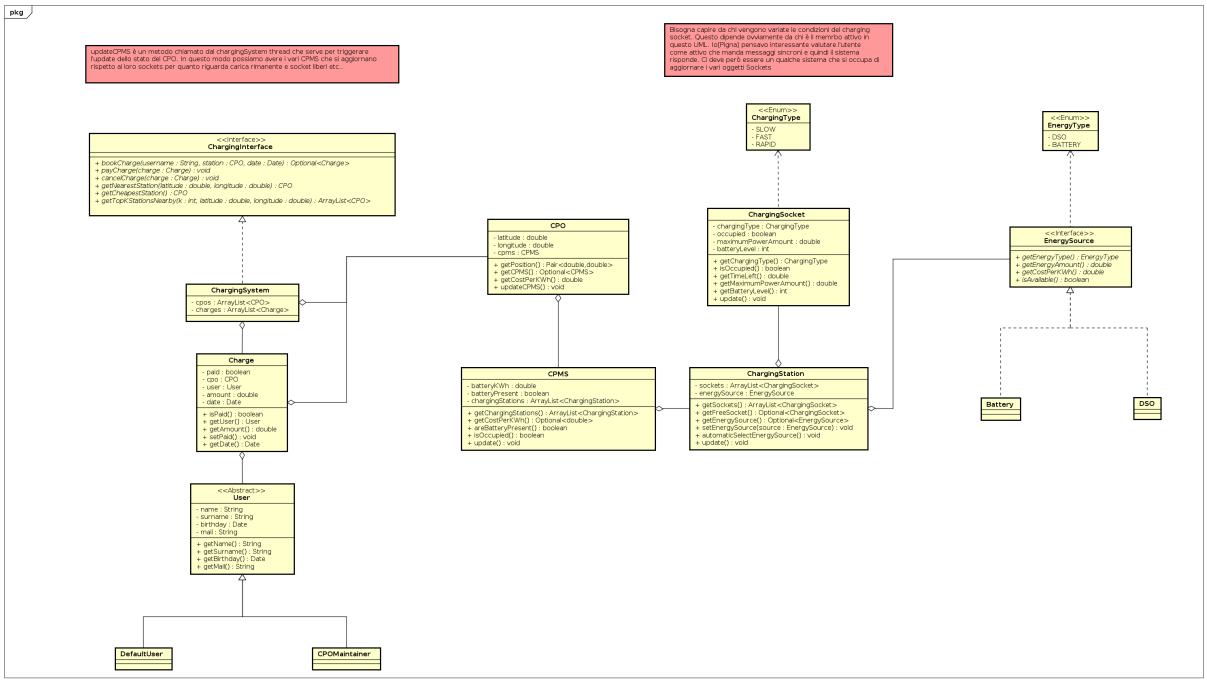

Figure 1: UML

2.1.1 Scenarios

S1 User Signs up:
Lucy, wanting to use the system, opens the app, she is prompted to login or register, she chooses to register herself and inserts her personal info (email, password, payment information); an email is sent with a link to confirm the activation of the account, if the link is clicked within the first 15 minutes the account is activated and the sign up is successful, otherwise it is considered failed and the process must be repeated.

S2 User Logs in:
Jay, after signing up, opens the app and he is prompted to insert his email and password, if the given information are correct the login is successful and he obtain access to his account and the service of the apps, otherwise the login is unsuccessful and it must be repeated.

S3 User searches for stations:
Robert, once logged in, inserts the location and the time frame to search for charging stations. Once submitted a list of available charging station is displayed, the list is ordered by the distance of the station from the desired location. Via a menu Robert can choose to order the station either via distance or price, or to display unavailable station and set the maximum distance from the chosen location. Robert chooses a station obtaining more detailed information.

S4 User books a charge:
Jessica, after choosing a station, decides to book it, the station location and booked time frame are displayed and she is asked to confirm the booking via a popup. Jessica then receives a confirmation email with the details of the charge (Location, time frame, socket id) and a confirmation pin to insert at the station.

S5 User charges the car:
Mary, after booking a charge, arrives at the station, she parks her car at the designed socket and plugs her car in, Mary then inserts the confirmation pin in the socket to start the charge. The socket displays on a monitor the status and the finishing time of the charge. Once the charge is finished Mary receives a notification of finished charge, she gets her car and complete the charge.

S6 User gets charging suggestion based on his calendar:
Josh is a very busy man, is also an avid google calendar user, setting up every event with correct time and locations. The service accessing his calendar finds the closest available charging station to each car movement, it estimates the battery level trough the gps data and once the battery is below fifty percent Josh gets notified about the possibility to charge his car. Josh liking the idea open the app and confirms the booking.

S7 Cpo subscribes to the system:
Judy, the CEO of a famous CPO, wants to subscribe it to EMAll to improve sales and to access the CPMS feature. She opens a Website and select to sign up, she inserts the name, partita iva, a master password and the stations of the CPO. For each station she has to insert the number of charging port, the presence of batteries and, if there are any, wether to use the CPMS automatic source selector or to choose the preferred energy source.

S8 Cpo updates info about its system:
The sysadmin of a CPO, Andy, after logging in with the master password has access to his CPO. Here he can change the number of stations, for each station he can update the number of socket and the energy source. He can also create and update maintainer account inserting the ID and password. For each maintainer he can choose which station the maintainer can maintain.

S9 Cpo employee logs in the service:
Brett a CPO employee wants to access the service, he connects to the site and inserts the ID and password, if correct he logs in; otherwise the procedure fails and must be repeated.

S10 Maintainer maintains his assigned stations
Lisa, a maintainer at a cpo logs in the service, here she can see the info of each station assigned to her. For each station she can: check the status(functioning or not), choose the energy source, update the number of available sockets. She can monitor the consumes, profitability and the usage of a specified station.

2.2 Product functions

In the following subsections the functions of each subsystem are described.

Secondo me questi dovrebbero rispecchiare i metodi delle interfacce che si vedono nell'UML.

2.2.1 eMSP

Registering to the eMSP as customer

Logging to the eMSP as customer

Book a charge

Cancel a charge

Start a charge

What about this point? Get information through the app about the starting of the charging process?

Get nearest station

Get cheapest station nearby

Get top K stations nearby in base of characteristics

Get infos about parcticular charging station number of charging sockets available, their type such as slow/-fast/rapid, their cost, and, if all sockets of a certain type are occupied, the estimated amount of time until the first socket of that type is freed

Notify the user about the finish of the charge

Pay for the obtained charge

proactively suggest the user to go and charge the vehicle depending on the status of the battery, the schedule of the user (this implies that the eMSP application can get access to the calendar of the user and his/her navigation system), the special offers made available by some CPOs, and the availability of charging slots at the identified stations

2.2.2 CPMS

Registering to the CPMS as CPO

Logging to the CPMS as CPO

Choose manually to use the batteries

Choose manually to use the DSOs energy

Choose to make the CPMS choose the energy source automatically

Providing charging station informations for utilizators

Providing charging station informations for maintainers

Acquire informations about DSOs price

2.3 User characteristics

2.4 Assumptions dependencies and constraints

2.4.1 Assumptions

A1 Users insert correct data in the forms

A2 Le persone non trollano

3 Specific Requirements

3.1 External interfaces requirements

3.1.1 User interfaces

R1 The eMSP must allow the users to register (providing email, password, payment method and his infos);

R2 The CPMS must allow the CPOs to register (providing email, password, id-station, partita iva, number of possible charging slots);

R3 The system must allow the CPOs to modify the possible charging slots in their stations;

R4 The system must verify the correctness of the identification data for the CPOs;

R5 The system must allow the user to login;

R6 The system must allow the user to choose a specific station, a timeslot;

R7 The system must notify the user when the charging process is finished via a notification;

R8 The CPMS must allow the CPOs to choose the mode (manual or automatic) of operation

3.1.2 Hardware interfaces

3.1.3 Software interfaces

3.1.4 Communication interfaces

3.2 Functional requirements

R1 The system must provide information () about the stations nearby;

R2 The system must reserve a position for a user who registered for a charge through the application;

R3 The system mustn't have collisions in the booking of charges; (non si possono registrare più di X user per timeslot sovrapposti)

R4 The system must take the service money from the user payment method after the charging is finished;

3.3 Performance requirements

3.4 Design constraints

3.4.1 Standards compliance

3.4.2 Hardware limitations

3.4.3 Other constraints (TODO MAYBE)

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

3.6 Requirements

3.6.1 External Interface Requirements

4 Formal Analysis Using Alloy

5 Effort Spent

5.1 Effort Spent

- 15/11/2022: 15:00 - 18:00 (all 3 same time)
- 16/11/2022: 08:30 - 10:00 (only 1) Emilio
- 17/11/2022: 21:00 - 23:00 (all 3 same time)
- 18/11/2022: 10:00 - 12:00 (2) Emilio, Federico
- 21/11/2022: 19:00 - 20:00 (only 1) Matteo
- 22/11/2022: 14:30 - 16:00 (only 1) Matteo
- 23/11/2022: 10:30 - 11:30 (only 1) Matteo
- 24/11/2022: 21:30 - 22:30 Matteo and Federico
- 25/11/2022: 09:00 - 09:30 Federico
- 25/11/2022: 19:00 - 19:30 Matteo
- 26/11/2022: 08:30 - 09:00 Federico
- 26/11/2022: 16:00 - 17:00 (all 3 same time)
- 28/11/2022: 08:30 - 09:00 Federico
- 28/11/2022: 10:00 - 12:00 Emilio
- 30/11/2022: 22:00 - 23:00 Emilio