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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	DSO	Distribution System Operators
CPO	Charging Point Operators		
CPMS	Charge Point Management System	API	Application Programming Interface

1.4 Revision history

1.5 Reference Documents

1.6 Document Structure

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 particular 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

DA1 Users insert genuine data in the forms

DA2 Users(Including CPOs) do not use the system with malicious intent

DA3 Forse cancellare i booking

DA4 All the electric vehicles can be charged by all the stations (no incompatibility)

DA5 All the user have an active connection always available while using the service

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
- 28/11/2022: 08:00 - 08:30 Federico
- 01/12/2022: 16:00 - 17:30 Matteo