ELECTRIC VEHICLES CHARGING RESERVATION BASED ON OCPP

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ABSTRACT

Management of charge of electric vehicle can be effectively integrated in a Vehicle To Grid system. This regulated operation is described in the OCPP standard. In this work we propose an extension of the OCPP protocol to the reservation phase. The user can reserve the charging station in advance negotiating the parameters for the charge: initial time, duration, location, price, percentage of final charge, power required. We developed an application for android smartphone affords to the customer to completely control the process of reservation and charge in all it's phases: authentication to the service, choice of the charge parameters, monitoring of the charge and payment.

Keyword:- *ElectronJs, ReactJs, React-Native, JavaScript, etc…*

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1. INTRODUCTION

Full electric vehicles (FEV) are gaining popularity and market penetration can grow and sustain itself, reducing the cost of FEV. Actually, one of the limitations in the diffusion of FEV is the lack of FEV charging infrastructure in spite of the wide diffusion of electrical infrastructure. This infrastructure will require investment from both the private and public sectors.

Although the cost issue of FEVs are expected to subside with their growing diffusion, the limited car autonomy and long battery charging time, much longer if compared to refueling of internal combustion vehicles (ICE) are still felt by buyers as serious barriers to the purchase.

The battery recharging time is primarily limited by the capacity of the grid connection. While a plug-in recharging can take place overnight at home, a faster recharge, requiring a high power to the electrical grid, can be made in recharging stations, in commercial or public parking lots, in shopping centers, and on streets or workplaces.
The purpose of OCA is to favor the development of a network infrastructure with the creation of an open protocol that is free from the characteristics of each individual manufacturer and that can allow the management of every single factor within the recharging operation.

The use of OCPP allows to:

- Monitor and control access to individual charging stations;
- Check and manage the recharge status;
- Send data to individual users and managers;
- Allow the payment procedure;
- Allow reservation mechanisms and management of the electricity grid;

In this work we propose an extension of the OCPP protocol to the reservation phase.The user can reserve the charging station in advance, negotiating the parameters for the charge: initial time, duration, location, price, percentage of final charge, power required. The reservation phase allows the optimization of the resources from the power grid side and from the user side.

2. RELEVANCE

Full electric vehicles (FEV) are gaining popularity and market penetration can grow and sustain itself, reducing the cost of FEV. Currently, the most serious limitations to the diffusion of FEV is the lack of a widespread FEV charging infrastructure, in spite of the wide diffusion of electrical infrastructure. This infrastructure will require investment from both the private and public sectors. Although the cost issue of FEVs is expected to subside with their growing diffusion, the limited car autonomy and long battery charging time, much longer if compared to refueling of internal combustion vehicles, are still felt by buyers as serious barriers to the purchase. The battery recharging time is primarily limited by the capacity of the grid connection. While plug-in recharging can take place overnight at home, a faster charging solution, requiring a high power to the electrical grid, can be made in recharging stations, in commercial or public parking lots, in shopping centers, and along streets or workplaces. With a mass diffusion of FEV, the battery charges will have a great impact on the configuration and operation of smart grids, considering the high power needed for a fast charge (e.g., 150 kW required to charge a Tesla model S from 20% to 80% in 30 min). Overloading problems may arise when several vehicles in the same neighborhood recharge at the same time, or during the normal peak loads. The effect of the electric vehicles (EV) charging process on a smart grid can be relevant. A pooling strategy of multiple charge points that could increase the grid stability in case of high fluctuation of renewable energy resources is presented.

3. LITERATURE REVIEW

This project depends on an EV charger (Electric Vehicle). We created OCCP (Open Charge Point Protocol) using ElectronJs framework.

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Refer to the link given below –
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- https://ieeexplore.ieee.org/document/8494366

OPEN CHARGE POINT PROTOCOL 1.6 -

The OCA has developed Open Charge Point Protocol 1.6 (OCPP 1.6) including a compliance toolkit and will be part of a certification program.

- **https://www.openchargealliance.org/protocols/ocpp-16/**

4. OBJECTIVE

1. To create a new user account through mobile application
2. To create a reservation for a certain time
3. To search best solution for charging

5.PROPOSED WORK

- The Open Charge Point Protocol (OCPP) is an application protocol for communication between Electric vehicle (EV) charging stations and a central management system, also known as a charging station network, similar to cell phones and cell phone networks.
- Mobile Application –

  The user can reserve the charging station in advance, negotiating the parameter for the charge: Initial time, duration, location, price, percentage of final charge, power required. The reservation phase allows the optimization of the resources from the power grid side and from the user side.
- Raspberry Pi –

  In this module we are able to see the status of charging and manage it.
- Central Management System (CMS) –

  As the heart of every intelligent charging station, the charge controller communicates with the vehicle and the connected backend, monitors the internal hardware of the charging system, the user interfaces as well as the charging socket and the charging cable

5.1 Proposed Architecture

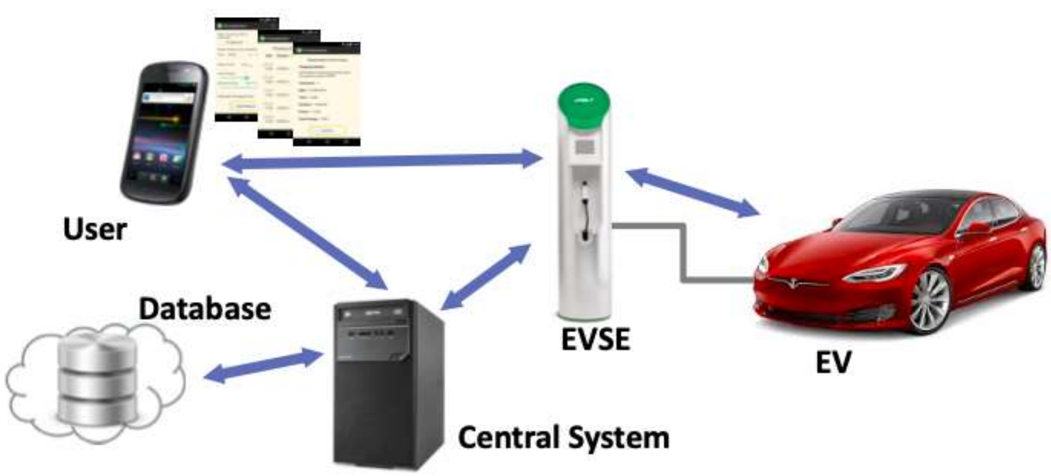

Chart-1: Agents of the Recharge System

5.2 Data Flow Diagram

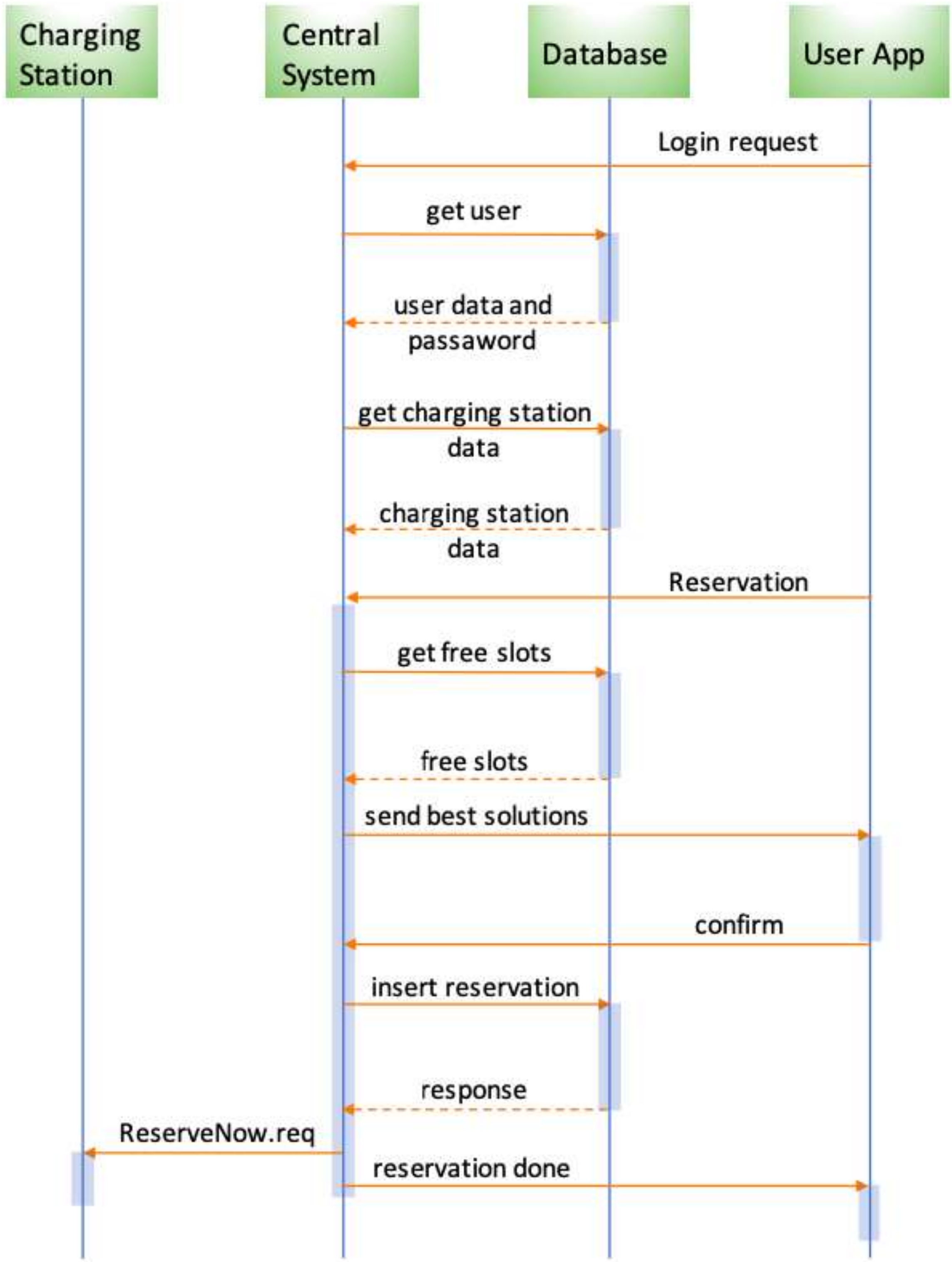

Chart -2: Exchange of data during the reservation

6. IMPLEMENTATION STEPS

1. Database Design –
    - Create and design the database of the application
    - Create the application according to that design.
    - Using MySQL Database.

2. Application –

    We are going to create three types of applications, like the following.

    i) Charger Application –
        (1) Users can see the status of charging and manage it.
        (2) Using ElectronJs.

    ii) Mobile Application –
        (1) Create a new user account.
        (2) The user can reserve the charging station.
        (3) User can search for the best solution for charging
        (4) Using React-Native

    iii) Server Application –
        (1) Using ReactJs.

3. Hardware –
    - Raspberry Pi (above 3 version)
    - Tab (minimum 7 inch)
    - Connecting wires
    - Resistor 1 kohm
    - LED
    - Ram 1 GB

7. SCOPE

Management of charge of electrical vehicles can be effectively integrated in a Vehicle to Grid system. This regulated operation is described in the OCPP standard. In this work we propose an extension of the OCPP protocol to the reservation phase. The user can reserve the charging station in advance negotiating the parameters for the charge: initial time, duration, location, price, percentage of final charge, power required. We developed an application for Android smartphone affords to the customer to completely control the process of reservation and charge in all its phases: authentication to the service, choice of the charge parameters, monitoring of the charge and payment

8. REFERENCES

[1]. https://ieeexplore.ieee.org/document/8494366
[2]. https://www.openchargealliance.org/protocols/ocpp-16/