OCPP v1.5

A functional description

Final version 2.0

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Introduction

Open **C**harge **P**oint **P**rotocol (hereafter OCPP) is an open standard initiated by E-laad which describes a method enabling electrical vehicles to communicate with a **central system**. This document describes the functionalities of OCPP.

Technology

The standard makes use of **S**imple **O**bject **A**ccess **P**rotocol (hereafter **SOAP**). **SOAP** is a framework which makes it possible to send messages between components over the internet. The advantage of SOAP is that the facilities for sending and receiving messages are covered by the standard. This makes rapid implementation possible.

The content of a SOAP message is drawn up according to the **E**xtensible **M**arkup **L**anguage (**XML**) standard. This language is related to the HTML we know from the Internet. In addition to written text, XML messages may also contain images and executable code. The big advantage is that the messages are sent in legible text.

OCPP Structure

25 operations are described within **OCPP** 1.5. Of these 10 are initiated by the charge point and 15 by the Central system.

Initiated by the charge point: *Authorize, Boot Notification, Data Transfer, Diagnostics Status Notification, Firmware Status Notification, Heartbeat, Meter Values, Start Transaction, Status Notification* and *Stop Transaction*.

Initiated by the central system: *Cancel Reservation, Change Availability, Change Configuration, Clear Cache, Data Transfer, Get Configuration, Get Diagnostics, Get Local List Version, Remote Start Transaction, Remote Stop Transaction, Reserve Now, Reset, Send Local List, Unlock Connector* and *Update Firmware*.

When communication takes place between a charge point and the central system it always begins with a request. In the OCPP specification this is described with **operationname.req()**. The recipient of the message will always reply with a confirmation. In the OCPP specification a confirmation is described as **operationname.conf()**.

Figure 1 shows the communication flow for the operation Authorize. It shows that the charge point sends a message to the central system, Authorization.req() and gets an answer in the form of Authorization.conf(). For the sake of clarity the message names and the rest of the communication flows in this figure have been omitted.

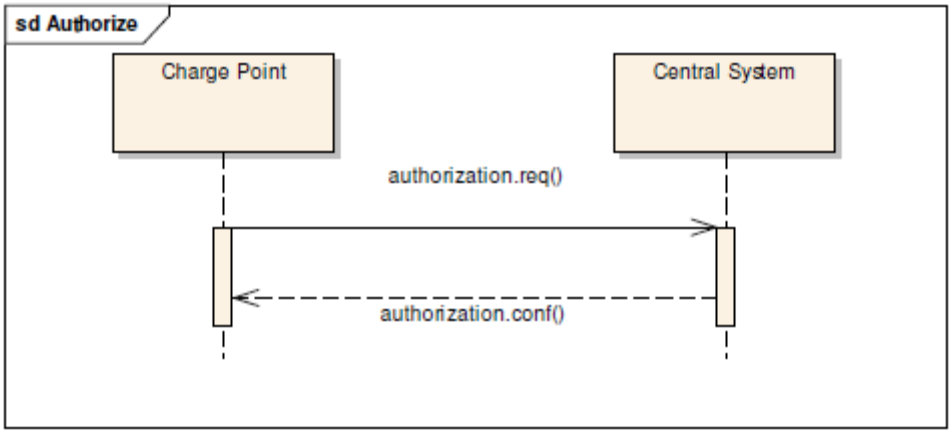

Figure 1

Functional description

There follows a functional description of the data which are exchanged between a charge point and the central system during various operations.

Starting up a charge point

Once a charge point has been turned on and started it will attempt to make contact with the central system. The charge point sends a message to the central system containing details of the configuration, brand and type.

The central system will then check to see if the charge point is known in the system. If this is the case the central system then sends a reply stating whether or not the charge point has been accepted. If the charge point has been accepted the answer will also include the time and date of the central system and the set heartbeat interval.

If the charge point is unable to contact the central system, or receives a message stating that it has not been accepted, it will then regularly continue attempting to make contact.

Heartbeat

Once the charge point has received confirmation from the central system that it is connected, it will send a heartbeat to the central system at an interval which was designated by the central system after contact was made. This informs the central system that the charge point is still available. In response to a heartbeat the central system always sends back the system's current time and date.

Starting a transaction

Before an electric car can be charged the owner first needs to authorize the charge action. When a charge pass is held in front of the reader the charge point then sends a message to the central system. This message contains the ID of the charge pass. The central system then responds with a message stating the validity, expiry date and possible parent-ID (a parent-ID is applicable when the pass belongs to a particular group). If the charge pass is approved then the charge point may proceed with charging.

A charge point has the option of maintaining a local list (Local White List) of ID cards used and accepted by the central system. This list can be used by the charge point to authorize charge actions when no connection can be made with the central system.

In the 1.5 version of OCPP the local White List has been extended and modified into an authorized list. The Authorization list includes the same functionality as the White list, with as difference that it is now possible to manage the authorization list from the central system. The central system can request, replace, synchronize and add or remove specific ID cards to and from the list.

Stopping a transaction

If the user wants stop the charge action they need to identify themselves using the charge pass at the charge point. The charge point then sends a request to the central system to stop charging. This request includes the final meter reading, transaction number, pass ID and the current time. The central system will indicate whether the user is authorized.

Firmware Updates

When a firmware update is ready the central system will send a message to the charge point containing the location where the update can be downloaded, the time and date when the update needs to be collected, the number of attempts, and the interval between download attempts. The charge point then sends a confirmation to the central system that the message has been received.

At the set time and date the charge point will download and install the update. During the installation process the charge point informs the central system of the current status, along with whether the update has been successfully downloaded or not and if the installation has succeeded.

Dealing with errors

When a technical error or failure occurs in a charge point, it will communicate this to the central system. Possible indicated errors are errors relating to: the plug lock, a too high temperature, the mode 3 communication, the reading of a KWh meter, resetting and the magnetic switch for enabling the charging voltage.

Diagnostics

The central system can ask a charge point to send diagnostic data. After such a request the charge point will upload a file with diagnostic data to the central system. This file will be compressed in order to reduce its size.

Reserving

Since OCPP version 1.5 there is the option of reserving a charge point. In this case the central system sends a message to the charging station containing the reservation time, the ID card and a reservation ID. The charge point responds to this with a message stating whether the reservation has succeeded, been refused, or is not possible. The reservation will also be refused when the charge point is in use. If the charge point is broken down or is not available, then this will be indicated by the charge point.

The central system has the capability of cancelling a reservation which was made earlier. When this happens the central system sends a message to the charge point containing the reservation ID. If the charge point knows of a reservation with this reservation ID then it will send a reply stating that the request has been accepted. If the reservation ID is unknown, then the charge point will indicate that the request has been refused.

Manufacturer specific tasks

Since OCPP version 1.5 it has been possible to implement manufacturer specific messages. This means that additional functionality can be realized and tested. When this concerns generic additions it may be plausible to incorporate these functions in the OCPP specification. Caution is required when implementing manufacturer specific tasks, as these can limit the compatibility with central systems.

A manufacturer specific data transfer can be initiated by both the charge point and the central system.

Change configuration

Change Configuration enables a central system to modify different charge point settings. These include the heartbeat interval, connector time-out, number of reset attempts, charge point name and reading interval for the energy meter.

Other options

It is also possible from a remote central system to start and stop a transaction (read: charge action), to unlock the cable, to restart the charge point and to modify the status. For further information and a more technical explanation please refer to the OCPP specification.

Glossary of terms

Central system
: Underlying system used in communication

HTML – ***H**yper**T**ext **M**arkup **L**anguage*
: {additional information}

HTTP – ***H**yper**T**ekst **T**ransfer **P**rotocol*
: protocol for the communication between a web client (usually a web browser) and a web server. {additional information}

M2M interface – ***M**achine **2** **M**achine interface*
: Machine-to-machine (M2M) refers to the technology which makes communication possible between devices by means of wireless and wired systems. {additional information}

SOAP – ***S**imple **O**bject **A**ccess **P**rotocol*
: A computer protocol which is used to communicate between different components. {additional information}

XML – ***E**xtensible **M**arkup **L**anguage*
: XML is a standard of the World Wide Web Consortium for the syntax of formal markup languages used to display structured data in the form of plaintext. This representation is legible for both machines and people. {additional information}