

OCPP Smart Charging

12 September 2019

ihomer
it's in us!

Agenda

Introduction to OCPP:

- What is OCPP
- Why OCPP
- OCA organisation
- OCPP Basics
- OCPP 1.5/1.6/2.0
- OCPP security

OCPP Smart Charging

- Supported use cases
- Different profiles
- Difference OCPP 1.6/2.0
- V2G

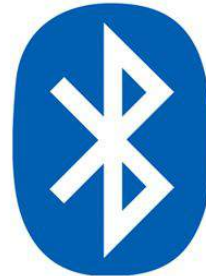
Robert de Leeuw

Software Architect @ ihomer

6 years experience EV Charging

5 years chair OCA TWG

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What is OCPP

Open Source Protocol for managing Charge Points



EV

Charge Point



Central System



OCPP



Why OCPP

- Open/free protocol
- Prevents vendor lock-in
- Reduce integration time/issues
- The de-facto standard for Charge Point to CPO communication

20.000+ downloads of OCPP 1.6 alone

- Based on experience and knowledge of the OCA participants



History

- Start in 2009 by E-Laad (now ElaadNL)
- The aim was to create an open communication standard that would allow the Dutch Charging Stations (CS) and Charging Station Management Systems (CSMS) from different vendors to easily communicate with each other.
- Versions:
 - OCPP 1.2 (2011)
 - OCPP 1.5 (2012)
 - OCPP 1.6 (2015)
 - OCPP 2.0 (2018)



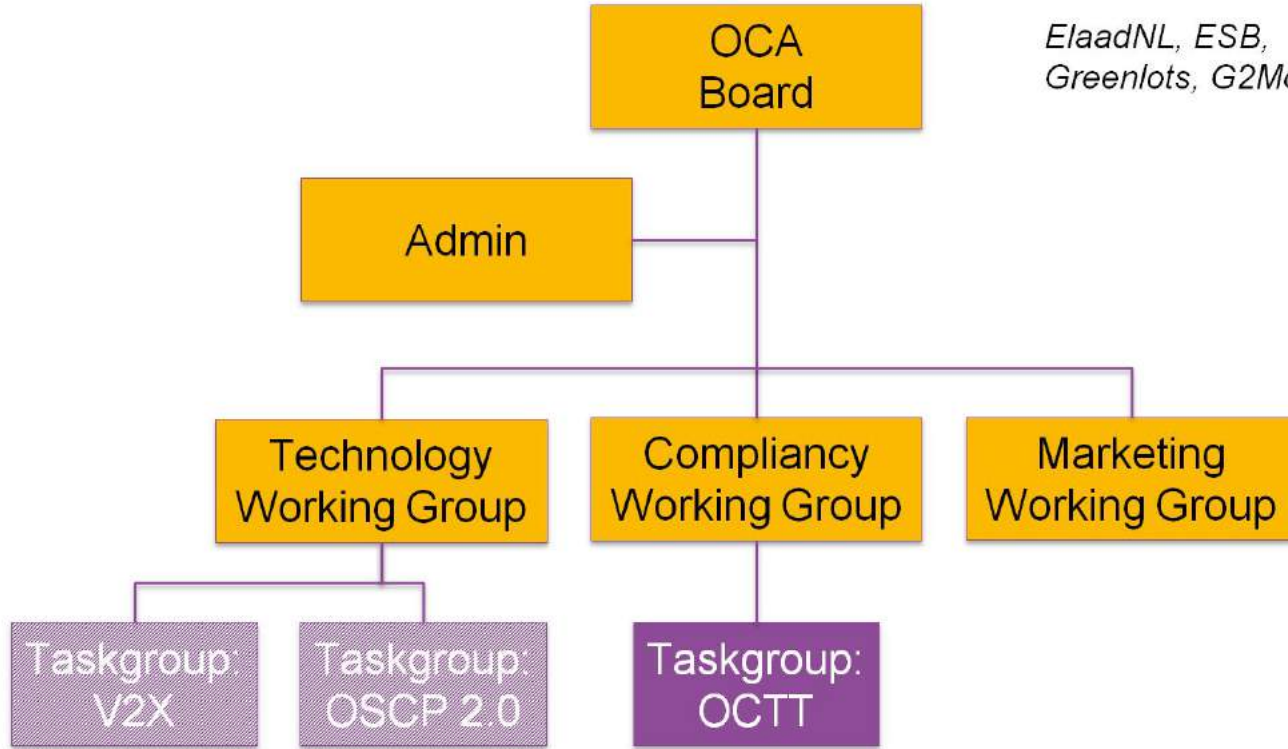
OCA

- OCA = Open Charge Alliance
- Free to use protocols:
 - no constraints on the use of the standards
- 120+ Participants
- OCPP and OSCP

OCA: Participants (2018)

OCA organization





OCA TWG

- Technology Working Group
- Responsible for development and maintenance of the OCPP and OSCP specification
- Whitepapers and application notes
- Bi-weekly calls



OCA CWG

- Compliance Working Group
- Responsible for development and maintenance of test cases, compliance toolkits and certification programs.
- Monthly calls
- Plugfests
 - Goal: twice a year
 - Safe testing environment



OCTT

- Validation of OCPP 1.6 implementations
- Test automation/continuous integration
- Conformance testing
- Will also be used in the future certification program

OCA Membership

Want to know more?

info@openchargealliance.org



OCPP Design principles

- Designed for wireless, unreliable, connections
- Guarantee delivery of information needed for billing purposes
- Only the Charge Point knows its current true state
- Essential to know what has happened and why



OCPP Basic functionality

- Authorization (Cache)
- Transactions Start/Stop & Metervalues
- Charge Point configuration
- Status information
- Remote Commands: Start/Stop/Unlock
- OTA Firmware updates



OCPP: 1.5

2012

New:

- Local Authorization List
- Reservation
- Get Configuration
- DataTransfer (Custom messages)

SOAP Only



OCPP 1.6

2015

New:

- Smart Charging
- JSON over WebSockets
- Trigger Message
- Lot of minor improvements (extra statuses)

2017: 1.6 edition 2 (contains a lot of errata)

2019: 1.6 edition 3, planned for later this year.



OCPP 2.0

2018

New:

- Improved security
- ISO 15118 support
- Improved charge point management (monitoring)
- Improved transaction handling
- Extended Smart Charging

2019: 2.0.1 (or 2.1) planned for later this year.



OCPP 2.0: Documents

Part 0: Introduction

Part 1: Architecture & Topology

Part 2: Specification

Part 2: Appendices

Part 3: Schemas

Part 4: JSON over WebSockets implementation guide

Part 5: Certification Profiles (not yet released)

Part 6: Test Cases (not yet released)

OCPP 2.0: Functional Blocks

- A. Security
- B. Provisioning
- C. Authorization
- D. Local Authorization List Mgmt.
- E. Transactions
- F. Remote Control
- G. Availability
- H. Reservation
- I. Tariff and Cost
- J. Metering
- K. Smart Charging
- L. Firmware Management
- M. ISO 15118 Certificate Mgmt.
- N. Diagnostics
- O. Display Message
- P. Data Transfer

OCPP 2.0: Functional Blocks

Use Cases:

Name

Description

Pre/Post conditions

Detail sequence diagram

Number requirement

OCPP 2.0: In numbers

	OCPP 1.6	OCPP 2.0
Messages:	28	67
Pages:	143	476

OCPP Security

Added in 2.0

Input and review by ENCS* & Radboud University

Secure connection profiles

1. Unsecured Transport with Basic Authentication
2. TLS with Basic Authentication
3. TLS with Client Side Certificates

OCPP 1.6 Security whitepaper (JSON only)

**European Network for Cyber Security*



OCPP Security

Functionality

- Certificate Management
- Security Events/Log
- Secure Firmware Update

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OCPP Smart Charging

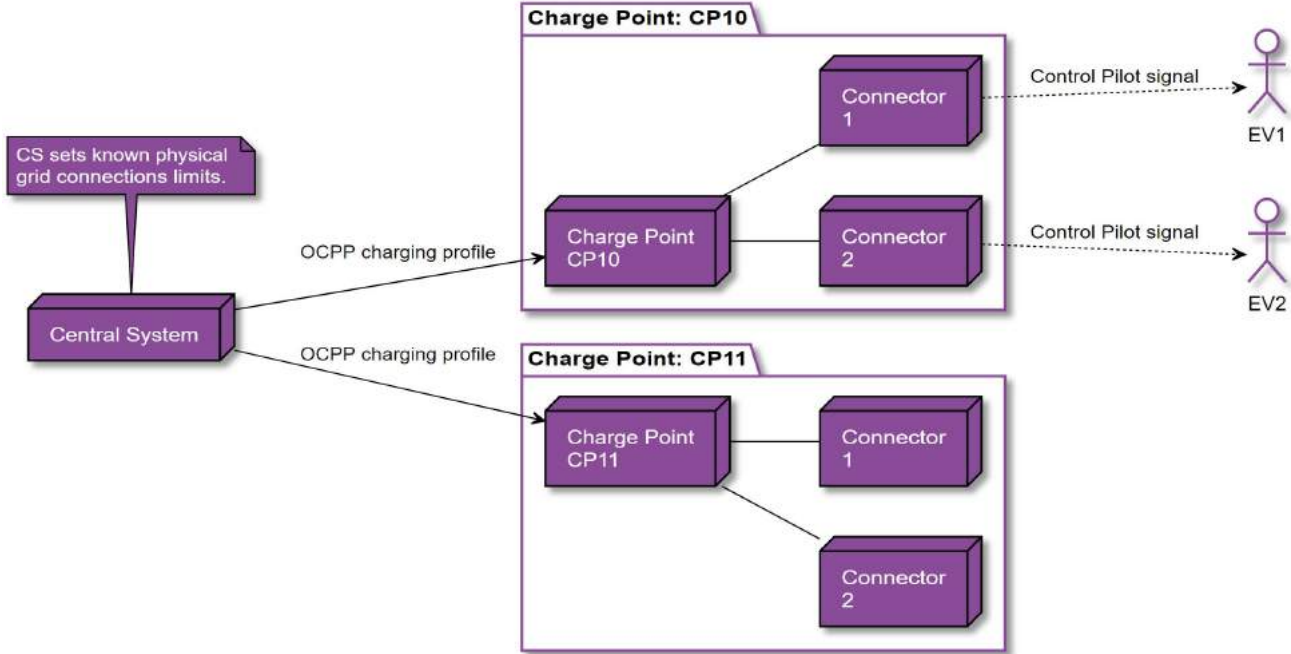
Supported Use Cases:

- Internal Load Balancing
- Central Smart Charging
- Local Smart Charging
- External Smart Charging Control Signals (OCPP 2.0)

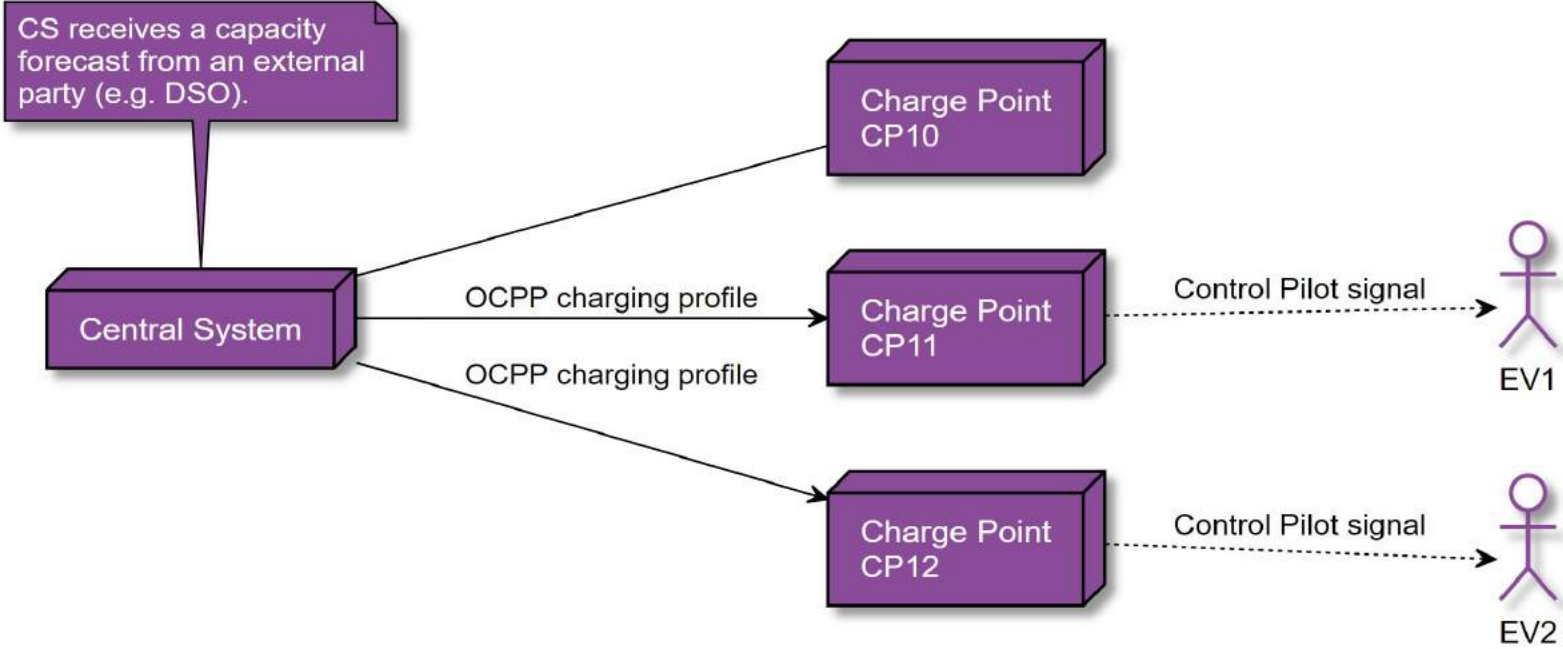
OCPP 2.0 also supported 15118 Smart Charging

All can be combined

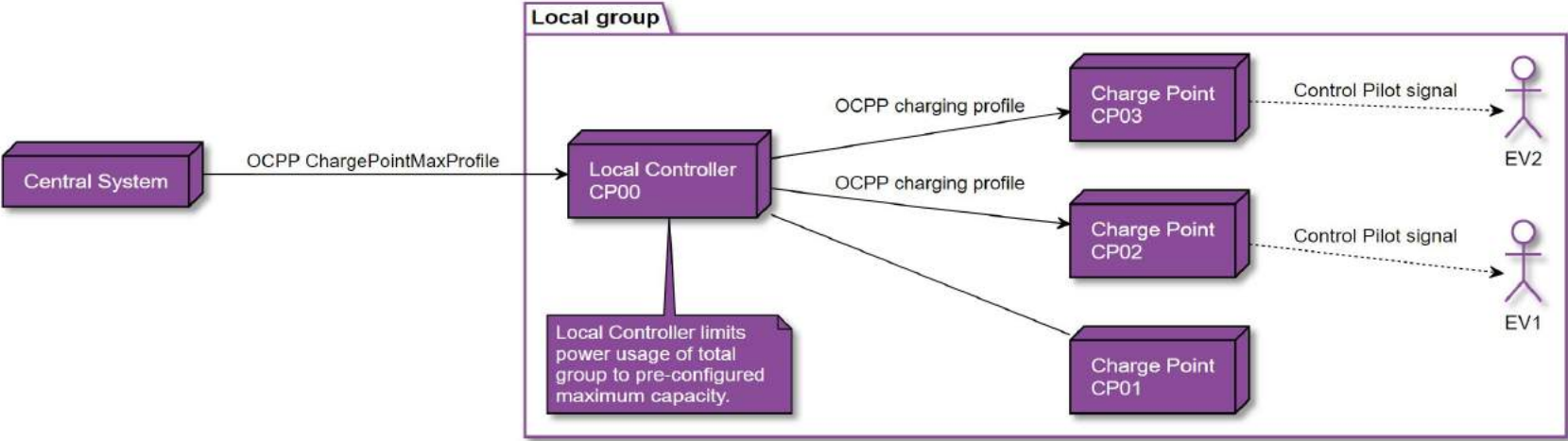
OCPP Smart Charging: Internal Load Balancing



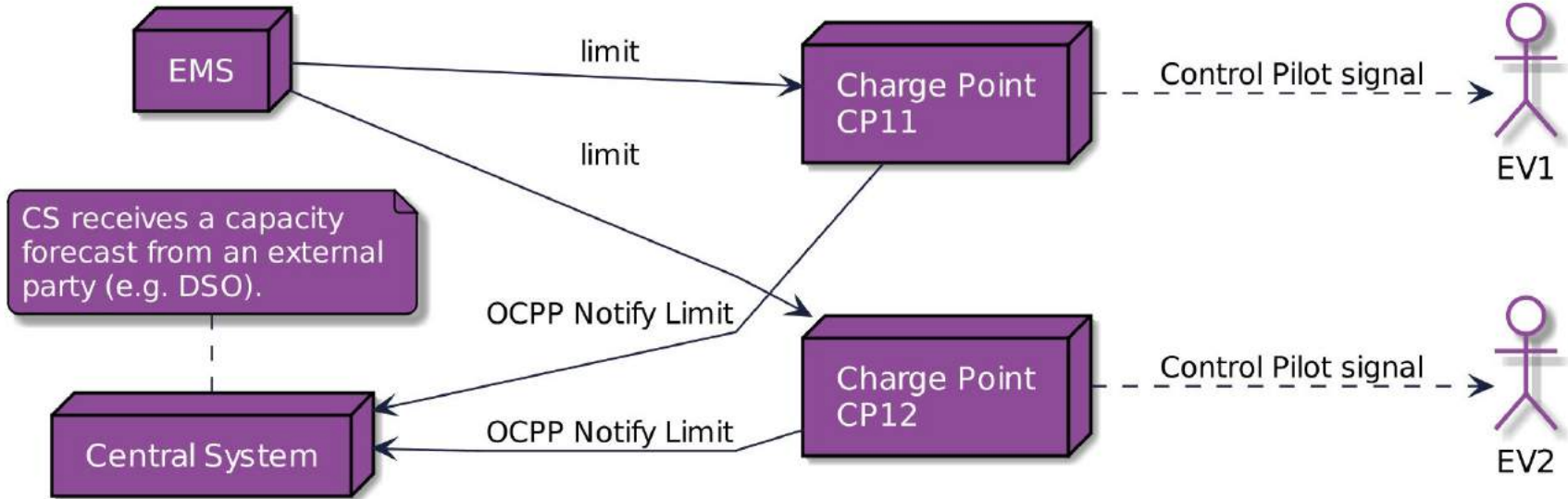
OCPP Smart Charging: Central Smart Charging



OCPP Smart Charging: Local Smart Charging



OCPP Smart Charging: External Smart Charging Control Signals (OCPP 2.0)

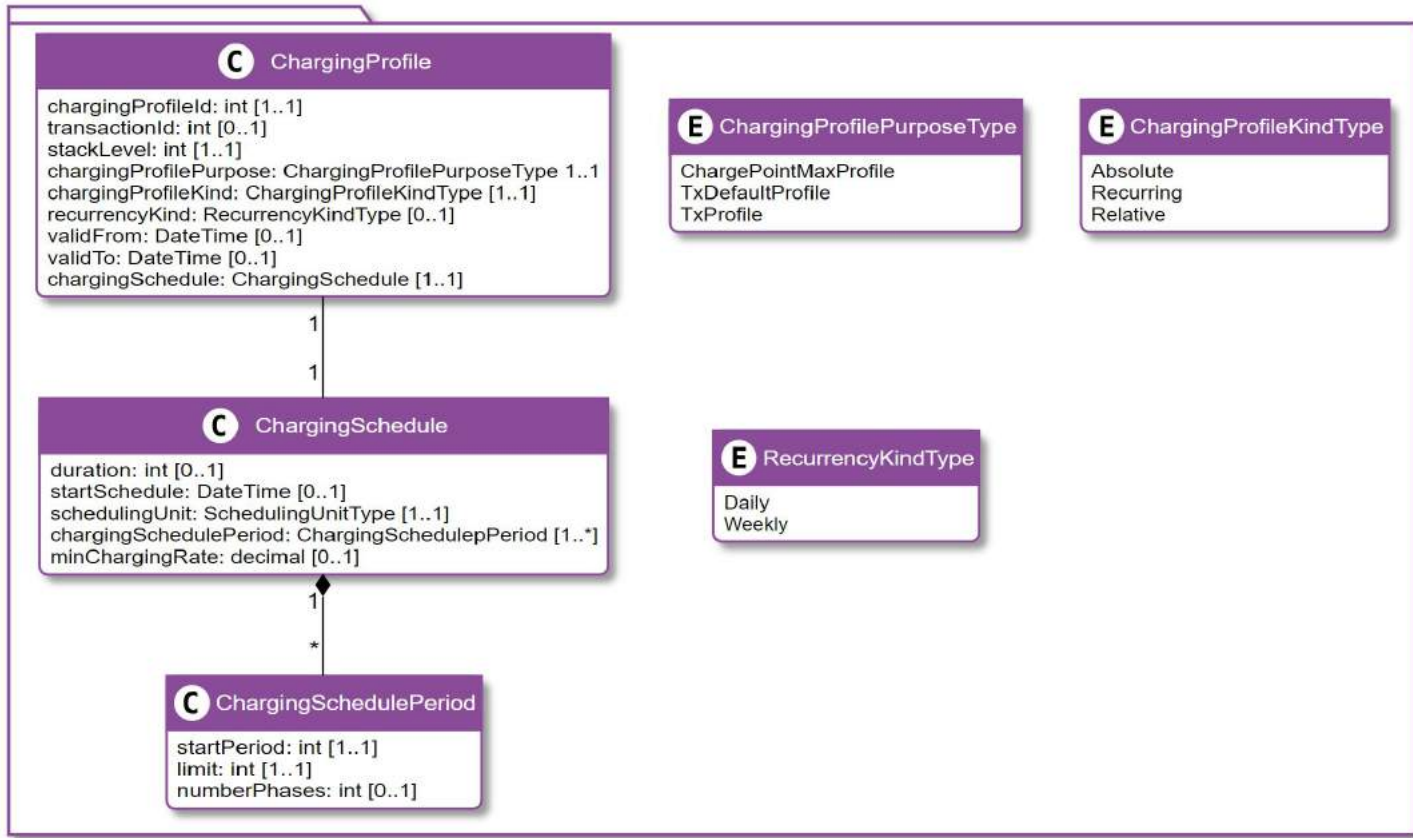




OCPP Smart Charging: Profiles

- ChargePointMaxProfile
 - *Limit the power or current taken from the grid (shared by all EVSEs of the Charging Station.)*
- TxDefaultProfile
 - *Pre-installed profile, to be used for all transactions, started or not started.*
 - *Also works when offline*
- TxProfile
 - *Charging Profile set on one specific transaction*
 - *Overrules TxDefaultProfiles*
- ChargingStationExternalConstraints
 - *Used to report limit set by an external system (not the CSMS)*

OCPP Smart Charging: Profile Content





OCPP Smart Charging: Stacking

- Multiple profiles with same purpose (TxProfile, TxDefaultProfile etc.) can be installed with different StackLevels.
- Highest StackLevel prevails over lower.
- Uses:
 - Complex calendars: daily 17:00 - 21:00 and on friday: 18:00 - 22:00.
 - Multi system providing inputs: DSO profiles higher stack level then eMSP profiles.

OCPP Smart Charging: Messages

- since OCPP 1.6:
 - SetChargingProfile
 - ClearChargingProfile
 - GetCompositeSchedule
 - RemoteStart with TxProfile
- since OCPP 2.0
 - GetChargingProfile
 - NotifyChargingLimitRequest
 - ClearedChargingLimit
 - NotifyEVChargingNeedsRequest (ISO 15118)
 - NotifyCentralChargingNeedsRequest (ISO 15118)



OCPP Smart Charging: V2G

- Charging Profiles can be negative
- Extra parameters could be configured via
 - Configuration Keys (1.6)
 - Device Management (2.0)
- OCA V2X workgroup
 - Input for future version of OCPP.

Questions?

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