

Live of the **WIND** and drive on the **SUN**



Elaadnl



ElaadNL researches and tests the possibilities for Smart Charging

Elaadnl

- Dutch Foundation (non profit), founded in '09
- Coordination on behalf of the Dutch Grid Operators (7) and Dutch Transport System Operator
- Installed 3,000 public charging stations between '09-'14
- Knowledge and Innovation Centre for Charging Infrastructure

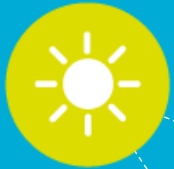
Our mission

In the future, everyone with an electric vehicle will be able to use Smart Charging to make full use of the energy from the sun and wind

Focus areas

- Smart Charging
- Simplification of Grid Operator procedures & requirements
- Open standards

Open Standards




An easy to use, affordable and accessible EV charging infrastructure is needed for consumers to embrace EVs and help achieve zero emission goals and fuel independence.

In many countries the EV charging infrastructure is in its early development stages. To be ready for mass adoption of EV's the charging industry will need to:

- **Improve the service to the customer (e.g. roaming, easy authentication, accurate information)**
- **Increase in numbers to service the increasing numbers of EV's on the road**
- **Lower its costs to make sustainable business cases for investors and keep consumer prices down**
- **Develop its technology to today's and tomorrow's requirements (e.g. fast charging, wireless charging, smart charging and cybersecurity)**

Open standards and open development are key to make the needed improvements happen

- **Through open cooperation and social development ideas and solutions are shared, challenged, improved upon and finally adopted and supported by all.**
- **Open development allows for competition of many players, pushing all parties to be the best they can be.**
- **Open development allows for inclusion of new entrants, bringing ideas, solutions and capabilities from other, perhaps more advanced industries into existing industries.**

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**We believe that
this crucial
infrastructure
–like the internet–
should be open
if we want it to
grow**

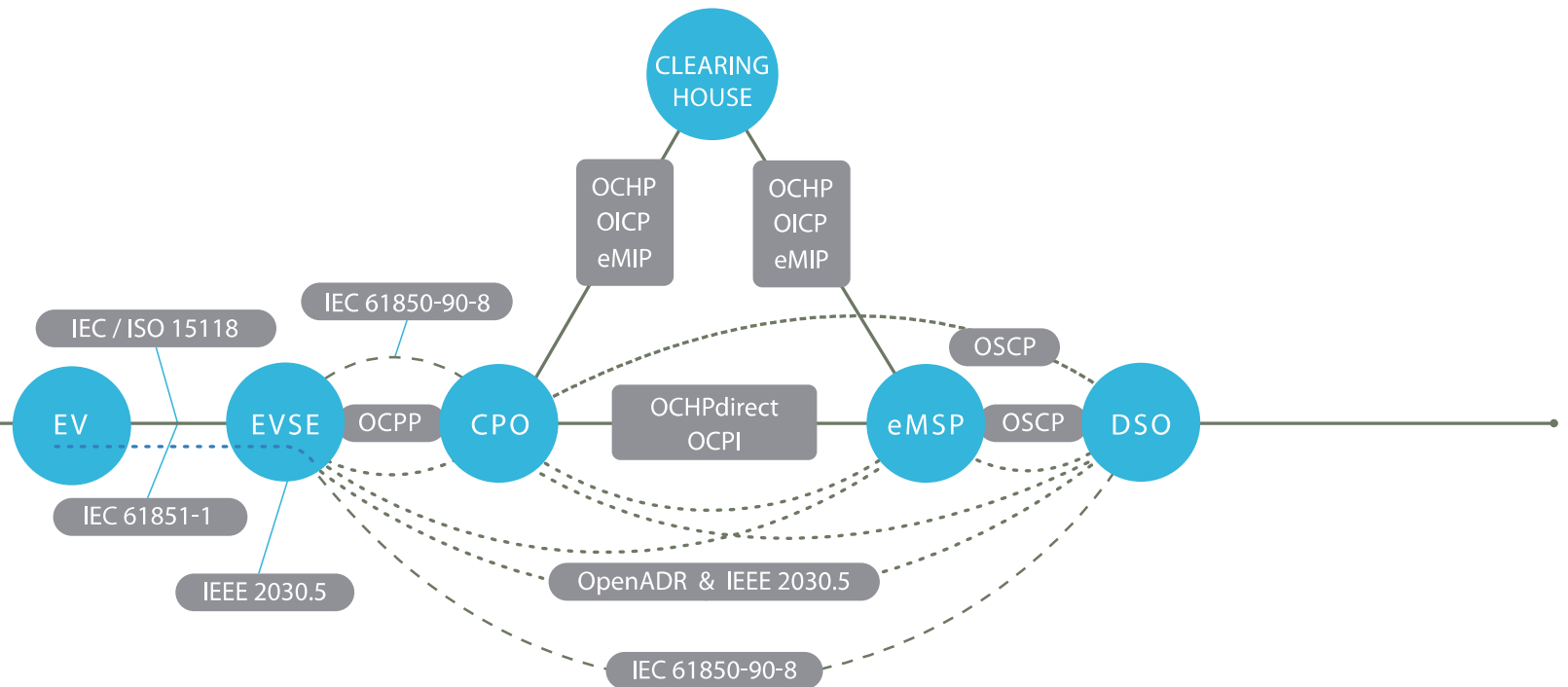
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EV related protocol study

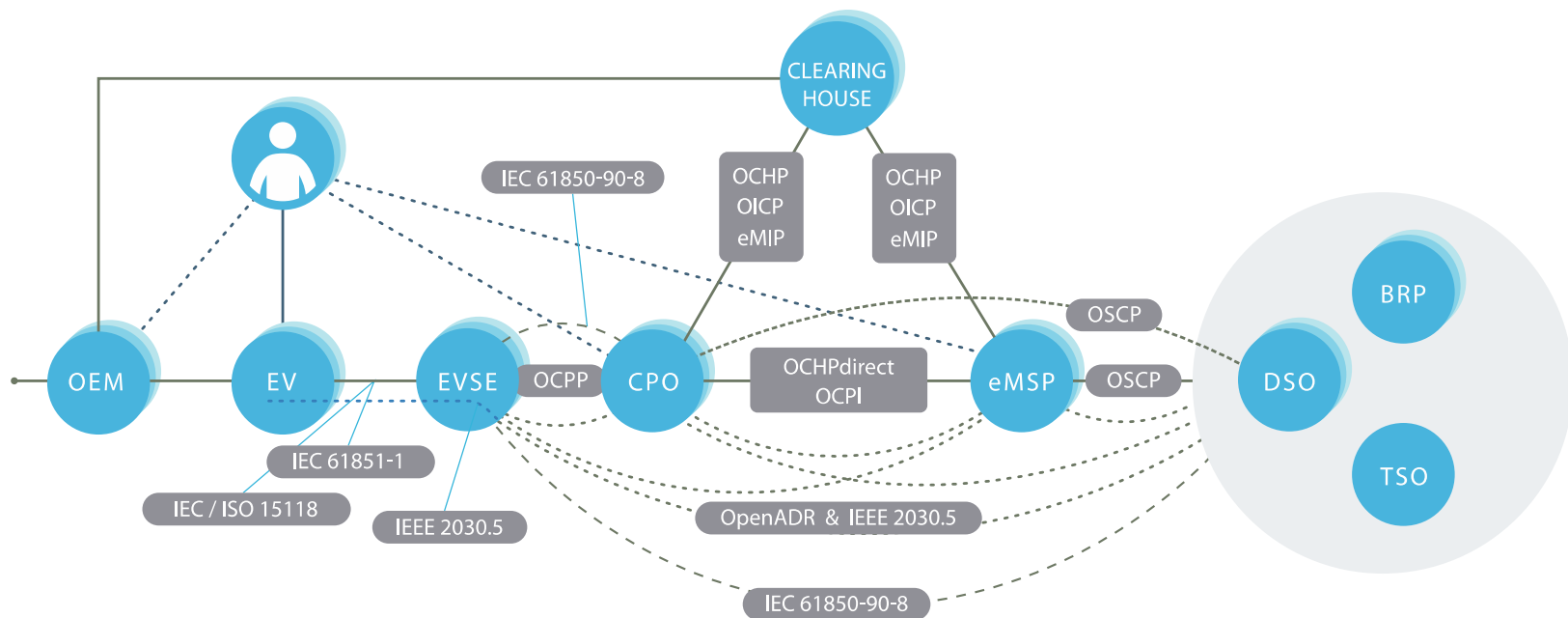
EV related protocol study to better understand the various protocols that are available

- **What part of the EV charging system does the protocol cover?**
- **What are the functionalities of each protocol?**
- **Do we need any or all of them as a DSO if we want to do smart charging ?**

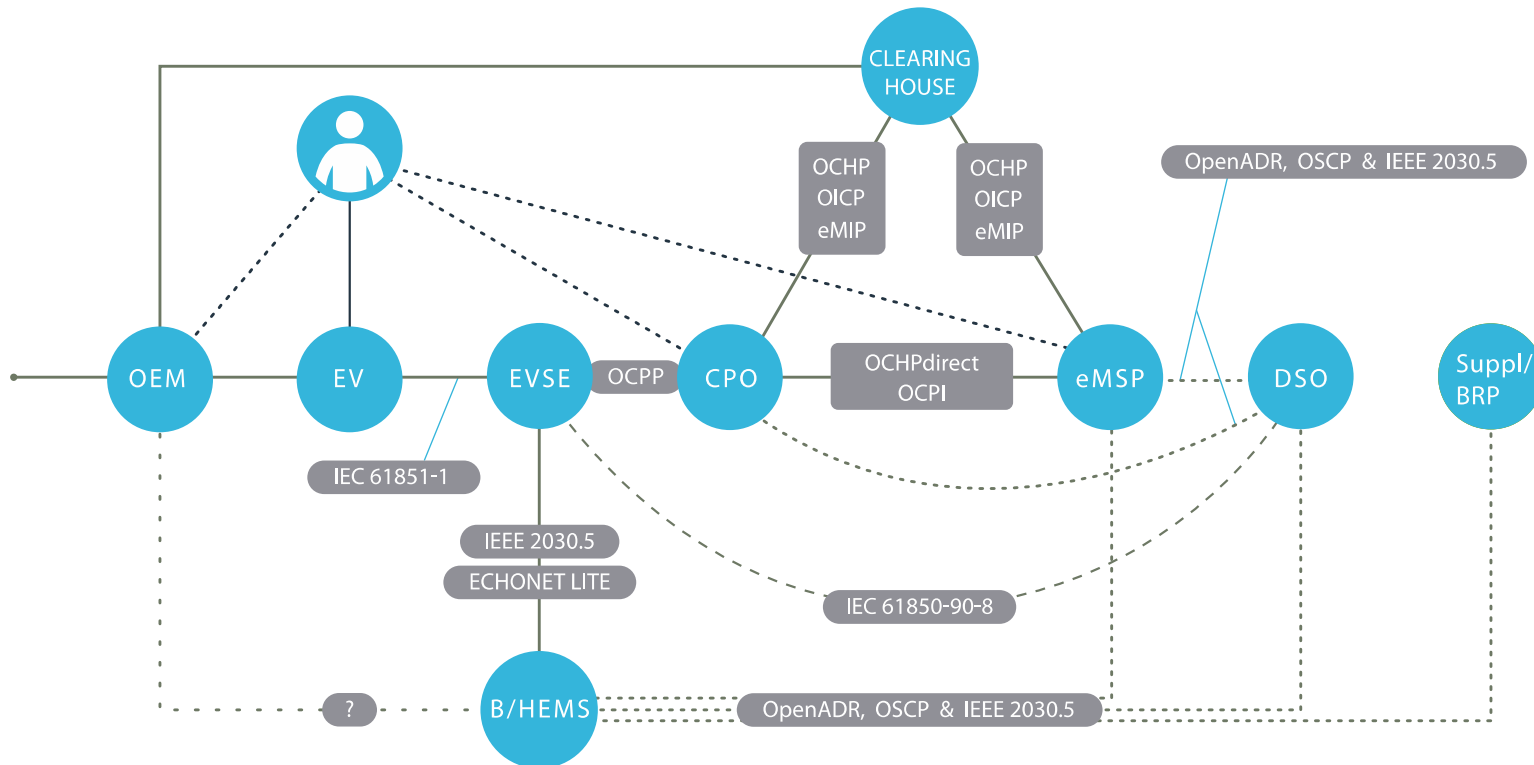
First protocol overview



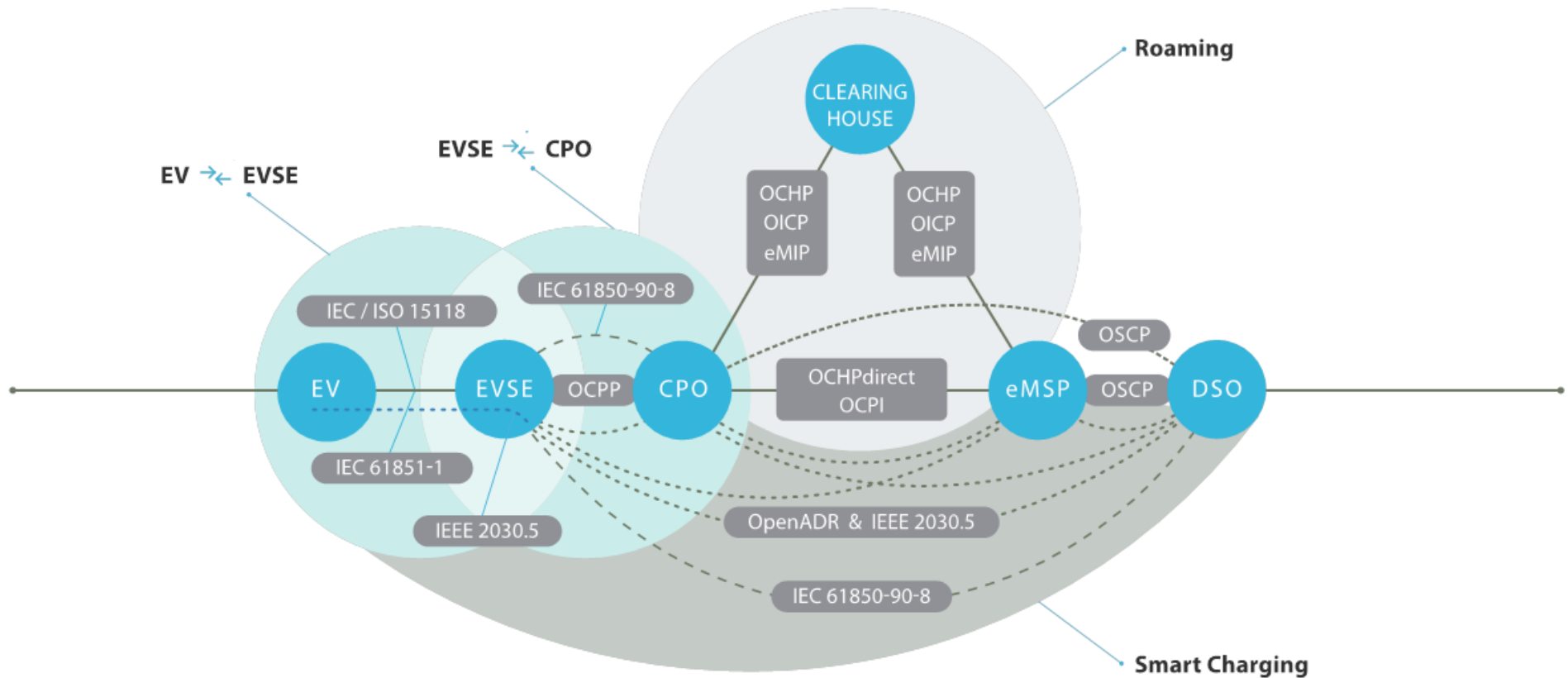
Protocol overview with the EV driver and OEM as actors



Protocol overview with the Energy Management system added



Scope of the protocol study (v1)



EV related protocol in scope of v1

Smart Charging

- Open Smart Charging Protocol (OSCP)
- OpenADR 2.0
- Open Charge Point Interface (OCPI)
- IEEE 2030.5 (SEP2.0)

Central System to Charging Station

- OCPP 1.6
- IEC 61850-90-8

Roaming

- Open Clearing House Protocol (OCHP)
- Open Charge Point Interface (OCPI)
- Open Inter Charge Protocol (OICP)
- eMobility Inter-Operation Protocol (eMIP)

EV to Charging Station

- IEC 61851-1
- ISO/IEC 15118

Supported functionalities

Authorize Charging Session

Billing

EV charging

Handle registration

Operate charging station

Provide charging station information

Reservation

Roaming

Smart charging

Rating of the protocols

Interoperability

- **Detailed behavior**
- **Clearly written**
- **Interop events**

Market adoption

- **Number of users/countries/companies that use the protocol**

Maturity

- **Number of releases**
- **Time in use**
- **Certification in place**

Openness

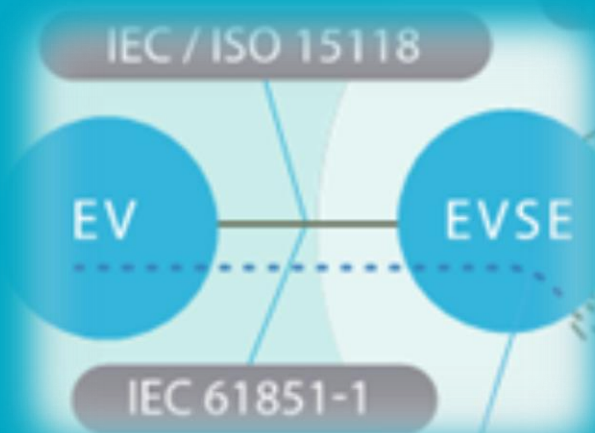
- **Developed by an easily accessible group (e.g. SDO)**
- **IP licensing**
- **Publicly accessible**

General findings

- **Many protocols are still evolving, expanding and improving**
- **Rating them on Interoperability, Market adoption, Maturity & Openness is only informative**
- **There are many different combinations of protocols possible**
- **You can download the report at <https://elaad.nl/innovatie/download/>**

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EV to EVSE



EV to EVSE

Currently in Europe 61851 is mandated, 15118 is a recommendation.

What do we get extra when using 15118?

- **Plug and Charge - A better customer experience**
- **State of Charge & Time of Departure - More information for smart charging**
- **Certificates - advanced security**

What is the impact of using 15118?

- **Need for more processing power and memory in the charging station**
- **Costly extra communication components in Charging station**
- **Significant increase of charging station to back end system data traffic**

What are ElaadNL's concerns?

- **Slow (no) deployment of 15118 cars and charging infrastructure**
- **Who will be, and control, the Certificate Authority?**
- **Schedule re-negotiation: will EVs respond?**

Next steps at ElaadNL

- **Project: Implementation of 15118 and OCPP in a charging system**
 - **Test plug & charge, data traffic, security & smart charging**

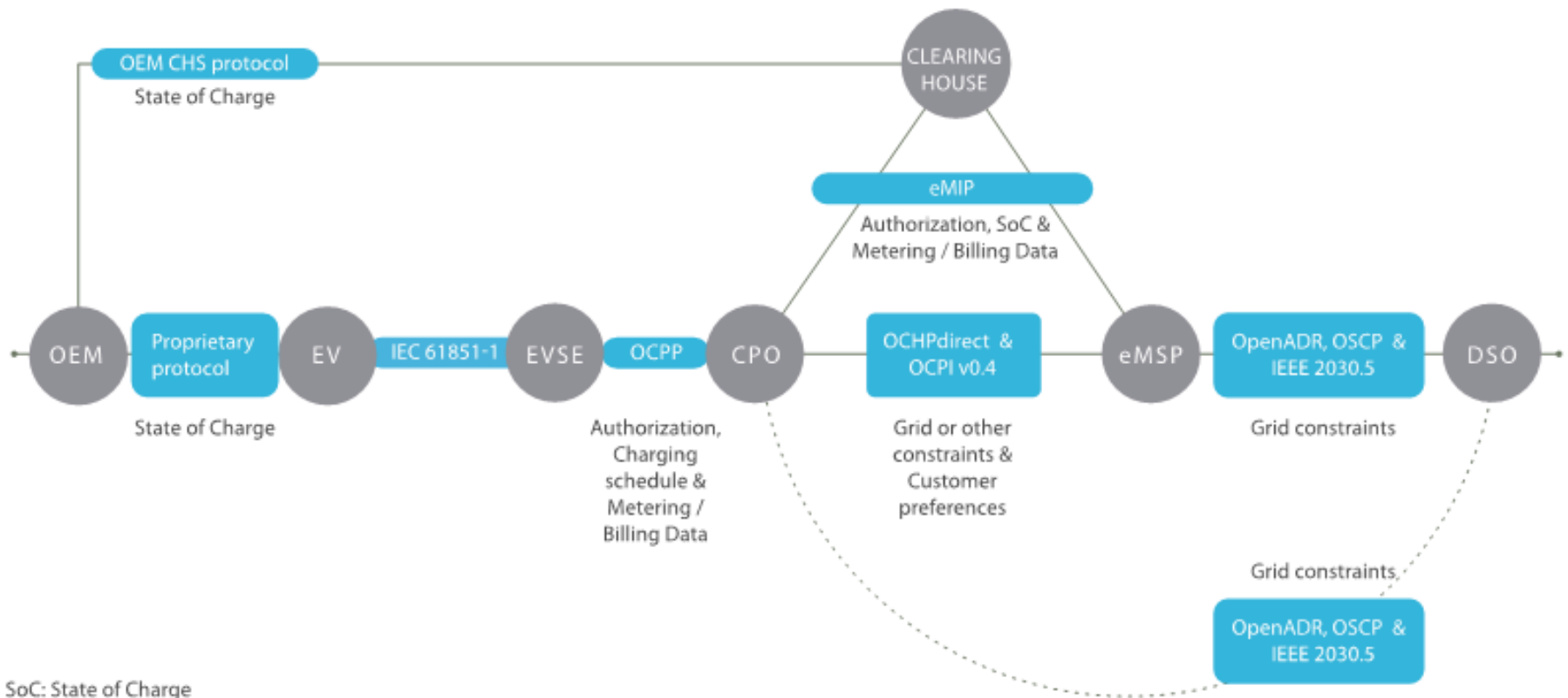
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Smart Charging

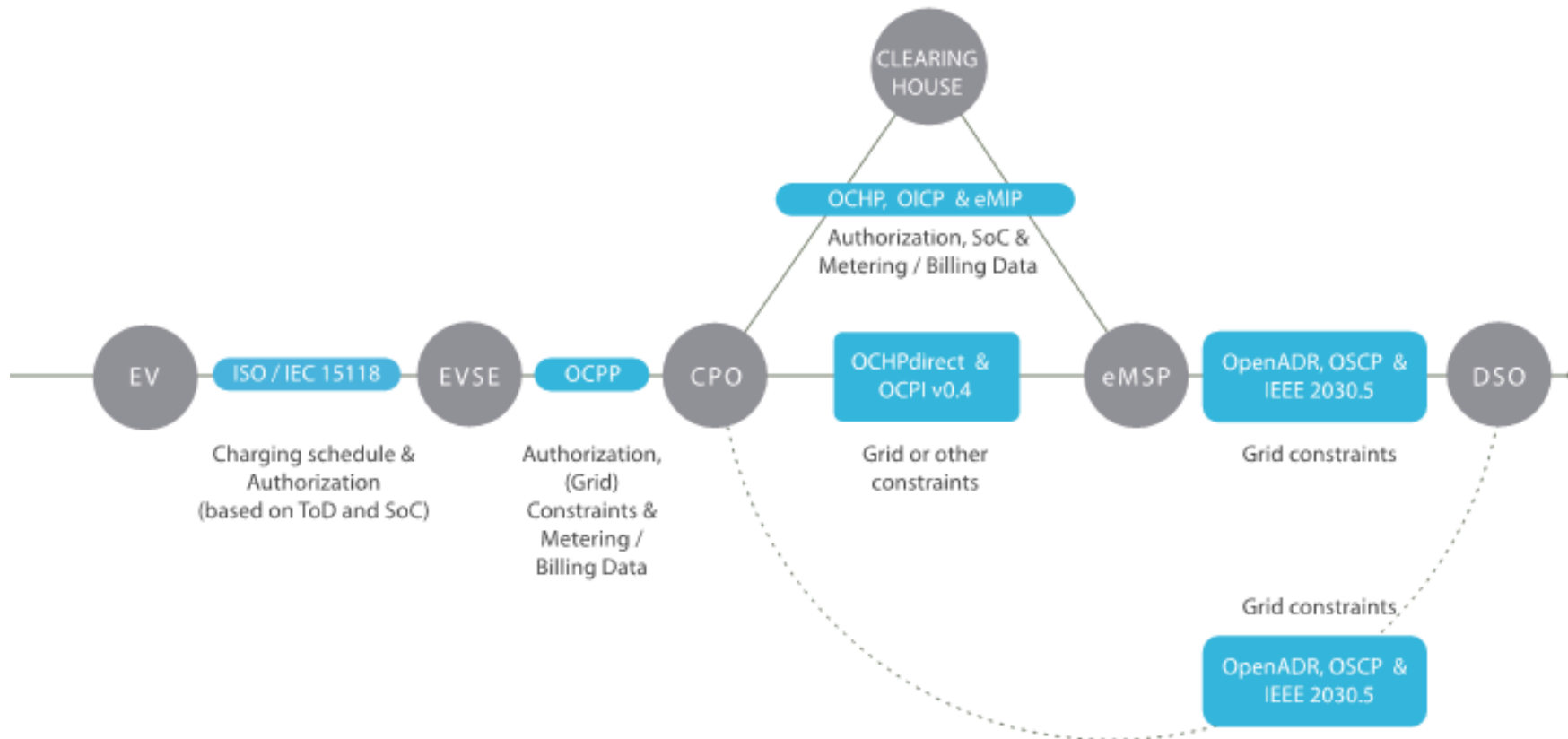
Findings regarding smart charging

- **There are many different set ups possible**
- **State of Charge (SoC) and Time of Departure (ToD) are very important for smart charging, but not yet supported by many protocols**

Possible set up for smart charging – using the Gireve Platform



Possible set up for smart charging – using 15118



Next steps at Elaad

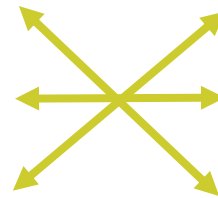
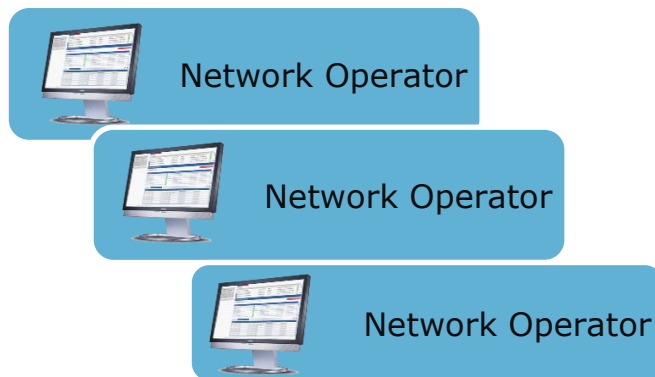
- 1. Project: Implementation of 15118 and OCPP in a charging system**
- 2. Project to implement OpenADR and asses OpenADR in relation to OSCP**
- 3. Project to implement and asses Smart Charging in relation to a Home Energy Management System (HEMS)**

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EVSE to CPO

Interoperability in infrastructure enables an open, innovative and affordable charging infrastructure

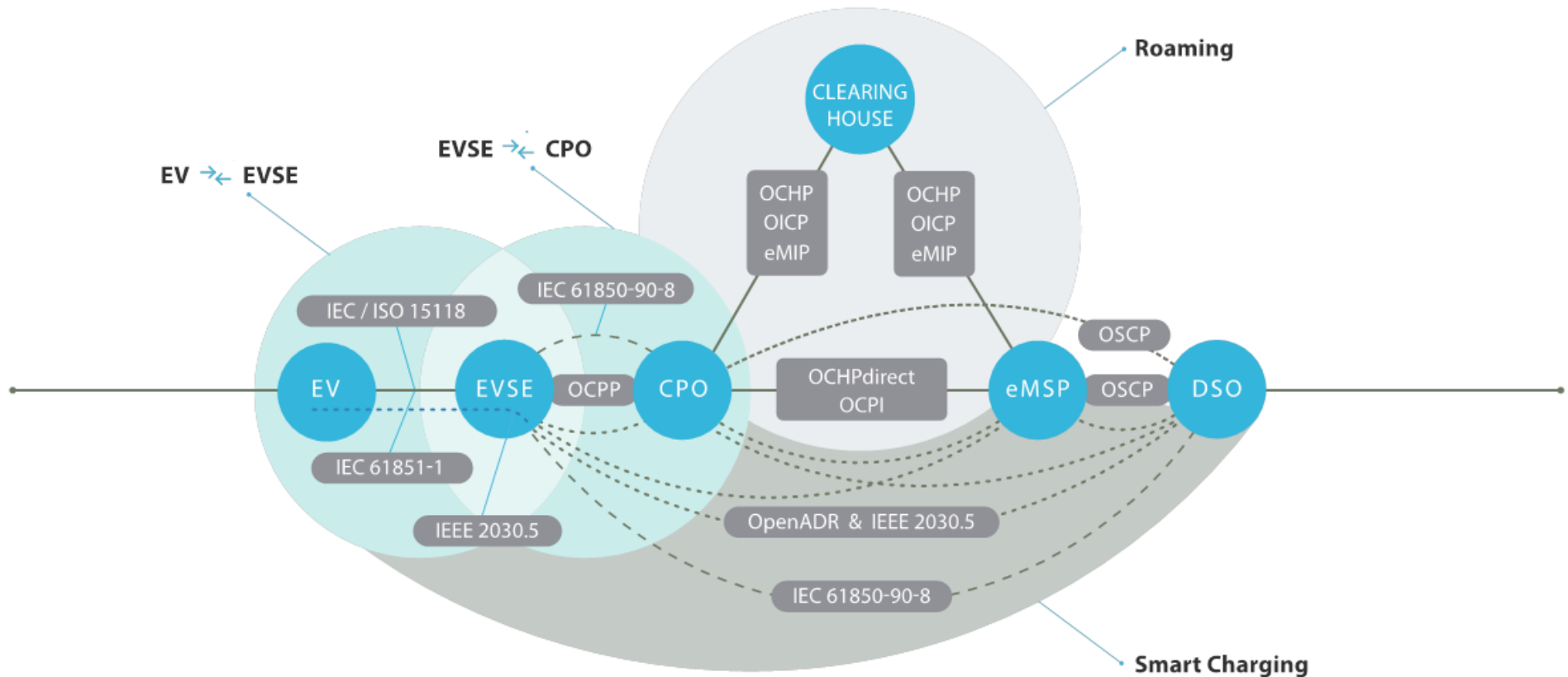
- 1 Asset owners (utilities, municipalities, private companies) can migrate from one Network Operator to another more easily whilst keeping charging stations operational



- 2 Network Operators can integrate more easily with multiple brands of charging stations

- 3 Charging station manufacturers can integrate more easily with multiple Network Operators

The link between EVSE and CPO is crucial if you want to have access to the charging infrastructure



Next steps at Elaad

- 1. Help the Open Charge Alliance to release OCPP2.0 (November 2017), which amongst many other things includes alignment with 15118**

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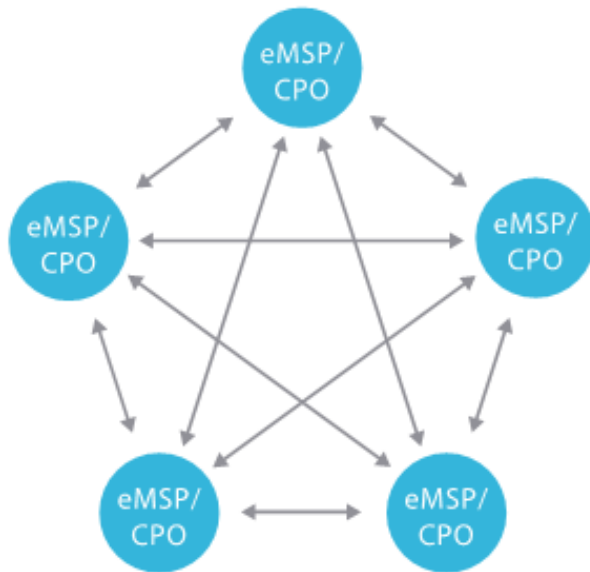
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Roaming

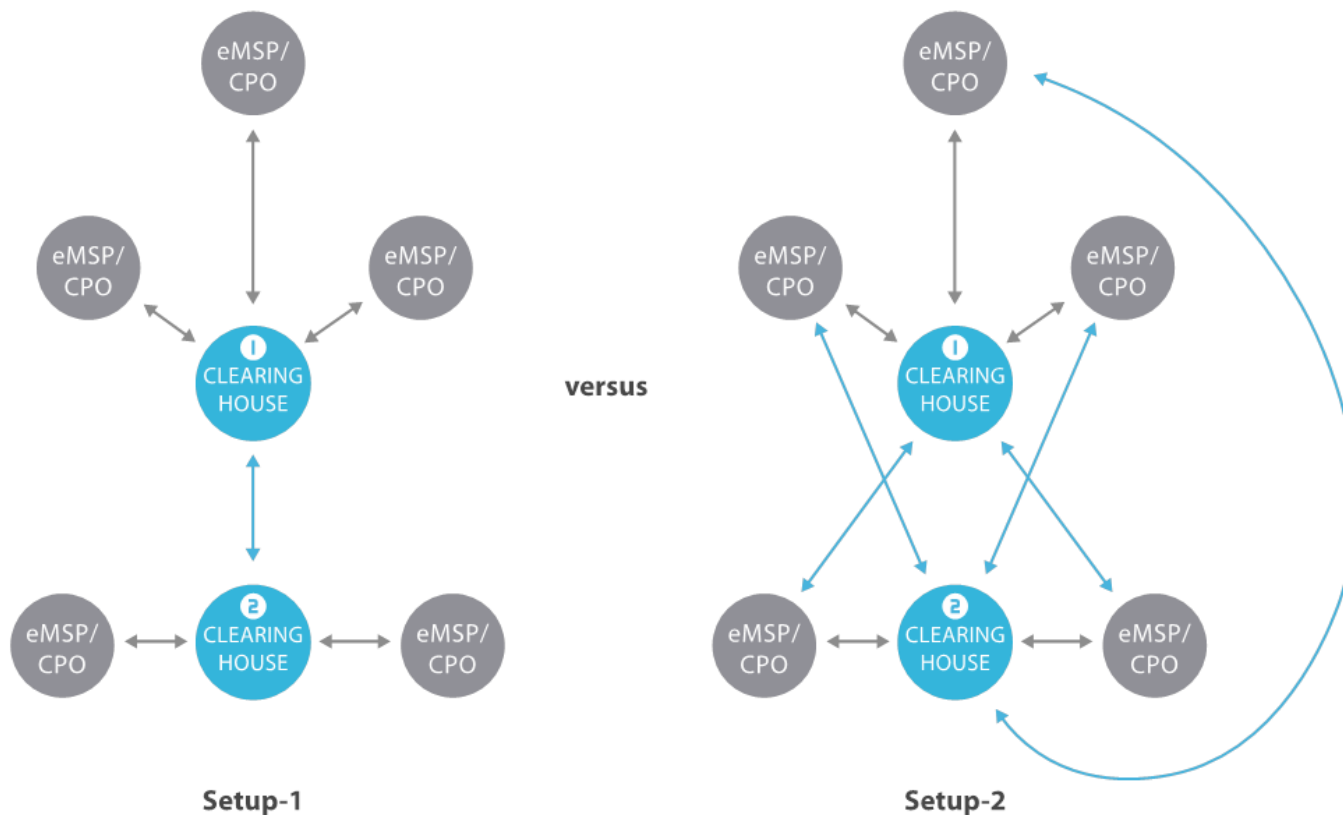
Findings regarding Roaming

- **Many protocols are still evolving, expanding and improving**
- **Roaming protocols are all very similar**
- **Roaming protocols should better facilitate smart charging**
- **More important that the actual protocols are the architecture and the business models**

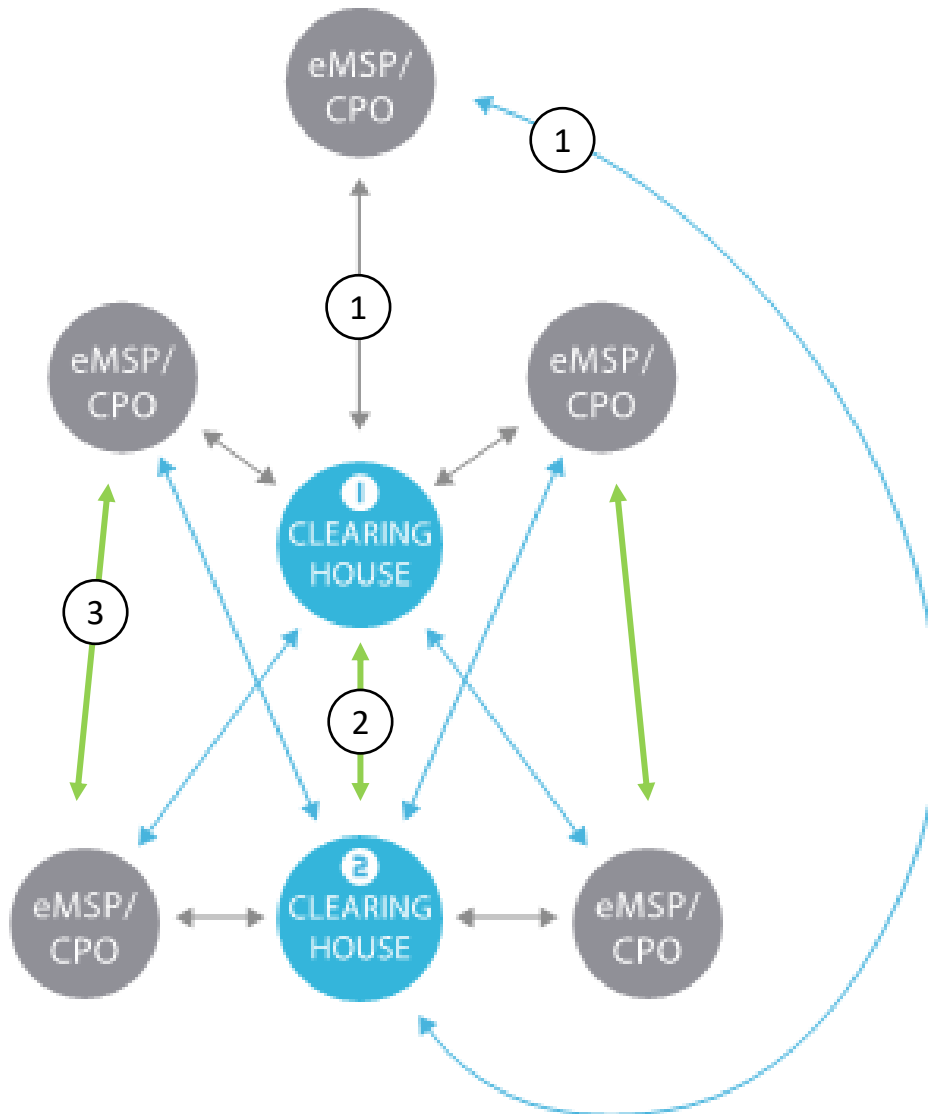
Finding: different options for roaming (1) Peer to Peer or a Clearing House



Finding: different options for roaming (2)



Current development of roaming in Europe



1. eMSPs and CPOs are connected to multiple Clearing Houses (using OICP, OCHP or eMIP)
2. Three large Clearing Houses are working on interconnecting (using OICP, OCHP and eMIP)
3. eMSPs and CPOs are connection peer to peer (using OCPI or OCHP-direct)

Pros and Cons

- Not a very efficient solution: many connections and many different protocols
- + Good for consumers: roaming will be widely available
- + Market balance: many options to roam; no lock in with one party for roaming

Next steps at Elaad

- 1. Project: Connecting the three major roaming platforms together with Eclearing.net, Hsubject and Gireve to enable pan European roaming**
- 2. Help to extend roaming protocols (OCHP and OCPI) with capabilities for smart charging and 15118**

**We invest in
open protocols
to make the
donut bigger**



Thank You
For your attention