

Combining OpenADR with OCPP

Turning EV's from Threats into Demand-response Assets

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Technische Universiteit
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Where innovation starts



About TU/e, ElaadNL and Auke Hoekstra

- The Eindhoven University of Technology has organized its mobility research into a multi-disciplinary strategic area smart mobility. One or three such areas: heavy focus.
- ElaadNL is a foundation sponsored by Dutch grid operators that invented the Open Charge Point Protocol and rolled out one of the first charge point networks in the world (first interoperable).
- Auke Hoekstra
 - Models the synergy between electric vehicles and the renewable energy grid (integral agent based model in GAMA).
 - Interested in open standards for EV's that stimulate renewable innovation.
 - Active in Dutch expert groups and recently appeared before parliament. Published op eds and three books about it (in Dutch).
 - Vegetarian with 7kWp of solar panels and a Nissan Leaf.
 - Can be reached at auke@aukehoekstra.nl.
 - Full disclosure: ElaadNL paid for this trip.



I will answer 3 questions in 3x5 minutes

1. Why is smart charging infrastructure better?
2. Why are truly open protocols better?
3. Why are OpenADR en OCPP better together?

Why is smart charging infrastructure better?

**Smart grids = electricity grid + internet technology
= VIP in the IoT**

Smart charging is using internet technology to control when and how fast EV's (dis)charge and to improve the user experience

Result:

- **Better+cheaper use of renewable energy**
- **Better+cheaper use of electricity grid**
- **Better+cheaper user experience**

Why is smart charging better?

Better+cheaper use of renewable energy

- Renewable energy fluctuates strongly during the day which leads to a mismatch between use and demand and thus price fluctuations.
- EV's use about the same amount of energy as the house (3x less than a regular car by the way) but are stationary >90% of the time (ElaadNL).
- Simulations indicate that if >25% of cars where EV's we could almost completely dampen daily fluctuation if they all engaged in smart charging and.
- Our research shows that Dutch users are willing as long as they have an “overrule button”.

Why is smart charging better?

Better+cheaper use of electricity grid

EV's are not just another appliance!

- In NL average grid use is 19% of maximum but EV's have a peak that often coincides with peaks on the grid and which counts for about ten households if you include the coincidence factor.
- If 10% of cars was an EV their combined power would be more than all fossil combined (in NL).
- EV's are extremely flexible (overnight charging, V2G)
- Using EV's as demand-response assets can make a BIG difference to grid resilience without more “copper in the ground” (aluminium now).

Why is smart charging better?

Better+cheaper user experience

- As a user you really like to know whether chargepoints are available and if your transaction is going as planned. I can attest to many sleep and appearance depriving experiences. And when something goes wrong you want the person of the helpdesk to have information about the problem.
- Good diagnostics means less costs for call centers and mechanics and less revenue loss.

Why are truly open protocols better?

Definition of truly open protocol:

- Easy access (no old boys network or red tape)
- Usage is free (no licencing fees or patents)
- Independently controlled (no monopolist or kartel)

Some examples:

- TCP/IP (Internet would be less successful otherwise)
- W3C (WorldWideWeb/Tim Berners Lee/CERN)
- Mennekes Plug (IP in return for influence)
- OCPP (Elaad: because there was nothing else yet)

Why are truly open protocols better?

Innovative and competitive markets

- **Innovation:**

- Low barrier for new entrants with good ideas (know thyself: Dutch grid operators are not the worlds greatest innovators)
- Everybody knows what to expect and can focus on added value in a certain domain (OSI model) vs playing defence (MS Office)

Competition:

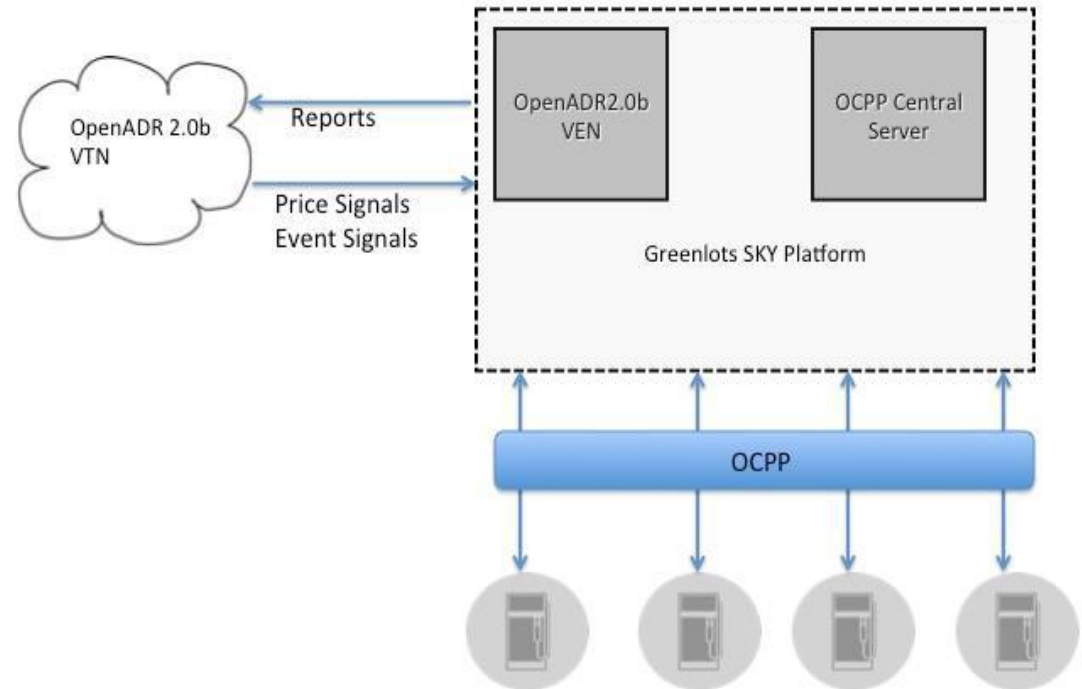
- More choice and less lock-in: keeps vendors “honest” (one of the main reasons for Dutch grid operators)
- Lower prices (monopolies/kartels inflate prices)

Why are OpenADR and OCPP better together? First: what are they?

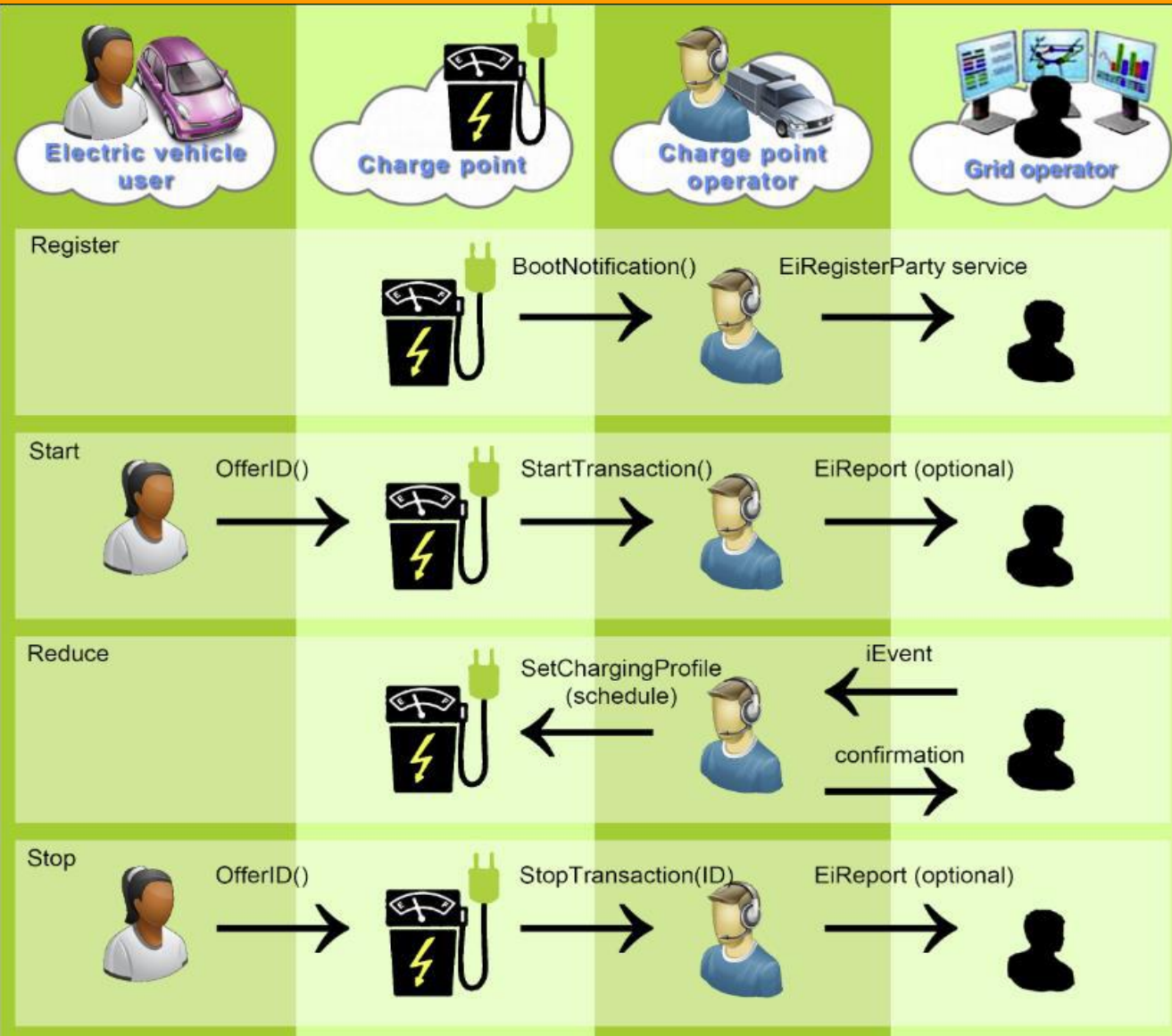
- **OpenADR is an open protocol for managing demand response assets. Often used for thermostats of connected to airco's. Widely used in America.**
- **OCPP (Open Charge Point Protocol) is an open protocol for communicating with charge points. It is the only open standard that is widely used. (The task of communicating with charge points and electric vehicles is a very specific task that adds a lot of EV specific functionality.)**

Why are OpenADR and OCPP better together? An example pilot.

Greenlots worked together with Southern California Edison to pilot charging at work and find out how EV users react to dynamic pricing.



Why are OpenADR and OCPP better together? An example pilot.



Why are OpenADR and OCPP better together? Overall conclusions

- **Smart charging is important to manage renewable energy, grid congestion and user experience.**
- **Open standards are important to drive innovation, competition and low prices without lock-in.**
- **OpenADR and OCPP are the leading open protocols for demand response and EV charging.**
- **Combining them is straightforward and literally creates a “best of both worlds” solution.**

Questions and discussion