

30/10/19

Using OpenADR and OCPP together to enable smart EV charging in UK homes

Carbon Co-op

carbon.coop / @carboncoop

About Carbon Co-op

- An energy services co-operative based in Greater Manchester, UK.

Provides energy services to it's householder and SME members.

Currently focussed on 'deep' retrofit of buildings and smart energy.



What is OpenDSR?

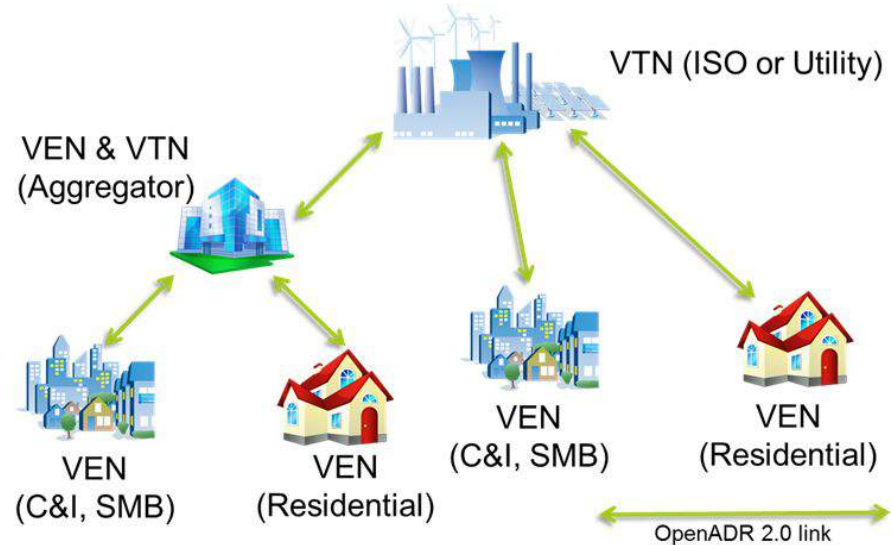
- Carbon Co-op have received funding from the UK government to develop and demonstrate an **open source** and **standards-based** system to enable demand side response in homes and small businesses.
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- This is aimed at automated control of **multiple** large electrical loads in **homes and SMEs** such as electrical vehicle chargers, direct electric heating systems, heat pumps, other HVAC, and commercial refrigeration systems.



What is OpenADR?

An application protocol for exchanging **information signals** between automated systems for the purpose of facilitating demand response activity.

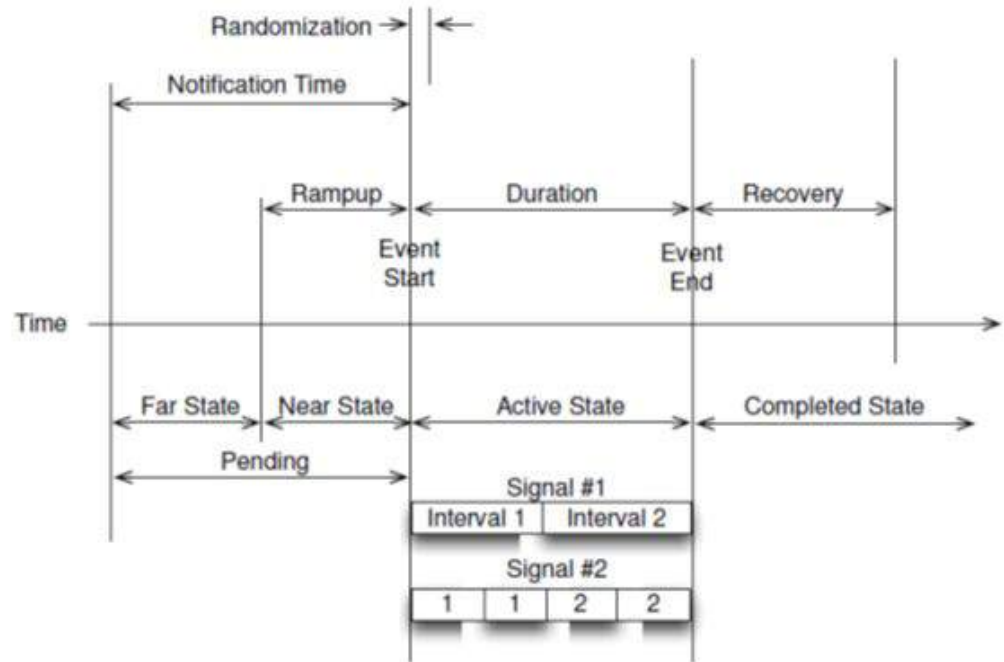
Sending/receiving XML messages between 'virtual end nodes' and 'virtual top nodes' over HTTP (or XMPP).



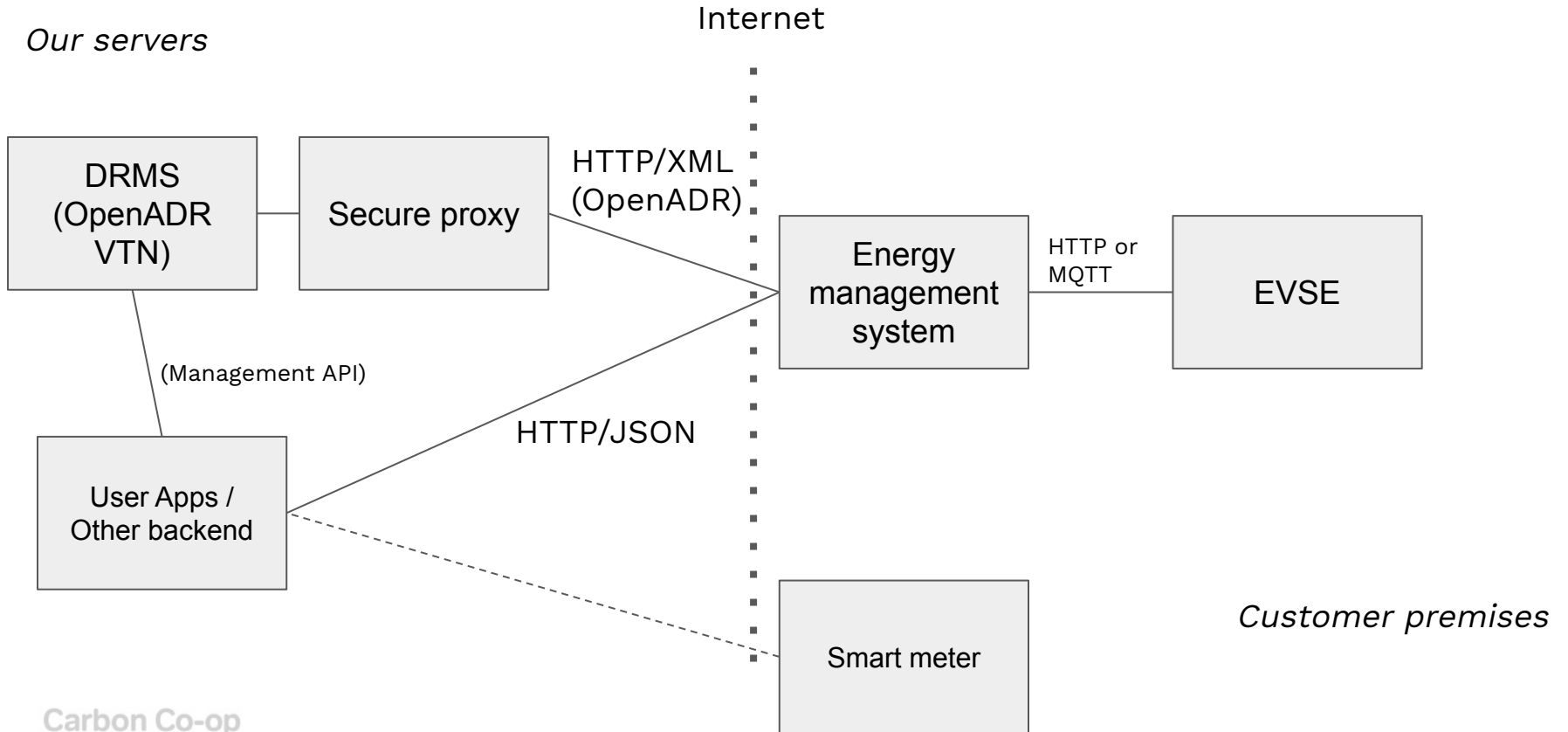
What is OpenADR?

VENs and VTNs implement different profiles which contain increasing subsets of functionality grouped into services with separate endpoints.

VENs are not 'slaves' to VTNs. VENs receive signals and decide themselves what to do with them!



Our original architecture without OCPP



How have we implemented OpenADR?

- Heavily modified/updated existing OpenADR 2.0b VTN implementation.

Integrated a PKI solution for handling the issuance of TLS client certificates.

Added basic management API to enable integration with other business systems.

Created a flow to enable simple online provisioning of client certificates.

Our experience of using OpenADR

XMPP: would MQTT be better in future updates to standard? web sockets?

Security: we used public server certificates from LetsEncrypt and separate certificates for signing client keys. This is not consistent with the OpenADR Certificate Policy!

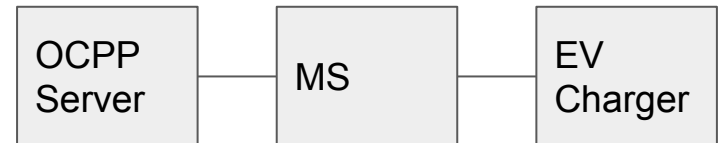
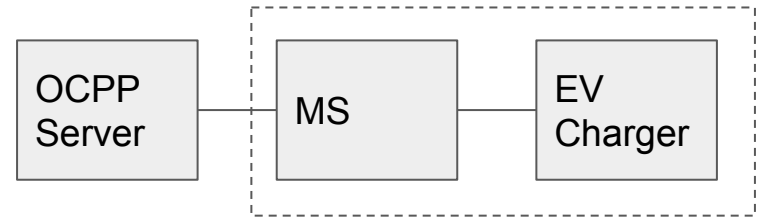
OpenADR 2.0 Program Guide: very useful addendum to the standard which provides templates for how it can be used in different use cases. Recent updates have included EV charging and flexibility markets.

OCPP in UK

- OCPP 1.6 or a functionally 'equivalent' standard are now required in UK EVSE systems in order to meet the minimum technical specifications required for OLEV approval and be eligible for installation grants.
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- This capability doesn't need to be integrated inside the charger unit itself and can be provided through a separate connected device.

Different ways of adding OCPP to existing EVSE systems

1. Add OCPP support to the charger unit itself (OLEV compliant).
2. Add OCPP support to a first-party management system (OLEV compliant).
3. Add OCPP support in a third-party management system.



OpenADR and OCPP

Whereas OpenADR is concerned with exchanging information/signals, in OCPP there is more emphasis on control.

Where control needs to be delegated to a management system then either an interface is required on the EVSE or the management system needs to run an OCPP server and register the OCPP enabled chargepoint to it.

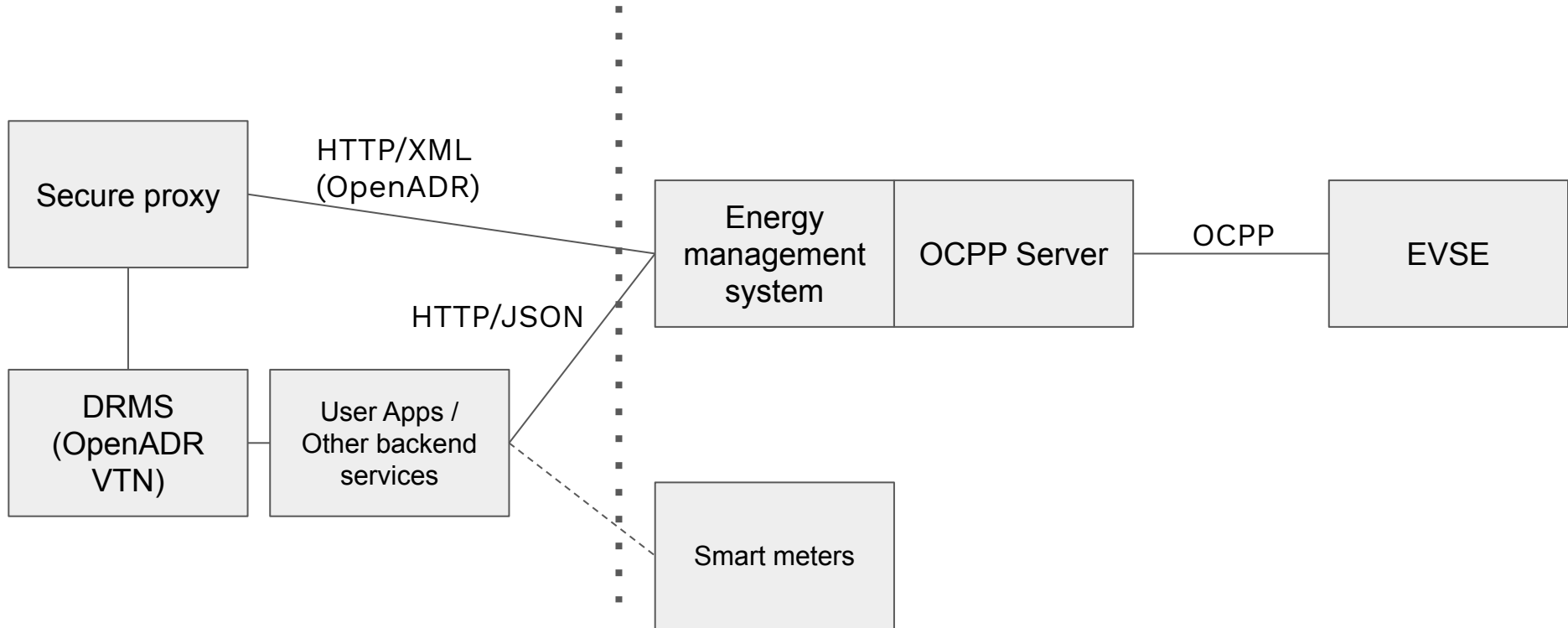
How do we plan to use OCPP?

We are working with Megni/Open Energy Monitor, who produce the emonEVSE - an open hardware EVSE system.

- To interoperate with OLEV-compliant OCPP EVSE we are developing a ‘thin’ appliance which runs on a home/building management system which we can register EVSE too and which can then be used for DSR control.

In addition we are working with Megni to implement OCPP 1.6 on their EVSE equipment.

OpenDSR architecture with OCPP



Future plans

- Demonstrator activity for OpenDSR begins in April 2020.
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- We are planning to release open source in early 2020:
 - Our OpenADR VEN and VTN implementations.
 - Our OCPP thin appliance for home energy management system interoperation.
 - (With Megni) OCPP 1.6J client library for ESP32.



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