Zen Digital Integration Platform
IoT device and application enablement platform for Energy Service Providers

Telecom Operators & CSPs
A complete end-to-end view of the network as the foundation to systems consolidation

Government & Large Enterprise
Zen Fault and Performance management of large, evolving, enterprise and safety critical networks
SysMech & ESC Living Lab
Digital Integration Platform (DIP)

Innovators
EV Chargers
Solar
Energy Management Systems
Heat Pump
Boiler
IHD
Thermostatic control
Data Model
Analytics
Researchers
Trial Results

The IDSR programme is part of the up to £65m Flexibility Innovation Programme within the Department for Energy Security and Net Zero’s £1 billion Net Zero Innovation Portfolio.
EV & Heat pump deployed capacity - UK

Capacity projections based on figures from “STATE OF UK FLEXIBILITY INNOVATION” (Draft, ESC, February 2023)
Solar & Battery deployed capacity - UK

Capacity projections based on figures from “STATE OF UK FLEXIBILITY INNOVATION” (Draft, ESC, February 2023)
## Core Principles

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interoperability</td>
<td>The ability of an energy smart appliance (ESA) to be operated by any authorised DSR Service Provider for DSR services.</td>
</tr>
<tr>
<td>Data privacy</td>
<td>The secure transmission and storage of data on the device or with any controlling party</td>
</tr>
<tr>
<td>Grid-stability</td>
<td>The prevention and mitigation of negative impacts to the energy system caused by inappropriate operation of ESAs</td>
</tr>
<tr>
<td>Cyber-security</td>
<td>The appropriate protection of an ESA, systems and data from unauthorised access, to reduce the risk of cyber attack</td>
</tr>
</tbody>
</table>

Key that the data collected is standardised and interoperable.

Includes data governance

ESAs update flexibility information to DSRSPs whenever their status changes whilst respecting consumer wishes.
IDSR Programme

Competition Aim

Design and develop ESAs, including Customer Energy Manager (CEM), and demand side response service provider (DSRSP) platforms according to the PAS 1878 and PAS 1879 technical frameworks:
OpenADR and PAS1878

Relationship

• PAS 1878 references a subset of OpenADR 2.0b

• VTN = DSRSP (Demand Side Response Service Provider)

• VEN = CEM (Customer Energy Manager)

• Our consortium are one of several projects implementing PAS 1878 solutions to prove the feasibility for UK markets
Project Overview

Solution
Solution Overview

Components

VTN

VEN

ESAG

ESAG

OpenADR

JSON

OCCP

*Ev icons created by GOWI - Flaticon

**Ev icons created by Umeicon - Flaticon
Benefits of a cloud hosted CEM

- Can support multiple different Interface B protocols
- Not resource constrained
- Simplified patching and maintenance
- Can be hosted by a carbon neutral data centre
- Avoids additional clutter in the home (hardware gateways may still be required for non-IP devices)
- Could also function as HEMS, more compelling when multiple ESA types are connected, can self-manage a cohort of devices based on consumer preferences in terms of tariff / environmental impact.
## Solution Overview

### Message Flows

<table>
<thead>
<tr>
<th></th>
<th>DSRSP</th>
<th>CEM</th>
<th>ESAG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Registration with DSRSP</td>
<td>✔</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>CEM and ESA Mutual Authentication</td>
<td>N/A</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Device registration of the CEM and the ESA with the DSRSP</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Initialization</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Normal Operation</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Exception Conditions</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Deregistration</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>
CEM
SysMech
ESAG & ESA’s

ev.energy

Smart charging
We optimise your home EV charging for the cheapest, greenest energy possible

Smart schedule
Tomorrow
07:00 AM
Mon, Tue, Thu, Wed, Thu, Fri and Sat
09:00 AM
Full schedule

Smart settings
Only charge off-peak
Price limit
12p/kWh
Maximum charge limit
80%
Trickle charging

Energy
Your tariff
Solar (Beta)

About

Tesla Model X
Statistics
24 hours
30 days
1 year

TOTAL ENERGY USAGE
33 kWh

75% Smart charge planned
Vehicle ready by 07:00
Next charge enabled from 23:30
Max charge limit set to 80%

Carbon intensity
Per charging session (Last 30 days)

TOTAL COST
£15
Avg. 7p/kWh
SAVED
£25
Avg. 7p/kWh

CARBON IMPACT
ESAG & ESA’s

ev.energy

V1G/V2X eco-system diagram

Interoperability Standards:
ISO 15118:2022: International vehicle-to-grid communications interface being developed between the EV comms controller and bi-directional charger.
OCPP: The Open Charge Point Protocol provides a standard for connecting chargers to EV charging platforms.
IEEE 2030.5: Developed primarily for California this is a standard for Smart Energy Profile Application Protocol.
OpenADR: Developed primarily for California this is a standard for Smart Energy Profile Application Protocol.
OpenADR
Benefits for Interface A

- Defined, accepted, open standard
- Should increase code quality and reduce in-house development effort
- Limits vendor lock-in
- Used internationally
OpenADR
Implementation of Interface A

• “Report Only” VEN, which only includes the following services:
  • EiReport
  • EiRegisterParty

• The periodic power report (Instantaneous) power values shall be implemented as described in the OpenADR 2.0 Demand Response Program Implementation Guide [17], “A.4.2 Fast DR Scenario 2 – Typical Use Case, B profile”, substituting the required reporting interval.

• PUSH vs PULL, VEN & VTN
QualityLogic OpenADR test tool
How we utilise it for Automated testing

- Containerised, so we can now run outside of Eclipse, or any other Java IDE
- REST Endpoint added so that we can remotely trigger any test case via a request (e.g. a curl command)
  - Also returns a response, including the result of the test and a tracelog, including things like the OpenADR payloads sent/received during the test
- Additional logic & endpoint added to simulate the CEM registering with a DSRSP
- Disabled user prompts, so that we can automate our test procedures
- Seeking clarification on whether the tool can perform XML signature signing and verification as per the “high security” profile (conformance rule 514)

Thank You

- Feedback and questions
- Contact SysMech at sales@sysmech.co.uk