



OpenADR and Flexibility in a Box

September 2022

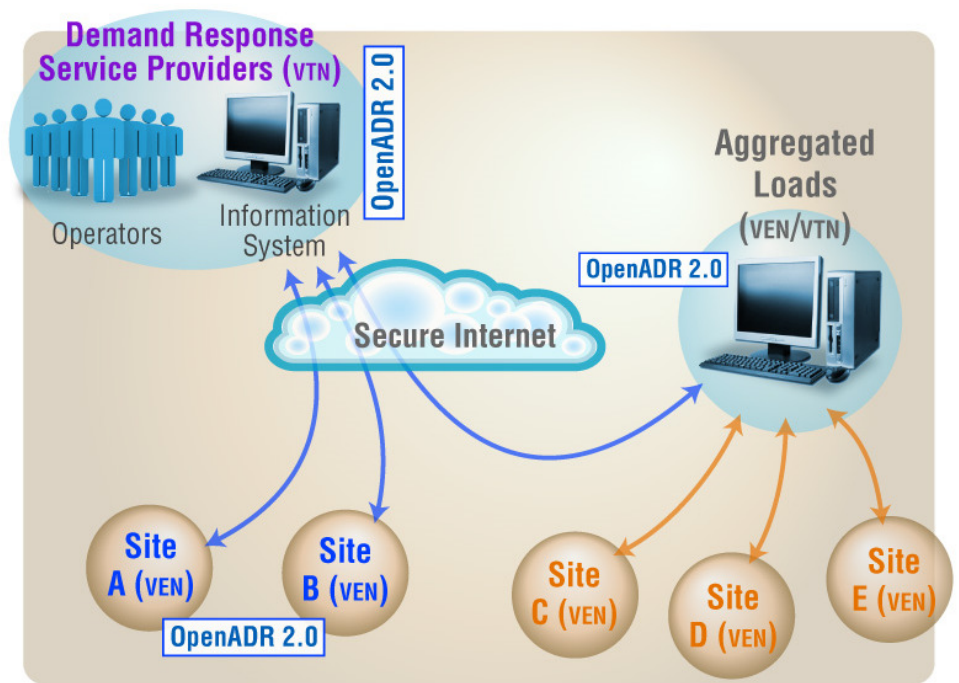


Housekeeping Items

- The webinar is being recorded and will be posted together with the slides at <https://www.openadr.org/webinar-series>
- Please use the Questions or Q&A function of GotoWebinar to send your questions and comments. We will answer them at the end
- All attendees will be muted. If time permits, we may open the lines for discussions. This will depend on the number of participants

OpenADR in a Nutshell

OpenADR provides a non-proprietary, open standardized Demand Response (DR) & Distributed Energy Resources (DER) interface that allows DR service providers to communicate DR, DER, and TE (Transactive Energy) signals directly to existing customers using a common language and existing communications such as the Internet.



Where are we today?

OpenADR Certified Product Database

Utilities and other DR/DER operators have a rapidly-growing selection of certified products to choose from for demand-side management.

Number of products on page: 10 20 30

ABC DEF GHI JKL MNO PQR STU VWX YZ

Sort Results By

Search

FILTER PRODUCTS

SERVER ▾

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BUSINESS TYPE ▾

OPENADR PROFILE ▾

SECURITY ▾

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In-Charge

In-Charge Energy | In-Control

In-Charge is dedicated to the pursuit of large-scale emissions reduction by providing turnkey solutions for commercial EV infrastructure projects. In-Control is charger an...

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MITSUBISHI ELECTRIC
Changes for the Better

Mitsubishi Electric Corporation | BLEnDer DR:VTN

BLEnDer@DR, one of BLEnDer series package software from Mitsubishi Electric Corporation, is fully complied with the OpenADR 2.0b profile. The software offers necessary func...

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CHARGIE
INTELLIGENT ENERGY

Chargie LLC | Chargie

Chargie is introducing the new era of electric vehicle service equipment to provide simple, intelligent and reliable energy solutions for a sustainable future. Chargie is a...

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opconnect

Community Connect
REALPAGE

The OpenADR Alliance is a non-profit member organization. We do not manufacture products.

- Two completed specifications
 - >9 years for 2.0a
 - >8 years for 2.0b
- 8 test houses validated
- > 271+ certified systems
- ~ 190 member companies
- [Certification \(openadr.org\)](https://openadr.org)
- [OpenADR – Product Database](#)

The 'Entities' of OpenADR

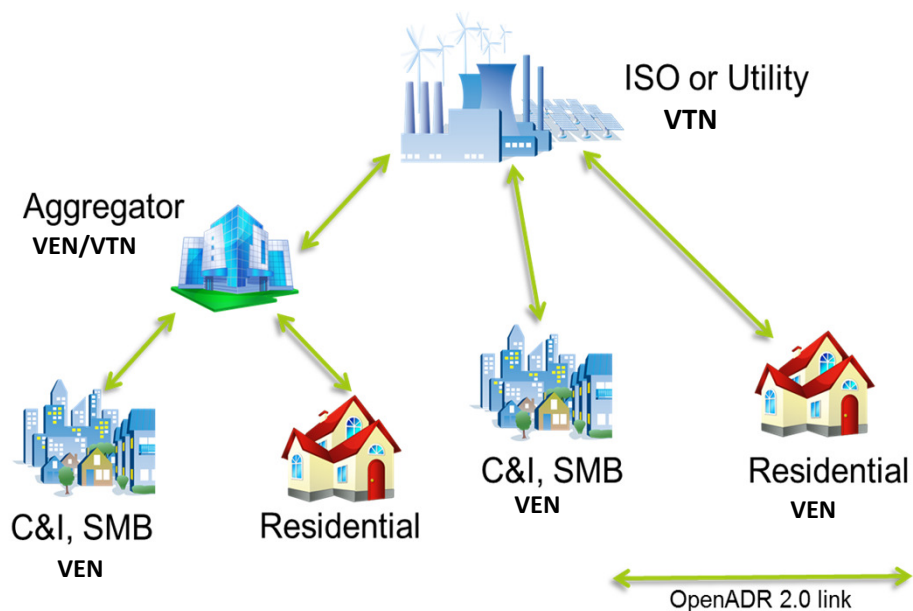
OpenADR is a message exchange protocol with two primary actors aka 'entities'

Virtual Top Nodes (VTN)

- Manages Resources
- Creates/Transmit events
- Request Reports

Virtual End Nodes (VEN)

- Receive events and respond to them
- Generate reports
- Control demand side resources

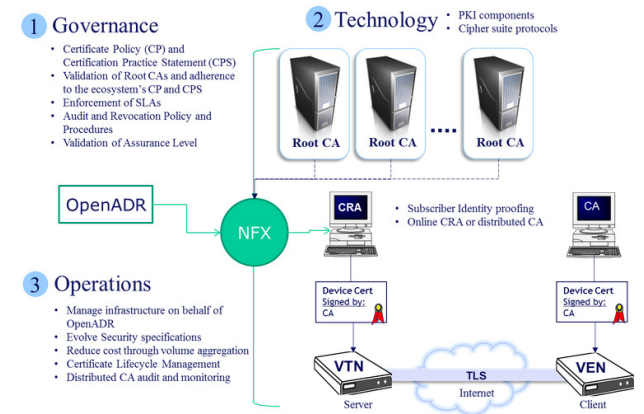


The 'Services' of OpenADR

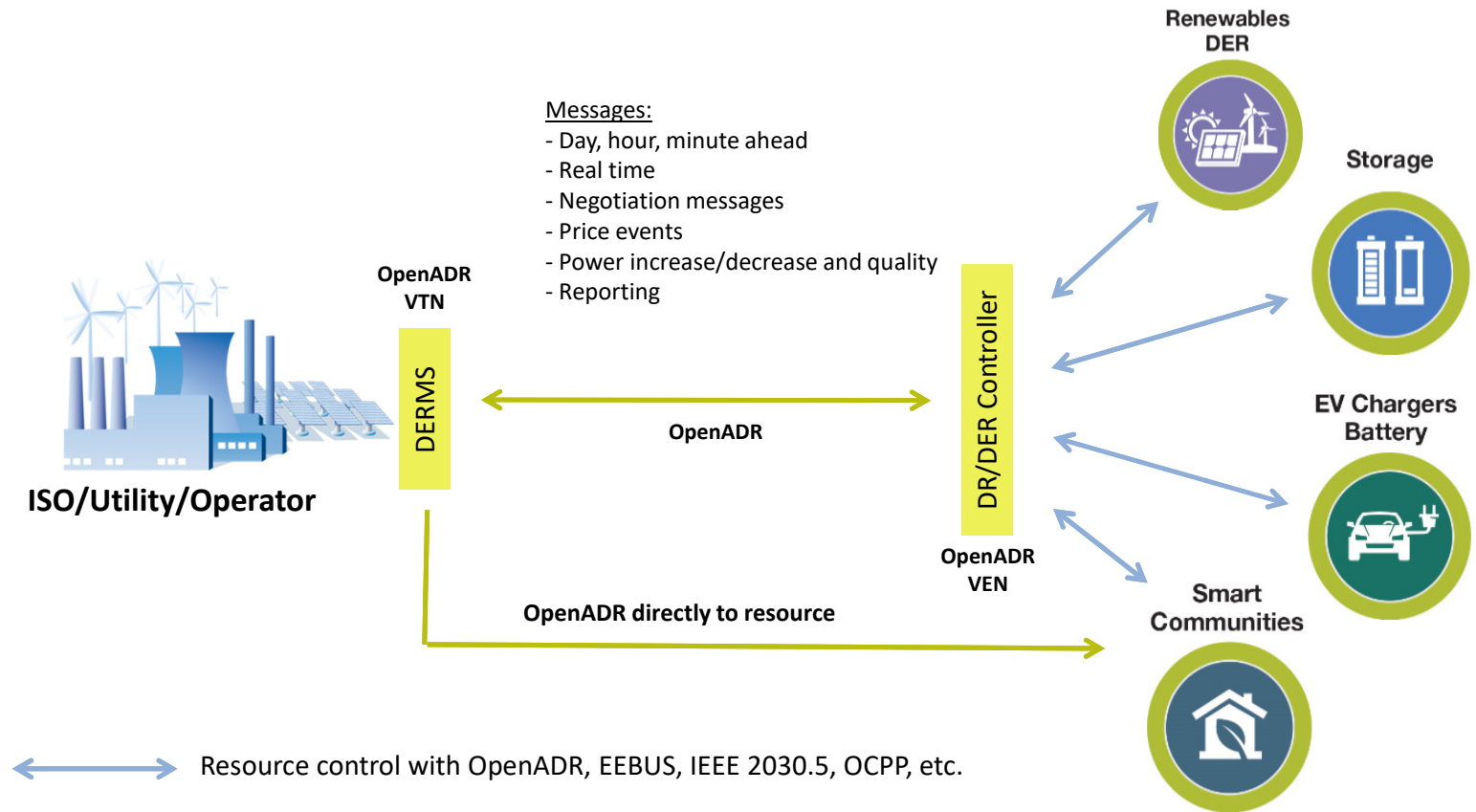
- Web Service like logical request-response services
 - Event Service – Send and Acknowledge DR Events **(2.0a & 2.0b)**
 - Opt Service – Define temporary availability schedules **(2.0b only)**
 - Report Service – Request and deliver reports **(2.0b only)**
 - RegisterParty Service – VEN Registration, device information exchange **(2.0a & 2.0b)**
- XML Payloads
- Communication through broadband or dedicated internet connection
- Security: TLS1.2 with server and client cyber sec certificates

Cyber Security Aspects

- Transport Layer Security 1.2
- Server and Client certificates
- Dedicated OpenADR ECC and RSA certificate authority
- Application up to user → utilities
- OpenADR allows for demarcation between utility network and customer owned equipment
- Security reviews performed by NIST/SGIP and IEC working groups



High Level Architectures



Common Adoption and Implementation Problems

- Return of investment for utilities and customers
- Customer engagement
- Controlling customer equipment
- Demarcation point for control systems

Common Adoption and Implementation Problems

- **Return of investment for utilities and customers**
- Customer engagement
- Controlling customer equipment
- Demarcation point for control systems

- Creating value for customers and Operators is difficult
- Plays into customer engagement
- Reducing implementation cost is key
- Standards usage vs. proprietary
 - No stranded assets

Common Adoption and Implementation Problems

- Return of investment for utilities and customers
- **Customer engagement**
- Controlling customer equipment
- Demarcation point for control systems

- Energy price and interactions are not on people's minds
- Day-to-day involvement has been envisioned and tried
- Difficult to keep customers engaged
- Opportunity for innovation – Set It and Forget It Approach

Common Adoption and Implementation Problems

- Return of investment for utilities and customers
- Customer engagement
- **Controlling customer equipment**
- Demarcation point for control systems

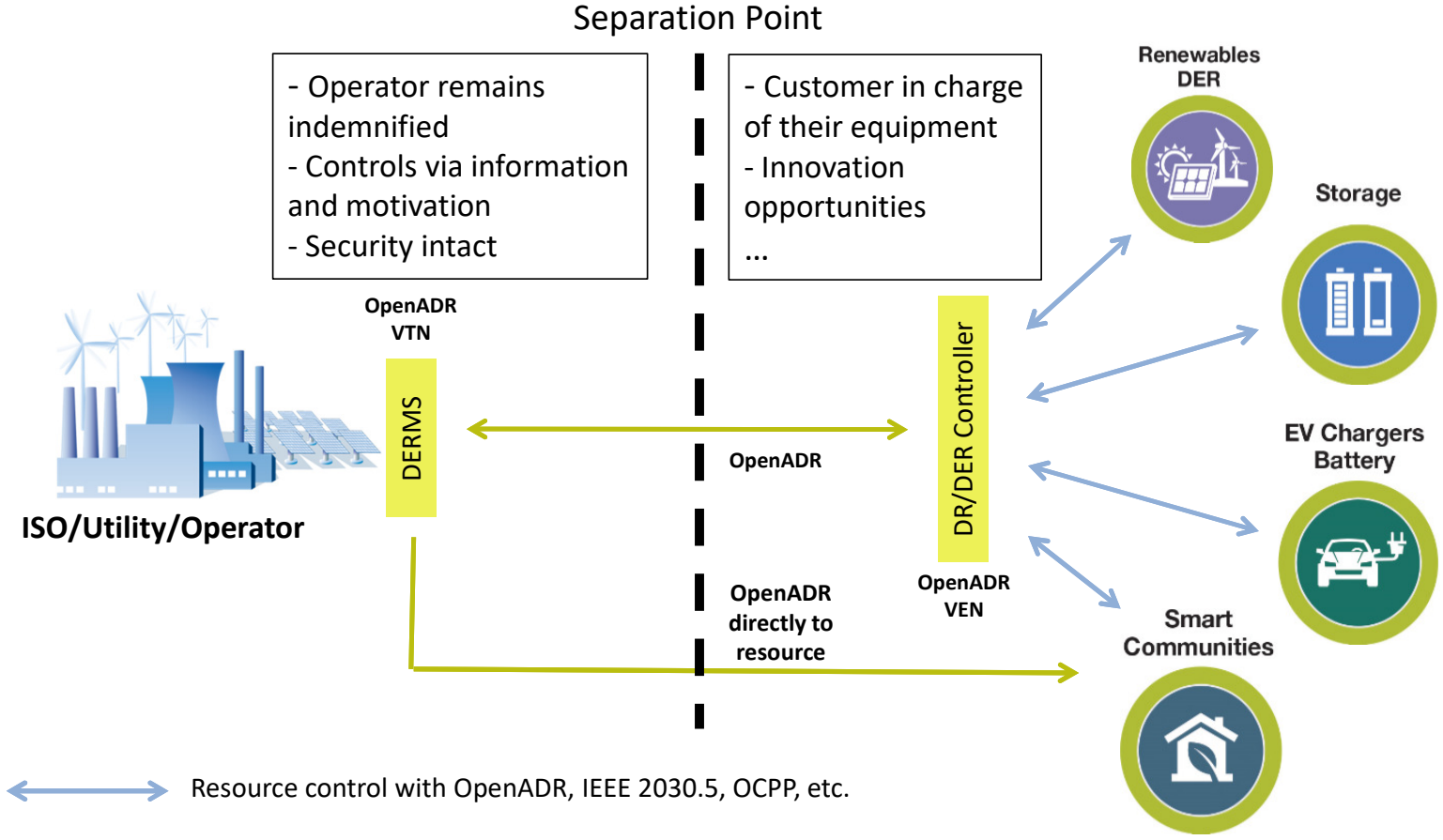
- Who is responsible?
- Who will the customer call during failures?
- Surveys about inverters seem to indicate 95% of customers do not want direct intervention
- Large percentage however open to suggestions

Common Adoption and Implementation Problems

- Return of investment for utilities and customers
- Customer engagement
- Controlling customer equipment
- **Demarcation point for control systems**

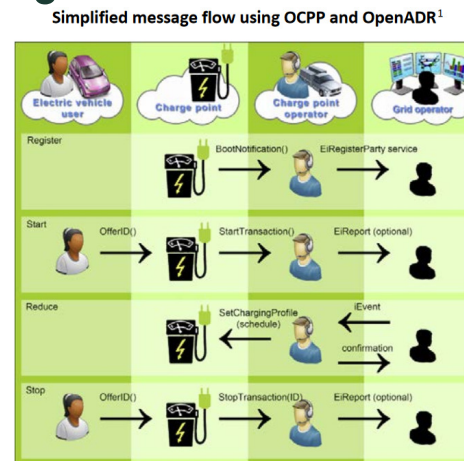
- How far should the SCADA reach?
- Responsibility for downstream systems
- Cyber Security impact
- Needs to be evaluated for SCADA and more direct control & networked systems

Demarcation

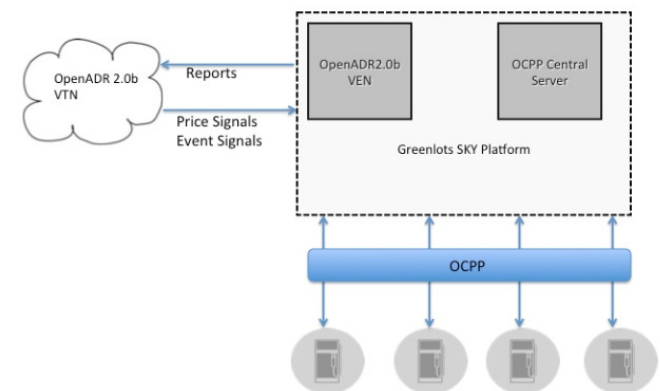


Interaction with other Standards

- OpenADR prefers to “inform & motivate”
- Therefore, it is well suited to integrate with other downstream standards like OCPP, EEBus, and others
- No direct translation
- Use of information elements to make decision



SCE pilot implementation by Greenlots



<https://openadr.memberclicks.net/assets/using%20openadr%20with%20ocpp.pdf>

<http://openadr.memberclicks.net/message2/link/c6fccd55-c1f0-40d5-be4c-99f381219d5c/3>

A Member Story...



DRMS/DERMS Integration

■ Demand Response Programs

- SaaS DR/DERMS Software Platforms can be deployed in **weeks** not months,
- Start small, rollout “Voluntary Demand Response” programs first,
 - Engage and enroll participants for voluntary load reduction commitments,
 - Voluntary DR program can roll out in weeks not months,
 - Utility can gauge the adoption patterns to influence future direct load control rollouts,
 - Smart Metering enables measurement & verification

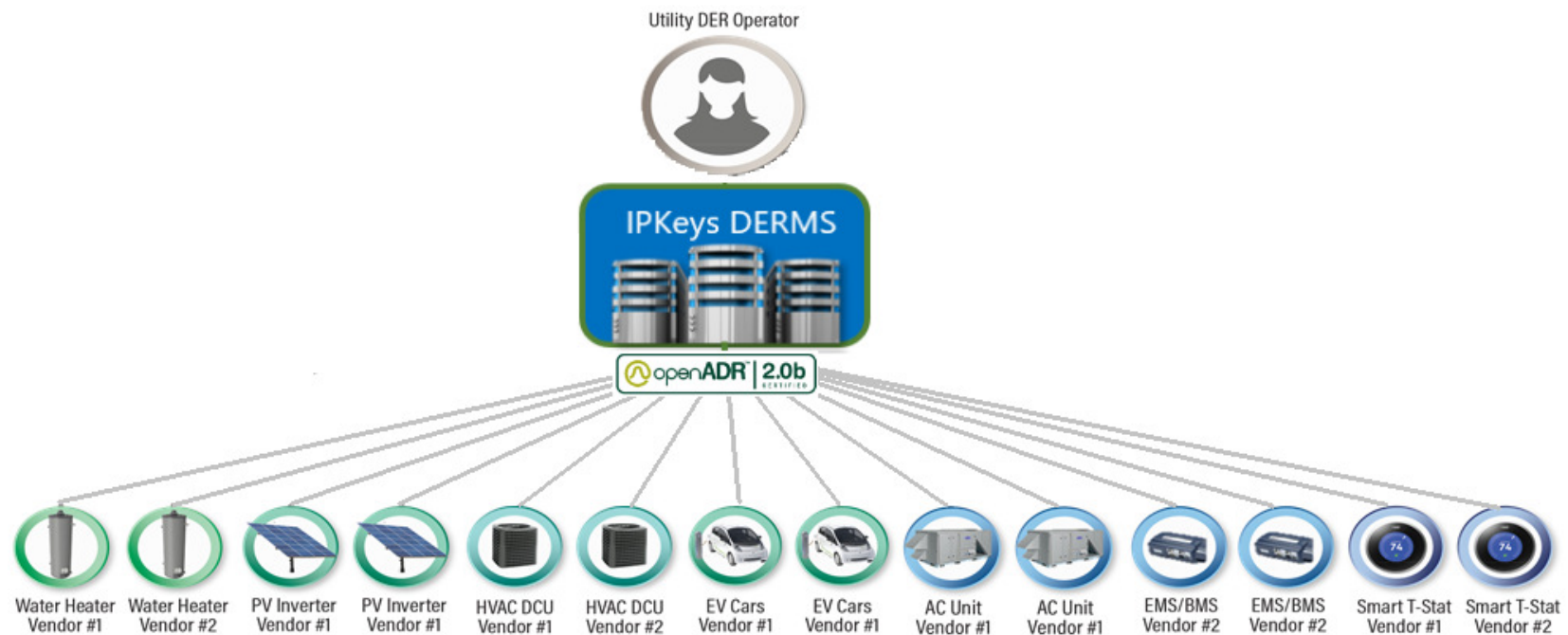
DR/DERMS Software Platforms and Solutions

DERMS platform should include the essentials

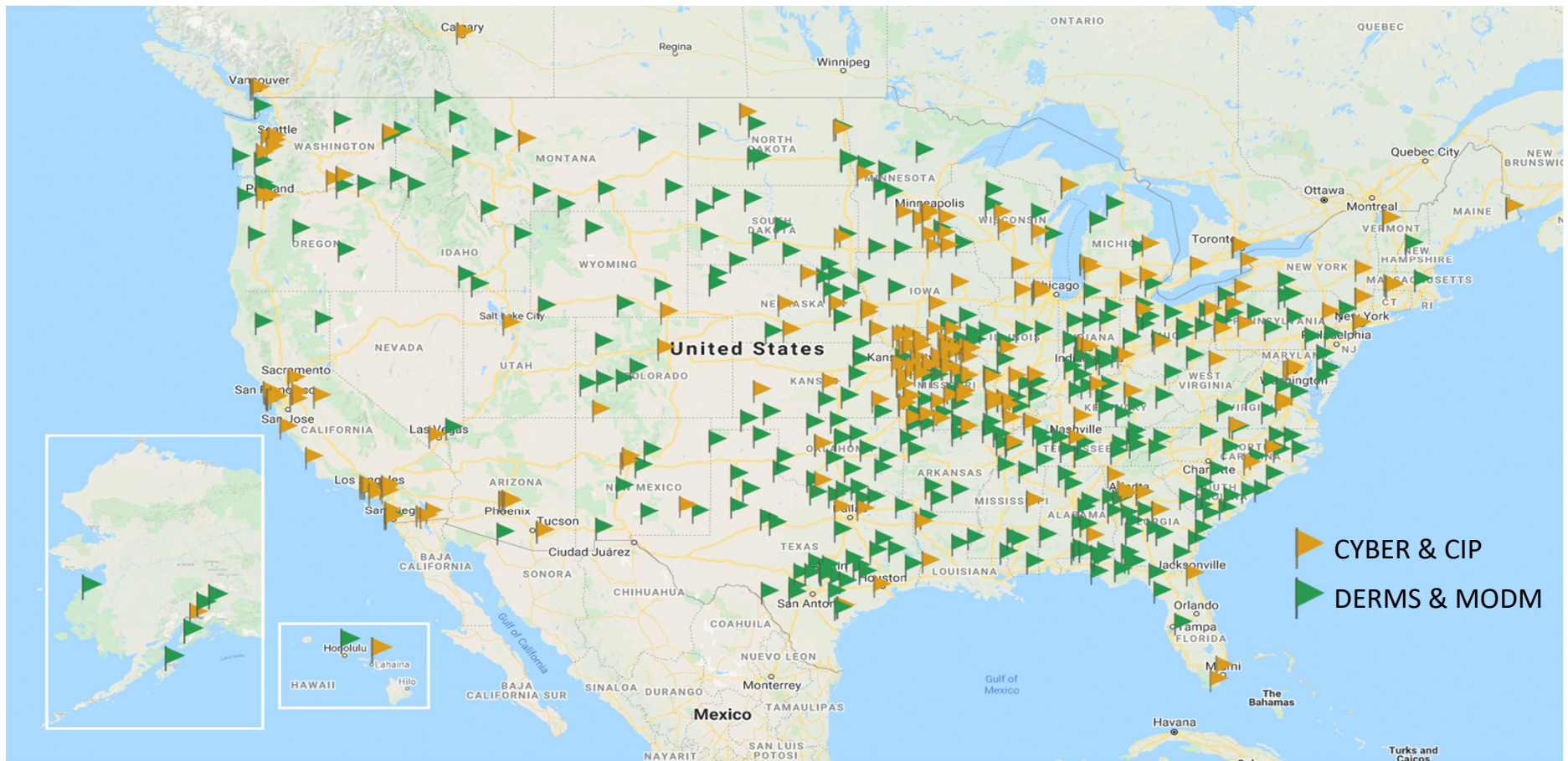
- Is offered as Cloud based “Software-as-a-Service”(ie. Fast rollout, weeks not months, low impact to internal IT, etc)
- Includes Load Forecasting,
- Supports control of load control end point devices using open standards (ie. OpenADR Compliant),
- Supports Voluntary DR programs,
- Includes the ability to:
 - Create DR groups and dispatch events by group,
 - Associate Smart Meters (AMI) to DR groups,
 - Create, Model and Dispatch DR Events(ie. Voluntary and Direct Load control events),
 - Issue Event notifications
 - Capture opt-in and opt-out responses from customers,
 - Perform what-if modeling to pre-plan and model events,
 - Perform post-event load review to determine the result of the participation
- Includes a DR Consumer Engagement portal for online customer enrollment, opt-in/out, event schedule access, etc.

DR/DERMS Software Platforms and Solutions

OpenADR reduces the interface challenges, a single protocol, hundreds of end point technologies, one platform....



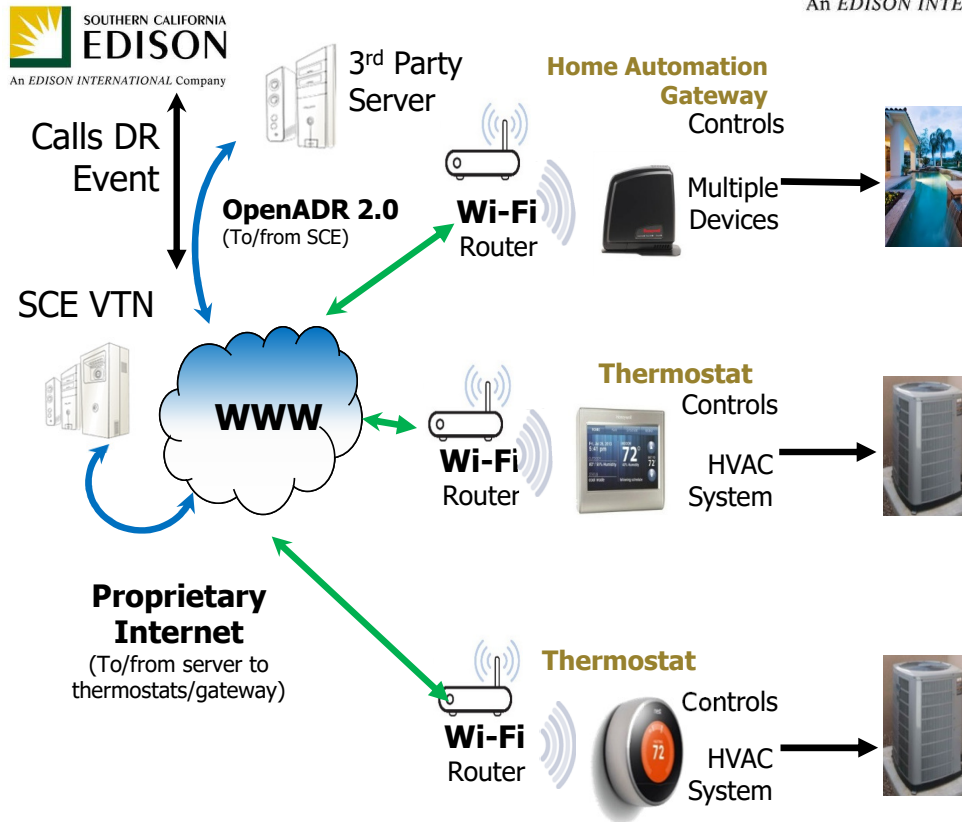
DR/DERMS Software Platforms and Solutions



Southern California Edison



- BYOT model
- Thousands of customers select own devices
- 8 events with an average 750 watts of load reduction per hour per customer
- Energy savings during trial:
 - 3.6MW of average energy reduction per event (peak ~7MW)
 - 115.2MWh of energy saved annually



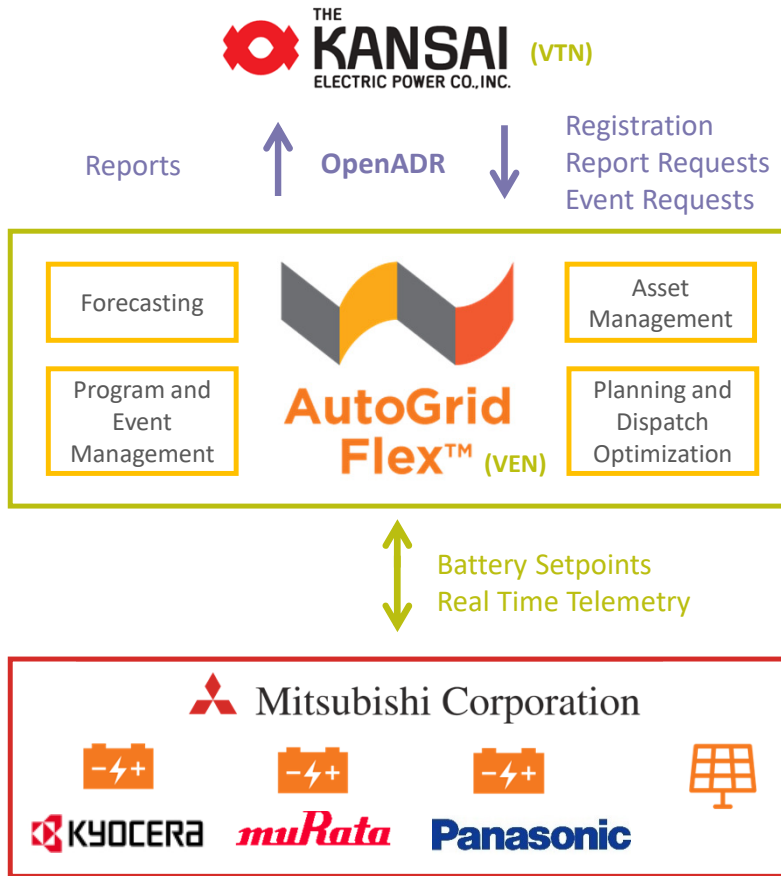
Hawaiian Electric Ancillary Services



- Used by ISO/utilities to obtain pre-committed load response in “real-time” from 10 minutes for resources that are used as reserves to 2 seconds.
- OpenADR supports
 - Spinning and non-spinning reserves
 - Variable event durations

Program Type	Wind Integration FastDR Pilot
Curtailment Window	7am – 9 pm
	Mon-Fri
Annual Limit	40 or 80 hrs/yr
Event Duration Limit	1 hr/event
Number of Events Limit	40 or 80/yr
Load Response	10-min w/notification
	UFR N/A
Notification Period	1- minute
Incentive	\$5 or \$10/kw-month
Implementation Incentive	TA/TI = Up to \$600/KW
YTD 2013 Events	34 - Evaluation
Gateway device	Any OpenADR 2.0b device

Kansai Electric Power Co



First Residential Solar and Storage Virtual Power Plant in Japan

Profile

- Mitsubishi Corporation owns and operates 5GW of generating capacity and 1,000 km of transmission
- KEPCO supplies 13M customers in the Kansai region of Japan

Problem

- METI-funded program for development of VPP applications
- Need flexible platform to support optimization over solar self consumption and communicate with multiple vendors
- Ultimately support more renewable integration for Japan

Solution: AutoGrid Flex

- Aggregation of 300 residential storage assets on one monitoring and control platform
- Storage vendors including Kyocera, Murata, Panasonic
- Co-optimization of self-consumption with aggregate-level capacity

National Grid

nationalgrid

Send Static
Event



Measurement and
Verification



OpenADR
Dispatch Signal



Device Usage
Information



Gas DR with smart thermostats

Profile

- 3.3 million U.S. customers in MA, NY, and RI

Problem: Natural Gas in New York

- Natural Gas pipeline constraints entering Long Island
- Existing gas turbines running up to capacity during peak demand
- Looking for non pipes alternative to reduce peak load

Solution: AutoGrid Flex

- Unified dashboard for gas and electric programs
- Focus on timely dispatch
- See device usage information at near real time on open platform
- First Natural Gas DR project in the world

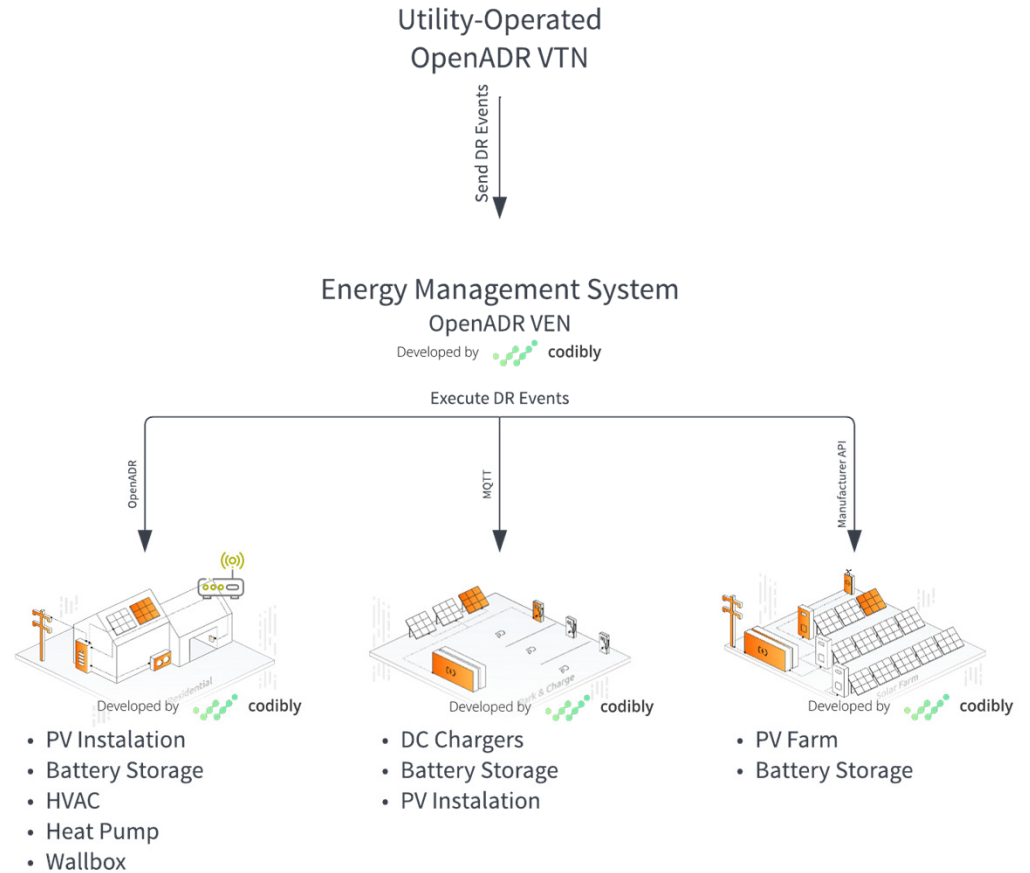
Integrated EMS for Renewables

Context

- 45,000 rooftop solar with Battery Storage, Heat Pumps and HVACs systems
- Average 15kWh battery capacity
- 100 PV Farms (average 1 MW)
- 1,000 public AC/DC Chargers

Solution

- All-in-one energy management system created for client by Codibly
- DR management and execution across wide portfolio of assets
- Utility communication using OpenADR 2.0



Con Ed Storage Case Study

- Consolidated Edison acted to make dispatch OpenADR-ready and OpenADR-friendly.
- In order to better integrate energy storage resources, Con Ed was looking in particular to leverage the OADR Report Service for purposes of battery telemetry.

<https://www.openadr.org/case-studies>



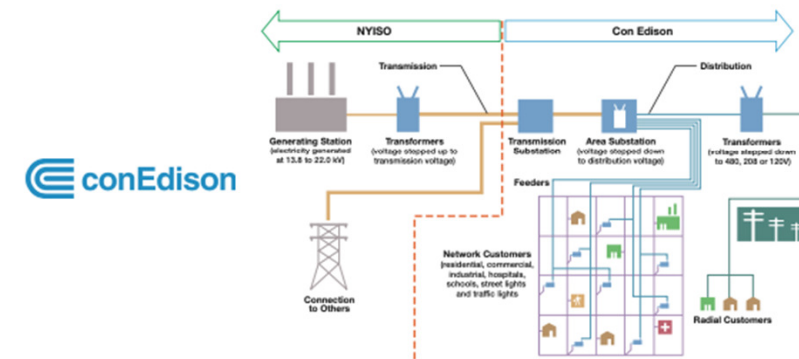
OPENADR UTILITY CASE STUDY

Energy Storage Consolidated Edison

PROJECT GOALS

Consolidated Edison (Con Ed) has been working to integrate a variety of distributed energy resources for and with its customers. Energy storage resources is one type of DER that led Con Ed to look to OpenADR as part of a solution built into their Demand Response Management System (DRMS). Con Ed's DRMS manages enrollment, validation, dispatch, and performance calculation of Demand Response resources.

Con Ed's goal in this use case was to make dispatch OpenADR-ready and OpenADR-friendly. In order to better integrate energy storage resources, Con Ed was looking in particular to leverage the OADR Report Service for purposes of battery telemetry. Report Service is one of several OpenADR capabilities (along with DR Event (signaling) Service, Registration Service, and others.)



Hawaiian Electric DER Case Study

- Swell Energy is working to augment Hawaiian Electric's energy supply by absorbing excess wind energy when needed and providing 24/7 fast frequency response to balance the grids.
- Once complete, the project will supply 25 megawatts of solar power and 80 megawatts of battery capacity Hawaiian Electric's needs.



OPENADR UTILITY CASE STUDY

Virtual Power Plant

Swell Energy / Hawaiian Electric

PROJECT GOALS

Hawaiian Electric is adding Virtual Power Plants (VPPs) as a smart, clean and cost-effective way to manage electricity supply and demand on an evolving US grid. A VPP is an aggregation of Distributed Energy Resources (DERs)—such as batteries, EVs, smart plugs and thermostats — that can be controlled by the grid operator in place of a large, central power plant. VPPs built with aggregated solar powered battery storage can address a variety of utility and grid needs without building new carbon-intensive infrastructure or transmission lines; can balance energy supply and demand on the network by adjusting or controlling the load during periods of peak demand; conduct fast frequency response supporting the overall health of the grid; absorb excess renewable energy for delayed consumption; and more.



Swell Energy's VPPs are based on an aggregated network of distributed energy resources that provide a variety of benefits to utilities and their customers. This large-scale commercial Virtual Power Plant (VPP) in Hawaii represents an important advance in battery technology and capability. The project contemplates linking batteries in 6,000 different homes to create a decentralized power plant for the local utility. The Hawaii program will deliver more than 25 megawatts of solar power paired with over 80 megawatts of batteries and 100 megawatt hours of stored energy, delivering capacity and fast frequency response to the three island grids while also reducing bills for participating customers.



Hawaiian
Electric



The contract was awarded in response to Hawaiian Electric's request for dispatchable energy storage and renewable generation through distributed energy resources along with capacity and ancillary services to ensure adequate supply and power system reliability across the Hawaiian Electric service territory. The project tackles several challenges simultaneously. Hawaii passed a law requiring 100 percent renewable electricity by 2045. That law in turn requires shutting down fossil-fueled plants and replacing them with suitable alternatives. And while solar is a plentiful resource, island grids quickly became saturated with solar production at midday, prompting the need for batteries to store the surplus and make it available after the sun goes down.

Europe EV Case Study

- ChargePoint a long-term Alliance member; OpenADR – Open ChargePoint Protocol (OCPP) interoperability is long- established.
- German utility implementers; Siemens a tech partner
- OpenADR Alliance is a member of SmartEN



OPENADR EUROPEAN CASE STUDY

PROJECT ELBE

Hamburg Energie, Stromnetz Hamburg, Vattenfall and ChargePoint

PROJECT GOALS

Project ELBE is an incentive programme for EV charging infrastructure and integrating EV chargers into buildings. (ELBE stands for "Elektrifizierung von Gebäuden für Elektrische Fahrzeug," In English, "Electrifying Buildings for Electric Vehicles"). Funding for the project comes from the German Economics Ministry via their Clear Air Program. The goal is to install in Hamburg 7,000+ intelligently controlled charging stations. Through ChargePoint, a sub-component of the programme, 4,500 charging points were installed in 2020.

From a research and development perspective, the target of the project is to create and scale an interface for grid-friendly charging with the Distribution Network Operator (DNO). As part of that interface, the project members chose the OpenADR protocols (standardized internationally as IEC 62746-10-1).



OpenADR Communications for the Project Involved 8 CPOs:

- **Utilities:** Vattenfall, Hamburg Energie, Stromnetz Hamburg
- **Networks:** ChargePoint, Parkstrom, The Mobility House
- **Oil and Gas:** Shell/New Motion, Total/Digital Energy Solutions
- **Curbside Charging:** ubitricity
- **Hardware Vendors:** ChargePoint, KEBA, Aifen, Compleo, NewMotion, Mennekes

OPERATIONAL DETAILS

After a period of lab testing with 6 Charging Point Operators (CPOs) in 2019, field testing began in 2020 with more than 100 connected ports. Field tests included information exchange with all customers for daily load reductions of 30 minutes with 50% participation. The number of charging points has since increased to 389.

OpenADR protocol services employed in this process include:

- **Registration (EiRegisterParty):** EiRegisterParty is used to identify entities such as CPOs and other parties. This is necessary before an actor can interact with other parties.
- **Event (EiEvent):** EiEvent are central event functions and information models that are used to reduce load. This service is used to activate a demand response.

In the operating mode, EiEvents are drawn from the Charging Point Operators (Virtual End Nodes (VENs) in the OpenADR vocabulary) from the distribution network operator (called Virtual Top Nodes (VTN)).

EcoPort^{CM} – CTA 2045 Certified Water Heaters and More



WWW.OPENADR.ORG/ECOPORT

What is EcoPort?

The EcoPort logo features the word "ECO" in blue and "PORT" in white, set against a black rounded rectangular background with a light blue gradient on the right side.

- EcoPort is the brand name associated with CTA-2045 certified products. CTA-2045 is a technical standard promulgated and published by the Consumer Technology Association (R7.8 Modular Communication Interface for Energy Management Subcommittee.)
- This standard enables any appliance to connect to any type of demand response system (Advanced Meter Reading (AMI), Smart Energy Profile (SEP), OpenADR), and/or home or building network. The concept is simple; encourage manufacturers to build an MCI interface into their products that can accept a simple communications module. Consumers and program managers are then free to select whatever communication solution works best for their particular environment.

Thank you!

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