Open Standards
Why they matter and how to implement them
(CTA-2045 & OADR)

ACEEE Hot Water Forum March 12, 2019

Introduction

About SkyCentrics

Leader in CTA-2045 and OADR 2.0b in the cloud

Customers include Con Edison, Portland General Electric, Jackson EMC, Duke, Southern Company, TVA, Hydro One

CTA-2045 partners with AO Smith, Mitsubishi (mini-split AC), Islandaire (PTAC), Pentair (Pool Pumps), Siemens (EVSE), Emerson (Thermostat, Water Heater Control Switch)

OADR 2.0b cloud VEN works with CTA-2045 partners and Ecobee thermostats.

Why Open Standards?
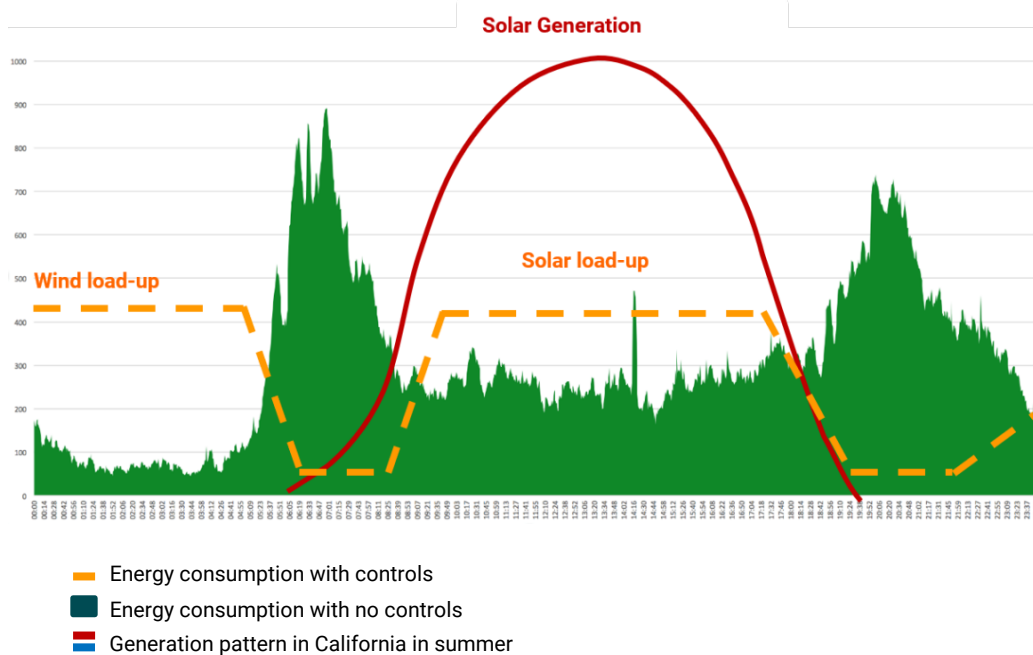
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Why Open Standards?

- Avoid stranded assets

- Reduce integration costs

- Simplify DRMS operation

- Limit long-term vendor tie-in

- Choose vendor with the right cost & features

- Update and upgrade

- Encourage innovation

Agenda

- Value of connected water heaters

- State of the market

- OADR v CTA-2045, cloud v device

Smart Device Example: Water Heaters

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Steep load curves load-up and shed combined with solar

Solar Generation

Wind load-up

Solar load-up

Energy consumption with controls
Energy consumption with no controls
Generation pattern in California in summer

Source: 38 residential electric resistance water heaters average daily consumption over 64 week days

Water heater control features

- 4.5kW instantaneous load
- 20-30 minutes to heat full tank
- Up to 8-10 hours of storage before quick recharge
- Cold water event protection
- On-device schedule storage

Utility benefits

- 'Load Up' before peak, 'Shed' during peak
- 'Shed' before "Load Up" to absorb renewable energy
- Reduces need for expensive/dirty peak power
- Use cheap/free electricity from renewables
- Avoid negative pricing and wasted energy

OADR

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+ 11 years in development

+ $10M+ per year invested by CA since 2013

+ Chosen by utilities, implemented by middleware providers

+ One VTN, VEN in device or cloud

+ Already in Title 24 2019

VEN in the cloud

+ Easy integration

+ Can have multiple other clouds or devices (Ecobee, CTA-2045)

+ OEM can choose a cloud partner to avoid complicated certification and development

− Potential for stranded assets
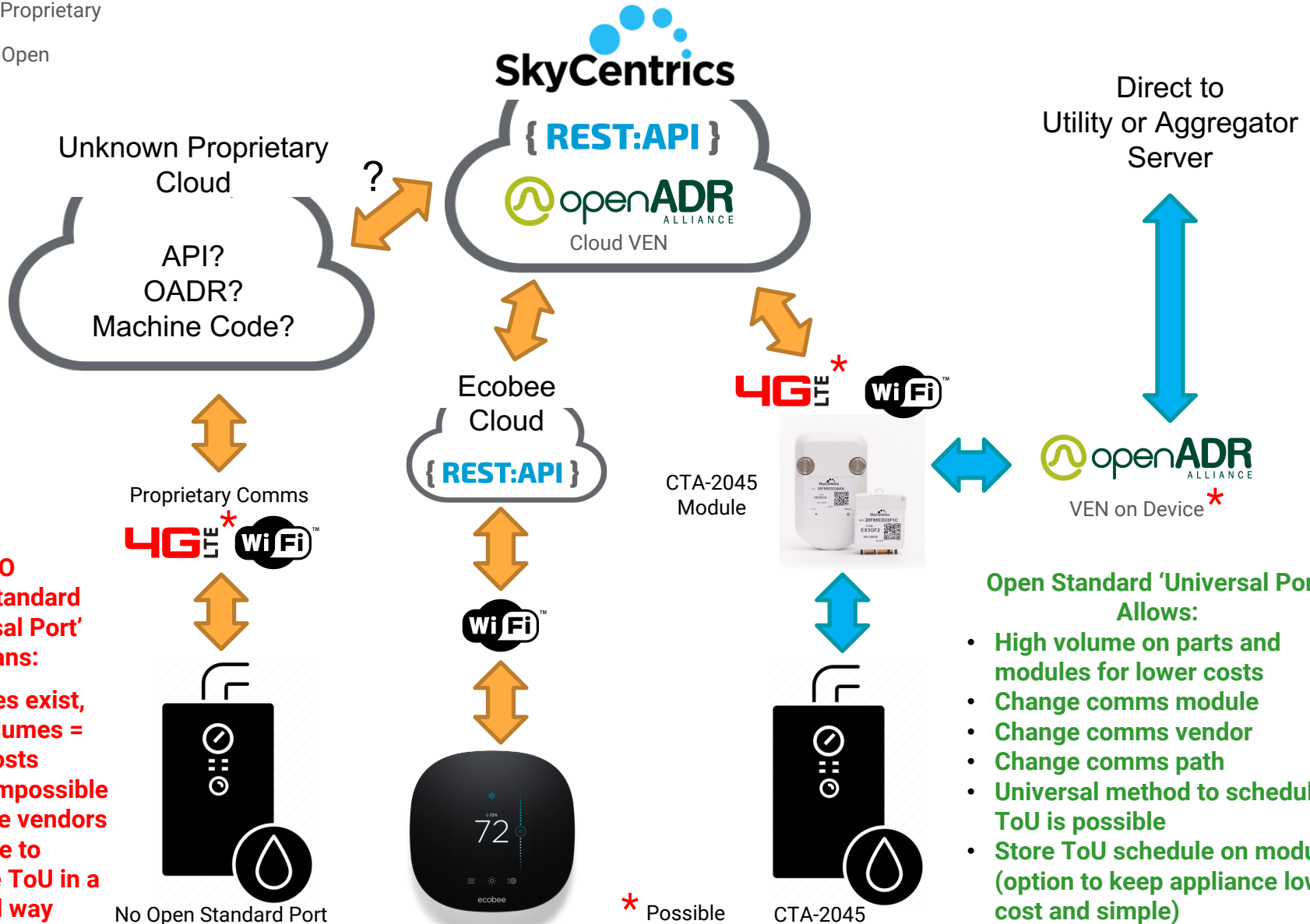
− Cloud vendor lock-in

VEN on the device

− Not implemented by any OEM

− No plan to have 'modules'

− Hardware cost: compared to CTA-2045, CPU/RAM an extra 2-3x for RTOS (long firmware dev) or 4-6x for Linux (shorter firmware dev)

− No data pass-through

− Certificates require annual fee

CTA-2045

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+ Both hardware and control standard

+ Choice of comms & cloud vendors

+ Easy to switch vendors

+ Easy to upgrade communications

+ Control set for load-up and shed

+ Pass-thru appliance and module firmware updates

+ Pass through allows 'extra controls and sensors' to be enabled...with a migration path to be part of the specification

− Hardware cost, currently only Siemens has embedded the port Other require a port adaptor

− Does not allow nested events: no event ID. No multi-stage events (pre-heating/cooling)

− Cannot change mode, temperature (in 2045-A), or schedule (in HVAC 2045.3)

− Limited uptake to date by OEM or utilities

Architecture Options Below Cloud

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↔ Proprietary (orange)
↔ Open (blue)

SkyCentrics
{ **REST:API** }
openADR ALLIANCE
Cloud VEN

Direct to Utility or Aggregator Server

Unknown Proprietary Cloud

?

API?
OADR?
Machine Code?

Proprietary Comms
4G LTE * **Wi-Fi**

Ecobee Cloud
{ **REST:API** }

Wi-Fi

CTA-2045 Module
4G LTE * **Wi-Fi**

openADR ALLIANCE
VEN on Device *

NO Open Standard 'Universal Port' Means:

- **If modules exist, lower volumes = higher costs**
- **Almost impossible to change vendors**
- **Challenge to schedule ToU in a universal way**

No Open Standard Port

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ecobee

Open Standard 'Universal Port' Allows:

- **High volume on parts and modules for lower costs**
- **Change comms module**
- **Change comms vendor**
- **Change comms path**
- **Universal method to schedule ToU is possible**
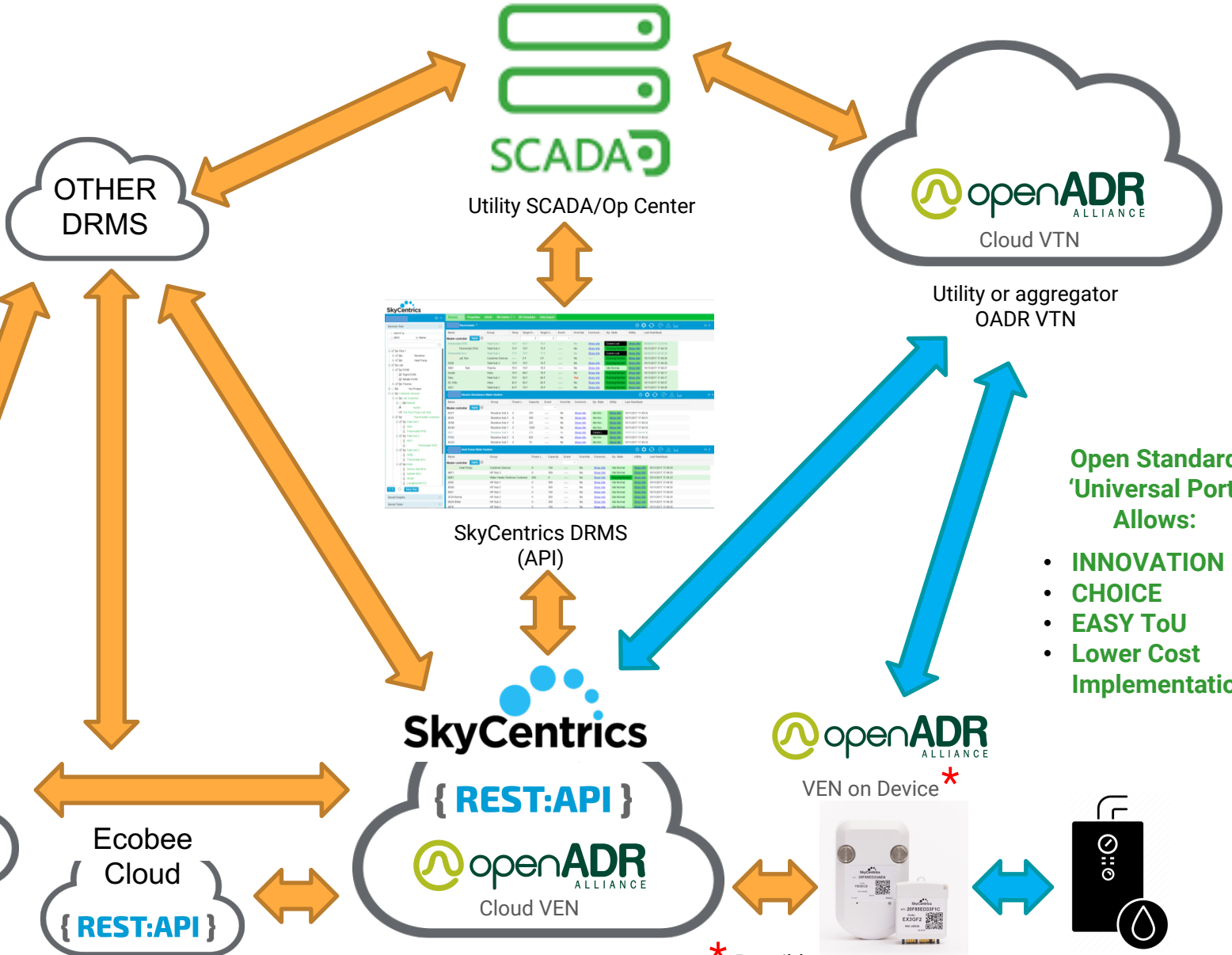- **Store ToU schedule on module (option to keep appliance low cost and simple)**

* Possible   CTA-2045

Architecture Options Above Cloud

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NO
Open Standard
'Universal Port'
Means:

- **Lots of individual implementations**
- **More challenging ToU scheduling**

OTHER DRMS

Utility SCADA/Op Center

SkyCentrics DRMS (API)

Cloud VTN

Utility or aggregator OADR VTN

Open Standard
'Universal Port'
Allows:

- **INNOVATION**
- **CHOICE**
- **EASY ToU**
- **Lower Cost Implementations**

Unknown Proprietary Cloud

API?
OADR?
Machine Code?

Ecobee Cloud
{ REST:API }

SkyCentrics
{ REST:API }
Cloud VEN

VEN on Device *

* Possible

CTA-2045

The Future of Open Standards

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What it will look like

- On the device

- Pass-thru for OEM

- Flexible communications

- Low-cost

- Choice of manufacturers and vendors

What it will take

- Utility commitment to open standards

- OEM investment in hardware and/or firmware

- Close relationships between OEM and module vendors to release features in tandem to compete with proprietary solutions (IT companies have shown the way)