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Accelerating EV adoption with Managed Charging

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KITU SYSTEMS

Intelligent Platform for the Advanced Energy Networks

Distributed Software Platform for

- Intelligent Energy Devices
- Cloud-Based Communication Aggregation Services
- Utility Management Systems

Solutions

- DER Coordination
- EV Charge Management
- Advanced Load Control

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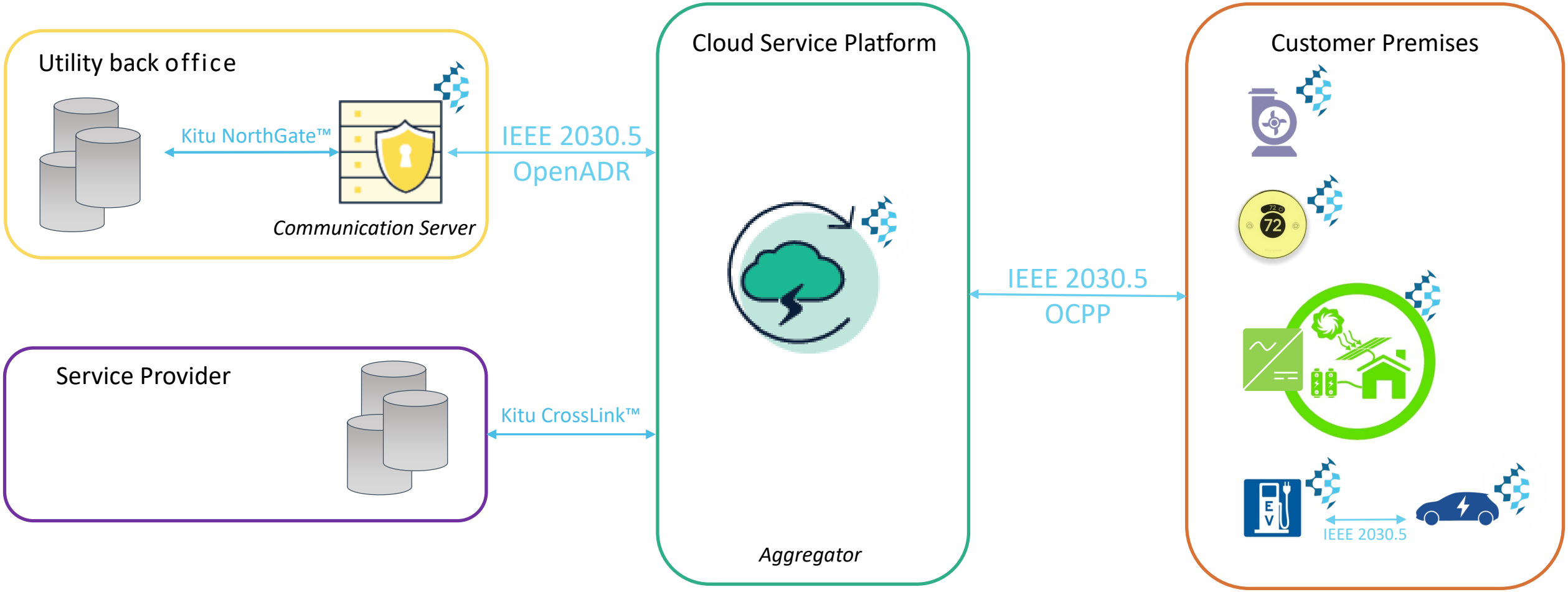
Smart Energy Devices on the Grid requires Advanced Communication Technology

- Scalability: Controlled devices 100's thousands to millions
- Cybersecurity: Secure protocols, hardened design
- Interoperability: Open, International standards
- Ease of use: Easy installation, provisioning, use and maintenance (ZeroConf)

- Both OpenADR and IEEE 2030.5 are broadly adopted standards, listed in the NIST/SGIP catalog of standards

Enabling Coordination at Scale of Intelligent Energy Devices



Solution for SCE Charge Ready

SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

Charge Ready

OpenADR VTN

OpenADR 2.0b

Kitu Convoy

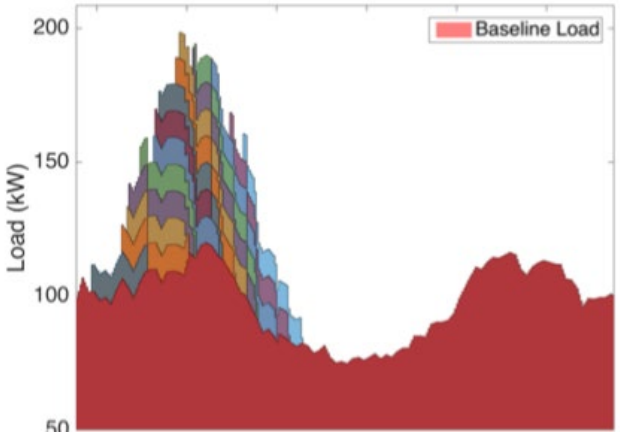
KITU SYSTEMS

IEEE 2030.5-2108
OCPP 1.6

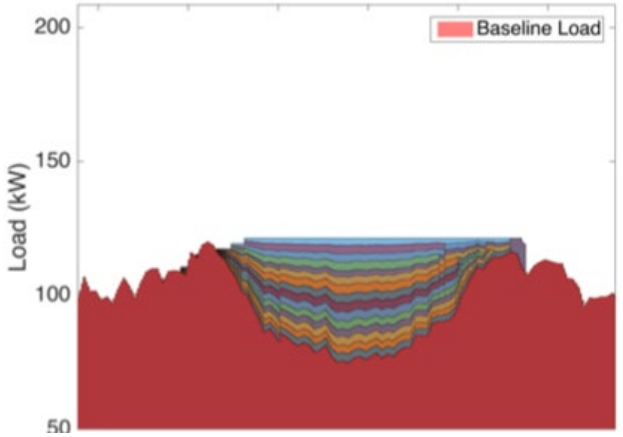
Customer Premises
(commercial or MUD)

Managed EV Charging Options: Immediate controls

- System intelligence partitioned in server
- E.g. DR events
- Event-based (with start time, duration)
- Charge Ready events limit maximum charging to a percentage of the EVSE nameplate rating
- Grid reliability requires low latency and reliable communications (expensive and difficult to scale)

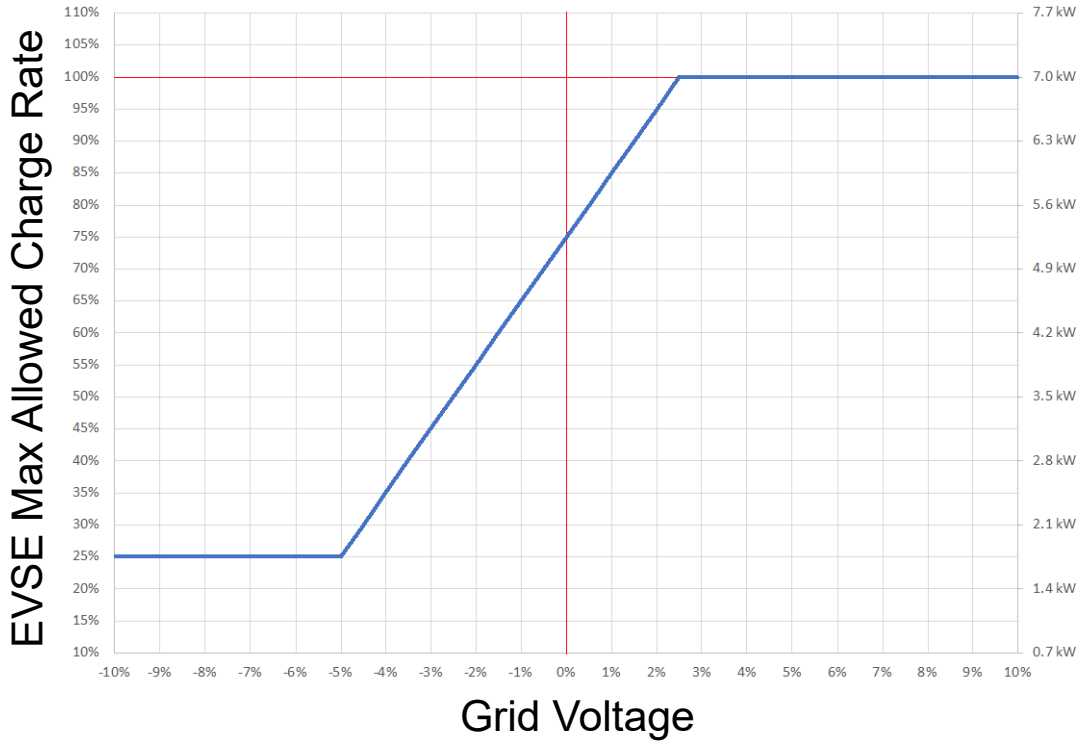


Load shifting to avoid peak



Managed EV Charging Options: Intelligent controls

- System intelligence partitioned to end-device
- E.g. end-device adjusts behavior based on grid conditions
  - Volt/Watt, Volt/VAR curves, flow reservation, pricing controls, etc.
- Easier to scale, less communication-intensive
- Can be used for grid reliability services



EVSE automatically adjust outputs based on measured grid voltage

From V1G to V2G and VGI

- EVs with bi-directional power flow subject to interconnection regulations (e.g. CA Rule 21)
- Smart Inverter functionalities are required
  - On-board inverter (AC charging)
  - External inverter (EVSE, combo) for DC charging
- CA Rule 21 specifies IEEE 2030.5 as the default communication protocol for DER
  - IEEE 2030.5 and OpenADR were evaluated by the CPUC VGI workgroup

V2G pilot at UCSD
- Kitu IEEE 2030.5 solutions

VGI Workgroup Protocol Mapping

	IEEE 2030.5	OpenADR	OpenADR (future)
1- Rule 21	Fully Supported	Not Fully Supported	Not Fully Supported
2- Pricing	Fully Supported	Fully Supported	Fully Supported
3- Load Control	Fully Supported[1]	Fully Supported	Fully Supported
4- Smart Charging	Fully Supported	Not Fully Supported	Not Fully Supported
5- Monitoring	Fully Supported	Not Fully Supported	Not Fully Supported
6- Restart	Fully Supported	Not Fully Supported	Not Fully Supported
7- Miscellaneous	Fully Supported[2]	Not Fully Supported	Not Fully Supported

[1] IEEE 2030.5 does not directly support the *acknowledgement* of program primacy. However, 2030.5 does support program primacy, and supports acknowledgement of events within programs, thereby indirectly acknowledging program primacy. The VGI Workgroup concluded that this requirement is satisfied by IEEE 2030.5

[2] IEEE 2030.5-2018 fully supports all requirements in this section. The VGI report was completed prior to the completion of IEEE 2030.5-2018

- Workgroup convened by the CPUC
- Purpose to align EV charging requirements with the needs of the electric grid
- Multiple use cases identified
- Evaluation of standards used for VGI
  - Did not consider the broader DR market
  - Other protocols were considered not shown in table

Conclusion

- Coordination of EV charging works
  - SCE Charge Ready pilot results / event participation / measured benefits
- Large scale adoption of EVs
  - Can be greatly accelerated by utilities (smart charging programs such as Charge Ready)
  - Requires coordination with grid management systems
- OpenADR is broadly used to implement DR programs for EVs
  - In conjunction with IEEE 2030.5 or OCPP to communicate with EVSEs
- Transition to V2G and VGI will require intelligent controls, currently best supported by IEEE 2030.5