Open Automated DR (OpenADR or Open Auto-DR) Communications Specification Overview

Rish Ghatikar

Lawrence Berkeley National Laboratory
Demand Response Research Center
http://drrc.lbl.gov/

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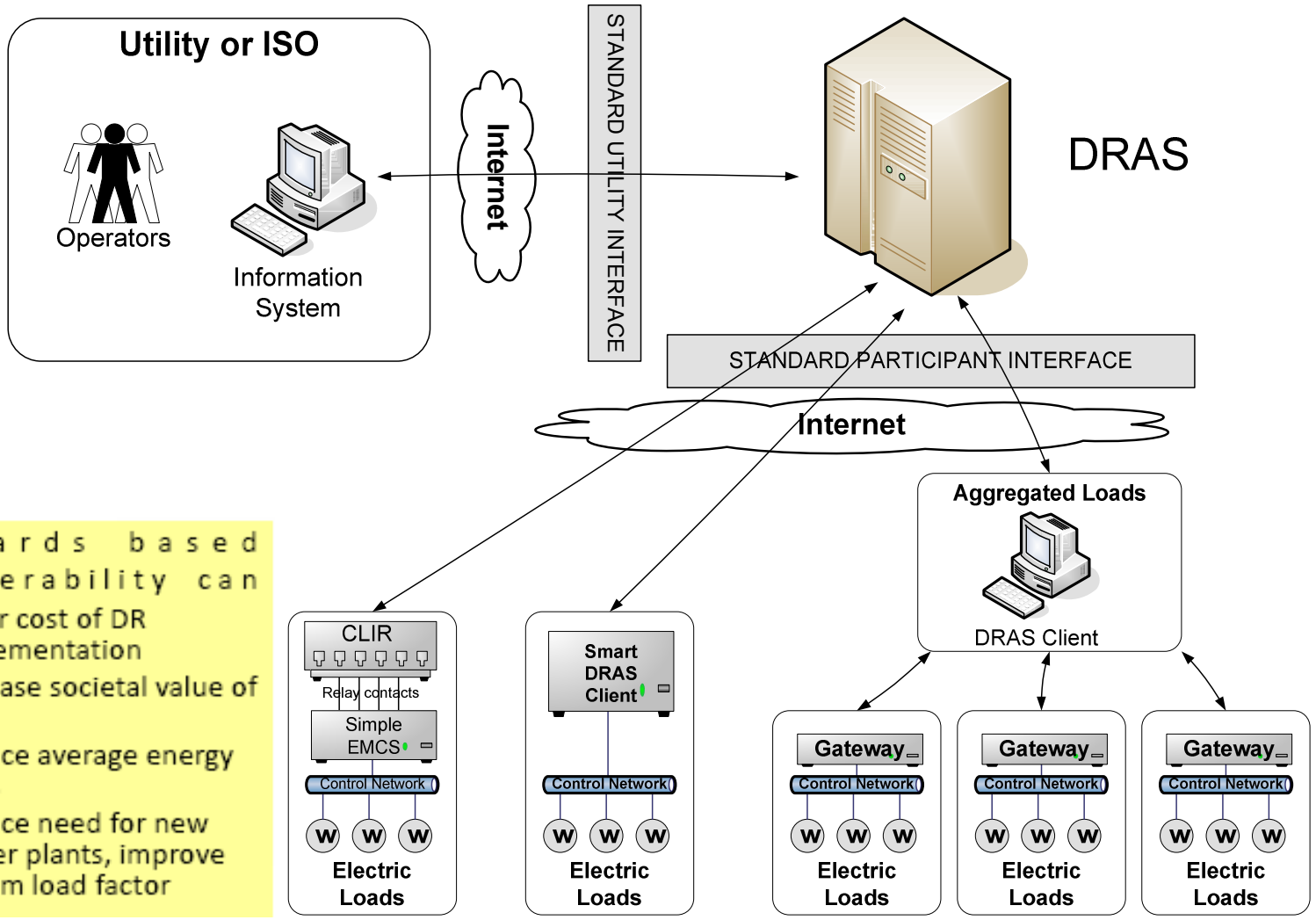
Agenda

- OpenADR Architecture and Communication
- OpenADR Motivation and Activities
- What is OpenADR?
- OpenADR and NIST Smart Grid Standards
- OpenADR Status and Standardization

OpenADR Architecture & Communication



Standards based interoperability can

1. lower cost of DR implementation
2. increase societal value of DR
3. Reduce average energy costs
4. Reduce need for new power plants, improve system load factor

OpenADR Motivation: Data Models, Price, and Reliability Signals

- Automating Demand Response allows DR resource ready for dispatch.
- Improve DR reliability, predictability, value, etc.
- Simplify and reduce cost of DR
- Create interoperability among customer systems
- Increase customer participation, reduce labor of manual price response
- Allows customer to choose level of response and how to enable a DR strategy
- Allow ability to embed automation in customer's control system

OpenADR Standards Development

- **Defines minimum fully-automated signals for end-uses – Improve cost & effectiveness**
  - ***Signaling*** – Continuous, secure, reliable, 2-way communication.
  - ***Automation*** – Automate pre-programmed DR strategies determined and controlled by the end-use customer.
  - ***Timing of Notification*** – Day-ahead and Day-of signals to facilitate diverse set of end-use strategies.
  - ***Scalable Data Model*** –Facilitate varied DR programs and tariffs – Reliability and RTP
  - ***Industry Open Standards and Translation*** – Open, interoperable standards and communication infrastructure integrated with EMCS and other end-use devices.
- **Implementation using Client/Server SOA with:**
  - ***Single DR Automation Server (DRAS) – Middleware***
  - ***Several client designs – Web Services***
    - Software
    - Hardware/Software – Relays

OpenADR Synergistic Efforts

Facility/Building Systems

- **BACnet** Standard Project Committee (SPC) and Analysis Program (http://www.bacnet.org/) – UIWG and XMLWG
- **LonMark™ International** (http://www.lonmark.org/)
- **Organization for the Advancement of Structured Information Standards** (OASIS) (http://www.oasis-open.org/) and **Open Buildings Information eXchange** (oBIX) (http://www.obix.org/)
- **Continental Automated Building Association** (CABA) (http://www.caba.org/)
- **American Society of Heating Refrigerating and A/C Engineers** (ASHRAE) (http://www.ashrae.org/) – RP1011

Utility/ISO and Smart Grid

- **NIST Smart-Grid Standards Research** (http://www.nist.gov/)
- **IntelliGrid™** (http://intelligrid.info/) Living Laboratory Project – EPRI and Enernex
- **Advanced Metering Infrastructure** (AMI) – SDG&E (http://www.sdge.com/ami/), PG&E (http://www.pge.com/smartmeter/), and SCE (http://www.sce.com/PowerandEnvironment/ami/) – **OpenAMI** (http://www.openami.org/) and **UCA International Users Group** (http://sharepoint.ucausersgroup.org/) – **Open Home Automation Network** (OpenHAN) (http://www.ucaiug.org/OpenHAN/)
- **Gridwise™** (http://www.gridwise.com/) and **Gridwise Architecture Council** (GWAC) (http://www.gridwiseac.org/)
- **Programmable Communicating Thermostats** (PCT) (http://pct.berkeley.edu/) – CEC/PIER
- **CA Independent Systems Operator** (CAISO) (http://www.caiso.com/) – MRTU & Standardization of Bidding Message Models
- **Southern Company RTP XML Demonstration (**http://www.southerncompany.com/**) –** OpenADR TAG
- **Institute of Electronic and Electrical Engineers** (IEEE) (http://www.ieee.org/) **Power Engineering Society** (PES) Intelligent Grid Coordinating Committee (http://ieee-pes-td.com/)

International Standard Bodies

- **International Electro-technical Commission** (IEC) Technical Committee (TC) 8 (http://www.iec.ch/) – 61850
- **American National Standards Institute (ANSI)** (http://www.ansi.org/) **and International Standards for Integrating Enterprise and Control Systems (ISA-95)** (http://www.isa-95.com/) – EPRI

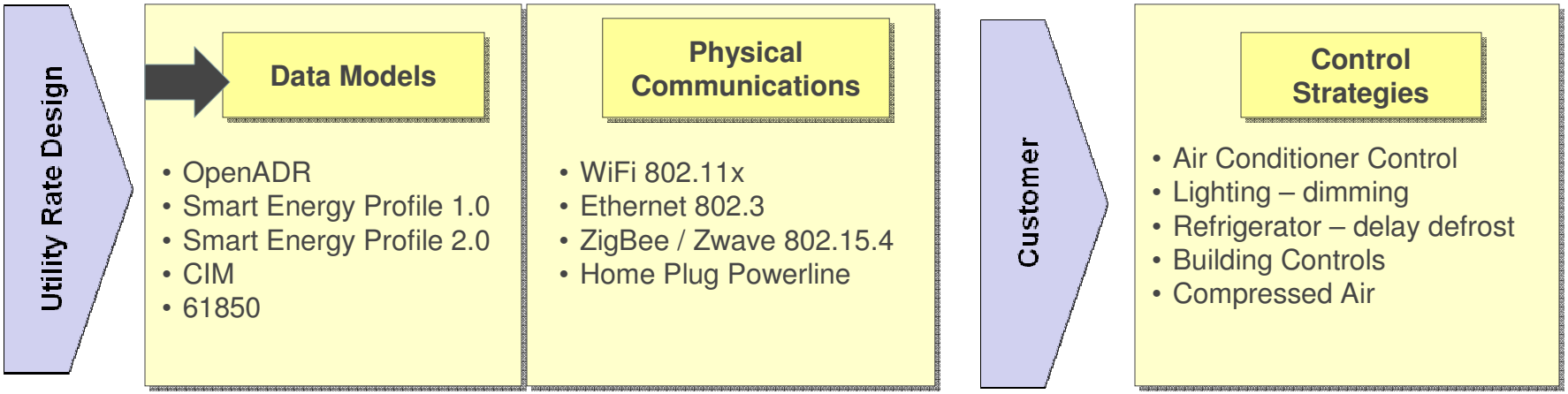
Industry and Other Initiatives

- **New Energy Alliance** (NEA) (http://www.newenergy.com/) – Constellation New Energy
- **Demand Response and Advanced Metering Coalition** (DRAM) (http://www.dramcoalition.org/)
- **Utility Standards Board** (USB) (http://topics.energycentral.com/centers/datamanage/view/detail.cfm?aid=1699)
- **Alliance for Retail Energy Markets** (AReM) (http://www.retailenergymarkets.com/)
- **MultiSpeak** (http://www.multispeak.org/)

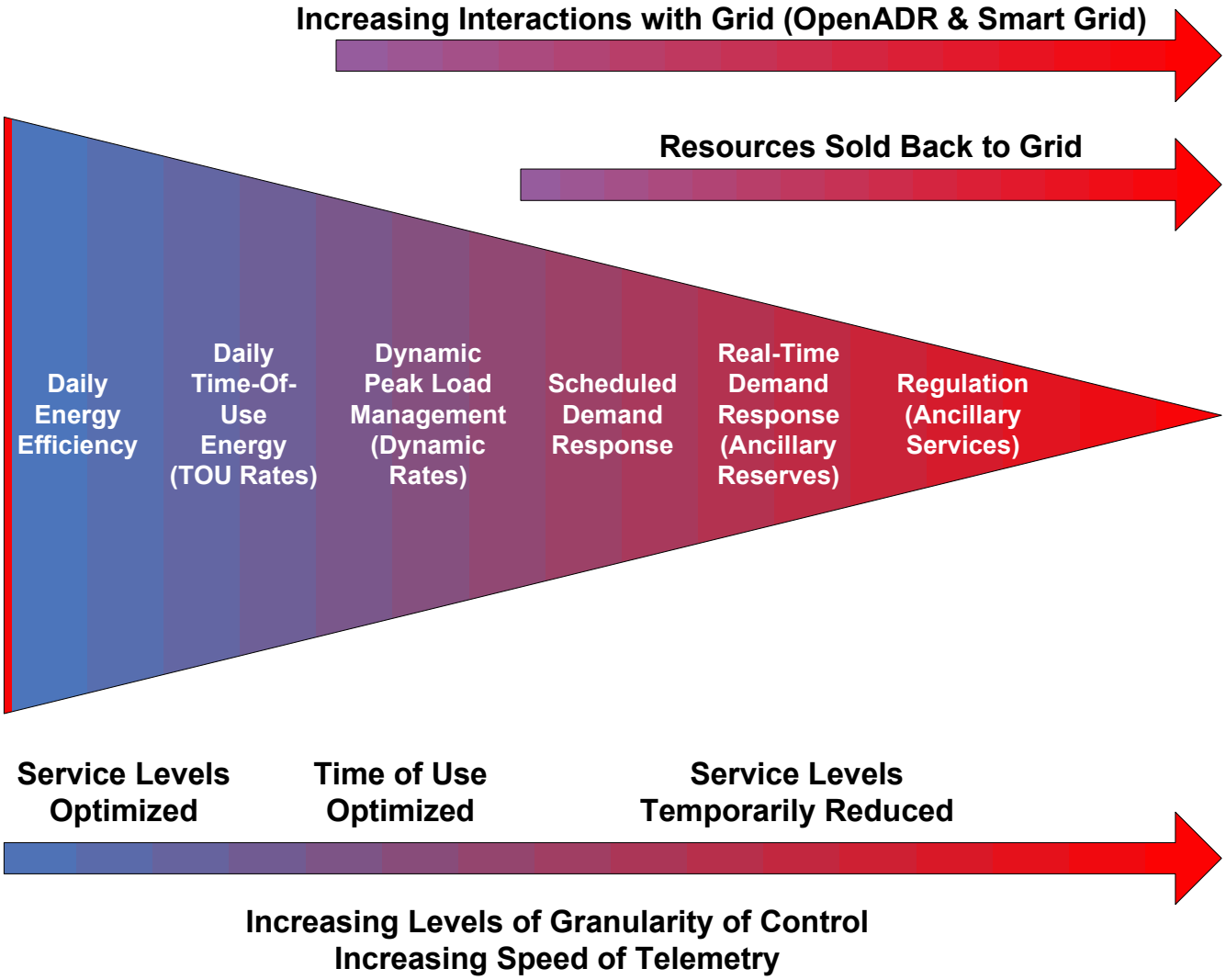
What is Open Auto-DR?

- 2007 – Standardization efforts for OpenADR
- Current Version 1.0 release: http://openadr.lbl.gov/

Many Methods for Integrating Pricing, Communications and Control to Automate DR



Continuous Energy Management for OpenADR – Electricity Value Chain



Link Traditional Energy Management & DR with IT & Controls

OpenADR Status: NIST Smart Grid Standards Roadmap

ID	Priority Action Plan (Interim Roadmap Reference)
1	**Role of IP in the Smart Grid**
2	Wireless Communications for the Smart Grid
3	**Common Pricing Model**
4	**Common Scheduling Mechanism**
5	Standard Meter Data Profiles
6	Data Tables Common Semantic Model for Meter Data Tables
7	Electric Storage Interconnection Guidelines
8	CIM for Distribution Grid Management
9	**Standard DR Signals (and DER)**
10	Standard Energy Usage Information
11	Common Object Models for Electric Transportation
12	IEC 61850 Objects/DNP3 Mapping
13	Time Synchronization, IEC 61850 Objects/IEEE C37.118 Harmonization
14	Transmission and Distribution Power Systems Model Mapping
15	Cyber Security Coordination Task Force

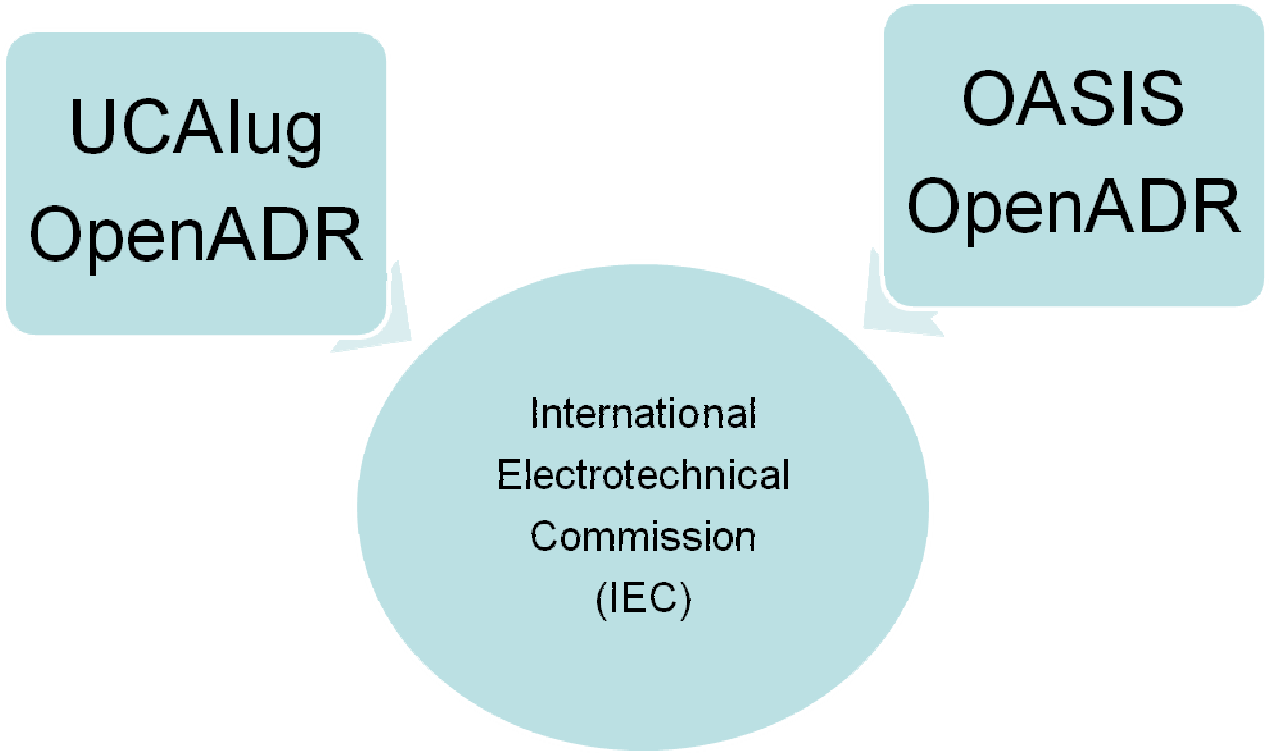
Domain Expert Working Groups (DEWGs)

1. **H2G**
2. **B2G (OpenADR role)**
3. **I2G (OpenADR role)**
4. **V2G**
5. **More…**

Source: http://collaborate.nist.gov/twiki-sggrid/bin/view/_SmartGridInterimRoadmap/PriorityActionPlans

OpenADR Status: Standard Development

OpenADR is collaborating with NIST and Standards Development Organizations (SDOs)



OpenADR Status: Standard Development (Contd.)

- **Organization for the Advancement of Structured Information Standards (OASIS)**
  - Formal Standardization Process under EnergyInterop Technical Committee (EI TC)
  - Focused on schema, semantics
  - All meeting notes posted to public
    - http://www.oasis-open.org/
- **Utilities Communication Architecture (UCA)**
  - Focused on requirements and Use Cases under International Users Group (UCAIug)
    - http://www.ucaiug.org/
- **Goal: International Electrotechnical Commission (IEC) –** http://www.iec.ch/

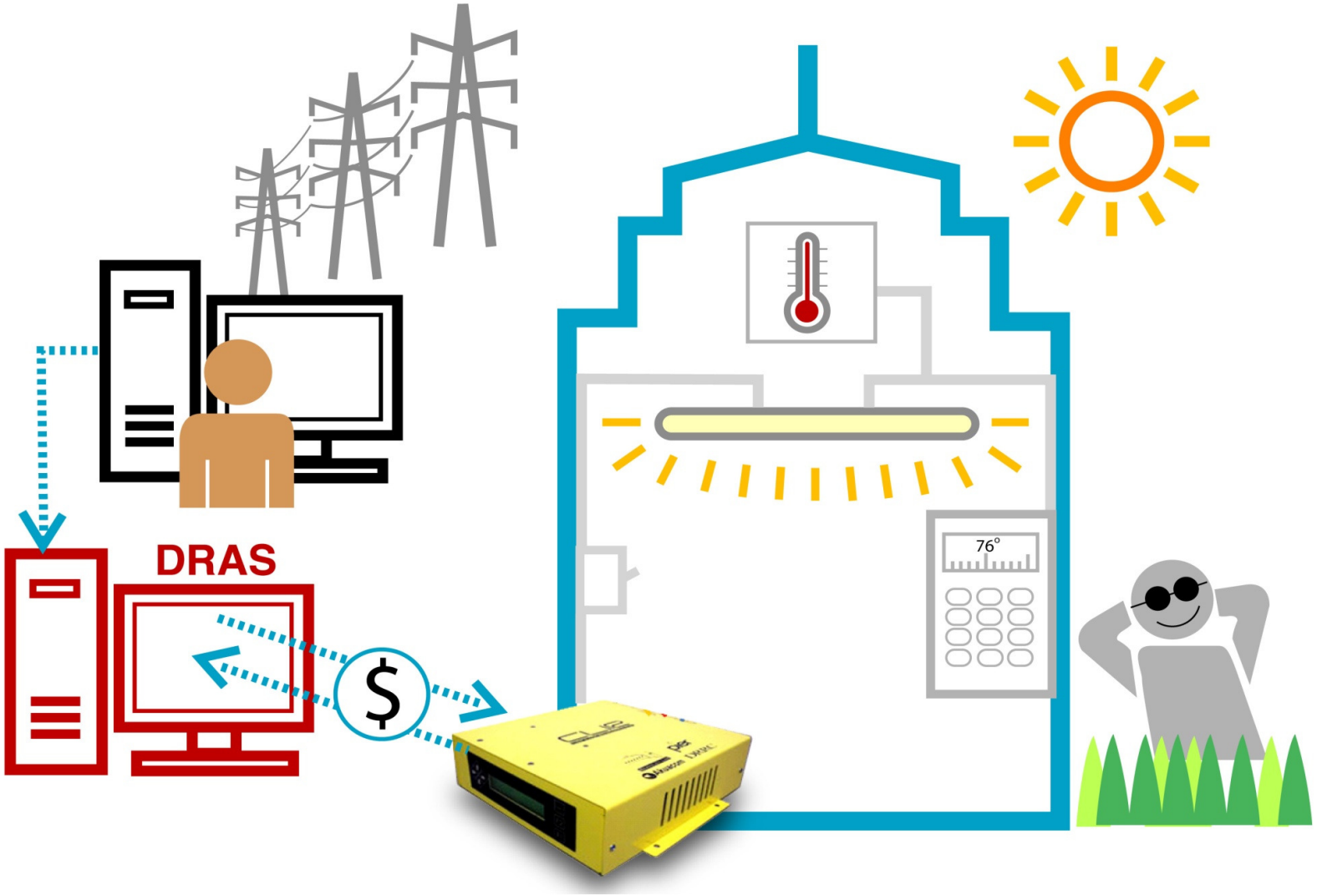
OASIS EI TC members

#	Participating Company or Individual
1	Akuacom Inc.
2	**Cisco Systems, Inc.**
3	Clasma Events, Inc.
4	Cox Software Architects LLC
5	Drummond Group Inc.
6	**Echelon Corporation**
7	**Electric Power Research Institute (EPRI)**
8	**IBM**
9	Lawrence Berkeley National Laboratory
10	**LonMark International**
11	**NIST**
12	OASIS
13	**Schneider Electric**
14	**Siemens AG**
15	Sonnenglanz Consulting
16	**Tendril Networks, Inc.**
17	The Cazalet Group
18	TIBCO Software Inc.
19	**Trane**
20	**Tridium, Inc.**
21	Universal Devices, Inc.
22	University of North Carolina at Chapel Hill
23	Individuals

End-user involvement is necessary for development of data models:

- **~37 members**
- **Controls and IT Companies**

Thank you! (Enjoy OpenADR Season…)



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