OpenADR and Internet of Things

An Overview

Presentation By:

Michel Kohanim
CEO
Universal Devices, Inc.

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Why OpenADR?

- **IoT is Here**
  - Ubiquity of connected and off-the-shelf communicating devices

- **DR Programs Target Large Loads**
  - No low cost and non-proprietary solution that extends DR and M&V to IoT

- **Automating IoT Is Cool But Benefits Are Not Tangible**
  - Customers cannot reap the benefits of energy conservation programs and rebates
  - How about those billions of IoT devices out there which can participate in DR programs but are left out?
Why OpenADR?

- The Marriage!
  - Why don’t we marry IoT Automation with Energy Management?
  - They are definitely compatible: Energy Management and Automation are pretty much two sides of the same coin
  - But: the marriage would be short-lived without a common language!

- The Language: OpenADR
  - Standards based and Device Agnostic (common)
  - Communicates DR and Price events to the VENs
  - Measurement and Verification reports sent to the VTNs

- The Rest is History!
  - And they are still married … but …
Interoperability

• Currently ISY figures out device classes and capabilities based on some heuristics
• In the brave new world of IoT, device classes and capabilities must be automatically discoverable
• Many disjoint and competing IoT standards: IPSO, AllJoyn, OIC/UPnP, Lightweight M2M, Thread, etc.

Cooperation

• OpenADR and IoT standards bodies must cooperate otherwise every minor change may cause major interoperability issues
TOPOLOGY

INSTEON, ZWave, Zigbee, WiFi, UPB, X10, A10

Zigbee SEP, Zigbee PRO

Lighting

Security

Climate

Tablets/Computers/Touch Panels

Universal Devices ISY994 ™

Smart Meter / Energy Monitors

OpenADR 2.0(a)/(b) / VTN

Internet

Wi-Fi Hotspot, Broadband Router,

Remote Access from Any Device

Broadband/3G/4G

Broadband Router

Remote Access from Any Device

Wi-Fi Hotspot, Broadband Router,

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Internet

Wi-Fi Hotspot, Broadband Router,

Remote Access from Any Device

Broadband/3G/4G

Broadband Router
SAMPLE - CONFIGURATION
Sample – Rules

Program Content for 'Precool'

If
- Module 'Climate' Temperature >= 95 °F
- Module 'OpenADR' Mode is High
- (Module 'OpenADR' Status is Pending Near
  Or Module 'OpenADR' Status is Pending Far)
- On Mon, Tue, Wed, Thu, Fri
  From 12:00:00PM
  To  Sunset - 1 hour and 15 minutes (same day)

Then
- Set 'ZW 004 Thermostat' 70° F (Heat Setpoint)
- Send Notification to 'michel@universal-devices.com' content 'pending'
  Wait 1 hour
- Run Program 'Normal Operations' (Then Path)

Else
- No Actions - (To add one, press 'Action')
Smart Meter, Thermostats, and Load Controllers in Residential (2.0b)
- Off-the-shelf Z-Wave
- Off-the-shelf INSTEON
- Zigbee SEP 1.1

Thermostats in SMB (2.0b)
- Off-the-shelf Z-Wave and Zigbee

Thermostats in College Campus (2.0b)
- Off-the-shelf Zigbee

Load Controllers on RTUs (2.0a)
- Off-the-shelf Zigbee

DR + Measurement & Verification (2.0b)
- Off-the-shelf wired relays
- EM3 Energy Monitor + Pulse counter
Thank you!

Contact Information

Michel Kohanim
Universal Devices, Inc.
michel@universal-devices.com
(818) 631 - 0333
ISY994 Series

- A fully autonomous and low cost Automation and Energy Management system:
  - Utilizes off-the-shelf devices for command/control
    - Z-Wave, Zigbee, INSTEON, A10, X10 and Network
  - OpenADR 2.0a/2.0b Certified
  - Simple configuration for how devices respond to OpenADR Events
  - Opt Schedules automate when to Opt-in or Opt-out of OpenADR Events
  - Measurements are automatically sent to the VTN/DRAS utilizing OpenADR 2.0b Report Service
  - Not cloud based
  - Supports up to 1024 devices and therefore applicable to both residential as well as SMB
ISY994zw ZS

- Ideal For SMB and Residential Venues
- Direct Communications with Smart Meters
  - SEP 1.1 Certified
  - PG&E, SCE, NVE, and Oncor Certified
  - Near real-time energy readings from the Smart Meter are automatically sent to the VTN using OpenADR 2.0b Report Service
- Z-Wave Support
  - Support for any off-the-shelf Z-Wave device, including – but not limited to – thermostats and heavy duty load controllers
  - Energy readings from Z-Wave devices that report energy information is automatically sent to the VTN
  - Our OEM Z-Wave thermostats show OpenADR Events on their displays
**ISY994R ZS – SMART METER / RELAY**

**ISY994R ZS**

- Ideal for Venues with Existing Building Management Systems
- Direct Communications with Smart Meters
  - SEP 1.1 Certified
  - PG&E, SCE, NVE, and Oncor Certified
  - Near real-time energy readings from the Smart Meter are automatically sent to the VTN using OpenADR 2.0b Report Service
- Relays
  - Two relays to send signals to building management systems
EM3 Series

- Ideal for Venues without Smart Meters
- A fully autonomous and low cost Energy Monitoring and Relay Control System
  - OpenADR 2.0a/2.0b Certified
  - Energy Monitor – 3 Phase / Billing grade
    - Up to 480 volts balanced
    - 5 Channels of energy monitoring
    - 2 Temperature sensors
    - 2 Pulse counters or 1 KZY Simple configuration
    - Up to 16GB of storage
  - 4 x Relays
    - Communicate with Building Management Systems or
    - Turn on/off devices directly
  - Opt Schedules automate when to Opt-in or Opt-out of OpenADR Events
  - Measurements, for all channels – and including Pulse Counts – are automatically sent to the VTN/DRAS utilizing OpenADR 2.0b Report Service
  - Not cloud based
**EM3 ZW**

- Ideal for Venues without Smart Meters and Building Management Systems (SMB)
- Extends EM3 with Z-Wave Capabilities
  - Support for any off-the-shelf Z-Wave device, including – but not limited to – thermostats and heavy duty load controllers
  - Energy readings from Z-Wave devices that report energy information is automatically sent to the VTN
  - Our OEM Z-Wave thermostats show OpenADR Events on their displays
EM3 ZB

- Ideal for Larger Venues without Smart Meters and Building Management Systems such as SMB and Rooftops
- Extends EM3 with Zigbee Capabilities
  - Support for our OEM Zigbee Thermostats and Heavy Duty Load Controllers
  - Our OEM Z-Wave thermostats show OpenADR Events on their displays
Hardware Specifications - ISY

Hardware
- Freescale CPU
- 2MB Flash/8MB RAM
- Up to 16GB SD Card storage
- 10/100 Ethernet
- Real Time Clock on board
- 2 Serial Ports
- 4 digital I/O

Firmware
- HTTP
- HTTPS
  - Up to TLS 1.2
  - Client Authentication/Digital Certificates
- Open ADR, SEP, Flex Your Power
- Abstraction layer for support of other devices/protocols
EM3™
- 3 Phase Energy Monitor
  - Automatic configuration
  - Up to 480 volts balanced
  - 5 Channels of energy monitoring
  - 2 Temperature sensors
  - 2 Pulse counters or 1 KZY
  - Zigbee communications to ISY

EM3-RTU™
- 3 Phase Energy Monitor and RTU Diagnostics (SMDS)
  - Same features as EM3
  - Up to 16GB data storage
  - Real time clock on board
  - Network accessible