EPRI’s Open-Source OpenADR Software
Leveraging Third-Party Resources

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OpenADR Member Meeting and Open House
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# OpenADR 2.0b Open-Source Software

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<td>Linux, Mac OS</td>
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<td>Yes</td>
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<td><a href="http://www.SourceForge.net">www.SourceForge.net</a></td>
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The EPRI OpenADR VTN User Interface (Current Release)

• The Admin menu consists of the following options: Accounts, VENs, Resource Types, Market Contexts, Groups, Events, Schedules, VTN Parameters, and Test Case Prompts.

• Non-admin users have limited access to the system. Their User Menu consists of five links: Account Settings, VENs, Create Test Event, Dashboard, and Download VEN.

More information about the EPRI OpenADR software is available in Automated Demand Response and Ancillary Services Demonstration Project Update: Volume One (Product ID 3002002782) and OpenADR Technical Workshop DVD – 6.19.2013 (Product ID 3002001822).
1. Settings: This section has the following controls and actions: Default Opt, URL, Client Certificate & Password, SSL/TLS, VEN Name, Password, Poll Interval, and Auto Scroll Log.

2. OpenADR Services: This area has tabs that show the status and state of the four OpenADR services: Events, Reporting, Opt, and Registration.

3. Log/Communication History: All OpenADR messages exchanged between the VEN and VTN are captured in the log list view. Selecting a message in the list view causes the associated request and reply messages to display in the request and reply XML areas.

4. Status: The status bar, located at the bottom of the VEN’s user’s interface, displays information regarding the current state of VEN polling, the last message status, the VEN version, and the OpenADR registration state.
C++ End-Node Library

- Released in December 2014
- Implements components of an OpenADR 2.0b pull VEN
- Intended for embedded applications
- Generates compliant messages for all four 2.0b services
- Manages HTTP/s connection with cURL and OpenSSL libraries
- Can be used to create a compliant VEN*

*Note: Use of EPRI’s Alliance-certified software to create a new application does not confer certification on the resulting application. All applications are individually certified by the OpenADR Alliance.
Austin Energy’s Load Coop Program Overview

- Voluntary program between AE and qualifying C&I customers who can reduce load at peak demand times
- Customers receive 1-hour notice to reduce their load
  - 3-hour time period
  - Most events last 2 hours (generally 4-6 PM time frame).
- Customers receive $1.45 per kWh curtailed
- Requires 15-minute IDR meters via AMI/AMR systems to collect meter data
- AE IDR data uploaded daily to Schneider’s Energy Profiler On-line (EPO)
- EPO used for event notification and settlement
VTN High-Availability Architecture

- VPC
- public Internet
- VENs, API
- Oregon Region (us-west-2)
- virtual private cloud – production
- EC2 Elastic Load Balancing
- Auto Scaling VTN (min 3, max 8)
- Docker Optimized Linux
- Database Master
  - Availability Zone A
- Database Slave
  - Availability Zone B
- Database Read Replica
  - Availability Zone C

mysql cluster

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Typical Configuration

OpenADR 2.0b VTN

Customer OpenADR 2.0b VEN

Customer System

Power Supply

LAN

CAT5e ethernet

High Availability WAN
w/auto failover

Public Internet

DSL, Cable, LAN

cellular

wifi

Cellular

WiFi
EV Charging Transformer Overload Mitigation

• Two-year project to ensure that transformers do not overload as a result of EV charging
• Sponsored by the Ontario Ministry of Energy
• Analyzes the effects of EV charging on transformers
  • Real-time transformer monitoring and analytics
  • Automatic management of charging between vehicles
Intelligent Electric Vehicle Charging System

IEVCS – High Level Architecture

EPRI VTN

EPRI VEN
What’s New?

- Much-Improved VEN C++ Library
  - Bug Fixes
  - Complete set of signal types
- VTN
  - New Features
    - Many UI enhancements
      - Simplified
      - Hides OpenADR terminology
      - Allows utility-specific terminology
    - Non-admin account features added
    - Time zone added to users, VENs, and events
    - Status pages
    - Search
    - Location Targeting
      - Major bug fixes
- Android VEN
Location Targeting

- OpenADR targets don’t have a notion of hierarchy
  - They are arbitrary groups of VENs
- Solution: create a Location object that maps to an OpenADR target, and has a parent Location object
  - Allows arbitrary hierarchy of Locations
- Built on OpenADR Targeting
- Location types
  - Circuit (Substation)
  - Feeder
  - Section
  - Distribution Transformer
  - Customer (Service Delivery Point)
  - Load (Physical Location of UCM)
- Hierarchy of Locations
Mobile Application Client for OpenADR (MACO)

- Research Project
  - Proof of concept development work
  - No intention for public release
  - Tested on PC (Android emulator), Android phone (Motorola Moto G), and Samsung tablet

- Simple polling VEN

- Supports only one event at a time

- Provides event notification and alerts, but takes no other actions
Together...Shaping the Future of Electricity

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