EPRI’s Open-Source OpenADR 2.0b Software

OpenADR Alliance Member Meeting

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Technical Executive

May 14, 2015
Help Move Technologies to the Commercialization Stage…

“Technology Accelerator!”
# OpenADR 2.0b Open-Source Software

<table>
<thead>
<tr>
<th>Role</th>
<th>VTN</th>
<th>VEN</th>
<th>VEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designed Use</td>
<td>Virtual Top Node</td>
<td>Virtual End Node</td>
<td>Virtual End Node</td>
</tr>
<tr>
<td>License</td>
<td>DRMS</td>
<td>Desktop Client</td>
<td>Embedded Client</td>
</tr>
<tr>
<td>Profiles</td>
<td>BSD 3-Clause</td>
<td>BSD 3-Clause</td>
<td>BSD 3-Clause</td>
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<tr>
<td>Data Models</td>
<td>2.0a and 2.0b</td>
<td>2.0b</td>
<td>2.0b</td>
</tr>
<tr>
<td>Transports</td>
<td>Push/Pull (Poll)</td>
<td>Pull (Poll)</td>
<td>Pull (Poll)</td>
</tr>
<tr>
<td>Programming Language</td>
<td>HTTP, XMPP</td>
<td>HTTP</td>
<td>HTTP</td>
</tr>
<tr>
<td>Tested Operating Systems</td>
<td>JRuby, Java</td>
<td>C#</td>
<td>C++</td>
</tr>
<tr>
<td>Available on</td>
<td>Linux, Mac OS</td>
<td>Windows 7, 8</td>
<td>C++</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.SourceForge.net">www.SourceForge.net</a></td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

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Chuck, do you have a better slide for this?
Walt Johnson, 12/3/2013
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Virtual Top Node (VTN) and Virtual End Node (VEN)

- Complete OpenADR 2.0b-compliant server and standalone client
- Made available to the open source community in February 2014
- Received Alliance certification in October 2014
- Revised versions released in December 2014
- Overview DVD available

View of all XML Messages
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).
The EPRI OpenADR VEN User Interface

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.
What’s Next: EPRI OpenADR Development

Integratability
Usability
VTN Enhancements

- CEA-2045 Project
- Other usability enhancements
- Create a more utility-friendly OpenADR server
  - Hide complex details of OpenADR
- Use utility terminology
  - Add a utility-specific layer on top of “bare” OpenADR
- Add new features useful to the base OpenADR system
CIM Message Interface

- Building on prior success – over 5,000 downloads worldwide of the EPRI VTN and VEN software
- Scope and use cases were taken from the PAP19 work, coding is in process
CEA-2045 Demonstration

EPRI’s VTN

Internet

OpenADR Client

CEA-2045

CEA-2045 Communication Module

Mapping

OpenADR Client → Map → CEA-2045

End-device Configurations

CEA-2045 Controls
What’s Changing?

▪ New Features
  – Many UI enhancements
    ▪ Simplify
    ▪ Hide OpenADR terminology
    ▪ Allow utility-specific terminology
  – Non-admin account features
  – Time zone added to users, VENs, and events
  – Targeting
  – Status pages
  – Search

▪ Make the base system generic
  – To make this process repeatable

▪ Major bug fixes
  – 91 tickets closed (bugs and features)
Updated UI

Slimmed down menu w/simplified Utility menu

Search

Data “Card” views
Targeting Enhancements

- Previous version supported four target types
- All types now supported
- VEN ID and PartyID not list – managed by system
New Non-Admin Account Features

- Non-admin users can create and edit test events
- Can only target their own VENs
- Useful for multi-user system for testing VENs
- In the current system, non-admin users can create an event, but can’t modify it and can't select targets (all VENs in the account are targeted)
Utility Terminology: Programs

- “Program” instead of “Market Context”

<table>
<thead>
<tr>
<th>Market Context ID</th>
<th>Program</th>
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<tbody>
<tr>
<td>LoadUp</td>
<td>LoadUp</td>
</tr>
</tbody>
</table>
Utility Terminology: Devices

- “Device” instead of “VEN”
Utility Terminology: Locations and Equipment Types

“Locations” and “Equipment Type” are OpenADR EiTargets behind the scenes
Utility Accounts

Only see Events and Devices

Utility Accounts see only Events and Devices

Admin accounts see everything
“Events” vs “Utility Events”

- OpenADR Events are very complex
  - Active Period
  - Event Descriptor
  - Signals
  - Signal Intervals
  - Targets
Events vs Utility Events (continued)

- Utility Events are more manageable
  - Program → Market Context
  - Location → Target
  - Equipment Type → Target
VEN vs (Utility) Device

- VEN setup requires multiple screens
Utility Devices need minimal information

- Enter device info
- Subscriptions, groups, etc., handled automatically
Location Targeting

- Built on OpenADRR Targeting
- Location types
  - Circuit (Substation)
  - Feeder
  - Section
  - Distribution Transformer
  - Customer (Service Delivery Point)
  - Load (Physical Location of UCM)
- Hierarchy of Locations
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
Location Targeting (continued)

- Each location has
  - OpenADR Target
  - Parent Location
- Assign device to the Location object at the bottom of the hierarchy
- Automatically added to each parent
- Result: selecting Substation as a location for an event will target ALL devices below the substation
Together…Shaping the Future of Electricity

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