

Open-Source Implementations of OpenADR 2.0b

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Today's Agenda

- What Is EPRI?
- EPRI's Automated DR Demonstration Project
 - Members
 - Activities
- EPRI's Open-Source Software for OpenADR
 - License
 - Capabilities
 - Availability
- Opportunities for Involvement

The Electric Power Research Institute

Independent

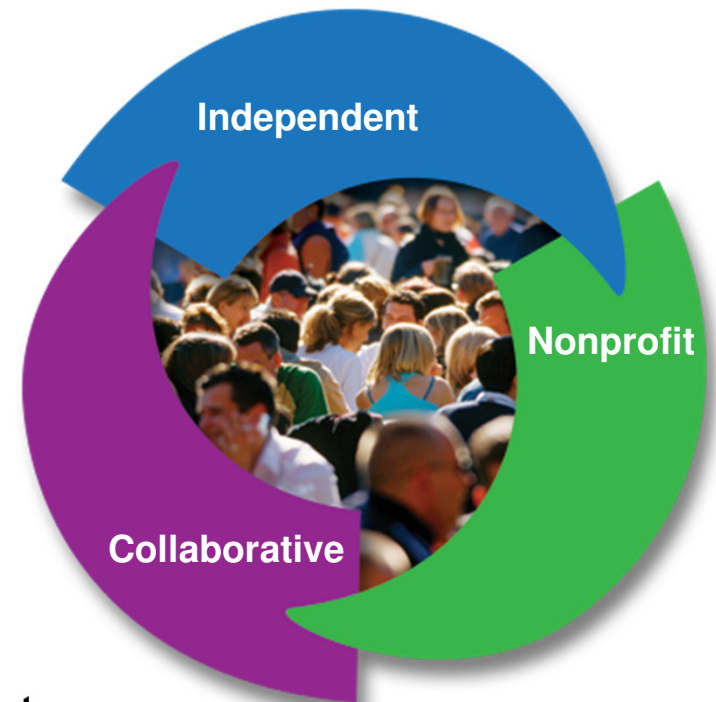
Objective, scientifically-based results addressing reliability, efficiency, affordability, health, safety and the environment

Nonprofit

Chartered to serve the public benefit

Collaborative

Bringing together scientists, engineers, academic researchers, and industry experts



Together... Shaping the Future of Electricity

OpenADR Project Activities

EPRI Project Demonstrations

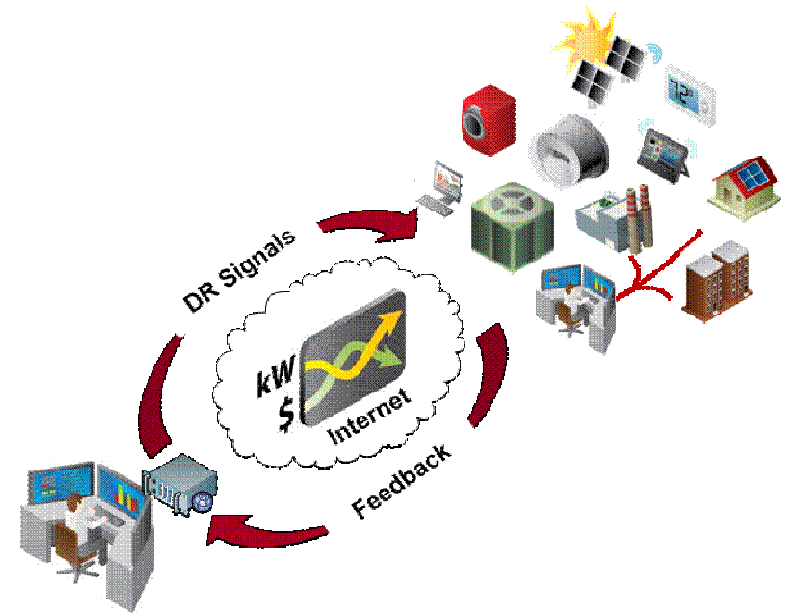
- **ISOs:** CAISO and NYISO
- **US Utilities:** AEP, KCPL, SDG&E, Southern Co.
- **International Utilities:** ESB Networks (Ireland), EdF (France), TEPCO (Japan)

Other Deployments In Progress

- California Utilities
- LBNL
- OpenADR Alliance (~100 Members)
- Other EPRI Activities

International Adoption

- Now an IEC Publicly Available Specification (PAS)



Virtual Top Node (VTN) - Server
<http://sourceforge.net/projects/openadr2vtn/>

Virtual End Node (VEN) - Standalone Client
<http://sourceforge.net/projects/openadr2bven-pull/>

Virtual End Node (VEN) - Client Library
<http://sourceforge.net/projects/openadrvcnlibrary/>

**EPRI Open-Source Contribution Accelerating Adoption;
Significant Global Impact**

EPRI Open-Source Software Components



- Virtual Top Node (Server)
 - Training and Support
 - Certified by OpenADR Alliance
 - Available on SourceForge: link at <http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000000001026755>
- Virtual End Node (Standalone Client)
 - Training and Support
 - Certified by OpenADR Alliance
 - Available on SourceForge: link at <http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000000001026751>
- OpenADR 2.0b C++ VEN Library (Embeddable Client)
 - Library that implements the functions required to build a VEN
 - Intended for creating embedded implementations of OpenADR VENs
 - Available on SourceForge: link at <http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000000001026753>

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 certification in October 2014
- Held two training sessions (Tennessee and Ireland)
- Overview DVD available

The top screenshot shows the EPRI OADR web dashboard in a Firefox browser. The URL is 192.168.2.117:8080/dashboard. The user is logged in as admin. The dashboard displays two sections: 'Dashboard: Test_VEN_Name (offline) (2013-09-20 16:10:41 UTC)' and 'Dashboard: TH_VEN (offline) ()'. Both sections show a table with columns: Event ID, Start Time, Priority, Status, Duration (minutes), Test Event, Market Context ID, and Opt State. The first table has one row with Event ID 7de285be9d9d9aefdc, Start Time 2013-10-08 23:20:49 UTC, Status completed, Duration 5, and Market Context ID http://MarketContext1. The second table is empty. The bottom screenshot shows the OADR VEN2b client application. It has a 'Settings' tab with fields for Default Opt (Opt In), Server URL (https://openadr.neiland.com/OpenADR2/Simple/2.0b), Client Certificate (ven.pfx), and Credentials (VEN Name: Test_VEN_Name, Password: *****). It also has a 'Log' tab showing a table of events with columns: Date, Response Time, Request Type, Response, and Response Code. The log shows several events from 12/5/2013 to 12/6/2013. A blue arrow points from the text 'View of all XML Messages' to the 'Log' tab. The bottom status bar shows 'Idle | 200: OK | Server time: 12/6/2013 11:31:46 AM | Version: 0.0.5.0 | VEN IS Registered'.




View of all XML Messages

C++ End-Node Library

- Implements OpenADR 2.0b VEN pull
- 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
- Intended for embedded applications

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.

OpenADR 2.0b Open-Source Software

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

Slide 8

WJ4

Chuck, do you have a better slide for this?

Walt Johnson, 12/3/2013

Other Opportunities for Involvement

■ Other EPRI OpenADR-Related Projects

- VTN Usability Enhancements
 - Improved user interface to simplify actions associated with common utility use cases
- CIM Interface for VTN
 - Connecting the IRC's WDRCP (CIM-based wholesale DR messages) to OpenADR
- CEA-2045
 - Modular communication controllers using OpenADR

■ EPRI ICT Innovators Forum

- Improved alignment between utility needs and wants and solution provider offerings and roadmaps
- New project just being launched now



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