



Automated Demand Response and Ancillary Services Demonstration

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The Electric Power Research Institute

Independent

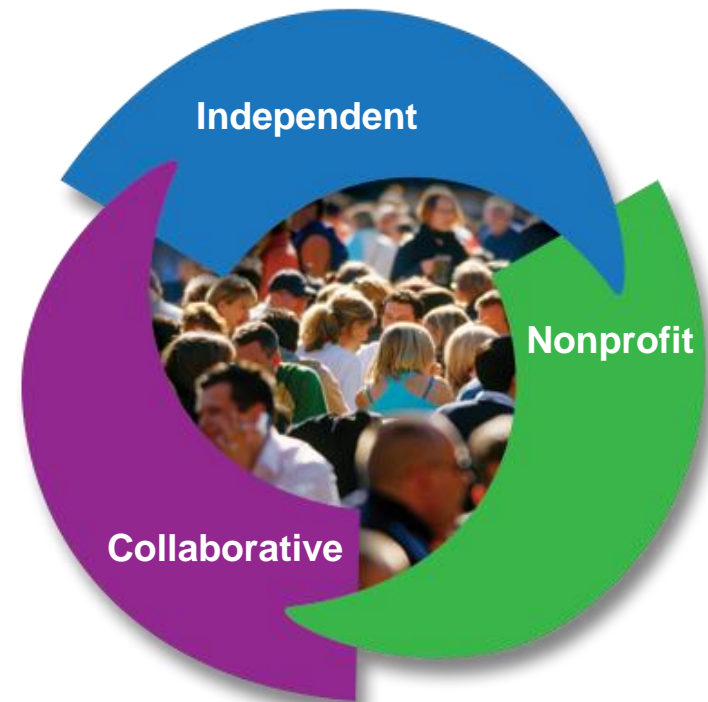
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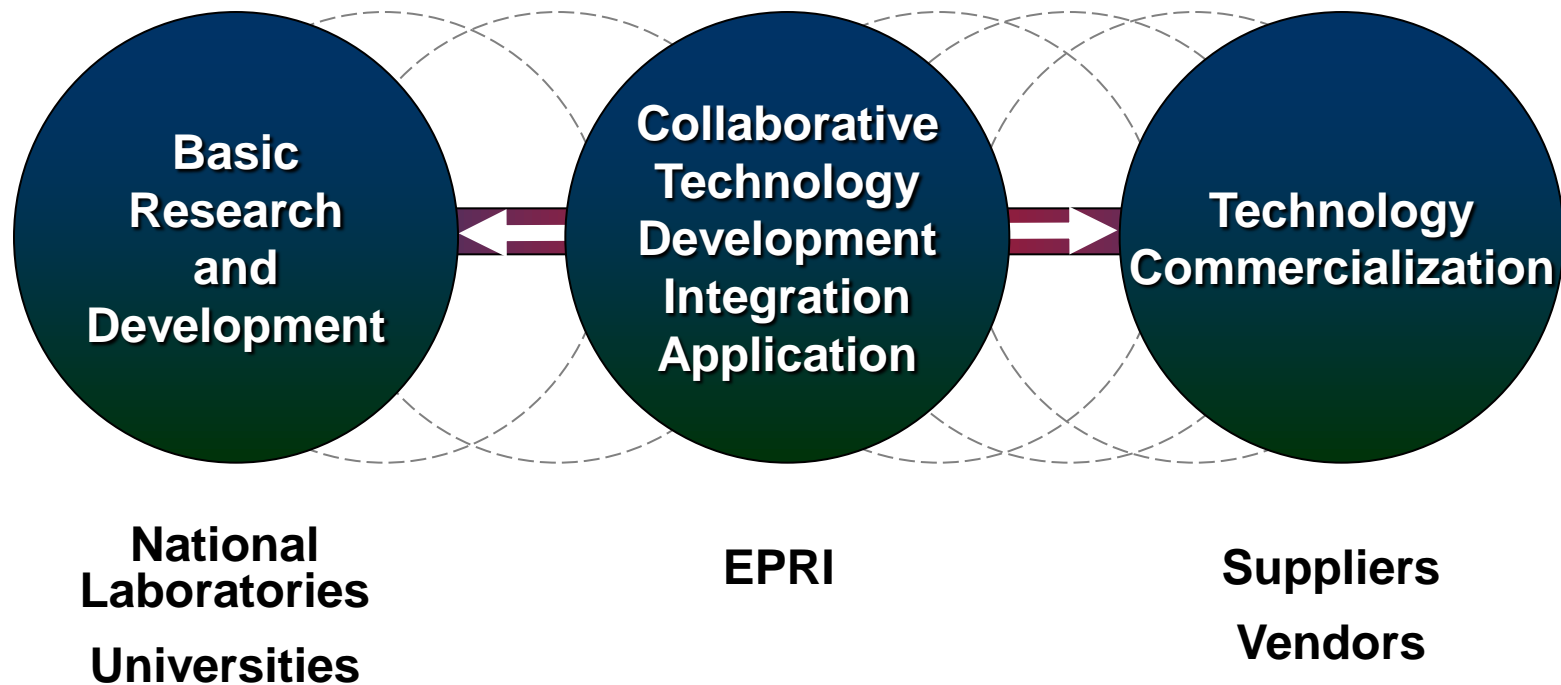
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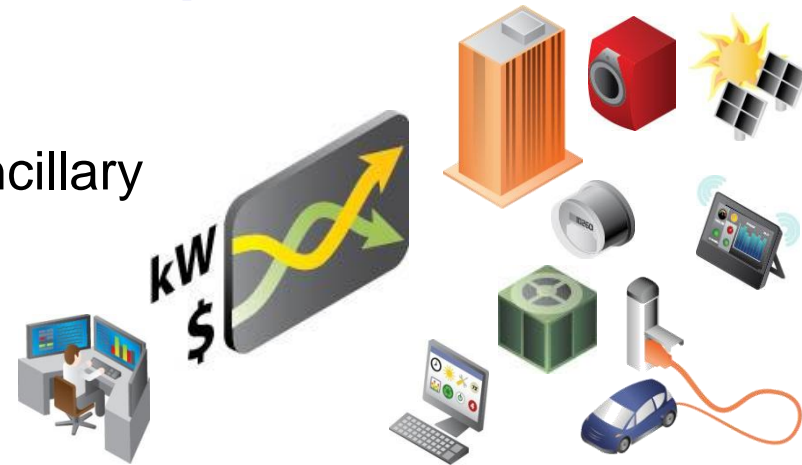


“Technology Accelerator!”

OpenADR and Ancillary Services Demonstration (4-Year Demo)

Objectives and Scope

- Advance Standards for DR-provided Ancillary Services (Fast DR) through Utility Demonstrations
- Address Research Questions
 - Quality of Service, Reliability, Security, Privacy, Scalability, etc.
- Develop Utility DR Technology Roadmaps



Value

- Increase Adoption and Innovation of Products
- Understand Utility Migration Strategies
- Characterize Load Classes for Ancillary Services

Advance Standards for Automated DR & Ancillary Services

Auto DR Demo Participants



Company
American Electric Power (AEP)
California Independent System Operator (CAISO)
Électricité de France (EDF)
Electricity Supply Board (ESB)
Kansas City Power & Light (KCP&L)
New York Independent System Operator (NYISO)
Southern Company
Tokyo Electric Power Company (TEPCO)


Hosting of Demonstrations



- Research what OpenADR can do (capabilities)
- Explore what applications can be enabled
- Evaluate responsiveness of types of loads
- Evaluate architectures that preserve existing (legacy) DR systems
- Evaluate certified products in utility host-site demos
- Feed information to standards bodies to help with identified gaps

EPRI Open Source OpenADR 2.0b Implementations

- VTN: <http://sourceforge.net/projects/openadr2vtn/>
- VEN: <http://sourceforge.net/projects/openadr2bven-pull/>




EPRI OpenADR 2.0 Virtual Top Node

This application is an implementation of a virtual top node (VTN) as defined in the OpenADR Alliance's ...
117 weekly downloads

This application is an implementation of a virtual top node (VTN) as defined in the OpenADR Alliance's OpenADR 2.0 Profile Specification B Profile, updated July 1, 2013. OpenADR defines a machine-to-machine interface and includes the information model, transport and security mechanisms, and the manner in which data is exchanged between two end points. OpenADR 2.0 defines what and how information ... [Read more.](#)

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EPRI OpenADR 2.0b Virtual End Node

This application is an implementation of a virtual end node (VEN) as defined in the OpenADR Alliance's ...
82 weekly downloads

This application is an implementation of a virtual end node (VEN) as defined in the OpenADR Alliance's OpenADR 2.0 Profile B Specification (HTTP pull), updated July 1, 2013. OpenADR defines a machine-to-machine interface and includes the information model, transport and security mechanisms, and the manner in which data is exchanged between two end points. OpenADR 2.0 defines what and how ... [Read more.](#)

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The EPRI OpenADR VTN User Interface

- 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, Dashboard, and Download VEN.*

The screenshot shows a web browser window displaying the EPRI OpenADR VTN User Interface. The browser is Firefox, and the address bar shows the URL 192.168.2.117:8080/dashboard. The page header includes the EPRI logo and the text "ELECTRIC POWER RESEARCH INSTITUTE". The user is logged in as "admin" and can click "Log out".

The interface is divided into two main sections: "Admin Menu" and "User Menu". The "Admin Menu" includes links for Accounts, VENs, Resource Types, Market Contexts, Groups, Events, Schedules, VTN Parameters, and Test Case Prompts. The "User Menu" includes links for Account Settings, VENs, Dashboard, and Download VEN.

The main content area displays two dashboards. The first dashboard is titled "Dashboard: Test_VEN_Name (offline) (2013-09-20 16:10:41 UTC)". It contains a table with the following data:

Event ID	Start Time	Priority	Status	Duration (minutes)	Test Event	Market Context ID	Opt State
7de285beff9d869aefdc	2013-10-08 23:20:49 UTC		completed	5		http://MarketContext1	

The second dashboard is titled "Dashboard: TH_VEN (offline) ()". It contains a table with the following data:

Event ID	Start Time	Priority	Status	Duration (minutes)	Test Event	Market Context ID	Opt State
----------	------------	----------	--------	--------------------	------------	-------------------	-----------

The page footer indicates "Last Refreshed: 2013-10-27 10:56:07 -0500" and "copyright © 2013 EPRI".

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.*

The screenshot displays the OADR VEN2b application window. The 'Settings' tab is active, showing fields for Default Opt (Opt In), URL (https://openadr.nebland.com/OpenADR2/Simple/2.0b), Client Certificate (ven.pfx), Client Cert Password, VEN Name (Test_VEN_Name), Password, Poll Interval (10s), and Auto Scroll Log. The 'Log' tab is also visible, showing a table of events with columns for Date, Response Time, Request Type, Response Code, and Response. The 'Status' bar at the bottom shows 'Idle', '200: OK', 'Server time: 12/6/2013 11:31:46 AM', 'Version: 0.0.5.0', and 'VEN IS Registered'.

ID	Start Time	Duration	Status	Market ...	Signal T...	Current ...
7d99315...	11/10/2013 ...	PT15M	complet...	http://...	level	normal

Date	Response Time	Request Type	Response Code	Response
12/5/2013 5:52:39 PM	0.1880108	oadrPoll	200	oadrRe...
12/5/2013 5:52:49 PM	0.2700155	oadrPoll	200	oadrRe...
12/6/2013 11:31:49 AM	1.2360707	oadrQueryRegistrat...	200	oadrCre...
12/6/2013 11:31:49 AM	0.4130236	oadrCreatePartyRe...	200	oadrCre...
12/6/2013 11:31:49 AM	0.3630207	oadrRegisterReport	200	oadrRe...
12/6/2013 11:31:49 AM	0.1080062	oadrRequestEvent	200	oadrDist...
12/6/2013 11:31:50 AM	0.2540146	oadrPoll	200	oadrRe...

Request XML

```
<?xml version="1.0" encoding="utf-8"?>
<oadrPayload
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns="http://openadr.org/oadr-2.0b/2012/07">
  <oadrSignedObject>
    <oadrPoll d3p1:schemaVersion="2.0b"
      xmlns:d3p1="http://docs.oasis-open.org/ns/energyinterop/201110">
      <d3p1:venID>9f4ced4cdf25cccbecf2</d3p1:venID>
    </oadrPoll>
    </oadrSignedObject>
  </oadrPayload>
```

Response XML

```
<?xml version="1.0" encoding="utf-8"?>
<oadrResponse d3p1:schemaVersion="2.0b"
  xmlns:d3p1="http://docs.oasis-open.org/ns/energyinterop/201110">
  <d3p1:eiResponse>
    <oadrResponse d3p1:schemaVersion="2.0b"
      xmlns:d3p1="http://docs.oasis-open.org/ns/energyinterop/201110">
      <d3p1:eiResponse>
        <d3p1:responseCode>200</d3p1:responseCode>
        <d3p1:responseDescription>OK</d3p1:responseDescription>
      </d3p1:eiResponse>
    </oadrResponse>
  </d3p1:eiResponse>
</oadrResponse>
```

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

2. 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 interface, displays information regarding the current state of VEN polling, the last message status, the VEN version, and the OpenADR registration state.

Features and Capabilities

- Demonstrate each of the four services (EiEvent, EiReport, EiRegisterParty, and EiOpt)
 - Reference Implementation
- View request and response XML messages (VEN)
- Create events on a schedule

Coming Soon

- VirtualBox appliance to allow easy VTN setup
- C++ library
 - Implements OpenADR 2.0b VEN pull
 - Generates compliant messages for all 4 services
 - Manages HTTP/s connection with curl and `openssl` libraries
 - Can be used to create a compliant VEN
 - Intended for embedded applications
- Certified versions of the VTN and desktop VEN software

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