i-Vu Pro Automated Demand Response v1.4

for i-Vu Pro v8.0 or later systems

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Important changes are listed in **Document revision history** at the end of this document.

Contents

What is the i-Vu Pro Automated Demand Response add-on?

The i-Vu® Pro Automated Demand Response add-on enables the i-Vu® Pro system to control equipment based on events sent by various utilities' Automated Demand Response (ADR) programs, provided those utilities have implemented their ADR programs using the OpenADR 2.0 protocol. When running this add-on, i-Vu® Pro participates as a virtual end node (VEN) in the utilities' ADR programs. The number of Demand Response programs you can participate in is determined by your Automated Demand Response add-on license.

This add-on has been certified by the OpenADR Alliance. For more information about OpenADR concepts and how to prepare to use the add-on see:

- OpenADR Alliance's website (www.openadr.org)
- i-Vu® Pro Automated Demand Response Add-on white paper on the Carrier Partner Community Website.

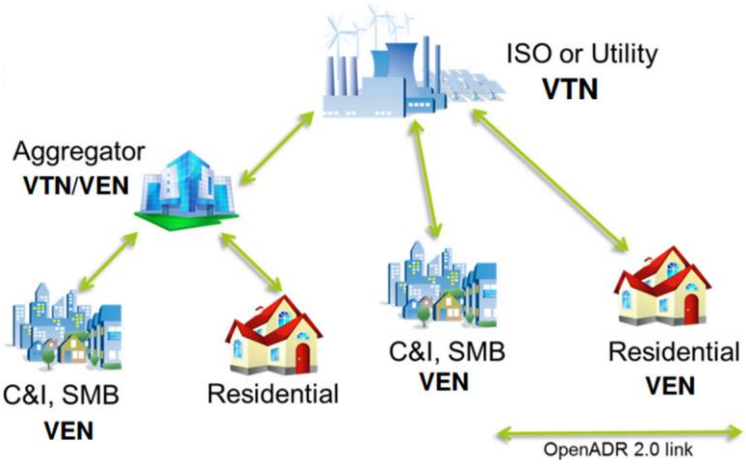
ADR concepts

Demand response (DR) is a change in energy use in response to either a change in the price of electricity or a signal indicating system reliability is jeopardized. Open Automated Demand Response (OpenADR) provides a non-proprietary, open, standardized DR interface that allows electricity providers to communicate DR signals directly to existing customers using a common language and existing communications such as the Internet.

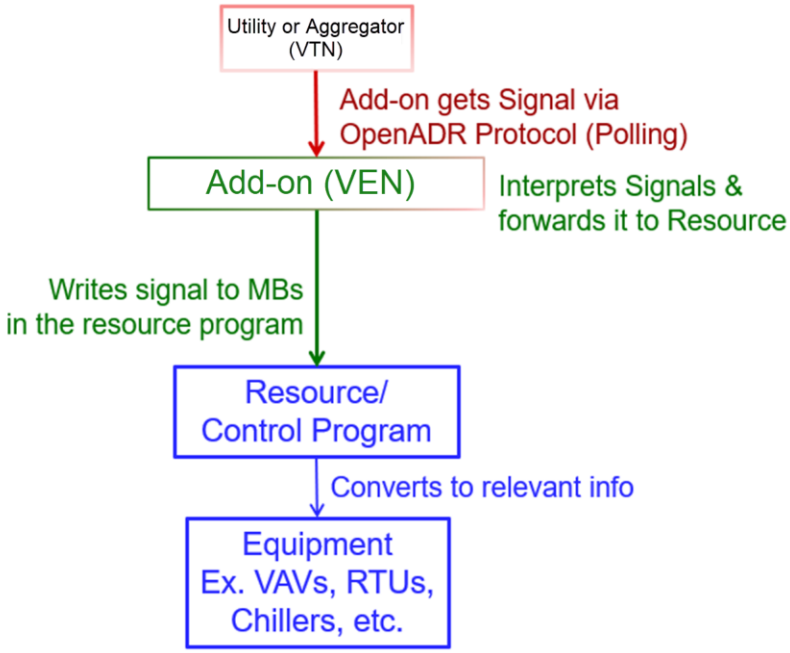
OpenADR is a message exchange protocol with two primary actors:

- Virtual Top Nodes (VTN)
  - Manages resources
  - Creates and transmits events
  - Requests reports
  - A VTN provider may be a utility or an aggregator.
  - An aggregator first acts as a VEN, receiving events from multiple utilities. The aggregator then acts as a VTN, sending those events to subscriber VENs.
- Virtual End Nodes (VEN)
  - Receives events and responds to them
  - Generates reports

- Controls demand side resources



How it works with the Automated Demand Response add-on:



Become familiar with the concepts in the table below. They are important for understanding the instructions in this manual.

Concept	Description
OpenADR	OpenADR is a standard message protocol used by many ADR programs. To learn more about OpenADR, visit the OpenADR Alliance website at www.openadr.org.
OpenADR Profile 2.0a and 2.0b	Profile 2.0a supports basic DR services and markets. The only signal type supported by profile 2.0a is Simple. Profile 2.0b supports most DR services and markets. It includes all 2.0a functionality plus opt schedules, telemetry reports, more complex targeting of events, and additional signal types.
Virtual Top Node (VTN)	The utility's server that transmits OpenADR signals to end devices or other intermediate servers (aggregators).
Virtual End Node (VEN)	A client that accepts the OpenADR signal from a utility's server (VTN). i-Vu® Pro acts as a VEN when running this add-on.
Account	A particular utility's ADR program See *To set up an account* (page 11) for instructions on how to configure accounts for your system.
Resource	A control program in your system that contains the logic needed to process the ADR requests See *To add an ADR resource* (page 13) for instructions on how to configure resources for your system.
Target	The load shedding equipment that is the intended recipient for the demand response event. An event is processed for a resource if the target value included in the event message matches one of the targets configured for that resource. **NOTE** It is not required to configure targets if the VTN does not include targets in their OpenADR event messages. Refer to the contract between the VTN provider (utility or aggregator) and the building owner. See *Appendix B: Example of target assignments* (page 31) for an example of how targeting is used. See *To manage targets* (page 15) for instructions on how to configure targets for your system.
Signal type	The actionable information contained in an event such as electricity pricing or specific levels of load shed requested that typically trigger some preprogrammed load shed behavior by the recipient of the event. A DR program definition should specify the types of event signals used. See *Signal types and Library symbols for automated demand response* (page 7) for a list of supported signal types.
Market context	Market contexts are used by the utility to categorize their events for different markets. When setting up an account, you must identify the events your system will process by entering the market context provided by the utility.
Opt Schedules	Specified time periods during which certain ADR events will or will not be processed by your system. See *Managing Opt Schedules* (page 20) for instructions on how to set up Opt Schedules.

Requirements

You will need the following information before you begin:

Gather ADR program information

- Determine how to connect to the ADR server. If the utility requires you to use their certificate for client authentication, you must set up SSL Mutual Authentication. See Appendix A.
- Determine which OpenADR profile you will participate in; profile 2.0a or profile 2.0b.
- Determine which signals and types you will use. See *Signal types and control programs for automated demand response* (page 7) for a list of supported signals and types.

Your i-Vu® Pro system

- Is a v8.0 or later system with the latest cumulative patch.
- Has the necessary ADR resource control programs (.equipment files) and demand response logic using the supported Universal Controller Library programs. See *Signal types and control programs for automated demand response* (page 7).

Browser Support

Any browser currently supported by the i-Vu® Pro system.

Preparing control programs to accept ADR signals

A set of control programs (.equipment files) are provided in the Universal Controller Standard Application Library (SAL). Each of these programs corresponds to a specific DR signal type to be processed. The list of supported signals and their associated .equipment file names can be found in *Signal types and control programs for automated demand response* (page 7).

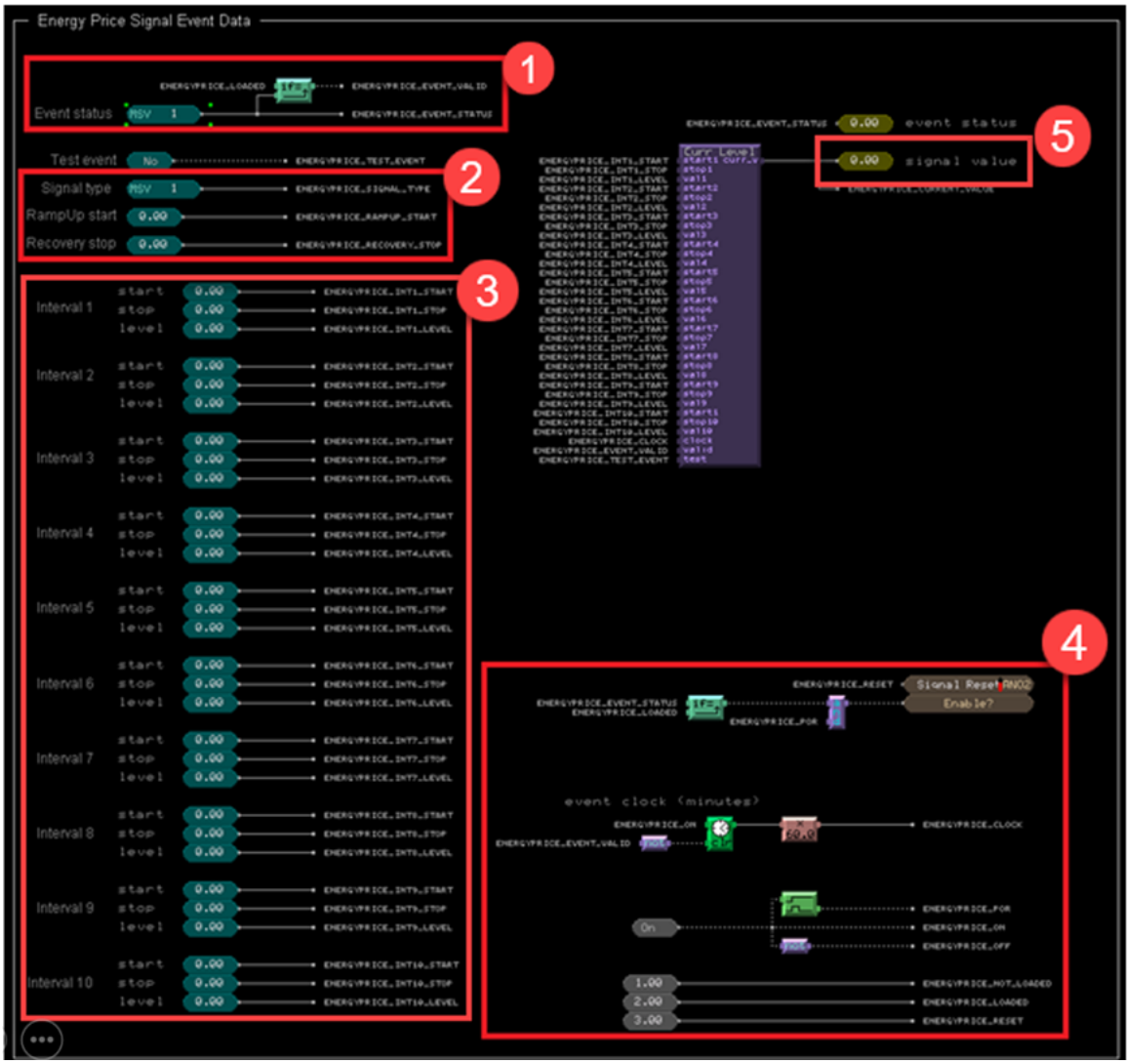
To process ADR events, install the necessary pre-configured program into your system. Assign these control programs as resources associated with an account in the add-on. See *To add an ADR resource* (page 13).

NOTE See *Understanding the ADR add-on control programs* below for more information.

Understanding the ADR add-on control programs

All of the ADR signal control programs function essentially the same way. The only difference is the type of signal value provided by the VTN to be used in the logic of your control program. The signal value types are listed in the **Signal type** column in *Signal types and Library control programs for automated demand response* (page 7).

See the Energy Price control program example below to understand how the library control programs work.



Sections 1, **2**, and **3** contain the event data provided by the add-on.

The **Event Status** in **section 1** is set by the add-on when an event is received from the VTN for this equipment. At that time, the add-on inserts basic event information into **section 2** and information about each event interval into **section 3**.

The right side of the control program contains the logic that uses the event data in **sections 1**, **2**, and **3** to update the signal value in **section 5** as an event is processed.

The default program is configured to receive events containing up to 10 intervals. If the contract requires more than 10 intervals, the program must be modified accordingly. Reference names for any added microblocks must be consistent with the names in the default program. The start/stop/levels from the event request are used by the logic in the custom microblock to determine when to change the signal value (**section 5**) to the value found in each interval's "level" microblock. The signal value is used by the customer's logic to control their equipment based on the requirements listed in the utility contract.

NOTES

- The “level” MBs are not well-named. For the Simple signal, they do represent demand levels (1, 2, 3, etc.). But for all the other signals, they represent the type of value indicated by the event’s signal type.
- If the “Test event” microblock between **sections 1** and **2** is **On**, the custom microblock will not forward the signal.

In our example, the Energy Price signal could have one of the following 3 signal types. The customer’s contract with the utility determines which type will be sent.

- PRICE – Actual dollar amount per kWh
- PRICE_MULTIPLIER – Multiplier to be applied to default price
- PRICE_RELATIVE – Amount default price will be adjusted (could be positive or negative)

The customer’s logic uses the signal value (**section 5**) appropriately based on the type. Map this signal value using a network point in the target equipment (Zone, AHU, Chillers, etc). Using the EnergyPrice PRICE type as an example, the logic in the equipment may adjust a certain setpoint when Signal Value > $1.15/kWh. See *Signal types and Library control programs for automated demand response* (page 7) for the list of Signals and Signal Types supported by the add-on.

RampUp Start and Recovery Stop (**section 2**) – The VTN may send a duration of time that the setpoints should “ramp up” before the event starts and the duration of time it should “recover” after it ends. The values in **section 2** have been calculated by the add-on to represent the number of minutes until the Ramp up period should start and the number of minutes until the Recovery time should end. To implement RampUp/Recovery, logic would need to be written by the customer based on these values with respect to the EnergyPrice_Clock in **section 4**.

Signal types and control programs for automated demand response

Event signals are the actionable information contained in an event such as electricity pricing or specific levels of load shed requested that typically trigger some preprogrammed load shed behavior by the recipient of the event. A DR program definition should specify the types of event signals used.

The following signal types are supported by the Automated Demand Response add-on.

Profile 2.0a or 2.0b	Signal name	Signal type	Values	Universal Controller SAL-Control Program
2.0a & 2.0b	Simple	Level	0, 1, 2, 3	**Simple Signal 10 Intervals**
2.0b	Electricity_Price	Price PriceRelative PriceMultiplier	Any	**Electricity Price Signal 10 Intervals**
2.0b	Energy_Price	Price PriceRelative PriceMultiplier	Any	**Energy Price Signal 10 Intervals**

Profile 2.0a or 2.0b	Signal name	Signal type	Values	Universal Controller SAL-Control Program
2.0b	Load_Control	LoadContolCapacity LoadContolLevelOffset LoadContolSetpoint LoadContolPercentOffset	0.0-1.0 Integer Any +/- 0.0-1.0	**Load Control Signal 10 Intervals**
2.0b	Load_Dispatch	Setpoint Delta Multiplier Level	Any Any Any Integer	**Load Dispatch Signal 10 Intervals**

Launching the Automated Demand Response add-on

In a web browser, type the address of your i-Vu® Pro system followed by `/openadr_2.0`.

After accepting the end-user license agreement, you are ready to set up the Automated Demand Response add-on.

NOTE `/openadr_2.0` is case sensitive.

Setting up the Automated Demand Response add-on

To set up the add-on:

1. *Configure* (page 10) system parameters.
2. *Add an account* (page 11) for each Automated Demand Response program you participate in.
3. Add resources for each equipment that will participate in an ADR program.
4. After resources have been assigned to an account, the account can be registered with the VTN. See *To view account status* (page 16) to learn how to register an account.

NOTE While configuring an account, you have the opportunity to create the Resources associated with that account. Alternatively, you can create and manage your resources independently of configuring the account.

To configure the system

Enter your system's configuration information.

1. Click **Admin** > **System Config** to configure the add-on (see table below).
2. Click **Save Config**.

Field	Description
Verbose	No = Display a limited amount of information. Yes = Display additional details. **NOTE** For additional details, check the log entries and the i-Vu Pro server **Output** tab. See "Output tab" in the *i-Vu Pro User Manual*.
Log Level	Number indicating the messages types to include in the log file: ○ 0 = No messages ○ 1 = Fatal errors only - application does not work ○ 2 = All errors - fatal and non-fatal ○ 3 = All errors plus warnings ○ 4 = All errors, warnings, plus additional status information ○ 5 = All errors, warnings, additional status, and debugging information ○ 6 = All messages **TIP** Level 3 is recommended for normal use.
Resource Check Time	Frequency in minutes to check whether to re-calculate and download parameters related to an event in case of a module reset. For example, if a controller is reset due to issues such as power loss or memory download, the current demand response event values are lost. The add-on restores those values by recalculating and downloading them to the controller.

Field	Description
Client Name	Client (VEN) identifier included in messages to the utility's (VTN) server; optional.
Use Public Certificate	If using 2-way authentication, select **Y**. See *Appendix A: SSL Mutual Authentication* (page 29) for more information.
Certificate Bundle File Password	If field above is **Y**, enter your private key password. See *Appendix A: SSL Mutual Authentication* (page 29) for more information.
Location of Certificate Bundle	Path is automatically filled in if using a private key.

To set up an account

In the Automated Demand Response, an account represents a particular utility's ADR program.

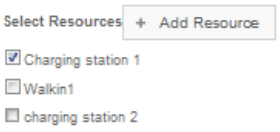
NOTE Some of the information required to create the account is in the customer's contract with the utility.

You must set up an i-Vu® Pro Automated Demand Response account for each ADR program in which you would like to participate. Your add-on license determines how many accounts can be set up.

1 Click **Configure** > **Manage accounts**.

2 Click **Add account** and complete the fields for an OpenADR® Program using the table below.

3 Select the checkboxes for the resources to be controlled by this ADR program.



NOTE If the resource you are looking for is not listed, click **Add resource.** See To add an ADR Resource.

4 Click **Save account**.

TIP To delete, edit, or view the account details, do one of the following:

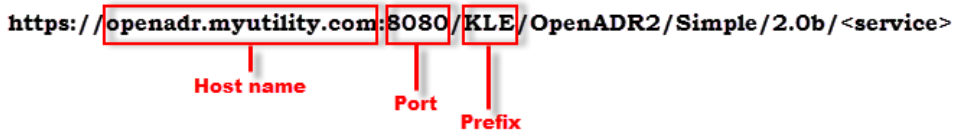
- Use the buttons ( ) under **Action**
- Select one or more boxes in the first column and click **Delete selected**

Field	Description
Description	Automated Demand Response program description
	Utility Provided URL - If utility has specified a URL, see *Utility Provided URLs* below.
Host Name*	Provided by utility
Port*	If the VTN is using a port number other than 80, enter it here; otherwise, leave the field blank.

Field	Description
Prefix*	If the URL includes a prefix between the host name and port and "OpenADR2", enter it here; otherwise, leave the field blank.
Connection Timeout	Adjust if timeouts are occurring on a particular connection
Market Context	Provided by utility - Enter '*' to process events for all market contexts from this utility.
Poll Rate	Polling rate, in seconds, of how often to poll the server—this value will be adjusted automatically if the utility specifies a maximum polling rate slower than what is configured
Account Enable	• Enable the account to receive signals from the utility • Disable to stop the polling, but not delete the account
Virtual End Node ID	VEN ID assigned by utility **NOTE** If the utility has provided a VEN ID to be presented during registration, enter it here. Otherwise, leave this blank and the VEN ID will be assigned as part of the registration process.
Profile	OpenADR profile (2.0a or 2.0b)
Reply Limit	• Maximum number of events a VEN can accept from server in a single message • This is a read only value that is assigned when the account is registered with the VTN. • The maximum limit is 50.
Virtual Top Node ID	VTN ID assigned by utility
VEN Client Name	Profile 2.0b only: Enter client name that appears in polls to the server; utility may specify the name
Query Registration	Profile 2.0b only: Enable if a query registration is required before registering
Authorization	If the utility requires username/password authentication, check the checkbox and enter your username and password provided by the utility

*** Utility-provided URLs**

If Port and Prefix fields are specified, the URL sent to you should resemble this:

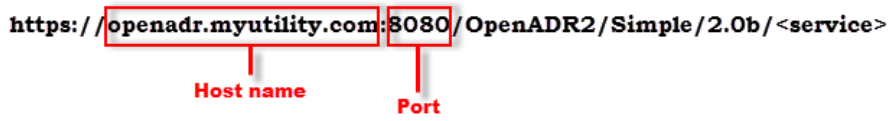


Host name = `openadr.myutility.com`

Port = `8080`

Prefix = `KLE`

If the Prefix field is not specified, the URL sent to you should resemble this:

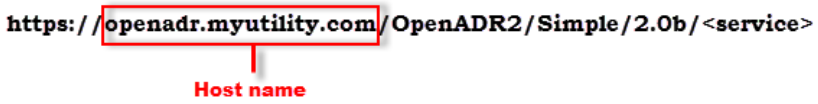


Host name = `openadr.myutility.com`

Port = `8080`

Prefix = `[leave field blank]`

If the Port and Prefix fields are not specified, the URL sent to you should resemble this:



Host name = `openadr.myutility.com`

Port = `[leave field blank]`

Prefix = `[leave field blank]`

To add an ADR resource

You must set up a resource for each piece of equipment to be targeted. Resources can be created ahead of time following the steps below, or added during the account set-up process using the **Add resource** button; see *To set up an Automated Demand Response account* (page 11).

1. Click **Configure** > **Configuration wizard** > **Single resource wizard** and follow the steps to set up the ADR resource and select the targets and signals related to it.
2. Follow the instructions in the wizard using the tables below.
3. Close window and repeat this procedure for each additional resource.

Resources must be 'attached' to the account after adding them; see *To attach a resource to an account* (page 14). Each resource may be attached to only one account.

Step	Step name	Fields
1	**Resource Identifier**	**Resource Name -** Name used to identify this resource, for example, "Charging station 1" **Profile -** 2.0a or 2.0b
2	**Select Equipment**	Select the control program that contains logic for the signal types to be processed for this resource.

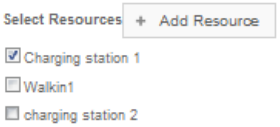
Step	Step name	Fields
3	**Select Targets**	Select or add a target icon value and drag it to the Target List. To add a new target value: Click **add** (⊕) next to the target type to be added. Enter the VTN provided target **value**. Click **save**. To delete an item from the target List, click **delete** (⊖). See the table below for a list of possible types of targets. See *Appendix B: Example of target assignments* (page 31) for an example of how targeting is used.
4	**Select Signal**	Specify the number of intervals supported by each listed signal type controlled by this resource. Supplied control programs provide support for up to 10 intervals. Each ADR event specifies how many intervals to include in the event and the duration and DR level of each interval. **NOTES** • "0" value does not accept events for respective signal. • If an event's intervals exceed the number configured in the resource, an alert is generated.
5	**Confirmation**	Verify information. To edit any fields, click **Previous**, then **Next** to confirm.

Target Types

Profile	Targets
2.0a & 2.0b	Group ID, Resource ID, Party ID
2.0b	Aggregated Pnode, End Device Asset, Meter Asset, Pnode, Service Area, Service Delivery Point, Service Location, Transport Interface, Group Name

To add a resource to an existing account

1. Click **Configure** > **Manage accounts**.
2. Locate the account and click **Edit account** (✎).
3. Scroll to the bottom of the **Edit account** page and check the resource to be added to the account.



4. Click **Save account**.

To manage targets

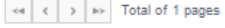
A target represents the load shedding equipment that is the intended recipient for the demand response event. An event is processed for a resource if the target ID value included in the event message matches one of the target IDs configured for that resource.

1. Click **Configure**.
2. Click **Manage targets** and expand.
3. Select a target type.
4. Currently-available targets of the chosen type are listed.
   - Click **Add** to add a new target of this type.
   - Click **Delete** ( ) under **Actions** to delete a target in the list.
   - Click **Info** ( ) under **Actions** to view details about a target.

TIPS:

- To locate an item in the list, type the item in the **Search** field:

- To change the number of items displayed in the list, select a different number in the **Display** drop-down list.
- To view pages of targets before or after the current page, click the single arrows. To view the first or last page, click the double-arrows:

- To delete an item, either click **Delete** ( ) under **Actions**, or check one or more boxes in the first column and click **Delete Selected**.

Managing the system

To view your status

1 Open the **Alerts** drop-down . The number of active alerts appears next to the icon.

2 Click **View System Status** to view the following information:

Field	Description
Id	Unique alert ID given by the Automated Demand Response add-on
Description	Brief description of the alert
Details	Additional details about the alert
Acknowledgment	Indicates whether the alert has been acknowledged
Actions	Delete the item, view its brief description, or acknowledge the alert

TIPS:

- To locate an item in the list, type the item in the **Search** field:

- To change the number of items displayed in the list, select a different number in the **Display** drop-down list.
- To view pages of alerts before or after the current page, click the single arrows. To view the first or last page, click the double-arrows:

Total of 1 pages

To view account status

1 Click **Configure**.

2 Click **Manage accounts** to view a list of accounts.

TIPS:

- To register an account that is pending registration, click **Register** ( ) beside the Status column.
- To edit the details of one of the items in the list, click **Edit** ( ) under **Actions**.
- To view the details of one of the items in the list, click **View Details** ( ) under **Actions**.
- To delete an item, either click **Delete** ( ) under **Actions**, or check one or more boxes in the first column and click **Delete Selected**.

To view resources

1 Click **Configure**.

2 Click **Manage resources** to view a list.

NOTE If **Delete** ( ) appears under **Actions,** the resource has not yet been attached to an account on the account management page. See *To add a resource to an existing account* (page 14).

TIPS:

- To edit the details of one of the items in the list, click **Edit** ( ) under **Actions**.
- To delete an item, either click **Delete** ( ) under **Actions**, or check one or more boxes in the first column and click **Delete Selected**.

Managing events

To view current events

1 Click **Events**.

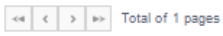
2 Click **Current Events** to view the following event information:

Field	Description
Event Id	The name of the event given by the utility
Mod Date Time	Date and time the event was modified by the VTN
Mod Number	Sequential number starting with zero that indicates how many times the event has been modified by the VTN
Priority	Event priority with zero being no priority Overlapping events received for the same resource are processed according to priority.
Event Start	The start time the event is issued by the utility server
Duration	Duration of the event displayed in standard notation of time issued by the server (ISO8601 time)
Event Status	Displays the status reported the last time this event was received (far, near, active, or canceled)
Actions	Opt out of an event by checking the checkbox and clicking **Click to OptOut**.

TIPS:

- To locate an item in the list, type the item in the **Search** field:

- To change the number of items displayed in the list, select a different number in the **Display** drop-down list.
- To view pages of events before or after the current page, click the single arrows. To view the first or last page, click the double-arrows:



- To view detailed event information, click **Event History**. Then click  under the Actions column beside the event.

To view event history

To view current or past events, do one of the following:

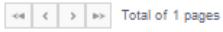
- Click the **Events Calendar** drop-down  , then click either **You Have Events** (current) or **More Events** (history)
- Click **Events**, then click **Current Events** or **Events History** to view the following event information:

Field	Description
Event Id	The name of the event given by the utility
Mod Date Time	Date and time the event was modified by the VTN
Mod Number	Sequential number starting with zero that indicates how many times the event has been modified by the VTN
Priority	Event priority with zero being no priority
Event Start	The start time the event is issued by the utility server
Duration	Duration of the event displayed in standard notation of time issued by the server (ISO8601 time)
Actions	Display the details of event

 **TIPS:**

- To locate an item in the list, type the item in the **Search** field:

- To change the number of items displayed in the list, select a different number in the **Display** drop-down list.
- To view pages of events before or after the current page, click the single arrows. To view the first or last page, click the double-arrows:

- To delete an item, either click **Delete** () under **Actions**, or check one or more boxes in the first column and click **Delete Selected**.

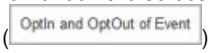
Managing Opt Schedules

In the Automated Demand Response add-on, **Opt Schedules** describe the equipment/facility availability or unavailability to participate in an event.

Based on your contract with the utility, you may be able to use **Opt Schedules** for any event. Opt Schedules allow you to opt-out or opt-in any resources participating in profile 2.0b. For example, you can configure an Opt Out schedule to opt-out of events while a piece of equipment is off-line for scheduled maintenance. Use an Opt In schedule to participate in events during the time range of an Opt Out schedule.

To add an Opt Schedule

To create an **Opt Schedule** allowing you to opt in or out of an event, you must first create the schedule, then select the targets and signals related to it. Do either of the following to create a schedule:

- Click **Configure** > **Configuration Wizard** > **OptIn/OptOut Wizard** and follow the instructions.
- Click **View/Cancel Opt Schedules**, then click **Add Opt Schedule** and follow the instructions in the wizard.
- Click **Events** > **Current Events**, then check the selection box for the event you would like to opt out of. Then click **OptIn and OptOut of Event** (

) and follow the instructions in the wizard.

Follow the instructions in the wizard to set a target and signals related to its availability.

NOTE To view later, click **Configure** > **View/Cancel Opt Schedules**.

Step	Step name	Fields
1	**OptIn/Out Information**	Complete the fields listed below. **OptIn/out name** — Schedule name, for example, "Charging station repairs" **Select account** **Opt type** **Opt reason**
2	**Select Availability**	Enter **start date time**, **duration**, and **market context** to specify parameters for the opt schedule, -or- select an **event ID** from the drop-down box.

Step	Step name	Fields
3	**Select Targets**	To associate a target to a schedule, select or add a target to the **target list**. Events associated with any of the selected targets will be affected by the schedule. If no targets are assigned to the **opt schedule**, all events for the selected account and **market context** are affected by the schedule. To add a new target value: Click **Add** () next to the target type to be added. Enter the VTN provided target **value**. Click s**ave**. To delete an item from the **target list**, click **delete** () See *To manage targets* (page 15) for a list of possible types of targets. See *Appendix B: Example of target assignments* (page 31) for an example of how targeting is used.
4	**Select Device Class**	To associate a Device Class to a schedule, select device icons and drag them to the **target list**. If a Device Class is specified, only events for that Device Class are affected by the schedule. **NOTE** To delete an item from the **target list**, click d**elete** ()
5	**Confirmation**	Click **next** to confirm the configured values.

Setting up Telemetry Reports

Telemetry reports are used by the VTN to obtain feedback from the VEN (in this case, i-Vu® Pro) on how a Demand Response event was processed by the VEN. Periodically VTN sends a message to the VEN to request a report. If your utility's OpenADR 2.0b program requires these reports, configure them using one of the following methods:

- Click **Configure** > **Configuration Wizard** > **Reporting Wizard**.
- Click **Configure** > **Manage Reports** > **Registered Report Specifier**, then click **Add Reports**.

To configure a Telemetry Status report

NOTE The Telemetry Status report is not working properly at this time. This will be fixed in a future release.

The Telemetry Status report is used by the VTN to obtain feedback from the VEN on how a Load Control DR event was processed by the VEN. When the VEN processes an event with the Load Control signal, it takes action to begin demand-limiting by updating a setpoint in the appropriate Setpoint microblock(s). The VTN can then request reports based on the information it received in the reporting metadata, which is submitted by the VEN during the OpenADR registration with the VTN. The Telemetry Status reporting metadata is sent during registration only when the report has been configured in the add-on.

Follow the instructions in the wizard.

Step	Notes
1 **Report Information**	Complete the fields listed below: • **Report name** • **Report type** • **Duration** – Enter the maximum amount of time to collect data per report request. The VTN limits its report requests to this time period. • **Select account** – Select from the list of accounts configured to use the OpenADR 2.0b profile. • **Market context** – If reporting on a specific Market Context, select from the list of market contexts that were assigned to the selected account. If no specific market contexts were assigned to the account, leave this field blank. • **Specifier ID** must be unique across your accounts.

Step	Notes
2 Selected Data Point	Follow the steps below to add points to be included in the report: **a** Complete the fields listed below. ○ **Select equipment** – Select the equipment that contains the Setpoint microblock that receives the output of the Load Control signal control program, then select from the drop-down list of eligible data point reference names. **NOTE** The trend must be enabled. ○ **Selected data point** – Display only – Displays the display name of the point selected above. ○ **Minimum sample rate** – Enter the minimum sampling interval that can be requested by the VTN. ○ **Maximum sample rate** – Enter the maximum sampling interval that can be requested by the VTN. ○ **Power type** – N/A ○ **Select SI Scale Code** – N/A ○ **Select AC/DC** – N/A ○ **Selected voltage** – N/A ○ **Selected hertz** – N/A **b** Click **Add report description** to add the point to the datapoint table at the bottom of the screen. **c** To add additional points, repeat steps a and b. **d** After adding all desired data points, click **Next**.
3 Select Targets	Select or add a target value and drag it to the **target list** for each target to be reported. To add a new target value: Click **add** (⊕) next to the target type to be added. Enter the VTN provided target **value**. Click **save**. To delete an item from the target List, click **delete** (⊖).
4 Select Device Class	Not applicable for Telemetry Status reports. Click **Next**.
5 Confirmation	Verify information. To edit any fields, click **previous**, then **next** to confirm.

To configure a Telemetry Usage report

The Telemetry Usage report is used by the VTN to obtain feedback from the VEN on how a Load Dispatch DR event was processed by the VEN. When the VEN processes an event with the Load Dispatch signal, it reacts to the event by updating the power, energy or pulse count value related to metering. The VTN can then request reports based on the information it received in the reporting metadata, which is submitted by the VEN during the OpenADR registration with the VTN. The Telemetry Usage reporting metadata is sent during registration only when the report has been configured in the add-on.

Follow the instructions in the wizard.

Step	Notes
1 Report Information	Complete the fields listed below: • **Report name** • **Report type** • **Duration** - Enter the maximum amount of time that data will be collected per report request. The VTN will limit its report requests to this time period. • **Select account** – Select from the list of accounts configured to use the OpenADR 2.0b profile. • **Market context** – If reporting on a specific Market Context, select from the list of market contexts that were assigned to the selected account. If no specific market contexts were assigned to the account, leave this field blank. • **Specifier ID** - Must be unique across your accounts.

Step	Notes
2 Select Data Point	Follow the steps below to add points to be included in the report: **a** Complete the fields listed below. ○ **Select equipment -** Select the equipment that contains the analog point or trend microblock that receives the output of the Load Dispatch signal control program, then select from the drop-down list of eligible data point reference names. **NOTE** The trend must be enabled. ○ **Selected Data point - Display only -** Displays the display name of the point selected above. ○ **Minimum sample rate** - Enter the minimum sampling interval that can be requested by the VTN. ○ **Maximum sample rate** - Enter the maximum sampling interval that can be requested by the VTN. ○ **Power type** - Select the power or energy type of the selected data point. **NOTE** For pulse count data points, select any option from this drop-down, then inform the VTN which Power Type they should use when requesting this report. ○ **Select SI scale code** - Select from drop-down ○ **Select AC/DC** - Select from drop-down ○ **Selected voltage** - Enter Voltage setting (in Volts) of the selected energy/power data point. ○ **Selected hertz** - Enter Frequency setting (in Hertz) of the selected energy/power data point. **b** Click **Add report description** to add the point to the datapoint table at the bottom of the screen. **c** To add additional points, repeat steps a and b. **d** After adding all desired data points, click **next**.
3 Select Targets	Select or add a target value and drag it to the **target list** for each target to be reported. To add a new target value: Click **add** (⊕) next to the target type to be added. Enter the VTN provided target **value**. Click **save**. To delete an item from the target List, click **delete** (⊖).
4 Select Device Class	Select device icons and drag them to add to the **target list** for each Device Class to be reported **NOTE** To delete an item from the **target list**, click **delete** (⊖)
5 Confirmation	Verify information. To edit any fields, click **previous**, then **next** to confirm.

Managing reports

To update a configured report

To update a previously configured report:

1 Click **Configure** > **Reports** > **Manage Report Specifier**.

2 Select an account

3 Click **Edit** ( ) next to **account**.

4 Click **Edit** ( ) beside the report to be updated.

To delete a configured report

To delete a previously configured report:

1 Click **Configure** > **Reports** > **Manage Report Specifier**.

2 Select an account.

3 Click **Edit (**) next to **account**.

4 Select one or more reports from the list using the checkboxes on the left

5 Click **Delete Selected**.

To send report updates to the VTN

After updating report configurations for an account, send the updated metadata to the VTN by doing the following:

1 Click **Configure** > **Reports** > **Manage Report Specifier**.

2 Select an account.

3 Click **Resend Metadata** ( ).

To view reports

To view reports requested from the VTN

1 Click **Configure** > **Reports** > **View Requested Reports**.

2 Follow the instructions in the wizard.

To view updated reports sent to the VTN

1 Click **Configure** > **Reports** > **View Updated Reports**.

2 Follow the instructions in the wizard.

Troubleshooting the Automated Demand Response add-on

The Automated Demand Response add-on is not communicating correctly

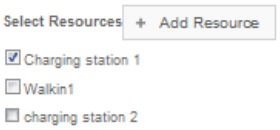
- Verify the URL of the Automated Demand Response server is configured properly
- Verify the correct certificates are installed

  NOTE The Automated Demand Response add-on automatically installs the root certificate of the OpenADR Certificate Authority. If the VTN server you are integrating to needs a different certificate, manually copy it into:

  - v8.0: **WebCTRLx.x/webroot/<system_dir>/webapp_data/openadr_2.0/private/truststore**
  - v8.5: **WebCTRLx.x/programdata/systems/<system_dir>/ webapp_data/openadr_2.0/private/truststore**
- Check log files for possible errors

Resources are not attached properly

Verify that resources are "attached" to the account, not just added to the system. If a resource is not attached to any account, **Delete** ( ) appears to the right of the resource in the **Resource Management** list. Unattached resources are available for selection on the account setup page, as shown below. In this example, charging station #1 is already attached to the account, but #2 is not yet attached to an account and can be selected.



See *To add a resource to an existing account* (page 14).

Account is "Unregistered" after power loss

After losing power, the i-Vu® Pro server is rebooted, but now the account's status is "unregistered." After the server resumes, the Automated Demand Response add-on automatically re-registers with the utility's server. If it is unable to re-register, verify the i-Vu® Pro server is connected to the Internet.

Events did not maintain the proper state after a download

After downloading the device containing the automated demand response control programs, the logic no longer reflects the proper state of events.

Active events do not persist through downloads or power losses. To avoid this, perform maintenance operations that require downloads or power disruptions at times when there are no active events.

You can do this by creating an opt out schedule for the maintenance period. See *To add an Opt Schedule* (page 20).

Appendixes

Appendix A: SSL Mutual Authentication

If the utility company requires SSL Mutual Authentication to connect to their Automated Demand Response server, their company's certificate is required to identify the add-on.

1. You must generate a private key and create a Certificate Signing Request (CSR).
2. Send the CSR to the utility company.

   The utility company provides the public certificate (.pem file) that must be combined with several other items (keys or chain certs) and be packaged in a PKCS#12 archive file format (.pfx or .p12 file). The utility company must provide instructions for this task.
3. Enter the certificate password (see *Setting up the add-on* (page 10)).

Step 1: Generate a private key

a Determine a filename for your private key using either `.pem` or `.key` as the file extension. For example, `private_key_file.pem`. See your certificate provider for more information.

b Generate a private key for the Automated Demand Response add-on by invoking the following command.

```
openssl genrsa -out private_key_file.pem 2048
```

c Enter a password for the file.

A 2048-bit RSA key pair is generated and encrypted using the password provided. The file is saved to the current directory.

Step 2: Create a Certificate Signing Request (CSR)

The private key generated above is used to create a CSR. The utility company provides the specifications, including the CSR file extension type, such as `.csr` or `.pem`. For example, `your_domain.pem`. See your certificate provider for more information.

a Generate a CSR for the Automated Demand Response add-on by invoking the following command.

```
openssl req -new -key private_key_file.pem -out your_domain.pem
```

b The CSR file is generated at the current directory.

c Send the CSR file to the utility company.

The utility company will provide you with the following based on your key and CSR:

- X.509 certificate. When you receive the certificate, verify that it uses the `.pem` file format. If it doesn't, you must convert it before proceeding. See `http://info.ssl.com/article.aspx?id=12149` for more information.
- Certificate Authority (CA) public certificate chain (intermediate certificates) that is used to establish trust with the root certificate.

WARNING Keep this private key file in a safe location.

Step 3: Preparing the certificates

Do the following to bundle all the certificates received from the utility company along with your key into PKCS#12 format.

a Place the following files in a temporary folder:

File type	for example...
Private Key	private_key_file.pem
Public Certificate from the utility company	pc_from_util.pem
CA Public Certificate chain(s) from the utility company	ca_chain_from_util.pem

a Invoke the openssl command from that folder by using the following OpenSSL command to generate the cert_bundle.pfx required in the Automated Demand Response add-on:

```
openssl pkcs12 –export –inkey customer_pk.pem –in pc_from_util.pem –certfile
ca_chain_from_util.pem –out cert_bundle.pfx
```

b When prompted, enter and verify a password for your export file.

NOTE You must have the cert_bundle.pfx file and the export password in order to load the certificates into the add-on.

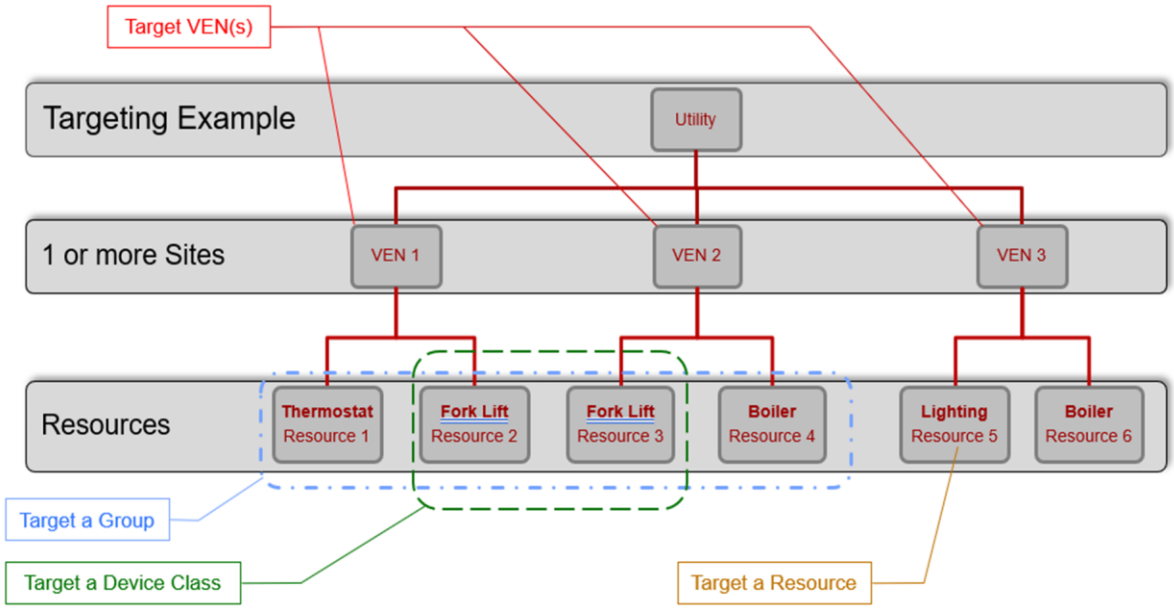
c Copy the cert_bundle.pfx file to a directory on the server where i-Vu® Pro and the add-on are running:

```
C:\<Your Install
Dir>\webroot\<system>\webapp_data\openadr_2.0\private\keystore
```

d In the Automated Demand Response add-on go to **Admin** > **Sytem Config**.

e In the **Certificate Bundle File Password** field enter the certificate's password, and then click **Save Config**.

Appendix B: Example of target assignments



Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

Date	Topic	Change description	Code*
1/28/25	Preparing control programs to accept ADR signals	Replaced previous example with "Understanding the ADR add-on logic symbols"	X-PM-LO-J-LO
5/15/23	Troubleshooting the Automated Demand Response add-on	Updated system folder location for v8.5	X-D

* For internal use only