Five steps to improving facility operations though Automated Demand Response

The U.S. Energy Information Administration – Annual Energy Outlook 2015 reported increasing costs of electric power generation, transmission and distribution, has resulted in an "18% increase in the average retail price of electricity".

This increasing variability of demand on the grid causes stress on utility equipment and generates risk for Commercial Buildings and Industrial Facilities (C&I) operations, impeding revenue and increasing costs. As the grid becomes more volatile, utility companies are eager to get customers to cut back on energy consumption during peak demand periods to limit these risks.

In many areas the utility grid operator offers Demand Response (DR) programs to customers where participants either generate or voluntarily reduce power for a requested period of time. In most programs the Utility or curtailment agents provide substantial incentives – making it a "win-win" for participants. For the grid operator, grid stress and consumption are reduced creating balance.
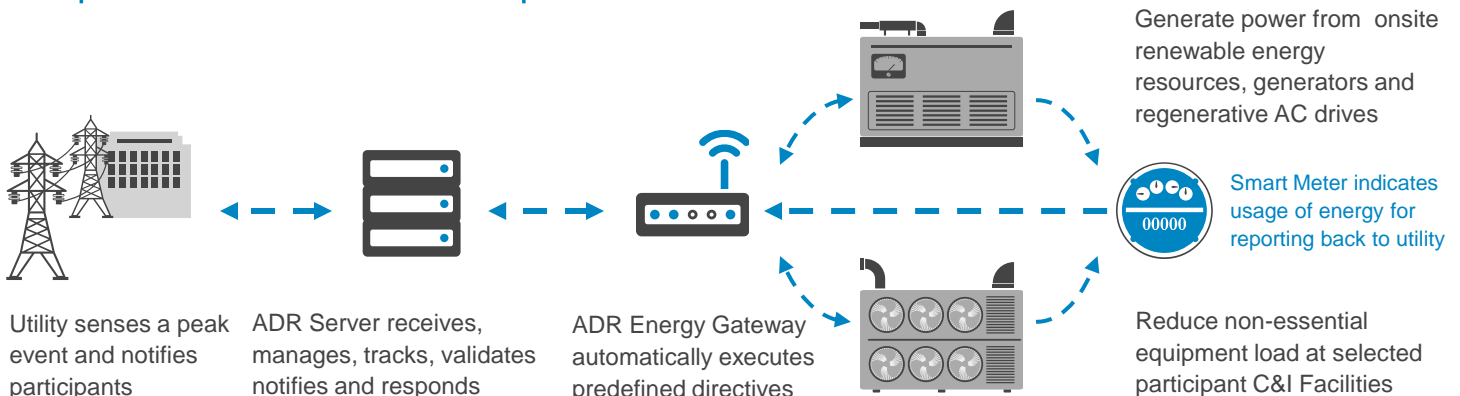
It's a great idea, with one operational challenge. When a utility calls a DR event, they literally call, email or text-message designated facility personnel. Sometimes it works. When it doesn't, the result is that participants don't receive the payments they signed up for – and the grid loses the demand balance expected to keep the grid running smoothly.

Automated Demand Response (ADR) technology offers C&I facility operators the ability to automate DR program participation by aggregating and combining required facility energy data. Going a step further using the IoT to push analytics to the edge of the network with intelligent devices enables automated control by balancing demand based on real-time equipment consumption data.

This data can empower cloud-based machine learning that considers consumption trends, historical utility demand, and weather data for even smarter energy consumption. All together IoT-enabled ADR overcomes many business energy challenges and provides benefits such as:

- **Improving profitability** — Enables automated / intelligent DR participation and energy cost savings by automatically reducing power during peak demand without disrupting operations.

- **Mitigating operations risk** — Receive advanced notice of outages that might otherwise affect your operations through two-way communications with Utility.

- **Enhancing control and compliance** — Enables complete visibility of energy usage for planning, remote automated control of critical equipment, and worry free compliance through automatic reporting.

Example of how Automated Demand Response works

Generate power from onsite renewable energy resources, generators and regenerative AC drives

Smart Meter indicates usage of energy for reporting back to utility

Utility senses a peak event and notifies participants

ADR Server receives, manages, tracks, validates notifies and responds

ADR Energy Gateway automatically executes predefined directives

Reduce non-essential equipment load at selected participant C&I Facilities

Follow these 5 best practice steps to plan your ADR implementation

1 | Develop Demand Response objectives

Key incentives offered by energy companies to encourage participation in DR programs are payment for lowering demand at requested times and rebates to cover deployment costs. The U.S. Department of Energy, lists 2 types of DR program classifications:
1. Price-based Programs: providing time-varying rates that reflect the value and cost of power during different time periods.
2. Incentive-based Programs: triggered by grid reliability problems or high prices.

Some questions to consider when developing your objectives include:
- What is your organization experiencing as far as energy cost expansion and what plans do you have to overcome this?
- Which stakeholders would you need to get support from to complete a DR deployment? (Operations, IT, Finance, etc.)
- What local DR programs are available, are there rebates you can take advantage of, and what are the program requirements?
- What energy usage data is currently being gathered, and what is being done with the data that you could build upon?
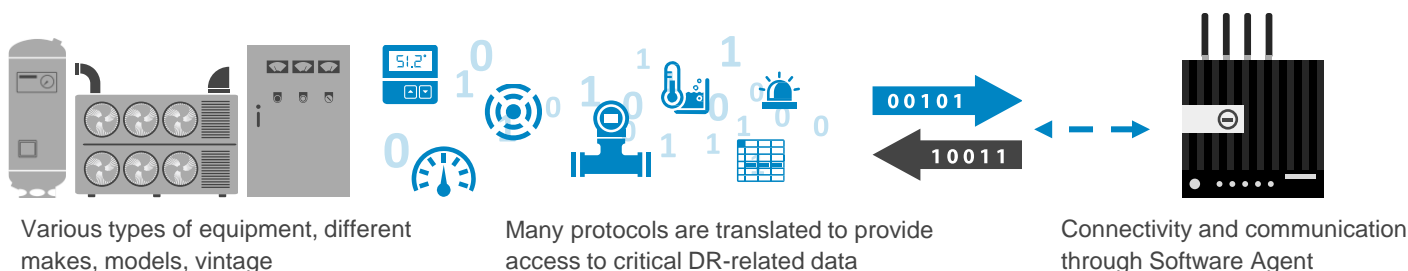
2 | Uncover your ADR potential through a comprehensive site survey

Conducting an ADR site survey is critical to understanding your facilities and identifying major equipment candidates for demand reduction. The survey can involve collecting facility data including equipment age, condition, operational schedules and existing Building Automaton System (BAS) information. When completed, the survey should offer data on the potential financial impact of an ADR deployment to gain stakeholder support. One option to expedite this process, and minimize any guesswork, is to use the fully automated, tablet based, facility survey utilizing Blue Pillar's Aurora® Survey engine. A representative from Blue Pillar will walk your facility with you to collect necessary data. The survey inputs streamline the deployment by eliminating the man-hours associated with connecting equipment in a custom facility integration project. Blue Pillar's survey tool can create a full commissioning plan with necessary engineering drawings and deployment instructions.

Identify major ADR equipment and system candidates

Equipment age, condition, location, operational schedules, historical data

Blue Pillar Aurora Survey tool collects necessary information and generates a full commissioning plan with drawings
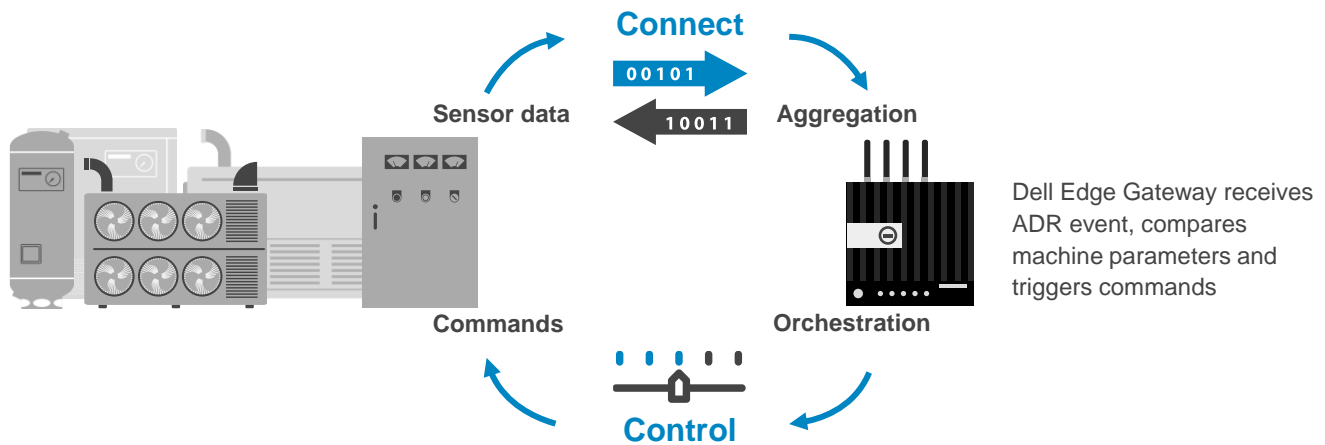
3 | Connect, aggregate and communicate with selected equipment and devices

The site survey should identify unique requirements for each facility. The first step is connecting to many types of equipment and collecting facility data produced in different non-IP languages (or protocols), aggregating the data. For a secure deployment, ensure a partnership between OT and IT from the beginning, and leverage Windows® 10 IoT Enterprise running on the Dell Edge Gateway 5000 for functions such as running only trusted applications, encrypting all device data, and intercepting unauthorized write or physical access attempts. The Aurora Energy app running locally provides a protocol translation layer to convert the data to secure IP network traffic, offering visibility to facility equipment. A predesigned protocol translation template based on your site survey will help to optimize your deployment by eliminating custom design, installation, and programming typical of ADR projects.

Various types of equipment, different makes, models, vintage

Many protocols are translated to provide access to critical DR-related data

Connectivity and communication through Software Agent
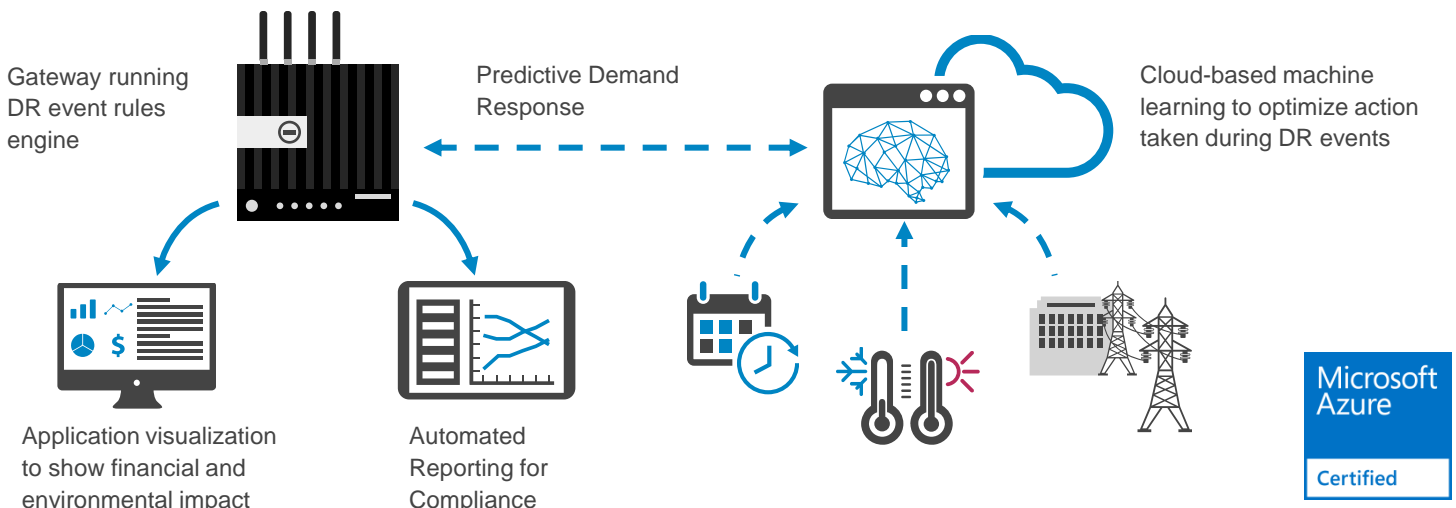
DELL | Microsoft

4 | Configure for automated control through local orchestration

Now that you have established connections to facility equipment to gather real-time data, you can quickly identify appropriate actions to take when DR alerts are received from the grid operator or DR aggregator. Beyond identifying the actions, the ADR agent running on the Dell Edge Gateway, enables local orchestration by securely sending commands back to the equipment. These automated commands trigger the equipment to take appropriate action based on the program requirements. In order to do this, the ADR gateway needs to be configured based on the equipment it is connected to, the data it needs to collect, and the parameters which can be controlled. The Aurora configuration manager utilizes the results of the initial survey process to auto-configure the Dell Edge Gateway to do all of the above without manual intervention at each device. The Edge Gateway is purpose-built with native I/O, and industrial grade without needing a fan to withstand challenging environments including the option to mount it outdoors in a panel or rugged enclosure.

Connect

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10011

Sensor data   Aggregation

Dell Edge Gateway receives ADR event, compares machine parameters and triggers commands

Commands   Orchestration

Control

# 5 | Optimize your ADR solution and monitor the ROI

The Dell Edge Device Manager agent running on Windows 10 IoT ensures that you have cloud-based access to your Gateway from anywhere, and have the control to always keep it up-to-date. To optimize your ADR solution, you can integrate all equipment and utility data into a single application so you can review DR events and see the actions that took place along with which pieces of equipment were impacted. The application can also be used to show the financial and environmental impact of your DR program, and automate reporting for compliance. To optimize the performance of your ADR assets you can utilize Microsoft Azure cloud based machine learning (the Edge Gateway is Azure Certified for IoT) to enable predictive demand response based on load forecasting, weather data, and operations logs. This ensures that your ADR solution will constantly improve in precision and financial performance. Finally, the Aurora solution offers a common platform which BAS vendors can securely access, enabling you to implement additional energy management and automation programs without adding additional devices. Empowering you to further optimize your facilities with the data you are now gathering.

Gateway running DR event rules engine

Predictive Demand Response

Cloud-based machine learning to optimize action taken during DR events

Application visualization to show financial and environmental impact

Automated Reporting for Compliance

Microsoft Azure
Certified

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Automated Demand Response Blueprint

This ADR Blueprint example represents a single solution provided by the industry leading partners below as a reference. Your specific ADR application may involve a combination of these and other technology providers within our IoT Partner ecosystem.

To help create a blueprint for ADR deployments, Dell has developed a flexible architecture centered around the Edge Gateway 5000 and integrating qualified partners for a complete solution. The Dell Edge Gateway 5000 enables you to collect, analyze, relay, and act on real-time data from energy producing, distributing, consuming, and measuring equipment and sensors. A Windows 10 IoT platform running on the gateway offers manageability and enterprise grade security enabling device-to-device, sensor-to-device, and device-to-cloud communications. With Blue Pillar's Aurora Platform also running on the gateway you get protocol translation that provides visibility to diverse data sets from PLCs, RTUs, meters, BAS, and SCADA systems which provides the foundation for ADR applications. Aurora receives signals from the grid and offers local orchestration based on real time data from equipment and sensors, running on the Intel® Atom™ processor in the Edge Gateway . This generates alerts to ensure that perishable data is acted on immediately, and also only sends meaningful data to the cloud to minimize consumption of expensive network bandwidth. The ADR solution is completed with the addition of historical and real time grid data provided by the utility. The Aurora Platform cloud application runs in Microsoft Azure, enabling machine learning on the structured and unstructured data to identify even more granular patterns to predict improvements for demand response actions.
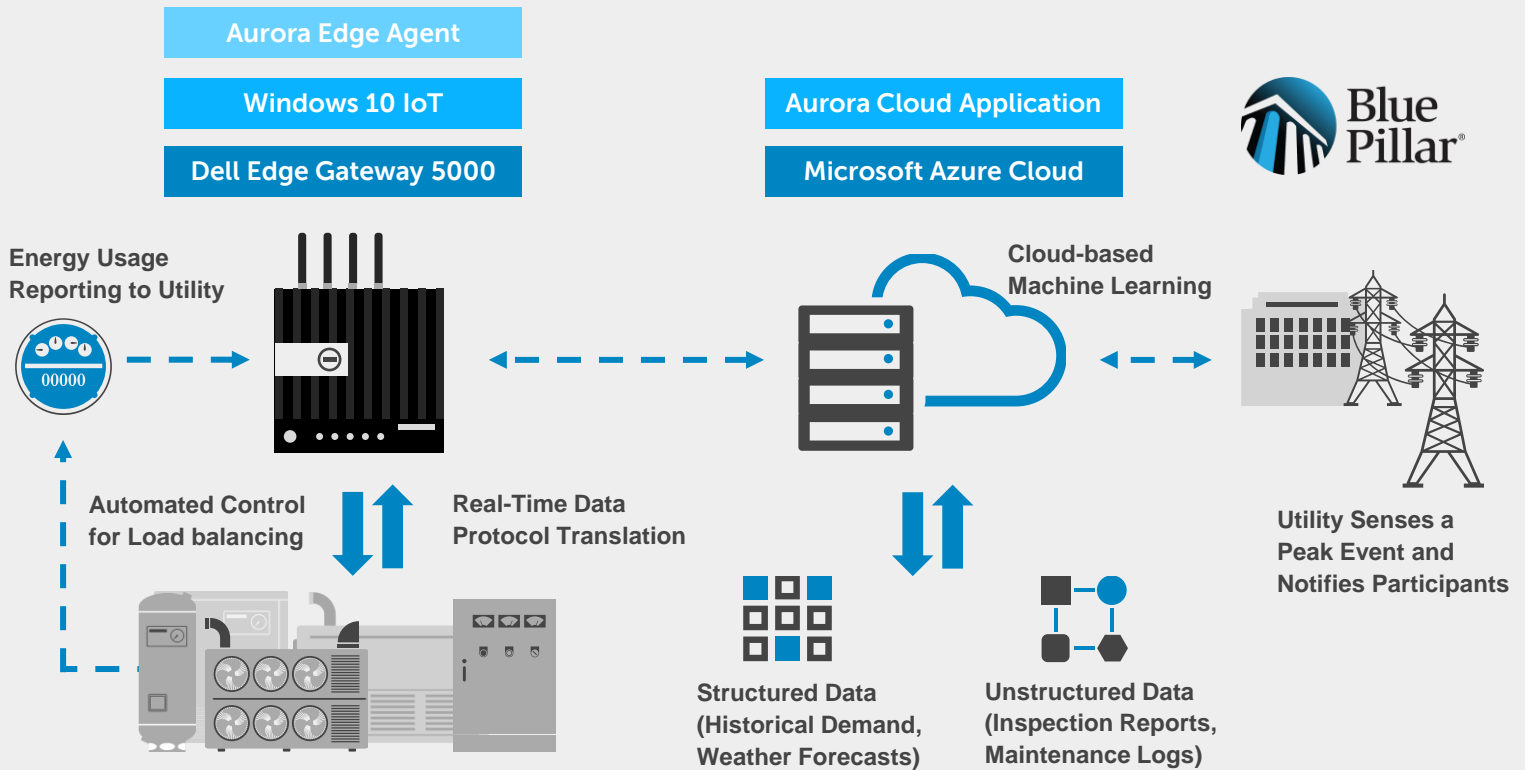
Along with our IoT Solutions Partners, we provide technology you can trust to help you get started quickly and efficiently.

Dell takes a pragmatic approach to the Internet of Things (IoT) by building on the equipment and data you already have, and leveraging your current technology investments, to quickly and securely enable analytics-driven action.

The Dell IoT Solutions Partner Program is a multi-tiered partner ecosystem of technology providers and domain experts to complement Dell's broad portfolio of IoT-enabling technologies.

To learn more visit us online at: www.delliotpartners.com

Contact Dell Sales to learn more about the Dell Edge Gateway 5000, our ecosystem of qualified partners, and to deploy this flexible predictive maintenance solution today.

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