



Comverge Apollo™ Demand Response Management System Software (DRMS)

The Industry's Most Comprehensive Demand Response Management System for Smart Grid Applications

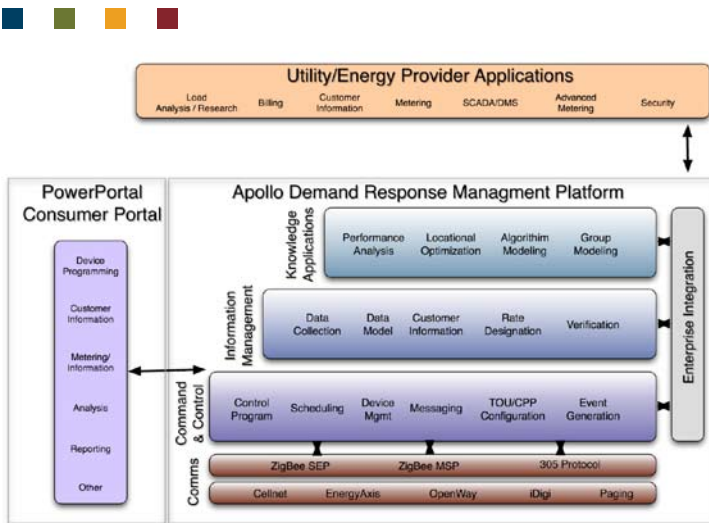
Demand response is becoming an ever-increasing asset in the smart grid ecosystem. While these assets are critical to customers' ability to make choices to potentially reduce energy consumption, they are vital to the operations of many electric utilities for peak load management, economic control, and distribution system operations and optimization. Making this linkage between the utility back office and its customers requires a platform capable of adapting to ever-changing business needs while remaining focused on providing the infrastructure for both command and control, as well as customer empowerment. Comverge's Apollo is a next-generation demand response platform capable of integrating with legacy paging systems and future AMI deployments, with the ability to provide two-way, real-time communication between utilities and their customers of all classes, including commercial and industrial customers, small business owners, and residential customers.

Apollo is based on an open-standards approach using web services, open database application programming interfaces, and application server architectures that allow utilities to pick and choose which applications will work best for them. Due to the strong enforcement of an open-standards approach, Comverge's Apollo Demand Response Management System (DRMS) is not a single solution, but rather an expandable platform for the next generation of systems to enable easy and simple adaptation to future business needs and system requirements.

"Apollo represents a defining step forward for the demand response industry and a key component of smart grid technology. Utilities will now be able to deploy this enterprise application directed toward demand response management that is capable of integrating with and functionally expanding their comprehensive back office infrastructure as AMI and smart grid deployments flourish."

– Bud Vos, Chief Technology Officer,
Comverge





Comverge’s Apollo Demand Response Management System (DRMS) was designed with four fundamental functional elements in mind that are required to support the emerging smart grid transformation:

1) Communication: Integrate with and functionally expand a utilities back office infrastructure to allow for future AMI and smart grid deployments. This system also supports interfaces for any third-party systems, including Computer Information System (CIS) and SCADA systems.

2) Command and control: Provide all command and control operations including:

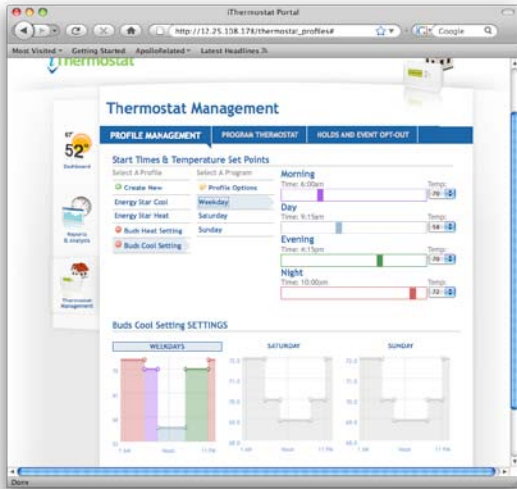
- **Grouping and addressing structures:** Apply device settings or perform maintenance tasks on multiple devices at one time by location or other customized setting.
- **Algorithms and control operations:** Implement control operations using a variety of control specifications based on ZigBee®, AMI, or paging systems. Information about the current state of the system, including running and pending events, system topology, alarms, and external data feeds is available through a customized dashboard. The direct load control interface will allow a dispatcher to setup and

activate, track pending or running schedules, and cancel or modify schedules. Apollo supports addressing/operations structures capable of supporting control-based models on the following:

- System address or utility I.D.
 - Weather region
 - Substation
 - Feeder
 - Distribution transformer
 - Individual address, serial number, or customer account
- **Device management and configuration:** Perform management and administrative tasks such as restoring, importing, and exporting device configuration settings. An administration tool will make it easy to define and update devices including device networks, serial ports, security, and alarms, and to easily update firmware and redirect devices to different destinations. Through device and connection monitoring features, system administrators can get up-to-date information and statistics about a device’s status and activity and view connection status and history information. This tool reports and logs all events to and from devices and provides the utility with a system of record for all device operations.
 - **Event generation and control:** Dispatch management tools for submitting prescheduled control events, reliability control events, and economic dispatch events.
 - **Data management:** Provides data collection including validation and verification information and additional parameters such as measurement and verification data used to perform demand response operations.
 - **Knowledge applications:** Provides graphical and statistical information for the user to visually analyze and evaluate the performance of a demand response program.



Through the Apollo customer web interface, PowerPortal, utilities can select the functions and operations they want to make available to the end-customer program participants, including:

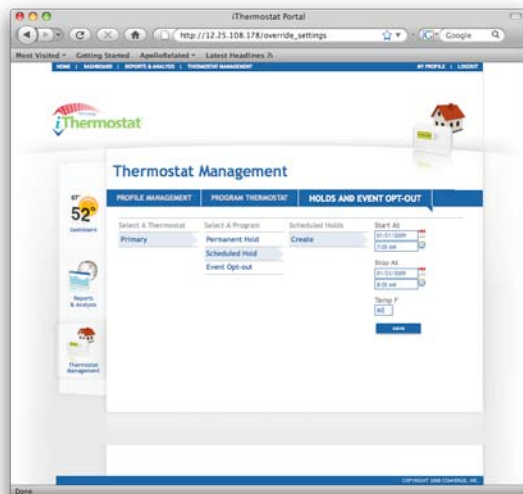


Weather information/dashboard:

Weather data can be collected by the customer's zip code and used for energy-analysis tools. The dashboard will also display current thermostat settings and configurations, including information on the system profile being used, current temperatures, filter times remaining, and system operations.

Thermostat programming:

Customers can program however many thermostats they have in their residence through the thermostat programming dashboard. The intuitive interface allows the customer to program any number of thermostat profiles and save their profiles for future use. Additionally, customers can configure the permanent and scheduled hold operations such as vacation settings.



Event overrides:

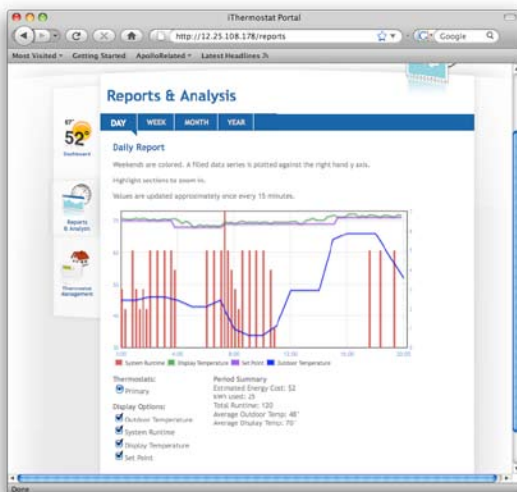
Customers may select the days that they do not want to participate in a demand response event. The interface verifies that the maximum number of events has not been exceeded and provides the customer verification of an opt-out.

Reports and analysis:

Reports provide customers a side-by-side view of historical energy usage patterns alongside temperature data to track their energy consumption and monitor costs.

Alert messages:

Customers may be alerted of specific conditions and situations that require their attention.



Comverge Apollo Demand Response Management System Software



The table below summarizes many of the features of the Apollo Demand Response Management System:

FEATURE / FUNCTION	APOLLO
Load control grouping	Intuitive UI based on geographical mapping, which can be combined with other spatial data
System of record and customer database	Included
Algorithm selection	Included
SCADA interfaces	Upcoming versions will support IEC standard SCADA interfaces, in addition to DNP and Modbus.
User interface	100% web-based interfaces
Resource types	Apollo is fully integrated to handle all types of resources, including programmable thermostats, load control devices, in-home displays, and other control equipment for the smart grid.
EAI interfaces	Flat file, TCP, and web services interface. Upcoming releases will support all developing standards in this area – including IEC CIM 61970/61968, MultiSpeak.
Deployment platform	Apollo is generally deployed as a stand-alone application. Apollo can also be deployed in any standards-based J2EE container such as Apache Tomcat or IBM WebSphere. Apollo currently supports Unix/Linux-based platforms, including RedHat Enterprise Linux and Ubuntu Linux.
Device protocol support	SA 3xx (POCSAG) and ZigBee SEP v1.0 support
Third-party integration	Currently supports Itron OpenWay v1.5 & v2.0, TAP/SNPP and Digi's iDigi platform. Support for other major AMI systems including Silver Spring Network, Elster, and Trilliant forthcoming.
Message triggers	V1.0 implements repeating time-of-day triggers.
Control algorithms / programs	Duty cycle, adaptive control, randomized control, direct control, and scheduled control
Two-way data collection	Fully integrated data collection for telemetry and verification
Database	Standard relational database used by the whole system; out-of-box support for MySQL; support for Oracle 10g and above
Dashboard UI	Powerful, extensible dashboard, displaying complete system status information.
Notification	Included
Reporting	Extensive reporting capability built on top of the standard relational database.
Archival	Allows use of powerful, third-party SQL-based archival tools
High availability / failover	Apollo is well integrated with the failover capabilities provided by the J2EE container or web server container and the relational database server. This allows for easy deployment of a highly available system.
Monitoring / management	Well integrated with the monitoring and management capabilities. This allows for easy system management and monitoring by industry-standard network management tools.

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