Niagara Appliances Enable Revolutionary Simplicity for Commercial Building Automation

OptimumEnergy enables campuses, health care facilities, pharmaceutical plants, data centers and other commercial buildings to cut energy costs and meet sustainability goals by optimizing HVAC systems, the largest consumer of energy in buildings. The company’s cloud-based OptiCx® platform and its associated modules reduce an HVAC system’s energy usage and resulting costs by up to 50 percent. The technology also reduces water use in chiller plants, tracks and reports on savings, provides detailed insights into building system operations, and efficiently scales across entire building portfolios. To date, Optimum Energy technology has enabled current customers to save about 500 million kilowatt-hours of electricity, reduce carbon emissions by nearly 290,000 metric tons, and save over 100 million gallons of water.

The company’s newest product, OptimumEDGE, dovetails with Tridium’s vision of developing “edge” devices that operate like appliances rather than controllers. Optimum Energy’s flagship product, OptimumLOOP®, has been installed in over 200 chiller plants around the world. However, each of these implementations had unique design characteristics and required energy engineering expertise.

With the introduction of OptimumEDGE, Optimum Energy sought to make its patented technology accessible to a wider range of facilities by taking an appliance approach that significantly reduced implementation time and complexity. A well-engineered appliance streamlines and simplifies the setup and operation of the controller, reduces BAS integration labor costs as well as project support costs, and enables system integration partners to handle installation directly. Lowering the financial barrier to implementing HVAC optimization also benefits the environment by enabling more building owners to reduce energy and water consumption.

OptimumEDGE® is a turnkey software solution, built on the Niagara 4 framework, that significantly reduces energy costs in water-cooled chiller systems with up to three chillers and a combined cooling capacity of 400 to 3,000 tons. At its heart is a setup wizard that allows fast and easy implementation. OptimumEDGE runs on a JACE® 8000 controller for optimal security and performance. The controls integrator powers up the controller, which comes preloaded with a wizard, and connects to it from a PC using a standard Ethernet cable and a web browser. The wizard downloads the optimization software and the site configuration file, which has been customized based on previously identified site specifications. The controls integrator then programs the BAS so that it maps to the points list generated by the setup wizard. The setup wizard also allows the controls integrator to verify the data mapping once the BAS is programmed.

Having completed development of OptimumEDGE, Optimum Energy will now begin using the partner portal and adapting the wizard for its other products, including OptimumLOOP®, OptimumAIR® and OptimumHEAT®.
Commercial buildings are typically designed individually for specific sites. Building automation system (BAS) and building management system (BMS) technologies have mimicked that custom approach, evolving to allow the ultimate in configurability, with most adopting a function-block programming approach that is more intuitive than line-by-line programming. This flexibility comes at a price, though—custom configurations require specially trained engineers, whose work comprises a significant component of the overall control and monitoring system cost.

As building designers attempt to standardize designs to reduce customization costs, simplifying the configuration, installation and commissioning of building control technology also is becoming a priority. Concurrent with this trend to reduce engineering time, the cost of computerized technology is falling dramatically, while more applications—such as submetering, shading control and renewable energy monitoring—are requiring greater configurability. This growing complexity risks increasing rather than decreasing the cost of deployment.

These trends have inspired Tridium and its ecosystem developer partners to create appliance solutions that effectively productize Niagara by standardizing its web graphics, control and monitoring strategy, and configuration process. Tridium’s launch of Niagara 4 in 2015 made this process easier, and several of its developer partners have already created successful appliances that take advantage of the new features Niagara 4 offers, such as HTML5 support. A good example of this up-to-the-minute implementation is Optimum Energy’s new OptimumEDGE® HVAC optimization product, which illustrates the potential to bring the most advanced technology to commercial buildings while reducing implementation costs.

A Niagara Appliance Up Close: OptimumEDGE

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**Tridium’s Appliance Vision**

Tridium designed the Niagara Framework to offer maximum flexibility. Its well-designed configuration features and inclusion of an integrated engineering tool called Workbench have led to its wide adoption. Development using the Niagara Framework costs dramatically less than designing software from scratch, and each successive version of the Niagara Framework has made the process progressively easier, but Tridium saw an opportunity to further reduce development costs by creating the Niagara Appliance Framework. The goal is to provide our partners with a set of software tools and components that enable the rapid creation of a wide range of appliance products. Most appliances have certain requirements in common regardless of their application. Everyone wants to de-skill the configuration process, so a simple step-by-step web wizard, with logic interlocks that ensure (as far as possible) correct data entry, enables deployment with minimal up-front training. Simplified user views and histories (data logs) are also common requirements.

Appliances built on the Niagara Framework generally enable configuration via a series of web pages without requiring Niagara Workbench engineering training. This simplification of the configuration process is made possible by predetermining the application that an appliance is addressing—such as chiller optimization in the case of Optimum Energy’s OptimumEDGE or door access control in the case of Tridium’s Security appliance.

Tridium’s approach to the Niagara Appliance Framework reflects its overall development road map: The company designs the foundational software and various modules, such as network drivers, that enable its partners to create solutions serving their specific market needs—in the building sector and many other arenas, such as manufacturing, industry, renewable energy, waste management, smart grids and smart cities.

There are precedents for how the Niagara appliance market could develop. When Apple first launched the iPhone, it would not let developers access the core software, which limited innovation to what Apple itself developed. With the release of APIs, Apple enabled the creation of an ecosystem of developer partners, as Tridium has done. It was Apple’s decision to create and support tools such as Swift, however, that drove rapid product development and accelerated the proliferation of iOS apps, since the cost to create a new product fell dramatically.
Niagara Appliance Framework Overview

Until now, each developer has had to construct its desired appliance on its own, building on top of Niagara. With the Niagara Appliance Framework, Tridium has established a new methodology for creating appliances, based on an intimate understanding of the Niagara Framework and its capabilities.

Tridium developer partners no longer have to spend time thinking through basic architectural issues, but instead can focus on their specific application. The new methodology, together with comprehensive documentation and additional Java components that enhance the core Niagara functionality, will enable a step change in developer productivity and open up a whole new range of applications that can benefit from the power and flexibility of the Niagara Framework. The Niagara Appliance Framework is a new layer of Java code modules, developed on top of the core Framework, that enable the features described above.

These modules fall into four categories:
- Server-side appliance
- Appliance-specific views
- Appliance-specific menu
- Appliance-specific functionality

The diagrams at right show the basic structure and the overall architecture.

Acceleration of the product design process and rapid field testing are the key benefits of using the Niagara Application Framework rather than hard-coded solutions developed by in-house R&D teams. With the Appliance Framework, developers can conventionally configure an application during an experimental phase in which they field-test the required control logic and other product features, and then they can turn the refined version into an appliance using the Framework tools for product rollout.

The Future of Niagara Appliances

In using the Framework, partners are leveraging the hundreds of thousands of labor-hours that went into Niagara 4, the latest generation of the leading software for integrating and managing building-related systems and devices. The Niagara Appliance Framework is in the final stages of development, and Tridium will make it available to Niagara Developer partners in the coming months. Its release will unlock huge potential, as it will allow new OEM partners to develop new products using Tridium’s partners or their own R&D teams within a matter of months, collapsing the normally prolonged time span required for the design and testing of new products.

The Niagara Appliance Framework will have a revolutionary impact, as Tridium’s existing and new partners will see how easily they can address specific market issues with products that would previously have been prohibitively expensive or too risky to develop.