

# White Paper

**Niagara Appliance**



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## INTRODUCTION

The concept of connecting smart devices to the enterprise — often referred to as “M2M” (Machine to Machine/Man to Machine) — has been around for some time, but recent advances in key technologies have accelerated growth and customer interest. Equipment manufacturers can increasingly see the benefits of web-enabling their products. Harbor Research, Inc., who specializes in the field, foresees rapid growth and has estimated that by 2010 there will be 1.5 billion Internet-enabled devices, creating \$700 billion of revenue opportunities for companies involved in enabling, monitoring, and providing value-added services for those devices.<sup>1</sup>

Manufacturers wishing to capitalize on this opportunity are faced with the challenge of developing new products and services that are dependent on skills outside of their core competencies. While they typically have deep expertise in their specific domain, their skill sets generally do not encompass rapidly advancing Internet and communications technologies. Manufacturers who invest in developing these capabilities internally typically experience long and expensive R&D cycles, as well as “rollout” challenges associated with training, marketing, and support.

Tridium’s Niagara Appliance program provides “out of the box” M2M solutions for manufacturers of all types of equipment. The appliance program combines Tridium’s deep expertise in Internet, and automation software technology with the domain knowledge of the manufacturer to bring solutions to market quickly. Today, Niagara Appliance solutions are being used in applications including: lighting control, packaged HVAC unit control, refrigeration control, residential unit control, telecom site monitoring and alarming, and hotel room control.

## OPPORTUNITIES

The business case for manufacturers to offer M2M enabled products is strong—reduce installation and support costs, differentiate products, increase service revenue, and improve customer satisfaction.

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<sup>1</sup> M2M Magazine, Fall 2003, Pervasive Internet, Page 9.

M2M-enabled products allow manufacturers to tap into a device's data stream to continuously track performance and optimize operating parameters and service through the entire lifecycle. Access to device information can provide insight into performance, usage profile and customer behaviors. This intelligence can yield optimized services and profits.<sup>2</sup>

Many manufacturers are looking to expand market opportunities and create new revenue streams that go beyond traditional product-centric offerings, and to leverage relationships with existing customers to generate new service-oriented revenue opportunities. Real time connectivity to installed systems, and the software infrastructure necessary to build applications, are essential elements in achieving these goals.

According to AMR, most manufacturers are looking for 50% to 80% growth in their services business by 2006.<sup>3</sup> Companies that sell, service and support often earn margins two to three times greater than those realized by product-only sales. Remote management capability can profoundly affect response time, support costs, customer satisfaction and ultimately, margins.

### Integration with other machines and systems

Enabling smart devices for M2M services often involves connecting those devices to other systems within a building (known as device integration), connecting them to "back end" or enterprise software applications, and connecting them to users via the Internet.

Integrating equipment with the other systems found in a facility can provide operational efficiencies to both manufacturers and end users. For example, a building owner that integrates real time data from an electric meter with cooling equipment can implement logic to optimize the operation of the cooling system in relation to real-time energy costs. As electric rates approach peak levels, the system can raise cooling setpoints a few degrees and modify the operation of fan systems to reduce the amount of energy being consumed.

Accomplishing device integration is not simple, however. There are a wide range of protocols utilized by the embedded devices today. Protocols such as BACnet®, LonWorks®, Modbus®, and OPC®, are just a few examples of the standard protocols in use. Although many of these protocols are open technologies, they do not provide interoperability between each other. The individual systems end up functioning as isolated networks or "islands". Add to this the large base of proprietary, or legacy systems, and you have literally hundreds of protocols being used by smart devices and equipment systems.

2 The FocalPoint Group, M2M White Paper: The Growth of Device Connectivity. www.thefpgroup.com  
3 AMR Research, Unconventional Wisdom: Focus on Cost to Grow Service Revenue. Dec. 29, 2003.

To take advantage of device integration opportunities, manufacturers need to be able to offer products that are compatible with the communication protocols utilized by the other systems their customers select. This presents a considerable challenge to manufacturers.

### The Service Side

The other side of M2M – Man to Machine – refers to connecting devices, and the wealth of information they contain, back to the user and to enterprise applications. For the user, the ubiquitous web-browser provides an efficient solution for accessing data and interacting with a device. No special software or extensive training is required. The device presents its data and features via an easy to navigate web site.

At the enterprise, the Appliance can provide real-time data feeds to back-end applications that manage alarms, schedule service or initiate workflow processes. For example, as vending machines run low on inventory, an alarm can be sent to an operator, who can quickly determine what items need replacing. In a more comprehensive implementation, the information from the vending machine can be directly communicated to the supply logistics system and a delivery automatically scheduled. This is an example of “device-to-enterprise.”

Remote configuration, commissioning, and diagnostics via the Internet, cell phone network, or dial-up phone modem can significantly reduce response time and improve customer satisfaction. Service contracts can be more efficiently carried out by the equipment manufacturer or service provider as technicians instantly receive alarms to notify them of abnormal conditions, and can quickly drill in to view both real-time and historical data. With the ability to diagnose problems operators can schedule maintenance and make adjustments, all through their browser. They effectively have anytime, anywhere access to their remote systems. Travel time is avoided, response time is improved, and equipment life cycle costs are reduced.

### Efficient Resource Utilization

Manufacturers who can remotely access equipment in this way can also achieve better resource utilization as any operator with appropriate security clearance can access the system. This allows tasks to be delegated to the appropriate resources, freeing up higher cost resources. Installations can be handled by a broader skill set at lower cost, as configuration and commissioning can be performed remotely, instead of requiring highly skilled resources to make expensive and time consuming site visits.

## **MANUFACTURER'S CHALLENGES**

Manufacturers face distinct operational and financial challenges. New products that address competitive pressures and support new business offerings are attractive, but carry risks with them. These risks are exacerbated by the complexity of Internet technologies, which are often outside of the domain knowledge of the equipment manufacturer.

Developing M2M enabled products that will support remote access, start up, commissioning, and after-sale services can be a daunting task for those not experienced in networking and web technologies. A lack of expertise in these new technologies may result in product managers not properly defining requirements, underestimating development cycles, and not choosing the optimal technologies for a given solution. This can lead to cost overruns, long time-to-market and products that do not meet customer expectations.

Deployment and rollout of new Internet-based products is another part of the challenge and can be extremely difficult for organizations not familiar with Internet technologies. Training internal resources and distribution networks that will be responsible for installing and supporting the product becomes a critical element. Customers who can't get questions answered or problems resolved will become disillusioned and look for alternatives, thus defeating the purpose of adding M2M functionality.

## **THE SOLUTION**

A piece of equipment may have the highest efficiency rating, best features, and longest service interval in the industry, but without the ability to communicate, monitor, and control the device remotely in real time, manufacturers remain disconnected from the device, unable to launch state of the art service offerings, and will increasingly be at a disadvantage as their competitors offer these new capabilities.

Given the challenges in successfully adding M2M functionality to products, consideration should be given to working with an experienced partner. An experienced partner with a proven track record for delivering M2M solutions quickly and reliably can help identify, develop, and deploy a successful solution. Tridium, Inc. has been helping manufacturers make the transition to Internet-enabled devices for years. With tens-of-thousands installations globally, our Niagara Framework® technologies have helped organizations expand their product capabilities and traditional business boundaries.

## Niagara Appliance

A Niagara Appliance is an integrated bundle of hardware and software designed to make a device or equipment system fully web and Internet enabled. The software application encapsulates the unique application knowledge of the manufacturer and creates an easy to navigate interface for the user. The result is a solution that allows manufacturers to configure and manage their equipment remotely and connect it to other systems, devices and enterprise applications as required. The Appliance hardware is small and can be embedded inside the manufacturer's product, or installed alongside it.

## **BRINGING AN APPLIANCE TO MARKET**

Bringing an appliance to market involves combining the knowledge of the manufacturer and the proven capability of Tridium's Niagara Framework technology. Professional services, hardware, and software are the key components.

**Professional Services** – The Niagara Appliance professional services team follows a three-phase approach:

### ***Phase One: Clarifying and Documenting Application requirements***

Tridium's team of engineers and product managers work with the manufacturer's staff to design and develop a comprehensive Appliance specification. The manufacturer's staff plays a vital role, contributing their requirements and domain expertise to the design of the Niagara Appliance application.

The process begins by identifying and understanding the specific needs of the product manufacturer, and the manufacturer's customers. Tridium helps identify business challenges and the goals of the product manager, sales team, and technical support staff, assisting the manufacturer in generating a detailed Statement of Work for the desired product.

### ***Phase Two: Building and Testing the Niagara Appliance***

Once the functionality and user interface experience have been defined, Tridium will develop the application. During this phase, prototypes of the software presentation are created for review by the manufacturers team so they can see exactly how the end product will work for the user and their service staff.

Graphic screens, control logic, alarming, scheduling, and other functions can be built into the application. Data presentation and configuration screens with appropriate entry fields, colors, and navigation paths, outlined in the Scope of Work, will be incorporated into the software and installed on the specified hardware platform.

### ***Phase Three - Implement the Niagara Appliance solution***

Implementation is more than simply adding a new part in the price list. Sales, marketing, training, manufacturing, and financial issues need to be considered with any product rollout, and a Niagara Appliance is no different. Tridium works with manufacturers to define and implement a comprehensive program that addresses all critical elements of a successful roll out.

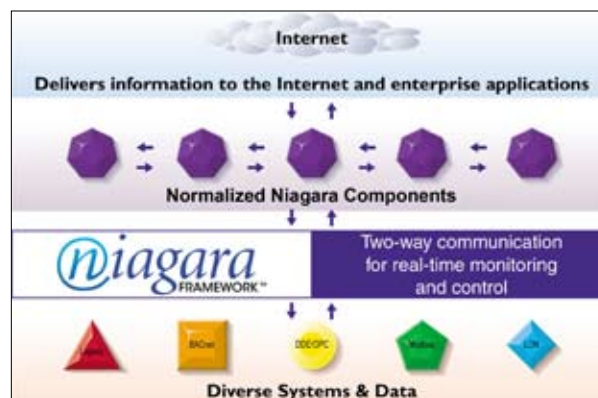
**Hardware** – The Niagara Appliance application can be provided on a variety of hardware platforms. Depending on the capacity and connectivity requirements, Tridium will select from its wide range of proven hardware platforms or develop custom hardware to meet the unique needs of the application.

## **LEVERAGING THE NIAGARA FRAMEWORK**

The Niagara Framework enables cost effective development of feature rich Appliance solutions. Its device integration capabilities, built-in Internet working capabilities, and efficient development environment provide the foundation for a Niagara Appliance.

### **Device Integration**

Once physically connected to equipment, the Niagara Framework identifies a device and creates a normalized representation of it as a Niagara component. Any device or combination of devices can be modeled as Niagara components. These components provide a unified database on which to build the Appliance application. This transformation is represented in Figure 1, with the diverse shapes



**Figure 1**

at the bottom representing unique devices or protocols, and Niagara components at the higher level demonstrating their “virtual”, normalized representation within Niagara.

**Application Development** – In addition to the engine that transforms external device data into normalized components, the Framework provides a comprehensive set of services and tools to enable applications to be developed efficiently. Software elements can be developed once and re-used in multiple applications. For example, components to support scheduling, alarm management, energy management, and more, can be developed and then assembled to address the needs of a wide range of applications. The component-based design of the Framework eliminates the need to create dedicated applications, with separate development effort, for each system. And, the Framework includes an extensive library of components that address the majority of application needs.

### ***A Bundled Offering***

The Niagara Appliance utilizes the features of the Niagara Framework to provide an “out-of-the-box” solution. Installation involves connecting Ethernet and power to the Appliance. The user then accesses the pre-built and pre-installed application through a browser on a PC or a hand held device.

Figure 2 shows a thin-client, browser-based configuration screen. Once the appliance has been installed and LAN/WAN connected, technicians with the appropriate access privileges can configure the appliance by simply filling in the entry fields. Once configured, the operator simply saves changes and lets the application run.

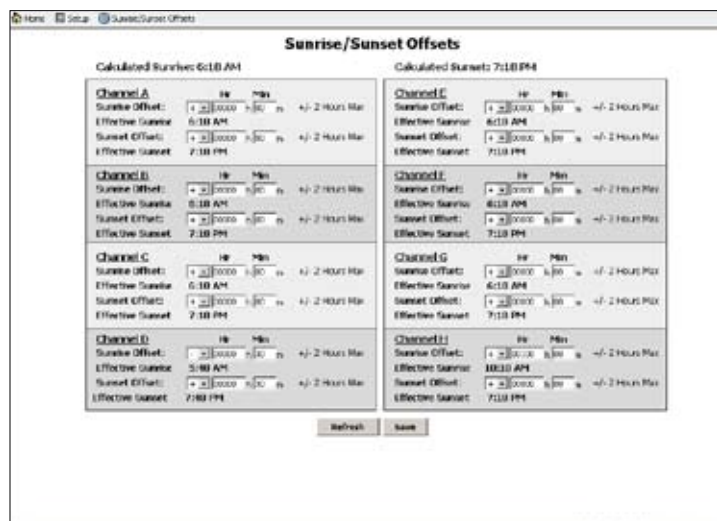


Figure 2

Figure 3 shows an example of an application where schedules and other functions are all provided in easy to navigate screens.



Figure 3

## SUMMARY

Equipment manufacturers increasingly see the need to provide new functionality and services with their products. Demand is being driven both by distributors who install and support the products, as well as end users who demand better response time and improved life cycle costs.

New business opportunities and revenue streams are available to those manufacturers who are agile enough to meet this challenge and offer M2M enabled products. Partnering with a proven partner is essential to achieving success with these new technologies. The ideal partner must be able to encapsulate the domain knowledge of the equipment manufacturer in a web-based application. The Niagara Appliance program from Tridium has proven to be a reliable and efficient means to this end.

# White Paper

## About Tridium, Inventors of the Niagara Framework

Tridium, based in Richmond, Virginia, was founded in 1996 with a goal of creating an open interoperable framework to solve the challenges associated with device-to-enterprise applications and connecting smart, non-IP devices to the Internet. The company has an established and growing revenue base, including offices in the United Kingdom to support the European market and in Singapore for the Asia Pacific market.

Tridium's main product is the patented *Niagara Framework*® (or "*Niagara*"); a Java-based framework that provides a software infrastructure that integrates diverse systems and devices - regardless of manufacturer, communication standard or software - into a unified platform that can be easily managed in real time over the Internet using a standard web browser

In addition to Niagara, Tridium develops and markets a suite of products and applications, powered by the *Niagara Framework*, and sold under the *Vykon*® brand. This product suite is designed to meet the specific requirements of two key markets served by Tridium - building automation and energy services. *Vykon Building*®, and *Vykon Energy*® enable facilities managers, energy service companies and systems integrators to integrate proprietary and otherwise incompatible solutions into a unified enterprise solution, which permits anyone using a standard Web browser to measure, manage and control a wide variety of facilities and energy applications from any location in the world. Customers in these markets (including OEM and reseller partners) have a choice of either developing their own applications utilizing Tridium's software framework or implementing these off-the-shelf *Vykon applications*.

Tridium's goal is to make Niagara a major global framework for integrating control and monitoring systems of all types via the Internet. Tridium sees the same need to create a standardizing force in the embedded-systems market as occurred in the personal computer market.



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