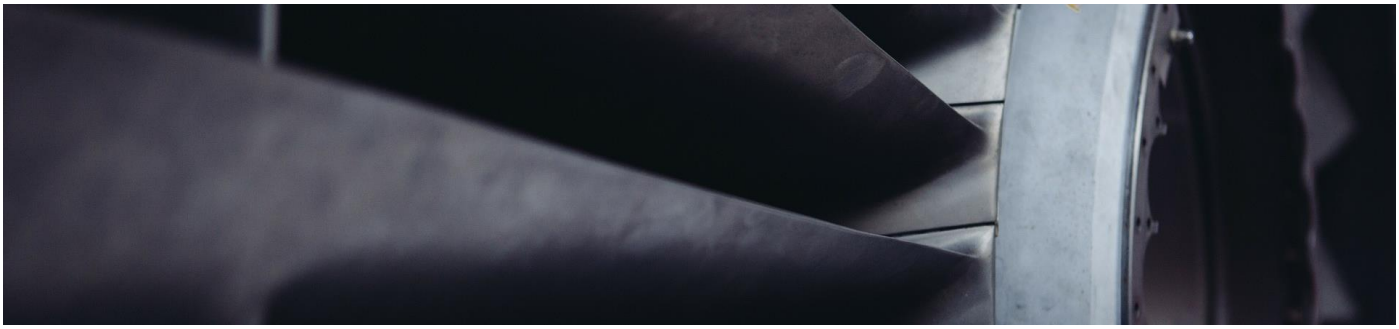
CASE STUDY

Data-Driven Solution Leads to More Efficient, Comfortable Buildings



Distributed network environment allows building managers and technicians to harness the Internet of Things to more precisely control heating and air conditioning systems

THE BACKGROUND

A specialty manufacturer of high-performance pressure independent control valves for industrial applications created a subsidiary to focus on creating innovative solutions for energy-efficient, cost-effective and comfortable buildings. The spinoff, which functions as a start-up company, incorporates these valves into heating, ventilation and air conditioning (HVAC) systems to allow for a more intelligent method of controlling the climate in individual rooms, buildings and office parks. By considering each element of an energy ecosystem and how they work together, the new company focuses on next-generation solutions, harnessing the power of the Internet of Things (IoT) as it defines a strategy for its clients to help identify and manage energy risks and opportunities so they can improve the bottom line.

IoT technologies are dramatically changing the way computing is woven into everyday business operations.

> With the IoT, a range of devices connects to the internet, creating the ability to implement an end-to-end solution that allows businesses to use data analytics to extract and act upon valuable information. It is this data that is the primary value of the IoT, and machine-driven data is expected to grow by a factor of 15x between 2014 and 2020.[1]

Manufacturers in a variety of industries are integrating IoT technologies, and among them, 82 percent have experienced increased efficiency, 49 percent have experienced fewer product defects, and 45 percent have experienced increased customer satisfaction as a result, according to a recent survey by the American Society for Quality.[2]

Today, the IoT is enabling companies in the HVAC industry to act on data to take a fresh look at their current operations and create efficiencies. The American Council for Energy Efficiency estimates that if all U.S. households and businesses were to take advantage of these technologies, energy use could be reduced by 12 to 22 percent, which equates to tens of hundreds of billions of dollars in savings.[3]

Client: Data-Driven Solution Leads to More Efficient, Comfortable Buildings

THE PROBLEM

The company's founders began with a vision to leverage their hardware breakthroughs to provide precision control of commercial heating and air conditioning systems. HVAC systems are important in the design of medium and large industrial and office buildings to ensure safe, healthy and comfortable building conditions and to allow them to operate at peak efficiency. A large office park or university setting can consist of hundreds or thousands of HVAC units managed by a variety of systems. Maximizing the efficiency of these systems can result in a considerable savings for an organization – industry estimates are that HVAC systems account for 35 percent of energy used in manufacturing facilities[4] and 40 percent of commercial building energy consumption worldwide.[5]

The client was driven to help organizations better manage costs related to commercial heating and air conditioning control systems. Statistical analysis of data collected via climate-control systems and existing building automation systems affords the opportunity to more precisely control the climate of a building or group of buildings. This level of control allows senior management to determine where energy is being used – and, correspondingly, where money is being spent. It allows building operators to better manage the climate in individual rooms, buildings or campuses. Precise control also reduces the resources needed for troubleshooting and addressing problems with the HVAC system due to central control of the systems and the ability to better pinpoint issues with the system.

To address these challenges, the new company needed to create a proof of concept for its vision, define the minimum viable product, then develop the first production product, so its executives decided to tap into ProKarma's expertise to reach these milestones.

THE SOLUTION

Through its partnership with ProKarma, the client was able to bring its ideas into fruition and help building management and owners meet today's rapidly evolving energy challenges via a data-driven solution.

Because the client needed a way to communicate value, collect data and control a distributed hardware network remotely, ProKarma helped create a streamlined data pipeline that allowed it to collect the information required, display the correct information to the clients who owned the data and give engineers access to devices from a central location.

> Access to the precision-control system was via a Web app, and ProKarma designed the embedded system's software for control and optimization of sensors and control valves – the software layer, or interface, with which the client's customers and technicians interacted.

Throughout the development of the proof of concept, then the product, the ProKarma team utilized an Agile development methodology to achieve quick turnaround during continuous development, both taking into account feedback from the client and also from its first customer, a Midwestern university, once the initial production run was underway. The solution, which utilized relational databases, sensors and Linux boxes that reported to the database using a web API, was built on a Windows server using .NET, Java, Python (for the embedded systems), SQL Server 2008 and iOS.

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The end solution included an extensive feature set that allowed multiple consumers to benefit. C-level executives could view information about the building at the campus or building level to determine where money was being spent on energy use. Because the solution worked with existing building-operation systems, building operators could log in to the app to better control building climates, choosing when to override the existing automated controls and responding to occupant comfort. A field engineer suite allowed technicians to monitor, analyze and update the control system, and enabled remote management and firmware updates for the system hardware – reducing the time and resources needed to send engineers out to examine individual connections for problems. ProKarma also created an app that allowed technicians to scan a Quick Response (QR) code to quickly identify a piece of equipment and the associated information.

By working with the client from ideation to production over the seven-month engagement, ProKarma was able to develop a state-of-the-art holistic architecture that allowed for rapid market expansion of the client's product to new customers and partners. These customers, in turn, were empowered with the tools and data they needed to optimize their controls, saving money and reducing energy use.

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1 *Big Data, Bigger Digital Shadows, and Biggest Growth in the Far East, Gantz, J. and D. Reinsel, December 2012.*

2 *Manufacturing Growth Continues But Economy Still a Challenge, According to ASQ Suryey. American Society for Quality. December 2013. www.asq.org/media-room/press-releases/2013/20131223-manufacturing -outlook.html*

3 *A Defining Framework for Intelligent Efficiency. Elliott, N., M. Molina and D. Trombley. 2012. Washignton, DC: American Council for and Energy Efficient Economy.*

4 *Energy Efficiency in Industrial HVAC Systems. N.C. Division of Pollution Prevention and Environmental Assistance, September 2003. http://infohouse.p2ric.org/ref/26/25985.pdf*

5 *Energy Efficient HVAC Systems. Navigant Research. 2Q 2013. http://www.navigantresearch.com/research/energy-efficient-hvac-systems*