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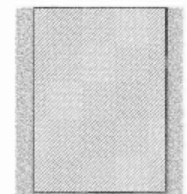
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FM Update: Building Internet of Things, Part 3



Where Does the BAS Fit in an IoT World?

Building automation systems aren't going away, but their role may well be transformed

by rita tatum, contributing editor

In an era where microchips are embedded in everything that operates electronically, Internet of Things (IoT) technology is showing up everywhere, from cars that drive themselves to smart thermostats and health-monitoring bracelets. In commercial and institutional facilities, the Building IoT already has made significant inroads in lighting, HVAC, video surveillance, and numerous other building systems and subsystems.

As the Building IoT expands, facility managers may wonder what role the building automation system (BAS) will play in this brave new world of sensors and Big Data. After all, the Building IoT offers a new range of options for advanced functions like aggregating data and detecting hidden faults in HVAC operations.

Don't count the BAS out, say industry sources. Most BAS manufacturers do not see the BAS disappearing or even being undermined by IoT technology. Instead, they see the BAS as being enhanced with expanded capabilities and functionality.

BAS: Where the IoT Began

Most facility managers think of the building control system when the subject of the IoT comes up, according to a recent *Building Operating Management* survey, with 85 percent of respondents associating IoT with controls. Experts view the legacy BAS as the precursor to today's IoT. "Over the past two to three decades, the move to direct digital controls led to sensors and actuators communicating through BAS to keep building occupants comfortable," observes Rich Blomseth, director of product management at Echelon. The use of open protocols and standards like LonMark and BACnet made it possible for devices from different manufacturers to interface, expanding the range of machine-to-machine communication.

Communication and interoperability capabilities have given the BAS a key role in facilities. But today, the rapid growth of the IoT is presenting facility managers with a wide range of new technology choices.

One reason for the phenomenal growth of the IoT is the rapid decrease in component costs, according to Peter Middleton, research director at Gartner. Gartner estimates IoT's installed base will grow to 26 billion units by 2020.

"By 2020, component costs will have come down to the point that connectivity will become a standard feature, even for processors costing less than \$1," says Middleton. "This opens up the possibility of connecting just about anything, from the very simple to the very complex, to offer remote control, monitoring, and sensing."

In Gartner's report, "Forecast: The Internet of Things, Worldwide, 2013," the IoT industry includes the devices themselves as well as embedded software, communications services, and information services associated with the devices. In the building industry, IoT is showing up in some widely used current smart-building technologies, including light-emitting diode (LED) lighting and intelligent HVAC systems.

Changing Role

The growth of the Building IoT means more data — and that's good news for the BAS.

"The crux of IoT is connecting sensor data from a variety of devices and making sense of it," says Sudhi Sinha, vice president of product development for Johnson Controls. Sinha notes that BAS has been doing just that by collecting building systems data and using analytics to optimize operations "for a very long time."

In fact, Darcy Otis, director of analytics and fault detection for the building technologies division at Siemens, says "the BAS is an integral part of the IoT environment." The IoT is simply giving the BAS role "more information and better tools" to perform its core functions, he says.

But that doesn't mean there won't be changes in the BAS as more facility managers tap the cloud's ability to amass massive amounts of data and quickly make that information useful. "The functionality of BAS will change as IoT is implemented," says Sohrab Modi, Echelon vice president of engineering. "Building management systems will need to be more flexible and scalable."

Modi predicts some key operations will remain within the BAS domain, while others may be best accomplished in the cloud.

Otis believes the cloud's capabilities can improve building management systems. "Using a tablet, the building operator may use a cloud app to prioritize, based on

predictive information, when things need to be changed or serviced," he says. "At the same time, he or she may tap into a BAS app, also accessible on the tablet, to get a real-time view of the same system in operation."

While he believes they can work well together, Otis points out that the BAS and the IoT come from two different technological bases. "BAS, its apps, and support are the domain of the engineering profession," Otis explains. "They have the expertise in engineered systems." By contrast, he says, "IoT comes from the information technology profession." By nature, IT is more concerned with data and statistics, while engineering focuses on how building systems actually operate.

Sinha from Johnson Controls considers the cloud "an efficient storage container and processing platform for Big Data." He also knows, however, that data may not always be complete. "Your analytics have to account for any data gaps."

Sinha uses a high temperature reading on one sensor to illustrate his point. It may indicate a fire. But it also may mean the sensor's temperature gauge is malfunctioning for some other reason. "This is where contextualizing data with domain bias and correlating data with other types of information becomes vital," he points out.

Data management is an increasing challenge for building automation companies. Tom Zaban, executive vice president of sales and marketing, Reliable Controls, says the priorities are access to data — "how to get it, how

to sort it, how to filter it, how to deal with large data sets in an efficient and meaningful way" — and also delivery of data in ways that make it useful for decision-making.

Tandem Operations

One option for facilities with BAS is to continue to use those on-site systems for daily building operations, while tapping the strengths of third-party software for functions like data aggregation, fault detection and analytics, performance enhancements, benchmarking, and mandatory reporting.

"We can look to other industries with IoT applications in predicting the future," notes Andy McMillan, president and managing director of BACnet International. "We see they still have on-premise or local components. For example, the Fitbit sends data to the phone and then to the cloud. In this case, the phone is the local component."

The concept works similarly with buildings. "The building management system often generates the raw electrical/mechanical data from the various sensors around the building and converts that into meaningful information for the IoT platform," explains Robert Hemmerdinger, director of business development for Schneider Electric's buildings business.

"Trying to get that level of analytical data on the building without those systems working together would be almost impossible," he says.

Another advantage of third-party IoT apps is that they may

be monitoring failure data on thousands of buildings. "The third-party IoT vendor can find trends and present cloud-sourced information on a product's quality," says McMillan.

A number of mobile apps already offer user control in commercial and institutional buildings. These applications can include heating and cooling, as well as lighting and blinds control, according to Hemmerdinger. They even are extending into segment-specific solutions, such as TV control for hotel or hospital rooms.

To show how mobile apps can add building-occupant value when tied to BAS systems, Modi of Echelon describes a simple but common need. "Suppose you are in a big building and you want to have a meeting. So you use your smart phone to see if any conference rooms are available. Scheduling says all conference rooms are booked, but the BAS sensors note that no one is in one conference room. It was booked, but is unoccupied. So you can have your meeting there."

Future-proofing the BAS

No one can completely predict what technology will last and what will be outdated next week. And even when a BAS technology is dated, it can still be useful for on-site locations. Still, planning for future possibilities is important to future-proof BAS and Building IoT purchases as much as possible.

Some factors to consider are basic, but shouldn't be taken for granted, like making sure that an analytics package will deliver useful information to the people who will use it the most. Other must-do considerations are new, like cyber security. Facility managers still don't rank cyber security as a top priority when evaluating new BAS options, according to a *Building Operating Management* survey: Only 8 percent of respondents ranked it as "most important," while 26 percent called it "least important."

Sinha of Johnson Controls suggests facility managers look at three other areas when evaluating Building IoT options in light of their existing or planned BAS: interoperabil-

ity between the new system and the older one; the incremental value provided by the new system; and the way that the new technology will impact the organization's revenue and cost stream.

Don't overlook the possibility that the existing BAS may have more capabilities than you are currently using. Fault detection and diagnostics capabilities are a case in point, says Drew DePriest, midwest regional sales manager, Automated Logic. Existing BAS software and controllers may be able to perform some real-time fault detection calculations. "There's quite a bit that we can do, that pretty much anyone in the industry can do these days, with regard to FDD (fault detection and diagnosis) at the edge," he says.

For facility managers who want more advanced analytics than the current BAS can offer, software overlays are an option. These packages pull data from the BAS to analyze it, while the BAS continues to control the building, De Priest says. When evaluating those options, he says, facility managers should ask, "How much human intervention is required to set it up to tell it what to look for?" Also important to know is whether the software will be installed within the building or in the cloud.

Regardless of whether the facility manager uses a BAS or a software overlay for analytics, it's important to think about the way that the data will be managed. Zaban of Reliable Controls says facility managers should ask questions like these: "How do I access my data? How flexible is the reporting system in terms of creating reports? How easily can I sort through the mountain of data that's there to extract intelligence out of that data set? Those are always the challenges of Big Data."

When upgrading or adding new BAS systems, Modi of Echelon suggests checking to make sure they are using well-established communications standards that work across multiple applications and media. "You want your BAS to use standards that can evolve to meet future requirements," he stresses.

And that's exactly what's happening today. Responding to the IoT evolution, BACnet Addendum 135-2012am defined new RESTful Web Services to replace the current SOAP-based Web Services in BACnet. RESTful Web Services moves BACnet into supporting IT technologies as well as integration with enterprise level applications, clouds, and modern user interfaces.

The BACnet addendum also introduced BACnet Extended Data Model (BACnet XD). Other addenda add device descriptions based on BACnet XD and updates for primitive value objects and revised event reporting. These addenda are now part of BACnet standard 135-2012 and are expected to flow into the new baseline 135-2016 edition.

Meanwhile, Echelon has developed a smart multiprotocol chip with BACnet, LON, and IP protocol stacks. The smart transceiver offers a platform for third-party vendors to develop products compatible with BACnet and LON devices as well as IP-enabled building control devices.

"As the technology changes and evolves, BAS will also need to adapt to these changes," says Hemmerdinger from **Schneider Electric**. "A good BAS will be ready for that change today." ■

Rita Tatum, a contributing editor for Building Operating Management, has more than 30 years of experience covering facility design and technology.

Email comments to edward.sullivan@tradepress.com.

MAKING GOOD CHOICES

- Today's building is "a sensor-rich environment," says Andy McMillan of BACnet International. When a facility manager is selecting or upgrading BAS, he says, "make sure you can add sensors easily and on your own."
- Complex equipment, such as variable frequency drives, may have sensors with 40 or 50 data points. While BAS may use three to five of these data points today, a web service may need access to 15 data points or more. "You need to have a strategy for adding points that you don't need today, but might need two years from now," observes McMillan. "You don't want to be paying money again and again as you add data points."
- When moving data into the cloud, McMillan recommends choosing a cloud service provider "with staying power." He admits that can be difficult as many cloud providers are new players.

— Rita Tatum