



This article was published in ASHRAE Journal, November 2010. Copyright 2010 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. Posted at www.ashrae.org. This article may not be copied and/or distributed electronically or in paper form without permission of ASHRAE. For more information about ASHRAE Journal, visit www.ashrae.org.

BACnet® for Visibility

By Terry Hoffmann

Innovations in technology continue to improve our ability to generate detailed data about what is happening in our buildings. Unfortunately, we're drowning in data. How can we make insightful choices when we're overwhelmed? Our goal must be to increase the visibility of building data by bringing it to life in a way that's relevant, meaningful and actionable. Until we do, the data is virtually useless.

How Do We Increase Visibility?

Back in the 1970s, various social scientists predicted that we were unavoidably headed toward an image-based culture full of visual language. Did they foretell the iPad? Perhaps not. But everywhere we turn, we are using images, pictures, colors and maps to organize information and visualize objects, plans and outcomes. We expect to interact with information visually.

The presentation of facility information should be no different. Think about your own experiences. If you were asked to monitor a building's energy use, which would be more meaningful, a spreadsheet or a graph? Text or a pie chart? The graphical representation of data not only helps us make sense of information, it reinforces things like time, distance, speed, direction, order and importance. It provides context and relevance. It helps us make informed decisions that allow us to become more efficient and less wasteful.

Fortunately, a foundation has been laid that will allow us to achieve greater visibility through graphical representation. BACnet normalizes the information from a tremendous amount of disparate systems so that the information can be easily ascertained, making BACnet an ideal protocol to facilitate visibility.

Why Visibility Now?

The technology to create more efficient buildings is well established. The data we need to make smarter choices is being generated. Unfortunately, we may not always be empowered or motivated to take advantage of these tools.

For example, in North America each year, billions of dollars are spent on powering data centers, yet only about 30% of that power ever touches a computer. The rest is used for loads such as cooling and lighting. Ask yourself, "When was the last time a computer ever complained about having adequate

lighting to do its job?" Ironically, we're generating the data to measure this type of inefficiency, but we're not using it to drive management decisions. Why? Because until we're able to easily view facility information *when* we need it, *how* we need it, and *in a way that's meaningful*—the data has no value.

Bringing visibility to building information is key because with it we can plan, instrument, measure, manage and improve.

What Does Visibility Look Like?

You do not have to specify or manage a campus of buildings to take advantage of visibility. It takes many forms, and delivers benefits in many ways at many levels.

Device-Level Visibility

Visibility starts at the level of the controllers. Menu displays, connectors, and alarm indicators should be designed to present information in a highly visible way. As a result, it is more usable, intuitive and efficient for its users.

Facility-Level Visibility

At the facility level, visibility takes shape in graphically rich, tailored summaries and reports that give managers a real-time view of building data.

About the Author

Terry Hoffmann is director of BAS Marketing at Johnson Controls in Milwaukee.

Figure 1 shows a screen of key performance indicators for a building compared year after year.

In intuitive graphics, it illustrates information such as actual energy use, heating and cooling degree-days and energy demand. Metrics are included to reflect the reliability of the sample data.

While this dashboard presents an easy-to-scan overview, more detailed information is always available, if needed, by drilling down into individual components.

Enterprise-Level Visibility

At the enterprise level, the graphic representation of data gives executives a quick overview of the performance of facilities within the portfolio.

Views, such as the one in Figure 2, show which facilities consume the most energy, which pay the most for that energy consumed and what the resulting greenhouse gas output is per facility.

High performers are in green. Under-performers are in orange. Because these displays emulate the level of information that is visible on a typical automobile dashboard, we often refer to them as such. That is not to say that dashboards cannot be used at the building level, but typically a facility manager likes more information and is eager for detail that will help solve an identified problem. Dashboards can be purpose built for use in applications such as energy or emissions monitoring or custom built using standard database tools and report generation software.

Whatever level of detail is required, visibility delivers real-time, actionable information we can use to ensure our buildings are operating efficiently. Managers presented with data transformed in such a way are quick to use it to implement change and optimize their operations. The key is to make the information available for them when it is needed, how it is needed and in a way that is meaningful.

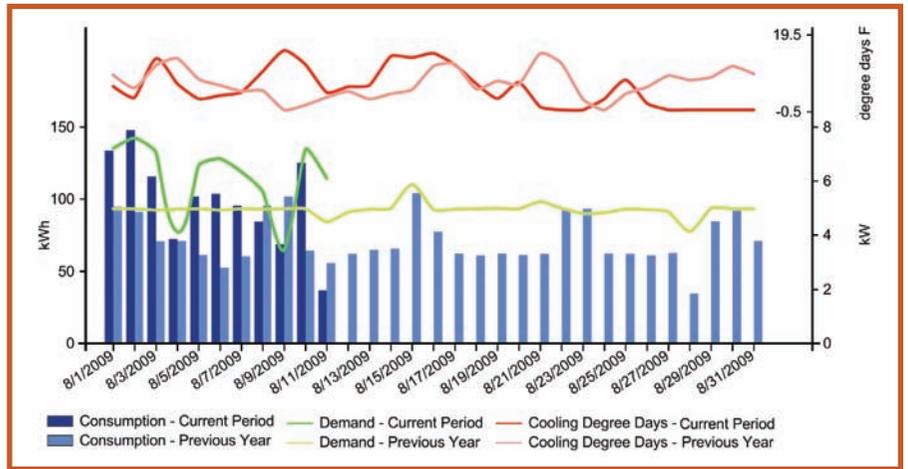


Figure 1: Key performance indicators are shown graphically.



Figure 2: A dashboard gives a quick overview of performance.

Where Does BACnet Fit In?

A decade ago we might have said that any open protocol for mechanical and electrical systems communication that was widely adopted and adaptable was acceptable for use in buildings. But we have moved on. We know now that interoperability is more than just devices that talk. It is the ease with which application programs can be written to

‘Unfortunately, we’re drowning in data. How can we make insightful choices when we’re overwhelmed? Our goal must be to increase the visibility of building data by bringing it to life in a way that’s relevant, meaningful and actionable.’

take advantage of that communication that determines the success of implementation. It is safe to say that BACnet has broad acceptance as the preferred protocol around the globe. BACnet supports the kind of data collection, storage, maintenance and transformation to information that has been suggested here.

Because BACnet has a variety of rich objects for many kinds of systems, including lighting, security, fire management, HVAC and electrical metering, it promotes standardization as opposed to experimentation. In addition, because BACnet services such as scheduling, trending and alarming are standard and well defined, it is possible to know what happened, what is happening and what is going to happen in our systems with a very high degree of certainty.

Because BACnet is developed and approved under the strict rules of ASHRAE, it is trusted for both quality and longevity. Finally, because BACnet works over a variety of media types it is nearly universal in its ability to be applied in any building, across buildings, or across the world.

Simply put, if you want good information that is visible and actionable, you have to start with good data. BACnet supplies the foundation, quality vendors supply devices and systems. ASHRAE and BACnet International provide the necessary oversight.

Increasing Visibility for Bottom Line

When we have greater visibility into the performance of our buildings, the opportunities for savings are virtually endless. Perhaps the best way to illustrate the breadth of efficiencies that can be uncovered through visibility is to share the story of what happened in Wisconsin.

The state established a goal in 2005 of reducing statewide energy consumption by 15% in five years. It entered into a performance contract designed to optimize its hundreds of buildings. The project was to provide increased visibility into building performance, delivering information that was relevant, timely and actionable across the full spectrum of building management areas:

- Enterprise energy management;

- Utility bill management;
- Business process management;
- Facilities communications infrastructure; and
- Computer-aided facilities management.

To date, the results have exceeded those guaranteed by the performance contract. The program has allowed the state to:

Reduce Energy. In its first year, the state realized a 5.5% reduction (more than \$3 million) in its energy bills.

Consolidate Facilities. The state consolidated both functions and facilities, resulting in more than \$20.9 million in excess real estate sold; and a nearly \$14 million reduction in leasing expenditures.

Assess Equipment. The increased visibility allowed the state to rank its buildings by energy use. When underperforming facilities were identified, the state found that in many cases, the culprit was defective steam traps. Nearly 20% of the steam traps were found to be defective. By replacing the defective traps, the state has saved approximately \$1 million annually.

Eliminate Waste. During an inventory of utility accounts, one facility was found to be paying for water it had not used in more than a decade. The water account was

billing \$425 a month, unnecessarily, for 13 years. During that time, the oversight cost the state \$66,300. The water account was immediately closed.



Users expect to interact with data visually.

Visibility is Key

In all of these examples, visibility allowed the state to tap into the power of its facility information to create efficiencies. We are visual thinkers, and fortunately, the tools are available today to deliver meaningful visibility into the performance of our buildings. As engineers, we owe it to ourselves and to our clients to take full advantage of what visibility can deliver. Identifying and collecting the facts that represent key indicators of performance for our facilities is the first step. When this data is delivered in a way that is timely, relevant and actionable, we have opportunities to fulfill the BAS promise to create comfortable, safe and efficient buildings that are sustainable.●