

Leveraging BACnet

April 2008

Back when most people used film to take pictures, drug store companies sold cheap cameras to customers with the promise of “free film for life.”

There were plenty of strings.

The film had to be developed in the drug store’s one-hour lab. Technicians replaced the film in the camera, which usually couldn’t be opened by the user. Prices for one-hour developing were outrageous. And because the lab loaded the film, you never could tell what kind of film you were getting.

Today, digital cameras offer a better way. Similarly, as an ISO-based open protocol, BACnet offers facilities executives the option to avoid being tied to a single vendor or a proprietary BAS over the life of a building.

“Being locked in to a vendor is one of the most painful experiences imaginable,” says Bill Swan, senior software engineer for Alerton.

One obvious problem with being locked into a proprietary vendor is cost. Vendors servicing facilities with proprietary systems have the equivalent of a “customer for life” because switching systems is typically cost-prohibitive. That leaves facilities executives without much leverage to negotiate. With BACnet, facilities executives have more options for choosing vendors to service their BAS after installation.

Increased leverage translates into better service. One university, for example, switched from working with a single vendor to requiring BACnet-compliant systems on future projects as a way of increasing its options.

The university stayed with the same vendor it had always been using, in part because prices dropped and service improved, says Steve Tom, director of technical information, Automated Logic. “He worked a little harder and the prices were just a little better because now he had competition,” Tom says.

Avoiding vendor lock-in is one advantage cited by BACnet backers. But it isn’t the only one. Today, BACnet is being offered on an increasing array of devices, including chillers and drives. That means facilities executives have the option of adding “best in class” devices to the network regardless of the vendor.

“Ten years ago, a company could design the coolest, most dynamic intelligent pump. But it wouldn’t do any good. They couldn’t sell it because it didn’t connect to a controller’s front end,”

says Andy McMillan, president and CEO of Teletrol Systems, and president of BACnet International. Today, BACnet would allow that pump to function in any BACnet environment, regardless of the other equipment used.

BACnet also offers the ability to ‘future-proof’ the BAS. Facilities executives who want to make changes aren’t dependent on one vendor to add a device to the network.

“Putting a BACnet implementation into your facility is really about protecting yourself and reducing risk,” says Brian Dutt, vice president of sales and marketing for Delta Controls. “You are putting in an open protocol because you want to avoid concerns about a future supplier and being locked in.”

Ultimately, the flexibility that comes with BACnet leads to better service as vendors no longer have a monopoly on building service, Dutt says.

But with a BAS, as with many building components, potential doesn’t automatically translate into performance. Building a BACnet system that performs as expected requires special attention from facilities executives.

Setting Goals

One simple step facilities executives can take is to establish goals for the BAS. Whether the goal is improved efficiency, better comfort or easier operation, decisions made early on will shape the system. “BACnet is really just a means to an end,” says Ed Merwin, director of Tridium’s Vykon channel. “What is the facilities executive’s goal? You don’t just use BACnet for BACnet’s sake.”

Part of planning includes getting input from operators and facility department employees, experts say. Getting the input early on from employees can help prevent problems that lead to complex or unintuitive control interfaces, for example. “There is a lot of good operating knowledge that sits in the boiler room that sometimes doesn’t get accessed,” says Merwin.

Because goals ultimately shape BAS design, poor planning can cripple facilities executives’ abilities to manage their buildings. In one case, soaring energy costs made energy a hospitals’ largest unpredictable cost. That put the facilities executive under pressure to forecast energy use to the CFO every two weeks, says Turner.

Unfortunately, the BAS wasn’t designed to gather the information in an automated fashion because it just wasn’t considered during design. An upgrade is now in the works. “You really have to know what metrics are going to be used to manage the building on an ongoing basis,” says Greg Turner, director of global offerings for Honeywell Building Solutions.

Once the goals are determined, facilities executives should make sure those goals are communicated — in writing — to all the key players in the process, from the consulting engineer to the vendors. “The biggest problems I see always go back to lack of prior planning,” says Terry Hoffman, director of marketing, Johnson Controls.

Once the goals are agreed to, facilities executives can focus on the specification. Not all facilities executives will feel the need to delve into the nuances of specification writing. But some, especially those on college campuses, might, experts say.

For those who want to have some backup, hiring an independent consultant to oversee the project isn't always easy. One challenge is that, unlike architects, lawyers or even those who use the U.S. Green Building Council's LEED rating system, there is no test or certification program to ensure consultants meet a minimum standard of competence.

As with any project, it's important ask for and check references of the consultants. "Did the consultant make sure the devices integrated properly? If all you hear is finger pointing, you better think twice," says Jon Williamson, senior product manager for TAC.

Even if a consultant is used, facilities executives still play an important role in determining the system's functionality. "Some people think you can put the words 'Shall be BACnet' in the spec and that takes care of everything," says Tom. "That doesn't get the job done."

A specification should include all information that facilities executives want to be able to access via BACnet, because the BACnet protocol by itself doesn't determine how a BAS is programmed, says Tom. Among the information to include is the sequence of operations, a points list and I/O points that should be accessible via BACnet.

Omitting those details won't cause implementation problems. "But a few years later, you may discover you have the hardware, but the information you expected to share with the next project isn't accessible via BACnet," Tom says.

Good specifications are both product-based and performance-based, experts say. A specification that includes outcomes and product attributes avoids boxing an integrator into a narrow list of products that can be chosen for implementation, says Hoffman.

A variety of terms can be used to describe BACnet devices. Among the terms: BTL-listed and BACnet-conforming. Facilities executives should insist on using products that are listed by the BACnet Testing Laboratories (BTL), most experts say. Products that have a BTL label have been independently tested and found to implement the required capabilities for a particular BACnet profile.

"In simple terms, if a company says a product is BACnet-conforming, you have their word for it but you don't have anyone else's," says Chris Hollinger, senior product manager for Siemens Building Technologies. "It becomes a trust issue."

On the other hand, facilities executives shouldn't use a spec that includes a blanket statement requiring all products to be BTL-listed. The reason? Some types of devices, like workstations, don't yet have a test so they can't be listed, says Dan Halvorson, director of controls for McQuay.

Facilities executives can draft a consulting engineer to help. But relying on a consultant doesn't mean the facilities executives can simply forget about the spec. "BACnet has to be specified correctly to have the level of interoperability that people presume is possible," says Hoffman.

Failing to consider how the BAS will be modified in the future can cause headaches. Changing the way devices report information such as trends, for example, may require programming tools from a vendor. If facilities executives intend to modify the BAS on their own, it's key that the spec be written so that vendors are required to provide the programming tools. Some facilities executives mistakenly think that using a BACnet system means any vendor can program any type of device. "You really have to sweat the details," says Merwin. "Everyone's tools to program devices are different."

Alternately, facilities executives can contract with vendors to have the work performed on a time and materials basis, says Turner. To avoid getting stuck with a system that doesn't perform as expected and is difficult to modify, make a decision at the outset to either get the tools or agree to a fee schedule, says Turner.

Facilities executives should also check the fine print on the warranty to makes sure that using another company's programming tools doesn't invalidate any warranties. "That leaves the operators frustrated because they feel like they have one hand tied behind their back," says Zaban.

One common BACnet myth is that the protocol is "plug and play" in much the same way PCs are these days. The idea is that adding a VFD is equivalent to plugging in a printer or mouse into a computer.

Not true.

An open protocol isn't the same as "plug and play." Facilities executives who confuse the two will be putting unrealistic expectations on the BAS. While the open protocol allows devices to coexist on the network, ensuring they can exchange the information facilities executives want to use isn't automatic. "BACnet still requires a collaborative mindset from the suppliers, the architects and the engineers," says McMillan.

If compatibility of equipment from different vendors is a concern, facilities executives can take heart: In an effort to smooth interoperability, vendors hold periodic "plugfests" — to test how their equipment works together.

Some facilities executives who manage large campuses have even required vendors to conduct an on-site demonstration to show that the equipment will work together, says Bruce Westphal, vice president of technology for KMC. "We've visited the customer site, connected our equipment to their test network and demonstrated the operations they need," he says. "That's a pretty sophisticated customer."

Some facilities executives may think they have to pay a premium for a BACnet system. While this may have been the case for some systems in the early days of the protocol, experts say that's

just not the case anymore. More than 10 years of development has given manufacturers time to drive down the costs, says Halvorson.

"I'm really struggling to recall a time when we got a complaint from an end user or contractor that they had to pay more because the spec demanded BACnet," says Tom Zaban, vice president of sales and marketing for Reliable Controls.

In any case, facilities executives who find themselves fielding unexpected last-minute offers for cheaper proprietary systems should avoid the temptation, says Williamson. "It's just contrary to your goals," he says. "And who knows if you are going to get that same deal on the next project."

Continuously Evolving

Despite the occasional challenge, BACnet is a robust protocol that offers more flexibility than proprietary systems and the potential for better performance and service. Part of the reason for that is that it is constantly growing.

"There is no question the protocol is moving forward and getting more mature," says Zaban. "That's good for everybody."

To understand BACnet's ability to grow and adapt, consider that when introduced, BACnet resided on its own network. Today, it communicates using the TCP/IP protocol that makes up the Internet. "BACnet is really a living standard," says Mike Olson, manager, HVAC applications, ABB. "When a change comes out, it's a solid standard and it makes sense to all parties involved."

Williamson agrees. "BACnet is really a living, breathing thing," he says. "As new technology comes out, the BACnet committee has a pulse on it."

The BACnet committee has proposed incorporating the Zigbee wireless networking standard into the protocol, a move that could reduce costs by eliminating the need to run wiring. Other potential changes include improved security of the protocol and the ability to connect with other building systems such as lighting and access control, experts say.

Adding Web services, another change under discussion, would further improve functionality. For example, Web services would allow a facility that generated ice to reduce cooling costs by automatically adjusting how much ice was generated overnight based on weather forecasts. Typically most facilities make the same amount of ice regardless of the weather, says Tom.

As the protocol has evolved, so has the value of BACnet to facilities executives, experts say. "Personally, I think the days of trying to go out and sell the BACnet value proposition are over," says Dutt. "I think most facilities executives are aware of the value of interoperability. Having an open protocol is really the minimum."

BIBBs and PICS

Facilities executives shouldn't assume that devices from different vendors will automatically function as needed just because they are BACnet devices.

Because they are BACnet devices, they will be easily recognized on the network. The devil is in the details: What points does the device have? Does it report information automatically? Or does the device only report information when prompted from a workstation? Those kinds of variables can have a big impact on how a system is configured.

Fortunately, there is a system in place to evaluate devices. Protocol Implementation Conformance Statements (PICS) are public documents that describe a host of performance attributes in a standardized way, allowing facilities executives to see how devices interact.

"A PICS really defines the capability of a BACnet device," says Bill Swan, senior software engineer for Alerton. "Especially the low-level networking capabilities."

A second document, called a BACnet Interoperability Building Block (BIBB) describes higher-level functions.

"The BACnet committee realized they needed to help," says Steve Tom, director of technical information, Automated Logic. "They created BIBBs to make it easier to specify the system."

About BACnet International

[BACnet International](#) facilitates the successful use of the BACnet protocol in building automation and control systems through product testing, educational programs, and promotional activities.

Members include building owners, consulting engineers, facilities executives, and companies involved in the design, manufacture, installation, commissioning, and maintenance of control equipment that uses BACnet for communication.

As a not-for-profit association, BACnet International complements the work of the ASHRAE BACnet standards committee and BACnet-related interest groups around the world.