New developments in BACnet

The BACnet standard has been updated and refined recently, allowing for greater flexibility and interoperability.

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The year 2010 marked the 15th anniversary of BACnet as an American National Standards Institute (ANSI) standard. BACnet products are currently deployed worldwide in many kinds of automation applications. Some estimates indicate more than 10 million nodes of BACnet, and that number appears to be growing aggressively each year. What's more, based on the issuance of BACnet Vendor Identifiers, growth rate of manufacturers using BACnet is also increasing sharply, having passed the 500-vendor mark in February 2011.

Looking back at 2010 in general and the recent BACnet conferences in Las Vegas, we see a lot of activity in the development and continued refinement and expansion of the standard, as well as among new products. If products are any indicator, the AHR Expo show floor in Las Vegas was teeming with vendor support for BACnet, and not just among controls companies. Let's take stock of the changes and additions that have been published for BACnet in the past year, as well as standards activities that are ongoing within the BACnet Standing Standard Project Committee (SSPC).

Beyond administrative changes to the standard-like clarifications, error codes, new engineering units, and so forth, 2010 continued the strong pace of publishing addenda to the standard set in 2009. For example, the addendum 2008t defines various extensible markup language (XML) data formats that can be used with BACnet. This paves the way for greater flexibility and interoperability with data exchange, enterprise integration, and automated configuration and management tools. 2008y defines wiring and deployment best practices for BACnet Master-Slave/Token-Passing (MS/TP) network segments, particularly isolated segments used with electrically noisy devices such as variable-speed drives (VSDs). This will improve reliability and daily operation of BACnet networks that adopt these practices. The long-awaited addendum 2008w defines a collection of new "value objects" that greatly expand the data types available for data modeling using standard object types. This will provide for richer data modeling of all types of automation devices, resulting in easier access to formerly proprietary data and parameters, and easier implementation of gateway products for legacy devices. In all, there have been 36 addenda to the 135-2008 standard, some of which are still in public review and not yet published.

Working groups

The ongoing work within ASHRAE SSPC135 is exciting, and 11 working groups are meeting quarterly to pursue an agenda of expanding influence and scope. Generally, the end-product of these working groups becomes one or more addenda to the BACnet standard. The process involves mandatory public review periods for any substantive changes. Anyone may submit public review comments through ASHRAE, and there is a compulsory review and consensus response required by the SSPC. This assures that any problematic changes to the standard have received sufficient consideration prior to publication.

The Applications Working Group is developing a new concept for specifying based on functionality areas that represent groupings of features that are implemented by devices. Using Functional Area Building Blocks (FABBs), one can describe the functionality of BACnet-based automation components as well as their interoperability requirements. A new Functional Area Declaration Statement (FADS) is a means of documenting capabilities in functional terms. The group is tasking domain experts to apply these models to specific devices like electrical meters, VSDs, variable air volume (VAV) terminal box controllers, and so on, as a means of developing what could become standardized application profiles for common devices. These developments should greatly simplify the task of specifying interoperability using BACnet.

The Internet Protocol (IP) Working Group has developed a new network port object to represent local area network (LAN)-specific characteristics that are interoperably visible and changeable. The group has also been researching and developing a model for how to make use of IP version 6 (IPv6) technology with BACnet, in particular providing both IP address mapping and a well-defined use of IPv6 multicasting to replace BACnet broadcasts. This work lays the foundation for defining how BACnet should be used in emerging IPv6 infrastructures. Although most IP networks today are based on the older IPv4 technology, it is clear that over the next decade there will be a transition to this newer standard, so BACnet needs to be prepared.

The LifeSafety and Security Working Group has been developing a comprehensive data model for closed-circuit TV (CCTV) systems, focused on switching, data archiving, and camera motion elements. Once completed, this will allow for not only integration but native interoperability between CCTV systems and other BACnet devices in buildings.

The MS/TP Working Group has been working on a scheme for automatic assignment of Media Access Control (MAC) addresses requiring zero configuration. Configuration today is a largely manual process, so if a viable scheme can be devised for automating these operations it will be a big time-saver, and less error-prone. The group also has begun investigating large frame formats that could potentially enhance performance in some applications. This could be a boon to program and data downloading, which are common applications.

The Objects and Services Working Group has been focused on public review of addenda 2008ac, 2008ad, and 2008af. These addenda add a number of important new features to BACnet including long overdue clarifications about usage of dates and times in specific contexts. However, a key area that has taken a lot of time is 2008af, which represents a specific agenda of changes and improvements meant to address issues that were the result of two "alarm summit" meetings held in recent years. These summits managed to unify the view regarding how certain aspects of alarm detection and reporting should work, and will simplify and eliminate unneeded options and complexity from the existing standard. There are other expansion proposals before the SSPC that are waiting for these issues to be addressed in the standard, so their imminent resolution is big news.

The Lighting Applications Working Group has been working on public review commentary for multiple proposals including Lighting Output and Channel objects, and a new WriteGroup service. These will provide long-awaited enhancements to BACnet that are a big value to lighting systems. Lighting Output more closely models actual dimmable lighting controls and takes into account features that are common to architectural lighting, such as ramping, fading, and stepping. Many fluorescent ballasts today are using the Digital Addressable Lighting Interface (DALI) standard which includes these features, so having those capabilities in BACnet is a natural fit to DALI.

The Smart Grid Working Group has been working on positioning BACnet as an ideal interface between a utility and a building's BAS. The group has developed a data model for electrical meters. Taking a leading position in this initiative will assist building owners and operators who want to take advantage of Smart Grid opportunities.

The Elevator Working Group has developed a data model for use in elevator and escalator systems. Historically, elevator controls have been proprietary and closely held, greatly complicating integration. BACnet hopes to overcome some of those difficulties by incorporating data models that match common practice in elevator controls, and encouraging vendors of those systems to adopt native BACnet interfaces.

The XML Working Group has been working in two areas. First, it has revised the BACnet Web Services (BACnet/WS) addendum to provide a REpresentational State Transfer (REST) interface in addition to Simple Object Access Protocol (SOAP). This proposal is being developed into a draft publication. The REST approach is a technique that allows interaction between BAS devices in much the same way that humans would interact with a website using a browser. This is somewhat simpler than the SOAP method, which requires more complex programming. The end result is a wider range of types of

enterprise level software that can interact with BACnet/WS based servers, and ultimately BACnet devices. Second, the group is developing extensions to the BACnet/WS concept that would support some functionality that is desirable for Smart Grid applications.

The Information Technology (IT) Working Group has been developing some draft proposals aimed at defining the use cases that would be served by replacing BACnet Network Layer technology with IP, and some Application Layer functionality with other IT mechanisms (such as domain name system, or DNS, instead of BACnet dynamic binding). Although there is no consensus yet, some groups are concerned that as buildings becomes more "IT-centric" there may be advantages in terms of security, management, and maintenance to base more of the building automation system on IT technology rather than building automation technology. So these efforts are more forward reconnaissance in nature.

Fisher is president of PolarSoft Inc., Pittsburgh. He was a charter voting member of ASHRAE's Standards Project Committee 135P and has been active in the development of the BACnet standard (ANSI/ASHRAE 135-1995, 2001, 2004, and 2008) since its inception. He served as a voting member on the Standing Standards Project Committee-135 until July 2000; he remains an active participant and one of the principal authors. He is the co-chair of the Education Committee for BACnet International.

What does it all mean?

The alphabet soup of technologies used with BACnet can be overwhelming. But the most encouraging thing is that BACnet is not standing still. Evolution and change are central to the continuous maintenance doctrine of BACnet and important elements in its success and growth into allied disciplines and markets. The technology of communications and building automation has changed a lot since 1995, and BACnet has changed with it. This concept is at the core of BACnet's approach and protects our (product developers', owners', specifiers', and integrators') mutual stake in BACnet and devices that make use of it over the long haul.

With a rapidly expanding array of products from a large and growing number of manufacturers, BACnet is more than ever the leading choice for open and sustainable interoperability between devices from different vendors and across different disciplines. The BACnet community is obviously very active, and in today's economy, nobody's making frivolous investments. That means BACnet is a fertile ground supporting new growth and opportunities for expanding markets, and for delivering big returns on investment. There are a lot of cool new products and technology in the pipeline for BACnet.

Resources

Several websites provide insights and useful information, as well as background for specifiers. While they do not represent the official views of ASHRAE, they are nonetheless central points for locating informed news and material:

www.ashrae.org

www.ansi.org

www.BACnet.org

www.bacnetinternational.org

www.dali-ag.org/

www.oe.energy.gov/smartgrid.htm

www.w3.org/XML/