

# BACnet<sup>®</sup> International



## JOURNAL

Issue **16**

### This Issue

BACnet Applications



Global Testing of the Global Standard





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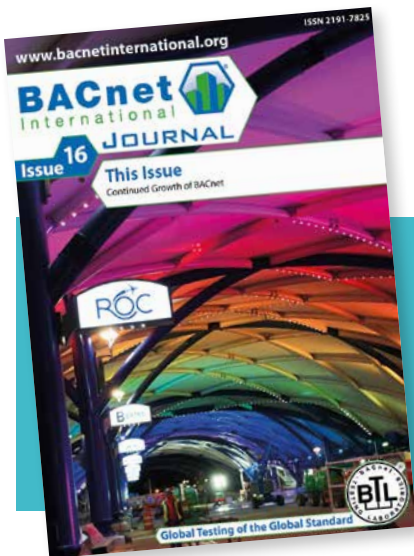
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# Benefits of BACnet Certification, the BTL Mark and Product Listing

Electronic systems communicate and coordinate their behaviors via protocols, which are literally languages with agreed upon descriptors and syntax that allow them to understand one another.

BACnet – short for Building Automation Control Network – is the standard communication protocol used by building automation systems and devices. Designed for openness and interoperability, the BACnet protocol is not proprietary; therefore it is open for any vendor to use. Not only is BACnet the industry standard communication protocol for building automation systems, it is actually an international standard (ISO 16484-5 and ANSI 135).

"That's the great thing about BACnet, we need systems to talk with one another between systems and vendors," says Tom Walker, Systems Design Specialist, Facility Automation Services, Penn State University. "The only issue is the way people implement it, and those differences can cause us problems. There is a big difference between being BACnet 'capable' and actually meeting BACnet Certification."

But how to certify compliance to the BACnet standard? Enter the BTL Certification Program.

## What's the BTL Certification Program?

In 2000, the BACnet community created BACnet Testing Laboratories, or BTL, a non-profit organization to address the need for independent interoperability testing and listing services for manufacturers of BACnet devices. A Listing and the right to use the BTL Mark were granted to those devices that successfully completed the rigorous testing. Concurrently, in the European Union, a similar program was developed that awarded a WSPCert Certificate when products completed rigorous testing. In 2017, the BTL Certification Program resulted from the merger of the two testing programs to provide a streamlined and unified experience for customers worldwide seeking BACnet product testing, certification and listing.

Certification testing is designed to validate that a product correctly implements a specified set of BACnet features. The scope of the test-

ing required for certification is dependent on the type of device being certified. The specific BACnet features tested in a product are detailed in the BTL listing associated with that product. BTL Certification applies to individual devices, and there is just one level of Certification (a device is either certified or it isn't).

Currently, there are four independent recognized BACnet Testing Organizations that perform the certification testing. (For more information on testing processes and locations, please visit [www.bacnetlabs.org/device\\_testing](http://www.bacnetlabs.org/device_testing).)

Once a product is certified via the BTL Certification Program, the supplier is provided with a Certificate of Conformance for that device, a BTL Listing (an entry on the searchable list of Certified BACnet products available on the BACnet Testing Laboratories website), and the right to use the BTL Mark. Use of the BTL Mark is a way for suppliers to visually indicate their products have successfully completed the industry testing.

### What is the BTL Mark?

The BTL Mark is a trademarked symbol that suppliers with BTL Listed devices can use directly on their products and in their marketing materials as a visual indicator of conformance with the BACnet standard. Only BTL Listed devices can include the BTL Mark. Use of the mark on certified devices is strongly encouraged because it is highly recognizable and meaningful in the industry as representing a high level of quality and the assurance that a product has passed the rigorous conformance testing.



## Benefits of Certification to Suppliers

For manufacturers, the rigorous testing methodologies associated with obtaining Certification often find implementation errors that can be corrected before a product reaches the market.

Suppliers also benefit by having an entry for each of their tested products on the searchable list available on the BACnet Testing Laboratories website. This database is frequently accessed by users looking for information on tested products. And the benefits go beyond the product listing. BACnet Certification improves customer confidence and is often driven by customer demand.

Josh Schulze, VP Technical Operations, Industrial Control Communications, Inc., "Having a BTL Certification instills confidence in a product for end users that the product will perform as expected and will be interoperable with equipment from other vendors. A BTL Certification also assures our customers that we care about our products and have gone through the time and effort to prove that our BACnet implementation is not only correct, but robust and interoperable. Because of these positive benefits that BTL Certification conveys, it has also been a great marketing tool for our products."

Brian Nicholas, Marketing Manager, ASI Controls Inc., "Historically we've negotiated design/build with owner-direct sales where BACnet Certification was not a necessity. With rapid growth in the plan and spec market, we saw the need to move toward securing BACnet Certification to align with industry protocol standards."

Along with achieving BTL Certification on their new controllers, ASI is also retroactively certifying legacy products.

Nicholas continues, "We believe all of our controllers should have the flexibility to interface efficiently across all industry protocols. It would have been much simpler to develop a brand new BACnet-only controller, but the long life expectancy of our products and our commitment to maintaining backward compatibility with legacy protocols influenced our decision to move forward with Certification of our existing controllers."

Nikki Henningsen, Marketing Manager, DENT Instruments, appreciates the benefits to both her company and their customers. “We manufacture power meters and work with a number of large, OEM customers, for whom we private label meters. Our OEMs require BTL Certification specifically as part of their launch process. We completely agree with the importance of certification. It gives our customers peace of mind knowing that our products have successfully gone through stringent testing to become certified. Like UL for safety, BTL Certification lets our customers know that our products will work flawlessly within their BACnet environments. We feel the BTL Certification increases customer confidence in our metering products and adds legitimacy to our brand.”

### And What About Third Party Manufacturers?

Customers who brand a supplier's BTL Certified products as their own can also use the BTL Mark. To do so, they need to apply for BTL Certification. They will need to work with the initial supplier to make sure all the correct forms are in place, and that both companies have signed off.

Again, Josh Schulze, ICC, Inc.: “BTL has a special OEM Product classification for certification of a product based on an existing BTL Certified product. Since our product, PicoPort, is BTL Certified, our OEM customers can easily receive BTL Certification and Listing for their products in which the PicoPort is integrated without requiring any testing. They simply need to complete paperwork and remit the certification fee, allowing them to release a BTL Certified BACnet MS/TP product to market in a matter of weeks, rather than months or years.”

For more information, visit [bacnetlabs.org/thirdparty](http://bacnetlabs.org/thirdparty) or email BACnet International at [info@bacnet.org](mailto:info@bacnet.org).

### What does BTL Certification Mean to Integrators?

BTL Certification provides an integrator or system designer with the assurance that the device will work with other BTL Certified devices. With the BTL Listing, users can go to one source to find information on tested products. For many, this listing is the primary research tool for BACnet product information.

Charles Benson, Controls Group Team Leader, AKF Group, “Our specifications reference providing a system that meets the latest version of the BACnet ANSI/ASHRAE Standard 135. We specify BACnet because it provides a level of open communications and because the majority of vendors we work with use it as a standard communication protocol.”

Benson continues, “Having BACnet Certification on control products provides a level of security to us and our clients. It is comforting to know that an independent agency is testing and verifying the Building Management System (BMS) vendors' claims that their products meet or exceed the Certification requirements as defined by BACnet and ASHRAE.”

Thomas Grimard, Associate Partner, Syska Hennessy Group, “Certification and submission of the Protocol Implementation Conformance Statements (PICS) are required in our specification. Since BACnet is an open protocol, it is important for consultants to not only specify BTL Certification, but to make sure documentation is handed over to the end-user when installation is complete to ensure that a technical understanding record of their “open” system is provided. Most commercial building users (95%) require BACnet products and are aware of BTL Mark and Certification.”

Grimard is looking toward the future as well. “BTL Certification, Data Standardization (pending ASHRAE standard 223P Designation and Classification of Semantic Tags for Building Data) and Cybersecurity (pending BACnet Secure Connect-SC\*) will be paramount in supporting the “reams of data” that next generation “open” systems will require to support IoT devices, building analytics, smart technology, etc. Open and secure low voltage systems facilitate interoperability and building operations!”

### BTL Also Benefits End Users and Building Owners

BTL Certification provides end users with the assurance that products have been independently tested and have successfully completed the rigorous conformance testing associated with certification. BTL Certification avoids additional time and cost caused by potentially discovering issues during integration, which can have significant impacts to schedule and budget. BTL product Certification decreases time to integrate, accelerates successful installations, and enables design flexibility without worry about compatibility. This can help avoid frustration, and also save considerable time and money during commissioning and routine maintenance.

### What are Some of the Hidden Benefits to BTL Testing and Certification?

There are capabilities that are designed into devices in building automation systems that many are not using yet. The emphasis here is on Yet. In the future, if system users desire to tap into those capabilities, and if the device is BTL Certified, the capabilities have already been independently tested and found to be compliant with the industry standard. This facilitates the expansion of current systems' capabilities in ways that may not have been foreseen in the initial design or commissioning. This can save both money and time in future expansions and upgrades, as the functionality is not only already built in, but tested.

### So, What's the Final Word on BTL Certification?

“As system integrators, we spec and commission projects as the owner's rep. We've been doing this a long time and started requiring BTL Certification a long time ago. Bottom line: BTL Certification makes all configuration, all testing, everything more predictable, and makes projects so much easier.” Mark Sankey, President, VS Energy

For more information on BTL Certification, testing, and for a searchable listing of BTL Certified components, refer to [www.bacnetlabs.org](http://www.bacnetlabs.org).

\*BACnet Secure Connect-SC is currently under development in the SSPC BACnet committee 🌐

Special thanks to: **ASI Controls:** [www.asicontrols.com](http://www.asicontrols.com) | **AFK Group:** [www.akfgroup.com](http://www.akfgroup.com) | **DENT Instruments:** [www.dentinstruments.com](http://www.dentinstruments.com) | **Industrial Control Communications, Inc. (ICC, Inc.):** [www.iccdesigns.com](http://www.iccdesigns.com) | **Penn State Physical Plant:** [www.opp.psu.edu](http://www.opp.psu.edu) | **Syska Hennessy Group:** [www.syska.com](http://www.syska.com) | **VS Energy:** [www.vsenenergy.us](http://www.vsenenergy.us)



“BACnet Certification saves money. The benefits more than compensate for the expense. Knowing your product plays well with other BACnet devices gives you the confidence to take on that highly integrated project you would otherwise be leery of. Knowing that you are integrating with other Certified products allows for better estimation of the total cost of the project. Finally, delivering the project on time and on budget makes for a very happy customer and that is immeasurable.”

Mike Osborne, Chair Standing Standard Project Committee 135 (ASHRAE SSPC 135, BACnet), Firmware Manager, Reliable Controls



# Building Internet of Things: Q&A with Andy McMillan

## Let's talk about the Internet of Things—and how it relates to Building Automation:

### What is the relationship between IoT (Internet of Things) and BloT (Building Internet of Things)?

The concept of IoT and the supporting technologies were developed and adapted with a focus on the consumer market. To the extent that building systems were considered, it was primarily in the context of residential applications. BloT, on the other hand, is precisely focused on the commercial building automation market. It uses the same technologies as IoT but applies them in ways compatible with commercial building equipment and systems. As a result, BloT gives building owners and operators the benefits of IoT while meeting the requirements of commercial building systems in terms of reliability, security and maintainability.

### How are BloT requirements different from consumer IoT requirements?

Consider a consumer device like Alexa. If it periodically can't reach the server, that's probably a minor inconvenience. You just get up and turn off the light yourself. But it's a different story in commercial and institutional buildings. There, the requirements for reliability and availability are far more demanding.

Another important difference in requirements is the approach to security and user interfaces. In consumer IoT it is acceptable, and in fact expected, that each device or subsystem will have its own app. So there is an Alexa app, a Fitbit app, a Nest app, and on and on. The scale and complexity of commercial buildings makes that approach hard to manage and hard to secure. Commercial building operators expect

an integrated building management system, not a collection of disparate apps.

In the same way, the building automation industry has spent the past three decades working to get rid of "islands of automation" — proprietary systems that don't talk to systems from other manufacturers. With the widespread adoption of BACnet, that goal is being accomplished. In the consumer IoT market, though, each major supplier is setting up their own, subtly incompatible ecosystem in an effort to create exactly the islands of automation we do not want in commercial buildings.

### How does BloT avoid the compromises inherent in using consumer IoT?

BloT is a very vendor independent ecosystem built on existing building infrastructure. It brings together building automation, IT and cloud technologies to meet the requirements of commercial buildings. BloT devices and systems incorporate technologies used in consumer IoT gadgets but they are part of the building automation infrastructure that provides interoperability, an integrated view of building systems and a secure connection to the cloud. This gives building operators the benefits of IoT while meeting their system requirements.

### How can the building automation industry leverage the growth of consumer IoT?

The core technologies in consumer IoT, such as wireless communications, intelligent sensors, natural language processing, cloud computing and others, are advancing rapidly. BloT incorporates those and therefore can capitalize on those advances and take advantage of the corresponding economies of scale.

### What are the biggest challenges that you foresee?

One of the biggest challenges will be the early adopter experiences with IoT in commercial

buildings. I expect people will apply consumer devices to commercial buildings because they are readily available. Some of those applications will likely have initial success, but then have problems — because they do not meet building systems requirements.

### Security is obviously a big concern. How do we address that with BloT?

Every connection from a device to the cloud is a potential security risk. Consumer IoT relies on a large number of suppliers managing their own security implementations utilized in their devices and apps. This creates a lot of potential vulnerabilities. BloT solutions built on BACnet will utilize a standard security infrastructure within the building and a single, managed interface to the cloud. The result will be a much lower risk profile. This approach will leverage the ongoing work in the BACnet committee addressing security and cloud connection technologies.

### How do you see the next few years playing out while we wait for the BACnet Standard to evolve?

I think early adopters will do what early adopters always do ... use whatever devices are available and build systems around them. In the short term that will include using consumer IoT devices. Those early systems will serve as testbeds and learning opportunities for the industry as it develops. To get beyond the early adopters, though, BloT needs to mature into a reliable, consistent platform that can be implemented with confidence. There will no doubt be people who say it will never happen and that building owner/operators will just have to live with the limitations of consumer IoT. But then, there were people who said BACnet would never happen, too. History suggests we should plan on a future built on BloT.



#### ABOUT THE AUTHOR

Andy McMillan is President and Managing Director of BACnet International, where he works with users and suppliers to expand and enhance the BACnet community. Previously he served as President of a building automation and energy management business unit of Phillips Lighting.



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#### Andy McMillan

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# A Celebration of SSPC History and Accomplishment

The history of SSPC began, officially, with a meeting regarding a proposed Standard for ASHRAE back in June of 1987. At that time it was called SPC 135, which stood for Standard Project Committee 135P (P for proposed).

In 1995, ANSI / ASHRAE Standard 135 was published. In 1996, Standing Standard Project Committee 135 (SSPC 135) was formed to interpret, maintain and extend the standard.

There is no doubt that the Standard can be called a success by all who use BTL-Certified devices. The idea of interoperability is largely lived out in successful Building Automation Systems and infrastructures large and small, compact and distributed.

As the Standard continues to evolve, Addenda and Errata bring us expanded capabilities verified and validated by the committee, and they

object that provides a writable string outside of Object\_Name and Device\_Type was also incorporated.

- New objects and services to support Access Control, Lighting and Elevators were added.
- There are many types of operator workstations that have been designed to meet the specific needs of Lighting, Access Control, Life Safety and HVAC. BACnet Profiles have been extended to include these diverse types.
- In all technical standards there are capabilities that are never incorporated or are no longer valid with changes in technology. As they are identified, these capabilities have been, and continue to be, deprecated by the committee.
- Several objects were added to improve the features a vendor can incorporate into products. These include trending of multiple values within a single log using the TrendLog Multiple object, the Notification Forwarder object to allow simpler devices to add alarming capabilities, and the Timer object that allows an interoperable method to support a countdown timer.
- Interoperable configuration of the diverse set of communication ports supported within BACnet was completed with the addition of the Network Port object.
- The ability to log any changes to a BACnet system was added with the addition of auditing objects and services.
- The evolution of technology resulted in the addition of BACnet Webservices with RESTful services and the deprecation of SOAP services.
- Last, and surely not least, was the addition of IPv6 into the standard.

The committee continues to add new addenda to the standard that will further improve existing capabilities and add new ones. The committee has no less than eight addenda in various stages from “in development” to “ready to publish”. This work includes adding a new security mechanism that incorporates the latest security requirements as well as incorporating semantic tagging methodologies. »



## The Growth of the Standard

A working Standard is, by its nature, a living document. Some changes have been extremely practical. Other changes and developments are more aspirational, showing a course that is being directed toward a future that we all desire to see – with increased capabilities, wider adoption, and even ahead-of-the-curve promotion that puts us in a leadership position to define technology rather than one of reaction to directions and actions that the fast pace of technological advancement and impatient development is already taking us.

In the beginning, the Standard’s intent was to align reasonable and best-use cases into a single language and protocol that ensured open understanding and enabled interoperability across many vendors. Our ongoing tests and interoperability workshops show that no document – however specific – can ensure successful implementation without proof of conformance via testing.

Of course, the Standard moves on, with the ongoing development and maintenance required to include technology that is moving on too. Technology and use cases evolve at lightning speed, and Standards, by their nature, are often in perpetual catch-up mode, trying to create guidelines for a future that is already creating itself.

range from the obvious to the future-reaching, both of which are necessary in building Standards. There will always be a need for addressing gaps as they are created or discovered, and there needs to be a way to look forward in the direction of what is to come and the challenges that we will need to be prepared to face.

We asked Michael Osborne, SSPC 135 Chair, to identify a number of additions to the standard from the past 10 years or so that should be recognized here.

## Highlights of Addenda to the Standard since 2008

This list is a small subset of a very long list of addenda that have been completed in the last 10 years. This list includes changes that have helped to extend or improve existing capabilities in the standard as well as extend it beyond the traditional HVAC industry.

- The methods used to configure and deliver alarms and events was completely revisited resulting in significant changes to clarify, improve and enhance usability and interoperability.
- Simple value objects, such as Large Analog values to allow very large values like kilowatt-hours to be incorporated into BACnet, and the CharacterString Value

### Those Tasked to Maintain and Extend

The official SSPC 135 committee includes a variety of stakeholders, including suppliers (vendors), users, consultants and liaisons currently totaling 34 members. Perhaps less well known is that all Committee meetings are open to anyone and participation is encouraged.

As a community, we are grateful to those who have been and remain involved, not only in crafting the Standard from the building blocks of current use, but also those who explore the future of what-ifs and what-about, that need to be considered and perhaps accounted for as we look ahead to the directions technological evolution will be heading. It is this intensive and expert creative and technically precise effort that makes our work, work.

The productivity and longevity of SSPC-135 is worth celebrating. For the success of Standardization, ASHRAE 135 (which led to ISO and international adoption, as well as a Companion Standard for Conformance Testing, ASHRAE 135.1); for the ability of the committee to address open issues (those exposed during current and past use); and the ability to look forward with curiosity to where the standard is headed, what capacities will be needed and what directions we want to be ready to address. This ongoing development, deliberate and creative thinking will allow us to remain relevant and integrated into new technology. And – with this forethought – we'll be more prepared to address interoperability challenges as our market expands and shifts in scope and scale, including technologies not even imagined when the committee began.

The Editors want to thank Michael Osborne, SSPC 135 Chair, Duffy O'Craven, former BACnet Testing Laboratories (BTL) Manager, along with other current and former members of the SSPC 135 for their invaluable input and insight. In addition, some dates and references were obtained from [www.bacnet.org](http://www.bacnet.org). 

# Trusted BACnet Router Now with Diagnostics and BTL



The popular BASrouter, a multi-network router, is now BACnet Testing Laboratories (BTL) listed and provides enhanced diagnostic capabilities for improved troubleshooting.

- Versatile stand-alone routing between BACnet networks
- Graphically view MS/TP devices, status and errors
- BTL approved for B-RTR and B-BBMD device profiles

**BASrouter**

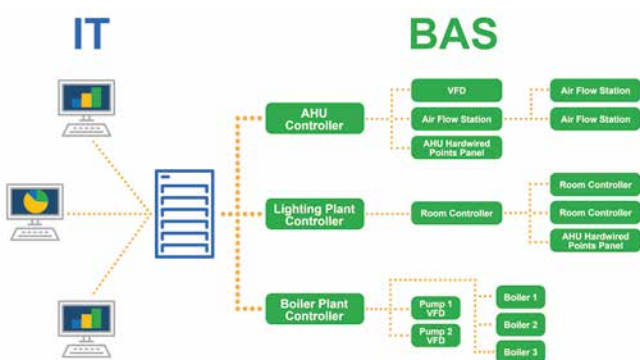
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# Leveraging IT in a BAS Implementation

Historically, the IT and Building Automation System (BAS) infrastructures have been two separate systems. However, web technology and recent trends in building automation have disrupted these two traditionally autonomous infrastructures by requiring a more holistic approach in BAS design. Now, due to these advancements, devices within a BAS can be connected to a centralized server, allowing for easy accessibility to monitor and manage key control functions, ranging from HVAC to lighting, from access control to elevators. (Note, in some cases, there may be separate servers for specific systems).

Leveraging the IT infrastructure makes a Networked Controls BAS possible. It also provides significant cost savings, since acquiring and maintaining BAS dedicated equipment, such as servers, workstations and cabling, is no longer necessary. However, while facilities management will still maintain responsibility over the equipment and devices within the subsystems of the BAS, IT will now assume control over several key elements of the BAS. It is important to understand what this means in regard to equipment and IP connectivity.



Leveraging the IT Infrastructure eliminates the need for facilities management to acquire and maintain BAS dedicated equipment such as servers, workstations and cabling. © BACnet International

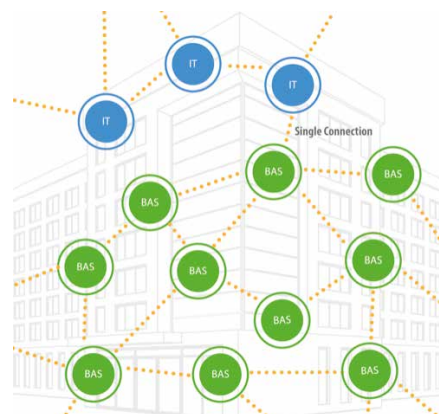
Servers, switches and other related equipment will be supplied by IT, not facilities management or the BAS vendor. This equipment will be secured by IT in rooms using a security access system in order to avoid open network connections in public areas. Maintenance of the operating systems and related server software will be completed only by IT as well. To avoid unmaintained computers and private networks devices, IP addresses should be assigned by IT.

While physical access to equipment will be controlled by IT, IT will also mandate strict login and password policies for users. Every user will have his/her own credentials; sharing will be prohibited.

For cabling, the BAS must follow IT cabling installation standards. To ensure this, specify that Ethernet cabling be installed by professionals in the Communications Trade, while the BACnet MS/TP and Modbus network cabling should be installed by the building controls contractor. BAS vendor network installation and maintenance should be contained to field buses only.

Ultimately, adherence to IT protocols and standards helps protect the system, and avoid costly system interferences and failures. To help IT ensure security of the system, the BACnet standard is being revised to include BACnet/SC (Secure Connect). This adds a measure of security to BACnet devices and will be welcomed by IT. However, the success of leveraging the IT infrastructure is not reliant on just best practices and protocols. Collaboration is key.

Since the BAS represents a small fraction of the IT network, and by design, BAS devices are managed differently than a typical computer or printer, IT may be reluctant to add the BAS to the enterprise network. Collaboration with IT at the onset of a BAS implementation project will not only ensure effective communication of responsibilities, but also provide an opportunity to voice concerns and recommendations. By initiating a collaborative partnership with IT from the beginning, constructive planning and implementation



BAS devices should be on a virtual subnet with one connection to IP backbone. © BACnet International

as well as responsive support following project completion is achieved.

**Would you like to learn more about how to achieve a more successful BAS implementation?**

The BACnet Institute now offers the **Facility Manager's Guide to Building Automation Systems** course. This course discusses not only IT considerations in design and implementation of a BAS, but also the principles of a BAS design, effective procurement best practices, as well as the benefits of streamlined facilities management using a Networked Controls design model.

To access this, as well as many other BACnet-related resources, visit [The BACnet Institute](http://TheBACnetInstitute.com). Registration is free!

## ABOUT THE AUTHOR

Grant Wichenko is President of Appin Associates and a Professional Engineer.

He is a member of:

- ASHRAE SSPC-135 (BACnet committee – voting member)
- SGPC-13 (BAS Guideline Specification committee – voting member)
- ASHRAE 201P (SmartGrid committee – member)

Appin Associates was the first Engineering firm in the world to join BACnet International in 1999.

© G. Wichenko



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# BACnet Plays Critical Role in HVAC Training Programs

Because BACnet is the most popular protocol for building automation and control, today's HVAC students are introduced to the ASHRAE standard early in their education. The original intent of BACnet was to define a common protocol over which control equipment could effectively communicate regardless of the vendor of the equipment or the services the equipment provided. That concept continues to be relevant today with HVAC students learning the benefits of an open building automation protocol and open freely-programmable controllers. With the growing emphasis on smart buildings to reduce energy and greenhouse gases, more HVAC technicians will be needed to maintain these sophisticated buildings. Their understanding of BACnet will be important.

The Building Efficiency for a Sustainable Tomorrow (BEST) Center was created to support HVAC training. Sponsored by Advanced Technological Education grants from the National Science Foundation, this national collaborative promotes state-of-the-art building technician education and dissemination of the latest research, technology, and industry collaborations in energy

efficient buildings. The BEST Center supports publicly-funded two- and four-year colleges with programs in heating, ventilation, air conditioning and refrigeration (HVAC/R), controls, building automation, and energy/facilities management.

This excerpt from the Building Efficiency for a Sustainable Tomorrow (BEST) Center mission statement best summarizes the importance of HVAC training to support the innovation in building automation: "As more existing buildings are retrofitted, and stringent environmental regulations are established for new buildings, demand is also rapidly increasing for highly-trained technicians to operate and maintain technologically-complex, 'high performance' buildings. In turn, education and training must prepare technicians to manage multiple building systems including HVAC/R, lighting, building automation, energy management, security, and indoor air quality. Technicians are also becoming essential to ensuring occupant health, energy conservation, and financial savings."

The BEST Center addresses these critical needs by providing model curricula, professional development for instructors, and disseminating

research to those in HVAC technician education. This is accomplished by leveraging resources from schools, non-profits, industry, and government.

To support quality HVAC programs, Contemporary Controls has worked with several colleges affiliated with the BEST Center to create a classroom experience that mimics the real world. The College of DuPage (COD) in Chicago's western suburbs is one of the more than 70 college affiliates and research partners of the BEST Center. COD has a successful curriculum for HVACR education offering associate degrees as Service Technician, Contractor and Facility Maintenance Mechanic. According to COD, "the HVACR industry is among the top 30 growth occupations in the United States, with reports of some seasoned technicians earning more than \$100,000. COD graduates are in demand in the public and private sectors." For those unable to commit to a two-year program, certificate programs are available for HVAC repair and building automation systems. Bennet Levine, Contemporary Controls' Technology Officer, serves on COD's HVAC Advisory Council.



A BEST Center training program at Laney College, Oakland, California

© Contemporary Controls

According to Bob Clark, HVAC Program Coordinator, "the demand for HVAC technicians is so great that many students receive job offers before completion of their degrees."

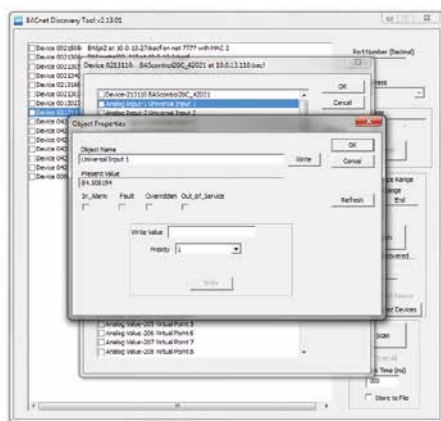
At their annual institute held at Laney College in January 2018 where HVAC school instructors from the various affiliates meet to learn and share experiences, Contemporary Controls donated a unitary controller to each instructor to take back to their schools. COD's Bob Clark then familiarized the instructors on how best to use the controllers for classroom training by making them power up the controller, configure the IP address and then create a simple thermostat application on the controller.

The controller is a BACnet/IP server that communicates over Ethernet thereby allowing the class instructor to observe what each student is doing by having all controllers interconnected to Ethernet using Ethernet switches. The controller is freely-programmable where components can be dragged onto a wire sheet and interconnected to create applications. Each student can download a free copy of an editor. Although each physical I/O point on the controller can appear as a BACnet analog input (AI), analog output (AO), binary input (BI) or binary output (BO) with real data to a head-end, the student can create a "soft-point" such as an intermediate calculation or setpoint and bring it out to a BACnet AV for head-end monitoring. This way the student learns the difference between physical points and what we call virtual points.

With a new controller, the student must first configure its BACnet device properties by directly connecting an Ethernet cable from the student's computer to the controller without any other devices connected. Upon power-up, the controller assumes its default IP address, so the computer must be on the same IP subnet as the controller. Using a standard web browser, the IP address is entered, and the configuration screen is accessed. On this screen, the student is taught to enter a unique BACnet device instance, a unique BACnet device name and configure the BACnet UDP port number. The instructor will establish rules for BACnet assignments and IP addressing so that all controllers can join the same network without conflict. Once BACnet device assignments are made, the controller is rebooted and connected to the class-wide network.

The student can now return to the controller and again using a browser make BACnet object assignments. With the controller, object instances for points are

pre-assigned but the student needs to configure each point for object name, object type, object description, and units. Universal inputs require additional configuration because they can be a binary point, analog point, or a temperature point. What the student learns from this process is that objects have properties.



BACnet Discovery Tool  
© Contemporary Controls

Since the controller is a BACnet/IP server that only responds to requests, we need a BACnet/IP client such as a BACnet supervisor or head-end to initiate the request. Instead of introducing more complexity, we provided a BACnet Discovery Tool (BDT). BDT is not a head-end but can serve as a crude head-end for purposes of training. BDT is a windows-based program that can operate from the student's or instructor's laptop. Through the computer's Ethernet or Wi-Fi port, the student or instructor can "discover" all the BACnet devices on the network and once discovered, determine all the objects within each device.

Connecting BDT to any point on the Ethernet network, the student first discovers all the devices on the network by conducting a search. All devices found will show their BACnet device instance, IP address and BACnet device description. From a discovery of all the BACnet devices, the student selects his or her device. Double-clicking the device leads to a screen of all objects including the device object. Double-clicking the device object leads to a screen that lists the objects in the device and the services

supported by the object. At this point the student gains a better understanding of the device and its capabilities.

The student can select any of the other objects to see the present value of the point. If it is a writable point, the value can be changed using BDT. Any or all points can be scanned by BDT allowing the students to observe how inputs and outputs from the controller can be observed with this simulated head-end. Using this simple head-end simulator, the student can gain an appreciation of how BACnet works.

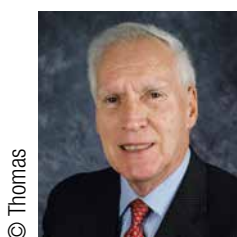
It is not the intention of this HVAC training to make BACnet experts out of these students. These students have other subjects to learn such as basic electricity, understanding sensors and actuators, introducing them to control, how to wire panels, and how to operate equipment safely. However, with a basic understanding of BACnet, they can begin to understand how multiple controllers in a building communicate with a supervisor to create comfort while saving energy.

HVAC training budgets are tight, so the use of low-cost controllers and free training tools are extremely important.

Today's HVAC students are faced with understanding sophisticated building automation equipment, but with a basic knowledge of BACnet the student gains insight on how everything fits together to make a smarter building.

#### ABOUT THE AUTHOR

George M. Thomas is president of Contemporary Controls which designs, manufactures and markets automation products worldwide. Mr. Thomas received his BSEE and MSEE degrees from the Illinois Institute of Technology in Chicago, Illinois. He is a life senior member of the Institute of Electrical and Electronic Engineers and a senior member of the International Society of Automation.



© Thomas

**George Thomas**  
President | Contemporary Controls  
info@ccontrols.com | www.ccontrols.com

**CONTEMPORARY**  
**CONTROLS**

# Direct Expansion Systems into BACnet

For the last several years, Air Conditioning Direct Expansion systems have become more and more popular for small and medium projects. Considering that electric energy costs related to climatization systems is estimated to be around 40% for these scenarios, controlling and monitoring those systems becomes one of the most significant points when talking about energy efficiency and cost control. BACnet offers a great opportunity for home and building management systems to create energy efficient scenarios through integration with Direct Expansion Systems.

## Energy efficiency

When talking about energy efficiency, some people tend to think about big companies or manufacturing plants as being the majority of energy consumers. In truth, they represent only around 30% of the total globally; so considering how our homes, offices and stores are managed in terms of energy consumption should be of interest.

The latest regulation changes in most countries focus on energy consumption, efficiency and sources of energy that are to be used in each new building construction and/or retrofit. On the one hand, all these changes are made on the basis of offering customers the most efficient and long-term cost-effective solution. On the other hand, governments and citizens are becoming more conscious of environmental issues and how the impact on the planet can be reduced. It is not just a matter of money, but society and the environment as well. Therefore, there is a real requirement for control and management of all systems involved in every single building or home.

Another topic to consider beyond the demand for heating spaces, cooling spaces and/or heating water, is the technology used behind that. There are many ways to generate heat or cold, so it is important to select the most appropriate solution for projects in terms of initial costs, running costs, maintenance costs and efficiency.

## Direct Expansion Systems

There are many types of climate control systems: central heaters (gas or oil), electric heat-



Improving customers' comfort with Direct Expansion AC systems and BACnet controls

ers, fan coils, and more. But one of the latest systems to appear is Direct Expansion. Direct Expansion Systems are based on the use of a special refrigerant liquid that transports the required cool or heat to the unit in charge of heating and/or cooling the air. Use of this technology, along with inverter systems, provides a very efficient solution.

The main advantages of these systems, with respect to traditional systems, are:

- Improved efficiency
- Easier installation
- Lower installation costs
- Lower maintenance costs

Moreover, these systems usually allow for direct control of many specific parameters of the system, offering great flexibility and control on the climatization stage. Nonetheless, it is also important to keep in mind that this is a solution mainly used on small or medium integration projects (homes, offices and stores).

## Control and Monitoring from BACnet

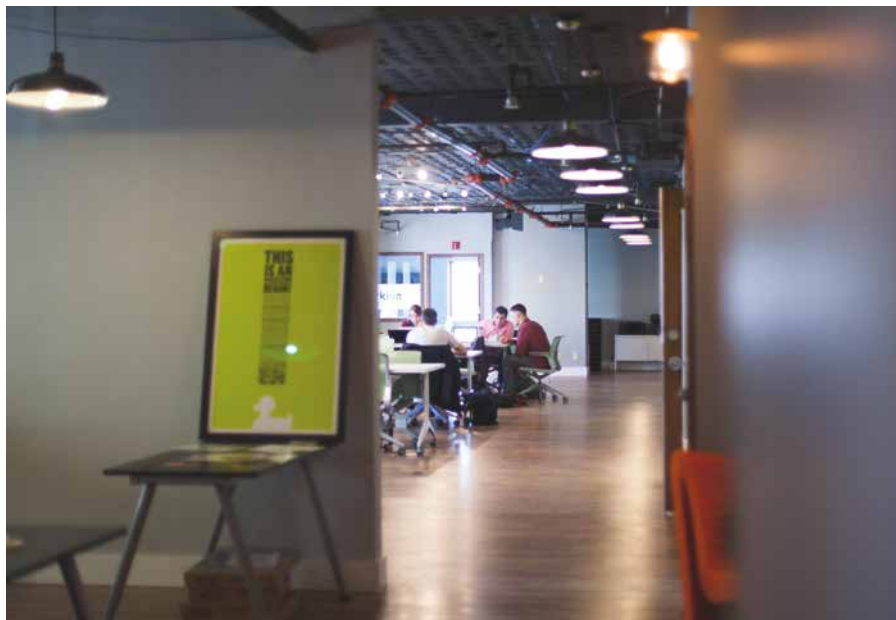
As many studies have demonstrated, having the right temperature setpoint provides large savings in terms of energy and budget.

But it is not only the setpoint temperature. Depending on the region, external temperature, time of the day and many other parameters, systems can provide a good trade-off between comfort and expense. In order to control these parameters and adjust the system to do so, it is important to communicate between all elements in the system.

As mentioned previously, it is important to centralize all information from our home or building into a management system capable of managing all this information and providing smart solutions for daily needs. Under this scenario, BACnet is a reliable and powerful solution.

BACnet offers interesting native features, such as calendars, schedules and notification classes. With these features, buildings can be automatically controlled with predefined schedules that match usability and occupation, react to specific scenarios, offer direct control of customers at any moment and assist the maintenance team.

Another important point is how extended BACnet is. For instance, we can have sensors, actuators, control panels, and protocol converters integrated with other building protocols and more. Thanks to all this, there are many devices in the market offering important information and control over BACnet based building systems.



Expenses under control thanks to the integration of Air Conditioning systems

© Intesis

## What's next?

Currently, there are plenty of integrations in progress and already running that provide specific and effective solutions for large installations. Nonetheless, small and medium projects remain one of an integrator's main goals and markets.

The prospect of new and stronger regulations regarding energy efficiency provides an interesting scenario for the inclusion of smarter solutions for small and medium homes and buildings. Stronger requirements may be achieved through the combination of Direct Expansion Air Conditioning systems and control on single units through specific devices. Therefore, expenses on the installation may be easily compensated with the savings provided by the use of such solutions.

## Air Conditioning integration

Integration of air conditioning systems into any management system is a process that includes, or takes into consideration the following:

- Improvement of energy consumption
- Improvement of the customer's comfort
- Easy integration
- Cost-effective solutions
- Control over the most significant signals:
  - On/Off
  - Mode
  - Set Point Temperature
  - Fan Speed
  - Vane Positions
  - Room Temperature

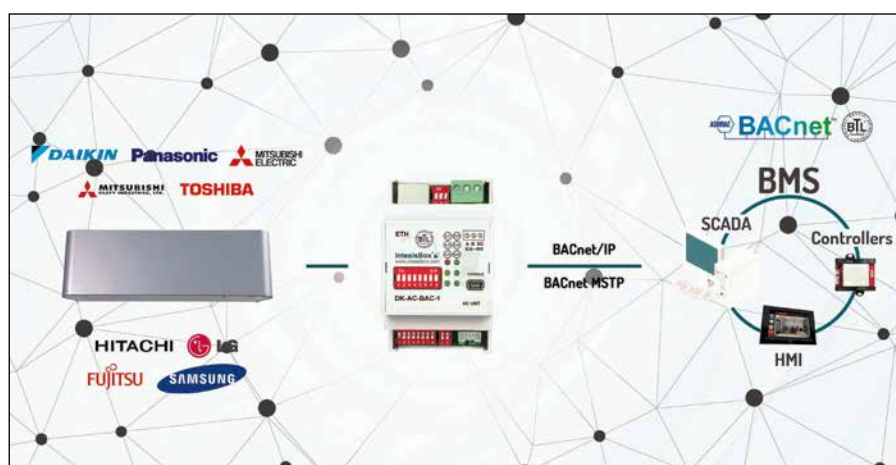
Standard solutions for large installations include expensive equipment based on IP networks and direct connection to centralized control of the air conditioning units. Nonetheless, as mentioned, small and medium installations are also a very important field to cover. In such cases, those standard solutions may not be appropriate or in budget, so something else needs to be considered.

IntesisBox, for instance, offers a large range of BACnet gateways to integrate **single Direct Expansion AC units** for the most popular AC brands.

In both cases, configuration of BACnet IP and BACnet MSTP is quite simple. On BACnet IP mode, the gateway provides an embedded web site to setup all the necessary parameters and provides a useful signal viewer that allows read and write of all the BACnet communication

objects to help testing of both control sides: the air conditioning system and the BACnet control. On BACnet MSTP the Intesisbox BAC-1 gateways can be configured in the field using DIP Switches without requiring any PC.

Over the next few years, there will be an interesting horizon for integrators working with Direct Expansion systems and its integration into any Building Management System, but especially on those running BACnet.



Air Conditioning system integration into BACnet control and managing systems

© Intesis

## ABOUT THE AUTHOR

Pere Mindan is Product Manager at Intesis, which designs and manufactures gateways for multiprotocol communication as well as specific interfaces for Air Conditioning integration. Pere is helping customers offering support and bringing solutions for home and building automation mainly based on BACnet, Modbus and KNX, among others.



© Mindan

### Pere Mindan

Product Manager | Intesis Software S.L.U.  
 pmindan@intesis.com | www.intesisbox.com

**Intesis**  
 Member of the HMS group

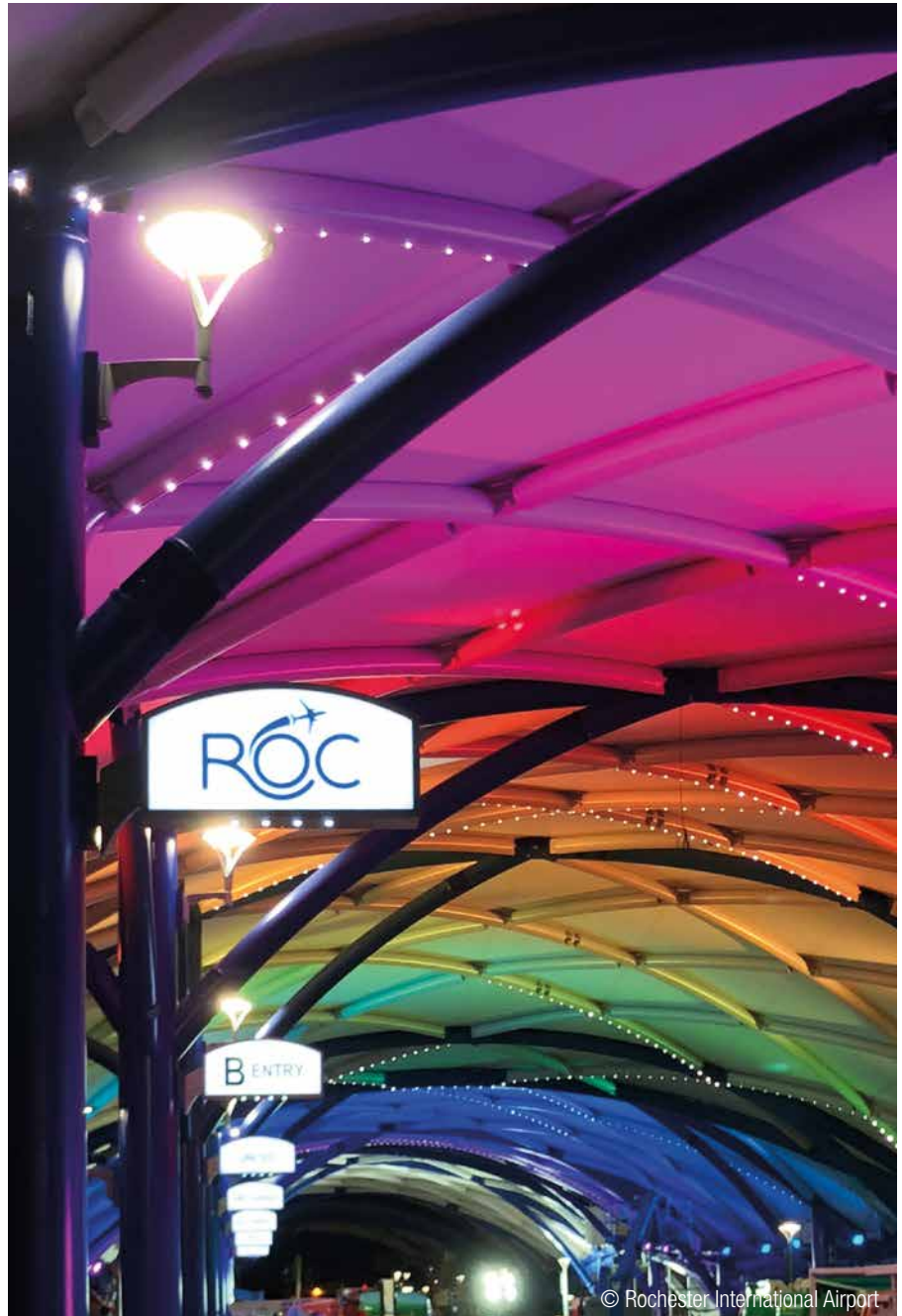
# New Technology Takes Off with BACnet at the Greater Rochester International Airport

**Background:** VS Energy has been engaged since 2011 with Monroe County, New York as a specialty consultant designing control system upgrades from proprietary systems to BACnet based control system architecture. Beginning with the original project in 2012, all specifications have carried the requirement for BTL listed products exclusively, or alternatively for documentation that products had been submitted to BTL for testing. The County of Monroe has transitioned to use of BACnet products for all new projects as well as retrofit projects. Based on the prior positive experience of the County, VS Energy was engaged for the design and construction administration of key technology improvements at the Greater Rochester International Airport Terminal Improvements Program.

**Project Scope:** VS Energy was engaged as a specialty design sub consultant by CHA Consulting Inc., to perform engineering design of the BACnet DDC control system for the Greater Rochester International Airport located in Monroe County NY in March of 2017, to be completed by October 2018. The initial project scope included the DDC control system, the BACnet Energy Dashboard, integration of BACnet Chillers, variable speed drives and BACnet Lighting Control Panels. Once engagement began on the project, additional scope items were added to include an innovative lighting retrofit providing a visual system for communicating gate and flight status, and associated control system prototyping.

In addition, a wayfinding App (ROC View) and new network infrastructure engineering were designed, administered and commissioned.

**Environmental Mechanical and Controls Design:** As a specialty subcontractor for the BACnet controls, VS Energy provided significant design input for the upgraded central chilled water plant. The conversion of the primary chilled water plant from chiller adder configuration to true Primary / Secondary pumping with variable speed chillers, primary pumps and secondary pumps significantly reduces chilled water generation cost and pumping horsepower requirements, while providing constant 42 degree chilled water to each chilled water coil for proper building dehumidification. The



control system was designed with the final startup and commissioning plan in mind according to the ASHRAE 2005 guideline. The Control System design specified BTL listing requirement for all controllers, including BACnet Advanced Application Controllers (B-AACs), BACnet Building Controllers (B-BCs), BACnet Application Specific Controllers (B-ASCs), and workstation software. BTL listed variable speed drives were specified as well as BTL listed drives for 18 variable speed pumps and 7 major air

handling systems. NIST traceable temperature sensors for liquid and air temperature were specified throughout to reduce measurement error, especially for the primary chilled water system and chilled beam dewpoint control. The BACnet DDC Control system integrates the 4, 450-ton Daikin Chillers, and the ABB variable frequency drives to provide additional monitoring and alarm data. Lighting control and dimming for the non-color-changing lights and outdoor lighting is controlled via Blue Ridge



© VS Energy

Idle gate holding area

Technologies BACnet controllers, integrated to the Alerton OWS. All BACnet data (analog input, analog output, binary input, binary output, as well as controller output and device feedback) is trended continuously at a 5-minute sample rate. This amount of trending may appear excessive, however, for this project it has been useful not only for commissioning purposes and control loop tuning, but also forensic troubleshooting.

**First-of-Its Kind Gate Holding Area Lighting Status Indicators and Gate-Status-Based Environmental Control:** The gate holding area lighting was redesigned by VS Energy based upon the owner's request to be able to use the ceiling lighting in the Gate Holding Rooms (areas where passengers wait to board) for visual indication of activity and flight status at the gate. This first of its kind concept uses active visual indication of holding area status and is especially important for deaf or hearing impaired travelers as well as travelers who regularly use in-ear audio devices (such as earbuds for smart phones, tablets, etc.) who may otherwise not be aware of gate activity through typical audio announcements. All data regarding flight information is routed through the Flight Information Display System (FIDS), the system that feeds the visual display boards showing flight numbers, departure/arrival times, gate numbers and status. The active lighting system was designed such that the Flight Information Display System (FIDS) data is integrated into the new BACnet System to initiate specific lighting scenes in

each gate based on flight and activity status. Different visual cues (light color and display pattern) were designed to indicate different gate statuses such as active gate, idle gate, instances of audible paging, and emergency situations. Prior to final design, VS Energy constructed a working prototype system including serial driver, DMX controller and multiple retrofit kits to prove concept viability. After acceptance of proof of concept, a complete retrofit package for the existing light fixtures was designed instead of requiring replacement of the current fixtures. Retrofitting resulted in significant cost and labor savings of approximately \$500,000. Each retrofit kit uses a constant voltage DMX decoder and 277/24v power supply, is individually addressable, and can be controlled through the DMX controller.

The retrofit kit design was submitted to Edison Testing Laboratories (ETL) by the manufacturer, Energy Solutions International, and approved to be marked with the ETL mark. The automation portion of the DMX lighting control is provided by an .XML data feed from the FIDS system, which provides gate number, gate status (idle, active, boarding, delayed) and paging status. The .XML data is converted to a serial string command to index (activate) the gate holding lighting scenario corresponding to the gate status. After the hold room lighting was demonstrated, the owner requested that notification lighting on vertical columns reflect the same visual gate status color and pattern indicators as the overhead lights. This will enable easier line-of-sight gate status awareness. The gate column »



Main Alerton Graphic Screen for the Greater Rochester International Airport



© VS Energy  
Daikin Magnetic Bearing Variable Speed Drive Chillers

lighting was completed in October 2018. Automated paging is synchronized with lighting and visual messaging on monitors at each gate. Integration of T-Coil hearing loops with overhead paging is installed to selected gate zones for additional hearing impaired accessibility.

The .XML data and serial converter used for the gate holding lighting scenes is integrated with the BACnet server to perform Demand Control Ventilation (DCV) functions in gate hold areas. When gate status is indicated as idle by the FIDS, the BACnet DDC system decreases the minimum air flow requirements of the VAV boxes

serving the respective hold rooms to a reduced flow rate, reducing the fan horsepower and ventilation air requirements. Ninety minutes before flight departure (as indicated by the FIDS data) the gate indexes from idle to active status, which changes the hold room lighting scene and the DCV minimum ventilation rate to active mode. This status-based ventilation change significantly reduces unnecessary energy usage.

"Our BACnet Control system has provided us with the ability to connect previously separate systems and functions into a smart facility, monitoring data feeds and reacting to them" stated William Johnston, Project Manager for Greater Rochester International Airport. "Flight information is the main business we support and now we are able to deliver customer-based needs with lighting, information, security, safety and customer experience enhancements. The business of operating the mechanical system that supports the building operation has been improved with the interface, providing easy to operate and functional controls. Facility-wide energy consumption has seen significant reductions of over 30% compared to pre-installation. This work scope has not to our knowledge ever been done anywhere before."



© VS Energy  
Alerton AAC - Advanced Application Controller with expansion modules for the central chilled water plant

**Additional Success Resulting from Project: ROC View Passenger Information System:** VS Energy performed conceptual design, prototyping, final design, construction administration and commissioning of the new ROC View app. The App is the first of its kind which allows travelers within the airport to view live gate cameras directly from their cell phones. The app also provides wayfinding maps to help travelers navigate efficiently to their departing gates, as well as view other concourse amenities such as rest rooms, food services, recomposure scales (areas to weigh bags prior to check-in and reconfigure as necessary), children's play areas, and pet relief areas.

**Network Design:** As a component of the terminal improvements project, VS Energy completed the design, construction administration, and commissioning of new fiber and POE Ethernet for the terminal facility. This project included new 48 pair single mode fiber backbone, switches, wireless access points, new gate technology racks at each gate to support current and future network requirements, complete labeling and demarcation of all media, and complete documentation of all networks and testing results. Not a common use system for airline use today but ready for the next steps and plenty of capacity new technology to come.

**Next Steps:** The energy data from the BACnet control system at the Greater Rochester International Airport will be added into the Monroe County Energy Dashboard, a BACnet based analytics tool that performs period over period analysis of building performance, calculates energy budgets, and integrates International Performance Measurement and Verification Protocol (IPMVP) based measurement and verification tools. The Energy Dashboard is used by Monroe County to monitor and assess building performance on an ongoing basis. 🌱

Copyright Images: VS Energy and Rochester International Airport

**VS Energy**  
info@vsenergy.us | www.VSEnergy.us



# New to the BACnet International Family



BACnet International is the global organization that encourages the successful application of BACnet through interoperability testing, educational programs and promo-

tional activities. BACnet International complements the work of other BACnet-related groups whose charters limit their commercial activities.

BACnet International community membership includes a who's who list of top tier companies and industry professionals involved in the design, manufacturing, installation, commissioning and maintenance of control and other equipment that use BACnet for communication.

We are proud to welcome the following new members to BACnet International.

## Silver Member



### Automation Components, Inc.

Automation Components, Inc. (ACI) designs and manufactures quality building automation sensors that optimize the energy and operational efficiencies of commercial, industrial, or residential buildings. Their product lines provide reliable and economical application solutions for Temperature, Relative Humidity, Pressure, Current, Gas, Wireless, and Interface Devices. ACI's state of the art facilities and ISO9001 Certification allow our staff to calibrate different product lines in a controlled environment tuned to ensure repeated quality.

2305 Pleasant View Road  
Middleton WI  
United States



### Armstrong Monitoring

Armstrong Monitoring manufactures gas detection and hazardous gas monitoring equipment. They are committed to ensuring safer environments, healthier air, and reduced environmental impact. For nearly 35 years they have helped clients adapt to the growing demands of both the gas detection and monitoring industry and the environment. Driven by a philosophy of "innovation through application", they design and manufacture a highly versatile product line using the most reliable sensing technologies available.

215 Colonnade Road South  
Ottawa, Ontario, K2E 7K3  
Canada

## Corporate Affiliate Member



### ETM Professional Control GmbH

ETM develops the SCADA system SIMATIC WinCC Open Architecture. SIMATIC WinCC Open Architecture forms part of the SIMATIC HMI range and is designed for use in applications requiring a high degree of client-specific adaptability, large and/or complex applications and projects that impose specific system requirements and functions.

ETM's solutions are particularly used in the areas of traffic, water, energy, oil & gas, building automation industry as well as research.

Marktstrasse 3  
7000 Eisenstadt  
Austria



### Wago Innovative Connections

Founded in 1951, WAGO specializes in electrical interconnection, industrial interface modules and automation products characterized by the original spring pressure connection technology. Its business is across Europe, North America, Latin America, Asia as well as other countries and regions. WAGO success originated in 1951, as the invention of the first spring clamp technology completely broke the traditional thought pattern of conductor connection.

Hansastraße 27  
32423 Minden  
Germany

# Member News



## Gold to Platinum



### Johnson Control

Johnson Controls is a global diversified technology and multi industrial leader serving a wide range of customers in more than 150 countries. Our 120,000 employees create intelligent buildings, efficient energy solutions, integrated infrastructure and next generation transportation systems that work seamlessly together to deliver on the promise of smart cities and communities.

507 E. Michigan Street  
Milwaukee, WI 53202  
United States

## Silver to Platinum



**HITACHI**  
Air conditioning solutions

### Johnson Controls - Hitachi Air Conditioning

Johnson Controls - Hitachi Air Conditioning is a joint venture company of Johnson Controls (JCI) and Hitachi Appliances, Japan. Through this joint venture they have combined the rich heritage and innovative technology of Hitachi with the industry leading expertise and global network of Johnson Controls. The partnership is aimed at addressing the cooling needs faster, smarter and much more efficiently than ever before.

390, Muramatsu  
Shimizu, Shizuoka-shi, Shizuoka  
424-0926  
Japan

BACnet International would like to congratulate the following companies on their strengthened commitment to the BACnet protocol and increasing involvement in the BACnet community. As part of these actions they have moved their membership to a higher tier. We thank them for their continued support and look forward to many more years of collaboration.

## Silver to Platinum



Since 1985 Triatek has been on the forefront of designing and manufacturing innovative airflow solutions for critical environments. Headquartered near Atlanta, Georgia, Triatek provides end-to-end solutions for healthcare facilities, laboratories, and municipal facilities around the world.

507 E. Michigan Street  
Milwaukee, WI 53202  
United States

## Silver to Gold



Contemporary Controls designs and manufactures the system building blocks for networking, integrating and controlling automation processes where performance and reliability are important. Their customers are systems integrators, contractors and mechanical and controls OEMs seeking simple and reliable networking and control products from a dependable source. With headquarters based in the US, they have operations in the UK, Germany and China with self-manufacturing in the US and China.

2431 Curtiss Street  
Downers Grove, IL 60515  
United States



IMI Hydronic Engineering provides a range of products and services that enable you to take control, increase efficiency and drive down initial and ongoing costs with innovative and reliable HVAC solutions. They have provided solutions to more than 100,000 projects worldwide. Their brand portfolio is built on more than 100 years of tradition and innovation and include IMI-Pneumatex, IMI-TA, IMI-Heimeier, IMI Flow-Design, IMI-EVU and IMI Aero-Dynamik.

Route de Crassier 19  
1262 Eysins  
Switzerland

## Member News

### Silver to Gold



Lennox International (LI) is a global provider of innovative climate control solutions for heating, ventilation, air conditioning, and refrigeration (HVACR) markets. Beginning over a century ago, Lennox International has built a strong heritage of Innovation and Responsibility. Lennox's position as an innovation leader continually inspires them to promote more efficient energy use and a healthier environment through their product operations.

1600 Metrocrest Drive  
Carrollton, TX 75006  
USA

### Silver to Gold



Shina System builds systems that provide operational convenience, stability and extensibility to customers through system integration and energy savings solutions made available by making building automation more intelligent. They not only accomplish customer satisfaction through creation of higher efficiency and value, but also contribute to the national economy and social advancement.

3305, O'BizTower, 126, Beolmal-ro,  
Dongan-Gu, Anyang-Si, Gyeonggi-Do  
Republic of Korea

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# BTL CERTIFICATION

## Your Best Path to BACnet Interoperability



If you are involved with building controls and automation, rely on the BTL Certification program to make sure the products you buy have been rigorously tested for compliance to the BACnet standard. BACnet is the world's standard for building interoperable solutions but it only works when products are correctly implemented. When you buy products that are not correctly implemented it can cost you a lot in terms of system integration time and money.

The BTL Certification program is operated by the BACnet Testing Laboratories (BTL), which is overseen by BACnet International. BTL was established more than 15 years ago to lead compliance testing and host interoperability events. To achieve certification, BACnet products must successfully undergo rigorous industry-standard testing conducted by recognized, independent testing organizations.

Users can identify tested products through the BTL Listing Service which is available to users globally at no cost. The service supports searching for specific products as well as browsing through products with different capabilities. In addition, the listing service provides detailed information on the specific tested capabilities of each product.

Accelerate your system integration and avoid unnecessary integration costs. Require all BACnet products in your system be fully tested. Ensure every product displays the BTL Mark or is verified through the BTL Listing Service.

There are over 900 products in the BTL Listing Service with more being added every month. **Find tested products to fit your needs at [www.bacnetlabs.org](http://www.bacnetlabs.org).**



**BACnet Testing Laboratories**

**[bacnetlabs.org](http://bacnetlabs.org)**

**[btl-coordinator@bacnetinternational.org](mailto:btl-coordinator@bacnetinternational.org)**

**+1-770-971-6003**

# The BACnet Institute Update

## New Course Added: The Facility Manager's Guide to Building Automation Systems



Education • Library • Community

The one-stop, online center for BACnet educational resources, The BACnet Institute, has continued to grow in both audience and resources available. The number of registered users on the site has increased by 84% over the past year, and we now have over 2000 learners.

To continue our positive growth, we're proud to announce a new course! The **Facility Manager's Guide to Building Automation Systems** provides insight on how facility managers can effectively participate in and contribute to a BACnet-based BAS integration.

While the course is positioned from a facility manager's perspective, it is still a valuable resource for other key professionals in the BAS integration process, including building owners, contractors, project consultants, and even IT professionals.

Registration for The BACnet Institute is free, providing access to a library of BACnet-related resources, as well as a BACnet Basics course. There is a nominal fee to access the Facility Manager's Guide to BAS course.

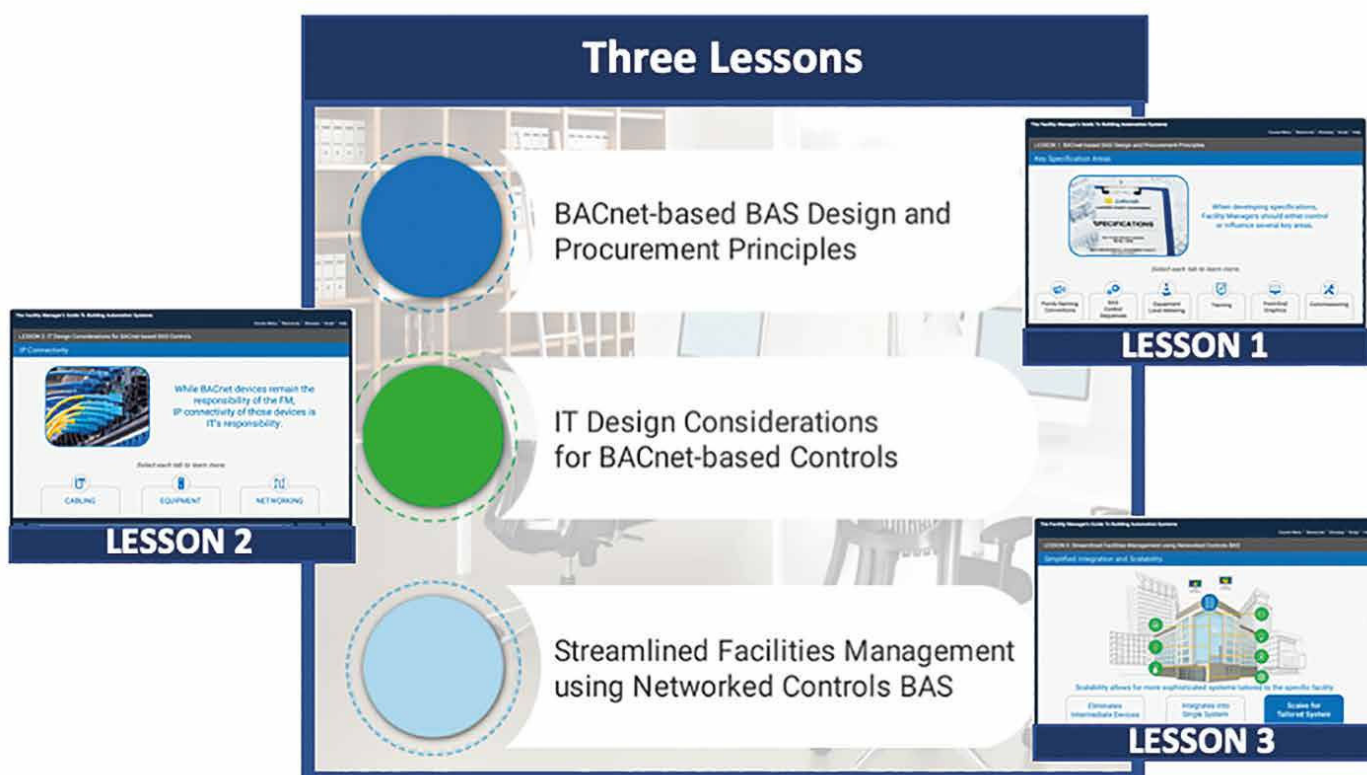
[www.thebacnetinstitute.org](http://www.thebacnetinstitute.org)



© BACnet International

**Michelle Eriquez**

The BACnet Institute | Education and Information Initiatives  
education@thebacnetinstitute.org | [www.thebacnetinstitute.org](http://www.thebacnetinstitute.org)



The new course is divided into three lessons as shown above. The lessons discuss key principles, elements and characteristics of a BACnet-based BAS.

© BACnet Institute

# BTL Management Evolution



Andy McMillan, President and Managing Director of BACnet International, announced an evolution of the BTL manager role that will take effect in January of 2019. The BTL manager has historically been responsible for the management of global testing and certification related processes and also for providing the BACnet expertise required to execute them. Beginning in January of 2019 the technical expertise portion of the role will be pulled out of the BTL manager's responsibilities and provided by a separate person under the title BTL Technical Advisor.

From 2009 through 2018 Duffy O'Craven has served as the BTL Manager. In January of 2019, Duffy will step down from that position and Emily Hayes will begin serving as the new BTL Manager where she will manage the Certification program, BACTOR (Test Organization Recognition), TEVIA (Testing Equivalence Verification), and Dispute resolution. She will also maintain the BTL business relation-

ships with RBTO's (Recognized BACnet Testing Organizations) and will continue to serve in her role of BTL Working Group Chair and manager of the BACnet Product Certification program.

A new BTL team member will take up the role of BTL Technical Advisor early in 2019 to complement and support Emily's work. The BTL Technical Advisor will serve as a resource to the BACnet community as well as to the RBTO's. The responsibilities of that role will include the following: Clarification Request analysis and response, BACTOR and TEVIA technical resource, Test Package review, BTL

Working Group contributions, BTL-related tools design (CAT / TRAY), and technical relationships with RBTO's.

Andy McMillan said, "Our goal with this evolution of the BTL leadership team is to increase our focus on test and certification process improvement." He added, "With several months of transition preparation we hope to see a smooth and efficient change over the first quarter of 2019."



© Hayes

**Emily Hayes**  
BTL Manager and BTL Working Group Chair  
btl-manager@bacnetinternational.org | www.bacnetinternational.org



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the right  
information  
as you move

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Cybersecurity  
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IIoT  
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## NEW BTL-LISTED PRODUCTS

| Manufacturer                            | Product Name                                                           | Model                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AB Regis                                | EXOrealC family of controllers                                         | C151D-4, C152-4, C152D-4, C152DT-4, C152T-4, C281D-4, C282-4, C282D-4, C282DT-4, C282T-4, C283DT-4, C283DTM-4, C283T-4, C283TM-4, C152T-3, C152DT-3, C283TM-3, C282T-3, C283T-3, C282DT-3, C283DTM-3, C283DT-3,, E151W-3, E151DW-3, E152W-3, E152DW-3, E152DWM-3, E281W-3, E281DW-3, E282W-3, E282DW-3, E282DWM-3, E283W-3, E283DW-3, E283DWM-3, HC191D-1, HC192DW-1, HC193DWM-1, HCA151DW-3, HCA152DW-3, HCA281DW-3, HCA282DW-3, HCA283DW-3, HCA283DWM-3, HCV191DW-1, HCV192DW-1, HCV193DWM-1, HCV203DWM-1, XF192T-1, XF193TM-1, XF193DTM-1, XF192DT-1, EC-PU4, IO-A15MIXW-3-BEM, IO-A28MIXW-3-BEM, IO-V19MIXW-1-BEM |
| ABB                                     | AC/S 1.2.1                                                             | AC/S 1.2.1 Application Controller, BACnet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Automated Logic                         | OptiFlex BACnet Gateway                                                | G5CE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Automated Logic                         | WebCTRL Server                                                         | WC-A, WC-S, WC-P                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Automation Components Inc.              | BN1100 Series                                                          | BN1110-R2, BN1120-R2, BN1130-R2, BN1120-D, BN1130-D, BN1110-O, BN1120-O, BN1130-O, BN1110-x1-PB where x1 is D-4, D-6, D-8, D-12, D-18, INW-2.5, INW-4 or INW-6                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| BELIMO                                  | Field Module for Fire Damper                                           | BKN230-24-MOD-BAC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| BELIMO                                  | ZoneEase VAV                                                           | LMV-BAC-001, LMV-BAC-002                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| BV-Control AG                           | Field Module for Fire Damper                                           | BKN230-24-MOD-BAC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Carrier                                 | iVu XT BACnet Link                                                     | XT-LB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Centraline by Honeywell                 | Centraline Eagle Building Controller                                   | CLEA2000Bxx1 where xx1 is 01, 21 or 31 CLEA2014Bxx2 where xx2 is 01, 02, 21, 22, 31 or 32 CLEA2026Bxx3 where xx3 is 01, 21 or 31                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Critical Room Control                   | Integrated Room Controller (IRC)                                       | CRC-IRC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Delta Controls                          | enteliBUS                                                              | eBCON, eBMGR, eBMGR-TCH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Delta Controls                          | enteliZONE                                                             | eZNTW-Enx1x2 where x1 is 868 or 902 x2 is C, HM, CHM or omitted eZNT-Tx3x4 where x3 is 100, 304 or 331 x4 is C, HM, CHM or omitted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Delta Controls                          | enteliZONE                                                             | eZNTW-Enx1x2 where x1 is 868 or 902 x2 is C, HM, CHM or omitted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Frimat GmbH                             | Frimat-BAVI                                                            | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Honeywell International                 | Excel Web II Building Controller                                       | XL2000Bxx1, where xx1 is 0A, 2A or 3A XL2014Bxx2, where xx2 is 0A, 2A, 3A, 0B, 2B or 3B XL2026Bxx3, where xx3 is 0A, 2A or 3A MVC-WEB-2014B2B, MVC-WEB-2026B2A, MVC-WEB-2026B3A                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Honeywell International                 | Honeywell ComfortPoint <sup>®</sup> Open Plant Controller              | CPO-PC400                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Honeywell International                 | O3-BACnet                                                              | TF428AD/U, TF228AD/U, TF223AD/U, TF423AD/U                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Honeywell International                 | Spyder                                                                 | PVBx1AS-x2x3 where x1 is 0000 or 4022 where x2 is E, O1, O <sub>2</sub> or O3 where x3 is -PACK or "null"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Industrial Control Communications, Inc. | PicoPort Communications Module   Mirius Multi-Interface Serial Gateway | PicoPort   Mirius                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Ing. Punzenberger COPA-DATA GmbH        | zenon 8.00 SP0                                                         | 8.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Johnson Controls                        | Advanced Terminal Unit Controller                                      | LC-ATC1500-0, LC-ATC1100-0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Johnson Controls                        | Premier RTU                                                            | SE-RTU1001-0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

|                                      |                                                 |                                                                                                                                                                                                                                |
|--------------------------------------|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| KONE Inc.                            | KONE Connection 015                             | KC015                                                                                                                                                                                                                          |
| Lennox International                 | intelliGen Refrigeration Controller             | 28918001                                                                                                                                                                                                                       |
| Lenze Americas                       | i500                                            | I51AEx1x210x3x4x5 Where: x1 is 125, 137, 155, 175, 211, 215, 222, 230, 240, 255, 275, or 311<br>x2 is B, D, C, E, or F x3 is 00, 01, V1, or V0 x4 is BAKA, 1002, or 0002 x5 is 0, S, M, K, or X                                |
| LG Electronics                       | AC Smart 5                                      | PACS5A000                                                                                                                                                                                                                      |
| Lutron                               | Vive Wireless Hub                               | HJS-2-FM, HJS-2-SM, HKS-2-FM, HKS-2-SM Where: J – 434 Mhz (North America) K – 858 MHz (UK/ Europe) FM – Flush mount SM – Surface mount                                                                                         |
| M-System Co., Ltd.                   | BACnet/IP I/O Controller                        | BA8BI-DAC8                                                                                                                                                                                                                     |
| Matrix iControl Sdn. Bhd.            | RCA Series Controller                           | RCA0664BV                                                                                                                                                                                                                      |
| MSA The Safety Company               | Chillgard 5000                                  | Chillgard 5000                                                                                                                                                                                                                 |
| OEMCtrl                              | WebCTRL for OEM                                 | WC-OEM, WC-OEM1, WC-OEM10                                                                                                                                                                                                      |
| Quantum Automation                   | iCON-3400PB-BC Programmable Building Controller | iCON-3400PB-BC                                                                                                                                                                                                                 |
| Resource Data Management Ltd.        | RDM Intuitive Range of Plant Controllers        | PR06x1x2x3x4x5x6 where x1 is 1,5 or 8 x2 is 0,2 or 7 x3 is blank, D, CD, TDB x4 is blank, NF, E or F x5 is BITZIQ, CCT, PACK, STCO <sub>2</sub> , SUP, TDB, BK or WH x6 is E1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11 or E12 |
| Royal Service Air Conditioning Corp  | ROYAL VAV                                       | RSC-VAV-BAC-CR-002, RSC-VAV-BAC-CR-001                                                                                                                                                                                         |
| Schneider Electric                   | MP Series Controllers                           | MP-C-15A, MP-C-18A, MP-C-18B, MP-C-24A, MP-C-36A, MP-V-7A, MP-V-9A                                                                                                                                                             |
| Schneider Electric                   | Multi-Purpose Manager                           | MPM-UN, MPM-GW, MPM-VA                                                                                                                                                                                                         |
| Schneider Electric                   | Network Management Card 2                       | AP9635CH, AP9630, AP9631, AP9635, AP9630CH, AP9630J, AP9631CH, AP9631J, AP9635J                                                                                                                                                |
| Setra Systems, Inc.                  | Setra FLEX                                      | FLEX-RM, FLEX-RC                                                                                                                                                                                                               |
| Shanghai Sunfull Automation Co., LTD | SunFull BACnet Gateway                          | BAC2004-ARM, BAC2004-Lite, BAC2004-A9, BAC1002-ARM, BAC1002-Lite, HMI2004-A9, HMI1002-ARM, HMI2001-PI, W7-1041, W10-1041, W15-1041                                                                                             |
| Siemens                              | Desigo Control Point                            | PXM30.E, PXM40.E, PXM50.E, PXG3.W100-1, PXG3.W200-1                                                                                                                                                                            |
| Sierra Monitor Corporation           | EZ Gateway                                      | FS-EZ1-MOD-BAC, FS-EZ2-MOD-BAC                                                                                                                                                                                                 |
| Sierra Monitor Corporation           | ProtoAir                                        | FPA-W34, FPA-W44, FPA-C34                                                                                                                                                                                                      |
| Sierra Monitor Corporation           | ProtoCarrier                                    | FPC-Cx1 where x1 is 34 to 43                                                                                                                                                                                                   |
| Sierra Monitor Corporation           | ProtoCessor                                     | FFP-ETH, FFP-485, FFP-LON                                                                                                                                                                                                      |
| Sierra Monitor Corporation           | ProtoNode                                       | FPC-Nx2 where x2 is 34 to 43 or 54                                                                                                                                                                                             |
| Sierra Monitor Corporation           | QuickServer                                     | FS-QS-1x3x4x5 where x3 is 0,2 or X, x4 is 1, 2, 3, 4 or 5, x5 is 0 or 1                                                                                                                                                        |
| Tridium                              | Niagara 4 BACnet Controller                     | 12977, 12466, 10820, 10820E, 11078                                                                                                                                                                                             |
| Xylem                                | ecocirc XL                                      | 130140651M, 130140661M, 130140701M, 130140751N, 130140821N, 130140891A,                                                                                                                                                        |

# BACnet Topics Captured at AHR Expo



If you missed a BACnet International session at this year's AHR Expo, no worries. Several sessions have been captured and will be made available online on The BACnet Institute educational site at [www.thebacnetinstitute.org](http://www.thebacnetinstitute.org).

The following sessions will be available early March 2019:

| Session Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Speaker                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BACnet 101: from an HVAC perspective</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Edward Tom, Yaskawa</b>                                                                                                                                                                                                                                                                                                                                                                                          |
| What is BACnet, Why do I need it? This session will answer your basic questions about BACnet, defining its purpose, origin, and basic characteristics. It will also explain how BACnet works within an HVAC subsystem, as well as how it allows the HVAC system to interoperate with other subsystems within a BACnet-based BAS.                                                                                                                                                  | Prior to his current position as a product manager in the Drives and Motion Division at Yaskawa, Edward Tom held positions involving application engineering and product marketing. He began his career, as a field engineer, performing mechanical and electrical technical support at Flolo Corporation. Edward holds a BS in Mechanical Engineering at the University of Illinois at Urbana-Champaign.           |
| <b>Developing a Cybersecurity Defense</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Brad Bonfiglio, Schneider Electric</b>                                                                                                                                                                                                                                                                                                                                                                           |
| Not only are the number of cyber-security threats increasing each day, so are their complexity and severity. Today's threats range from ransomware involving confidential data to a breach in a facility's critical infrastructure. This session will define today's cyber-security reality, as well as discuss a defense-in-depth (DiD) approach that ensures the best coverage for a secured, open building automation and controls system.                                     | Brad Bonfiglio, currently the National Director for the EcoBuilding Division, started at Schneider Electric in 2007 as the Southwest Director. Prior to Schneider Electric, Brad spent 13 years with Entech Sales & Service serving in various roles in energy management and security solutions. Brad holds a BS of Industrial Engineering from the University of Florida and a MBA from the University of Dallas. |
| <b>Is HVACaaS (HVAC as a Service) in your future?</b>                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Steve Shaw, Sierra Monitor</b>                                                                                                                                                                                                                                                                                                                                                                                   |
| In 10 years, will people buy HVAC units (or any industrial infrastructure)? Or will they pay for a service that delivers cold air? In this session, we'll explore the powerful trends in subscription-based services, and the implications for traditional equipment manufacturers and capital-intensive businesses.                                                                                                                                                              | Currently the Vice President of Marketing at Sierra Monitor Corporation, Steve Shaw has over 20 years' experience in B2B marketing in networking and wireless companies. Previous to SMC, he was the Vice President of Marketing for Accuris Networks, a SaaS provider to the mobile/wireless industry. Steve holds a B.S. in Computer Science from University of Southern California.                              |
| <b>Alexa has left the Building: Because Building IoT is So Much More</b>                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Andy McMillan, BACnet International</b>                                                                                                                                                                                                                                                                                                                                                                          |
| This session outlines the business case for implementing Building IoT (BioT) and contrasts the corresponding BAS system requirements with the expectations and implementation of IoT in the consumer world. Several BioT system implementation approaches are explored in terms of their efficacy, cost-effectiveness and impact on network security. In addition, current and near-term extensions to the BACnet standard that could support BioT implementations are presented. | Andy McMillan is President and Managing Director of BACnet International. Prior to this position Andy was President of the Teletrol Systems business at Philips Lighting which provided enterprise energy management and control systems to large scale multi-site retailers. Andy holds a MBA and a BS in Electrical Engineering from the University of Michigan.                                                  |

While registration on The BACnet Institute educational site is required to access these sessions, it is free. Sessions are available in the Library section of the site. Please make sure to take advantage of the other educational resources available on the site as well.

# Calendar of BACnet International Events

| Dates 2019              |                                                               |                  |
|-------------------------|---------------------------------------------------------------|------------------|
| January 10, 2019        | BTL Working Group Meeting                                     | Atlanta, GA      |
| January 14 – 16, 2019   | ASHRAE AHR Expo                                               | Atlanta, GA      |
| March 20 – 21, 2019     | GLOBALCON Conference & Expo                                   | Boston, MA       |
| March 26 – 28, 2019     | National Facilities Management & Technology Conference & Expo | Baltimore, MD    |
| April 8, 2019           | BTL Working Group Meeting                                     | Plantation, FL   |
| May 21 – 23, 2019       | LIGHTFAIR International                                       | Philadelphia, PA |
| September 23, 2019      | BTL Working Group                                             | Durham, NH       |
| September 24 – 26, 2019 | PlugFest Interoperability Workshop                            | Durham, NH       |
| November 20 – 22, 2019  | Greenbuild Conference & Expo                                  | Atlanta GA       |

Subject to change. For more information, contact David Nardone, BACnet International, [david@bacnetinternational.org](mailto:david@bacnetinternational.org) or visit [www.bacnetinternational.org](http://www.bacnetinternational.org)

## BACnet International Journal 16

The BACnet International Journal is a global magazine for building automation based on BACnet technology. Experts, practitioners and professionals show the way in applying and developing the BACnet standard – from building automation trends to devices and application projects; from qualification and training to testing and certification; from who's who in the BACnet community to useful information on events and publications. Special attention is given to members and activities of BACnet International.

### Distribution

This Journal can be ordered free of charge by BACnet users as well as partners, members, media representatives and friends of BACnet International. Order the BACnet International Journal by e-mail at [info@bacnetinternational.org](mailto:info@bacnetinternational.org).

### Online Distribution

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