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BACnet International JOURNAL

Issue 08

This Issue

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Cover picture

"BACnet Building of the Future"
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A Few Loose Screws

Or Is That a Few Screws Loose?

As I write this article I have a couple of two inch screws rolling around my desk. A few months back they were buried in the bones of my left ankle. Needless to say, between then and now I've experienced a little "hardware removal surgery" and a few doses of really good pain pills. I mention this up front in case what follows leaves you wondering if I not only have a few loose screws on my desk, but perhaps a few screws loose in my head, too. Anticipating major industry changes is always a challenge but in building controls, automation and energy management it is particularly difficult right now. Traditional methodologies and business models are being stretched to accommodate the growing role of IT as well as rapid advances in wireless, analytics and LED lighting technologies. So any projection of the future has to take into account each of these as well as the interactions among them. That makes prognostication error-prone but since this issue of the Journal is focused on the future of building automation, let me offer the following list of intriguing predictions for the industry over the next fifteen years.

The Bigger They Are The Harder They Fall

Building owner/operators might want to ensure they have effective multiple supplier strategies because it is possible that at least one long-established, multi-billion dollar player in this industry will disappear over the next fifteen years. Why would I say this? Well, it seems to me that some major suppliers are implementing business models driven more by a desire for "recurring revenue" than a desire to serve their customers' needs. And, other suppliers seem determined to become "solutions providers" without investing enough to fully understand what "solution" means to their customers. If you are working with suppliers that seem to be going down either one of these paths, watch out. No matter how big they might be, losing sight of customer needs is a road that leads suppliers to nowhere but ruin.

Efficiency per se Becomes Passé

Energy efficiency of equipment and controls solutions is currently a significant selection criterion in project bid reviews. That will not last. Increasingly, regulatory requirements (think Title 24 et al.) and voluntary sustainability standards (e.g. LEED) will drive the whole industry to common reference points. At the same time, the industry's ability to increase efficiency through equipment improvements and controls approaches will plateau leaving most suppliers with comparable solutions from an energy efficiency point of view. As a result, the key issues that will differentiate supplier bids will be their speed of implementation, the simplicity of user interaction with their system, and as always, cost.

Lighting is the Point … the Focal Point, that is

The time is coming when your building's lighting system will be its focal point for sensor data generation and controls intelligence. In fact, virtually all space sensors and much of the on-site intelligence for building automation and energy management will be embedded in lighting components fifteen years from now. This shift will be driven by the rush to retrofit buildings with LED lighting combined with the low cost of including these capabilities in LED lighting solutions. The result will be widespread implementation of lighting-centric, low-cost, distributed sensor networks that are far more robust and comprehensive than anything being done today. With lighting becoming the focal point for sensors, controls and data collection, it is possible that users will look to lighting suppliers to take the lead in project definition and execution rather than the traditional HVAC companies. If so, this could drive a complete re-shaping of the automation industry (elsewhere referred to Automation Armageddon).

Kiss Programming "Goodbye!"

Controls and energy information system programming will become little more than an interesting anachronism. There simply will not be time or money enough to develop custom controls programming or software for every building, much less for every subsystem in a building. Instead, building components that currently require controls will evolve to the point where they can simply be assembled and then configured at a high level – by people who know buildings and equipment, not programming. Data streams from those systems will flow seamlessly into applications that know how to interpret them and what to do with them. Controls configuration will become much like selecting apps for your smart phone. And, getting access to your controls and energy data steams for analysis and display will be like using the Netflix and Pandora app on your smart TV to access video and audio data streams.

Rags to Riches

Another really easy call is that we will see at least one billion dollar company rise up from the ranks of the innovative "little guys." It is hard to predict where they will get their start because there is such a wealth of opportunity for new businesses in the industry this point in time. LED and wireless technologies are enabling new solutions and the "cloud"; meanwhile analytics engines are enabling new business models. There is little doubt that you will look back in fifteen years, reflect on the early days of what was then a major company, and wish you could have known now what you will know then.

In The END …

Fifteen years from now, it could be that little of the building automation and energy management industry as we know it will remain. I realize it is an industry that is historically rather slow moving (and I'm being generous at that). But the reality is that the industry is being infused by people, technologies and concepts that have historically been fast moving. Will they slow down just because this industry has been slow? I think not. We are going to see the industry speed up and those facility managers and suppliers who are a little slow will be left behind. Which brings me all the way back to where I started this article… the loose screws on my desk. As long as they were in my ankle, my speed was limited to a slow walk. Taking them out opens up the possibility that, with some work, I could get back to running at full speed. And that raises an interesting question: Do you know of any organizations that have a couple of screws in the ankle that slow them down? In this time of rapid change, unless they are willing to suffer the pain of removing the screws and working to regain full speed, the industry will pass them by. Don't let your organization be one of them.

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Note: the views expressed in this article are the author's and do not necessarily reflect the position of BACnet International, ASHRAE, or any other organization.

BACnet TO THE FUTURE

15 November 2037

Alalisa Ferro, was a pro. She had used her information technology degree and years of experience in facility-related matters to obtain several positions as a Building Network Associate for a number of smaller properties. All of this had prepared her well for her new position as Building Network Manager for all of Nuemag Corp's facilities in the Midwest – including their showcase property, Nuemag One, in the west Chicago suburbs.

On this Thursday morning, however, she was surprised to learn that her boss, the Chief Infrastructure Officer, had committed some space within Nuemag One to new building occupants. They'd be moving in tomorrow. "Heaven forbid he lift a finger to swipe a proper communication," she muttered.

The potential problems were numerous. Alalisa knew that some of the intended space was still lit using old LED technology. That meant the occupants' wearable tech wouldn't be recharging through the office lighting system. The space also lacked the Kinetic Energy Harvesting Enhancement System. Occupant swipes at their workstations wouldn't be enough to sustain all the power-hungry technology.

BACnet Consortium Cloud Services

"That's two work orders to generate," she mumbled to herself as she used her own wearable tech to "login" to the BACnet Consortium Cloud Services (BCCS). While there, she voiced a request for an indoor environmental quality audit. "We certainly don't need any more BRI (building-related illness) issues," she said, half out loud. (By this time, the BCCS knew enough of her routine not to interpret her last comment as instructional to the system.)

Results from the automated indoor environmental quality audit were already beginning to populate a portion of her workstation screen as she examined the Reconfigurable Parking System. Fortunately, she had plenty of capacity here. Further, all spaces were not only dynamically reconfigurable, but could automatically adjust recharging functions to the size, type, and style of the vehicles – from personal transports to scooters to larger vehicles.

The BCCS did offer one suggestion while she was reviewing the parking situation however. The billing system associated with these previously unoccupied parking spaces was in need of a firmware update. Alalisa confirmed the system recommendation to initiate the upgrade.

Recommendation and Lottery Functions

By this time, the BCCS was offering suggested remediation measures from the environmental quality audit. In particular, several offices, including the one slated for the section's new department head, were reporting slow ventilation response to the commissioning routine. The BCCS was recommending replacing several BACnet/IP control modules. Why? They were still wired. BCCS had calculated a 45 % increase in response performance in recommending aircom replacements. In addition, the system had already performed the required lottery function to select the provider from among pre-approved vendors.

Alalisa confirmed this new work order while another portion of her screen displayed acknowledgment from the contract technician regarding the previous work orders.

Pressing one section of her screen connected Alalisa to Geoff Fiser, Building Network Associate at Nuemag One. "Morning boss," Geoff acknowledged.

"Hey Geoff," Alalisa responded. "Just want to make sure, that you can handle the security and access issues associated with our new occupants." "I'm on it boss," Geoff said. "Anything else while I have you?"

"Thanks, yes," Alalisa said. "Could you do a physical walk-through of the space while the techs are there addressing the work orders? I want us to keep a personal touch to these relationships."

As Geoff acknowledged the idea, Alalisa bid farewell. By now, BCCS notifications were coming in from other Neumag facilities. And as she began to plan out the remainder of her work day, Alalisa activated her smart home fenestration system to open a window on another beautiful morning in Atlanta.

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Building Automation. So What's Next?

There has been a tremendous amount of advancement in our buildings environment over the last several years, and the building's automation is no exception. What has been driving these advancements? What have been the contributing factors?

First, disruption. A significant disruptive class of technology emerged in the market that tested the traditional building automation world, and nothing has been the same since. A primarily mechanical driven environment was introduced to affordable microcomputers and the advent of IP-based technology. With that came the arrival of embedded electronics and interoperable subsystems: mechanical, electrical, and software.

Second, the concepts of integration and interoperability, converged solutions, the growth of Internet Protocol (IP), and the "open system/open protocols/open standards" influence on physical systems. Open protocols are essential to making buildings more intelligent and operate at peak performance levels, since they enable building systems and devices from different manufacturers to interoperate – to communicate and work with each other. A system that uses open or standard protocols like BACnet has made every project competitive, allowed vendors to work together and given facility managers and building operators the flexibility to use products from different manufacturers and promises long term cost savings.

Third, the operational and business side of managing buildings has been driven by financial pressures to contain costs and improve operating efficiencies, the rising cost of energy and maintenance, and the need to maintain occupant comfort.

So what's next? What's driving our next generation building automation systems? What influences are shaping the direction of the industry as we move forward?

Transformation will continue. In looking at the changes we've seen in technology and the evolving demands of the market, I believe we will see unprecedented growth when it comes to anytime, anywhere, "real time" information and business intelligence that further drives the way we operate facilities. The industry will continue to shift in regards to facility management methodologies – driven not just by the technology side but by the business side. We will operate our buildings in timely, new ways – what I call CBO (Conditioned Based Operations) – where buildings are driven by facility usage and performance, financial optimization, business intelligence, and operational maximization.

In addition, I see a new metric emerging: Maximizing building equipment and system lifetime value. Lifetime value is a critical metric for any business. Those that are able to measure and maximize the lifetime value of their customers and their assets have a distinct competitive advantage over those who do not.

Then there is a shift in the value equation; we are moving beyond efficiency to a more holistic view encompassing the overall performance of buildings and their increasingly sophisticated equipment systems as assets to be exploited for increasing value. This is driving increased collaboration across business functions. And it's not just the economic factors that can be captured with simple ROI calculations; it's a combination of the economics, and the rising expectations of building owners and operating management. Both of them increasingly live in a technology environment that is more advanced than their building systems.

IoT leads to Connected Intelligence

The industry is also entering a new turning point and experiencing another monumental shift as the Internet of Things (IoT) increases its influence on building automation and pushes the envelope of traditional supervisory control and data acquisition. At the edge of the network, devices are becoming more intelligent and gateways are enabling the efficient transmission of data by connecting legacy and new infrastructure to each other and to the cloud. IoT is enabling us to move from connected devices to connected intelligence; it is allowing us to redistribute and process data independently at the edge, at the device level and in the cloud.

The architecture of building automation continues to collapse as more devices directly connect to IP networks resulting in a more direct and streamlined connectivity between systems and decision-making. Real-time decision making at the network edge will become the norm not the exception.

Devices that connect directly to the enterprise will accelerate. These new devices will be smarter, more powerful and offer higher levels of functionality with enhanced embedded systems software, present direct to cloud capabilities, and will become less dependent on middleware. In many cases they will bypass the infrastructures of conventional building automation systems to give users more immediate solutions and insight to their needs. The trend is toward connecting more and more devices that provide information within each device. Additional value will take shape when the devices are extended by layering applications that leverage the activities, services, and interrelationships – not only of the devices but of all people, systems, and connected devices in the network.

Facility and IT grow together

Cyber threats and vulnerabilities will persist to make headlines within our industry and be a major issue. Cyber threats against the building environment are more frequent and increasingly sophisticated. And our systems and devices are targets and vectors into the network. There's no issue that's become more important and that is less understood than cyber security in buildings and facilities.

I believe this is the one issue that can set back all the advances building automation technologies have made all these years and the value these technologies deliver. No one will invest in any technology, product or solution if they know there is a security/threat issue. Furthermore, I believe we are heading down a path that will require building owners to deploy additional layers of cyber protection for their building systems. If not a compliance issue it will surely be a risk mitigation issue.

If there's ever been a role that's changing quickly, it is the role of IT as it relates to building management systems and facility operations. It was not that long ago when our technology and systems were viewed as a necessary evil and received only the most basic attention and resources from IT. This is changing. Several influences are driving this including the continuation of convergence, transformation of our technology and systems to full-blown enterprise systems, the network as the conduit that allows information to flow within the enterprise and the outside world, the importance of building management and control both operationally and strategically to an organization, cyber security and finally, the wall separating facility and IT is starting to come down.

Using Data

Collecting data on scale use to be an issue; today it is not. The data journey will continue and accelerate. We are far from where we need to be to fulfill the vision of a data-enabled enterprise. Going forward, data is shifting from big to continuously actionable data. Big data doesn't solve business problems. With that data, people do.

Building automation data needs to be given context. Industry groups like Project-Haystack are working on standards and tools to simplify this process. Over time we will see an increase in "open data" that includes necessary semantic information to enable it to be automatically consumed by different applications. Standardization of naming and tagging conventions and taxonomies data models for building equipment and operational data for energy, HVAC, lighting, and other environmental systems will enable reductions in the costs of utilizing data. Going forward, facilities will operate with one data pool with the various applications and individuals drawing from it instead of from many individual data silos. New enhancements to data will continue evolving, but the issue of data ownership will still be debated and have to be figured out.

Together we have built a strong foothold for going forward. Today's building automation technology offer a strong foundation for the future. The Next-generation building systems are being designed with the new value propositions, new operational applications and analytics in mind. Building automation systems are becoming operating platforms that support a wide variety of applications. We will continue to see the streamlining of integration with enterprise applications, increases in synergies available from using data from all business units, and continued migration from proprietary systems to open environments. We will be driven by financial and performance demands and a new level of smart integration that stretches the reach from devices out on the edge to cloud applications and data analysis. Building automation innovations will be fueled by collaboration and ecosystems of non-traditional partnerships and allies that lead to radical ways to work together to extend the value of our building automation systems.

About the Author

Marc Petock is Vice President, Marketing at Lynxspring and Connexx Energy where he leads corporate and product marketing strategy and execution, brand management, public relations and communications to support both companies strategic and growth initiatives. Marc is a contributing author, noted speaker and recognized industry leader having earned Realcomm's Top 35 People to Watch for the last six years in a row, Who's Who in M2M, a Digital Impact Award and several other industry accolades. Marc also serves on the board of directors of Connexx Energy and as an advisor to Realcomm.

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BACnet Committee Prepared Protocol Revision 16

In early April, the ASHRAE SSPC 135 BACnet committee met for the spring interim meeting at the Lutron Experience Center in Plantation, near Fort Lauderdale in Florida. Although the Lutron lighting showrooms were undergoing a complete overhaul, the committee enjoyed great hospitality, great meeting facilities, and catering even. Thanks to Lutron for this experience! Seattle, the town of Boeing, Starbucks, Mount Rainier and much more was the place of the ASHRAE annual conference end of June. As part of this conference, the BACnet committee and its working groups met for four days.

Addenda Approved for Public Review

Addendum 135.1-2013*p* to the test standard was voted out for its first public review a while ago. It will add some new EPICS consistency tests. The time this review will start will need to be determined.

Addendum 135.1-2013*p*	PPR1	EPICS Consistency Tests

While meeting in Florida, the resolution of comments from last public review and drafts for next review of three addenda were completed, and finally the drafts were voted out for a next public review. Those addenda were:

Addendum 135-2012*ai*	PPR5	Network Port Object Type
Addendum 135-2012*aq*	PPR3	Elevator Monitoring and COV Multiple Reporting
Addendum 135-2012*as*	PPR2	Command and Value Source Information

The public review of these addenda was scheduled for summer.

Addendum 135-2012*ai* defines a new Network Port Object Type. This object will be used to represent the configuration and status of every network port of a device. This new object will be mandatory for all devices that implement the respective protocol revision. The Network Port object type inspired a new informal method of measuring the complexity of an object type: The higher the number of footnotes of the property table, the more complex the object is.

Addendum 135-2012*aq*, Elevator Monitoring and COV Multiple Reporting, went through its second review in last fall. The elevator object types and fault reporting were amended to cover applicable definitions from elevator industry standards. The COV multiple reporting got improved in its error reporting.

Addendum 135-2012*as*, Command and Value Source Information, was modified after its first public review to address the requirements of the Institute of Electrical Installation Engineers of Japan (IEIEJ). It now allows providing source information not just for commands, but also for all write operations.

In Seattle, the committee approved the following addenda for a first or subsequent public review, to take place in fall:

Addendum 135-2012*aj*	PPR4	Virtual Link Layer for IPv6
Addendum 135-2012*bb*	PPR1	MSTP Zero Config
Addendum 135-2012*bc*	PPR1	Various BIBB Updates

Addendum 135-2012*aj* introduces a new BACnet Virtual Link Layer (BVLL) for IPv6. With this, BACnet will be capable of running over IPv6. BACnet routers will be used to integrate BACnet devices on IPv4 and other BACnet networks with those on IPv6 networks.

Addendum 135-2012*bb* adds zero configuration capabilities to MS/TP devices. With this mechanism, MS/TP master devices can determine their MAC address automatically.

Addendum 135-2012*bc* collects a larger number of BIBB and device profile updates. Among those are:

- Amendments of BIBBs and workstation device profiles for the revised event reporting.
- New BIBBs and device profiles for life safety panels, user interfaces and workstations.
- New BIBBs and device profiles for physical access control devices, user interfaces and workstations.
- New BIBBs and device profiles for lighting devices, user interfaces and workstations.
- A new device profile for a cross-domain advanced workstation (B-XAWS) that includes all features of the advanced workstation device profiles for HVAC, Access Control and Lighting.

The life safety domain is excluded on purpose from the new cross-domain advanced workstation. Life safety workstations are usually subject to codes and regulations. The committee does not want to make such a requirement to the cross-domain advanced workstation. However, life safety support can easily be specified through the new family concept for device profiles.

Device Profile Family Concept

Addendum 135-2012bc is making use of the device profile family concept being introduced with addendum 135-2012al. A device profile family consists of device profiles with increasing functionality for a particular purpose. The family concept enables both manufacturers and specifiers to define features of a device in a more flexible way, almost like from an a la carte menu. There is not just one device profile an implementation can claim. It can claim one profile from each family at the same time. For example, it could claim to be an operator display (B-OD) for HVAC; and an advanced lighting workstation (B-ALWS). This becomes important since multiple application domains now come into the game, and not all products will support all domains to the same level.

Addenda Ready for Publication Approval

The following addenda completed the public review cycles and are ready to be approved by higher level ASHRAE committees for publication:

Addendum 135-2012*al*	Gateway Best Practices, New BIBBs and Device Profiles
Addendum 135-2012*ay*	Timer Object Type
Addendum 135.1-2013*o*	SubscribeCOVProperty Error Tests

Due to dependencies, the publication of Addendum 135-2012al will be delayed until the Network Port object type (Addendum 135-2012ai) is approved and published.

Addendum 135-2012*ay* went through its second public review and will see editorial changes only. The new Timer object represents a count-down timer. On status change, the object may generate event notifications and write configured values to properties.

Addendum 135.1-2013*o* to the test standard went through its first public review without substantial changes.

Addenda Approved for Publication

In Seattle, a number of addenda to standard 135-2012 were approved for publication by the ASHRAE Standards Committee and the ASHRAE Board of Directors. These addenda will make up protocol revision 16. To be published in summer are:

Addendum 135-2012*an*	Large Frames for MSTP
Addendum 135-2012*at*	Interface_Value Property for Input and Output Objects
Addendum 135-2012*au*	Clarifications for Authentication Factor Encodings and Coercion Requirements for the WriteGroup Service
Addendum 135-2012*av*	Server-side GetAlarmSummary and GetEnrollment Summary Service Support Relaxations
Addendum 135-2012*aw*	Alarming and Reporting Complements
Addendum 135-2012*ax*	Miscellaneous Small Changes
Addendum 135-2012*az*	Binary Lighting Object Type

Other Addenda in the Works

A number of addenda are in work for a subsequent public review. In particular, the Data Modelling working group is working hard to resolve the comments received on the new RESTful web services and the extended data model for classic devices.

Addendum 135-2012*am*	PPR2	BACnet XD and RESTful Web Services
Addendum 135-2012*ap*	PPR2	Application Interfaces
Addendum 135-2012*ba*	PPR3	BACnet XD for classic BACnet Devices

Addendum 135-2012*am* has two major parts. Fundamental is the introduction of a common extended data model for BACnet (BACnet XD). This extension will enable BACnet to represent complex data structures such as provided by the "Facility Smart Grid Information Model" (FSGIM, ASHRAE 201P). The new RESTful Web Services will be used to access the entire extended model.

Addendum 135-2012*ap*, Application Interfaces, is currently on hold. The Applications Working Group is now working on an approach in which the application interfaces are defined and identified through semantic tags.

Addendum 135-2012*ba* enables classic BACnet devices to contain or refer to a static description, based on BACnet XD. New properties are introduced that provide semantic information on objects and relationships.

Public review and final versions of addenda are available at no cost from ASHRAE (www.ashrae.org) as well as on the BACnet website (www.bacnet.org). To stay up-to-date on public reviews, publications, and interim meetings, you can subscribe to the weekly ASHRAE Standards Actions electronic newsletter, or read it, at the ASHRAE website www.ashrae.org/standards-research--technology/standards-actions.

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BACnet Associations Regulate Accreditation for Test Labs Globally

BACnet International and BACnet Interest Group Europe (BIG-EU) have established a standard method for the accreditation and recognition process for BACnet product test organizations. Only test reports from recognized BACnet Test Organizations can be used as the basis for a BTL Mark, a BTL Listing and a BIG-EU Certificate. A global standard method has been established to facilitate the application process. The BTL Working Group is responsible for oversight of the recognition process.

Contact person is the working group's Chairman, Duffy O'Craven, the BTL Manager who can be reached via: btl-manager@bacnetinternational.org.

Meanwhile, O'Craven has passed the management of the BACnet test laboratory at SoftDEL to the new test coordinator, Emily Hayes. She can be reached via: btl-coordinator@bacnetinternational.org.

More and more testing centers are applying for recognition as BACnet Testing Organizations. BACnet International and the BIG-EU have now created a common authorization procedure. For new applications a standardized application form has been developed. The recognition process was developed by the BACnet Test Laboratory Recognition Committee (BTLRC) under the direction of Mike Newman, a BACnet community leader. The committee consisted of two members from each of the two organizations. Their goal was to develop a common procedure that regulates the use of existing and future test organizations. The BTLRC was dissolved after successfully completing its work. Since then, the BTL Working Group is responsible for recognition of BACnet testing organizations. The BIG-EU is represented on the BTL Working Group by Thomas Kurowski and Patrice Hell. Beside Andy McMillan as chairman, the BACnet International representatives are Glen Vande Zande, Lori Tribble, Chris Howard, Jeffrey Jones and Michael Osborne.

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Manufacturing Facility Compatible With Future Requirements

The 147,000 square-foot ABB manufacturing facility in New Berlin, WI, underwent a major renovation and expansion in the spring of 2014. The continued growth in variable frequency drive (VFD) sales, along with the addition of new products – medium voltage drives, electric vehicle charging stations, power electronics, and controls products – rendered the existing building too small. The task was to develop a building that not only met today's needs, but also one that would be compatible with future requirements. Words such as "green," "LEED Silver," and "sustainable" were not simply buzzwords, but were instead used as a roadmap on this project. The following success story will focus primarily on the building's HVAC system.

The existing design of the HVAC system dated back over 30 years. There was no central plant or building automation system (BAS) and most control was independent. Monitoring, maintenance, and troubleshooting were all done the old fashioned way. Unfortunately, walking around with a pen and paper results in a more reactive than proactive approach. Costs associated with the mechanical equipment continued to increase due to the age, down-time, and inefficiency of the equipment. While an HVAC system in a manufacturing facility is important for comfort, it is also critical for manufacturing and reliability. Imagine the humidification system going down in the middle of a Wisconsin winter. Low humidity increases the possibility for electrostatic discharges causing damage to electronic components. While many think of data centers and hospitals as being critical facilities, those who are responsible for maintaining an electronic manufacturing facility may ask that you do not forget about them.

Multi-Use Building as a Challenge

Most of the existing mechanical system was removed as part of the renovation. With any good HVAC solution, one needs to start with a good design that is enhanced upon with the correct hardware, and supplemented by the best control scheme and software. One could hypothetically have a magical piece of equipment that is 100% efficient, but if it isn't being controlled or utilized correctly, there is no point in having said equipment. The hardware used on this particular project included ALC controllers, a Huntair FANWALL AHU, Daikin McQuay Skyline AHUs, a Multistack chiller, Baltimore Air Coil ICE CHILLER thermal storage, a Marley NC cooling tower, Lochnivar condensing boilers, MeeFog humidification, Marlo reverse osmosis, and ABB VFDs powering Baldor motors on most equipment.

The ABB building is a multi-use facility consisting of office and manufacturing space, along with shipping and receiving docks with large doors. The building is located in a geographical location that ranges from well below 0°F in the winter, to highs above 90°F in the summer. One of the challenges encountered in a multi-use building such as this, was the scenario of multiple factory loading docks with large doors opening and closing all day long. Proper heating (staged radiant heating, cabinet heating, AHU heating, positive building static pressure) in the winter and cooling (AHU cooling, positive building static pressure) in the summer is required for comfort in this area. Building static pressure is one of the solutions in both heating and cooling modes. Diving deeper into the topic of building static pressure, the simple control solution states that having a high positive pressure within the building reduces the amount of outside air penetrating through the open loading dock doors, i.e. air is blown out the doors opposed to sucked in through the doors. However, if factory static is too high relative to the office static, air undesirably flows from the factory in to the office. One's gut reaction may be to simply increase the office static setpoint, an idea which sounds great until someone notices all the outside entry doors in the office are not closing completely and are being held open. This is just one example of real world HVAC challenges faced in designing and maintaining a building.

How do we deal with this and other challenges? ABB's solution was to design a highly intelligent and flexible building, and BACnet communications played a critical role in both monitoring and control of the system. Nearly every device in the HVAC system communicates via BACnet, and there are few Modbus devices. Solving challenges, such as the previously mentioned building static pressure control, was made much easier by having all the AHUs on the same network. Serial communications also played a key role in either the monitoring and/or control of other advanced HVAC systems. Some application examples include:

- The HVAC system is designed such that the chiller will make ice (thermal storage) during off-peak summer hours to take advantage of low utility rates. During the day (at the building's peak energy usage period), the chiller backs off and the system uses the ice storage to assist in chilled water generation.

The HVAC System is critical for manufacturing and reliability

Nearly every device in the highly intelligent and flexible building communicates via BACnet

This scheme results in lower daily energy costs, and a reduction of peak demand penalties. The advanced automation system optimizes the system by monitoring the building's energy meter, trending performance, outside air temperature, water temperature, ice levels, etc. Having the right equipment is only the first step; using said equipment to its full potential is the key.

- The warm chiller condenser water is capable of being used for variable air volume (VAV) reheat, instead of simply going out to the cooling tower. This approach nearly eliminates the need for boilers in the summer.
- The two boilers talk to each other via serial communications, determining the most efficient operating point.
- The four fan FANWALL unit has a single VFD per fan motor. Via serial communications, the unit's PLC starts and stops the individual fans as required, to operate at the most efficient operating point.
- Demand-controlled ventilation that monitors the buildings indoor air quality (CO_2 level) and appropriately controls the amount of outside air brought into the building.
- The chilled, condenser, and hot water systems are all designed as N+1 systems. This means there are two VFDs and two pumps instead of a single VFD and pump. If a VFD, motor, or pump were ever to fail, the BAS would seamlessly switch over to the back-up system.

Top Notch HVAC System to Match the Future

As with any major remodel or construction, there are going to be items added that were initially missed or not part of the original scope. This project was no different. Adding an item after the fact has the potential to incur costly change orders. However, taking advantage of BACnet communications and the VFD's pass-through I/O helped mitigate that cost. A few examples:

- A 4–20 mA analog input (AI) needed to be monitored, and in one case there was no controller nearby. In another case, the local controller did not have a spare analog input available. The solution was to run the AI into the nearby VFD, with BACnet communications monitoring the status of the AI. While the AI had no influence on the VFD's operation, the VFD was able to pass on the AI value to the BAS.
- An auto drain feature was added to the cooling tower. This allows the cooling tower to automatically drain in the fall during extended periods of cold weather. Due to the I/O requirements, another controller would have been required for this operation. However, there happened to be a NEMA 3R VFD at the cooling tower to run the cooling tower fan. The solution was to have the BAS, via BACnet, control the VFD's relay outputs. The relay outputs were wired to the motorized valves that control the auto drain. By using the VFD's relay outputs, the cost of an additional NEMA 3R enclosed controller was avoided.
- High duct static safeties needed to be added on several VAV systems. The safety was wired to the VFD, which already included a freeze stat and smoke alarm wired into different digital inputs on the VFD. The VFD was programmed to respond to the safety, while the BAS also monitors the status of those three inputs, and can alarm the operator work station with the exact safety that just tripped. This solution was better than running all the safeties in series, as a series scheme results in no way to know which of the three safeties opened. The safeties also work with the VFD in either "auto" or "hand" mode, a concept which is far too often overlooked.

The ABB facility was designed to adapt to future requirements. A dedicated HVAC server runs ALC's WebCTRL, which is a front end providing a graphical interface of the HVAC system from any computer in the building. As an example of marrying the HVAC system with the overall building, consider that a future phase of this building renovation will be to add power factor correction units. While this phase may not be HVAC related, the status of the power factor correction units will be shown on the HVAC system's graphical interface because those units are capable of serial communications. The HVAC system will email the facilities manager of an alarm condition if there is ever a problem with the power factor correction units. The examples and possibilities are virtually endless with the properly applied BAS and serial communications network within this building.

Buildings will continue to become smarter, and buildings need to become smarter to stay competitive. BACnet, as an open protocol, plays a significant role in the intelligence and sustainability of a building. By applying a top notch system that controls and monitors essentially the entire building's HVAC system, this building not only deals with today's challenges, but is ready to take on any future trials as well.

Tim Skell
Sr. HVAC Application Engineer | ABB, Inc
tim.r.skell@us.abb.com | www.abb.us/drives

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Dear BACnet user, we would like to invite you to take part in our Global Roadshow.

It will span April – November 2015 and celebrates the 10th DIN EN ISO anniversary and the 20th ANSI anniversary of the BACnet standard. The Roadshow focusses on the benefits of BACnet for sustainable buildings in terms of construction, retrofitting and the integration in smart grids. It includes a state-of-the-art exhibition and provides the latest information about:

- Open communication in building automation,
- Development of standardization,
- Interoperability of BACnet devices,
- BTL Listing and European Certification,
- BACnet vendors and suppliers.

Therefore the roadshow will be a decisive meeting point for BACnet users in the Americas, Europe, Middle East, Africa and Asia Pacific – and a fantastic networking platform for planners, integrators, specifiers, facility managers, owners, investors and manufacturers of building automation devices and systems.

Our goal is to increase the global awareness for BACnet. We will introduce the newest capabilities of building management systems and demonstrate the benefits of BACnet applications. We will give an update on the standard and develop new fruitful partnerships with planners, specifiers, operators and investors in industry, services and public administration. And we will encourage the establishment and nurturing of local interest groups of users, developers, providers of smart grids and IT infrastructure and local distributors.

Seize the day and confirm your participation in the international market. The global roadshow is the first worldwide event which is commonly hosted by BACnet International and the BACnet Interest Group Europe.

We are looking forward to meet you in one of the roadshow locations.

Andy McMillan
President & Managing Director
BACnet International

Volker Röhl
President
BACnet Interest Group Europe

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www.bacnetroadshow.org

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- Integrate all building services
- Apply energy management
- Connect to the internet of things
- Talk to business systems
- Manage comfort, safety and costs

"Our goal is to increase the global awareness for BACnet. We will introduce the newest capabilities of building management systems and demonstrate the benefits of BACnet applications. We will give an update on the standard and develop new fruitful partnerships with planners, specifiers, operators and investors in industry, services and public administration. And we will encourage the establishment and nurturing of local interest groups of users, developers, providers of smart grids and IT infrastructure and local distributors."

Andy McMillan
President and Managing Director
BACnet International

Volker Röhl
President
BACnet Interest Group Europe

14 April - 26 Nov 2015

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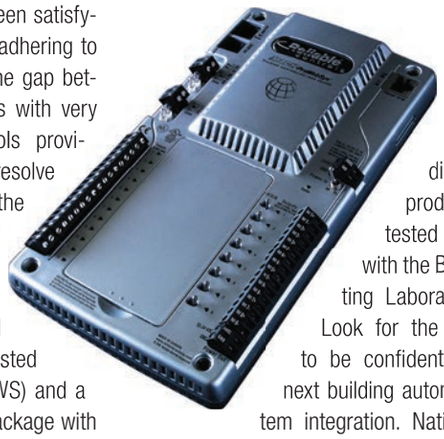
Reliable Controls Leverages BACnet Capabilities in 3-in-1 Product

Reducing inter-departmental inefficiencies while increasing functionality, the BACnet B-OWS listed MACH-ProWeb controller provides the capability to quickly and easily publish building automation system information to the web with minimal demands on IT.

As Internet technology and building management systems rapidly advance, facility managers are often caught in the middle between satisfying facility management needs and adhering to IT security requirements; bridging the gap between two inter-departmental worlds with very different priorities. Reliable Controls provides a practical and professional to resolve this cross-functional concern: the Reliable Controls® MACH-ProWeb™ (MPW) controller. The device features a unique combination of elements, amalgamating a BTL-listed BACnet Building Controller, a BTL-listed BACnet Operator Workstation (B-OWS) and a powerful web server, into a single package with the installed footprint of a typical building controller. The first three-in-one device of its kind, the MPW provides the capability to quickly and easily publish building system information to the web, with minimal demands on IT. This product combines the field controller, configurable web server, and browser-driven workstation, all into a single device that's simple to use, flexible to engineer, and economical to acquire

A BACnet Operator Workstation (B-OWS) provides a rich user environment. It is designed to provide the operator with all the information and editing ability to manage a system on a daily basis. In addition to viewing and editing selected BACnet objects, an Operator Workstation can display trends, schedules, and other specialized objects, also providing the capability to display reports and graphics.

The MACH-ProWeb allows the facility management team to program and implement building controls processes just as it normally would, but instead of having to purchase server equipment and potentially infringe on sensitive IT procedures, the controller features its own built-in server that resides right inside the controller, and does not require a separate rack-mounted server in the IT department's domain. This efficient set-up allows each department to independently manage their own equipment and procedures. The only requirement from IT is a local IP address on a subnet unique to the building management department. The controller ships with default port settings typical for the industry and often doesn't need additional configuration; the configuration of the controller makes set-up a very intuitive process.



All Reliable Controls building controls products are tested and listed with the BACnet Testing Laboratory (BTL). Look for the BTL mark to be confident with your next building automation system integration. Native BACnet means that the BACnet operating stack is embedded directly in the device, and every Reliable Controls BACnet controller has the BACnet stack at the board level. Additionally, every Reliable Controls device is peer-to-peer. There are no additional management devices required for communications with other vendors' products.

Providing the basis from which to grow the smart building industry while continuing to use proprietary hardware, BACnet allows for interoperability between different manufacturers' products as it enables networks from multiple vendors to be bound together. BACnet defines a basic set of rules for how and what building controllers can communicate, which promotes the protection of investments in building controls. In the past, building owners were forced to replace entire systems when only a simple expansion was required, and were often unable to obtain competitive quotes for new projects because they were locked into a manufacturer's proprietary system.

All controllers manufactured by Reliable Controls use BACnet protocol as the primary method of communication. An open standard protocol (ASHRAE Standard 135), BACnet was built with a guarantee against obsolescence, as it can easily be extended with new features to meet the rapidly changing demands of the building automation industry, and was designed to be extendable without altering existing capabilities. As a result, BACnet controllers made today are interoperable with the controllers and workstation of the future. BACnet is here to stay: this year marks two significant anniversaries of BACnet protocol; DIN EN ISO 16484-5 celebrates ten years while ANSI ASHRAE 135 reaches an impressive twenty-year milestone. By leveraging the BACnet protocol and by allowing IT and facilities management to keep equipment and procedures separate, the Reliable Controls MACH-ProWeb provides the ideal, flexible and synergistic solution, perfect for streamlining web access to the building automation system. Your building automation system will begin paying dividends immediately through energy savings, and improved comfort. Future-proof your facility by insisting on native BACnet Controller products.

About Reliable Controls

Since 1986 Reliable Controls has been designing and manufacturing building controls and specializes in Internet-connected green building solutions. The company's design philosophy delivers building control that is simple, flexible, and competitively priced. All designs utilize the ASHRAE standard BACnet protocol and ship with a 5-year warranty.

Would you like to know more?

To learn more about Reliable Controls and the nationwide network of Reliable Controls Authorized Dealers ready to serve you, please visit www.reliablecontrols.com

Karina Wright
MarCom Writer | Reliable Controls
www.reliablecontrols.com

Off-loading MS/TP Traffic Improves Building Controller Performance

Routing BACnet MS/TP messages to BACnet/IP requires a standalone BACnet router or routing capability in a BACnet building controller (B-BC) but there is a performance penalty if routing i cycle, it must relinquish the token to its logical neighbour and the round-robin sequence continues indefinitely. Token-passing is complicated but it improves real-time responsiveness over nondeterministic protocols such as Modbus – but it comes at a price. The building controller must not only scan sensor inputs, execute logic and set outputs, it must also participate in the token-passing protocol of MS/TP which is always generating traffic even when no data is being transferred. The recent increase in MS/TP baud rates to 115.2 kbaud exasperates the problem.

Understanding the requirements of a standalone BACnet router and a building controller doing BACnet routing we decided to run a test. We connected 31 Alerton MS/TP devices on a single 76.8 kbaud MS/TP segment to a Tridium JACE-3E BACnet building controller. The JACE was configured to read 10 points from each Alerton controller and create a 10-point history for each device with an update time of one-minute per point. We felt this would simulate the actions of the JACE in handling alarms, trends and graphics. The JACE has a handy resource monitor and we saw that the CPU load was between 40–80% for much of the time. Typical results are shown in figure 1.

We then installed a Contemporary Controls' BASrouter (BACnet MS/TP to BACnet/IP BACnet router) between the JACE and the Alerton controller segment using the JACE's BACnet/IP client driver. The JACE was able to automatically detect this change and start communicating with the Alerton devices through the BASrouter. After this was done, we were able to witness a large improvement in performance from the JACE. Figure 2 shows that on average the CPU resources were now lowered to be between 20–40%.

Besides improving building controller performance by off-loading MS/TP traffic to a standalone router, the BACnet router offers wiring convenience. Instead of running MS/TP cable to the building controller, the installer can run MS/TP cable to the nearest Ethernet drop and install a standalone router at this location. As more IP networks are installed, there will be less need to install long MS/TP cables.

An application note on our testing can be found at www.ccontrols.com/support/basrouter.htm Although testing was done using a JACE, similar performance improvement is expected from any building controller that off-loads MS/TP traffic to a stand-alone BACnet router.

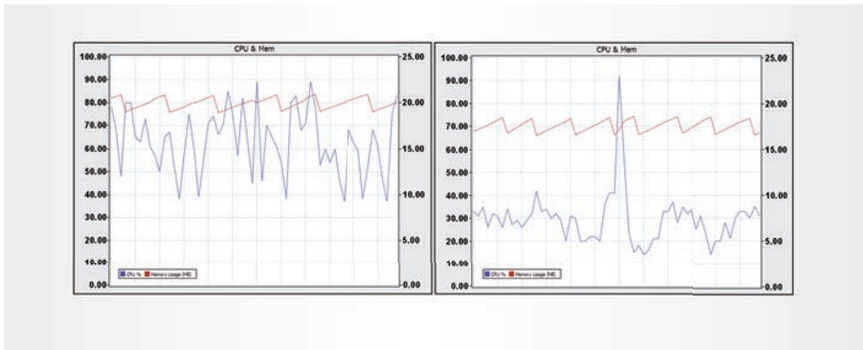


Figure 1: JACE CPU and memory usage when the JACE-3E is directly attached to 31 Alerton MS/TP controllers.

Figure 2: CPU and memory usage when a JACE-3E is attached to a BASrouter BACnet router which in turn is connected to 31 Alerton MS/TP devices.

George Thomas
President | Contemporary Controls
www.ccontrols.com

Integrated Building Management Helps Cut Operator Costs

The latest version of Honeywell`s flagship Building Management System, Honeywell's Enterprise Buildings Integrator™ (EBI), Release R430, addresses the growing trend of smart, integrated buildings and facilities, where automated systems are integrated and managed across the enterprise network. This provides an enhanced and more comprehensive view. Controlling the equipment and activities in a facility helps boost productivity and deliver operational savings over the life of a building.

EBI is a modular platform, which integrates a wide variety of systems such as HVAC, Lighting, Security, and Life Safety applications in one central system. This provides facility – wide insight, improved reporting, as well as more efficient information management and decision making. EBI communicates with industry-leading open protocols like BACnet, OPC® and LonWorks®, which helps customers integrate with third-party software and hardware, and benefit from the scalability and flexibility that come with an interoperable architecture.

The recent upgrades to EBI R430 promote operational efficiency with enhanced mobility, increased automation and intelligent intuitive user interface.

- Improved integration – EBI is now compatible with many common web services to provide facility managers and IT staff with new ways to customize how building systems import and mine data. It also allows users to synthesize the information into actionable recommendations.

- Enhanced mobility – operators can continue to use smartphones for remote access and management. They can now also implement connectivity, which replicates the user interface of an EBI workstation and provides access to all building information, such as system status and trend data that can help optimize energy use in real time.

- Intuitive interface – while the basic layout and navigation remain, the new software incorporates features common to consumer applications, such as drag-and-drop interaction, that make day-to-day tasks and training easier.

More than 20,000 EBI systems have been deployed in over 160 countries in the last decade. Current customers can easily migrate to the latest release, providing them with the new functionality, as well as continued returns on their investment.

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Honeywell

Intelligent, Integrated Built on BACnet® Solution

Contemporary Controls' Scalable Building Strategy utilises Niagara[AX] hardware and software for an intelligent, integrated, device-to-the Internet solution for small to large sized buildings.

The Niagara AX Supervisor network server provides centralised data logging, alarming, scheduling and real-time displays to web browser clients. Tridium JACE building controllers provide local supervision over BACnet routers, gateways and Powered by Sedona Framework™ field controllers. Control programming and configuration are accomplished using a single tool — Niagara WorkPlace AX.

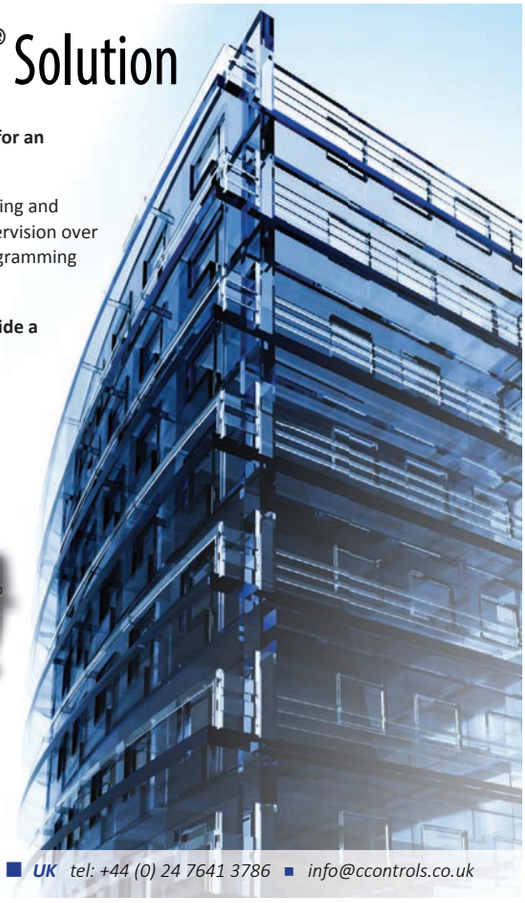
Tridium's open-architecture with Contemporary Controls' BACnet connectivity products provide a seamless intelligent and integrated building solution.

AX Network Supervisor

Powered by niagara AX FRAMEWORK

Tridium JACE Controllers

CONTEMPORARY CONTROLS



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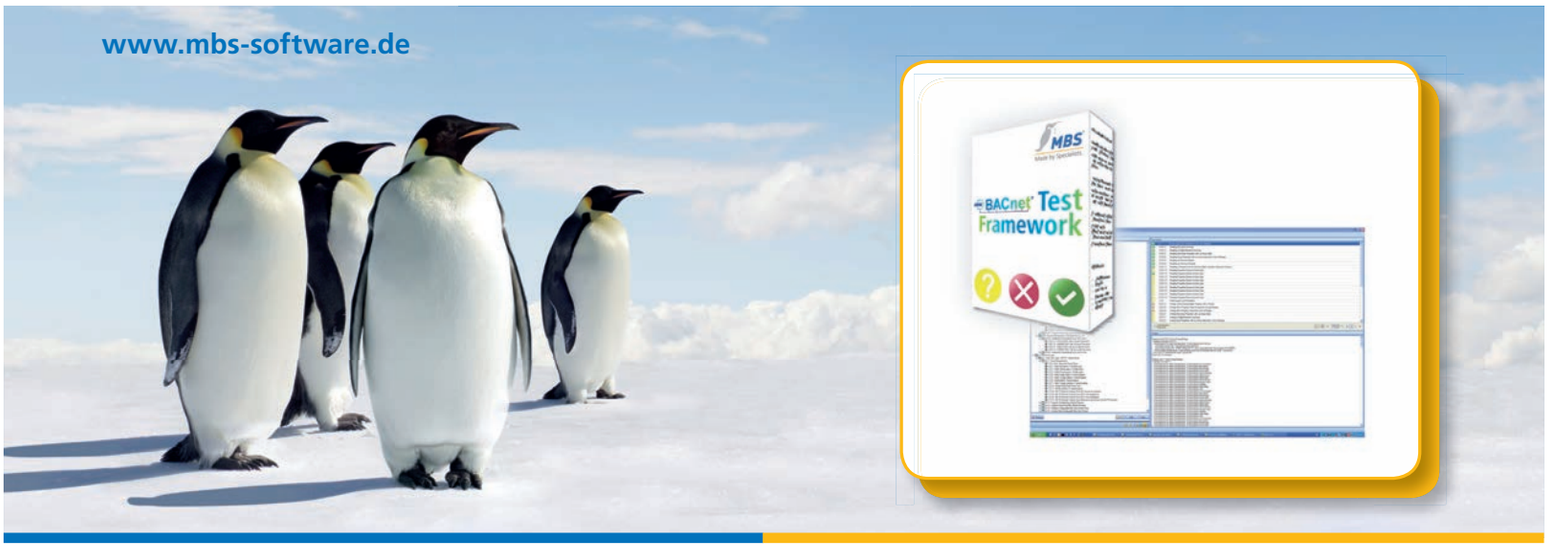

BACnet Test Framework

The perfect tool for pre-testing and quality assurance

The BACnet Test Framework is a software to test devices on conformance to the BACnet standard. Since 2007, this software is used as the official BACnet test tool.

The software supports the latest test-plans released by the working group BTL-WG. A comprehensive API with over 370 BACnet functions allows the programming of own test producers based on the programming language Python.

Furthermore, the software can be used for quality assurance for continuous testing of BACnet-devices. A complete automation of test steps is possible.

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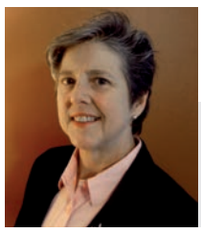
About BACnet International

BACnet is an industry association that facilitates the successful use of the BACnet protocol in building automation and control systems through interoperability testing, educational programs and promotional activities. The BACnet standard was developed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and has been made publicly available so that manufacturers can create interoperable systems of products. BACnet International complements the work of the ASHRAE standards committee and BACnet-related interest groups around the world. BACnet International members include building owners, consulting engineers and facility managers, as well as companies involved in the design, manufacturing, installation, commissioning and maintenance of control equipment that uses BACnet for communication. For more information, please visit www.bacnetinternational.org.

New BTL Listed Products 2013 - 2014

A new addition to our testing organization is the creation of the BTL Testing Coordinator position. We welcome Emily Hayes to the BACnet International team. Emily comes to us with a technical background and years of experience in project management. She will be coordinating all testing activity for the BTL Reference Lab in Pune, India. Duffy O'Craven continues in his role as BTL Manager but will be concentrating on the technical aspects of testing while Emily takes over the more administrative and organizational side.

ASHRAE standard 135.1 - 2013 and the BTL Test Plan governs the testing. There are three documents required to be filled out and mailed/emailed to btl-coordinator@BACnetinternational.org in order to make application for testing and begin the testing process. Fillable forms and instructions describing the process will be available soon for the 14.0 test package at www.bacnetlabs.org/test_documentation. The 14.0 test package will be available in early September. The BTL Checklist and the BTL Testing Application determine the testing which will be performed. Every device is different, but a schedule estimate and test case can be created from those two documents. A signed BTL Testing Agreement and non-refundable US $750 Application Fee are required for application acceptance and securing a scheduled test time. BACnet International member companies at Silver level or higher receive a discount on testing fees. It is common for Testing and Listing to apply to a family of devices that share underlying BACnet software. We test only the BACnet software and functionality. If the same firmware is used in common amongst devices, one Testing and Listing can apply to the family of products. If you have any further questions, please do not hesitate to ask. We look forward to seeing your application for BTL testing!



Emily Hayes
BTL Coordinator
btl-coordinator@bacnetinternational.org

ABB
- E-Clipse

Airtek
- Airtek AWS
- Airtek OWS
- DAC
- DSC DSF
- GC-RB23
- Operator Display Panel

ALC
- LGR-Line
- ME812U-LGR
- ZN341V

Azbil
- Azbil InfBC

Beckhoff
- Beckhoff TwinCAT

Belimo
- Belimo P6

Bosch
- Bosch Heatronic

Carrier
- iVu CIV-OR
- MPC-Open-XP

CtrlAppl
- CtrlAppl LT
- CtrlAppl LT-PQ-GR-MC IP
- CtrlAppl LT-PQ-GR-MC MSTP
- CtrlAppl Elnet

Distech
- Distech ECB-PTU series
- Distech ECB AAC
- Distech ECB series

Delta
- Electric DAC
- Electric DSC DSF
- Electric GC-RB23
- Electric Operator Display Panel

Dwyer
- Dwyer CDTA

Ebtron
- Ebtron GTC116
- Ebtron GTM116

FieldServer
- FS-B35XX
- FS-QS-1010

Fuji
- Fuji Frenic

Gavazzi
- GFR ems2

Greystone
- CO_2 Detector

Grundfos
- CIM500

HNW
- HNW Centraline ARENA-AX OWS
- HNW CentraLine Eagle
- HNW ExcelWebII
- HNW Spyder

Honeywell
- CPO-DIO

Johnson Controls
- JCI FAC361x
- JCI Fxexplorer
- JCI NIE
- JCI ODS

Kamstrup
- MULTICAL-602

KMC
- AG-BAC-4000
- KMC BAC-8x0x-03
- KMC SimplyVAV

Lennox
- ProdigyII

LG
- SmartGreen

LGE
- PNF-PQNFB
- PQNFB17C1

MREng
- mrBCON
- Smartrol

OEMCtrl
- IOZone
- LGR 812u
- Prtl-Pro

Phoenix
- Phoenix Portal
- Phoenix RoomController
- Phoenix RoomIntegrator
- Phoenix RoomManager
- Phoenix Supervisor

Price
- CriticalCtrls

Regin
- ExoCompact

SAMSON
- TROVIS

Sauter
- ecos500
- modu525

Schneider
- ENS-BAC-AWS
- iEM3365
- NXT
- OWS
- TRD

SE-Elektronic
- E-DDC-3.2

Shina
- Shina FCU-series

Siemens
- Siemens Desigo
- Siemens PTEC
- Siemens PXC22
- Siemens PXC3
- Siemens PXC001
- Siemens PXC3
- Siemens PXG3

Toshiba
- BMS-STBN10E

Trane
- TR150
- Tracer-ES

Trend
- IQ4

Triatek
- xMS-165x

Tridium
- JACE-3E

Unitec
- BAQ08V

WAGO
- 750-831

Yaskawa
- Z1000

New to the BACnet International Family

BACnet International is the international organization that encourages the successful application of BACnet through interoperability testing, educational programs and promotional 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 also proud to have welcomed the following new members to our ranks in 2014:

Abies Technology Inc.
Abies Technology Inc. focuses on state-of-the-art microprocessor-based with embedded firmware/ software technology in applications of HVAC controls, homes and buildings field controls, and green control products. With more than 20 years of engineering and design experiences, they design and manufacture the quality and competitive control products that best fit customer specific requirements around the world.

Abies Technology Inc.
Taiwan
Silver Member of BACnet International
www.abiestech.com

ASI Controls
ASI Controls manufactures Direct Digital Controls (DDC) for the Heating, Ventilating, and Air Conditioning (HVAC) and light industrial marketplace. They offer a powerful, cost-effective, and easy to configure family of web enabled, OPC compatible, controllers, peripherals and software products.

ASI Controls
United States
Silver Member of BACnet International
www.asicontrols.com

Carlo Gavazzi
Carlo Gavazzi is an international group active in designing, manufacturing and marketing electronic equipment. The Group's products (sensors, monitoring relays, timers, energy management systems, solid state-relays, safety devices, fieldbus systems) provide automation solutions for the global markets of industrial and building automation.

Carlo Gavazzi
Italy
Gold Member of BACnet International
www.carlogavazzi.com

Eaton
Eaton is a power management company with 2013 sales of $22.0 billion. Eaton provides energy-efficient solutions that help their customers effectively manage electrical, hydraulic and mechanical power more efficiently, safely and sustainably. Eaton has approximately 101,000 employees and sells products to customers in more than 175 countries.

Eaton
United States
Silver Member of BACnet International
www.eaton.com

Heat-Timer Corporation
Since 1937, Heat-Timer Corporation has set the standard for heating control systems in NYC buildings, starting with the introduction of the world's first weather actuated controls. Decades later, Heat-Timer ICMS Internet Control Management Systems are helping New York property owners stay afloat despite rising fuel costs and limited manpower.

Heat-Timer Corporation
United States
Silver Member of BACnet International
www.heat-timer.com

Lennox Industries Inc.
Lennox Industries Inc. produces a wide range of innovative, energy-efficient and cost-effective HVAC systems designed to reduce the operational costs, energy consumption and environmental impact of commercial buildings. Customers include schools, healthcare facilities, government buildings, retail stores, restaurants and office complexes, and the engineers and contractors who design and build them.

Lennox Industries Inc.
United States
Silver Member of BACnet International
www.lennox.com

New to the BACnet International Family

LG CNS

LG CNS provides industry-specific solutions based on smart technology. Through smart technology, LG CNS strives for the convergence of the existing IT environment with new technologies (i.e. cloud computing and big data) and with diverse industries. Such convergence will produce diverse combinations of technologies, create greater added value, and further the advancement of smart technology.

LG CNS
South Korea
Silver Member of BACnet International
www.lgcns.com

Optergy

Optergy uses innovative technologies to create intelligent automated buildings that are cost effective, operationally efficient and manageable for their owners, and which provide a productive and safe environment for their occupants.

Optergy
Malaysia
Silver Member of BACnet International
www.optergy.com.my

S-1 Corporation

S-1 Corporation is a Samsung affiliate company, founded on Samsung Group's corporate vision and philosophy. Since its establishment in 1977, S-1 has continued to lead the way as the industry leader in security and safety services.

S-1 Corporation
South Korea
Silver Member of BACnet International
https://www.s1.co.kr

Shina System

Since it's establishment in 2002, Shina System has 100$ localized creative and unrivaled building monitoring and control systems as well as the system software through continous R&D and investment in the automatic control field. Shina System builds systems that provide operational convenience, stability and extensibility to customers through system integration and energy saving solutions made available by making building automation more intelligent, and accomplishes customer satisfaction through creation of higher efficiency and value.

Shina System
South Korea
Silver Member of BACnet International
www.shinasys.com

Unitec Corporation

Unitec Corporation is a manufacturer and developer of electronic devices for use in building automation and factory automation.

Unitec Corporation
Japan
Silver Member of BACnet International
www.uni-tec.co.jp

Vacon

Vacon is driven by a passion to develop, manufacture and sell the best AC drives and inverters in the world – and provide customers with efficient product lifecycle services. Their AC drives offer optimum process control and energy efficiency for electric motors. Vacon inverters play a key role when energy is produced from renewable sources. Vacon has production and R&D facilities in Europe, Asia and North America, and sales offices in 30 countries.

Vacon
Finland
Gold Member of BACnet International
www.vacon.com

Vector Controls

Efficient, simple and inexpensive HVAC control solutions from Vector Controls optimize your indoor climate and conserve resources. They provide projects ranging from stand alone ventilation controllers to HVAC system solutions for entire buildings with internal and external devices. The universal programmable controllers are the heart of all Vector applications. Complemented by the wide range of sensors, the fieldbus connection of the controllers and the graphical representation of the data with the GSM series (gateway server modules), every HVAC project can be optimally implemented with Vector Controls systems.

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Calendar of BACnet International Events

Date	Location	Event	Highlights
2014 – 2015			
October 7 – 8, 2014	Las Vegas, NV	NFMT Vegas / BACnet International Educational Conference Vegas	BACnet International booth (member product showcase display) and education track
October 1 – 3, 2014	Washington DC	WEEC	
October 26 – 28, 2014	Charleston, SC	BACnet International Plugfest	www.bacnetinternational.org
January 26 – 28, 2015	Chicago, IL	2015 AHR Expo	BACnet International booth
March 10 – 12, 2015	Baltimore, MD	NFMT Baltimore	www.nfmt.com/baltimore
April 14, 2015	Chicago, USA	BACnet Global Roadshow	www.bacnetroadshow.org
April 21, 2015	Vancouver, CDN	BACnet Global Roadshow	www.bacnetroadshow.org
April 28, 2015	Buenos Aires, ARG	BACnet Global Roadshow	www.bacnetroadshow.org
May 5, 2015	Sao Paolo, BRA	BACnet Global Roadshow	www.bacnetroadshow.org
May 5 – 7, 2015	New York City, NY	LightFair	www.lightfair.com

Information about all Events:

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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.

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