

BACnet
International



JOURNAL

Issue 14

This Issue

Knowledge is Power



Global Testing of the Global Standard



THE BACnet TESTING LABORATORIES

(BTL) was established to support BACnet® compliance testing and interoperability testing activities as well as oversee the BTL Mark and Listing program. The tests are designed to validate that the product correctly implements a specified set of BACnet features.

To date there are **over 800 BTL-Listed products**, providing users with assurance that these devices have passed the industry standard BACnet conformance tests conducted by recognized, independent testing organizations.

For suppliers, the rigorous testing associated with obtaining the right to use the BTL Mark is a powerful methodology for ensuring any implementation errors are found and eliminated before a product reaches the market. This improves product quality and reduces cost.

The BTL Mark is a mark of distinction that many building owners and control system designers have concluded **accelerates and lowers the cost of system integration**. As such, it is becoming commonplace for specifiers to require the BTL Mark and/or BTL Listing in order to be eligible for a project.



BACnet Testing Laboratories

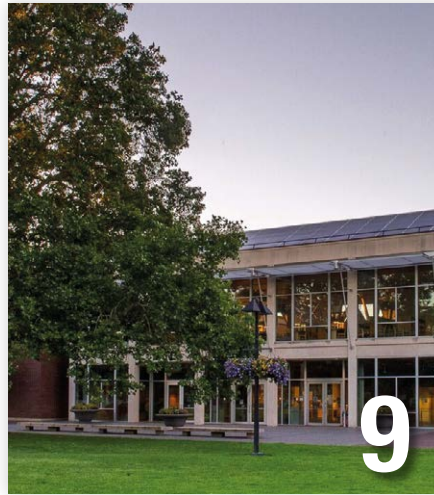
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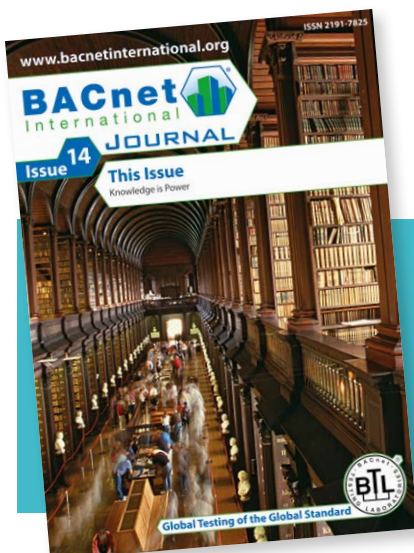
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Getting There from Here

The shift in thought and action the BACnet community needs to make

I was very pleased to be asked to write another letter to the readers of the BACnet International Journal. I am consumed by the changes now occurring in our industry, and some of these shifts in thoughts and actions need to be shared and discussed within our community. We all need to exchange our perceptions and thoughts while morphing them into our own personal realities. I find that I never know how I feel and think about something until I write about it. That leaves you victim to my outpourings.

Instead of providing answers all I ever do is ask questions in the hope of being the catalyst of change! Please defend yourself and share your thoughts and opinions on the social media stream of your choice, or even provide an article for a BACnet International publication.

How does the smart building automation industry make the transformation that it needs to undergo? This "Getting There from Here" discussion deals with the shift in thought and action that we all need to make to deal with the rapid change that is upon us.

There is an ongoing discussion in the community about a couple of significant developments in system architecture that have the potential to reshape our industry. One is the emergence of low-cost, connected automation devices that allows for intelligence and cloud connectivity in every device in an automation system instead of just at the operator workstation or major control nodes. The August Autonomous Actions on the Intelligent Edge discussions on AutomatedBuildings.com, in addition to my track's theme for the AHR Expo Chicago education sessions, The Future of Building Automation – "Data at the Open Intelligent Edge", provide some background on the challenges this creates and highlights the likely path of transformation we all encounter.

Much like the auto industry is trying to redefine itself as a systems and software industry, the building automation industry needs to evolve to the point where it looks and thinks like the self-learning software companies we are morphing into. Which leads to the question of, "Who will become the new Building Data Architects and the virtual building software companies of our future?"

Self-driving, autonomous cars are a good analogy for what we need to do with buildings. We need to ask ourselves, "How can we make smart buildings more self-driving, and improve our client/customer experience?" We need to ask ourselves, "How will we deal with continuous connection starting at the edge, and moving the bits of intelligence, intelligently?"

To pay for all this we have to answer the question of, "How will we create value from our newly found data and bring it back to the hive to discover new ways of providing comfort, health, and satisfaction in our buildings?"

Bottom line, we need to recreate ourselves and our industry to do things we never imagined in setting a path that can take us from there to here.

A critical part of our transformation will be the "new kids on the block" who are coming into our industry. They are creators and makers who fully understand IoT views and the importance of open standards. In addition, they philosophically dislike proprietary approaches. In some sense they live on the other side of the transformation, urging us to change our ways. These newer members of the industry are a positive force that leads us to think younger, and differently, about how we can utilize an intelligent self-learning self-acting edge to enable people-serving, self-driving buildings.

How dramatic a transformation are we talking about? Ponder this from Tom Goodwin:

Uber: The world's largest taxi company, owns no vehicles.

Facebook: The world's most popular media owner, creates no content.

Alibaba: The most valuable retailer, has no inventory.

AirBnB: The world's largest accommodation provider, owns no real estate.

It seems likely the transformation in building automation will be as dramatic, if slower developing. There are lots of articles on IoT with different perspectives on how it will impact our industry. There is no telling which view will turn out to be right, only that it will indeed have an impact. And the core IoT capabilities that will drive that impact are data acquisition combined with machine learning.

One view of the future is that application programming itself disappears in favor of machine learning, fed by broad streams of real-time data. In this view, the development methodology of deterministic, rules-based application programming will be replaced with the probabilistic logic that's at the heart of AI applications like chatbots, recommendation engines and self-driving cars. Can you even imagine a building automation industry that serves occupants and delivers ultimate energy savings while requiring no application programming? A system where design consists mostly of installing really intelligent components that use data to figure out on their own what to do and when to do it? Talk about dramatic transformation! Of course that leads us to ask, "What about existing systems and technologies?" Are they a barrier or an enabler? And what about the evolution of service businesses that help building owner/operators make the best choices among diverse technologies and approaches? Which leads us to follow on questions about the new roles that will come with these service businesses (think Big Data Engineer, Digitalization Specialist, etc).

There are so many questions and most of them have many evolving answers. So, be informed. Participate in the discussion. Join me in puzzling out how we get from there to here – how we navigate the inevitable changes facing our industry, while thinking younger and differently, using new IoT tools to create People-powered, self-driving buildings, from the intelligent self-learning, self-acting edge.

A great way to get started is to participate in my Industry Collaboratory interactive panel discussion on Tuesday, January 23 at 1:30 pm at AHR Expo in Chicago.



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The Next Level for Smart Buildings: Total Room Automation



Integrated Room Solutions

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The vision of the BACnet standard has always been focused on consolidating building automation systems to make the facility manager's life easier. In the beginning, this was mainly focused on the HVAC-specific systems which BACnet was originally designed to support. But end user expectations have expanded considerably: Users have asked for, and the industry trends have pointed towards, a broader definition of smart systems and smart buildings, beyond the original HVAC-specific focus. And now, conversations about the Internet of Things (IoT) and or Smart Systems and Smart Buildings, are taking place in a way that seem much more tangible than conversations five years ago would have presumed.

In the past, a customer request for a fully integrated HVAC, lighting control, and shades control package would be fulfilled via three different and separate control systems, integrated and communicating using BACnet. This was the best solution available. The user would have a consolidated view at the user interface level, fulfilling the promise of an integrated system. But ultimately, behind the scenes, there were three different and separate systems with redundant networks and controls increasing the complexity and integration challenges during construction and throughout the complete lifecycle of the building.

Today, however, better options are becoming more readily available. Instead of three independent but integrated control systems for HVAC, light and shades, there are now options for a single infrastructure and system that controls all three disciplines. Control platforms that deliver control of HVAC, lights, and shades from a single integral controller, with a single device on the wall.

This concept provides many benefits for the user and facility manager. Having one system instead of three significantly reduces installed costs and operating costs including energy, maintenance and support and elevates the user experience. Simplification of installation and reduction of costs is achieved with a single zone controller providing integral control of all three disciplines: HVAC, the lighting control and shade control. Redundant lighting and shade controllers and networks are no longer needed. This integral concept eliminates the need for complex field integration, significantly reducing complexity during construction and operation of the building. One system configuration and commissioning tool provides the facility engineer with a simplified workflow, with common tasks managing all three disciplines at once. A single user interface allows room occupants to manage lighting and shade scenarios, while also managing control of the temperature and airflow to the space.

Much of the energy consumed by building systems is to serve the occupants and provide for their comfort. But building automation can reduce non-productive energy use. Comprehensive setback strategies apply to ventilation, temperature, lights and shading. Proposed guideline (ASHRAE GPC 36P) on High Performance Sequences of Operation suggests the value of connecting schedules and occupant sensors across control systems. With separate systems, this requires additional wiring to connect occupancy sensors from the lighting control system to the HVAC control and shade control system, or field integration using BACnet. Both approaches add cost and lead to increased complexity, integration challenges and maintenance issues. With this integrated approach, occupancy information

is available to HVAC control, light control and shade control through the single zone controller. These single controller solutions are options for architects / engineers looking to differentiate their offering for customers, construction managers looking for ways to reduce installed costs and construction complexity, and facility managers looking to take advantage of a simplified user experience. This new approach extends the vision of BACnet beyond an integrated solution to a BACnet-based single and integral system solution. 

ABOUT THE AUTHORS

Chris Hollinger has held various positions in Building Automation Systems Product Management in his 20+ year career and is currently Business Line Manager for Siemens Building Technologies. He actively leads product definition, development and introduction of BACnet based products and systems for Siemens, while being active in the speaking circuit regarding System Integration and BACnet topics, and involved in the BACnet International Marketing Committee. He holds a BS and an MBA from the University of Illinois, Urbana-Champaign.

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Green Buildings Linked to Cognitive Function

Air Quality Measurably Improves Employee Productivity

The increased adoption of renewable energy is resulting in a rapid paradigm shift around the world. There is a global focus on attaining more sustainable solutions to reduce global warming and meet sustainability while reducing expenditures. Building automation systems (BAS) are at the forefront of this green movement, providing the ability to track energy usage and make effective changes to the way buildings operate. This reduces both the environmental footprint of a building and its operating costs. The capability to track energy usage and make effective changes to reduce negative effects on the environment can turn a conventional building into a green building – and these achievements have an additional and perhaps surprising benefit besides sustainability and costs savings: green buildings make employees more productive.

Green buildings are typically designed using an integrated approach to save energy, use less water, and create less waste during construction and operation, while resulting in an elevated level of indoor comfort. By implementing such a well-rounded, holistic approach, green buildings can provide enduring social, environmental, and economic benefits. While the benefits of green buildings have been studied extensively, the emphasis in the past has been on costs versus benefits. However, newer studies show that green buildings can provide both cost reduction benefits and value added benefits like measurable employee productivity.

The measurement, verification, and controllability of the performance of mechanical and electrical systems are critical aspects in the design and operation of sustainable buildings. By using effective planning and putting parameters in place to provide accurate metrics and feedback, building operators are able to “game” the system, and achieve major results through minor changes based on real-time data.

The BACnet Protocol

Choosing the BACnet protocol for building controls supports green buildings because the stan-

dard allows multiple vendors to co-exist and share data on a common network, thereby maximizing the usefulness and longevity of the network. At the Reliable Controls headquarters, for example, there are at least eight different BACnet vendors integrated into a single system. BACnet integration of the HVAC, lighting, and security systems allows occupied comfort settings to be enabled, maximizing energy savings. Individual control of temperature, light, sunshades, and occupancy is provided via LAN or wireless access.

Building automation systems are continuously evolving as the industry embraces more integrated systems based on both emerging technologies and proprietary products. The trend of moving forward towards more open systems is in part due to the BACnet protocol. BACnet provides the basis on which the green building industry can grow through using a variety of products because of its high level of interoperability, while also promoting the protection of the investment 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. BACnet resolved these issues by defining a basic set of rules for how and what building controllers could communicate, creating more sustainable, flexible systems that make an impact on the green building space.

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 it was designed to be extendable without altering existing capabilities. As a result, BACnet controllers made today are designed to be interoperable with the controllers and workstations of the future. The BACnet protocol truly allows for the sustainable growth required in order to achieve green certifications.

Links to Cognitive Functionality

There are several recent studies that review the links of green buildings to cognitive functionality. In *At Home with Nature*¹, the effects of “greenness” on cognitive functioning are examined, and there are clear links environment and behavior. It demonstrates that a natural environment plays a far more significant role than has previously been recognized. Results of this study indicate the most improved buildings in terms of greenness also tend to house those with the highest levels of cognitive functioning. This is echoed in *Healing Spaces: Elements of Environmental Design that Make an Impact on Health*² which finds that the “ambiance” of a space has a measurable effect on its occupants.

*Green Buildings, Organizational Success, and Occupant Productivity*³ examines a variety of frameworks used by organizations to evaluate performance, along with correlations between investment in green buildings and productivity. The bottom line of this study is that green buildings are relevant to business interests across the full spectrum of concerns, from portfolio issues, to enhanced quality of individual workspaces. The topic of air quality is explored, along with

Footnotes:

- 1) *At Home With Nature*: Wells, Nancy. (2000). *At Home with Nature Effects of “Greenness” on Children’s Cognitive Functioning*. *Environment and Behavior*. 32. 775-795. 10.1177/00139160021972793.
- 2) *Healing Spaces: Elements of Environmental Design That Make an Impact on Health* Marc Schweitzer, Laura Gilpin, and Susan Frampton. *The Journal of Alternative and Complementary Medicine*. October 2004, 10(supplement 1): S-71-S-83. <https://doi.org/10.1089/acm.2004.10.S-71>
- 3) *Green Buildings, Organizational Success, and Occupant Productivity*: H. Heerwagen, Judith. (2000). *Green buildings, organizational success and occupant productivity*. *Building Research and Information - BUILDING RES INFORM*. 28. 353-367. 10.1080/096132100418500.
- 4) *Associations of Cognitive Function Scores with Carbon Dioxide, Ventilation, and Volatile Organic Compound Exposures in Office Workers: A Controlled Exposure Study of Green and Conventional Office Environments*: Allen JG, MacNaughton P, Satish U, Santanam S, Vallarino J, Spengler JD. 2016. *Associations of cognitive function scores with carbon dioxide, ventilation, and volatile organic compound exposures in office workers: a controlled exposure study of green and conventional office environments*. *Environ Health Perspect* 124:805–812

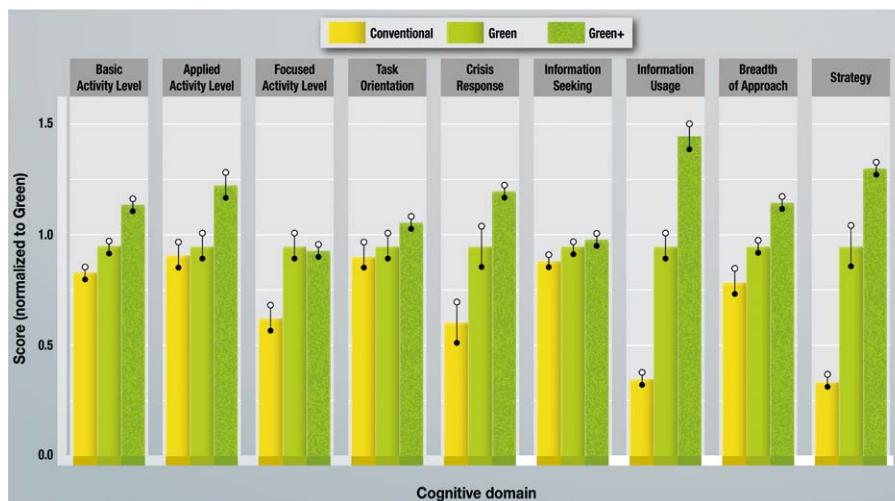
showing a strong link between environmental factors and work performance, as well as actual work output compared to access to personal controls and self-reported comfort.

The research on personal control over environmental conditions, especially temperature and ventilation, shows a strong link to enhanced work performance as well as to comfort. Just the perception of personal control makes a measurable difference in employees' performance, even when the controls are limited by the facility operator.

Air Quality

One of the most comprehensive studies linking green buildings to cognitive functionality, Associations of Cognitive Function Scores with Carbon Dioxide, Ventilation, and Volatile Organic Compound Exposures in Office Workers: A Controlled Exposure Study of Green and Conventional Office Environments⁴ examines how physical elements affect the physiological, psychological, cognitive, and social functioning of building occupants. It cites the advent of sustainable design and green building strategies as the reason for reinvigorating questions regarding specific factors in buildings that lead to optimized conditions for health and productivity. This double-blind study was undertaken in a controlled office environment to estimate the effects of several indoor environmental quality parameters on an objective measure of cognitive function in nine domains: basic activity level, applied activity level, focused activity level, task orientation, crisis response, information seeking, information usage, breadth of approach, and strategy functions. Cognitive performance was measured in indoor environmental quality conditions in "green" and "conventional" buildings. Additional conditions simulated a green building with a high outdoor ventilation rate ("green +") and elevated carbon dioxide (CO₂) levels independent of air ventilation.

The results of this study tie green building to a higher level of cognitive function. Cognitive function scores were significantly higher in green building conditions compared to the conventional building condition for all nine functional domains. The largest effects were seen for crisis response,



information usage, and strategy, all of which are indicators of higher-level cognitive function and decision-making.

For crisis response, scores were 97% higher for the green condition compared to conventional, and 131% higher comparing green+ and conventional conditions. For information usage, scores in the green conditions were 172 – 299% higher than conventional. And for strategy, which tests the participants' ability to plan, prioritize, and sequence actions, the green and green+ scores were 183% and 288% higher than with conventional conditions.

As CO₂ levels rise, the quantity of volatile organic compounds (VOCs), odors, and micro-organisms in the air also rise. This is the reason HVAC engineers use CO₂ level transmitters to regulate airflow in modern office buildings. CO₂ measurement is primarily used to estimate the number of occupants in a defined space.

The LEED Platinum certified Reliable Controls Headquarters Annex has installed carbon dioxide monitors throughout the building and integrated them into the BAS. The trickle vent dampers, wind tower dampers, and an air handling unit maintain the CO₂ set point with programmed alarms if any levels exceed 1,200 PPM.

Air quality is important, not only to ensure that sustainability guidelines are met and that energy consumption and costs are reduced, but also because a higher level of cognitive functioning impacts the health and well-being of building occupants, which in turn, can have a measurable effect on employee productivity and the bottom line.

Green buildings not only save money on operating costs and address environmental concerns, but the resulting improvements are also establishing a more productive workforce that is measurably more cognitively functional than in dated and inefficient conventional buildings.

ABOUT THE AUTHOR

Karina Wright is the Marketing Communications Writer for Reliable Controls at its LEED Platinum certified HQ Annex in Victoria, BC, Canada. The company specializes in the design and manufacture of Internet-connected building controls. Karina develops industry content related to Reliable Controls products, building automation, and sustainability.

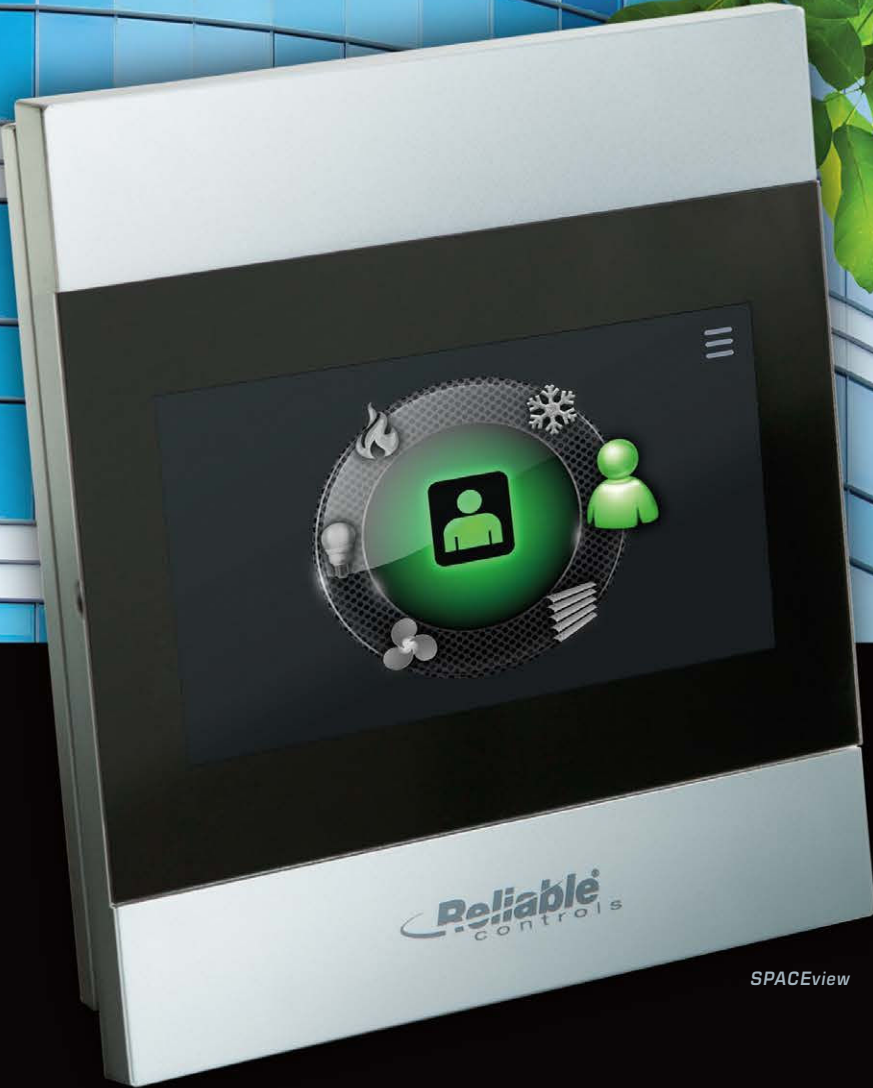


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MACH-ProView™ LCD



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Reliable Controls unveils the new MACH-ProView™ LCD. This freely programmable, combination BACnet® Building Controller (B-BC) and BACnet Operator Display (B-OD) resides on Ethernet, Power over Ethernet, Wi-Fi or EIA-485 networks. Backed by an industry-recognized 5 year warranty and a nation-wide network of certified Authorized Dealers, the new MACH-ProView will empower you to stay in touch with your building's performance.



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Beaverton City Library,
Beaverton, Oregon

BACnet Simplifies Controls Upgrade at Beaverton City Library

The Beaverton City Library in Beaverton, Oregon, needed a controls upgrade because their older proprietary C-Bus unitary controllers were failing. The existing JACE-600 NiagaraAX head-end with its support for BACnet and LON was to be retained, but all the C-Bus unitary controllers needed to be replaced. The goal was to not only replace failing equipment, but also to modernize the system to be completely BACnet compliant.

BACnet is an open protocol that is very popular. Because of its popularity, it is supported by numerous vendors across product lines. That makes system integration easier and it gives the building owner the advantage of being able to choose between different systems.

The Beaverton City Library, the second busiest library in the state, serves a population of approximately 142,000. Each month over 84,000 people visit the library to check out nearly 300,000 items. The total annual circulation exceeds 3.3 million items. The main library, located at 5th St. and Hall Blvd., is a 69,000 sq.-ft. full-service library maintaining a collection of over 350,000 items, has meeting rooms, a computer lab and youth programs.

To meet the need for BACnet compliance, Contemporary Controls' BAScontrol series of BACnet/IP Sedona controllers were used to replace the non-BACnet compliant controllers. Introducing BACnet/IP connectivity at the controller level allowed remote access to both the head-end and the unitary controllers.

The library's unitary controllers, along with some defective sensors and actuators, were replaced with seven BAScontrol22 controllers. BAScontrol22s now control a variable-air-volume AHU, a constant-air-volume AHU, a multizone AHU, two fan coils serving the boiler


and chiller rooms, and two unit heaters in the mechanical room and associated chiller pumps. The two Aerco boilers had local controls but a BAScontrol22 provided lead/lag coordination and supervision.

The BAScontrol22 is a BACnet/IP B-ASC compliant controller that can be programmed using the open control language called Sedona where components are dragged and dropped onto a wire sheet to create applications. The BAScontrol22 has eight universal inputs, four binary inputs, four analog outputs and six binary outputs – enough I/O to accommodate each application at the library without I/O expansion. There are two Ethernet ports on the controller allowing for daisy-chain network connectivity to the JACE-600 head-end over Ethernet. Points integration was over BACnet.

Since this was a retrofit project, the City of Beaverton put out the bid documents with con-

tractor American Heating of Portland OR becoming the successful bidder. American Heating sub-contracted DDC Support Services to provide control drawings, points-lists, and all the Sedona and Niagara programming. DDC Support Services also assisted with startup commissioning.

"The BAScontrol22 demonstrated its versatility in that it could accommodate a wide variety of applications including AHU-VAV, AHU-CV, AHU-multizone, boiler, chiller, cooling tower, fan coil and unit heater control with the same model controller," said Jon Vietti of DDC Support Services. "Sedona programming has the same look and feel as Niagara thereby simplifying control sequence programming."

The future goal is to replace the existing LON VAV terminal units with BACnet units to make the complete system BACnet. 

Retrofit control panel with three BACnet controllers using daisy chained ethernet connections



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Energy Savings and Ease of Operation of Building Automation Systems Drive Success

Schneider Electric Norway leveraged the experience they gained on a previous project to win an energy performance contracting project for the public buildings, schools, and nursing homes within the Orkdal municipality. A primary requirement was to deliver a uniform Building Management System for all the public buildings in the municipality.

Much of the project involved delivering BACnet technology through SmartStruxure to greenfield buildings. Two of the municipality's buildings contained legacy JCI Metasys® systems and were included in this project phase. The project scope involved heating zone control- and ventilation systems at Orkdal Nursery, and heating and zone control at Rianmyra Kinderkarten. A project requirement was to bring these two buildings into the single seat uniform user interface implemented for the entire municipality. This stream-

lined operations, training, and support of all buildings which, in turn, gave them energy savings. BACnet standards and the S4 technology made this possible.

Enterprise Level Automation was provided by a Schneider Electric StruxureWare Enterprise Server. Building level automation was provided by Schneider Electric StruxureWare Automa-

tion Servers at each location. The savings are measured in an Energy Operation system from Schneider Electric that was included as part of the technology upgrades delivered to the municipality.

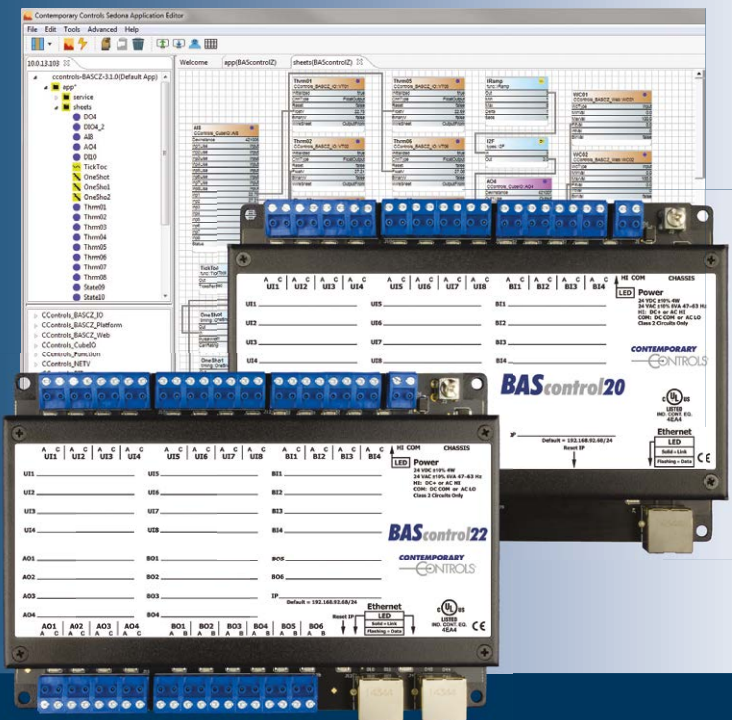
During the building assessment and planning process the Schneider Electric team determined that the existing Metasys® field control-

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Jan Arild Kleiven (L) and Terje Ebbesen (R)
Orkdal Nursey



Open Unitary Controller



- Open protocol – BACnet®/IP and MS/TP
- Open drag and drop component based programming language – Sedona Framework™
- Unrestricted programming tool – our free Sedona Application Editor

BAScontrol

CONTEMPORARY CONTROLS®



Orkdal Nursery

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lers (DX-9100s and FX07s) were still performing well and probably could for the foreseeable future. The selection of the S4 Router allowed the integration team to extend the useful life of, and enhance the services provided by, the existing devices.

The building operator wanted to completely replace the Metasys® user interface, and did not require a transition period of coexistence with the legacy Metasys® head end system. In addition, the small amount of time required to perform the integration would not adversely affect the comfort of building occupants. Therefore, the decision was made to not utilize the unique ability of the S4 Open: BACnet-N2 Router to enable the coexistence of the legacy Metasys® head end and the SmartStruxure Automation Servers on this project.

Instead, one of the integration tasks was to move all scheduling, global variable support, and other services and functions of the Metasys® NCM supervisory controller to the Schneider Electric Automation Server in each building. Because most of the legacy Metasys® N2 controllers were application specific devices they continued working with last known good values of global variables minimizing the impact on building occupants during this transition.

The Configure Wizard built into the S4 Open Management Console (the user interface for the S4 Open: BACnet-N2 Router) led the Schneider Electric team through the integration process, accurately discovered the N2 devices, and assigned the appropriate S4 device templates that provided BACnet point mapping for application specific controllers. When the Configure Wizard completed its task, the discovered N2 devices were automatically published as BACnet devices under a virtual BACnet network. The DX-9100 systems are a special case. Each is custom programmed and has a unique point map. The Schneider Electric team used the S4 Open Metasys® Configuration File Conversion Utility to generate custom Device Templates exactly matching the point assignments for each DX-9100. The integration team then assigned the custom Device Template to the device object in the BACnet-N2 Router for each DX-9100.

The legacy Metasys® field devices will continue to serve these buildings well into the future. This is a testament to the design and manufacturing quality that JCI put into these devices. But all electronic devices have a finite lifetime no matter how good they were on day one. So a short-term plan is included to replace these devices if any fail prior to a major building renovation being scheduled.

Call out: Outcomes were measured through interviews with the client after the integration of these two buildings was completed and the user interface was provided via Schneider Electric's SmartStruxure. The building operators observed that they can operate their installations in an easier way than with the legacy system and, as a result, use less time for inspection. The goal of a single, uniform building management system for all buildings in the municipality has been achieved, creating less energy costs. 🌱

The S4 Group
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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 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 proud to welcome the following new members to BACnet International.

Platinum Member



LOYTEC

LOYTEC develops, manufactures, and distributes router and gateway solutions, embedded Automation Servers and I/O Controllers, the room automation system L-ROC, DALI lighting controls, the VAV system LIOB-AIR, and also graphical user interfaces in the form of touch panels or via PCs or mobile devices.

Blumengasse 35
1170 Wien
Austria



Delta Electronics

Delta Electronics is one of the world's leading producers of power supplies and electronic components comprising cooling fans, EMI filters and solenoids. Their key power management products consist of switching power supply, EV chargers DC-DC Converters and solar inverters. The products are widely used in applications for automotive, medical, telecommunications, IT, automation and more.

F 186 Ruey Kuang Road
Neihu Tai-pei Shih 11491
Taiwan

Silver Member



Comfy

Comfy is a smart building solutions provider enabling building occupants to instantly regulate the temperature and lighting of their workspace from a mobile app. For building operators around the world, Comfy has delivered increased employee satisfaction and operational savings through fewer workplace complaints, improved fault detection, increased energy savings, and more robust building analytics.

300 Frank H. Ogawa Plaza
Oakland, CA 94612
United States



Dialight

Dialight defines the current state of LED lighting technology with continuous innovations in light output, efficacy and reliability for their complete line of high-specification lighting fixtures specifically designed for industrial, commercial, hazardous location, transportation & public infrastructure applications. These results are directly related to their ongoing commitment to advancing solid-state lighting products that vastly reduce maintenance, improve safety, ease disposal, and are more environmentally friendly – thereby helping to reduce CO₂ emissions, the dominant GHG contributor to global warming.

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Farmingdale, NJ 07727
United States



Matrix Controls

Matrix Controls, founded in 1989 is a building management system manufacturer located

in Singapore. Their leading range of BMS solutions provides fully automated HVAC management that is designed with energy efficiency in mind. Their solutions have been proven in the quality conscious markets of Singapore, Taiwan, Malaysia and China.

10 Jalan DBP
Dolomite Business Park
68100 Batu Caves, Selangor
Malaysia

MegaChips

MegaChips

MegaChips provides Integrated Circuits (ICs) and System on Chips (SoCs) that are essential for the advancement of Application Specific Standard Products (ASSPs). Leveraging decades of technology excellence, partnerships and acquisitions, MegaChips is shaping the next wave of the digital revolution with innovations in the Internet of Things, Communications, Displays, Mobility, Timing, Sensor Fusion and Wearable devices.

2033 Gateway Place
Suite 400
San Jose, CA 95110
United States

MesaLabs

Mesa Labs

Mesa develops, manufactures and markets, high-quality process validation and monitoring instruments and consumables. From Fortune 500 companies, to high tech start-ups, Mesa Lab's products are used to assure product quality, control manufacturing processes, and to solve problems in niche markets in healthcare, industrial, pharmaceutical, medical and food processing applications.

12100 West 6th Avenue
Lakewood, CO 80228
United States



Mircom

Founded in 1991, Mircom is a global designer, manufacturer and distributor of Intelligent Building Solutions. It's vision is to make buildings worldwide safer, smarter, and more livable. Reaching customers in over 100 countries worldwide, Mircom's portfolio includes: fire

detection & alarm, communications & security, mass notification, nurse call, and building automation & smart technologies.

25 Interchange Way
Vaughan, ON
L4K 5W3

M-SYSTEM

M-System

M-System offers a wide range of instrumentation / automation components used for process, factory and building automation, from the field level up to the control room level. They are your supply partner for the interfacing applications of analog/discrete signals, communication networks and intelligence systems.

5-2-55, Minamitsumori,
Nishinari-ku, Osaka 557-0063
JAPAN

NAO DIGITAL

NAO Digital

NaoDigital was founded by engineers with many years of field and development experience in the IBS (Intelligent Building System) field. Based on their knowledge of product development and system integration, they have advanced technology in ergonomic interface design, distributed object-oriented database, direct digital control (DDC), networking and real-time systems.

1106 Kolon Digital Tower Billant
32gil 30, Digital-ro, Guro-gu,
Seoul Republic of Korea



ODIN Automation (Viking Controls)

ODIN Automation is a company that is committed to providing the highest quality control products and services to the HVAC industry. They represent a number of control product manufacturers, and as an Authorized Building Control System Specialist (ABCS) their goal is to provide to the HVAC industry a complete turnkey offering of control products and services.

2 Townsend West, Unit 2
Nashua, NH 03063
United States

OSRAM

OSRAM

OSRAM is one of the world's leading lighting manufacturers with a history dating back around 100 years. Its product portfolio includes high-tech applications based on semi-conductor technology, such as infrared and laser lighting. The products are used in all kinds of applications ranging from virtual reality, autonomous driving, and cellphones to smart and connected lighting solutions in buildings and cities.

200 Ballardvale Street
Wilmington, MA 01887
USA



Samsung Electronics

Samsung Electronics inspires the world and shapes the future with transformative ideas and technologies that give people the power to discover new experiences. With a constant focus on innovation and discovery, they keep redefining the worlds of TVs, smartphones, wearable devices, tablets, cameras, digital appliances, medical equipment, network systems, and semi-conductor and LED solutions.

129, Samsung-ro, Yeongtong-gu
Suwon-si, Gyeonggi-do 16677
Republic of Korea



Setra

Setra, founded in 1967, designs and develops one of the most comprehensive portfolios of sensors in the world. It has nearly 50 years of experience in critical applications in many industries, and is part of the Fortive Corporation, a Fortune 500 science and technology leader.

159 Swanson Road
Boxborough, MA 01719
United States

Upgraded Memberships



BACnet International would like to congratulate the following companies on their strengthened commitment to the BACnet protocol by moving up a tier in their association membership. We thank them for their continued support and look forward to many more years of collaboration.

Silver to Gold



ASI
ASI Controls manufactures BACnet direct digital controls (DDC) for the heating, ventilating, air conditioning (HVAC) and light industrial marketplace. Customers use their products to manage environmental conditions, monitor status of key systems and components, and optimize building energy use.

2202 Camino Ramon
San Ramon, CA 94583
United States



Blue Ridge Technologies
Blue Ridge Technologies' Unified control solutions provide maximum energy savings, and increased reliability, at a fraction of the cost of traditional systems. By combining existing BACnet and other open protocol networks, along with their innovative modular designs, Blue Ridge has created a networkable solution that brings contemporary and legacy control systems into a Unified building automation platform.

1800 Sandy Plains Industrial Parkway
Suite 216 B
Marietta, GA 30066
United States



Carel
Carel leads the evolution of control technology and humidification for air conditioning and

refrigeration. Their products support customers with the most efficient energy savings solutions. Data-driven services through our IoT platform grant personalized value.

Via dell'industria, 11 35020
Brugine, PD
Italia



Danfoss
Danfoss is a worldwide manufacturer with a leading portion in industrial, commercial and retail refrigeration, heating as well as air conditioning and climate solutions. They focus on making quality products that enhance performance and reduce total life cycle costs for our customers. Every product manufactured by Danfoss is backed by more than 80 years of technical expertise.

Ulsnaes 1
DK-6300 Gråsten
Denmark



Dwyer
Founded in 1931, Dwyer is a leader in designing and manufacturing innovative controls, sensors and instrumentation solutions. They continue to grow and serve major markets including, but not limited to HVAC, chemical, food, oil and gas, and pollution control.

102 Indiana Hwy 212
Michigan City, IN 46360
United States



Price
Price Industries is a market leader in manufacturing and supplying innovative air distribution, critical controls, and noise control products through their high-quality products, reliable delivery, and knowledgeable follow-up service. After more than 60 years, Price remains a privately held family company with a deep heritage and commitment to innovation and service.

638 Raleigh Street
Winnipeg, MB R2K 3Z9
Canada



Strato Automation
Strato Automation offers automatic control products in compliance with the BACnet® protocol. They are designed to meet the requirements of all DDC centralization projects. For nearly ten years, Strato and CIMEQ (Centre d'innovation en microélectronique du Québec) have been working in close collaboration developing a new generation of building automation systems.

6781 Bombardier
St-Lenard, QC H1W292
Canada

New Course Coming Soon!!

Following the positive feedback of its BACnet Basics course, as well as the resounding request for more courses, The BACnet Institute is proud to announce the coming release of its new course, *The Facility Manager's Guide to Building Automation Systems (BAS)*.

This new course provides insight on how facility managers can effectively participate in and contribute to a BACnet-based BAS integration. However, 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.

By taking the course, you will get a stronger understanding of the key principles of BAS design and procurement, ensuring integra-

tion achieves required results. In addition, the course discusses the importance for collaboration between Facility Management and IT with a focus on how the relationship can be leveraged effectively in order to maintain long-term success. Lastly, the course explains how a BAS design model enables streamlined facilities, thereby ensuring adaptability to future opportu-

nities. Like the current BACnet Basics course, this new course is on-demand and self-paced so you can access it at anytime, anywhere. And it is free!

Become a catalyst for effective BAS integration, visit TBI today and take the course! thebacnetinstitute.org



Education • Resources • Community

New BTL Certification Program in Full Swing

In January of 2017, the BTL Certification Program was launched, combining the BTL Listing Program and the WSP-Cert Program. The BTL Certification includes all the privileges previously granted by the BTL Listing and WSPCert, including a Certificate of Conformance, a BTL Listing and the right to use the BTL Mark. This Certification is the indicator that a product has successfully passed rigorous verification by testing and demonstrates that it correctly implements rules and interoperability of the BACnet protocol.

The total transition to the BTL Certification Process is a yearlong process that is taking place during the 2017 calendar year. The transition of products from WSP Certificates to BTL Certification has already been completed. We are now receiving applications for products that are eligible to transition from BTL Listing-only to BTL Certification. The transition for this phase will be completed by the end of 2017.

More and more product specifiers are requiring BACnet as a "must-have" for system requirements. There are now 155 distinct manufacturers with BTL-Listed or BTL-Certified Products. This is an increase of 16% since last year. Specification of BACnet as the protocol, and requiring BTL Certification is becoming **THE** benchmark

for project specifications to ensure interoperable installations. The BTL Mark may be displayed only on products that have successfully passed BTL Testing. Testing ensures that the device correctly implements all of the BACnet functionality it contains as governed by ASHRAE standard 135.1. The BTL Working Group defines the BTL Test Plan and governs the testing.

Testing Process

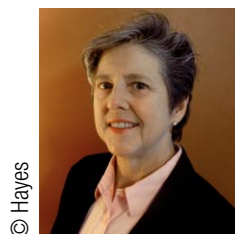
Suppliers can have their products tested at various global BTL Recognized Testing Organizations. These locations can be found on the **Device Testing** page of the BACnet Testing Laboratories website.

For those wanting to test at the BTL Lab, please submit the following three forms to btl-coordinator@bacnetinternational.org: BTL Checklist, BTL Testing Application, and BTL Testing

Agreement. Instructions for the entire testing process can be found under Current Test Package at bacnetlabs.org/test_documentation. Specific forms for each of the Recognized BACnet Testing Organizations may be obtained from the individual lab. Contact information may be found at bacnetlabs.org/page/device_testing. Forms for the BTL Lab may be downloaded by selecting "BTL Lab" on that page.

BACnet International member companies with Silver level or higher memberships receive a discount on testing fees. (The Testing Application fee is the same for all applicants.) Participants may apply for Testing and BTL Certification of a family of devices that share underlying BACnet software in order to minimize testing costs.

If you have any questions, please contact btl-coordinator@bacnetinternational.org.



© Hayes

Emily Hayes

BTL Coordinator and BTL Working Group Chair
btl-coordinator@bacnetinternational.org



Collaboration Leads to Ingenuity at PlugFest

The 18th annual PlugFest Interoperability Workshop was held September 26 – 28, 2017 at the University of New Hampshire's Interoperability Laboratory. Attendees included engineers from five different continents representing many manufacturers of BACnet and BACnet-related products – truly exemplifying BACnet's global presence.

The workshop included 12 sessions during which attendees performed interoperability testing of their BACnet solutions with BACnet devices from other vendors in a neutral and friendly environment. These sessions provide an opportunity for companies to improve their BACnet implementation and testing methods.



Photos page 16 to 18 © all images are property of BACnet International

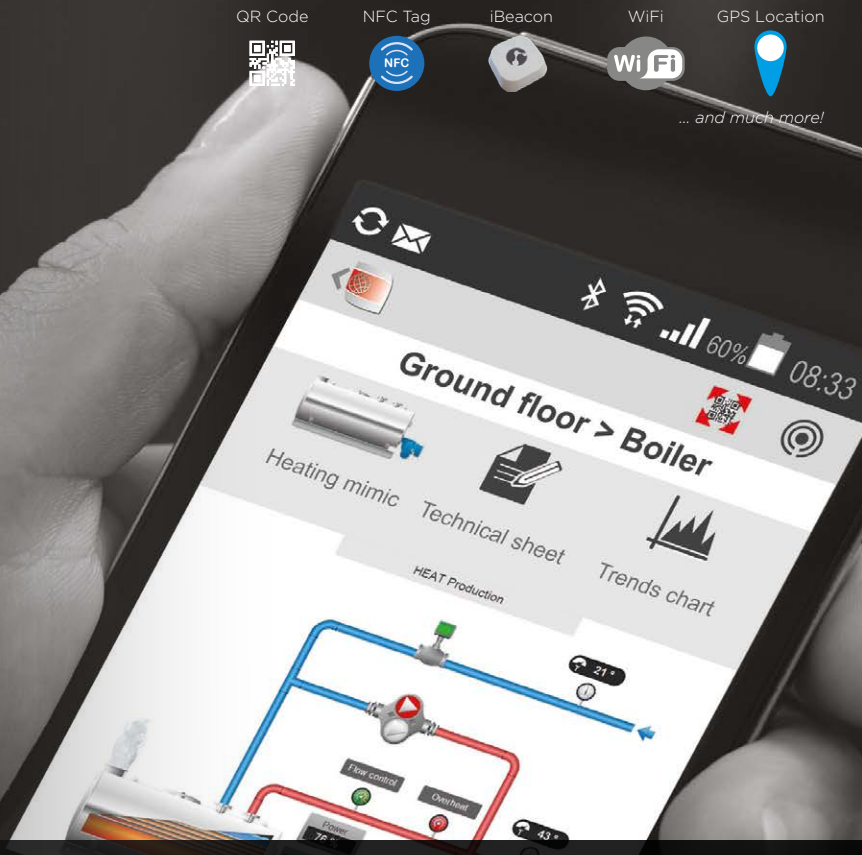
Testing sessions

PlugFest is an opportunity to mix testing one-on-one with a specific manufacturer in a given round (Pairing), or to arrange your equipment on a larger Local Area Network (Round Table) with multiple other manufacturers that round.

On the first day of the workshop the testing sessions were all Pairing, each with a different manufacturer. The first round was double length, providing time for getting any of the logistical hurdles worked out in making connections, and understanding what can be accomplished in testing with a given device in a constrained time.

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- #at the right time
- #in the right place
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Team captains for each attending vendor were given the chance to select preferences for their pairings prior to arrival.

Testing during the following two days was Round Table format, with both MS/TP and BACnet/IP networks. Most attendees selected two or three Round Table sessions, out of the twelve. These Round Table sessions provided a no pressure break from the one-on-one as well as the opportunity to plug with teams with which the attendees did not get to pair. These sessions were also used to investigate issues that were seen in the pairings, but attendees did not have time to fully explore. Some found the longer session on the second day to be the most fruitful since they were able to test with multiple other manufacturers' devices.





Educational sessions

The PlugFest workshop also included educational sessions conducted by Natsuko Takahashi of Delta Controls, Lori Tribble of Automated Logic and Mike Osborne of Reliable Controls. Topics included BACnet resources, updates to the BTL test packages, and the “new, cool stuff” happening with the BACnet protocol.

Attendees were also able to interact and get to know one another during several networking events. These enable relationships to form and provide a sense of collaboration for moving forward.

PlugFest continues to be a success and a great opportunity for BACnet manufacturers to come together and help one another while moving the BACnet standard forward!!



BACeye 2.0

THE “SWISS ARMY KNIFE” FOR BUILDING AUTOMATION

Obtaining neutral information about data exchange in a BACnet network is not always easy. Especially if the various components have been supplied by different manufacturers. BACeye 2.0 is a cross-functional tool that can be used to clearly visualise networks and quickly identify problems. As a de facto standard, this compact tool makes the work of system integrators, commissioning engineers, plant operators and end users considerably easier.

- BACnet Revision 14
- Device Management
- Profile B-OWS
- Verify successful COV
- Commandability
- Flexible CSV Export



Lori Tribble

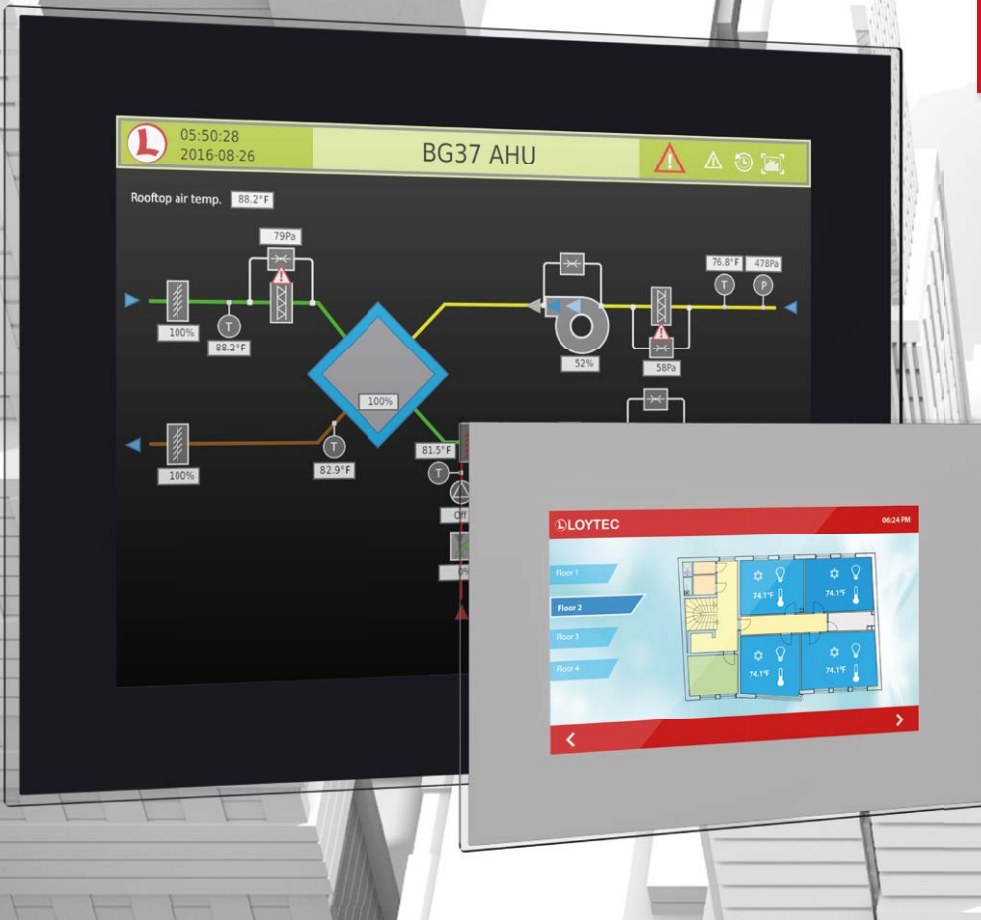


Michael Osborne



Natsuko Takahashi





Control is just a touch away!

L-VIS – High quality BACnet Touch Panel Solutions

- Frameless glass front with capacitive touch or aluminum frame with resistive touch
- 7", 12", and 15" versions
- Dual port Ethernet communication
- BACnet/IP, BACnet MSTP/IP routing
- BACnet alarm, schedule, and trend with email
- Modbus TCP (Master or Slave)
- Full color animated graphics
- Web access from smartphone, tablet, or PC

buildings under control

BACnet-Focused Sessions at 2017 NFMT Orlando



The countdown to the 2017 NFMT Conference in Orlando, November 14–15, 2017, has begun!

This conference provides an excellent opportunity to connect with other professionals in the Facilities Management industry, as well as share the benefits of the BACnet protocol in building automation. In that effort, BACnet International will be sponsoring a full educational track as part of the 2017 NFMT Conference.

The following sessions are scheduled:

Tuesday, November 14, 2017

Time: 9:00 AM
Session: BACnet 101
Speaker: Ben Dorsey III, Chief Content Strategist

You've heard the term for some time but are still a little confused about what it is and, more importantly, what it can do for you. In this session, we'll examine what BACnet is, learn about its value proposition, discuss some caveats of working with it, and examine its future.

Time: 10:00 AM
Session: HVAC 101: Chillers and VFDs and BACnet – Oh My!
Speaker: Tim Skell, Sr. HVAC Application Engineer, ABB

A multipurpose (office & factory) facility recently underwent a major HVAC renovation, including the addition of a central chiller plant and thermal (ice) storage. This renovation will be used as a case study, educating the attendee on how a complete HVAC system operates, energy savings opportunities, along with how BACnet communications contributed to an intelligent and sustainable building.

Time: 3:10 PM
Session Title: Interfacing Elevators and Escalators with BACnet: The Time is NOW
Speakers: Grant Wichenko, President, Appin Associates, and Christopher Mason, Senior Manager IoEE Development, Schindler Elevator Corp.

Facility Managers commonly use BACnet to monitor HVAC, lighting and other systems. Elevators are expensive to maintain but few elevators are currently monitored using BACnet. The presenters will outline the benefits of elevator/escalator monitoring via BACnet. The BACnet standard now has new objects and services for monitoring elevators and escalators in a standard manner. The presentation will give elevator monitoring project examples. The presentation will outline BACnet's role in implementing elevator Occupant Evacuation Operation (OEO).

Wednesday, November 15, 2017

Time: 9:00 AM
Session: Lighting & IT Collaboration: When lighting is living on or connected to the corporate intranet
Speaker: Scott Ziegenfus, Manager of Government and Industry Relations, Hubble Lighting, Inc.

Networked lighting, PoE, IoT brings little doubt lighting is becoming dependent on IT. With natural efforts to save infrastructure and resources, the installation of networked lighting demands an interaction with an institution's IT administration. However, the IT domain has many, if not most, in the lighting community not understanding the line of when networked lighting

comes under the jurisdiction of the institution's IT administration and what parts of that system must live within the institution's established IT policies. This seminar will provide fundamental understanding of how and when to work with IT departments.

Time: 10:00 AM
Session Title: Best Practices for Implementing BACnet in Your Facility
Speaker: Grant Wichenko, President, Appin Associates

This presentation will explain the value of networked controls to FMs in implementing top down policies on energy conservation, sustainability, LEED, etc., helping FMs to work "leaner and meaner" while achieving policy targets. In addition, this presentation will outline best practices that will help the FM manage the BACnet component in a BACnet-based Building Automation Systems project.

While we hope you are able to attend, we realize it may not be possible. Therefore, all the BACnet International educational sessions will be captured and shared in early January 2018 on The BACnet Institute e-learning site, thebacnetinstitute.org.

For more information about the NFMT Conference and the sessions available, visit www.nfmt.com/orlando/education/sessions.aspx#sessions



The Orange County Convention Center

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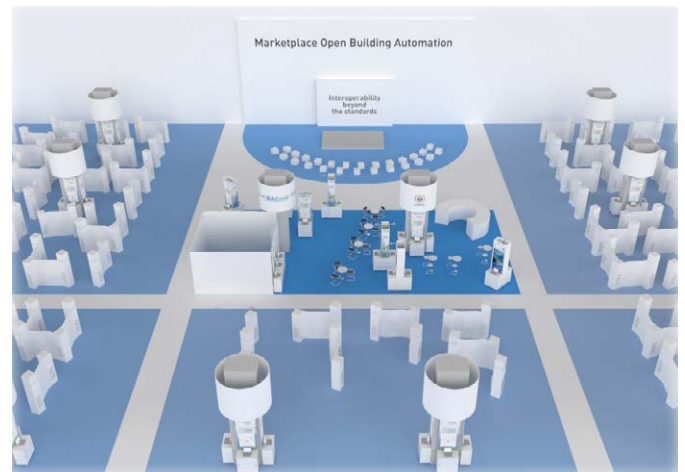


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BACnet will present itself at a central location on the OPEN BUILDING AUTOMATION market place at Light+Building 2018.

BACnet at Light+Building 2018

BACnet will present itself at the next Light+Building, in Frankfurt, Germany, from March 18 – 23, 2018 in a brand new environment. At the OPEN BUILDING AUTOMATION market place in Hall 9.1, the world's leading providers will be displaying the interoperability of tomorrow. BACnet is assuming a central role amid further pioneering standards. Top themes such as the migration of building automation to IoT technologies and 20 years of BACnet in Europe will be included in the joint presentation program.

Building automation and control technology are in a state of rapid change. IoT-driven offers are competing with traditional solutions. Increasing diversity! This is extremely satisfying for users looking for new perspectives – for the digitalization of their properties and for the Internet as a communication platform. Word of the interoperability between the standards is spreading.

New perspectives for BACnet and the entire sector

Whereas previously the open networking within building automation maximized investment security, today potential cost reductions and new synergies between the building, energy, IT, transmission and industry systems are highly sought after. Progress in building information modelling (BIM), with wireless technologies and at the interface with industrial automation, is creating new perspectives for BACnet and the sector as a whole.

The BACnet stand is being organized by MarDirect for the BACnet Interest Group Europe (BIG-EU). Supported by Messe Frankfurt, the OPEN BUILDING AUTOMATION market place is a joint venture between MarDirect and TEMA AG. Contact: bruno.kloubert@mardirect.de

NEW BTL-LISTED PRODUCTS

| Manufacturer | Product Name | Model |
|----------------------------|--|---|
| ADF Technologies Sdn. Bhd. | ADF XTEC | UC |
| Automated Logic | G5 | G5RE |
| BELIMO | | LRX24-EV+EVx ¹ S-x ² , LRX24-EV+EVx ¹ S-x ² - B where x ¹ is 050, 075, 100, 125, 152 and where x ² is 055, 103, 182, 285, 396 and x ³ RX24-EV+EVx ⁴ S- x ⁵ , x ³ RX24-EV+EVx ⁴ S- x ⁵ -B where x ³ is A or G where x ⁴ is 200, 250, 300, 400, 500, 600 where x ⁵ is 761, 761-B, 1000, 127, 50-127, 180, 50-180, 317, 50-317, 495, 50-495, 713, 50-713 EVX24-EV-x ⁶ +EVx ⁷ 0S-127-250 where x ⁶ is L or B and where x ⁷ is 25, 30, 40, 50, 60 AKRX24-EV+EVx ⁸ S- x ⁹ , AKRX24-EV+EV x ⁸ S- x ⁹ -B where x ⁸ is 050, 075, 100, 125, 150, 200 where x ⁹ is 055, 103, 182, 285, 396, 76 x ¹⁰ KRX24-EV+EVx ¹¹ 0S-x ¹² where x ¹⁰ is A or G where x ¹¹ is 20, 25, 30, 40, 50, 60 where x ¹² is 1000, 127, 50- 127, 180, 50-180, 317, 50- 317, 495, 50-495, 713, 50- 713 AVKX24-EV- x ¹³ +EV x ¹⁴ 0S- x ¹⁵ -250 where x ¹³ is L or B where x ¹⁴ is 25, 30, 40, 50, 60 where x ¹⁵ is 127, 180, 317, 495, 713 |
| BELIMO | Energy Valve (Europe/Asia) | EV0x ¹ R+BAC where x ¹ is 15, 20, 25, 32, 40, 50 EV050R+BAC-N Px ² Wx ³ EV-BAC where x ² is 6065, 6080, 6100, 6125, 6150, 6065, 6080, 6100, 6125 where x ³ is 800, 1100, 2000, 3100, 4500, 806, 1106, 2006, 3106 x ⁴ R24AX-EV+EV0x ⁵ R where x ⁴ is L, N, or S where x ⁵ is 15, 20, 25, 32, 40, 50 SR24AX-V+EV050R-N x ⁶ R24AX-EV+P6x ⁷ W x ⁸ 00EV where x ⁶ is S or G where x ⁷ is 065, 080, 100, 125, 150 where x ⁸ is 8, 11, 20, 31, 45 x ⁹ R24AX-EV+EV0x ¹⁰ RV where x ⁹ is L, N or S where x ¹⁰ is 15, 20, 25, 32, 40, 50 x ¹¹ R24AX- EV+P6x ¹² WVx ¹³ 00EV where x ¹¹ is S or G where x ¹² is 065, 080, 100, 125, 150 where x ¹³ is 8, 11, 20, 31, 45 SRK24AX-EV+EV0 x ¹⁴ R where x ¹⁴ is 15, 20, 25, 32, 40, 50 SRK24AX-EV+EV 050R-N |
| BELIMO | Rotary actuator for butterfly valves (America) | PRBUP-MFT-T, PRBUP-MFT-T200, PRBUP-MFT-T-250 PKRBUP-MFT-T, PKRBUP-MFT-T- 200, PKRBUP-MFT- T-250 |
| BELIMO | Rotary actuator for butterfly valves (Europe/Asia) | PRCA-BAC-S2-T, PRCA-BAC-S2-T- 200, PRCA-BAC-S2- T-250 PRKCA-BAC-S2-T, PRKCA-BAC-S2-T- 200, PRKCA-BAC- S2-T-250 |
| Bihl+Wiedemann GmbH | AS-i 3.0 BACnet/IP Gateway | BWU3356 |
| Blue Ridge Technologies | Essentials | ZCSB, ZCSS, RPSB, RPSS, RPDS, CM-02-T-D, CM-04- T-D, CM-08-T-D, CM- 16-T-D, CM-32-T-D, CM-02-T, CM-04-T, CM-08-T, CM-16-T, CM-32-T |
| Carel S.p.A. | c.pCO Family | P+5 XX ¹ X ² X ³ X ⁴ X ⁵ X ⁶ X ⁷ X ⁸ X ⁹ where XX ¹ is 00, 04, 0N, KO, HV, PX or DN X ² is S X ³ is B, E, F, G, N or W X ⁴ is 0, A, B, C, D, E, F, G, H, Z, 7, 8 or 9 X ⁵ is 0, 1, 2, 3, 4, 5, 6, A, B, C, D, E, F or Z X ⁶ is 0, 1, 2, 3, 4, 5, 6, 7 or 8 X ⁷ is 0 or E X ⁸ is X, S, M, L, C or Z X ⁹ is 0, 1, 2 or K P+D XX ¹ X ² X ³ X ⁴ X ⁵ X ⁶ X ⁷ X ⁸ X ⁹ , P+P XX ¹ X ² X ³ X ⁴ X ⁵ X ⁶ X ⁷ X ⁸ X ⁹ , P+R XX ¹ X ² X ³ X ⁴ X ⁵ X ⁶ X ⁷ X ⁸ X ⁹ where XX ¹ is 00, 0N, 0R, 0B, HV or NM X ² is 0 X ³ is U, N, B or F X ⁴ is 0, C, B, E or H X ⁵ is 0, 1, A, B, C or D X ⁶ is 0 or D X ⁷ is 0, E, B, L or F X ⁸ is 0, N or F X ⁹ is 0, 1 or K |
| Carel S.p.A. | c.pCO Family | P+5 XX ¹ X ² X ³ X ⁴ X ⁵ X ⁶ X ⁷ X ⁸ X ⁹ where XX ¹ is 00, 04, 0N, KO, HV, PX or DN X ² is S X ³ is B, E, F, G, N or W X ⁴ is 0, A, B, C, D, E, F, G, H, Z, 7, 8 or 9 X ⁵ is 0, 1, 2, 3, 4, 5, 6, A, B, C, D, E, F or Z X ⁶ is 0, 1, 2, 3, 4, 5, 6, 7 or 8 X ⁷ is 0 or E X ⁸ is X, S, M, L, C or Z X ⁹ is 0, 1, 2 or K P+D XX ¹ X ² X ³ X ⁴ X ⁵ X ⁶ X ⁷ X ⁸ X ⁹ P+P XX ¹ X ² X ³ X ⁴ X ⁵ X ⁶ X ⁷ X ⁸ X ⁹ P+R XX ¹ X ² X ³ X ⁴ X ⁵ X ⁶ X ⁷ X ⁸ X ⁹ where XX ¹ is 00, 0N, 0R, 0B, HV or NM X ² is 0 X ³ is U, N, B or F X ⁴ is 0, C, B, E or H X ⁵ is 0, 1, A, B, C or D X ⁶ is 0 or D X ⁷ is 0, E, B, L or F X ⁸ is 0, N or F X ⁹ is 0, 1 or K |
| Carel S.p.A. | c.pCOOEM | P+1 XX ¹ X ² X ³ X ⁴ X ⁵ X ⁶ X ⁷ X ⁸ X ⁹ where XX ¹ is 00 or 0N X ² is S X ³ is E, N or W X ⁴ is 0 or C X ⁵ is 0, 1, 2, A or B X ⁶ is 0 or D X ⁷ is 0 X ⁸ is S or M X ⁹ is 0, 1 or K |
| Carel S.p.A. | c.pCOOEM | P+1 XX ¹ X ² X ³ X ⁴ X ⁵ X ⁶ X ⁷ X ⁸ X ⁹ where XX ¹ is 00 or 0N X ² is S X ³ is E, N or W X ⁴ is 0 or C X ⁵ is 0, 1, 2, A or B X ⁶ is 0 or D X ⁷ is 0 X ⁸ is S or M X ⁹ is 0, 1 or K |
| Carel S.p.A. | uPC3 | UP3 X ¹ XX ² X ³ X ⁴ X ⁵ X ⁶ X ⁷ X ⁸ X ⁹ where X ¹ is A, B, C, X, Y or Z XX ² is 00, AE or DN X ³ is 0, 1, 2, 3, A, B or T X ⁴ is 0, A, BorC X ⁵ is 0,1,2,3,4,5,6,7,8,9, Y or Z X ⁶ is 0, SorT X ⁷ is 2,3,4, AorB X ⁸ is X, S, MorL X ⁹ is 0,1,2orK |
| Carel S.p.A. | uPC3 | UP3 X ¹ XX ² X ³ X ⁴ X ⁵ X ⁶ X ⁷ X ⁸ X ⁹ where X ¹ is A, B, C, X, Y or Z XX ² is 00, AE or DN X ³ is 0, 1, 2, 3, A, B or T X ⁴ is 0, A, BorC X ⁵ is 0,1,2,3,4,5,6,7,8,9, Y or Z X ⁶ is 0, SorT X ⁷ is 2,3,4, AorB X ⁸ is X, S, MorL X ⁹ is 0,1,2orK |
| Carrier | XT-RB | XT-RB |
| Cylon Controls Ltd. | CBM Series | CBM08, CBM12, CBM16, CBM24, CBM24K, CBM24LC |
| Cylon Controls Ltd. | CBT Series | CBT12, CBT12NAVAV, CBT14 |
| Danfoss | NovoCon S | CO6 |
| Distech Controls, Inc. | ECY-303 Series | ECY-303, ECY-303-M3 |
| Distech Controls, Inc. | ECY-PTU/TU Series | ECY-PTU-107 ECY-PTU-207 ECY-PTU-208 ECY-TU-203 |
| Distech Controls, Inc. | ECY-S1000 Series | ECY-S1000, ECY-S1000E, ECY-S1000-16, ECY-S1000E-16, ECY-S1000-48, ECY-S1000E-48, ECY-S1000-48-MS, ECY-S1000E-48-MS |
| Distech Controls, Inc. | ECY-VAV Series | ECY-VAV, ECY-VAV-POE |
| Fidelix | Fidelix PLC Building Controller | FX-2030A, FX-2030A-BASIC, FX-3000-C, FX-SPIDER |
| Fujitsu General Limited | BACnet Gateway for VRF System | UTY-VBGX |
| Fujitsu General Limited | BACnet Gateway for VRF System | UTY-ABGXZ1 |
| Honeywell International | Honeywell Enterprise Buildings IntegratorTM | R500 |

| | | |
|------------------------------|--|--|
| INGA mbH | iBMS | iBMS |
| Intesis Software, SLU | IntesisBox BACnet Server Series | IBOX-BAC-KNX, IBOX-BAC-MBM |
| Kamstrup A/S | BACnet MS/TP module for MULTICAL 403, MULTICAL 603 | HC-003-66 |
| Kieback&Peter GmbH & Co. KG | Qanteon | Version 1 |
| Kieback&Peter GmbH & Co. KG | DDC4000e | DDC4002e, DDC4200e, DDC4400e |
| NAO Digital co., Ltd. | eCube – Smart Thermostat | BIU-3000 |
| ODIN Automation Systems, LLC | Operator Display Integrated Network (ODIN) | ODIN-BOD |
| OSRAM SYLVANIA Inc. | BACnet Integration | SWBACNET |
| SAUTER | EY modulo 3 Room Controllers – ecos311 | EY-RC311F001 |
| Shina System Co. Ltd | Field Control Unit 2200 series | FCU-2200B, FCU-2200 |
| Shina System Co. Ltd | Lighting Control Unit series | LCU-2200B, LCU-2200, LCU-3000B, LCU-3000 |
| Shina System Co. Ltd | Peak-demand Control Unit series | PCU-2200B, PCU-2200 |
| Siemens | SEM3 | US2:SEM3CONTROLLER |
| Siemens | DESIGO CC Workstation | V3.0 |
| Titan Products Ltd | FCU-4 Fan Coil Controller | FCU-402, FCU-403, FCU-404 |
| Xylem | AquaForce Pump Controller | e-MT |
| Xylem | TechnoForce Pump Controller | e-MT |

Calendar of BACnet International Events

| Dates 2017 | Event | Location |
|------------------------|-------------------------|-------------|
| October 23 – 26, 2017 | SSPC 135 Meeting | Atlanta, GA |
| November 14 – 15, 2017 | NFMT Orlando | Orlando, FL |
| Dates 2018 | | |
| January 22 – 24, 2018 | AHR Expo | Chicago, IL |
| May 8 – 10, 2018 | LIGHTFAIR International | Chicago, IL |

For more information about all events, contact David Nardone, BACnet International, david@bacnetinternational.org or visit www.bacnetinternational.org

BACnet International Journal 14

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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Online distribution

The BACnet International Journal is posted to www.bacnetinternational.org.

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ISSN 2191-7825



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