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International



JOURNAL

Issue 12

This Issue

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BACnet International 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.

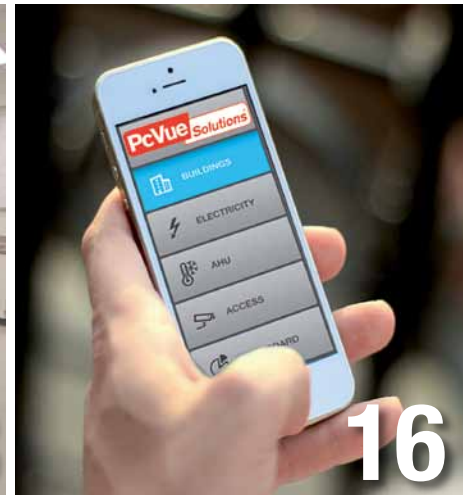


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Cover picture:

Mechanical room at MaRS, located within the Discovery District of Toronto Canada

Photo courtesy of Modern Niagara Group Inc.

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All issues can be downloaded from <http://www.bacnetinternational.org/journal>

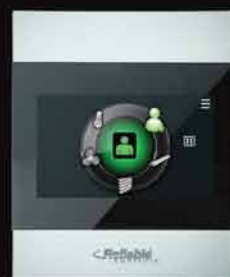
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Opportunities for a Better BACnet



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Dear Reader

The Edge Revolution coupled with machine learning embedded in Maker Culture (https://en.wikipedia.org/wiki/Maker_culture) will do what the DDC Revolution with programed logic did to pneumatic controls – completely replace an industry while providing a quantum leap in capabilities, connection, control and apparent simplification of everything. This presents amazing opportunities for BACnet to again grow and adapt.

There is a definite parallel to be drawn with the DDC revolution, but Building IoT (internet of things) or BIoT has the chance to be even more pervasive as it will cut across ALL industries. Fully automated 'self learning' buildings do not seem that far off!

How will BACnet be part of this? Will BACnet expand across all industries, or will new standards from other industries and evolving IoT methods prevail? It stands to reason then that with a protocol as robust and capable as BACnet there is very good chance it will dovetail nicely into the IoT world, so long as we continue to allow the standard to evolve with the Edge and Cloud movement.

The power I found in my youth in the DDC industry of turning what these systems were telling me into logic in a control language to provide amazing energy savings and comfort improvements is now giving way to a self learning Edge revolution.

The Edge revolution sees new powerful mobile phone-like edge devices purposely built for cloud communication with amazing computing power and low cost memory, redefining our DDC systems' capabilities and architecture.

My old pneumatic mind is struggling to understand Machine learning, but I do get it! When combined with low cost power and memory on the Edge, self learning is poised to fuel the next revolution while replacing my old pneumatic mind in the development of control logic.

These new Edge devices will not come from our industry but will land on us as mass produced devices that the newer generation will re-purpose and reprogram for our industry's use. As in the early days of the DDC revolution, expect chaos plus an incredible amount of DIY IoT solutions. In the future, programming will become less significant, or not at all, and edge controllers will just simply learn what to do.

Working with low cost, high memory edge devices and understanding "maker culture" ushers in a new world and revolutionary way of programming and interfacing. However, we all need to bring our industry expertise and experience to the revolution, as this will define the direction and how BACnet fits in this brave new world of automation.

How will you help BACnet grow and adapt and become part of evolving IoT maker culture? We all need to be aware of the speed of the evolution and nearness of the "The Self Learning Edge Revolution." BACnet has a large part to play, and it is the youth of today that will usher it in. Contact me to discuss. Let's continue to make BACnet better than ever! 🌐

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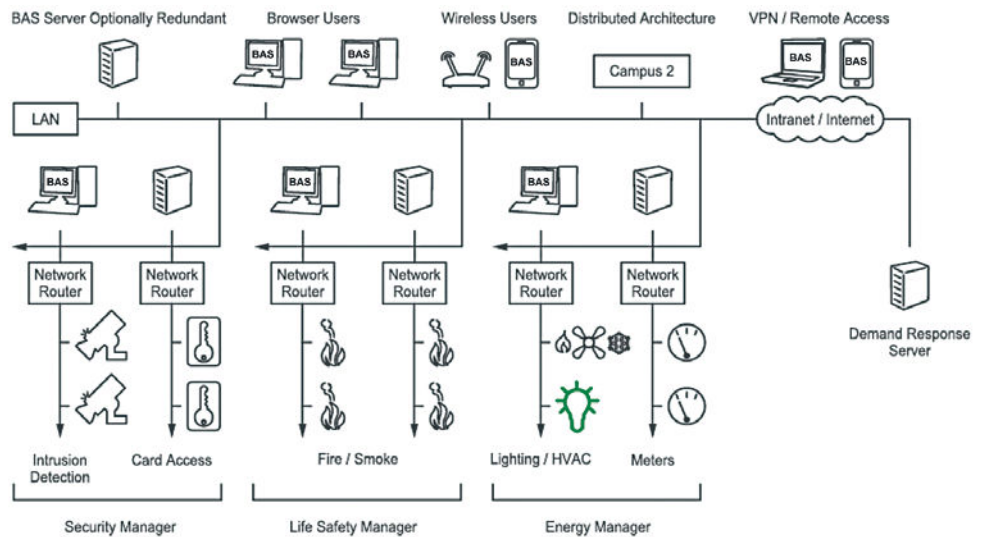


ABOUT THE AUTHOR

Ken Sinclair is the founder, publisher and owner of AutomatedBuildings.com, an online magazine and web resource providing the news as well as connection to the rapidly evolving industry that automates and implements truly intelligent, integrated buildings. He has authored numerous industry articles on internet integration and convergence for several international magazines and has provided free automation seminars at each AHR Expo for the last 18 years.

BACnet, BAS, and... Lighting? Oh My!

“What is BACnet?” Say this in any BAS related community and, most likely, you will get a response that defines it as the most specified open protocol in the BAS market today. Ask an End-User and you might hear that it is what allows them to have a choice between manufacturers. Ask a manufacturer, and you could hear the protocol enables them to integrate to other systems to meet their customer’s demands. It’s understood, right? All of us in the BAS industry know BACnet has gained significant momentum since its inception over 20 years ago to become arguably the most specified and utilized open protocol in the market today. It’s common sense right? Everyone speaks BACnet! But wait, what about lighting? Isn’t it an automated system that goes in a building? All lighting speaks BACnet right? The answer for most lighting companies at this juncture is... well... sort of.



With lighting natively on the BAS infrastructure other applications like demand response and occupancy detection can be shared. © Blue Ridge Technologies

It might seem like common sense that lighting controls should integrate seamlessly to a BAS infrastructure, but if we investigate the matter closely the truth is BAS and lighting have been on separate development paths for so long it has made getting complete integration between systems a difficult task. BAS has traditionally been the automation of HVAC mechanical systems and temperature controls, and lighting has been seen separate from this as a stand-alone system with its own front-end and controls. Even in the traditional specification, lighting and BAS are separated into different divisions, with the electrical contractor doing all of the lighting install and programming (division 26), and the BAS controls contractor only getting involved in lighting if there is a need for some sort of integration (outlined in division 25 or 23). For all intents and purposes, this is how it has been since the beginning (division numbering, etc. notwithstanding). However, with the advent of BACnet and its proliferation, open has become the rule and the market has become accustomed to leveraging multiple systems under one BAS infrastructure. This demand is driving the next wave, carrying traditional BAS and lighting to the shores of pure integration.

Right now, with the exception of a handful of companies, traditional lighting control integration is done through a gateway. These are generally designed and sold by the lighting control manufacturers to speak to their proprietary system and translate the lighting communications to BACnet. Oftentimes this means there may be limited integration as not all points may be readable, and in frequent cases some points will not be writable. This means that BAS systems may be able to get data, but not be able to do things like share schedules, occupancy sensors, or the sequence of operations. In these cases, the uncertainty principle for integration creates more cost as the electrical and BAS contractors cannot predict integration issues and are sure to add in resource cost for uncertainty in integration. This, of course, does not mean users should avoid integration. What it does mean is they should be very clear on what level of integration they can achieve. There is a wealth of lighting solutions out there and almost every manufacturer is striving to create better forms of integration, and an overwhelming majority of

them have selected BACnet as their protocol of choice. The key point being, lighting is moving towards BAS and wide-open integration.

In my opinion, one of the most interesting shifts in the market right now is the move of the lighting control industry into the BAS market space. While this shift has been at the forefront of the BAS conscious for years, the traditional method of specification and integration has created so much momentum that the overall cost to create an open, native BACnet lighting control solution has stymied the ability for many corporations to move the direction most BAS manufacturers went 10-20 years ago. Case in point is the Acuity Brands acquisition of Distech Controls in 2015 and their acquisition of DGLogik this year. If anything, the expense associated with these purchases should signal the relative perceived opportunity lighting companies see in being natively open in the BAS space. My employer has been singing this song for years and we have created Native BACnet solutions that eliminate the gateway and talk directly to the BAS.

We have been watching the shift closely and are glad to see much larger companies recognizing this market demand. It, after all, is where we believe the customer gets the best value and functionality.

Over the years the BAS landscape has changed, and we have seen the development in BACnet systems create a common sense approach to integration. As a result, the market now expects most systems will talk to each other in a way that allows them the ability to centralize their data and workflow. Developments in the BACnet standard, and the work of countless individuals and manufacturers, have led to a more open and inviting BAS landscape where systems share data and sequences in a manner allowing for more centralized control. As lighting and HVAC make up, on average, over 65% of a building's energy consumption, it only makes sense these systems should be sharing as much information as possible as well as leveraging the sequences

associated with efficiencies. As the world of BAS and lighting continues to merge and the ever expanding and quickening pace of technology changes, BACnet, BAS, and... yes... lighting are going to continue to morph. In this one humble controls guy's opinion, they are going to continue to unify. Oh My!



© R. Moore

ABOUT THE AUTHOR

Rocky Moore is currently the Director of Business Development at Blue Ridge Technologies and brings 12 years of commercial and industrial Building Automation and control market experience. During his tenure, he has headed multiple Operational, Marketing, and Sales efforts in the BAS industry related to customer support and acquisition, regional management, branding and messaging, new product release, market and product trends, pricing, and competitive analysis.

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Use your BACnet Router to Improve Security and Performance

Not only can your BACnet/IP to MS/TP router allow BACnet/IP devices to communicate with MS/TP devices, it can also improve network security and improve performance by providing more flexible networking options. The BACnet standard outlines optional security features that greatly improve BACnet security. However, if your devices do not support these optional security features, there are other options available.

You could utilize standard IT security devices to implement Virtual Private Networks or Virtual Local Area Networks. Virtual Private Networks, or VPNs, are generally used over the Internet to provide security for messages that travel over the unsecured Internet networks. VPNs can also be utilized internally but require VPN routers and will add complexity to your network, and are probably overkill for your internal network. Virtual Local Area Networks, or VLANs, are used by IT departments to separate network traffic in a facility. These can provide enhanced security but will require VLAN routers when you need to communicate between VLANs. VLANs also require managed Ethernet switches and add complexity to your network. Both of these are great solutions for providing enhanced security for your BACnet communications. However, there is a simpler technique that can be provided in your BACnet router, and it does not require any additional equipment or add any complexity.

The Whitelist

One simple security feature, which is prevalent in IT security, is the "whitelist". This is a list of IP addresses, to which the IP device will only communicate. All other devices are blocked or ignored. After the user enters his/her user ID and password he/she can enter the selected IP addresses into the whitelist of the device.

BACnet routers can also support this feature. This would improve the security of communications to your MS/TP devices that are connected to the BACnet router. The BACnet router would only carry BACnet/IP traffic which used one of the whitelist IP addresses. Any other BACnet/IP message would be blocked from the MS/TP network.

The MS/TP Backbone

MS/TP networks are very popular in BACnet. They provide much greater distance than copper Ethernet connections and also support multi-drop connections, which Ethernet had supported in the past with 10BASE2 but that has since become obsolete. We find that many customers try to use MS/TP for a lot of their BACnet communications. Some of the reasons are:

- 1.) "There is already an MS/TP drop in the area and even though my device only supports BACnet/IP I would prefer to use MS/TP to bring it into the BACnet network." Here they would use a BACnet router to make this connection.
- 2.) "The IT department gets involved if I use Ethernet. They don't care about my MS/TP network." Here they would use a BACnet router to make any BACnet/IP device communicate via MS/TP.
- 3.) "My BACnet/IP devices require a static IP address. The IT department won't give me any more static IP addresses. So I would like to use MS/TP to connect to my BACnet/IP device." Here they would use a BACnet router to make this connection.
- 4.) "The BACnet/IP device is too far away. I would like to use MS/TP to connect to the BACnet/IP device." Again a BACnet router would be needed to make this connection.

5.) "MS/TP is viewed as being more secure than IP or Ethernet due to its special wiring and physical layer attributes."

Granted, using MS/TP in place of Ethernet will provide slower communication speeds, but many communications do not require 100Mbps, especially if you are just communicating temperatures or using COV (Change of Value), which would only transmit messages when a change has occurred.

It is important to remember there are sometimes issues when bouncing between BACnet/IP and MS/TP. MS/TP traditionally has supported smaller frame sizes than Ethernet. There are times when the small message size of MS/TP can be a problem. However, through the use of "MS/TP Backbone" this can easily be remedied.

For example, if you were to use an MS/TP network between two BACnet/IP devices, then the two BACnet/IP devices may not be aware that the MS/TP link will limit their message sizes. In this case any large messages could be dropped by the BACnet routers (see figure 1).

Here the BACnet/IP client and server will advertise that they can support messages in the range of 1476 bytes (APDU). However, any message which is greater in size than 480 bytes will be dropped by the BACnet router. Even if the BACnet router supported messages up to 1476 bytes on the MS/TP network, MS/TP devices that are connected to the MS/TP network, which do not support the larger message size, could have issues. The BACnet routers used in this example using a feature called "MS/TP backbone" would make the BACnet/IP server think the BACnet/IP client only supports 480 bytes and the BACnet/IP client would also think the same of

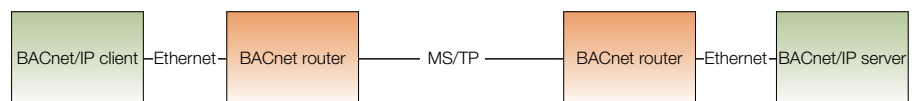


Figure 1: MS/TP backbone

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the BACnet/IP server. This would limit the messages being sent by the BACnet devices to 480 bytes when the client and servers are communicating through the BACnet routers and allow all messages to properly reach both BACnet/IP devices.

Another scenario we sometimes hear about is "backward routing" (see figure 2). Typically the BACnet client uses BACnet/IP to communicate with BACnet server devices, which are using MS/TP, and both are interconnected via a BACnet router. In the "backward" scenario the BACnet client is using MS/TP to communicate and the server is using BACnet/IP. Normally there are no issues with this scenario; however, sometimes issues can occur. For example, if the server supports ReadPropertyMultiple (RPM) messages then the client can send a small request asking for "all" properties or objects in the server. The BACnet routers will have no trouble carrying this small message. As the server supports RPM it will answer back with a large



Figure 2: Backward routing

© Contemporary Controls

response. This response can often be greater than 480 bytes. As the server uses Ethernet for its communications it may view a larger message as not being a problem. However, in this case the BACnet router will drop the message if it exceeds 480 bytes. If the BACnet router has the "MS/TP backbone" feature it would also

indicate to the BACnet/IP client that the BACnet/IP server does not support RPM and this will limit the BACnet/IP server responses to smaller size messages which can be carried over the MS/TP network.

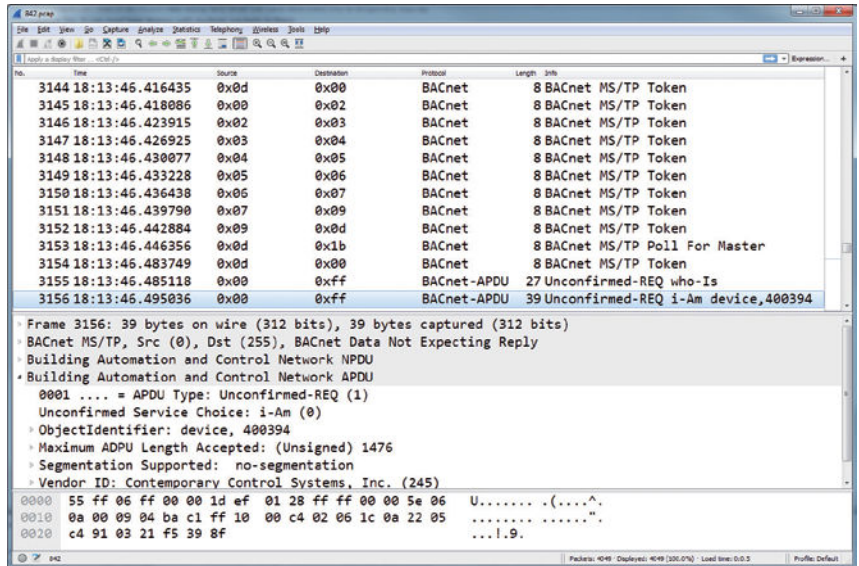
Wireshark Capture

One way to optimize your MS/TP network performance is to view its behavior and correct any issues. Some BACnet routers provide the ability to capture and view MS/TP traffic on its MS/TP port. As the router is always connected to the MS/TP network it is the perfect device to make this capture, eliminating the need to connect to the MS/TP network locally with a

RS-485 adapter. Being able to view this traffic in Wireshark (www.wireshark.org) also makes the captured data very easy to work with and understand. The Wireshark capture can show you the token passes which helps you understand if devices are dropping out of the network. It can show requests and responses being passed between devices, which can help optimize your client settings (for example enabling COV and the COV increment). It can show discovery messages so you can optimize your

client's discovery settings. One of the best uses is to send the capture to your BACnet suppliers to help troubleshoot your system.

Your BACnet router can go beyond simply routing BACnet/IP messages to MS/TP. It can also help add security to your network and increase your BACnet performance and flexibility. These features may not be found on all BACnet routers so care should be exercised before selecting one.



Wireshark Capture

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ABOUT THE AUTHOR

Bennet Levine is the Research & Development Manager at Contemporary Controls and, for over 20 years, has been involved in developing a wide variety of controls and communication products. At Contemporary Controls he is currently assisting in the development of many leading-edge networking and control products. He has written many articles on the use of Ethernet in control systems for various trade magazines. Bennet received a BSSE degree from Southern Illinois University.

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More European-based Options for BACnet Product Testing



The DIAL building, Lüdenscheid: The architecture and overall technical concept were developed in-house. © DIAL




In the iHomeLab, visitors can experience the future of intelligent building technology. © IHL



The iHomeLab of the Lucerne University of Applied Sciences and Arts in Lucerne, Switzerland, and DIAL's DAKKS accredited testing center in Lüdenscheid, Germany, have recently achieved formal recognition as BACnet test organizations. iHomeLab and DIAL join the two existing test organizations, MBS and the BTL Lab in providing BACnet conformance testing in accordance with the relevant test policies and requirements.

The iHomeLab of the Lucerne University of Applied Sciences and Arts has been conducting research in the field of building intelligence for the past 15 years. It employs approximately 30 scientists and operates a smart building on the campus.

To learn more about BACnet product testing, the BTL Mark and BTL Listing, visit the BTL website at www.bacnetlabs.org or contact a testing organization directly. 



The compliance of products with the latest requirements is tested by DIAL's engineers using ultra-modern laboratory equipment. © DIAL

The services offered at DIAL include pre-testing, formal testing and tests for acquiring AMEV attestation. As well as standardized tests, DIAL also offers individual testing services. The engineers make use of their wide experience and comprehensive know-how acquired from years of successfully testing KNX and DALI services as well as experience with various BACnet committees.

BTL testing can help suppliers find issues that could create interoperability problems in the field. The early identification of conformance issues through testing benefits manufacturers through lower life-cycle costs and increased customer satisfaction. Also, a BTL Mark and Listing is a requirement to bid on many projects, so acquiring the BTL Mark can help increase sales and aid in marketing efforts.

All tests at these four labs are performed in accordance with the ISO 16484-6 test standard or ANSI/ASHRAE 135.1 and BTL test plans. Products are required to successfully pass the rigorous testing process at one of these organizations in order to display the BTL Mark.

Conformance testing is offered in English, German and French, and the presence of the two new test organizations further expands BACnet's reach, making it easier for more products globally to become certified.

ABOUT THE AUTHOR

Andy McMillan is President and General Manager of BACnet International, where he works with users and suppliers to expand and enhance the BACnet community.

Previously he served as President of a building automation and energy management business unit of Philips Lighting.

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New BACnet International Committee Leaders

BACnet International is pleased to welcome new committee leaders to its Marketing and Education committees. Rocky Moore is the new Marketing Committee Chair, Steve Karg is the Education Committee Chair and Scott Ziegenfus is the Education Committee Vice Chair.

Marketing Committee

The Marketing Committee's purpose is to encourage the adoption and use of BACnet in building automation and control systems through marketing, social media, trade shows, publications and other promotional activities.

Rocky Moore – Chair

Rocky is currently the Director of Business Development at Blue Ridge Technologies and brings 12 years of commercial and industrial Building Automation and control market experience. During his tenure, Rocky has headed multiple Operational, Marketing, and Sales efforts in the BAS industry related to customer support and acquisition, regional management, branding and messaging, new product release, market and product trends, pricing, and competitive analysis.

Rocky has contributed to the creation and introduction of award-winning control platforms and has participated in a wealth of engineering and facility tradeshows. He has been published in industry related publications, and presented to various audiences globally on a number of topics including building and integration market trends, BACnet, and HVAC solutions. Rocky has been a contributing member of the BACnet International Marketing Committee for 10 years.



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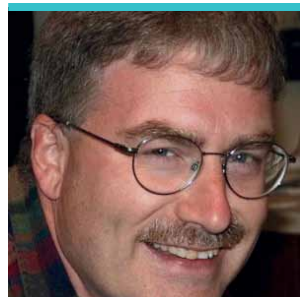
“Being a volunteer member of BACnet International is an opportunity to not only work with some of the leading minds in our industry, but also a chance to have a hand in the direction and promotion of one of the most accepted standards in the Building Automation Industry. And, did I mention the people? You get to collaborate and have fun with some really great people!”

Education Committee

The Education Committee's purpose is to guide the development and promotion of education and training materials to help inform the public and industry professionals about BACnet and its application.

Steve Karg

Steve is a senior engineer for Wattstopper products at Legrand, North America, in Birmingham, Alabama. He has been an active member of the BACnet standards committee since 2001, and convenes its Lighting Applications working group. He created the open source BACnet Protocol Stack hosted on bacnet.sourceforge.net, and continues to help maintain the BACnet decoder in Wireshark.



© S. Karg

“I volunteer to help teach new vendors how to adopt BACnet as their network protocol.”

Scott Ziegenfus

Scott has been a member of the lighting industry since 1994 and has been with Hubbell Lighting since early 2016. Prior to Hubbell Lighting, Scott spent 22 years as Senior Engineer for Lutron Electronics Co., Inc.

As Manager of Government and Industry Relations, Scott uses his unique understanding of communication protocols, building regulations, and product standards along with his background in engineering and Information Technology to breakdown, analyze, and compartmentalize the promotional onslaught of emerging standards and technologies. Scott works with all areas and across product lines within HLI to help drive understanding of new and changing standards and technologies. Besides Scott's role with the Education Committee his other industry participation includes ASHRAE committee member for SSPC 135, BACnet committee as Chair/Convener of the Data Modeling Working Group and SPC 201P, Facility Smart Grid Information Mod, NEMA High Performance Building Council serving on Codes and Standards Review Committee and Title 24 subcommittee, ANSI C137 Lighting Systems committee, Educational reviewer for the USGBC Greenbuild Expo, IES committees for Controls & Protocols and Energy Management.



© S. Ziegenfus

“I truly believe in the Intelligent Building with every building system working together and volunteering specifically with BACnet gives me to a way to ‘walk the walk’ and not just ‘talk the talk’.”

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PSH550-UPS-BC (shown without cover)

New Building Controls in One of the Largest Urban Innovation Hubs in the World

Located within the Discovery District of Toronto, Canada, MaRS is a place where innovation and entrepreneurship thrive.

In early 2014, the completion of the 780,000-square-foot Phase II facility expanded MaRS' footprint to 1.5 million square feet, making it one of the largest urban innovation hubs in the world.

When Public Health Ontario (PHO) relocated its largest laboratory from Etobicoke to the MaRS Discovery District in downtown Toronto, Modern Niagara provided the fit-up of an integrated, state-of-the-art Building Controls for its certified laboratory space. The relocation was a key aspect of Ontario's multi-year plan to renew the province's public health system.

In order to complete this project, Modern Niagara implemented Distech Controls' technology, including its EC-NetAX™ web-based multi-protocol building management solution, for unified integration, control and monitoring of HVAC and mechanical systems, as well as office and laboratory spaces. This included over 500 ECB series BACnet programmable controllers (ECB-

VAV, ECB-103, ECB-300, ECB-400, ECB-600), Allure™ EC-Smart-View communicating sensors, and Open-to-Wireless sensors.

By combining EC-NetAX with BACnet programmable controllers, Modern Niagara was able to provide control and integration of mechanical systems for all tenant spaces and laboratory equipment. In the laboratory, this included AHUs and dedicated exhaust fans with a combination of VAV boxes and venturi air valves. In the office, this involved compartment AHUs with VAV boxes. Overall, approximately 450 terminal zones and 20 air-handling unit/exhaust fan systems were involved.


Care was also taken to ensure the sequencing of specialized containment operations in case of failure.

This project involved the development of a web-based graphical user interface (GUI) for end-users, providing a unified view of mechanical equipment, office spaces and laboratory equipment. The GUI features 3-D modeling of labs, allowing end-users to quickly see the containment status of their facility through an easy-



Mechanical room at MaRS.
© Modern Niagara Group Inc.

to-understand visual representation. The ability to remotely access the GUI allowed building staff to monitor the system, review any alarms, etc. In addition, the web-based capabilities of EC-NetAX permitted integration with the PHO's cloud-based training and documentation program.

Finally, Modern Niagara successfully created a system that was intuitive and user-friendly, while successfully delivering on all efficiency and control requirements, achieving the laboratory Containment Level certifications. 



Public Health Ontario's new laboratory at MaRS.

© Modern Niagara Group Inc.

Centralizing Control at University after Half a Century of Growth

The Chinese University of Hong Kong (CUHK) was founded in 1963 from an amalgamation of 3 tertiary colleges dating back to 1949. Most of the 137.3-hectare (340 acre) campus is covered in greenery, which is nicely carved out of rocks on three plateaus. In addition, there are more than 150 buildings nestled among the greenery, featuring a mix of historical Chinese and contemporary Western architectural styles, including world-class libraries, art museums, music halls, a swimming pool, sports fields, tennis courts, squash courts, a water sports centre and gymnasiums.

Issue

During the history of the campus development, new buildings were erected and old buildings were retrofitted. Building Management Systems (BMSs) were installed in various buildings by different contractors employing different BMS vendors at different stages and times. The result was

“islands” of 20 different BMS vendors within the campus. The need for a campus-wide Building Management System for centralised monitoring and control became a necessity rather than luxury. This was due to several factors:

- There was an increasing workload on the technicians and engineers who dealt with the many different HVAC systems among the various buildings. Moreover, with staff turnover, there was a longer learning curve in the BMS operations for new recruits taking away from training in other technical areas.
- Many interactions were required among the buildings, such as the sharing of chilled water between buildings and homogenized switching of campus lighting. Daily operation required such interoperability among the various sub-systems, and a smooth interaction among the different devices was imperative.

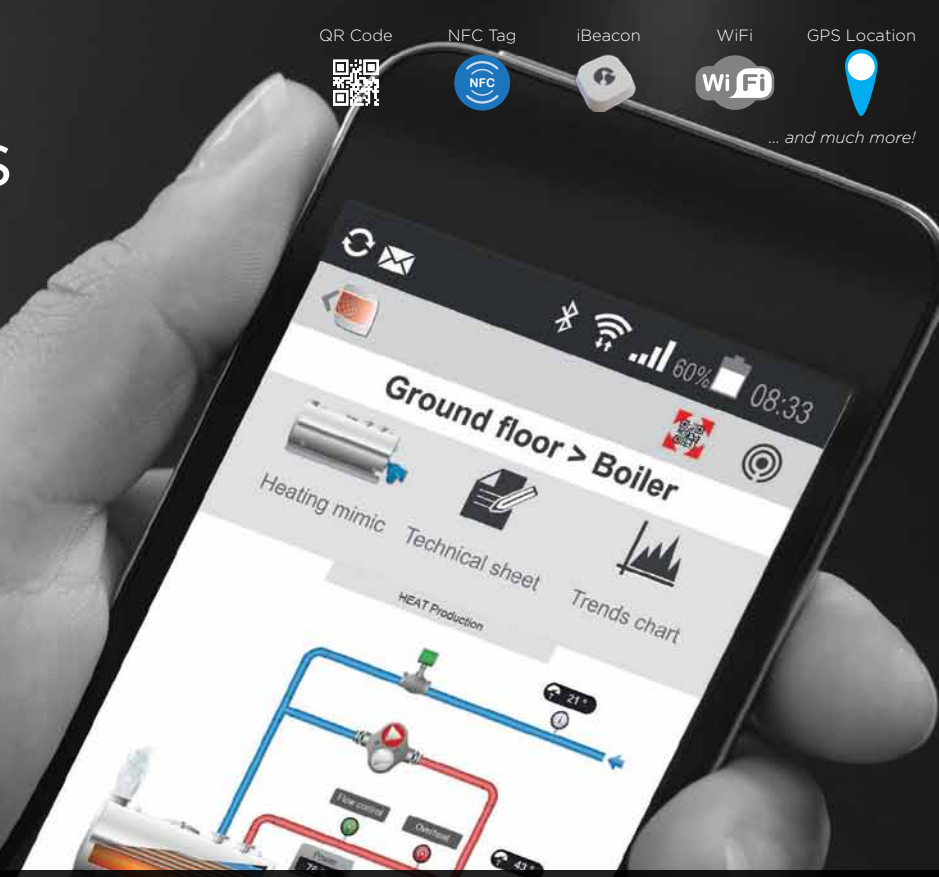
- As more AA&I (Addition, Alterations and Improvement) works were to be performed within the campus, a single tender was no longer acceptable to the board. However, having multiple vendors without a common BMS protocol would have been a nightmare to the already overloaded operation and maintenance team.

Solution

With the intent to satisfy all of the requirements above, an open protocol approach to the campus BMS was adopted in 2006. BACnet was the obvious protocol of choice.

In order to achieve the ultimate goal of integrating all BMS on campus, studies were carried out and it was decided a phasing approach would be taken to migrate all of the existing BMS equipment into BACnet while also specifying BACnet compliance in any future AA&I works.

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This would help converge the campus into an open platform based on BACnet.

One vendor was selected to integrate the existing BMS “islands” into a single system and the architecture was simplified through the BACnet implementation:

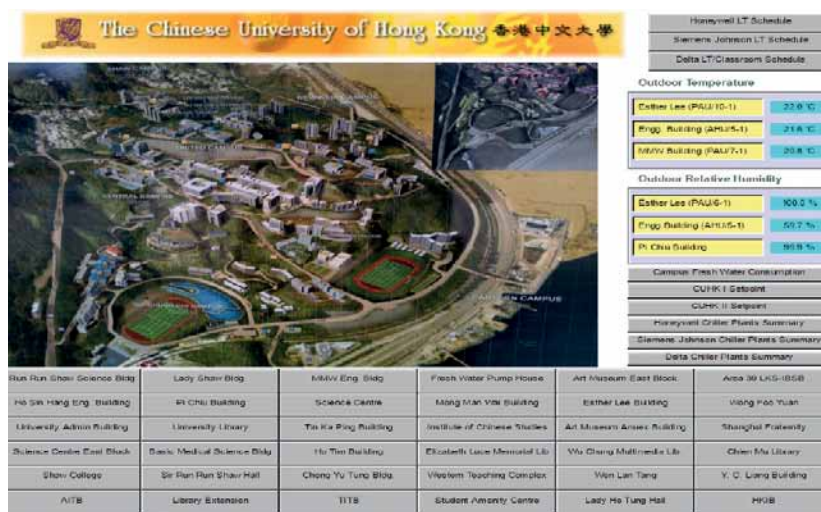
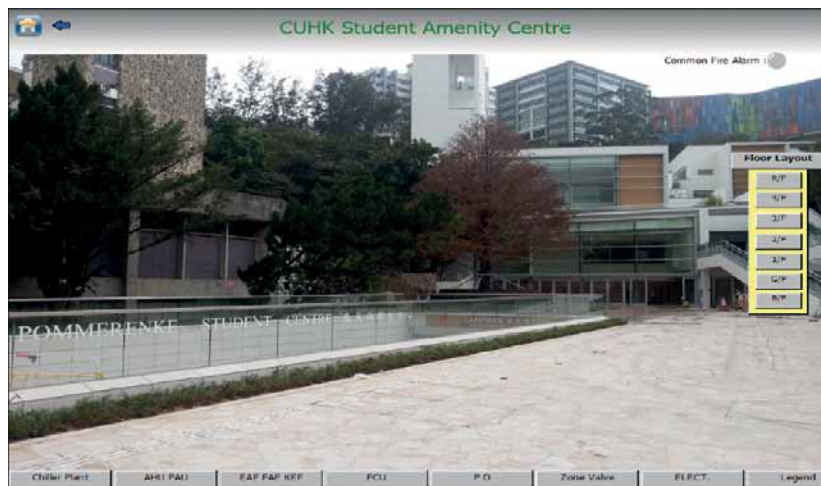
A central web server was set up for supervisory control and monitoring. It also served as a common window for an operator to access BMS devices in various buildings. A dedicated VLAN (virtual LAN) was constructed within the campus intranet to connect all the BACnet devices. Operator terminals or tablets were designed to access BMS information via the intranet. Legacy systems were evaluated based on their scale, importance and ease of migration. As a result, some were left as individual islands until their lifetime is over, while others were connected with a BACnet gateway to migrate the existing points into the BACnet network.

Results

Uniform User Interface – Upon login to the web server, users are presented with an overview of the university campus and some general conditions such as Outdoor Air Temp and Relative Humidity. They can then choose a particular building of interest. Every Building in the system has a consistent UI layout where the outlook of the building is shown and users can further penetrate the system to view details via sub-systems or floors selected.

Interoperability – There is a third party classroom booking system that is used by all students and staff throughout the campus. Lighting and HVAC services, such as the Fan Coil Unit, must be enabled during the booked periods. With the BACnet devices connected, sophisticated gateways are not needed in order to transfer schedules among the different vendors to coordinate such bookings. Moreover, just a single interface is needed in order to transfer booking information into the BACnet schedule for control of relevant devices.

Clock Synchronization – This was always an issue on this vast campus. With BACnet, it had been remedied. All of the clocks on all devices in the network are synced to the main workstation clock, which is in turn synced with an internet clock via NTP.



Images of the new user interface from the BACnet system.

© The Chinese University of Hong Kong

Integration facts

There are approximately 92,000 BACnet objects on campus, out of which 44,500+ objects are third-party. (Third-party meaning non-Delta Controls BACnet objects.) The objects are being treated the same as Delta Controls's BACnet objects according to the services and properties offered in their respective PIC statement.

There are in total 34,800+ physical I/O points on campus, out of which 20,000+ are interfaced from 3rd party devices.

There are in total 2,589 BACnet devices on campus, out of which 903 BACnet devices are third party, constituting more than 30%.

Contextual Mobility

PcVue Mobile Solutions makes mobile technologies more efficient and user-friendly.

The massive adoption of smart mobile devices in the professional world in the ever more connected world of the Internet of Things (IoT) or the Industrial Internet of Things (IIoT) raises new opportunities and also new challenges.

The systems generate more and more data that has to be filtered to bring relevant information on smart mobile devices with their limited size screens.

Moreover, the way in which people interact with smart mobile devices differs from the way in which people interact with laptop and workstations.

Historical approaches to monitor, diagnose, maintain and control industrial and building assets must be reconsidered.

In this increasingly communicating universe, PcVue Solutions innovates with solutions that

facilitate exchanges between people, connected objects and the SCADA system by taking advantage of the latest mobile and geolocation technologies: NFC, Bluetooth LE Beacons, QR Codes, GPS, etc.

IPS (Indoor Positioning System) and the long-standing Global Positioning System (GPS) are standard features of today's mobile devices. PcVue Solutions has developed a mobility infrastructure that takes advantage of these new technologies to serve a contextual mobility based on proximity and location services.

The mobile worker is now able to automatically get relevant information on his mobile device depending on his location and his role without the need to navigate.

The PcVue Solutions mobility infrastructure consists of geo-tags deployed in zones of control, a Proximity Services application on the mobile




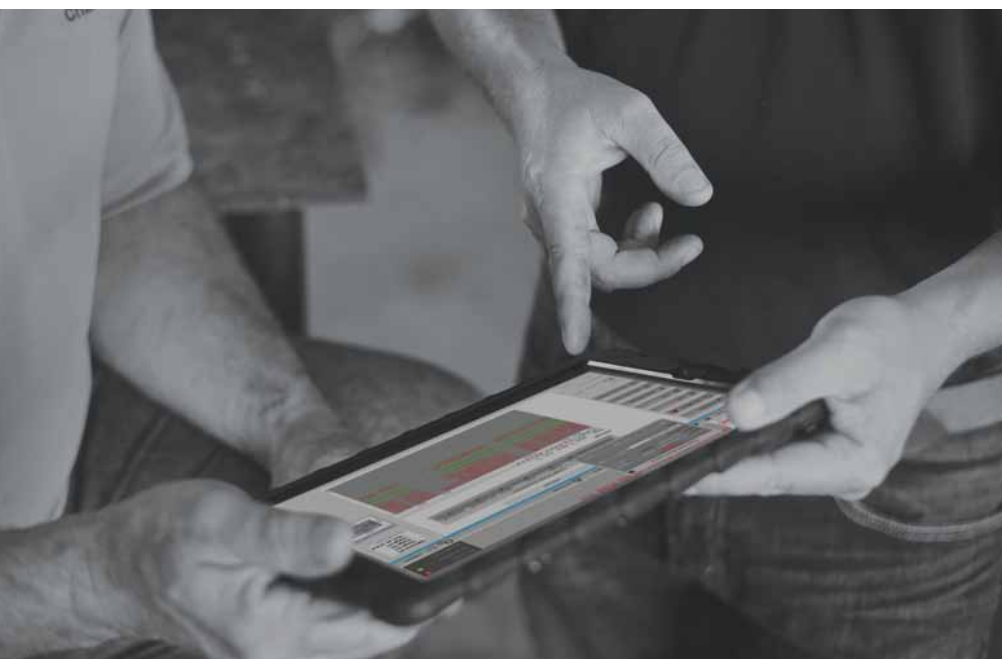
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devices and a Mobility Server responsible for evaluating the appropriate contextual requirements.

The Mobility Server is connected to a SCADA system which handles the communications needed to monitor and control equipment and other assets.

The mobile devices are communicating with the Mobility Server using standard wireless network connections.

Many benefits are realized with the deployment of a Mobility Infrastructure. These include benefits to all users depending on their roles and to the entire organization in safety, security, comfort and efficiency. 



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PcVue Solutions

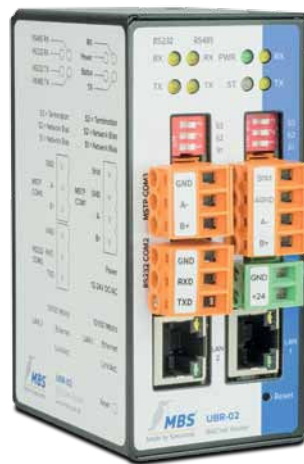
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Encrypted Communication and Authorized Access

MBS GmbH implements BACnet network security architecture in a router for the first time.

MBS GmbH integrated the network security mechanism of the BACnet protocol into their BACnet router UBR-02. "This way, we can meet the growing desire among users to utilize their company-wide IT structures for BACnet communication," explained Nils-Gunnar Fritz, CEO of MBS GmbH, an expert for industrial and building automation based in Krefeld, Germany. For financial reasons, a growing number of building operators wish to use their company networks for the overall BACnet data exchange. This is not without its risks, as this essentially enables unauthorized parties access to the building automation infrastructure.



© MBS

Avoiding Manipulation with Tunneling

Similar to the existing UBR-01 model, the new UBR-02 model routes packages between the MS/TP media (RS485), Ethernet, and IP, which can be linked to create a common network. The UBR-02 can now link two separate IP areas for the first time with two network connections. Moreover, the new router has two RS485 interfaces and can be linked to two BACnet MS/TP bus systems simultaneously. Using the security architecture, the new router is thus able to tunnel the overall data exchange. If several UBR-02 BACnet routers are connected to one another, the communication between network segments can be encrypted and data access authorized.

Unlike existing approaches that enable communication via a virtual private network (VPN) or virtual local area network (VLAN), BACnet users are able to implement the UBR-02 BACnet router without any support from the IT department. "With the UBR-02, BACnet users have the opportunity to meet the high security demands of overall data communication with minimal effort for the first time," said Fritz.

MBS GmbH
info@mbs-software.de
www.mbs-software.de



BACeye Store:
www.baceye.com

BACeye 2.0

VISUALISATION AND ANALYSIS OF BACnet NETWORKS

BACeye allows easy access to BACnet devices and their objects and properties. In addition, it offers the possibility to generate EDE files („BACnet data point lists“) and read, graphically display and export trend log data, among other things. BACeye 2.0 now supports BACnet protocol Revision 14 and offers an expanded watchlist with logging and export functionality. Furthermore BACeye 2.0 offers device management functions and recording of BACnet communication in packet logs.

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

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, manufacture, 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.

Gold Member



Expanding the boundaries of lighting™

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Acuity Brands, Inc. is a North American market leader and one of the world's leading providers of indoor and outdoor lighting and energy management solutions. Its innovative lighting solutions cover both conventional fixtures and advanced solid-state technology that can seamlessly integrate with powerful digital controls and daylighting to create greater energy efficiencies and a higher quality of light.

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United States

Silver Members



AccuEnergy

AccuEnergy manufactures end-to-end power metering solutions with class-leading features that can be configured to meter a wide selection

of energy parameters, peak demand, alarm automations, tariff scheduling and power quality analytics. Its products are used to monitor electrical systems in commercial buildings, industrial facilities, data centres and cell towers.

2 Lansing Square, Suite 700
Toronto, ON M2J 4P8
Canada



ADF Technologies Sdn. Bhd.

ADF Technologies Sdn Bhd is a privately-owned company, founded in 2006 and accredited with MSC status. As a solution and service provider in Building Automation System (BAS) and Energy Management, ADF Technologies strives to provide the best solutions and service for commercial and industrial applications, in line with the green building concept.

Plot 88F, Lintang Bayan Lepas 10,
Non Fiz, Phase IV
Bayan Lepas
Penang
Postal Code: 11900
Malaysia



Critical Environment Technologies Canada Inc.

Critical Environment Technologies Canada Inc. is a leading gas detector manufacturer for commercial and light industrial leak detection applications. It is dedicated to designing, developing and servicing hazardous gas detection systems for a wide range of applications that require monitoring of refrigerants, TVOCs, combustible and toxic gases in hazardous and non-hazardous environments.

Unit #145 - 7391 Vantage Way
Delta, BC, V4G 1M3
Canada



Ges Teknik Klima Kontrol ve Otomasyon Sistemleri San Tic AS

Ges Teknik is a private company that has been operating in the fields of HVAC Control and Building Management Systems since 2003. In addition to BMS, R&D has become an integral part of the company's day-to-day business. Ges Teknik started offering unique products, specifically for OEM customers, whose design, algorithm, and production was totally provided by the company. Thanks to the latest technological developments, Ges Teknik has further enforced its position in BMS and room automation.

Girne Mah. Irmak Sok.
Kucukyali Is Merkezi
C10 34852 Istanbul
Turkey

Hysine

Hysine Controls

Hysine Controls company's main business is the development and production of building automation products and industrial control products. It is committed to BACnet systems product development and promotion. It provides a complete solution and the full range of BAS products.

Hysine building, Bingbing Group, DingfuHuangZhuang
Chang Ping District
Beijing
102206
China

Intesis

Member of the HMS group

Intesis

Founded in 2000, Intesis Software is a leader in manufacturing innovative solutions for the home and building automation market. Based in Igualada (Barcelona), Spain, it offers a wide range of products to customers in more than 90 countries. This has been possible as a result of a continued commitment to an investment in R & D, on the basis of a highly qualified team.

c/ Milà i Fontanals
1 1ºBis
08700 Igualada, Spain



Kepware

Kepware is a software development business of PTC Inc., headquartered in Portland, Maine. Established in 1995, Kepware has spent the last 20+ years building a portfolio of industrial connectivity solutions to help businesses connect diverse automation devices and software applications. It has been recognized as an early player in the Industrial Internet of Things (IIoT), and serves a wide range of customers in a variety of vertical markets – including Manufacturing, Oil & Gas, Building Automation, Power & Utilities, and more.

400 Congress Street
Portland, ME 04101
United States



King I Electronics Co., Ltd

King I Electronics Co., Ltd is a pioneer in Timer & Temperature Control Devices and famous for its high distinction in the design & production of devices provided to customers worldwide. It has earned a great reputation in the field of programmable & non-programmable thermostats for HVAC digital temperature control for both residential and commercial systems due to its state-of-the-art features, highly reliable production, and superior product design & development.

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Sangmyung University

Sangmyung University was established in 1937, based on the philosophy of national education conceived by Dr. Bae Sangmyung. With the educational ideology of truth, justice, and love, in its 76 years of leaping upward in continuous development, Sangmyung University has strived to fulfill the university mission of talent cultivation and scientific research.

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Rep. of Korea

t-mac Technologies

t-mac Technologies manufactures and distributes the t-mac energy management system. It provides remote access to real-time mains metering, sub-metering and environmental monitoring information on building and equipment performance and use. It is also a mini building management system (BMS), controlling equipment performance and use. t-mac's main aim is to assist businesses in reducing energy costs and carbon.

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United Kingdom

Corporate Affiliate



Cylon Controls

Since 1985 Cylon has provided building energy control systems worldwide, becoming one of the largest independent manufacturers of building controls in Europe. Cylon provides building energy management systems across all categories of buildings maximizing comfort and efficiency. Cylon's building energy management solutions have been installed in Europe, North America, Asia, the Middle East and Africa.

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BACnet® Router Now with Enhanced Security and MS/TP Flexibility

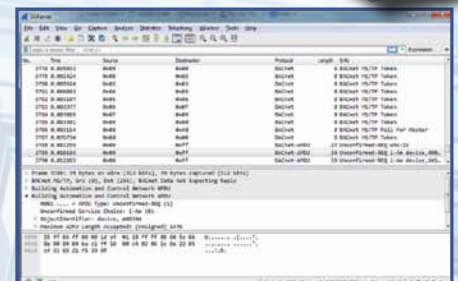
Our highly popular BASrouterLX BACnet router has been enhanced with two new features. It now has a whitelist security feature which limits the BACnet/IP devices which can communicate through the router to connected MS/TP devices (version 1.3.0 or greater). The new MS/TP backbone feature provides more flexibility to your BACnet network by allowing MS/TP cabling to be used more often to interconnect BACnet devices (version 1.3.0 or greater).

Product Features:

- MS/TP Capture / Storage for Wireshark® Analysis
- **NEW** Whitelist: Enhance BACnet Security by Only Allowing Specific BACnet/IP Devices to Communicate with MS/TP Devices (version 1.3.0 or greater)
- **NEW** MS/TP Backbone: Provides More Flexibility to Your BACnet Network by Allowing MS/TP Cabling to be Used Frequently to Interconnect BACnet Devices (version 1.3.0 or greater)
- BBMD with 50 BDT and 147 FDR for Larger Networks
- Supports Slave Proxy with Auto or Manual Discovery
- NAT Traversal to Connect BACnet to Internet
- Routing Between BACnet/IP, BACnet Ethernet, MS/TP
- 10/100Mbps Ethernet
- Optically Isolated MS/TP
- TX and RX MS/TP Status LEDs



BASrouterLX



Wireshark® Analysis



Growing Number of BTL-Listed Products Adds Exposure and Credibility

BTL Testing and Listing has continued to add greater exposure and credibility to BACnet product offerings in the building automation industry with the growing number of products showcasing the BTL Mark.

BACnet Testing Laboratories (BTL) was established by BACnet International to support BACnet compliance and interoperability testing activities, publish BTL Listings, and grant authorization to use the BTL Mark on successfully tested products. There are now four officially recognized BACnet test organizations, making it easier than ever for products to get tested and certified.

The BTL Listing and BTL Mark indicate that a product has successfully passed rigorous verification by testing, and demonstrates the correct implementation of rules and interoperability of the BACnet protocol. More and more product specifiers are requiring BACnet as a "must-have" for system requirements. There are now over 125 manufacturers with BTL Listed Products. Specification of BACnet as the protocol, and requiring BTL-Listed products, 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 is designed to ensure devices correctly implement BACnet functionality as governed by ASHRAE standard 135.1. The BTL Working Group defines the BTL Test Plan and governs the overall product testing process.

BACnet product test reports from all four of the BTL Recognized BACnet Test Organizations can be used to earn the BTL Mark and be included in the BTL Listing. The four recognized test organizations are the BTL Lab, DIAL, iHomeLab and MBS.

For suppliers who want to submit applications to test their products at the BTL Lab, the following three forms must be completed and sent to btl-coordinator@bacnetinternational.org: BTL Checklist, BTL Testing Application, and BTL Testing Agreement. These forms, and instructions for the entire testing process, may be found at: http://www.bacnetlabs.org/test_documentation under the heading "Current Test Package and Application Forms". The time from application to the start of testing is generally 60 days but may vary depending on the number of applicants at any given time.



Emily Hayes
BTL Coordinator

btl-coordinator@bacnetinternational.org



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- Web access from smartphone, tablet, or PC

buildings under control

NEW BTL-LISTED PRODUCTS

(Products Listed from mid-December 2015 – September 2016)

Manufacturer	Product Name	Model	Manufacturer	Product Name	Model
Automated Logic	Automated Logic AAR	AAR	Honeywell International	IRM HVAC Room Controller	CPO-RL1, CPO-RL2, CPO-RL3, CPO-RL4, CPO-RL5, CPO-RL6, CPO-RL7U, CPO-RL8, CPO-RS1, CPO-RS2, CPO-RS3, CPO-RS4, CPO-RS5, CPO-RS6, TE-RS4, TR-RS5, PCD7, LRL2, PCD7.LRS4, PCD7.LRS5, CLMERL2, CLMERL8, CLMERS4, AL-RL2, AL-RS4
	Automated Logic AMR	AMR			
	Automated Logic Equipment Portal	EQ-PRTL			
	Automated Logic LGR Line	LGR25, LGR250, LGR1000, LGR-25-32M			
	Automated Logic ME Line	ME812U, ME812U-E, ME812U-LGR, ME-LGR25, MELGR200			
	Automated Logic Room Controller	RC642, RC642D			
	Automated Logic SE Line	SE6104, SE6104A, SE6166			
	Automated Logic WebZONE	WebZONE			
	Automated Logic ZN341v+	ZN141v+, ZN220, ZN253, ZN341v+, ZN551			
Carlo Gavazzi Automation	WM20/30/40 Smart Power Analyzer	MCBAMS, MCBAMS01, MCBAMSM	Industrial Control Communications, Inc.	PicoPort Communications Module	PicoPort
Computrols	VAVB-BACnet	VAVB-BACnet	Johnson Controls	Facility Explorer, General Purpose Controller	FX-PCG2511-x
Critical Environment Technologies	CETCI BACnet Module for QCC-B, FCS-B, LPT-P-B and LPT-B	QCC-B-X, FCS-B-X, LPT-P-B-XX-XXX-X, LPT-B-XX-XXX-X – (X's) indicate various options, e.g. gas type, splash guard, etc.		Field Equipment Controllers	MS-FEC2511-x
Danfoss	MCA 125 BACnet/IP	MCA 125	King I Electronics Co., Ltd.	Fan Coil Controller	BAC-TH-1312
Delta Controls	enteliWEB	eWEB-4.1	Mitsubishi Electric Europe B.V. UK Branch	Procon MelcoBEMS MINI (A1M)	Procon MelcoBEMS MINI (A1M)
EasyIO Holdings Pte. Ltd.	EasyIO FG+ Controller	FG-32+, FG-20+	Neptronic	Temperature Controller Series	CMMB, PMMB, TUxB, TFXB, EFxB, TRxB, EVxB, HROB, SG2B, SxRB
Flexim Americas Corporation	Fluxus ADM Flow Meter - BACnet/IP	704	Price Industries	Price Critical Controls	PMT
	Fluxus ADM Flow Meter - MS/TP	704	Priva	Blue ID C4 Controller	C4 C-MX34m, C4 C-MX34
Functional Devices Inc	BACnet RIB	RIBMNW24B-BCAI, RIBTW24B-BCAI may be followed by -N4, RIBMNWD12-BC, RIBMNWD12-BCDI, RIBMNWX2401B-BC, RIBMNWX2402B-BC, RIBTNWX2401B-BC may be followed by -N4, RIBTWX2402B-BC may be followed by -N4, RIBMW24B-44-BC, RIBTW2401B-BC, RIBTW2402B-BC, RIBTW24B-BCAO	Sangmyung University	BACnet Interface Controller	BIU-1000
Gesellschaft für Regelungstechnik und Energieeinsparung m.b.H.	ems2 building controller	Base product: ems2.CP04D Derived product: ems2.R4D1B	Schneider Electric	PM5500 Power Meter Series	PM5560/61/62/63, PM5562MC, PM5563RD, PM5564RD/ 64RDMC
			Siemens	BT300 Variable Frequency Drives	Siemens BT300
				Climatix BACnet IP, MSTP and advance web communication modules	POL908.00/XXX, POL904.00/XXX, POL909.80/XXX
				DESIGO PXG3	PXG3.L PXG3.M
				DXR2	E09T-101A, M09T-101A
					E10-101A, M10-101A, E09-101A, M09-101A
					E12P-102A, E12P-102B, M12P-102A, M12P-102B
					E18-101A, E18-102A, E18-101B
					M11-101A, M11-101B
					M18-101A, M18-102A, M18-101B
				PXC3	E16A-100A
					E72, E72-100A, E72A, E72A-100A
					E75, E75-100A, E75A, E75A-100A
				RDY BACnet Thermostat	RDY2000BN
			SEM3	US2:SEM3CONTROLLER	

Manufacturer	Product Name	Model	Manufacturer	Product Name	Model
Strato Automation	BACplus-IP	4,3	Tridium	VYKON IO	IO-28U, IO-22U, IO-22D, DDC-28P
Toshiba Carrier Corporation	BN interface	BMS-IFBN640TLE, BMS-IFBN640TLUL	Vacon	VACON 100	100 HVAC
Trane	Tracer® Ensemble™	Tracer® Ensemble™	Woorizen	eDDC	1

Calendar of BACnet International Events

Dates 2016	Event	Location
November 1 – 2	NFMT Vegas & BACnet International Conference	Las Vegas, NV, USA
November 16	BACnet Golden Week China	Beijing, China
Dates 2017	Event	Location
January 28 – February 1	SSPC 135 Meetings at ASHRAE Winter Conferences	Las Vegas, NV, USA
January 30 – February 1	AHR Expo 2017	Las Vegas, NV, USA
May 9 – 11	LIGHTFAIR International	Philadelphia, PA, USA

Information about all events: David Nardone, BACnet International: david@bacnetinternational.org or at www.bacnetinternational.org

BACnet International Journal 12

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

Distribution

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

Online distribution

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

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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 600 BTL-Listed products**, providing users with assurance that these devices have passed the industry standard BACnet conformance tests conducted by a recognized, independent testing organization.

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 specifications to require the BTL Mark and/or BTL Listing in order to be eligible for a project.



BACnet Testing Laboratories

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