

JOURNAL OF BUILDING AUTOMATION



Issue
22

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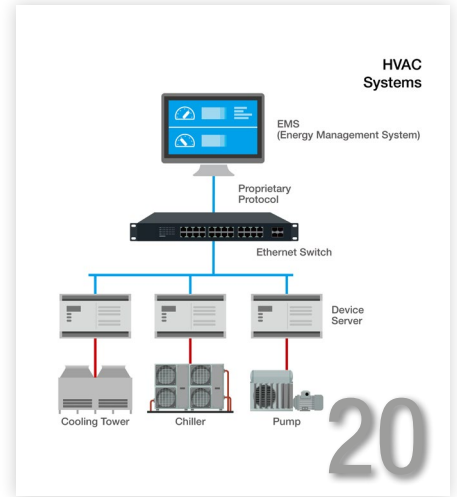
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Letter from the President

Welcome to our New Journal of Building Automation!


Dear Reader,

Perhaps you noticed the new cover design for the Journal. If you look closely, you will notice the Journal also has a new name. Rather than the BACnet International Journal, it is now the Journal of Building Automation, published by BACnet International. So, what's in a name? Well, in this case, quite a bit.

The Journal was founded to provide in-depth information on the BACnet protocol, its benefits, its applications, and its ongoing development. Since then, BACnet has evolved and expanded to become the global standard for building automation so it's time for the Journal's focus to evolve and expand as well. The Journal will continue to report on BACnet developments and applications but will also cover related building automation issues. In addition, the Journal will address the role of BACnet in the industry as the open, interoperable integration platform for intelligent buildings.

Intelligent buildings optimize their performance by orchestrating the operation of all building systems to achieve their goals. This requires integration of the Building Automation System (BAS) components across the

various building systems, and integration of sophisticated data collection, analytics, and diagnostics capabilities. Cost-effectively achieving this level of integration requires a standard, interoperable integration platform with strong roots in both BAS and IT. BACnet is that platform and it continues to evolve to meet the rapidly changing needs of the industry. The refocused Journal will help our readers understand the significance and implications of BACnet as an integration platform.

I invite you to explore all the articles in this issue. You will find content that addresses integration from a system specification perspective as well as from a multi-protocol perspective. Recognizing the opportunity in existing buildings, you will also find content relating to legacy building systems. Hopefully you will find some useful information and insights to help you get the most value out of your building automation projects. 




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BAS Integration: The Reality of a Multi-Protocol World

The Building Automation industry has seen migration from vendor-specific proprietary protocols towards BACnet that has provided tremendous benefits and choice to the building owners and systems installers resulting in lower ownership costs. BACnet provides the unifying protocol and universal access for not only Operator workstations and global controllers but any value-added application that follows the BACnet standard. This includes not only being able to incorporate legacy, proprietary Building Automation Systems (BAS) into BACnet but also incorporating newer non-BACnet technologies into this common ecosystem.

BACnet Integration using Routers and Gateways

A gateway can translate one protocol to another and there are multiple protocol gateways available for integration to BACnet. The use of routers and gateways has enhanced the life of legacy BAS installations like N2-Metasyms and Novar by integration into BACnet. Replacement devices in these installations can be based on the new BACnet standard and can co-exist with the existing legacy devices with the use of gateways – preventing a full-scale replacement.

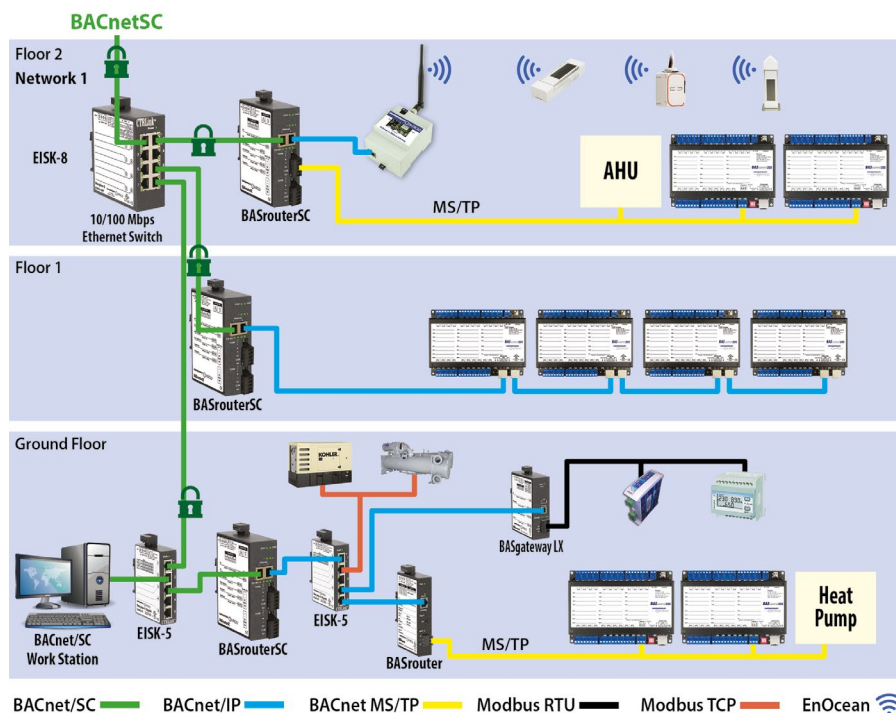
Modbus is another popular protocol traditionally used in the energy industry that lends itself well for BMS integration with the use of a gateway. Chillers, energy meters and Variable Frequency Drives (VFDs) are an important part of any energy optimization strategy in building automation. More and more equipment manufacturers are incorporating BACnet for these devices but a Modbus to BACnet gateway provides a viable alternative. Heat Pump systems are also gaining popularity and can be integrated into the BMS with the use of a VRF to BACnet gateway. EnOcean is another protocol that provides options for easy installation with its wireless energy-harvesting technology. This can be useful for cleanroom, retrofit or remote installations. Again, a gateway can provide the interconnect for EnOcean devices to BACnet and vice-versa.

BACnet Integration using Physical Inputs/Outputs

There are other options available for equipment manufacturers that do not yet have BACnet support but want to offer BACnet integration to their customers. One option for systems with unused I/O, or systems that can have I/O added

to them, is BACnet remote I/O because it can be used as a gateway to BACnet. For example, unused Analog Outputs from the non-BACnet device can be connected to BACnet remote I/O's Analog Inputs and now the system can communicate analog signals to BACnet clients. If the non-BACnet device has some relay outputs, these can be connected to remote I/O Binary Inputs and now they can communicate binary data to BACnet clients.

A BACnet controller can also be similarly used as remote I/O. An additional advantage of the controller products is the ability to do data conversion. For example, Contemporary Controls BAScontrol can use Sedona logic to convert analog signals from the non-BACnet equipment connected to the BAScontrol to something more meaningful to the BACnet client. For example, a 0-10V output signal from the equipment connected to a 0-10V input on the controller could be converted/scaled to temperature, where 0-10V maps to 50-85 degrees Fahrenheit. This converted value will be connected to a virtual point. The BACnet client/head-end can then view the actual temperature from the system without the need to do a conversion for the reported BACnet data.



BACnet as the backbone to unify a multitude of protocols used in a BMS system
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BACnet, Cloud and IoT-based Systems

The advent of cloud and IoT-based systems has brought up the question – should one choose BACnet or an IoT-based system? These two technologies both present advantages that can be complemented towards a hybrid system. BACnet is an open, multi-vendor protocol that is backed by ASHRAE. The addition of security with BACnet Secure Connect and ASHRAE Guideline 36-2018, High-performance Sequences of Operation for HVAC Systems, is a testament to the support of BACnet from a large community. BACnet can operate over different physical layers – BACnet/IP can operate over wired Ethernet or over Wi-Fi as well as EIA-485 with BACnet MS/TP. BACnet provides the unifying connectivity and local control while the IoT and cloud provide options to analyze the data for optimization for greener energy efficient buildings. This approach is evident with the addition of an IoT protocol like MQTT and cloud connectors in traditional BACnet devices. Cloud integration also allows for enhanced visualizations, easier data segmentation specific to the user type and alerts. For IoT systems, care must be taken to prevent single vendor lock-in with proprietary protocols. The shutdown of Google IoT Core (<https://cloud.google.com/iot-core>) offers a reminder to device manufacturers to have a migration path for their devices and not rely on a single cloud provider.

BACnet Community and Associations

ASHRAE continues to add support for new devices with the release of each BACnet protocol revision. BACnet now supports all aspects of the building including HVAC, Access Control, Elevators and Lighting, to name a few. The BACnet International and BIG-EU associations provide great support for anyone new to BACnet or looking to upgrade their devices. The BACnet PlugFest Interoperability Events provide an invaluable resource to developers to test their products in a neutral environment and get feedback from experts to ensure product compliance with BACnet and interoperability among different vendors. The BTL Certification program offers peace of mind that all the devices will work without issues in the field. The BACnet Institute, as well as webinars and articles in the publications, offer information regarding new products and best-in-class installations and trends. With all the above resources and advantages, BACnet will continue to be the protocol of choice for the building automation industry for the foreseeable future. 🌐



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Why BACnet Is the Key to Energy Efficiency in Data Centers

Data centers are at the heart of our digital world. If someone should switch off all the data centers in the world—nearly 8,000 of them spread around 110 countries—life as we know it would be drastically different. No YouTube, no Netflix, no Google Maps. We don't even dare mention the ramifications for industrial applications, heavily reliant on big data, should digital traffic come to a complete standstill.

Over the past two decades, expanding data requirements, such as data processing, data storage, and data connectivity, have paved the way for the rise of data centers. Furthermore, emerging data-intensive applications, such as artificial intelligence (AI), the Internet of Things (IoT), and digital manufacturing, to the name but a few, have solidified data centers' ubiquitous role in big data and industrial applications. As innovations continue to take the world to the next stage, and the world consumes more and more data, data centers will have an even bigger role to play.

As physical facilities, data centers house critical applications and data of organizations, enterprises, and many other entities. Their design rests on a complex network of computing and storage resources that enable the delivery of shared applications and data. The key components of a data center's network design include routers, switches, firewalls, storage systems, servers, and application-delivery controllers.

Traditionally, the SNMP protocol, the de facto standard in network monitoring, monitored these devices. The recent introduction of Data Center

Information Management (DCIM) systems, which enable real-time monitoring and management of all the equipment and complex systems in a data center, has made a significant impact in collecting accurate and important information related to the assets in data centers, the resources used, and operational status. DCIMs track all the connections deployed across the facility—from the lowest level in the power chain to the highest level—as every little detail needs to be monitored and managed in a data center.

This especially applies to achieving specific benchmarks for energy consumption, as cooling systems are the big culprit when it comes to data centers less stellar green record.

The World's Greatest Energy Guzzlers

Data centers are unlike any other buildings as they are energy-hungry, consuming collectively up to 3% of the world's electricity. Fueling this insatiable energy demand is an unrivaled cooling requirement, as the optimal required temperature in a data center is between 24 to 27°C. The prerequisite of 24/7 power availability also adds to high energy consumption in data centers. Cost-wise, these energy demands make big dents on the profits of data centers.

But how can data center managers keep their operations secure and reliable while also keeping costs low?

Energy efficiency is the key. This entails keeping a close eye on energy consumption, which has

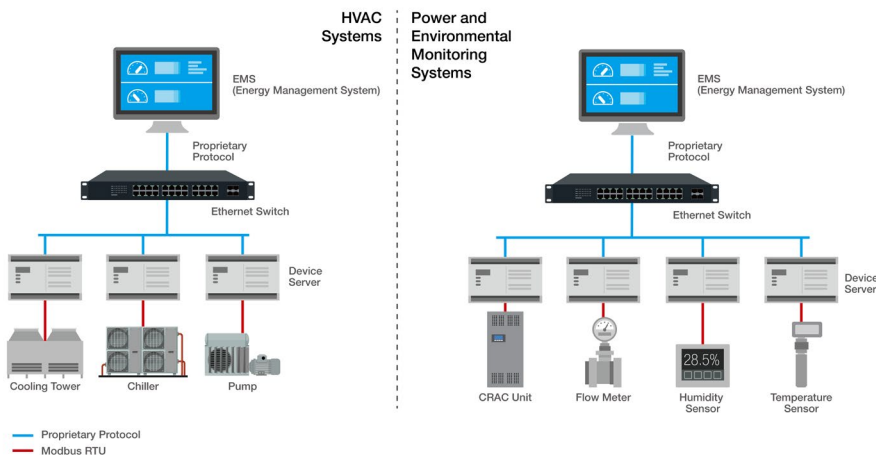
not always been the easiest task should you ask any field engineer or system integrator (SI) in a data center. SIs are under immense pressure to optimize operational performance and achieve one of the key KPIs of a data center: power usage effectiveness (PUE), the industry standard for measuring operational efficiency of data center cooling systems.

The push for energy efficiency in data centers not only comes from within data centers themselves but also from public and regulatory pressure to reduce the energy footprint in data centers. To meet increasing external pressure to optimize energy efficiency and stabilize power supply calls for data centers to invest in reliable data collection from their building automation system.

BACnet—A Game Changer in Building Automation Systems

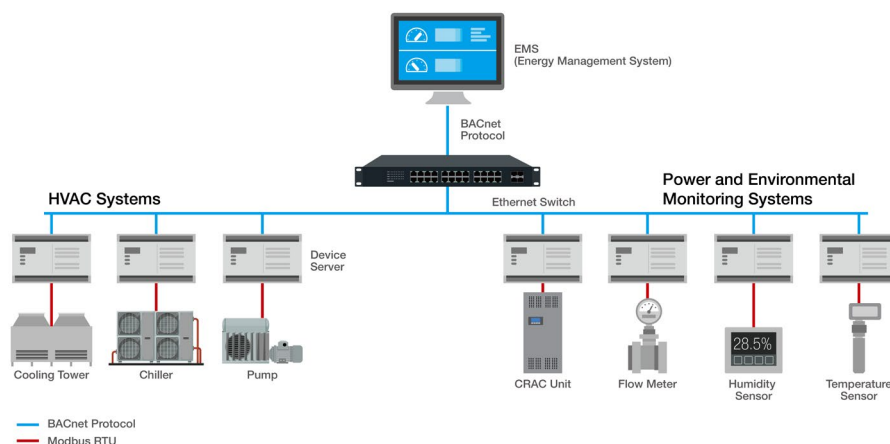
The control of and access to data in data centers are highly dependable on the smooth running of every system in the building, from heating and cooling to lighting and ventilation. In recent years, building management systems (BMS) and control devices have been integrated into the networks of data centers to simplify the control of many operations.

However, BMSs were not always so easily integrated into networks because the subsystems used different communication protocols, making it difficult to unify a network and allow interconnections between equipment from different manufacturers. Consequently, numerous maintenance efforts were required, and predictive maintenance was impossible.



Integration is difficult because isolated systems were developed by different Systems Integrators (SIs).

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Using BACnet protocols to unify networks between HVAC systems and monitoring systems.

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BACnet, short for Building Automation Control network, has changed all of this, making network integration of BMSs much easier. Developed in 1987 to create a unified language that would unite all automated system management, this open-source multi-vendor communication protocol eases the integration of devices and works with many vendors, allowing data to be shared. As this encompassing standard now controls most subsystems in commercial buildings, building automation and control systems for applications, such as heating, ventilating, and air-conditioning control (HVAC), lighting control, access control, and fire detection systems and their associated equipment, can now communicate with each other seamlessly.

The Benefits of BACnet

As a global standard, BACnet's benefits dwarf other protocols in ensuring minimum system integration time and cost. Foremost, as mentioned, this protocol's object-oriented model and high-performance communication make the integration of building automation and control systems from different manufacturers into one project possible, optimizing interoperability. BACnet also facilitates unrestricted growth and the ability to add new innovations and new features anytime.

An added advantage is that the major building and automation vendors have adopted BACnet. This presents an array of choices for scalability regarding cost, performance, and size.

Systems are based on a single, unified ANSI and international standard. To facilitate interoperability between BACnet device manufacturers, the introduction of the BTL (BACnet Testing Laboratories) Certification Program ensures manufacturers comply with the BACnet standard. Unlike other protocols, BACnet is not limited to a

single physical layer because it also communicates over multiple physical layers or link layers that are, among others, BACnet/IP, BACnet MS/TP, Ethernet, BACnet/IPv6, and BACnet/SC.

Most importantly, to achieve the KPIs for energy consumption, BACnet is by far the most suitable protocol—thanks to it facilitating better energy management of buildings—for today's smart buildings.

Improved Monitoring for Better Energy Efficiency

A smart strategy for energy efficiency in data centers begins with cooling systems. They are integral in data centers as they help prevent servers, especially large clusters, from overheating. But cooling systems are one of the biggest electricity hogs in data centers, accounting for up to 40% of electricity consumption.

A variety of factors influence the efficiency of cooling systems. They range from the architecture of cooling systems to the optimization of airflow in the server room and the improved control of cooling systems. Monitoring cooling and power systems gives operators the best chance to optimize their energy usage.

However, monitoring and optimizing cooling systems is easier said than done. For starters, identifying the critical parameters for PUE is complicated. These parameters encompass control parameters (the number of pieces of equipment, water supply temperature of chilling units, chilled water supply-return temperature difference, cooling tower proximity, cooling water supply-return temperature difference, etc.), process parameters (water flow, pressure difference, equipment power consumption, etc.) and environmental parameters (outdoor temperature and humidity, IT load rate,

etc.). Tweaking just one parameter complicates everything, as it will require the adjustments of other parameters in the system.

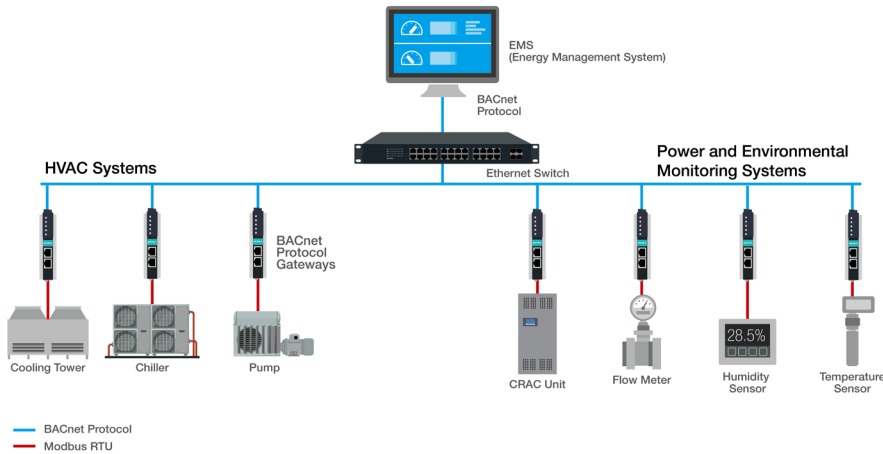
What's more, data centers are dynamic environments. As data centers change, ranging from an increased number of servers to fluctuating server heat loads due to varying computer loads, new challenges arise. Thus, the parameters for cooling systems will need to accommodate changes not only in data center loads but also outdoor temperatures and humidity levels.

Then, there is the issue that most cooling control methods only monitor the operating status of cooling units, performing no control whatsoever. For example, they may monitor operating parameters such as temperature, humidity, pressure, etc., but they do not conduct real-time adjustments of compressors, fans, or pump speeds to maximize performance. Ideally, operators would like to spring the incoming data into action by making the necessary changes in real time.

Also, precise control is tricky and requires more than decision making based on experience, which usually involves a lot of trial and error. In theory, we can only realize efficient cooling control through comprehensive control of all cooling devices, including Computer Room Air Conditioning (CRAC) units, chillers, cooling towers, and pumps.

Breaking the Mold

Therefore, one data center sought a solution that breaks the "monitoring without control" convention of IT rooms to achieve simultaneous monitoring and control in its server room. Achieving this solution lies in enabling the simultaneous monitoring of the indoor IT



Replacing device servers with BACnet protocol gateways in field sites
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environment and the HVAC system to ensure ambient temperature values can be fed into the cooling system to support setting adjustments of chiller units, such as regulating compressors, fans, or pump speeds, to achieve energy savings.

To achieve full-fledged environmental monitoring and control, SIs looked toward BACnet protocol gateways to collect Modbus data and convert it for BACnet/IP networks. But it is not a case of simply choosing any BACnet protocol gateway, as several key considerations must be addressed. Although BACnet gateways are a proper solution, we should be vigilant about the gateway's performance regarding protocol conversions — not only to achieve real-time monitoring but also real-time control to get the job done. For example, the protocol gateway you choose should be able to deliver high-priority commands to achieve real-time control for optimizing your energy usage. With cascade control of HVACs

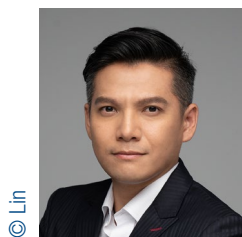
and energy management systems (EMSs), the upper-level EMS dynamically regulates the HVAC and CRAC units, according to the conditions of the IT room environment, to reduce electricity usage. The more real-time environment data it receives, the faster the EMS can control the HVAC and CRAC units to optimize energy-saving results.

A Solution for Future Data Centers

The success of this solution, in which the BACnet protocol streamlines communications to enable monitoring and control at the same time, will surely spur on other data centers to look at BACnet protocol gateway offerings for similar upgrades to their cooling systems.

References:

1. [Data Centers Around the World: A Quick Look](#), May 2021
2. [Data Centers & the Environment 2021 – Report on the State of the Green Data Center](#), March 25, 2021
3. [How to stop data centres from gobbling up the world's electricity](#), September 13, 2018



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Avoid Integration Issues with BMS Specifications



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Proper specification of a building management system (BMS) with other data-integrated building systems is important to ensure that the end user gets the building performance and user experience they expect. Specification errors happen far too often, causing added project costs, project delays, commissioning nightmares, and disappointed end users. Fortunately, by answering some key questions and following a few guiding principles, many of these integration issues can be avoided.

BMS Specification Using MasterFormat

MasterFormat is a common layout or index for design requirements or specifications of all aspects of building components to be used in the construction of a building. The common layout is composed of divisions. Each division has a set number system that is focused on a construction subgroup, such as the Facilities Services Subgroup, which includes the divisions shown in Table 1.

Table 1. Facility Services Subgroup

- Fire suppression (21)
- Plumbing (22)
- HVAC (23)
- Integrated Automation (25)

- Electrical (26)
- Communications (27)
- Electronic Safety and Security (28)

The AIA MasterFormat is basically the Dewey Decimal System for locating and indexing the design specification for buildings. However, a complete design specification for a large building can be thousands of pages and includes multiple subsystems whose specifications reside in different divisions. The specifier's challenge is to make sure the information is clear, complete, and, most of all, easy to find so that it will meet the design team's Basis of Design (BOD) and fulfill the end users' expectations.

In 2004, there was a major expansion in divisions for the MasterFormat, and HVAC was placed in its own Division 23; Division 25 was established specifically for building subsystem integration. It was expected that BMS specifications would migrate to that division, but instead, most BMS specifications are still listed in HVAC (23) along with HVAC specifications and requirements.

Using Division 23 can provide challenges since building management, which includes lighting, elevators, access management, and life safety, is technically not HVAC and many

contractors, installers, and manufacturers do not look in Division 23 if their scope is included in other divisions. It can also be difficult for contractors and installers to access Division 23 specifications if their scope of work is included within another division.

Specifying Integration in Divisions 25 and 27

Division 25 provides a specification framework for a BMS that integrates multiple systems from separate divisions:

- Section 25 30 01 covers the items to be monitored or the data to be exchanged from each subsystem.
- Section 25 05 01 defines the control functionality of each system.
- Section 25 90 01, one of the most important sections, provides for the sequence of operations between the systems and the BMS.

Division 27 is where the details of the building's communication infrastructure are listed. Division 27 equally applies to a common IT infrastructure that can be shared by building technology systems and information technology systems or a dedicated network for the BMS.

Using Division 23 can provide challenges since building management, which includes lighting, elevators, access management, and life safety, is technically not HVAC and many contractors, installers, and manufacturers do not look in Division 23 if their scope is included in other divisions.

Each building system is listed in its own division. For example, the specification for lighting system integration would normally fall under Lighting Controls sections within Electrical Division 26 09 23. If the system consists of a simple panel it would probably be listed under section 26 09 43 Network Lighting Controls or a subsection such as Digital-Network Lighting Controls.

Each division is where the installer will access the information for system requirements and where the requirements for integrating the systems with a BMS should be listed. Even if listed in earlier divisions, the integrated system functionality should also be listed in the traditional division of that system or it may never be known by the system installer.

Specifying Integrated System Functionality

Data flow between systems is a basic function of an integrated BMS. Many parameters need to be specified, including the mechanics of the data flow, what data is stored and/or displayed, what data can be sent and what data can be received, the format of the data, and who is responsible for configuring and managing the data flow.

One of the most important items in a specification for system integration is the sequence of operations. The sequence of operations is important for a stand-alone system but even more important for data-integrated systems from different manufacturers. The sequence of operations is where the specifier defines “what” each system should do. This part of the specification is often documented as a narrative, flowchart, table, use case, or similar format. The system installers are often unfamiliar with the capabilities and characteristics of the other systems, so both the details of the overall system operation and system implementation need to be clearly specified. Additionally, listed in both Division 25 and within its own division, each system would list the sequence of operations or interaction between the system and the BMS, such as detailing each system’s responsibility in implementing command or monitoring actions.

Data exchange is core to systems integration, and its specification answers such questions as:

- Do the systems need to pull the data or will each system push the data?
- How fast does the data need to be transferred?
- What data needs to be transferred and where is it stored?
- Where is the data analyzed?
- What capability does each system have to control devices in other systems?
- Can schedules in multiple systems impact devices and parameters outside their system?
- Can schedules be modified from more than one system?
- What devices or functions can be controlled or overridden from which systems?

Specifying Communication Protocols

Each division including networked systems needs to clearly specify the communication protocol or protocols for integration. Many BMS and subsystems can accommodate multiple protocols. BMS protocols have two basic components:

- **The message**, such as what data needs to be transferred, how fast it needs to be transferred, and where it is analyzed
- **The structure** to transport the message, which dictates the wiring and physical connections used

Many of the most popular BMS protocols have multiple structures for message transport such as Modbus ASCII and Modbus TCP/IP or BACnet/MSTP vs. BACnet/IP. Wired media like RS-232, RS-485, and Ethernet have different connectors, different communication speeds, and different wire types. Wireless media have different frequencies, speeds, and modulation types. Many BMS protocols offer a certification process for devices to ensure a base level of compliance. Some offer only third-party certification while others offer self-certification or both.


Media converters and protocol routers are used to change the transport structure while maintaining the same message. For instance, a BACnet/IP to MSTP router communicates the same BACnet command but changes the wrapper with source and destination information to work between an IP-based message and a RS-485-based message.

Gateways are a translator between protocols. The advantage is that a gateway allows a system that does not support a specific protocol to communicate with a system with another protocol. Because gateways support multiple protocols, both open and proprietary, they often have to be updated when either protocols change or the configuration of the connected systems changes. Some highly integrated BMS employ middleware software running on a separate server that can support multiple standard and proprietary system protocols and convert building system data to a common format for data storage, analysis, reporting, and compatibility with third-party applications.

Specifying Responsible Parties

A common mistake in specifications of an integrated BMS is to not include who is responsible for making the system ultimately work. The specific responsibilities of installers of the individual systems and the integrating BMS need to be specified. If there is an issue and additional equipment is needed to address the integration between systems, who is responsible for purchasing that equipment? Systems on the same project can individually be tested using third-party BMS testing software all showing that each works adequately, but when connected they don’t work together.

Each installer needs to stay on the project until the specified functionality is achieved. Sometimes a consultant or master system integrator is hired with the responsibility to sign off that each system has met the integration requirements and that the overall system works and meets user expectations. These responsible parties can also address aspects of network access, cybersecurity, operator training, and lifecycle management, which are critical with integrated systems.

In conclusion, experience has shown that specifiers do not have to be BMS protocol or systems integration experts to achieve project goals. Successful integration involves answering some key questions and following some guiding principles related to system functionality, technical implementation, and the location of integration information in specification documents. 

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Legacy Buildings Need Love Too



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The facility operations and maintenance staff at an educational institution were struggling to keep their heads above water. Students, teachers, and administrators don't care that the BAS systems and controllers are aging. They just want a comfortable indoor environment that facilitates the learning process. At the same time, finance staff are monitoring the budget and don't want to overspend. How do you keep everyone happy? Does this sound like a familiar situation?

Eventually, those aging systems will need to be replaced. Some will fail before you have the opportunity or funding to replace them, so you must navigate through that process. How do you get the best ROI on the funds that you do have to maintain and invest in your building infrastructure? In the short term, it becomes both a risk management scenario and an energy efficiency opportunity.

This could be a discussion within almost any industry. It just so happened that it occurred with management of a school district struggling to balance all the demands on their limited resources.

Treat Your Building as an Asset

As a facility operator, stop looking at your building as an expense and educate management to do the same. Instead, look at everything you do as

an investment in achieving the core mission of the organization: making all your building occupants more effective and more productive. There are a lot of things short of ripping the BAS out and replacing it that you can do to improve building efficiency and improve IAQ and occupant comfort at the same time. You don't have to rip and replace the legacy BAS in one fell swoop to make significant improvements. With careful planning, it can be an incremental process that is executed over time, delivering value very early in the process and paving the way to renewing your entire building infrastructure.

As a BAS or HVAC contractor, the technology you are delivering needs to be secondary to solving the problems and issues that the building owner / operator is facing. It needs to enable the solutions to the building owner and operator's challenges. In the short term, these may be very specific problems with the mechanical systems. In the longer term, what you do must make the building occupants more efficient, and more productive. That may mean stepping outside of your comfort zone and introducing value added applications and associated training so that the building can be managed with information instead of intuition. Applications like analytics, energy management, and continuous commissioning can make a huge difference. Some of these applications have a very short ROI. When you make the facility operator look like a hero to the building owner, you look good at the same time.

Commercial Buildings BAS Inventory

Buildings are a major consumer of energy. According to the 2018 **Commercial Buildings Energy Consumption Survey** (CBECS), there are 5.9 million commercial buildings in the U.S. Of these, approximately 933 thousand are equipped with a BAS. If you are lucky enough to be working in a modern building with an open BACnet standards-based BAS installation, you can simply introduce those value-added applications.

Prior to the introduction of BACnet BAS systems in approximately 1996, BAS vendors were innovating with proprietary offerings. These early offerings are now legacy as most of the industry has adopted BACnet. Monitoring and managing these legacy buildings are important because they too consume a lot of energy, but this may be a bit more difficult. There is a huge installed base of these legacy buildings whose BAS has not been upgraded since the initial installation.


Opening The Door

Gateway technology can open the door to very quickly and cost effectively improve the operation, monitoring, and management of buildings with legacy BAS installations. Making those legacy systems look like modern, standards based, BACnet systems, enables upgrades of your operator workstation and global controllers immediately, improving the building's operational

efficiency. The best gateway technologies allow your new applications and head end to co-exist with your legacy head end and provide network performance metrics to help manage the installation.

Gateway technology also enables you to introduce value added applications like energy management, continuous commissioning, and analytics to start managing your buildings with information. This will help you apply the funds you have available in areas where you will get the best ROI in the short term and a solution that will serve you for many years to come. When it comes time to replace those legacy systems, your investment in BACnet technology is preserved because it is based on open standards. Be careful to avoid a quick fix with proprietary point solutions that are attractive because they

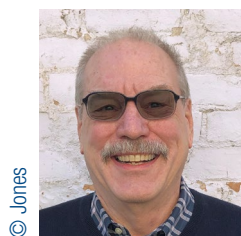
can deliver a quick solution but may lock you into a specific manufacturer and not interoperate with other building subsystems. You will eventually need to replace those aging legacy systems. With careful planning, you can do it on your own terms when it fits both your building's operational needs and your budget. In fact, this approach may enable you to complete the upgrades with OPEX (operating expense) funds instead of having to initiate a major CAPEX (capital expense) project.

With this approach, ALL buildings can quickly start their transition to open BACnet technology and a migration to a smarter building, enabling the building owner / operator to make informed decisions that will improve their energy efficiency and the overall effectiveness of their building operations. 

ABOUT THE AUTHOR

Steve Jones founded The S4 Group, Inc. in 2002. His professional experience includes delivering networking and integration services for carriers, networking vendors, and system integration companies in both the government and commercial sectors, and he is currently Chair of the BACnet International Marketing Committee.

Mr. Jones previously held multiple positions with Johnson Controls focusing on developing enterprise solutions and integrating the Metasys® Building Automation System into customers' IT environments, network infrastructure, and management platforms. He belonged to both ASHRAE and BACnet International and reviewed BACnet standard Annex J (BACnet/IP) as it was being adopted. He holds a Master's degree in Computer Science from Stevens Institute of Technology, a Bachelor's degree in Computer Science from Rutgers University, and an Associate degree in Computer Science from Penn State.



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Three Ways BACnet Is Changing HVACR in 2023

In 1995, the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) presented the standard that would detail the Building Automation Control Network or BACnet protocol. Originally developed in 1987, this innovative protocol was way ahead of its time in the 1980s and 1990s—a time when Wi-Fi as we know it did not yet exist and IoT-enabled building automation was still years into the future.

BACnet can rightfully claim its position as the protocol that revolutionized the way operators control building systems by allowing computers and controllers to interoperate without being dependent on any one manufacturer or system.

Most notably, BACnet pushed the envelope of its early capabilities just two years after the standard was launched with a rather famous project known as “450 Golden Gate.” This project, named for



BACnet revolutionized interoperability of building automation devices and systems.
 ©MSA Safety

the location of the Phillip Burton Federal Building and U.S. Courthouse in San Francisco, was the first large-scale test of whether or not BACnet could successfully connect multiple energy management system (EMS) controls.

As history now shows, BACnet proved itself more than capable.

Today, BACnet continues to be the de facto communications protocol to enable Building Automation device and system interoperability. And it's made even more powerful with help from solutions and devices featuring integrated BACnet capability. Gateways and products that specifically use BACnet as an interface can help HVACR companies enter or remain in the BACnet world quickly and efficiently.

So, as we look forward to 2023, let's also look at three ways BACnet and a new generation of BACnet-integrated tools will make their mark on the future of the HVACR industry.

Improved Energy Efficiency

It's no secret that HVAC is the single largest energy consumer in the U.S. and the single largest market for chillers.¹ In fact, it's one of the reasons the DOE (Department of Energy) enacted new minimum cooling energy efficiency requirements for both commercial and residential HVAC equipment, effective January 2023.

Thus, commercial operations of all kinds are looking to device manufacturers to help them keep up with these new regulations and to reduce their energy consumption.

While taking advantage of technologies from HVAC device manufacturers may be nothing new



Mechanical equipment rooms are subject to refrigerant leaks
©MSA Safety

for commercial building owners and managers, thanks to the BACnet protocol they now can expect to update and/or upgrade their controls with minimal, if any, disruption – as long as they're using a multi-protocol gateway. That's because a multi-protocol gateway can enable disparate energy metering equipment to become an integral part of the connected energy management system.

The result? A system of interconnected devices that can be easily controlled and automated.

And, by using a gateway, building owners and system specifiers can tap into as much information about the BACnet objects on their network as they want—while also being notified via SMS text or email when a value moves out of a predetermined range.

This ability to monitor and measure is especially crucial when it comes to HVACR because as

the saying goes, “you cannot manage what you cannot measure.”

Reduced Carbon Footprint

In the past few years, the BACnet protocol has begun to forge a new pathway toward green initiatives. Just in time, too.

According to the Air Conditioning Contractors of America, there's been more than four consecutive decades of higher-than-average global land and ocean temperatures as a result of climate change.²

Which is why the topic of climate change and how to protect the planet has become such a hot one. Another hot topic? The HVACR industry's use of refrigerants in 2023. The fact is the use of refrigerants is evolving, so it's incumbent upon the HVACR industry to prepare accordingly.

Fortunately, both the industry and HVAC controls manufacturers are embracing the green movement. In the future, we can expect to see an array of new, more sustainable solutions, ranging from cold climate heat pumps to electrification to lower-GWP (global warming potential) refrigerant alternatives.

Additionally, connected BACnet-enabled HVAC technologies will help building owners and facility managers reduce their carbon footprint by equipping them to:

- Monitor specific data objects and properties, such as carbon dioxide
- Establish alarms based on data ranges or change of value, such as refrigerant leaks



HVAC is the single largest energy consumer in US.
©MSA Safety



New technologies provide real-time device data in the palm of your hands anywhere, anytime.

©MSA Safety

- View and troubleshoot from anywhere, anytime
- Access real-time data to ensure that time-sensitive issues are addressed quickly
- Enhance personnel and occupant safety
- Optimize operational efficiencies

Better Air Quality

Starting in the early 2000s, BACnet helped streamline building automation for the comfort of personnel and building occupants, but in 2023 it will also help ensure their well-being.

Now building owners and facility managers will be better equipped to monitor and manage indoor air quality (IAQ) with help from HVAC products that use BACnet as their interface. That's a good thing, too, because according to the Occupational Safety and Health Administration (OSHA), IAQ problems in commercial and industrial buildings is a major concern, with many IAQ complaints resulting from HVAC systems.³

So, in 2023 new HVAC technologies will come into play that will support commercial building owners and managers in providing acceptable IAQ for tenants, occupants, and HVAC workers.

Even though these technologies have not been introduced as of this writing, there is one thing that is sure: solutions with integrated BACnet capability will enable next-generation communication between mobile and Cloud-enabled devices and HVAC systems, helping alleviate the health and safety hazards associated with poor IAQ. 📍

References

1. International Energy Agency. "The Future of Cooling: Opportunities for energy-efficient air conditioning." iea.blob.core.windows.net/assets/0bb45525-277f-4c9c-8d0c-9c0cb5e7d525/The_Future_of_Cooling.pdf. Accessed 14 October 2022.
2. ACCA. "Climate Change and the HVACR Industry." hvac-blog.acca.org/climate-change-and-the-hvacr-industry/. Accessed 14 October 2022.
3. OSHA.gov. "Indoor Air Quality in Commercial and Institutional Buildings." osha.gov/sites/default/files/publications/3430indoor-air-quality-sm.pdf. Accessed 14 October 2022.

ABOUT THE AUTHOR

Richard Theron is the Product Manager for FieldServer® at MSA Safety, the global leader in the development, manufacture, and supply of safety products that protect people and facility infrastructure. Theron works closely with the HVACR industry in support of MSA HVACR Point Gas Sensors, Aspirate Leak Detectors, and Demand Control Kitchen Ventilation, as well as Cloud-enablement of equipment.



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New York City Airport Keeps Flights Flying



TEC Building Systems, LLC, one of the largest New York City master systems integrators, was challenged by the owners of a local airport terminal to extend the life of the building's VAV control system – a key part of the HVAC infrastructure. The VAV system's supervisory controllers were slowly failing and were no longer supported by the manufacturer, and a protocol mismatch between the building's many field-level VAV controllers and the BACnet-based BMS made communication impossible.

Ripping out and replacing the entire VAV system was cost prohibitive and unnecessary since it was a functioning system, so TEC needed a solution

that could provide a critical bridge between the many field-level controllers and the BACnet infrastructure. They chose EnOcean's SmartServer IoT because of its ability to completely map the many field bus protocols with BACnet based supervisory systems and BMS. With SmartServer IoT, TEC was able to extend the life of the terminal's legacy infrastructure in an easy and affordable way.

By replacing the supervisory controller and the router/repeater with a SmartServer IoT, TEC was able to reinvigorate the control system at the airport terminal to ensure it would be in working order for the foreseeable life of the terminal. Today, the system is running smoothly, and because it is not a full-fledged operating system, SmartServer IoT doesn't need ongoing maintenance. The cost savings were significant: by avoiding the need to rip out and replace the entire VAV system, the terminal owners were able to save hundreds of thousands of dollars. Importantly, they were also able to do this with minimum disruption – a huge consideration for an occupied airport terminal supporting hundreds of flights per day.

EnOcean
Self-powered IoT

EnOcean
info@enocean.com | www.enocean.com/edge



CORPORATE MEMBERSHIP BENEFITS

BACnet International provides its corporate members with extensive financial, informational, marketing and promotional benefits. Its information services make it easy to keep up with the growth and evolution in the industry and with BACnet technology. BACnet International membership enhances a supplier's credibility with potential customers and partners while providing a variety of opportunities for exposure and promotion.

Corporate Member Benefits:

- Corporate logo appears on BACnet International website, in newsletters and in trade show materials
- Ability to share Success Stories which become a permanent record on BACnet International website
- 50% discount on hourly BTL testing rate for Platinum, Gold, and Silver corporate members when using the BTL Lab
- Options for expedited testing when using the BTL Lab
- Included and/or deeply discounted BTL Certified Product Listings
- Discounts on event registrations for your whole team, including the annual BTL PlugFest
- Discounted developer resources and services

Corporate Membership Levels:



MORE INFORMATION:

For more information on BACnet International membership, product testing & certification, and to sign up to receive our newsletters, visit BACnetInternational.org or contact our Executive Office at +1-770-971-6003 or via email at info@bacnetinternational.org.

Integrated Ecosystem for State of Art Hospital in the United Arab Emirates

Johnson Controls implemented a comprehensive building management system for state of art 720 bed hospital in United Arab Emirates, extending over 358,000 square meters of space designed for specialized clinics, medical rehabilitation, and teaching hospital.

Enabling Facility Goals

Execution of this new hospital, considered as one of the most important healthcare projects in the country forms part of the efforts to provide high quality healthcare services throughout the country.

Some of the prime characteristics to drive quality service required for this facility are as below:

- Convenient access to the facility
- Controlled indoor environment
- Safety of the facility
- Round the clock service
- Technology to support critical patient care

Creating a Multi-Level Connected System with BACnet

Using Metasys 10.1 building automation system from Johnson Controls, numerous third-party systems were seamlessly integrated via a combination of BACnet MS/TP, BACnet/IP, and other BAS protocols as listed below:

- Chillers
- Access Control System
- CCTV System
- Air Handling Units
- Fan Coil Units
- Under Floor Cooling System
- Close Control Units
- Car Park Management System
- Plumbing systems



© JCI stock image marketing collaterals

Metasys is a true integrations platform to unify even non-HVAC systems – like Fire Alarm System, Access Management and Video Management– into a single interface using standard data formats and communication protocols, including BACnet. Johnson Controls BACnet based Network Automation Engines (NAEs) deliver comprehensive equipment monitoring and control through features like scheduling, alarm and event management, energy management, data exchange, data trending, and data storage. These network engines helped streamline integration to enhance interoperability between systems in this multi-disciplinary, specialized hospital while ensuring smoother, and efficient operations.

Johnson Controls has also deployed the latest Metasys User Interface for this project which helps to maximize efficiency and protect client investments with its intuitive space-based navigation and award-winning Cyber Health Dashboard for fast access to critical data.

Contributing towards an optimum healthcare complex

The integration of the 20,000 data points realized with the help of the higher-level server Metasys ADX has empowered this healthcare facility operators with data analytics and real-time management of the systems to deliver smart, connected and healthcare-tailored solutions thus taking advantage of BACnet's value proposition of being able to implement a unified control system.

With the recent release of Metasys 12.0 in the Middle East & Africa (MEA) region, Johnson Controls now delivers a future-ready BAS with enhanced security and a clear path to modernization. 🌐



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SmartServer™ IoT to Connect Lighting Control to the BMS at World Cup Football Stadium



Ahmad Bin Ali Stadium.
© Qatar 2022/Supreme Committee

Delmatic, an international supplier of advanced lighting management solutions, was appointed to provide a lighting control solution with the highest levels of sustainability for the 92,000 sq. meter Ahmad Bin Ali Stadium, one of the major sporting venues hosting the FIFA World Cup Qatar 2022™.

SmartServer IoT Seamlessly Networks DALI to LON and BACnet BMS

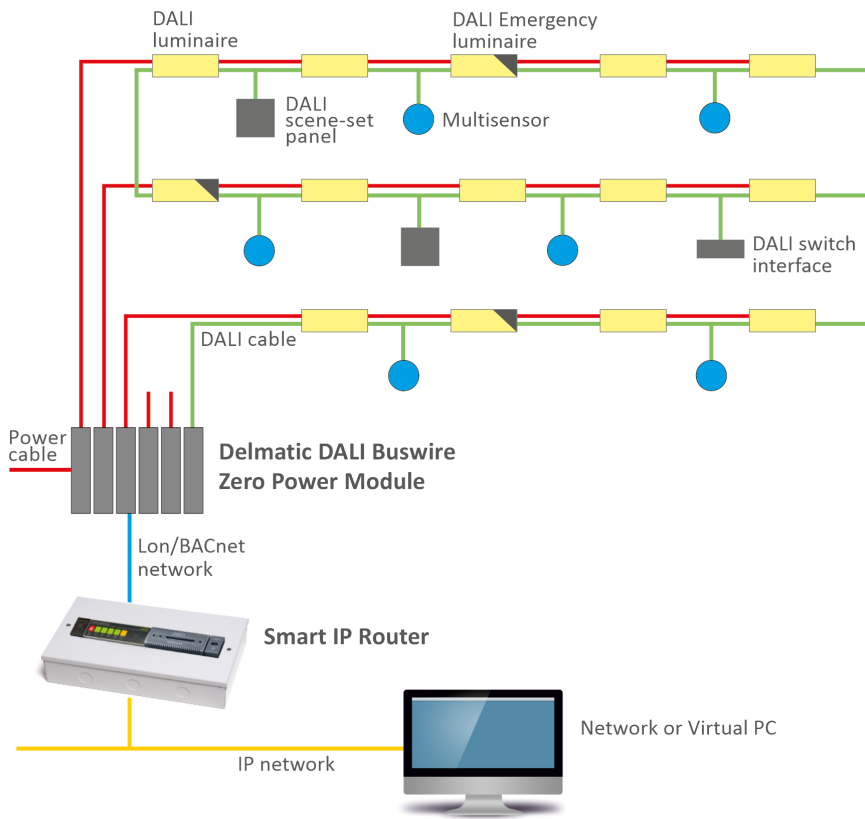
Delmatic's lighting solutions, based on DALI/ DALI-2 (Digital Addressable Lighting Interface), provide addressable scene-setting of normal, emergency and decorative lighting across the event stadium's canopies and façades. The lighting control modules for Ahmad Bin Ali Stadium use LON FT-10. Delmatic needed a solution that would easily route the FT-10 signals from the lighting control modules onto Ethernet, and they needed the solution to act as a BACnet gateway so the LON-based lighting control modules could connect with the BMS.



Delmatic's Smart IP Router incorporating the SmartServer IoT.
© Delmatic

Delmatic chose Renesas' SmartServer IoT™ to act as a LON router and also as a BACnet gateway. SmartServer IoT is an open, easy to use, freely customisable, BACnet-ready edge server that enabled Delmatic to seamlessly and securely

connect the DALI system to the LON based lighting control modules via Ethernet (IP) and connect the modules to the BMS via BACnet. Delmatic had used the SmartServer IoT previously and knew they could get it up and running quickly.




Schematic of the Delmatic lighting management system at Ahmad Bin Ali Stadium.
© Delmatic

The Ahmad Bin Ali Stadium lighting control system uses sixteen IP/LON Routers controlling 584 LON nodes. Data from all sixteen routers is converged into one SmartServer IoT and effectively routes the LON messages through its standards-based data fabric called the IoT Access Protocol (IAP), which provides a common information model and standard services that are harmonised with BACnet object models. Via an MQTT based message bus, IAP enables autonomous cross communication across disparate protocols and services, handling all translations and data normalisation. It creates digital twins of the LON control modules and feeds

them into the BMS, which sees each LON datapoint as a native BACnet datapoint.

To maximise operational efficiency and sustainability, the lighting management system is capable of tracking the stadium's energy usage and sharing key sensor data with connected services and the BMS via BACnet/IP. Delmatic modules feature DALI Zero Power technology, which smartly turns off the mains power to areas where lights are digitally off, thereby eliminating wasteful standby parasitic power consumption. The SmartServer IoT in conjunction with DALI Zero

Power technology, optimises the transmission and sharing of module data with the BMS.

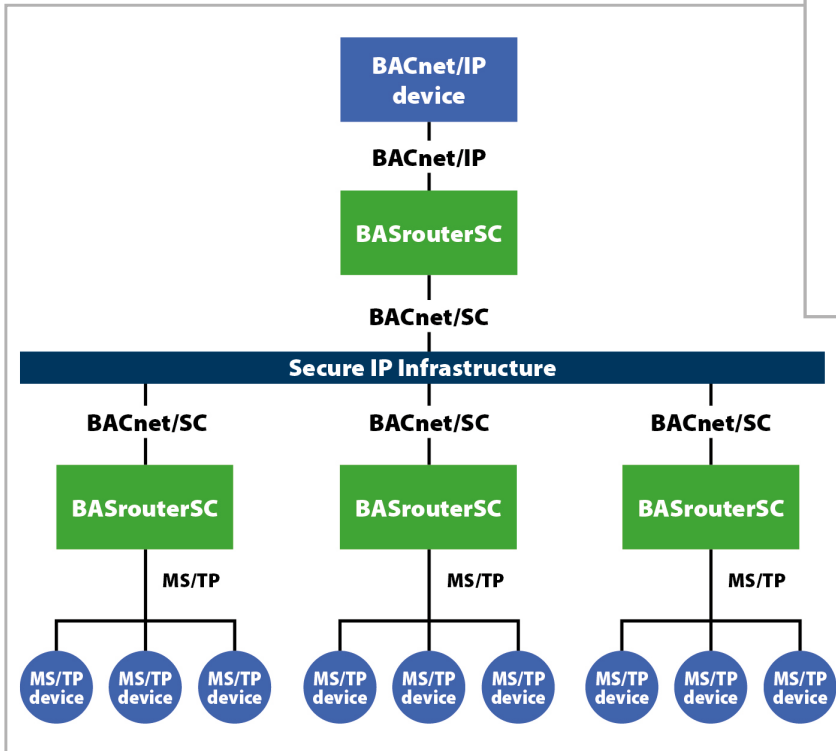
For its lighting control systems at the World Cup Stadiums, Delmatic received the High Commendation in the Entertainment & Architectural category at the 2021 DALI Lighting Control Awards. The systems were recognised for their array of technical features that maximise efficiency and sustainability. Delmatic's smart lighting system using SmartServer IoT contributes to the stadium's four-star Global Sustainability Assessment System (GSAS) rating. 



EnOcean
EMEA Sales Manager, Industrial Edge Computing
EnOcean Electronics Corporation
giovanni.disanto@enocean.com | www.enocean.com/edge

EnOcean
Self-powered IoT

BASrouterSC – Bringing BACnet/SC to BACnet/IP- and MS/TP-Networks



BASrouterSC.
© Contemporary Controls

Contemporary Controls' new BASrouterSC supports BACnet/SC as well as MS/TP, BACnet/Ethernet, and BACnet/IP devices. Designed with the same ease of configuration and operation as our popular BACnet routers – BASrouter and BASrouterLX – the BASrouterSC adds BACnet/SC to existing BACnet networks without the need for additional BACnet/SC equipment.

For example, in a BACnet/SC system devices need to act as BACnet/SC hubs. BACnet/SC devices also require certificates which must be signed by a certificate authority (CA). The BASrouterSC can act as the hub and CA for smaller BACnet/SC networks. It can also be part of a larger BACnet/SC network and utilize certificates from other CAs and communicate to other BACnet/SC hubs.

The BASrouterSC retains the BACnet routing functionality found on our other BACnet routers, such as support for BACnet/IP, MS/TP, and BACnet Ethernet (ISO 8802-3) networks. It has two MS/TP ports and can bring these networks to BACnet/SC systems.

As BACnet networks may be a mix of BACnet/IP and BACnet/SC, the BASrouterSC provides two Ethernet ports, one for the BACnet/IP network and one for the BACnet/SC network. Thus, the Ethernet infrastructure supports secure BACnet/SC communications while connecting to one or more isolated BACnet/IP devices. The BASrouterSC also supports connection to BACnet/SC devices.

It is easy to configure using a standard web browser with Help text to guide you through the process. The BASrouterSC has webpages to help diagnose system issues and can capture BACnet communications to be analyzed by applications, such as Wireshark.

CONTEMPORARY
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Contemporary Controls
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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, 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.

New Platinum



Nlyte Software

Nlyte Software, a Carrier company, is a leading software company focused on planning, managing and optimizing data centers. Nlyte Software enables enterprises to extend IT management software to include the physical layer with the logical and virtual layers of the data center, maximizing the financial benefits from the optimized utilization of assets, power and space. Nlyte's proven platform is used in the data centers of some of the largest and most valued companies in the world.

**1150 Roberts Blvd. NW
Kennesaw, GA 30144, US**
www.nlyte.com

New Gold



iSMA Controlli

iSMA CONTROLLI S.p.A. capital group operates in the field of building automation, formed by the merger of two companies: iSMA CONTROLLI Italy S.p.A. and iSMA CONTROLLI Poland S.A. Its purpose is to build an international brand which helps to make the buildings better places to live and work through the innovative solutions for wellbeing, intelligence, sustainability and efficiency.

**Giuseppe Garibaldi 1 Street
Assago, Milan 20057, IT**
www.ismacontrolli.com/en

New Gold



Badger Meter

Badger Meter

With more than a century of water technology innovation, Badger Meter is a global provider of industry-leading water solutions encompassing flow measurement, quality and other system parameters. These offerings provide its customers with the data and analytics essential to optimize their operations and contribute to the sustainable use and protection of the world's most precious resource.

**4545 West Brown Deer Road
Milwaukee, WI 53223, US**
www.badgermeter.com

New to the BACnet International Family

New Silver



75F

75F uses smart sensors and controls to make commercial buildings healthier, more comfortable, and more efficient than ever before, all at a disruptive price. They offer a vertically integrated line of hardware and software, leveraging IoT and machine learning to deliver predictive and proactive control of HVAC, lighting, and Indoor Air Quality Management (IAQM) out-of-the-box. With an average customer savings of 41.8 percent in energy consumption and carbon footprint, 75F has a system that will work for any size of commercial space.

**1650 W 82nd St.
Minneapolis, MN 55431, US**
www.75f.io

New Silver



PassiveLogic

PassiveLogic is disrupting the world of automation with the first fully autonomous platform for buildings. It reinvented automation to replace legacy control logic with real-time control decisions at the edge, reducing the world's carbon footprint, while paving the way for smart cities. PassiveLogic brings together the most talented engineers, thinkers and creatives – backed by the world's leading investors - to make the future a reality.

**6405 S 3000 E
Suite 300
Salt Lake City, UT 84121, US**
www.passivelogic.com

New Silver



Chicago Faucets

Chicago Faucets manufactures commercial plumbing faucets and fittings, with a complete range of products for schools, hospitals, laboratories, office buildings, restaurants, and other public buildings. Maintaining your Chicago Faucets with genuine Chicago Faucets replacement parts ensures that they will provide a lifetime of reliable operation. Whatever your requirements may be, Chicago Faucets offers products and parts designed to meet any application.

**2100 S Clearwater Drive
Des Plaines, IL 60018, US**
www.chicagofaucets.com

Member News



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

Silver to Gold

INNOTECH

Innotech

Based in Brisbane Australia, Innotech Control Systems Australia has been designing, manufacturing and servicing HVAC, Environmental Control, and Building Automation/Management Systems for over 38 years. They combine an award-winning inventory of high quality products with friendly and practical advice from their dedicated team of professionals, and are supported by a network of local and international distributors.

**12 McKechnie Drive, Eight Mile Plains QLD 4113
Brisbane, Queensland
Australia**

www.innotech.com

Silver to Gold

MOXA

Moxa

Moxa is a leading provider of industrial networking, computing, and automation solutions for enabling the Industrial Internet of Things. With over 30 years of industry experience, Moxa has connected more than 71 million devices worldwide and has a distribution and service network that reaches customers in more than 80 countries. Moxa offers a full spectrum of innovative, high-quality solutions that have been deployed in a wide variety of industries, including factory automation, smart rail, smart grid, intelligent transportation, oil and gas, marine, and mining.

**601 Valencia Avenue #100
Brea, CA 92823, US**

www.moxa.com

BACnet Testing Laboratories (BTL) Testing Updates



BTL Testing and BTL Test Package Information

A BTL Certification indicates that the BACnet Stack of the product has successfully passed rigorous industry standard testing and demonstrates that the device correctly implements all of the BACnet functionality it contains as governed by ASHRAE standard 135. The BTL Listing, the BTL Certificate of Conformance, and the right to use the BTL Mark are the three elements that indicate a product has passed the testing and achieved BTL Certification.

The BTL Working Group defines the BTL Test Plan and governs the testing. The BTL Test Package and BTL Testing Policies are published on the BTL website: btl.org/testing-documentation.

New BTL Test Package – Coming Soon

The BTL Working Group is preparing BTL Test Package 23.0 for publication in early 2023. This test package includes testing up through Protocol Revision 23 of the BACnet standard (ANSI/ASHRAE 135-2020 plus addenda: cd).

Test Package Transition Period Following Publication of Test Package 23.0

The BTL Working Group will establish a transition period when BTL Test Package 23.0 is published. During the transition period, vendors with products claiming Protocol_Revision 20 or less may test with either Test Package 20.0.1 or with BTL Test Package 23.0. Products claiming Protocol_Revision 21 or greater must test with BTL Test Package 23.0. The transition period will be 1 to 3 months. After that date, all products entering BTL Testing must test with Test Package 23.0.

BTL Testing Policies Update

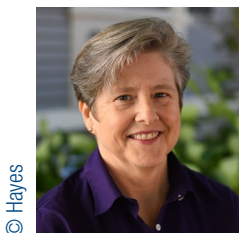
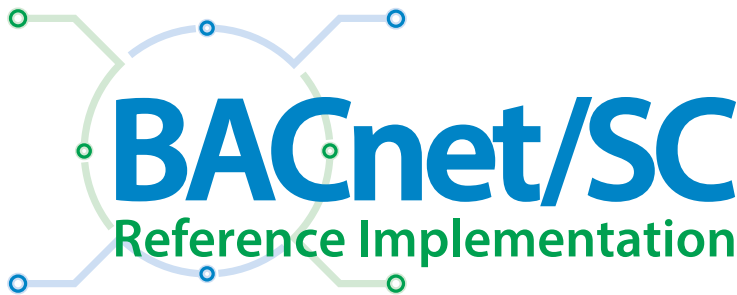
The BTL Working Group has updated the Testing Package Transition Policy in the BTL Testing Policies document. This update is to include the previously unspoken policy that products in BTL Testing during a BTL Test Package transition period may continue testing with the previous BTL Test Package. The policy also defines how long a previous BTL Test Package may be used. The new testing policy document can be found on the BTL website here: btl.org/testing-documentation.

BACnet Resource Available to the BACnet Community

This **BACnet Secure Connect (BACnet/SC) Reference Stack** was developed as part of BACnet International’s BACnet/SC Interoperability Acceleration Program. It is available to anyone in the BACnet Community. You can download it here: sourceforge.net/projects/bacnet-sc-reference-stack/.

BACnet International conducted three educational webinars, as part of the program. These BACnet/SC Webinars were recorded and uploaded to the BACnet International YouTube channel in September 2021 and can be found here: youtube.com/c/BACnetInternational.

For additional information on BACnet Secure Connect resources, visit the BACnet International website at bacnetinternational.org/secureconnect.



© Hayes

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ABOUT THE AUTHOR

Emily Hayes began work with BACnet International in 2014 as BTL-Coordinator, coordinating BTL Testing at the BTL Lab. In 2017, Emily took over leadership of the BTL Working Group as chair. Additionally, she led the transition from the BTL Listing Program to the BTL Certification Program. She became BTL Manager in January 2019.

Emily maintains professional membership in the Project Management Institute (PMI), North Carolina Chapter of PMI (NCPMI), and Institute of Electrical and Electronics Engineers IEEE.

Emily has a BEE from Auburn University and an MSEE from Duke University. She has maintained a Project Management Professional (PMP) Certification since 2010.

BTL CERTIFICATION

Your Best Path to BACnet Interoperability



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

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

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

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

There are over 1200 products in the BTL Listings of Tested Products Database with more being added every month. **Find tested products to fit your needs at www.bacnetlabs.org.**



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NEW BTL-LISTED PRODUCTS, March 2022 – September 2022

Manufacturer	Product Name	Model
ABB	BACnet/IP option module	FBIP-21
ABB	HVAC Drive	ECI, ECIN
Alerton	ECON-ZIP-BASE + ECON-ZIP-COM	ALERTON GLOBAL CONTROLLER – SMOKE
Automated Logic Corporation	OptiFlex BACnet Router	G5RE
Badger Meter Inc	M2000 Electromagnetic Flow Meter	<p>M2000-y1 -y2 -y3 -y4 y5 -B-y6 y7 y8</p> <p>where</p> <p>y1 is 002, 003, 004, 005, 007, 010, 012, 015, 020, 025, 030, 040, 050, 060, 080, 100, 120, 140, 160, 180, 200, 220, 240, 280, 300, 320, 360, 400, 420, 480, 540</p> <p>y2 is R1, R2, R4, P1, P2, P4, PA, H1, H2, H4</p> <p>y3 is A, S, P, T, R, C, D, G, L, H</p> <p>y4 is M, R, S, T, E, F, G, B</p> <p>y5 is WW, AA, AB, AC, AF, AK, AR, BW, BE, BK, BR, DW, DE, DK, DR, EW, EE, EK, ER, FW, FE, FK, FR, GW</p> <p>y6 is XX, TF, TH, TJ, TK, NG, NJ, CF, CI</p> <p>y7 is G, B, D, C, E, T, H, F, J, K, L, N, P, Q, M, R, A, S, Z</p> <p>y8 is F, 3, S, T, K</p>
Badger Meter Inc	ModMAG M2000	<p>M2000-y1 -y2 -y3 -y4 y5 -V-y6 y7 y8</p> <p>where y1 is Meter Type (pipe diameter) and can be the following options: 002, 003, 004, 005, 007, 010, 012, 015, 020, 025, 030, 040, 050, 060, 080, 100, 120, 140, 160, 180, 200, 220, 240, 280, 300, 320, 360, 400, 420, 480, 540</p> <p>y2 is Detector Material and can be the following options: R1, R2, R4, P1, P2, P4, PA, H1, H2, H4</p> <p>y3 is Electrodes and Grounding and can be the following options: A, S, P, T, R, C, D, G, L, H</p> <p>y4 is Amplifier Type and can be the following options: M, R, S, T, E, F, G, B</p> <p>y5 is Remote Cable Length and can be the following options: WW, AA, AB, AC, AF, AK, AR, BW, BE, BK, BR, DW, DE, DK, DR, EW, EE, EK, ER, FW, FE, FK, FR, GW V is for the Communication Option of: BACnet IP</p> <p>y6 is Wiring Method and can be the following options: XX, TF, TH, TJ, TK, NG, NJ, CF, CI</p> <p>y7 is Units of Measure and can be the following options: G, B, D, C, E, T, H, F, J, K, L, N, P, Q, M, R, A, S, Z</p> <p>y8 is Testing and Tagging and can be the following options: F, 3, S, T, K</p>
BDR Thermea Group B.V.	GTW-21	7756023
BELIMO	Duct and outdoor air sensors	<p>22DTM-16, 22DTM-56,</p> <p>2DTH-16M, 22DTH-56M,</p> <p>22UTH-160X, 22UTH-560X,</p> <p>22ADP-164, 22DTM-164L,</p> <p>22ADP-56Q, 22ADP-56QB,</p> <p>22ADP-564L, 22ADP-566L</p>
BELIMO	Energy Valve	<p>EVx' Rx2 (V)+(K)x3 (2)(x4)(-N)(X)</p> <p>where</p> <p>EV: Energy Valve</p> <p>R: Thread connection</p> <p>V: Grey housing</p> <p>K: Failsafe actuator</p> <p>2: NEMA4</p>

Manufacturer	Product Name	Model
BELIMO	Energy Valve	<p>-N: Highflow</p> <p>X: Configured VC product x¹ : 015,020,025,032,040,050 Valve DN size x² : 2,3 No. of valve ports x³ : MID, BAC MID yes/no x⁴ : HT, HH NEMA4 Heater type</p> <p>EVx5 (H)+x6 (X)-E (C) (N4)(x7) (GR) where EV: Energy Valve H: Highflow X: Configured VC product -E: Generation EV4.X C: CSA9000 N4: NEMA4 GR: Grey Housing</p> <p>x⁵:050,075,100,125,150,200 Valve size x⁶ : LR, NR, AR, AKR Actuator type x⁷ : HT, HH NEMA4 Heater type</p>
BELIMO	Field Module for Fire Damper	FSKN24, FSKN120/230
BELIMO	Thermal Energy Meter	22PE(M)(C)-X1Ux2 (N)(K)(-SG) where x ¹ is 1, or 5 x ² is C,D,E,F,G,H, or HH
BELIMO	VAV-Universal	VAV-Universal, VRU-D3-BAC, VRU-M1-BAC, VRU-M1R-BAC

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Manufacturer	Product Name	Model
Carlo Gavazzi Controls S.p.A	MONITORING GATEWAY AND CONTROLLER	UWP40RSEXXX, UWP40RSEXXXSE
Carrier	i-Vu XT Router	XT-RB
Davidsmeyer & Paul	BACring	DPC Centrale
Delta Controls	V4 Product Platform	O3-DIN-CPU, O3-DIN-SRC, eBCON-2, eBMGR-2, eBMGR-TCH-2
DEOS AG	OPEN.WRX AS	DS-OPEN.WRX AS
Distech Controls Inc.	ECY-APEX	ECY-APEX
Distech Controls Inc.	ECY-STAT Series	ECY-STAT-F, ECY-STAT-R, ECY-STAT-Z
Duksan Mecasys Co., Ltd.	3iWebBACnet	3iWebBACnet
EasyIO	EasyIO FW Controller	FW-VAV
Esme	DIP Family	DIP-1xx family DIP-120, DIP-130, DIP-140, DIP-150 DIP-2xx family DIP-220, DIP-230, DIP-240, DIP-250 DIP-3xx family DIP-320, DIP-330, DIP-340, DIP-350 DIP-4xx family DIP-420, DIP-430, DIP-440, DIP-450 DIP-5xx family DIP-520, DIP-530, DIP-540, DIP-550
Frimat GmbH	AS315bac	C
GD Midea Heating & Ventilating Equipment CO LTD	KONG DDC-E0 series	MKG3122/Y22 (E0), MKG3112-Y12 (E0-Lite) MKG3222-Y22 (E0-Plus)
Honeywell International	BEATs	BEATS-10, BEATS-100 BEATS-50, BEATS-200, BEATS-500, BEATS-5000, BEATS-8000
Honeywell International	Honeywell Commercial Thermostat TC500A	TC500A-N, TC500A-W
Innotech	SKIA Controller	SK8CD, SK8CE, SK8CM, SK8VD, SK8VE, SK8VM, SK8PM
Johnson Controls	Application and Data Server - Lite - A (ADS-LITE-A)	MS-ADSLA5U
Johnson Controls	Application and Data Server (ADS)	MS-ADS05U
Johnson Controls	Extended Application and Data Server (ADX)	MS-ADX10U, MS-ADX10SQL, MS-ADX25U, MS-ADX25SQL, MS-ADX50U, MS-ADX-50SQL2, MS-ADX50SQL, MS-ADX100U, MS-ADX100SQL2
Johnson Controls	Facility Explorer I/O Expansion Module	F4-XPM04060-0, F4-XPM09090-0, F4-XPM18000-0
Johnson Controls	NAE85 Network Automation Engine (NAE), LCS85 LonWorks® Control Server (LCS)	MS-NXE85SW-0, MS-NXE85SW-6, MS-LCS85SW-0, MS-LCS85SW-6
Johnson Controls	Network Automation Engine (NAE)	MS-NAE5510-3, MS-NAE5511-3, MS-NAE5520-3, MS-NAE5521-3
Johnson Controls	Open Application Server	OAS, M4-OASSTD-0, M4-OASMIN-0

Manufacturer	Product Name	Model
Johnson Controls	SNC Series of Supervisory Controllers	F4-SNC25151-0, F4-SNC25151-04, F4-SNC25151-04H, F4-SNC16121-0, F4-SNC16121-04, F4-SNC16121-04H, F4-SNC25152-0, F4-SNC25152-04, F4-SNC25152-04H, F4-SNC16122-0, F4-SNC16122-04, F4-SNC16122-04H
Johnson Controls	SNE Series of Network Engines, SNC Series of Network Control Engines	M4-SNE22000-0, M4-SNE22001-0, M4-SNE22002-0, M4-SNE11000-0, M4-SNE11001-0, M4-SNE11002-0, M4-SNE110L0-0, M4-SNE110L1-0, M4-SNE110L2-0, M4-SNE10500-0, M4-SNE10501-0, M4-SNE10502-0, M4-SNC25150-0, M4-SNC25151-0, M4-SNC25152-0, M4-SNC25150-04, M4-SNC25151-04, M4-SNC25152-04, M4-SNC25150-04H, M4-SNC25151-04H, M4-SNC25152-04H, M4-SNC16120-0, M4-SNC16121-0, M4-SNC16122-0
Kaiterra	Sensedge	SE-100
METZ CONNECT GmbH	BMT-Routers	BMT-RTR 11088001, BMT-F-RTR 1108800170
NETxAutomation Software GmbH	NETx BMS Platform	NETx BMS Platform
Packet Power LLC	Ethernet Gateway EG4	EG4
Reliable Controls	RC-FLEXair®	RCFA-12-F, RCFA-12-A-F, RCFA-33-A, RCFA-33-A-F, RCFA-34-A, RCFA-34-A-F, RCFA-35-F, RCFA-36-F
SAUTER	EY-modulo 5 Room Automation Controller	EY-RC504F001, EY-RC504F101, EY-RC504F202, EY-RC504F011, EY-RC504F021, EY-RC504F041, EY-RC504F0C1, EY-RC504F0D1, EY-RC505F031, EY-RC505F051, EY-RC505F061, EY-RC505F071, EY-RC505F081, EY-RC505F091, EY-RC505F0A1, EY-RC505F0B1, EY-RC505F0E1, EY-RC505F0F1, EY-RC505F0G1, EY-RC505F0H1, EY-RC505F0J1, EY-RC505F0K1

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Manufacturer	Product Name	Model
Schneider Electric	EcoStruxure Building Operation	AS-P, AS-B, ES, AS-P-NL
Schneider Electric	SpaceLogic KNX BMS IP Gateway	LSS100300
Schneider Electric	Three Phase Easy UPS Network Management Card	AP9640, AP9641, AP9643, AP9544, AP9547
Secure Meters (Sweden) AB	Multi Function Panel Meter	Elite500
Siemens	Desigo CC Workstation	6
Siemens	DESIGO PXC7, PXC5 and PXC4 Automation Station	PXC7.E400L, PXC7.E400S, PXC7.E400M, PXC5.E003, PXC4.M16, PXC4.M16S, PXC4.E16, PXC4.E16S
Toshiba Carrier Corporation	BN interface	BMS-IFBN1280U-E/-TR/-IN/-UL
Trane	Tracer® SC+	Tracer® SC+
Vector Controls GmbH	CS1-BAC-002	
WAGO Kontakttechnik GmbH & Co. KG	Controller PFC200	750-8210, 750-8210/0040-0000, 750-8211, 750-8211/0040-0000, 750-8212, 750-8212/0000-0100, 750-8212/0025-0000, 750-8212/0025-0001, 750-8212/0025-0002, 750-8213, 750-8216, 750-8217
WAREMA Renkhoff SE	BACnet 4M230.8I AP	2047 065



A Versatile Interoperability Solution

MSA FieldServer's BACnet Router offers a complete BACnet internetworking solution for BACnet/IP, BACnet Ethernet, and BACnet MS/TP networks, while also providing a secure connection to the cloud.

MSA GRID CLOUD SUPPORT

Register your BACnet Router to the MSA Grid FieldServer Cloud interface for remote access to local applications, configuration, and device management.

BTL CERTIFICATION

Most compliant and highest quality BACnet stack enables interoperability and reduces troubleshooting time.

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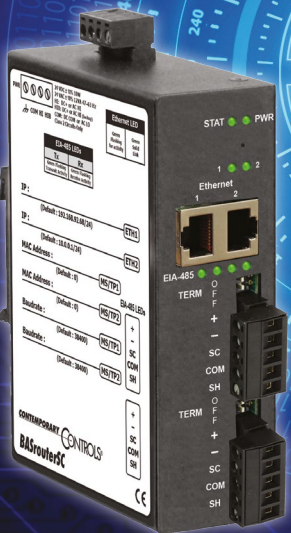
Calendar of BACnet International Events

2023	Event	Location
February 6 – 8, 2023	AHR Expo 2023	Atlanta, GA
May 23 – 25, 2023	LightFair	New York, NY

Enhance the Security of Your BACnet System

The BASrouterSC provides easy BACnet/SC integration for existing BACnet/IP and BACnet MS/TP networks without the need for additional BACnet/SC equipment.

- BACnet/IP to BACnet/SC routing
- BACnet/SC to MS/TP routing
- BACnet/IP to MS/TP routing
- Switchable termination/bias



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ISH

Frankfurt am Main
13. – 17.03.2023



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BACnet/SC



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