

JOURNAL OF BUILDING AUTOMATION



**Issue
26**

**Developments in Security and
Interoperability**

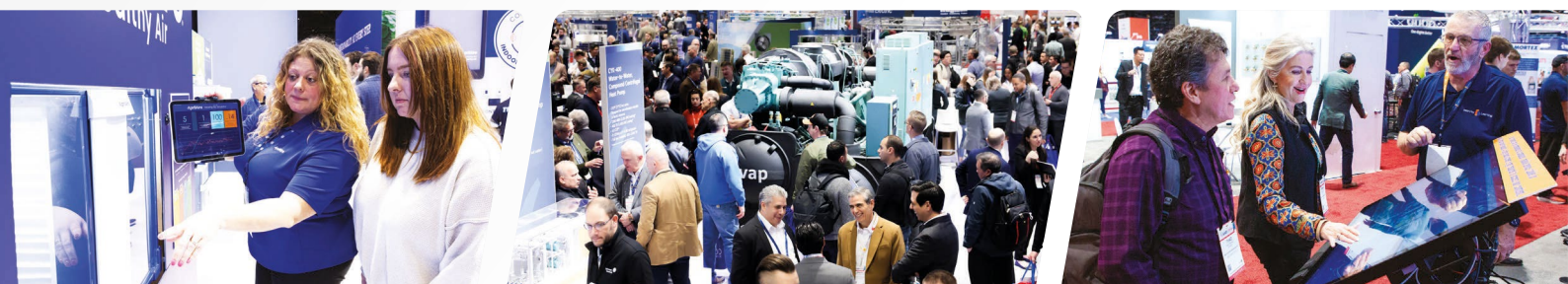
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a technology show.”

Level up at the event for HVACR.





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Letter from the President

Dear Reader,

Welcome to this edition of the Building Automation Journal, arriving as we prepare to celebrate a remarkable 30 years of BACnet in 2025. In this issue, we explore the transformative power of BACnet – a communications protocol that, against all odds, dramatically changed the industry and enabled the secure, sustainable, and integrated solutions we need now, and in the future.

We begin in this issue by tracing BACnet's roots, revisiting a time when interoperability was a mere aspiration. We reveal the challenges and triumphs faced by H. Michael Newman, the "Father of BACnet," whose vision laid the foundation for the intelligent buildings we see today.

Building on this foundation, we explore how BACnet continues to evolve to meet the demands of the 21st century. This issue examines the key benefits and applications that make BACnet an indispensable tool for building professionals:

- **Enhanced Energy Efficiency:** Discover how BACnet facilitates advanced control strategies and seamlessly integrates renewable energy sources, empowering you to optimize energy consumption and reduce your environmental footprint.
- **Robust Cybersecurity:** In an increasingly interconnected world, cybersecurity is paramount. We delve into BACnet/SC, a secure networking option that provides robust authentication and encryption mechanisms to safeguard your building automation systems.
- **Seamless Integration:** Explore how BACnet unites disparate building systems – HVAC, lighting, access control, and more – into a cohesive and responsive whole. This integration fosters efficiency, enhances occupant comfort, and streamlines building operations.
- **Data-Driven Insights:** Unlock the power of data with BACnet. Learn how this platform facilitates comprehensive data collection and analysis, enabling you to make informed decisions, optimize building performance, and identify areas for improvement.

Through real-world case studies, we showcase the tangible benefits of BACnet across multiple sectors, including healthcare, data centers, and commercial real estate. Witness how organizations are leveraging BACnet to address specific challenges, achieve impressive outcomes, and create truly intelligent buildings.

Explore each article to discover how BACnet can transform your building operations and contribute to a more sustainable future. 

Enjoy!



Andy McMillan

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

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BACnet: The Standard Integration Platform for Intelligent Buildings



BACnet's adaptability and cost-effectiveness have made it integral for modern, intelligent buildings.

Since its inception in 1987, BACnet has become the cornerstone for integrating intelligent building systems. Originally developed to create a cost-effective, interoperable data communication protocol, BACnet has grown into much more than that. Celebrating its 30th anniversary in 2025, BACnet is now recognized as the standard integration platform for intelligent buildings, providing a robust framework for seamless integration across various products and systems. This evolution reflects BACnet's adaptability and its critical role in modern building management, where it supports comprehensive automation, data analytics, and system interoperability essential for today's intelligent buildings.

Key Components of Intelligent Buildings with BACnet:

- **Automation and Optimization:** Efficiently automating and optimizing building operations.
- **Data Collection and Analysis:** Facilitating deep data collection for comprehensive analysis.
- **Responsiveness and Anticipation:** Enhancing responsiveness to external events and anticipating future needs.
- **Information Sharing and Security:** Ensuring secure information sharing and cloud connectivity.

Integration: The Essential Element

Integration is critical in intelligent buildings, involving effective communication and cooperation at multi-

ple levels. Within subsystems, integration ensures the effective operation of individual components, such as the various parts of an HVAC system working together to regulate temperature efficiently. Across subsystems, integration ensures that different systems, such as HVAC, lighting, and security, work together seamlessly. Additionally, integration with cloud systems opens new possibilities for data sharing and remote management. Cloud integration allows for centralized monitoring and control, advanced data analytics, and predictive maintenance. Building managers can access real-time data and insights from anywhere, enabling proactive decision-making and streamlined operations.

Effective integration, driven by purposeful automation system design, encompasses cooperative control, where different parts of the system not only communicate but also coordinate actions to enhance overall building performance. This level of integration means that systems participate in extensive strategies beyond any particular subsystem's scope. By sharing data and cooperatively controlling the system, intelligent buildings become more responsive, efficient, and adaptable to changing needs.

Cost-Effective and Practical Integration

Before BACnet, proprietary systems and protocols were costly and limited vendor choices. BACnet replaced these with a practical and affordable solution, facilitating integration in intelligent buildings. As a global standard, BACnet defines data properties, interchange, and control message exchange,

supporting systems like HVAC, lighting, elevators, life safety, access control, and power management.

BACnet: More Than a Protocol

BACnet is a comprehensive integration platform offering seamless integration across suppliers and systems. It provides centralized control and management, scalability, and futureproofing, supported by a global product certification program ensuring interoperability compliance.

Benefits for Building Managers and Operators

For building managers and operators, BACnet offers:

- A wide selection of products for sustainable systems
- Faster bid evaluation, system design, and commissioning
- Greater flexibility for future expansion
- Staff portability among systems and buildings
- Re-use of specifications across projects
- More service supplier options
- Integration-powered value creation opportunities
- Reverse compatibility

Environmental, Social, and Governance (ESG) and Decarbonization Impacts

BACnet benefits building owners and managers, but its impact goes far beyond that. It is an essen-



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BACnet provides numerous benefits for building managers and operators.



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BACnet is a standard integration platform that provides many positive ESG impacts.

tial element of achieving ESG objectives and decarbonization goals, including:

Environmental Impacts

The environmental benefits of intelligent buildings using the BACnet platform are substantial. By optimizing energy efficiency and reducing carbon emissions, BACnet enables buildings to operate more sustainably. The integration capabilities of BACnet facilitate the use of onsite renewable energy sources, making them more accessible, affordable, and sustainable. This, in turn, accelerates the adoption of green building technologies and promotes innovative solutions for energy management. Overall, BACnet's environmental impact contributes significantly to the global effort to combat climate change and reduce the carbon footprint of buildings.

Social Impacts

The BACnet platform significantly lowers social barriers to entry in the building automation industry. By establishing a standardized protocol, BACnet allows startups and innovation companies to develop new components for building systems without being constrained by proprietary systems. This broadens the market for new innovations and enhances practicality in building automation. Additionally, BACnet

improves occupant productivity, comfort, safety, and wellness by ensuring that building systems work harmoniously together. The platform also supports a more mobile workforce with lower training costs and contributes to a more resilient infrastructure grid, enhancing the overall quality of life for building occupants and operators.

Governance Impacts

In terms of governance, the BACnet platform delivers increased transparency in building performance. It allows occupants, building operators, and management to accurately measure and analyze energy waste and inefficiencies. This transparency provides a solid framework for compliance monitoring with regulatory applications and facilitates industry benchmarking. By offering detailed insights into building operations, BACnet enables better decision-making and accountability. This heightened level of governance helps organizations meet regulatory requirements, improve operational efficiency, and achieve their sustainability goals.

Decarbonization Impacts

As the building automation industry increasingly focuses on sustainability, the BACnet platform plays a crucial role in decarbonization. Buildings are significant contributors to global carbon emis-

sions, and BACnet helps mitigate this by enabling real-time monitoring and advanced diagnostics of energy use. This capability allows the industry to identify and address energy waste, leading to significant resource savings and reduced carbon emissions. The platform's ability to simplify the integration of onsite renewable energy sources supports a faster transition to renewable energy and greater grid stability. BACnet also promotes the adoption of new control strategies and enhances transparency in energy performance reporting, further driving the industry's efforts toward carbon neutrality.

Conclusion

BACnet, an ANSI/ASHRAE standard, has revolutionized the framework for intelligent buildings for almost thirty years through its practicality and affordability. BACnet provides numerous benefits to building owners and operators, value-chain suppliers, the community, and the environment. With its profound ESG impacts on the built environment, BACnet is more than a continuously evolving protocol. It is the standard integration platform for intelligent buildings, ultimately paving the way for the next chapter in building automation innovation in the greater global community.

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BACnet: The Standard's Journey from a 'Fool's Errand' to Global Ascendancy



Steven Bushby (left) and Michael Newman (right) discuss the formation of the BACnet standard.

© Steven Bushby

H. Michael Newman (1942-2020), known as the “Father of BACnet,” first realized the need for a standard protocol for the building automation industry while working at Cornell University. In the 1980s, manufacturers began developing direct digital controls (DDCs) systems with microprocessors. Manufacturers developed their own proprietary communications protocols for their products. The numerous proprietary controls did not allow for interoperability, forcing users to become dependent on one manufacturer. Newman realized the building automation industry needed one accepted standard. Thus, the journey to develop the building automation and control networking protocol, also known as BACnet, began.

The Road to Committee Creation

On the advice of his Cornell University supervisor, Newman attended his first ASHRAE Annual Meeting in January 1981 in Chicago. There, he sat in on Technical Committee 1.4 Control Theory and Application and realized that nobody else was discussing the lack of interoperability and communication between DDC systems. He joined the committee to rectify that.

To avoid corporate pushback and other hurdles, Newman submitted a Guideline Request to the ASHRAE Standards Committee in hopes of forming a guideline, rather than a standard. After review, the Standards Committee realized the need for a full standard. Thus, in New York City in 1987, the Standard Project Committee (SPC) 135P was formed with Newman serving as its first chair.

From day one, Newman faced opposition in developing the standard. “They just thought I was on a fool’s errand; that the opposition from the big controls companies would simply crush the effort. Maybe I should have listened to them, but I didn’t,” reflected Newman in his book *BACnet: The Global Standard for Building Automation and Controls Networks*. Before departing New York City, Warren Hurley, National Bureau of Standards (NBS) (NBS was renamed NIST in 1988), suggested that he meet with Steven Bushby, an NBS engineer, who was in support of the formation of the standard. Bushby agreed to serve as the committee’s first secretary and would be instrumental in the industry’s acceptance of BACnet by launching independent testing efforts.

The First Committee Meeting in Nashville

To say the first SPC 135P Committee meeting was tense and full of uncertainty would have been an understatement. Most attendees met face-to-face for the first time at the Opryland Hotel in Nashville, Tennessee, in June 1987. Many companies had sent sales and marketing representatives to the inaugural meeting rather than engineering and technical people. Newman and Bushby were concerned that they attended to champion their own company’s protocols. To prevent this, Newman had the committee members brainstorm the characteristics of an ideal protocol. It quickly became apparent that none of the existing protocols had the necessary requirements to become a standard.

During the meeting, it was clear there was a lot of work ahead. Prior to the meeting, Newman, Bushby, and Jim Coggins, an engineering consultant, prepared descriptions of three working groups: “Data Type and Attributes,” “Primitive Data Formats,” and “Application Services.” They had deemed these groups vital in the formation of a standard. Many meeting participants were unaware of the amount of work required for each group. The vote to approve the creation of these working groups required company representatives to go on record then and there of either their support or opposition. Newman used the following analogy to describe the situation: “It was like a guy with one foot on a dock and the other on a speed boat: the boat’s engine was revving, and the guy would have to decide whether to get on the boat, stay on the dock, or risk being split in half. Happily, everyone decided to get on board, and the rest, as they say, is history.” The motion to form the three working groups passed, and the work began.

Six months later, the group reconvened in Dallas, Texas. The press expected a nearly finished standard. They waited another eight and a half years for the published standard. At another meeting in Vancouver, Canada in June 1989, the name “BACnet” was coined and ASHRAE approved the name change to “BACnet – A Data Communication Protocol for Building Automation and Control Networks.”

The Standard Crosses the Finish Line

The first public review of the standard occurred in 1991. It received 507 comments within three months. The second public review received 228 comments; all but three were resolved. The third public review only received six comments. During the public review process in 1993, the need for independent product testing became apparent. Bushby was instrumental in creating the National Institute of Standards and Technology (NIST) BACnet Interoperability Testing Consortium. Controls manufacturers were given the opportunity to test BACnet prototype products, and engineers at NIST could develop testing software and methods. The program grew to include 22 companies. In June 1995, BACnet was finally approved as an ASHRAE Standard. In December 1995, ANSI approved BACnet as an American National Standard.



Manufacturers test their BACnet products at the National Institute of Standards and Technology (NIST) BACnet Interoperability Testing Consortium in 1995. © Steven Busby



The 1996 AHR Expo in Atlanta proved to the industry that the standard worked. Members of the testing consortium were invited to showcase and demonstrate their BACnet products. Visitors to the booth could see first-hand multiple workstations with different types of controllers, displaying the level of interoperability Newman set out to achieve for the industry.

This article provides a condensed history of BACnet's formation up to the 1996 AHR Expo. BACnet: The Global Standard for Building Automation and Controls Networks, by Mike Newman, provides a very insightful narrative. BACnet International's YouTube Channel contains "A BACnet Retrospective from the People Who Were There." In this video, Mike Newman and Steve Bushby discuss the origins of BACnet from their perspectives.

Today, nobody is questioning whether BACnet will succeed. It is here to stay. The standard continues to evolve to meet the industry's needs and is overseen by the ASHRAE SSPC 135 Committee. According to BSRIA Research, BACnet remains the most widely specified standard, with 77% of projects specifying BACnet at a global level. BACnet has come leaps and bounds from a 'fool's errand' to revolutionizing the building automation industry. 🌱



The BACnet booth at the 1996 AHR Expo in Atlanta. © Steven Busby



The first three committee chairs of the ASHRAE SSPC 135 Committee. Pictured left to right is Michael Newman, Steven Bushby, and Bill Swan. © Steven Busby

ABOUT THE AUTHOR

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The Cornerstone of Sustainable Buildings



The potential to reduce energy consumption in existing and new commercial buildings is enormous. According to the U.S. Environmental Protection Agency, an astounding 30% of the energy used in commercial buildings is wasted (United States Department of Labor, n.d.). This waste represents a significant opportunity to make a meaningful impact on sustainability. Energy efficiency in commercial buildings helps address environmental concerns and offers economic benefits. Building owners can reduce operational costs by optimizing energy use while contributing to global efforts to combat climate change.

In the current climate, where sustainability is increasingly becoming a priority for governments, corporations, and individuals alike, the focus on reducing energy consumption in buildings has never been more critical. Buildings are responsible for significant global energy use and carbon emissions, making them a key target for sustainability initiatives. By implementing energy-efficient measures, the commercial building sector can play a pivotal role in achieving these goals.

Building owners and operators can adopt several strategies to make commercial buildings more energy efficient. These strategies include switching to more energy-efficient lighting, reg-

ular HVAC equipment maintenance (or upgrading), enhancing insulation, and educating occupants on energy-saving practices. Each of these measures can contribute to meaningful improvements in a building's energy efficiency, thereby reducing overall energy consumption.

Switching to energy-efficient lighting, such as LED technology, is one of the most straightforward ways to reduce energy consumption in commercial buildings. LEDs consume significantly less power than traditional incandescent bulbs and have a longer lifespan, resulting in lower maintenance costs and reduced waste. Moreover, LED lighting systems can be integrated with intelligent controls to adjust brightness based on occupancy or natural light availability, further enhancing energy savings.

Heating, ventilation, and air conditioning (HVAC) systems are among the largest energy consumers in commercial buildings. Regularly maintaining these systems is essential to ensure they operate at peak efficiency. Additionally, upgrading to modern, energy-efficient HVAC equipment can save energy. For example, variable frequency drives (VFDs) can be installed to regulate motor speed based on demand, reducing energy consumption during periods of low occupancy.

Proper insulation is crucial for maintaining comfortable indoor temperatures and reducing the energy required for heating and cooling. Enhanced insulation reduces heat transfer between a building's interior and exterior, thereby minimizing the load on HVAC systems. This not only improves energy efficiency but also enhances occupant comfort.

Educating building occupants about energy-saving practices is another effective way to reduce energy consumption. Simple actions, such as turning off lights when not in use or adjusting thermostats to appropriate temperatures, can make a significant difference. By fostering a culture of energy awareness, building owners can encourage occupants to take responsibility for their energy use, further contributing to overall efficiency.

The Role of Smart Building Controls in Energy Efficiency

While the strategies above are effective, one of the most impactful approaches to enhancing energy efficiency in commercial buildings is the implementation of intelligent building controls. Smart building controls leverage advanced technologies, strategies, and algorithms to optimize energy use based on real-time data, occupancy

patterns, and usage trends. These systems can automatically adjust lighting, HVAC settings, and other building systems to ensure energy is used only when needed.

Smart thermostats are a prime example of how building automation can lead to energy savings. These devices learn a building's occupancy patterns and adjust the temperature accordingly, ensuring that energy is not wasted on heating or cooling unoccupied spaces. Similarly, smart equipment, such as VFDs and energy-efficient chillers, can dynamically adjust their operation based on real-time demand, reducing energy consumption.

Intelligent lighting systems use sensors and automation to control lighting based on occupancy and time of day. For instance, lights can be programmed to dim or turn off when a room is unoccupied or to adjust their brightness based on the amount of natural light available. By providing optimal lighting conditions, these systems save energy and improve the comfort and productivity of building occupants.

A comprehensive Building Automation System (BAS) integrates various smart building controls into a unified platform. This system allows for centralized monitoring and control of a building's energy use, enabling facility managers to make informed decisions based on real-time data. A

BAS can coordinate optimize HVAC, lighting, security, and other systems, leading to significant energy savings and improved operational efficiency.

BACnet is the Platform for Smart Building Technologies

As buildings become increasingly complex and reliant on intelligent technologies, the need for a common platform that allows these technologies to operate in concert becomes paramount. BACnet, acknowledged internationally as EN ISO 16484-5, is that platform. It ensures seamless interoperability between diverse building devices and systems, fostering a vendor-independent communication model within the context of smart buildings. This standard is instrumental in integrating various building systems, including HVAC, lighting, sensors, drives, elevators, and more, into a cohesive whole.

BACnet, which stands for Building Automation and Control Networks, was developed by ASHRAE (the American Society of Heating, Refrigerating, and Air-Conditioning Engineers) in 1987. Since then, it has evolved into the most widely accepted global standard for building automation systems. Its continuous evolution is driven by the need to accommodate new technologies and ensure it remains relevant in an ever-changing landscape.

BACnet's appeal lies in it being a fully open standard, which is not tied to any specific manufacturer. This openness allows for greater flexibility and choice when selecting building automation products and systems, as building owners are not locked into a single vendor. Moreover, BACnet is a tested standard with rigorous testing protocols and certification to ensure that products meet the specifications for interoperability and performance. To ensure the reliability and interoperability of BACnet products, several testing and certification processes have evolved:

Manufacturer Testing: Products are tested at the manufacturer level to ensure they meet the BACnet standard's requirements. This initial testing is crucial for identifying any issues before products are submitted for formal testing, certification, and release.

PlugFest Testing: BACnet PlugFest is an event where engineers from various manufacturers come together to test their products in a vendor-neutral environment ((n.d.), PlugFest Interoperability Workshop., 2024). This collaborative setting allows for identifying and resolving implementation errors, ensuring that products work seamlessly with those from other vendors. The presence of BACnet experts and the BTL (BACnet Testing Laboratories) Technical Advisor provides participants valuable support and educational opportunities.



Screen capture from the WebCTRL building automation system of the ASHRAE WHQ PV power screen.

BTL Certification: BACnet Testing Laboratories (BTL) certification ((n.d.), BTL Certification, 2024) is the final step in the testing process. Products that receive BTL certification have undergone rigorous, independent testing to guarantee quality and performance. BTL certification is recognized as a mark of excellence, providing greater buyer confidence and a competitive advantage in the market. Additionally, BTL-certified products help reduce integration costs and risks by ensuring interoperability in multi-vendor environments, minimizing project delays and cost overruns.

BACnet Future Role in Sustainable Building Practices

As the demand for energy-efficient and sustainable buildings continues to grow, BACnet's role in facilitating these practices will become even more critical. The BACnet standard's flexibility and adaptability make it well-suited to accommodate new technologies and trends in building automation. For instance, integrating renewable energy sources, such as solar panels and energy storage systems, into building automation systems will be made simpler with seamless communication between different components. BACnet's ability to support such integration will be essential in achieving the full potential of these technologies.

One recent challenge in sustainable building execution is integrating renewable energy systems into existing building infrastructure. BACnet can facilitate this integration by enabling communication between renewable energy sources and building automation systems. For example, BACnet can be used as the platform to help simplify the BAS' coordination of the use of solar energy by adjusting HVAC and lighting systems based on real-time data from solar panels. This maximizes the use of renewable energy and reduces the building's reliance on non-renewable energy sources.

As new technologies emerge, such as the Internet of Things (IoT) and artificial intelligence (A.I.), the BACnet standard will continue to evolve to support these innovations. IoT devices, for instance, can provide real-time data on energy use, occupancy, and environmental conditions, allowing for more precise control of building systems. A.I. can analyze this data to identify patterns and make recommendations for optimizing energy use. BACnet's flexibility ensures that it can accommodate these advancements, providing a future-proof platform for building automation.

Today, the ASHRAE World Headquarters in Atlanta, Georgia, features a state-of-the-art photovoltaic (P.V.) system to achieve net-zero energy performance. This P.V. system is integrated into the building automation system, and the information coordinated with other systems via BACnet, allowing efficient monitoring and management of energy production and consumption. The integration ensures that the building's energy systems operate optimally, contributing to ASHRAE's commitment to sustainability and energy efficiency (ASHRAE, 2021).

BACnet's role as the global standard sustainability language for commercial buildings aligns with broader global sustainability goals (Nations, 2015). Particularly, Goal 7 (Affordable and Clean Energy) and Goal 13 (Climate Action) emphasize the importance of improving energy efficiency and reducing carbon emissions. By enabling the efficient use of energy in commercial buildings, BACnet contributes to these goals and helps mitigate the impacts of climate change.

Today, BACnet is deployed in projects every corner of the globe and its impact on energy consumption, operational efficiency, and sustainability has become increasingly evident. In regions where energy costs are high or where there is a strong regulatory push towards reducing carbon emissions, the benefits of BACnet are particularly pronounced.

Case Studies of Global Implementation

In Europe, where stringent energy efficiency and carbon emissions regulations are in place, BACnet's value as a sustainability enabler has become critical to building automation systems. Countries such as Germany, France, and the U.K. have embraced BACnet for its ability to support the complex needs of modern buildings while ensuring compliance with E.U. and national directives on energy performance. BACnet's flexibility allows for seamless integration of sophisticated energy management systems, enabling buildings to meet or exceed regulatory requirements.

In rapidly developing regions like Asia-Pacific, where urbanization is driving the construction of new commercial buildings, BACnet is being adopted as the standard for ensuring these buildings are energy efficient from the outset. In countries like China and India, where the demand for energy-efficient infrastructure is growing, BACnet provides a scalable solution that can be implemented across various building types and sizes.

BACnet has been widely adopted in new construction and retrofitting projects in North America. In the United States and Canada, where there is a recent focus on sustainability and reducing operational costs, BACnet is instrumental in helping building owners achieve these goals. BACnet enables a wide range of products and systems to be used efficiently together making it ideal for retrofitting older buildings with modern, energy-efficient technologies.

BACnet in an Evolving Landscape

As we look to the future, the landscape of building automation and sustainability will continue to evolve, driven by technological advancements and changing societal needs. BACnet is well-positioned to adapt to these changes, ensuring it remains the global standard for building automation.

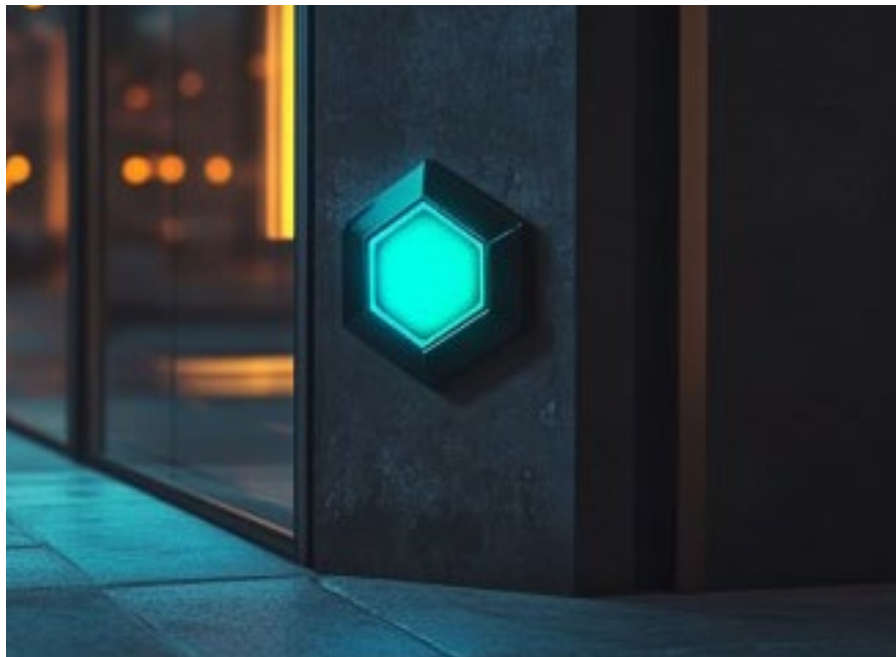
The concept of smart cities, where buildings, infrastructure, and services are interconnected and optimized for efficiency and sustainability, is gaining momentum worldwide. BACnet is already pivotal in developing smart buildings, and its importance will only grow as the Internet of Things (IoT) expands. BACnet's ability to support a wide range of devices and systems makes it an ideal standard for the interconnected environments of smart cities.

In a smart city, buildings equipped with BACnet-compliant systems will be able to communicate with each other and citywide networks, enabling more efficient energy use, better traffic management, and improved public services. For example, a BACnet-enabled buildings could adjust their energy consumption based on real-time data from the city's power grid, reducing strain during peak hours and contributing to overall energy grid stability.

Cybersecurity in Building Automation

As building automation systems become more connected, the need for robust cybersecurity measures becomes increasingly important. BACnet is evolving to address these concerns by incorporating cybersecurity features into its standard. These features include secure communication protocols, authentication mechanisms, and encryption methods that help protect building systems from cyber threats.

Today, the BACnet International Cybersecurity Acceleration Program is helping manufacturers streamline their cybersecurity implementation processes and align their product develop-



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ment with industry standards for interoperability and best practices. This program provides a fast track to developing in-house technical knowledge of BACnet/S.C. through education and experience sharing (International, 2022). It includes access to a reference implementation for in-house interoperability testing, significantly reducing manufacturers' adoption curve. By participating in this program, manufacturers can ensure their products meet the highest cybersecurity standards, enhancing the reliability and security of building automation systems.

By prioritizing cybersecurity, BACnet ensures that building automation systems remain safe and reliable in an increasingly digital world. This is particularly important as more critical infrastructures, such as hospitals and data centers, rely on building automation. Protecting these systems from cyberattacks is essential for maintaining the safety and security of occupants and assets.

BACnet is the Cornerstone of Sustainable Buildings

In conclusion, BACnet has established itself as the global standard sustainability enabler for commercial buildings by being a comprehensive, standard platform for building systems. Its open standard, rigorous testing, and continuous evolution ensure that it remains relevant in an ever-changing world, capable of adapting to new technologies and emerging trends.

By adopting BACnet, building owners and operators can provide a platform to enable significant energy savings, reduce operational costs,

and contribute to global sustainability efforts. As the demand for energy-efficient and sustainable buildings continues to grow, BACnet's role in facilitating these practices will become even more critical, ensuring that commercial buildings can meet future challenges while minimizing their environmental impact.

BACnet's impact is not limited to individual buildings; it can influence entire cities and regions by enabling more intelligent, sustainable urban environments. As we move towards a future where sustainability is not just a goal but a necessity, BACnet will be at the forefront, guiding the way towards a more sustainable and efficient built environment.

The global adoption of BACnet represents a collective step forward in pursuing a more sustainable world. By providing a common platform for building automation, BACnet enables buildings to operate more efficiently, reducing energy consumption and carbon emissions. As more buildings adopt BACnet, the cumulative impact on global sustainability will be profound, contributing to the preservation of our planet for future generations.

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Stronger Cyber Security is Needed for Buildings



Introduction

Industry experts are aware of the growing risk to office buildings, hospitals, and campuses. A broad range of applications are managed in these facilities using Building and Energy Management Systems (BEMS), which control industrial and utility operations. Attackers might cause operation outages, appliance damage, and panic evacuation of people working in the building. On the lower floors of the building, often found on several levels under the ground, you will discover Medium Voltage (MV) feeders and backup generators, an uninterrupted power supply (UPS), heat, ventilation, and air-conditioning (HVAC), water and sewage, smoke and fire, CCTV surveillance, door locks, etc. Finally, in critical buildings, you will find the Data Center (DC) on these floors, which holds the organization's critical data. Understanding these operations is mandatory when dealing with cyber defense.

Expected Cyber Risks

When listing the expected risks in large office buildings, you might find a complete range of vulnerabilities created by low-cost parts, faulty software, or subcontractors who do not understand buildings-related cyber security risks. CCTV cameras-related malfunction along walking sites, in buildings, and in critical areas of the building might cause a significant problem. If an adversary gets access to the CCTV control computer, he might turn off their operation and even manipulate the pictures or videos that are sent to the control room. Among critical risks, you might find:

- Intentional or mistaken activation of smoke-fire alarms might immediately trigger the building evacuation. Such an action might be caused by a disgruntled employee who may access critical sites in the building or by someone who can access the fire alarm computer.
- Adversaries might shut down the HVAC by damaging the chiller or accessing the system through the BEMS computer. Shutting down the HVAC system might also be combined with shutting down the ventilation, which is required as a mandatory alternative to the cooling system.
- A malfunction of the cooling system in the data center (DC) might cause an immediate shutdown of business activity and severely damage the organization. In

the worst case, the Computer Room Air Conditioning (CRAC) manipulation might damage the DC servers.

- Adversaries might also shut down the lighting in offices and corridors, creating a scary panic, even though the independent emergency lights still operate. They might combine this action with damaging the elevator control and locking the fire doors in corridors.

Cyber defense for buildings

In a typical building, hospital, or large campus, you will find many independently operating control systems. Some of these use simple controllers that are part of the supplied appliance, such as the air-conditioning chiller, complex medical equipment, streetlight control, fire and smoke detection, etc.; others may be part of an extended BEMS that supervise many control devices. An integrator usually deploys the BEMS in these facilities without experience with cyber security or purchasing low-cost parts. Therefore, in these projects, the system owner must consult with a dedicated cybersecurity expert who will be responsible for overviewing the following operations:

- The integrated controller in HVAC machinery must be protected against manipulation. Each such controller shall be linked to the central BEMS computer and monitored via a serial RS-232 or Ethernet-type connection using MODBUS, Ethernet IP, or BACnet protocols.





- In highly secured systems, it is strongly recommended that the use of unsecured wireless networks be prevented, as they might be intercepted by an attacker. However, if wireless communication is mandatory for a remotely connected controller or industrial IoT device, the link must include encrypted media using an internationally certified method such as AES 256.
- The various zones must be interfaced through security segregation measures to allow control through a centralized HMI. In some segregated zones, you may use just a firewall; in more critical zones, you may use a Unidirectional Diode, which transfers data to the BEMS control room.
- As most facility owners rely on an external expert for maintenance, it is essential to have a dedicated maintenance laptop owned by the building operator. Otherwise, they may face the risk that their trusted service provider might connect an infected laptop to the system.
- Deploying an Intrusion Detection System (IDS) is a suitable method for detecting anomaly situations. It can detect a broad range of anomalies in communication or processes, and it may also effectively detect an unexpected attack. Furthermore, that same IDS may create an accurate list of connected devices and allow a visual view of data exchange across the network.
- As an adversary may cause operation outage and damage, the physical security and surveillance of the entire facility are an absolute precondition to cyber security. It refers to people coming to the facility and vendors who send updating programs on a USB stick or CD media.
- Periodic cyber security assessments can be conducted through external service providers who understand the risk but have no prior knowledge of control systems. Therefore, deploying corrective actions and software updates are among the most effective actions. Furthermore, all updates received from vendors must be pretested prior to their deployment.
- Hardening all standard communications and Control devices that are connected to the BEMS architecture is an essential action. Therefore, it is critical that all

unused services and functional ports (hardware and software) are disabled and their status is inspected periodically.

- Secured Remote Access (SRA) shall be provided using a certified tool that allows authenticating the remotely connected service computer. This solution is mandatory to ensure the continuity of business operations when an unexpected problem arises that might harm the normal operation of appliances.
- When conducting a process for designing a new BEMS or upgrading an existing system, the asset owner must request that the design process, selection of integrators, and selection of products comply with an international cyber security standard applicable to OT systems such as the ISA-IEC 62443.

Summary

Building and facilities operators must be aware of attackers aiming to harm the operating continuity. These threats might become a reality through internally or externally generated attacks or by disgruntled employees with specific knowledge of the system structure. Risk assessment for any BEMS should be conducted regularly to be prepared for constantly growing threats.

Cyber security managers should be ready for the deployment of advanced cyber defense measures, which will ensure business operation continuity. The management in these organizations must allocate the needed budget and resources for incremental improvements, cyber defense modernization, and training so that employees are always two steps ahead of cyber attackers.



ABOUT THE AUTHOR

Daniel Ehrenreich, BSc. is a consultant and lecturer acting at Secure Communications and Control Experts, and periodically teaches in colleges and presents at industry conferences on integrating cyber defense with industrial control systems. Daniel has over 33 years of engineering and cyber security experience with ICS and OT systems for electricity, water, gas, and power plants as part of his Tadiran, Motorola, Siemens, and Waterfall Security activities. Re-selected as Chairperson for the 9th ICS CyberSec 2025 on 8-1-2025 in Israel.

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SCCE

Enhance your BAS with EnOcean Devices

EnOcean devices can add functionality to a Building Automation System (BAS), and in many cases, these devices can be added without the need to run additional wires. As most BASs do not support EnOcean, an EnOcean to BACnet gateway can bring the EnOcean devices to a standard protocol that is supported by most BASs, such as BACnet.

EnOcean devices can improve the performance and sustainability of a building automation system (BAS) and smart building. Most of these devices harness energy from surrounding resources, such as solar, temperature differentials, or mechanical motion. As a result, most EnOcean devices are self-powered and do not require batteries, external power sources, or communication wires. They can deliver reliable wireless data transfer in locations where it is difficult or costly to run wires. The devices are upgradable, expandable, and flexible to relocate at any time.

EnOcean devices can be easily installed in a facility to add features and functionality to the BAS or for retrofits. These devices include sensors that monitor temperature/humidity, light,

and occupancy, and wall switches that control lights or position window blinds. Most BACnet systems do not inherently support EnOcean, but by installing a BACnet to EnOcean gateway, such as Contemporary Controls' BASGE-EN868 or BASGE-EN902, EnOcean devices can be easily brought into the BAS. This article describes some of the EnOcean devices currently available that can enhance BAS and smart building applications within a BACnet network. These switches and sensors do not require external power or communication wires which make them easy to integrate into the BAS.

Rocker Switches

The EnOcean rocker switch is a pushbutton device normally used to turn on/off EnOcean controlled lights or to position blinds. However, this data can also be made available to the BAS for other purposes. There could be situations where you would like to allow the occupants to signal the BAS, such as to report occupancy or to enable/disable fans. Also, a rocker switch can be held down to act as a dimmer and control the brightness of a light. The BAS could utilize a similar behavior for analog values going to the BAS.

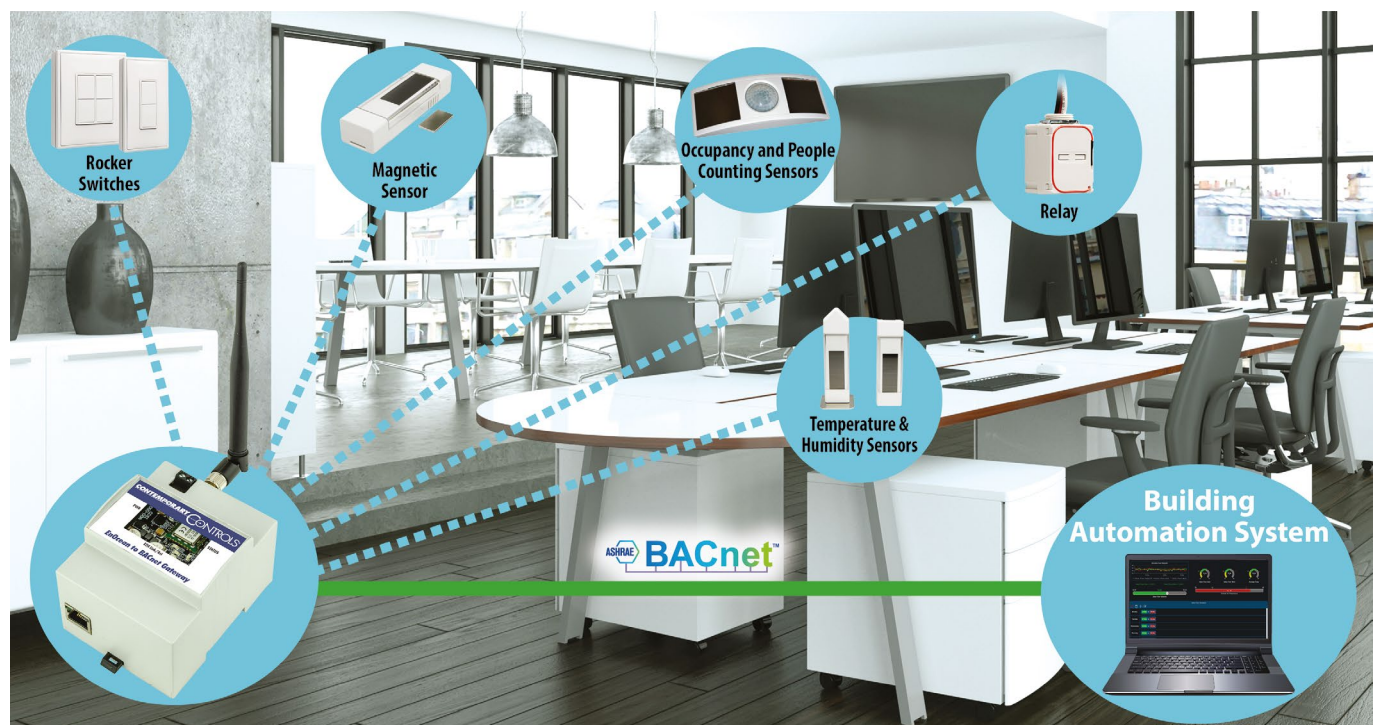
This wireless device is powered by the physical act of pressing its buttons. It can be installed in a convenient location in the facility, and the EnOcean gateway can receive this data and make it available to the BAS supervisor/head-end.

Magnetic Sensor

Magnetic sensors can be useful for monitoring windows. For example, zone heating or cooling can be disabled when the sensor detects an open window or windows. Adding this to a BAS can be much easier than adding wired versions.

Temperature and Humidity Sensors

EnOcean temperature/humidity sensors are solar powered and feature integrated energy storage. These sensors can be added to zones to provide additional temperature data to the BAS. For example, if occupants complain that the temperature is too hot or too cold, an EnOcean temperature sensor can be brought into the BAS supervisor to help monitor the temperature for threshold values. The humidity feature can also be used when zones are lacking humidity sensors. This can be useful when the



A BAS utilizes an EnOcean to BACnet gateway that allows EnOcean input and output devices to be linked to and controlled by devices in the system's BACnet network. © Contemporary Controls

Individual images of the rocker switches, magnetic sensor, occupancy and people counting sensors, relay, and temperature & humidity sensors are printed with permission from EnOcean GmbH. © 2024 EnOcean GmbH. All rights reserved.

economizers are bringing in air that is too humid due to problems with the economizer sensors or other mechanical issues.

Light Level Sensor

A light level sensor can detect the level of available natural light from outside windows that may affect the comfort levels of a zone.

Multisensor

A Multisensor measures temperature, humidity, window, light level, and motion to deliver a combination of data for the BAS.

Air Quality Sensor

Air quality sensors provide the status of a zone's air quality, measuring CO₂ levels, ambient temperature, and humidity. Solar-powered units use ambient room light with a battery back-up for periodic low-light conditions.

Lighting Control

An EnOcean relay can control LED lights. It also has a 0-10 V output to control the brightness of the light. The rocker switches can be used to turn the lights on and off and to adjust the brightness. The relay must be wired into the light, but there are no communication wires, and the rocker switches communicate directly with the EnOcean relay. An EnOcean gateway can be used to allow the BAS to control all the lights in the facility. For example, during the day building occupants can turn the lights on and off; while at night, the BAS can turn off any lights that were left on.

EnOcean Alliance

The EnOcean technology and standard is managed by the **EnOcean Alliance** – a coalition of companies that work to provide open and



For more information on EnOcean devices, including the switches and sensors shown in this article, visit the EnOcean Alliance: <https://www.enocean-alliance.org/products/>

Image of air quality sensor is printed with permission from Pressac Communications Ltd.

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Images of the rocker switches, relay, multisensor, and light level sensors are printed with permission from EnOcean GmbH. © 2024 EnOcean GmbH. All rights reserved.

interoperable wireless and service-free sensor solutions for the building automation industry. The technology is based on the EnOcean Radio Standard (ISO/ IEC 14543-3-1X) which is optimized for wireless solutions with ultra-low power consumption and energy harvesting and provide the following operating standards: Europe: 868 MHz

- Japan 928 MHz
- US/Canada: 902 MHz

The EnOcean Alliance defines EnOcean RF communications and message formats. It also defines EnOcean Equipment Profiles (EEPs) to ensure that sensors from one manufacturer can communicate with receiver gateways of another.

Conclusion

According to the Building Automation and Controls Market Outlook to 2030, "The global building automation and controls market was valued at \$86.4 billion (USD) in 2021. The market is expected to reach \$221 billion (USD) by 2030, at a Compound Annual Growth Rate (CAGR) of 11%." The report indicates that "improvements in HVAC systems are one of

the main things driving growth in the building automation and controls market."

EnOcean is a self-powered, wireless communication protocol that powers devices without the need for batteries or an external power source. EnOcean self-powered, wireless sensors and switches can improve the performance and sustainability of a BAS and smart building. An EnOcean to BACnet gateway can seamlessly integrate EnOcean devices into BACnet systems.

The EnOcean Alliance estimates the wireless technology in Smart Buildings translates to:

- Energy savings of 30%
- Cost savings of 80% for retrofitting and 15% for installation in new buildings
- Labor reduction of 2,333 hours/291 days for installation of lighting, shading, and temperature control (based on 20,000 m² of space)

Further, EnOcean battery-free, wireless technology can save an entire year of labor in battery replacement (for a building equipped with 10,000 sensors).

ABOUT THE AUTHOR

Bennet Levine is Director of Research & Development at Contemporary Controls which designs and manufactures BACnet building controls and networking equipment. Levine's group designs many of the building automation products from Contemporary Controls. He also sits on the advisory board of the HVAC/R program at the College of DuPage near Chicago, Illinois.

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CONTEMPORARY
CONTROLS

Strengthening Cybersecurity and Interoperability in Building Automation Systems with BACnet/SC

1. INTRODUCTION

Building Management Systems (BMS) have become an integral part of modern infrastructure. It is central to the 'smart building concept'. It depends on interconnected devices, sensors, and software to control HVAC, access control, fire safety, and lighting control. BMS reduces energy consumption, maintenance costs and improves operational efficiency. With the evolution of Artificial Intelligence (AI), the building owner wants more advanced ways to gather and access more building data. The BACnet/IP protocol is the fast communication protocol, compared to the BACnet/MSTP protocol. That meets the demand of more building owners and has been an ISO standard since 2003 and ANSI standard since 1995. With an increasing demand for detailed data related to operations and costs, BMS uses more integrated devices and software. The BMS is becoming advanced and is now shifting from IP based to cloud-based hosting systems and often needs to integrate with IT infrastructure. However, they also introduced vulnerabilities of interconnected systems that can be exploited by hackers. In addition, the U.S. Executive order 14028 focuses on 'Improving the Nation's Cybersecurity' (issued May 12, 2021) and requires agencies to enhance cybersecurity and software supply chain integrity'. To protect the building network from cyber-attack and eliminate the likelihood of unauthorized access and data leakage, the building owner should consider BACnet Secure Connect (BACnet/SC). Adopting state-of-the-art security protocols and deploying BACnet/SC, organizations can prevent risks and verify their BMS system's feasibility without data leakage. While cybersecurity in building management systems has become more and more effective, using the latest technologies, for example, BACnet/SC, is no longer a matter of choice but a vital prerequisite to protecting critical infrastructure.

2. THE LOOMING THREAT: CYBERSECURITY CHALLENGES IN BMS

There is an increase in demand for integrated BMS, so it is important to understand their inherent cybersecurity challenges. On the one hand, BACnet brings a host of advantages. On

the other hand, it also introduces another layer of complexity and risk. With the constant development of intelligent technologies, the more buildings depend on these systems, the likelihood of cyber-attacks on BMS systems increases. Here are a few of the most prominent cyber challenges faced by BMS today.

2.1 Insecure Communication:

BMS systems typically use proprietary and open-standard protocols to communicate with each other. There are many older protocols, like BACnet, Modbus etc. BACnet communication, as having merits, may face the most pressing challenge because this method lacks built-in encryption and other security features. Insufficient encryption and authentication protocols will cause data sent over the BACnet networks to be subject to eavesdropping and alteration. Hence, it is a possible loophole that hackers can use to expose or change vital data and systems, leading to significant threats to buildings and inhabitants.

2.2 Remote Access Vulnerabilities:

The fact that BMS systems can be accessed remotely from anywhere brings in new risks and vulnerabilities. Unauthorized people may provide a gateway to access the network with weak security at remote access points. Poor authentication or misconfiguration of remote access mechanisms can expose the BMS to such attacks as unauthorized control or data breaches, which render the building operations insecure and confidential.

2.3 Legacy Systems:

Legacy BMS systems typically found in most buildings include a significant cybersecurity issue because their design is outdated, and they do not have any built-in security features. This can be because these systems were commonly set up without sufficient cybersecurity in mind, thus making them an appealing target. Upgrading legacy systems with modern security protocols can be complicated and pricey; hence, they will remain exposed to different cyber threats

without active measures that will be used to tackle their vulnerabilities.

3. THE PRICE OF NEGLECT: POTENTIAL RISKS OF INADEQUATE CYBERSECURITY

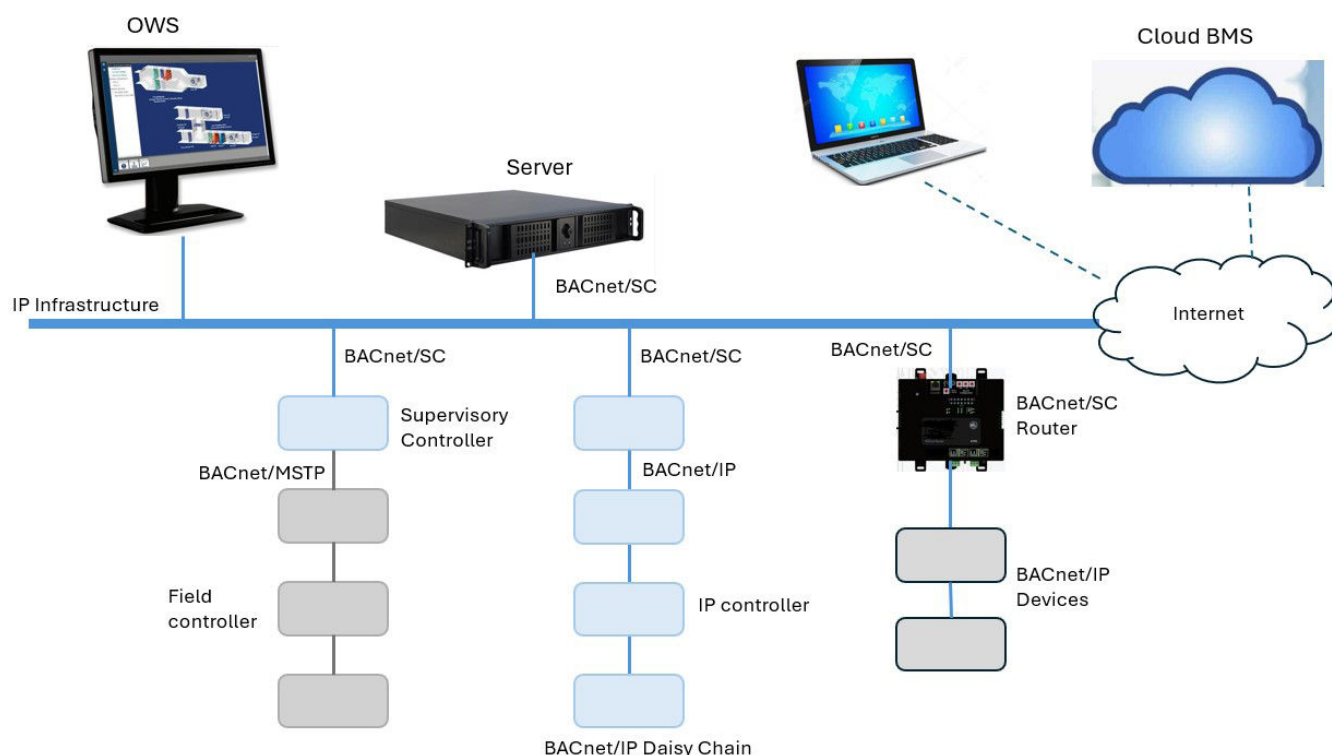
The consequences of inadequate cybersecurity result in data breaches, financial losses & reputation damage. The following scenario explains the importance of cybersecurity in building management systems. A research laboratory of a pharmaceutical manufacturing plant, their research is in progress on an active drug compound for treating a chronic human illness. The research and their production facility require a stable indoor condition. Suddenly, the lab room temperature rises and the lab in charge gets an email from an anonymous sender explaining that hackers have now taken control of all buildings. The hackers threatened to shut down the temperature, humidity and room-pressure regulation systems if his ransom demand is not fulfilled. Ongoing research not only spells the company's reputation in this (fictitious) case, but also company investment and millions in public research funds would go down the drain. Here are a few of the most cybersecurity risks faced by BMS explained.

3.1 Disrupted Operations:

A cyberattack can cast doubt on the everyday work of BMS. Hackers may take advantage of attack vectors to disturb guests' HVAC settings, compromising comfort and safety. Improper use of lighting or security systems may lead to the dismemberment of operations and endanger staff safety, thus creating a crisis-prone society.

3.2 Data Breaches:

A breach of an organization's BMS may expose confidential information that will be available to the public. The theft of information details, such as occupancy patterns or energy usage records, could endanger residents' privacy and empower cyber criminals to engage in more intensive malicious campaigns.



BACnet/SC network architecture diagram

3.3 Financial Losses:

Cybersecurity threats in BMS systems can lead to dire financial downsides. Because of the requirement for repair from the beginning, the time lost during the system restoration can result in huge losses. Moreover, legal responsibility, including victim lawsuits, also adds monetary costs to such attacks.

4. BACNET/SC: A KNIGHT IN SHINING ARMOR:

Security features have become crucial in Building Automation and Control Networks (BACnet). Determining which one is competent is unavoidable. BACnet/SC steps into the shining armor to cloak crucial security concerns, eventually enveloping these networks in a robust integrity layer through data transmission. BACnet secure connect (BACnet/SC) communication protocol first launched by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and BACnet International in Nov. 2019. BACnet/SC protects the various systems in the BMS against cyber threats like hacking, data breaches and cyber-attacks. BACnet/SC allows better integration and interoperability between different devices and systems in BMS. It can provide the below benefits for building owners, facility managers and IT professionals.

4.1 Encryption:

The essential component of BACnet/SC, cryptographically centric encryption protocols, provides adequate protection against cyber threats. With one-way encryption algorithms, BACnet/SC makes it virtually difficult for intruders to carry out their eavesdropping ambitions. By employing an approach of data transmission encryption, protected sensitive information is undoubtedly kept out of the pursuing eyes, resulting in reinforced security of the BACnet communications.

4.2 Authentication:

In the quest to keep the BACnet systems safe, the secure authentication mechanisms stand as the first line of defense. Devices and users seeking admission to the network are submitted to rigorous authentication procedures listed and administered by the network supervisor. This imperative step holds back the attempt of groups with no right to remote access to BACnet since unauthorized devices and persons will not enter the BACnet environment.

4.3 Digital Signing:

BACnet/SC works with digital signature technology and is a robust measure that does not allow intrusion into BACnet networks. Digital

signatures for messages transform BACnet/SC into a reliable information channel that prevents data manipulation and forgery during transmission from sender to recipient. It is meant to guarantee that the data circulating the BACnet core network remains pure and untampered, providing us with confidence in the reliability of the system.

The BACnet/SC network architecture diagram is shown for easy understanding. In the diagram, the main network is secure connected because all its devices are BACnet/SC. There are legacy BACnet/IP, and BACnet/MSTP devices are shown. It is a very expensive solution to change all controllers to BACnet/SC controllers. BACnet/SC router can be used to communicate with the legacy system and BACnet/SC network.

5. HOW BACNET/SC MINIMIZES THE RISK OF CYBERATTACKS:

As cybersecurity challenges rise more and more, the use of BACnet/SC, which ensures the prevention of networked building control and management systems (BMS) attacks, is the most effective solution used in cyber defense. This protocol outlines what the system does and the features that protect the system against security threats.

5.1 Encrypted Communication Channels:

BACnet/SC takes advantage of the encrypted communication channels, so only the BACnet devices can send sensitive and private information to one another. Encryption secures data transmission and ensures minimal or no possibility of unauthorized access and tampering with vital information. Hence, in addition to the assurance against data breaches, an organization also avoids the possibility of either data interception or exploitation by threat actors.

5.2 Multi-Factor Authentication:

Notably, the success of BACnet/SC security is due to the implementation of MFA, contrary to conventional password-based authentication methods that need only a single type of authentication. For instance, users must use MFA to give multiple security elements, such as passwords, tokens, or biometrics. This more layered approach visibly increases security by creating additional obstacles to unnecessary access. BACnet/SC provides the required multiple authentications, which in turn ensures that authenticated users are the only ones that can access the critical energy nuanced functionalities in this context, reducing the probability of intrusions or unauthorized manipulation.

5.3 Secure Remote Access:

BACnet/SC establishes secure remote access to BMS, meaning authorized personnel can operate BMS functions and other operations even remotely without sacrificing safety. By imple-

menting profound authentication approaches and secured communication systems, BACnet/SC allows access to remote management while supporting the diminishing risks related to system breaches. Such functionality optimizes the system's operational effectiveness by enabling the management of emergencies or system quirks, with integrity and confidentiality kept in mind, and the whole BMS data system is considered.

6. CONCLUSION: BUILDING A SECURE FUTURE

Online stability is a significant cornerstone in the network, which also powers building energetic systems (BMS), where HVAC controls play an important role. BACnet/SC emerges as a more extensive solution that is operational for BACnet networks and complete with an interoperable communication protocol. Implementing it arms the owners and operators of buildings with a robust safety shield and assures that these intelligent buildings perform seamlessly, efficiently, and safely. Using BACnet/SC, the stakeholders will be able to oversee the complexities of the digital world with a high level of confidence that the systems are safe from cyber threats, creating security gaps. Moreover, this preventative measure not only safeguards the present but lays the foundation for a future where the inviolability and robustness of our built environments are uppermost. In other words, BACnet/SC marks the beginning of a new era of security-oriented design and operation, providing a foundation for safer and more reliable built environments being shaped in the future. 🌐



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Pradip Thorat is a Building Automation & Energy Management professional with 14 years of experience in system design, estimation, site commissioning, and project management. I worked with Honeywell Automation, Johnson controls and various clients from the Building Automation in multiple countries, including USA, Canada, KSA, & Qatar. I have completed master's in Mechanical Design Engineering from Pune University and a Bachelors degree in Mechanical Engineering from Dr. B.A.T. University, Lonere.

BACnet International Hosts Collaborative PlugFest Workshop in Durham, New Hampshire

BACnet International recently hosted its 24th PlugFest Interoperability Workshop, September 24th – 26th, at the University of New Hampshire's Interoperability Laboratory. PlugFest allows participants to test the interoperability of their company's BACnet products with other vendors in a friendly and neutral environment. Attendees can discover and fix implementation errors during PlugFest before they are found in the field. Twenty-eight companies sent 69 total attendees, consisting of 33 teams and 31 first-time attendees.

"PlugFest attendees ranged from returning veterans with years of BACnet experience to new faces testing their first implementations. Companies brought a wide range of products from simple sensors to Cross-Domain Advanced Workstations (B-XAWS). There were many MS/TP and BACnet/IP products along with 11 BACnet/IPv6 and 15 BACnet Secure Connect products," stated BTL Technical Advisor Michael Osborne.

Attendees also found value in the two education sessions offered at the workshop. Coleman Brumley, Chair of the SSPC 135 Committee, and Michael Osborne presented "What's New in BACnet?" which detailed multiple addendum changes since the publication of 135-2020. Dave Robin, BSC Softworks, presented "BACnet Authorization and Authentication," which gave an overview of the features of Addendum cp. Robin also gave a first-hand demonstration of BACCARI (BACnet Certificate Authority Reference Implementation Tool). The tool builds and processes files using the CARI file format, as stated in 135-2020 Addendum cs. The zip file format conveys BACnet/SC CSRs to a certificate authority and returns the signed operating certificates.

"The two very well-attended education sessions provided attendees with an opportunity to hear about changes to BACnet that impact them today, as well as changes that will impact

them tomorrow," stated Osborne. The PlugFest education sessions are available to view in The BACnet Institute (TBI) Resource Library.

PlugFest was a great success and enjoyed by attendees. As the BACnet standard continues to evolve and shape the building automation industry, PlugFest workshops are vital to improving product interoperability and BACnet implementations. BACnet International looks forward to welcoming BACnet enthusiasts for its 25th PlugFest in 2025.



Coleman Brumley, Chair of the SSPC 135 Committee, presents updates on multiple addendum changes since the publication of 135-2020.



PlugFest attendees from 28 companies test the interoperability and implementations of their BACnet products.

ABOUT THE AUTHOR

Mary Catherine Heard joined BACnet International in 2022 bringing a decade of marketing experience that includes website management, email marketing, social media, copywriting, and graphic design. Prior to joining BACnet International, she worked in the auto industry and state government.

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Belimo Energy Valve™ Helps New York City Property Manager Cut Carbon Emissions by 40%



In response to New York City's Local Law 97, which mandates improved energy efficiency and reduced carbon emissions for large buildings starting in 2024, property owner Paramount Group undertook a significant retrofit of three key properties in New York City: 1301 6th Avenue, 1633 Broadway, and 31 West 52nd Street. This law aims for a 40% reduction in carbon emissions by 2030 and becomes progressively more stringent through 2050. The retrofit project utilized the Belimo Energy Valve™, a pioneering, IoT-enabled device designed to optimize energy use and maintain design Delta T in HVAC systems.

Ian Morrell, Director of Engineering at Paramount Group, highlighted the challenges they faced with the legacy systems. "We were either overheating or overcooling the offices and there

was no real way to control tenant comfort, which is not great being a landlord in New York City. The legacy pressure-dependent valves that were in place were two-way pneumatic valves. Really not much controllability on the valves. They were tying into an old MSTP Apogee BMS system," he explained. The retrofit involved creating a pressure-independent system by integrating the Belimo Energy Valve. "Today we're seeing the true design 18-degree delta at those coils, and in some cases above 20-degree Delta T," he added, demonstrating the effectiveness of the Energy Valve in optimizing coil performance and energy consumption.

Anthony Marinelli, Chief Engineer at 1301 6th Avenue, noted, "The EV's flow control has been a huge help with our fan coil units." The Energy Valve utilizes an integrated ultrasonic flow meter

and control logic that throttles its characterized control valve (CCV) to maintain the flow set point. "We were operating at low Delta T's using maximum GPMs. We are now at 18° Delta T's making supply air set points at 150 GPM's on 500 GPM FCUs. It is a significant amount of energy savings in our pumping system and our chillers. It has been a complete difference from what this building was used to all the years prior."

The Energy Valve provides advanced cloud monitoring and analytics with recommended Delta T and flow setpoints, which can be updated remotely. "The Belimo cloud is a great tool," Anthony said. "I personally use it daily. I take a look at all my fan coils, make sure the numbers look right, and if there's any variance in the operating numbers, it allows me to look deeper into the coil and its operation. That's



Energy Valve cloud reporting can be used to diagnose problems in the system remotely, saving time and maintenance costs.

© Paramount Group

Ian Morrell, Director of Engineering, Paramount Group.

© Paramount Group

how we stay efficient, and we provide maximum tenant comfort."

Anthony also recounted an instance where the Energy Valve's reporting capabilities identified a reversed flow issue in a fan coil unit. "We had one FCU where we found that about 50 years ago the supply and return lines were actually backwards. Once the Energy Valve was installed, we had constant reverse flow alarms, which actually led us to find this."

The measurable outcomes of the retrofit are impressive. From 2022 to 2023, energy consumption at 1301 6th Avenue was reduced by over 1.9 million kilowatt-hours, 1633 Broadway saw a reduction of 2 million kilowatt-hours, and 31 West 52nd Street reduced its consumption by 188,000 kilowatt-hours. Combined, these reductions translated to over \$1 million in utility savings in 2023. These achievements have aligned the buildings with the 2030 requirements of Local Law 97.

Paramount also leveraged the Energy Valve's data reporting to secure substantial rebates from local utility provider, Con Edison. Ian emphasized the importance of this functionality: "Belimo's cloud reporting made it much easier for us to prove the measurement and verification process to Con Edison because all the data was easily exportable, and you can see in real-time all

the kWh and the reduction in BTUs that you're actually achieving with the valves in place." This data was crucial in securing a \$2.1 million rebate incentive, highlighting the EV's ability to improve efficiency and prove that it's doing the job it's supposed to be doing.

In addition to improving efficiency, the EV's ability to maintain precise temperature control has reduced occupant complaints in the buildings. "We've had a huge improvement in occupant comfort since the Energy Valves were installed," Anthony said. "They allow us to have a more consistent temperature throughout the space where we're not seeing as many hot and cold complaints throughout the summer months."

"The Energy Valve was a way for us to defer capital," Ian explained. "It was an easy retrofit. The valves drop right into place. They're compatible with the new BMS system we put in place, which is BACnet/IP. It allowed us to create a far more efficient, pressure-independent system in an existing 1960s commercial office building."

Michael Jackson, Belimo District Sales Manager for New York City, noted, "I'm very excited about our partnership with the Paramount Group and I love to see these results where we're reducing their kilowatt hours and reducing their carbon footprint."

This retrofit has positioned Paramount Group's assets for compliance with Local Law 97, demonstrated substantial energy and cost savings, improved tenant comfort, and enhanced operational efficiency. The project highlights the transformative potential of integrating advanced HVAC technology into legacy buildings, setting a benchmark for future sustainability efforts in New York's commercial real estate sector. The success of this retrofit underscores Paramount Group's commitment to sustainability and the effectiveness of the Belimo Energy Valve™ in achieving significant energy efficiency improvements.



BELIMO

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technicalsupport@us.belimo.com

www.belimo.com

Enhancing Healthcare Environments with BACnet Connected Devices



The United States Public Health Service (USPHS) Claremore Indian Hospital (CIH), located in Oklahoma, is a 110,000 sq. ft. federally operated facility accredited by The Joint Commission. It provides emergency, acute, outpatient, and dental care to the Native-American population in the Indian Health Services Oklahoma City Area, which includes Kansas, Oklahoma, and Texas. Established in 1977, this 50-bed hospital serves at least 36,000 patients and annually conducts over 300,000 total visits. Claremore Indian Hospital has an overall Medicare Spending Per Beneficiary score of 0.73, which indicates that the cost of care at this specific hospital is lower than the national average.

In addition to providing world-class medical care, the hospital prioritizes energy efficiency in its facilities. It continuously looks for ways to ensure building performance, maintain Indoor Air Quality (IAQ), and achieve proper ventilation to reduce the spread of infectious diseases. The hospital's wide range of services requires a healthy and pleasant environment for patients' recovery and the efficient performance of the medical staff. Poor IAQ in healthcare facilities has been recognized as a primary contributor to healthcare-associated infections (HAIs). Among the significant effects of HAIs on public health are prolonged hospital stays, long-term disabili-

ties, high treatment costs, and excess mortality rates. The proven strategies for reducing HAI are environmental infection control and engineering controls.

Integrating digital communication into devices and equipment provides Claremore Hospital building management system (BMS) operators with easily accessible device data to control, monitor, and maintain. Facility managers also gain valuable insights regarding equipment operation and performance. Access to device data enables timely fault detection and aids in system diagnostics. As no additional hardware is required, this eliminates errors and reduces the commissioning time. Expensive home-run wiring is avoided.

The EBTRON airflow stations with BACnet MSTP communication protocol the need for data integration and operational transparency at Claremore Hospital. The BAS extracts data to help with decision-making, trend analysis, interoperability, and issue resolution. It provides Charles Lewis, Electromechanical Project Manager at Claremore, more actionable data, and the ability to monitor and trend historical events, thus optimizing outside air, supply air, return air, and exhaust systems. For quick on-site access, the EBTRON EB-Link App allows TAB commis-

sioners to access the Gold series temperature, humidity, enthalpy, and dew point and traverse data in real-time with the ability to store it on their phone or email as a text file. It provides quick validation anytime without going through the BAS. The hospital is 90% full nearly 100% of the time, which would make conducting traditional commissioning and maintenance a difficult task. Having technicians periodically check components and service systems from room to room is impractical. System integrators take full advantage of the flexible control provided by field devices with built-in BACnet digital communication protocols.

Claremore Indian Hospital's ability to measure and control OA precisely is critical. The hospital no longer depends on the damper position to guess the OA volume, and knowing the correct amount helps the team determine the air handling unit's (AHU) performance, especially during dehumidification. Also, during major infectious events, complete fresh air flushes of buildings become extremely necessary to lower potential viral load. However, they can drastically increase HVAC energy usage depending on OA conditions. With precise, real-time measurement of OA flow, excess beyond what is required for the flush can be eliminated, reducing energy usage. A proper air change rate maintains the IAQ and



reduces airborne cross-infection risk. The difference between the supply air rate to the space and the return air rate from the space determines the room pressurization. ASHRAE 170 Standard for Ventilation of Health Care Facilities prescribes various total and outside air change rates, pressurization relationships, temperature and humidity requirements for patient care, sterile storage, and surgical areas. Accurate measurement of total and outside airflow is critical to maintaining compliance with this standard.

Airflow measurement stations with BACnet communications enable real-time monitoring and storage of crucial parameters such as temperature, humidity, enthalpy, dew point, and traverse data. The data collection empowers Claremore Indian Hospital to make informed decisions, maximize system performance, ensure IAQ compliance, and proactively address potential issues. This approach provides a proper air change rate to maintain the IAQ and reduce the risk of airborne cross-infection. Claremore Indian Hospital's commitment to leveraging technology continues to create a healthier and more efficient environment. 🌱

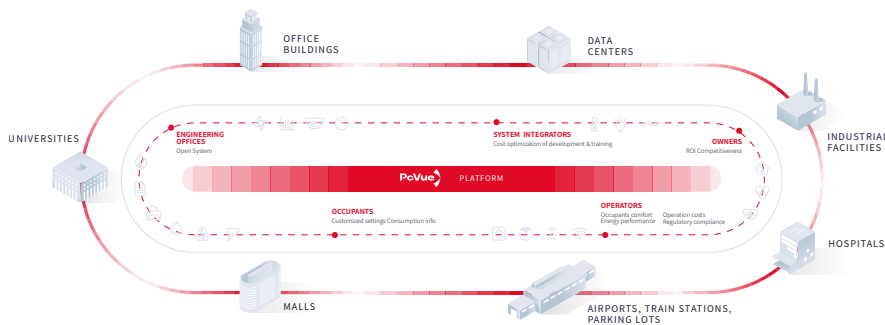
ABOUT THE AUTHOR

Darryl DeAngelis is the Director of Business Development for EBTRON, with over 30 years of experience in the HVAC industry. He holds a B.S. in Marine Engineering from the Massachusetts Maritime Academy and is a LEED AP. A 20-year ASHRAE member is active in ASHRAE technical and standard committees, including chair of TC 7.7 Testing and Balancing and a voting member 62.1 Ventilation subcommittee. Darryl is a participating voting member in ASTM and a member of ISIAQ and I2SL. He represents EBTRON as a member of the board of directors for ASHB, and as a partner of IFMA, AABC, NASECO. Darryl holds four HVAC-related patents.



Darryl DeAngelis
Director of Business Development | EBTRON
DarrylD@ebtron.com | www.ebtron.com

An Open, Scalable and Reliable BMS



Schematic of the PcVue Platform. ©PCVue

With the ability to analyze archived data and real-time events, coupled with advanced contextual remote solutions, PcVue improves overall building efficiency and increase maintenance team responsiveness, ensuring optimal user comfort. More than that, it keeps ensuring interoperability and open systems through certified implementations of open standards dedicated to BMS.

Besides its support of LON, KNX and OPC®, PcVue is BTL listed for its BACnet Operator Workstation profile (B-OWS). It is also recognized as a compliant BACnet Advanced Workstation (B-AWS) by the BACnet Testing Laboratory. To be more precise, B-AWS allows the operator access to multi-vendor systems through a common workstation. This B-AWS can be used to commission and operate

a BACnet system, including modification of device configuration. All interoperability areas are covered, including Data Sharing, Alarm & Event notification, Trending, Event logging and Scheduling.

Those characteristics convinced hundreds of key sites that are now monitored and controlled by PcVue, including several skyscrapers in La Défense Paris business district, the Airbus A380 assembling site in Toulouse, several Charles de Gaulles Airport terminals and the 4th highest building in the world, TAIPEI 101, in Taiwan. As many projects that benefit from our company's 40 years of experience in the BMS Industry. Let's engineer.



ARC Informatique
arcnews@arcinfo.com
www.pcvue.com

EnOcean to BACnet Gateway

Integrate your EnOcean sensors and actuators easily to a BACnet/IP building automation network

- Webpage configuration – no special tools or software required
- Webpage-based remote commissioning of EnOcean devices
- Each EnOcean device appears as a virtual BACnet device



EnOcean to BACnet Gateway

CONTEMPORARY CONTROLS®

Providing Solutions to Your Automation Needs

Learn more at www.ccontrols.com/enoceangw

+1 630-963-7070 • info@ccontrols.com

Secure Multi-Site Building Management with enteliCLOUD



Delivers Secure Multi-Site Building Management: enteliCLOUD.

Managing multiple buildings across diverse locations poses unique challenges. Delta Controls' enteliCLOUD offers a transformative solution, ensuring efficiency, centralized control and cost savings. Here we explore enteliCLOUD's exciting features, emphasizing its impact on multi-site management with BACnet Secure Connect (BACnet/SC).

enteliCLOUD provides cloud-based control of buildings, enabling facility managers to oversee sites from a single platform, simplifying management and reducing complexity. Designed to scale, enteliCLOUD can manage a few buildings or a vast network without additional complexity. The platform maximizes operational efficiency through remote access, allowing facility managers to monitor and control systems from anywhere, reducing on-site visits. It aggregates data from multiple locations, offering insights and analytics to optimize performance and reduce costs.

enteliCLOUD supports advanced energy management strategies, helping organizations reduce energy consumption and achieve significant cost savings. It incorporates BACnet/SC, enhancing security with secure authentication and encryption of data, protecting sensitive building data. Finally the user-friendly interface includes customizable dashboards for real-time monitoring and management, simplifying visualization and understanding of system performance.



Delta Controls Inc.
sales@deltaccontrols.com
www.deltaccontrols.com



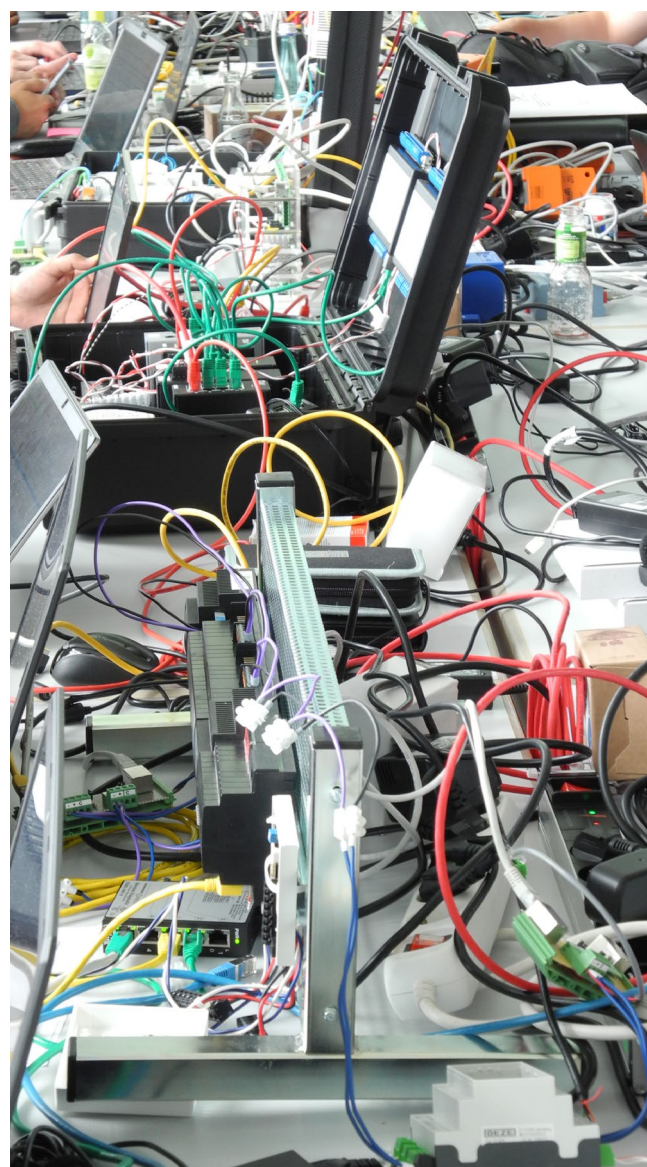
BIG-EU Plugfest 2025

Lisbon, Portugal

May 14th–16th



www.bacnetplugfest.org



VAV-Based Zone Control with App

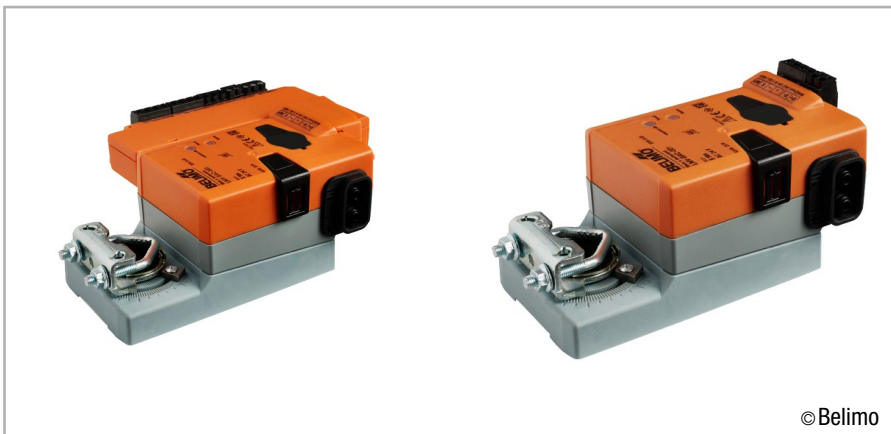
Belimo ZoneEase VAV is a VAV-based zone control solution with 19 pre-loaded and configurable applications to control CO₂, temperature and volumetric flow. The solution encompasses a cloud-based engineering and commissioning workflow with offline capabilities to support a seamless and error-free experience.

The link from the zone control solution to its project data in the cloud is done via commissioner's smartphone with integrated NFC communication. Wireless smartphone access to ZoneEase VAV system is possible via the VAV actuator or its connected room operating unit.

The cloud supported workflow provides easy and configurable access to share and change zone control data to different project stakeholders as for instance the VAV OEMs, planning offi-

cers, system integrators, back-office workers, local site commissioners and in the end also to the facility managers. The unavoidable project and parameter changes in the phase of planning and commissioning are thus cleverly solved.

Seamless BACS integration is achieved over BACnet MS/TP or Modbus RTU. Of course, local access via smartphone is possible as well. Supplementary components can be added to enhance precise measurement or to increase functional use. The dedicated room operating units are provided in divers variety. The room operating units without physical display are operated with end user's smartphones. 



VAV zone control actuators 5/10 Nm: LMV/NMV-BAC-001 and LMV/NMV-BAC-002.



Room Operating Units and Belimo Display App: P22RT...-1T00D1 and P22RT...-1T-1.

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BELIMO Automation AG
 info@belimo.ch
www.belimo.ch



The next phase of BACnet/SC has arrived.

Cybersecurity Acceleration Program



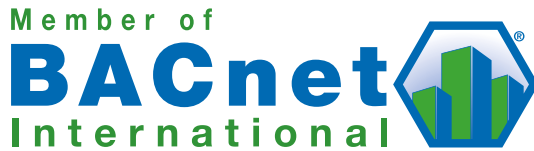
The program provides a complete Certificate Authority reference implementation and a sister tool (BACCARI) that can generate and validate Certificate Signing Request files and package them into an interoperable file format for the Certificate Authority. Additionally, all program participants will have access to cybersecurity implementation webinars and an interactive, peer-to-peer forum led by experts in BACnet and cybersecurity.

The program includes reference implementation and source code components including:

- Certificate Authority (CA) server
- Certificate Signing Request (CSR) generation and validation tool
- Machine readable, interoperable certificate file format



New to the BACnet International Community



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 Corporate 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.

New Gold Member

The logo for Advéco, featuring the word "Advéco" in a blue sans-serif font with a green accent over the 'e'.

Advéco

Room 901, Tower B, Swan Tower,
Wuxi Software Park, No.111
Linghu Avenue,
Xinwu District, Wuxi, China

**Learn more about membership
opportunities with BACnet International.**



New Silver Members:



Ketima

Headquartered in Sweden, Kentima's automation and security product lines include HMI/SCADA software, industrial computers, operator panels/boxes, video management software, NVR/NVC/NVP, NVRN rack solutions, and PSIM software. The company's business concept is to develop high-quality products that communicate with different systems to visualize, store, monitor, and manage information and images. This sales occur primarily through distributors and resellers.

Kastanjevägen 4
245 44 Staffanstorps
Sweden
kentima.com



Rockwell Automation

Headquartered in Milwaukee, Wisconsin, Rockwell Automation is an industry leader in industrial automation and digital transformation technologies. Founded in 1903 by Dr. Stanton Allen and Lynde Bradley, Rockwell Automation has over 25,000 employees and serves customers in over 100 countries. The company's brands include Allen-Bradley, LifeCycle IQ, and Factory Talk. Their services include asset optimization and workforce services, cybersecurity and network infrastructure, digital thread, and production automation.

1201 S. Second Street
Milwaukee, WI 53204
USA
rockwellautomation.com



Mircom Engineering

Founded in 1991 by Tony Falbo, Mircom Engineering has continuously remained focused on research, new product development, life safety, building security, and an exceedingly high level of customer and market satisfaction. Headquartered in Vaughan, Ontario, Canada, Mircom's product lines include Fire Detection & Alarm, Communications & Security, Mass Notification, Building Automation, and Smart Technologies. Their brands include Our brands include Mircom® (principal brand), Secutron™, and U.E.C.™ United Export Corporation.

25 Interchange way
Vaughan, Ontario, Canada
L4K 5W3
mircom.com



Signify

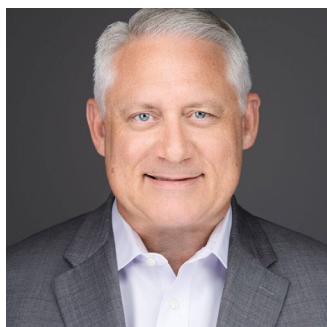
Headquartered in the Netherlands, Signify has been an industry leader in lighting for professionals, consumers, and lighting for the Internet of Things for over 125 years. With over 37,000 employees and a presence in over 70 countries, the company's product lines include Advance, Color Kinetics, Interact, Philips Dynalite, Philips, Philips Hue, and WiZ. Signify is committed to innovation and sustainable leadership with breakthrough technologies like ultra-energy efficient lighting and EyeComfort lighting, design for circular economy, use of sustainable materials that can be recycled and bio-circular, and phasing out of most plastic packaging materials for consumer products.

High Tech Campus 48
5656 AE Eindhoven
The Netherlands
signify.com

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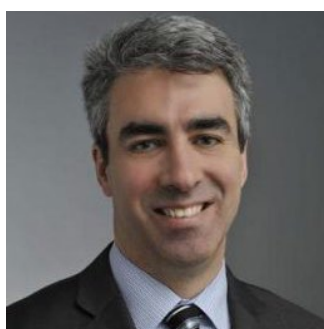
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A VERSATILE INTEROPERABILITY SOLUTION



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.

Easy Configuration with Discovery

One page set and forget configuration along with unique network discover capability minimizes installation time.

BACnet Explorer

Minimize commissioning time by automatically discovering all BACnet devices connected to a BACnet network.

Dual RS-485 Port Option

Results in lowest cost per connected device or highest performance (response time) per connected device.



To learn more, visit msasafety.com/fieldserver



Expand your BACnet Knowledge



The BACnet Institute (TBI) continues to grow. There are now over 6,000 registered users, and articles and presentations are continually being added to the Resources section, providing many materials to help you and your colleagues stay connected and engaged. A better-informed community brings positive change, so take a moment to expand your knowledge of BACnet as well as encourage others!

Multi-Level and Multi-Lingual Materials in Resources

With over 200 articles and presentations focused primarily on BACnet, the TBI library offers a variety of topics, in different languages and expert levels. Among the top articles accessed are "An Introduction to BACnet," "Deploying and Maintaining BACnet Systems in Today's Networks," "LED Lighting – An Automation Armageddon," "Cybersecurity for BACnet BAS Webinar," and many more. Also, check out the bi-lingual "Device Profile Families Facilitate Planning" article by Bernhard Isler. Check back often, since articles will continue to be added.

Interactive Courses Fit into Your Schedule, and Offer FREE CEUs & PDHs!

There are three interactive courses available on TBI, and, as an IACET Accredited Provider, BACnet International offers FREE Continuing Education Units (CEUs) upon completion of each course. Professional Development Hours (PDHs) are also available upon completion. The three courses are:

- BACnet Basics – a comprehensive course that covers all the basics of BACnet. Don't know anything about BACnet or need a refresher? This is an excellent course to take.
- The Facility Manager's Guide to Building Automation Systems. You don't need to be a facility manager to take this course, in fact, this course is incredibly beneficial to anyone who works in the building automation industry.
- BACnet Device Profiles – introduces learners to the various BACnet device

profiles and explains the role of each in the building automation. It also shows the learner how various profiles can be combined in a single device and explains the rules behind the combinations.

A Community Forum to Get Your BACnet Questions Answered

The BACnet Community Forum is an interactive environment that offers knowledge-sharing and provides an opportunity for users to submit BACnet-related questions to be answered by a panel of experts in the BACnet industry.

Participants in the forum can submit new discussions, reply to discussions, and receive updates of peer posts through email subscriptions. Answers to submitted questions are posted in the forum, which can then be searched by all registered users.

Past discussions submitted through the Cornell University BACnet-L email list server are also included.

Visit TBI!

TBI is a central and global source for BACnet knowledge and education. To access the wide array of resources and information, visit thebacnetinstitute.org to sign up or log in. 



Sign-up for a FREE TBI account



Does your building have **BTL Certified BACnet products?**

Time and money are valuable during a project. Require all your BACnet products be independently tested and certified.

BTL Certification provides users with confidence that a product has passed the industry standard BACnet conformance tests conducted by a recognized, independent testing organization (RBTO). Many building owners and control system designers consider BTL Certification a must-have to be eligible for a project. BACnet products that have successfully completed compliance testing are eligible for BTL Certification. **Certified products are listed in the BTL Listing of Tested Products, which contains over 1,420 products from over 220 manufacturers.**

Lower Integration Cost

BTL Certified products accelerate and lower the cost of system integration. As such, it is becoming commonplace for specifications to require BTL Certification to be eligible to bid on a project.

Assurance of Independent Compliance Testing

BTL Certification provides users with assurance that a product has passed the industry standard BACnet conformance tests conducted by a RBTO.

Less Integration Risk

Reliance on BTL Certified products lowers the risk of integration problems, project delays, and cost-overruns. It also provides a solid foundation for future system enhancements and extensions.

Interoperability Assurance in a Multi-Vendor Environment

Tests are designed to validate that the product correctly implements a specified set of BACnet features to ensure that the products integrate seamlessly.



[Learn more about
BTL Certification](#)



[View BTL Listing
of Tested Products](#)

BACnet Testing Laboratories (BTL) Test Package Update

BTL Testing and BTL Test Package Information

A BTL Certification indicates that the product's BACnet Stack 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.

Coming Soon: BTL Test Package 26.0

The current BTL Test Package is 23.3. This test package includes testing up through Protocol Revision 23 of the BACnet standard (ANSI/ASHRAE 135-2020 plus addenda: cd)

BTL Test Package 26.0 will be published by year end 2024. It will include testing up through BACnet Protocol Revision 26. Once BTL Test Package 26.0 is published, the BTL Working Group has established a transition period for BTL Test Package 26.0, so that testers can update tools used in BTL Testing. During the transition period, vendors with products claiming Protocol_Revision 25 or less may test with either Test Package 26.0 or with BTL Test Package 23.3. Products claiming Protocol_Revision 26 or greater must test with BTL Test Package 26.0.

The changes in the BACnet Standard (ASHRAE 135), the BACnet Testing Standard (ASHRAE 135.1) and the new BTL Test Package 26.0 are the normal progression and enhancement of these two organizations collaborating to improve the documentation and testing process for BACnet develop organizations and Recognized BACnet Testing Organizations.

Minimum Protocol Revision for Testing

BTL Testing Policies requires that the minimum Protocol_Revision for BTL Testing increase over time. The minimum Protocol_Revision is determined each January 1st and is the highest Protocol_Revision which has been available in the BTL Test Plan for at least 4 years. Protocol_Revision 18 becomes the minimum Protocol_Revision for BTL Testing as of January 1, 2025.

Products at an RBTO either waiting for testing or in the process of testing as of January 1, 2025, must have a minimum Protocol_Revision of 16 (the current minimum PR). All products entering testing January 1, 2025, or later must have a minimum Protocol_Revision of 18 or higher. 🌐



Scan for BTL Test Documentation

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.

© Hayes



Emily Hayes

BTL Manager, Certifications and Listings Manager and BTL Working Group Chair | BACnet International
btl-manager@bacnetinternational.org | www.bacnetinternational.org



New BTL-Listed Products, March 2024 – September 2024

Manufacturer	Product Name	Model
Automated Logic	OptiFlex™ BACnet Building Controller (BTL-31132)	OFBBC-A
	OptiFlex™ Chilled Water System Optimizer (BTL-31149)	OF-OPT
Carrier	TruVu™ Chilled Water System Optimizer (BTL-31150)	TV-OPT
	TruVu™ ChillerVu™ Plant Controller (BTL-31151)	TV-PSM
	WebCTRL®Server (BTL-31180)	WC-A, WC-S, WC-P
	TruVu™ Compact BACnet Router (BTL-31171)	TV-CRB-E2
	TruVu™ Compact Link BACnet Integrator (BTL-31172)	TV-CLB-E2
	TruVu™ BACnet Advanced Application Controller (BTL-31173)	TV-022-E2
Johnson Controls	EasyIO and EasyIO Neo Series Controller (BTL-31218)	FS-32, FS-20, FW-28, FW-14, FW-08, FW-08V, FW-VAV, EC-1208, EC-1616, CW-0404, CW-0806, CW-1612
	Smart Equipment Unit Control Board (BTL-31148)	SE-SPU2011-0, SE-SPU2012-0
	Advanced Application Programmable Controller (PCA) Programmable Controller VAV (PCV) (BTL-31236)	FX-PCA4911-0, FX-PCV1930-0
	Advanced Application Programmable Controller (PCA) (BTL-31235)	FX-PCA2513-0, FX-PCA3613-0
	Advanced Application Programmable Controller (PCA) (BTL-31233)	CH-PCA2513-0, CH-PCA3613-0
Price Industries	Antec Controls (BTL-31146)	LUME20
Samsung	b.IoT Smart Gateway (BTL-31186)	EDGE-S (ACM-Q300SK)
Siemens	BACnet Edge Router (BTL-31158)	Connect X200, Connect X300
	Desigo CC Workstation (BTL-31189)	8,0
	Desigo Automation PXC5.E24.A, PXC7.E400.A and PXC4.E16.A Automation Stations (BTL-31203)	PXC5.E24.A, PXC7.E400.A, PXC4.E16.A
Wago	Touch Panel 600 Edge Controller (BTL-31188)	762-4301/8000-0002, 762-4302/8000-0002, 762-4303/8000-0002, 762-4304/8000-0002, 762-4305/8000-0002, 762-4306/8000-0002, 762-5303/8000-0002, 762-5304/8000-0002, 762-5305/8000-0002, 762-5306/8000-0002, 762-6301/8000-0002, 762-6302/8000-0002, 762-6303/8000-0002, 762-6304/8000-0002 2.0.2, 752-8303/8000-0002

Manufacturer	Product Name	Model
Wago	Controller PFC200 (BTL-31227)	750-8210, 750-8210/0040-0000, 750-8211, 750-8211/0040-0000, 750-8211/0040-0001, 750-8212, 750-8212/0000-0100, 750-8212/0025-0000, 750-8212/0025-0001, 750-8212/0025-0002, 750-8213, 750-8214, 750-8215, 750-8216, 750-8216/0025-0000, 750-8216/0025-0001, 750-8217, 750-8217/0025-0000



Calendar of BACnet International Events

2025	Event	Location
February 8 th – 12 th , 2025	ASHRAE Winter Conference	Orlando, FL
February 10 th – 12 th , 2025	AHR Expo	Orlando, FL

Journal of Building Automation 26

The Journal of Building Automation published by BACnet International is a global magazine for the building automation industry. Experts, practitioners and professionals show the way through articles, updates, developments, case studies, and news on the BACnet protocol as well as the wider building automation industry as a whole. Special attention is given to Corporate Members and activities of BACnet International.

Online Distribution

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