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The Language of Smart and Sustainable Buildings

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PLUGFEST 2025

Mark your calendars!

PlugFest Interoperability Workshop

Tuesday, October 14th - Thursday, October 16th

University of New Hampshire's Interoperability Laboratory

bacnetinternational.org/plugfest

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Letter from the President

Dear Readers,

Welcome to this issue of the BACnet International Journal of Building Automation! It's truly a pleasure to bring you this latest issue, filled with timely and insightful articles.

This year marks a significant milestone – it is the 15th anniversary of the BACnet Journal, and it brings me memories of penning that very first letter to you, our readers, filled with the hope and vision for what this journal could become. As I wrote then, the Journal "promises to be an important addition to the global flow of information and dialogue on BACnet and the solutions it enables." Looking back, it's remarkable to see how that promise has unfolded. The BACnet community has flourished, and this journal has been privileged to serve as an important element of our collective growth.

This issue explores the crucial issue of cybersecurity with **"Secure HTTPS Provides Enhanced Security in a Building Management System" and "Cybersecurity in Building Automation Systems: Protecting your Assets."** Just as we emphasized the need for interoperable communication from the start, ensuring that communication is secure is paramount in today's interconnected world. These articles provide essential insights into safeguarding your building automation systems.

Building on the foundation of a reliable standard, **"BACnet Testing and Certification: Maintaining the Integrity of the Standard"** underscores the vital role that rigorous testing plays in ensuring the interoperability and dependability we all rely on.

Our perspective then broadens to the cutting edge of technology with **"Data Center Trends: Insights from the Edge."** As the demand for accessible information has grown – a point we highlighted in our inaugural letter – understanding the impact of edge computing on data centers becomes increasingly critical.

Looking towards the future of AI-driven automated communication, **"BACtology and the Future of Semantic Interoperability in Building Automation"** delves into the exciting possibilities of semantic technologies, promising even greater levels of understanding and data exchange between building system.

Finally, we are delighted to share the news of **"KTC Designated as Fourth 'Recognized BACnet Testing Organization'."** This development signifies the continued expansion and strengthening of the BACnet ecosystem, providing even greater confidence in the quality and interoperability of BACnet products worldwide.

As we celebrate 15 years of the BACnet International Journal, it's clear that the spirit of collaboration and knowledge sharing within the BACnet community remains as strong as ever. Just as we hoped in our first edition, this journal continues to serve as "a new link in the communications chain that ties the global BACnet community together and benefits us all."

Thank you for being a part of this journey. We hope you find this issue both informative and inspiring. We encourage you to engage with the ideas presented and continue to contribute to the vibrant dialogue that defines our community.

Enjoy!

Andy McMillan

ABOUT THE AUTHOR

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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Andy McMillan
President and Managing Director BACnet International
andym@bacnetinternational.org | www.bacnetinternational.org

Secure HTTPS Provides Enhanced Security in a Building Management System

BACnet-complaint devices that incorporate HTTPS provide encrypted webpage communication and protect the integrity of client data. © Contemporary Controls

Network Security is more critical than ever in today's building management system (BMS) networks to ensure authentication, integrity, and confidentiality of data transferred over the Internet. This article describes how BACnet-complaint devices that incorporate HTTPS deliver encrypted communication and protect the integrity of client data. This article also describes the HTTPS authentication and encryption method which utilizes keys and digital certificates. It compares certificates generated by a Certificate Authority (CA) vs. self-signed certificates and provides a resource to create your own self-signed certificate.

BACnet remains the most popular protocol utilized in HVACR control systems and there is a robust ecosystem of devices that comprise these systems, including Gateways to integrate other protocols, such as Modbus and EnOcean, to BACnet. As more and more devices are utilized to meet the demands of today's building management system (BMS) and smart building infrastructures, network security is more critical than ever to ensure authentication, integrity, and confidentiality of data transferred over the Internet.

BACnet-complaint devices that incorporate HTTPS (Secure HTTP) deliver encrypted communication and protect the integrity of client data. Resident HTTPS webservers allow commissioning, status reporting, and troubleshooting in a secure manner using any standard web browser, thereby improving access control to the devices.

HTTPS (Secure HTTP) uses encryption for secure communication over an IP network. HTTPS traffic is encrypted using Transport Layer Security (TLS), formerly Secure Sockets Layer (SSL). The protocol is still referred to as HTTP over SSL, commonly shown as https:// in the browser address bar.

Digital Certificates

SSL/TLS relies on the use of keys and digital certificates for data encryption, device authentication, and data integrity. Keys occur in pairs (public/private) and are used for encryption/decryption. A public key is used for encryption, while the private key is used for decryption.

Digital certificates are used for authentication and encryption, verifying ownership and authenticity to ensure that only authorized devices communicate with each other. The public key is part of the certificate, while the private key is secret to the device.

Mechanisms exist to generate certificates and keys for a device and to scale the architecture to multiple devices.

Digital Certificates – Certificate Authority

Certificates are typically issued and managed by a trusted third-party company, called a Certificate Authority (CA). Getting an SSL certificate installed for a website by a well-known CA that is trusted by all devices and browsers, such as DigiCert, Comodo, GoDaddy, Lets Encrypt, can provide access to the website seamlessly over the public Internet. The device can get the certificate directly from the CA or send a Certificate Signing Request (CSR) to the CA to get the corresponding certificate. These trusted CAs only provide certificates to websites or devices which have a public IP address. They won't provide certificates for devices on an internal network with private IP addresses.

Digital Certificates – Public Key Infrastructure

For an internal BMS network, getting a certificate from a public CA is not necessary and can be expensive given the considerable number of devices in a building. The IT department can implement their own infrastructure to generate these keys and certificates. The term PKI (Public Key Infrastructure) is used to define this setup. The building automation product vendors may also have specific software tools to implement the PKI, but the certificates and keys for all devices at a site,

BACnet-complaint devices that incorporate HTTPS provide encrypted webpage communication and protect the integrity of client data. © Creative Commons

irrespective of their brand, must be generated from the same tool to ensure interoperability. The certificates on devices also expire and need to be renewed.

Devices used on internal networks can also employ a self-signed digital certificate to make a web browser trust your internal devices. A self-signed certificate is a type of SSL/TLS credential you sign yourself rather than having it signed by a trusted third-party CA. If you don't have an IT department, you can generate the self-signed certificate yourself. In addition, generating a self-signed certificate for internal network devices eliminates the associated cost of getting a certificate from a trusted third-party CA.

Digital Certificates – Self-signed

Self-signed digital certificates are created by signing the certificate with the owner's private key. They are created, issued, and signed by the company or developer who is responsible for the website/software being signed. Unlike certificates issued by a trusted CA, no external party verifies a self-signed certificate. Self-signed certificates are fast, free, and easy to issue. They are appropriate for local development, testing, or staging environments, internal network websites and providing secure webpages for devices. However, you must be aware of their limitations, such as despite the strong encryption they provide, they lack the backing of recognized authority, so browsers on different PCs will display security warnings for them.

Digital Certificates – OpenSSL

You can generate and install a self-signed certificate using OpenSSL, a commonly used command-line utility for generating keys, creating certificate signing requests (CSRs), and managing certificates.

According to OpenSSL documentation at https://docs.openssl.org/master/man7/ossl-guide-introduction: "OpenSSL is a robust, commercial-grade, full-featured toolkit for general-purpose cryptography and secure communication. Its features are made available via a command line application that enables users to perform various cryptography related functions such as generating keys and certificates. Additionally, it supplies two libraries that application developers can use to implement cryptography-based capabilities and to securely communicate across a network. Finally, it also has a set of providers that supply implementations of a broad set of cryptographic algorithms.

OpenSSL is fully open source. Version 3.0 and above are distributed under the Apache v2 license."

If you don't have OpenSSL on your Windows's PC, you can install an OpenSSL package. If you are accessing the HTTPS device from a different PC, a security warning message will appear. You must download the self-signed certificate and install it to your local machine's trusted certificate store.

For more information, Contemporary Controls has created an Application Note: How to Create and Use Self-Signed SSL Certificates that explains how to add OpenSSL and create a self-signed certificate for Windows using Windows Package Manager, WinGet. WinGet is a free and open-source package manager designed by Microsoft that allows users to discover, install, upgrade, remove, and configure applications on Windows 10, Windows 11, and Windows Server 2025 computers. The application note also explains how to install this self-signed certificate on the device, and how to download and install the self-signed certificate on different Windows machines to eliminate the security warning. Instructions are provided for commonly used browsers – Google Chrome, Microsoft Edge, and Mozilla Firefox – and how to overcome the Security Warning message.

Conclusion

HTTPS encrypts the transport of data to ensure data integrity and prevents information from being modified, corrupted, or stolen during transmission. SSL/TLS protocols authenticate users to secure information and ensure it won't be revealed to unauthorized users. HTTPS requires digital certificates to validate the domain ownership and integrity. For external networks, you should obtain this credential from a trusted third-party CA.

Self-signed certificates are valuable for creating secure communication channels for internal networks when you control the environment. They offer quick deployment and cost savings and are ideal for testing, local development, or internal applications. Understanding these concepts is critical to implementing security for IP devices in general. For the Building Automation world based on BACnet, they provide the foundational knowledge for successful and robust implementation of BACnet/SC.

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Harpartap Parmar
Director of Product Management | Contemporary Controls
hparmar@ccontrols.com | www.ccontrols.com

ABOUT THE AUTHOR

Harpartap Parmar is a Director of Product Management at Contemporary Controls, which designs and manufactures BACnet building controls and IP networking equipment. Parmar focuses on network security, IP routers and their application to Building Automation. He has over 25 years of experience at Contemporary Controls with a range of networking, control, and communication products.

BACnet Testing and Certification: Maintaining the Integrity of the Standard

Industry Overview

According to a recent market study by Fortune Business Insights, the building automation systems market is forecasted to grow to $150.73 billion USD worldwide by 2032. The US Department of Energy reports that the average person spends 90% of their time in buildings, amounting to $370 billion USD in annual energy costs. In conjunction with industry expansion, BACnet market adoption will continue to grow. The latest BACnet Market Adoption Report drawn from BSRIA's Market Penetration of Communications Protocols concludes that BACnet remains the most widely specified protocol at a global level with 77% of projects specifying BACnet, up from 64% in 2018. By 2027, the BACnet protocol is projected to have a 97% market share in North America, 86% in Latin America, 69% in the Middle East, 65% in Europe, and 63% in Asia Pacific.

With the increased use of BACnet in HVAC, lighting, elevators, access controls, security and life safety, energy management, and operations data products, it is imperative that the protocol is correctly implemented, particularly in a multi-vendor environment.

A Brief History of BACnet Testing and Certification

Steven Bushby, Leader for the Mechanical and Controls Group Engineering Laboratory, NIST, and one of the first BACnet pioneers, began voicing this concern regarding correct implementation in 1991. Years before BACnet became an ASHRAE Standard in 1995, there was already an apparent need to test the implementation of early BACnet products. Bushby developed the first BACnet protocol analyzer tool with a colleague. By 1993, BACnet testing gained further traction from manufacturers, prompting Bushby to facilitate the NIST BACnet Interoperability Testing Consortium. This fostered a symbiotic environment allowing manufacturers to build BACnet implementations and products and for Bushby's team at NIST to develop testing software and methods. The consortium eventually grew to include 22 companies.

Members of the consortium were invited to participate in the first public demonstration of BACnet in a multi-vendor environment held at the 1996 AHR Expo in Atlanta. Several companies participated and the booth was a great success.

"Steve's presence and the availability of the NIST lab was key. We needed a place where people could come together that was seen as neutral with the hardware and software needed to conduct the tests. NIST was the ideal place for that," stated the late Mike Newman, also known as the "Father of BACnet."

In 1995, Busby contracted David Fisher, Polarsoft, to write the first publicly available testing tool, Visual Test Shell. The tool was released in 1997 with second and third versions released in 1997 and 1998. Bushby's documentation led to the first draft of 135.1 Method of Test Conformance (ASHRAE BACnet Companion Standard), released for public review in 2000 and published in 2003. Later that year, NIST hosted the first PlugFest Interoperability Workshop. BACnet International and BACnet Interest Group Europe continue to host annual PlugFest workshops for BACnet manufacturers.

In 1998, BACnet Interest Group North America was formed. The following year, a group of manufacturers recognized that BACnet testing efforts needed to expand further within the industry. This group formed the BACnet Manufacturers Association (BMA). Their initial

Early days of BACnet product testing through the NIST BACnet Interoperability Testing Consortium.
© Steven Bushby

The BTL Mark provides users with confidence that a product has passed the industry standard BACnet conformance tests conducted by a recognized, independent testing organization.
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focus was solely on testing. The BMA formed BACnet Testing Laboratories in June 2000 and created the BTL Mark that is still used today. The first BTL Listing was awarded in 2002. In 2006, BACnet Interest Group North America and the BMA merged to form BACnet International.

Overview of BACnet Testing Laboratories

Today, BACnet Testing Laboratories (BTL) continues to support compliance testing and interoperability testing activities. BTL oversees the operation of the global product certification program and administers the BTL Working Group (BTL-WG). BTL's activities include developing and maintaining the BACnet product test requirements and testing policies as well as maintaining a public listing of BTL-certified products. The BTL-WG is open to all those interested in BACnet testing. However, voting members must be members of BACnet International or BACnet Interest Group Europe, be knowledgeable experts in the BACnet community and able to commit to five-year terms.

The BTL Mark provides users with confidence that a product has passed the industry standard BACnet conformance tests conducted by a recognized, independent testing organization.

Once a product has successfully completed testing, the manufacturer can apply for formal BTL Certification. BTL Certified products can be identified by the BTL Mark on the physical product or by searching for their BTL Listing online. The BTL Listing of Tested Products contains over 1,430 products from over 225 manufacturers. All products in the listing have been independently tested by a recognized BACnet testing organization with an industry-accepted test package and include a Certificate of Conformance.

The Benefits of the BTL Certification Program

BACnet continues to be a driving force in the building automation sphere. With any project, manufacturers and end-users must be assured that their BACnet products implement the protocol correctly or otherwise risk project delays and cost overruns.

While BACnet is an open protocol, specification is extensive and complex for even the best developers. BACnet implementation errors in the field are grievous for both manufacturers and end-users. Resolving interoperability problems in a multi-vendor environment during BACnet system integration can be expensive and potentially discouraging for customers. In the event of an interoperability problem between a product with BTL Certification and one without it, a common assumption is the product without is at fault. Whether it is or not, the burden of finding and resolving the problem tends to weigh most heavily on the manufacturer that has not demonstrated compliance through the BTL Certification program. BTL Certification lowers integration cost and risk, which is why many projects today require BTL Certification in order for a manufacturer to bid.

The Integrity of the BACnet Standard

BACnet testing and certification has an extensive history dating back to the founding years of the protocol before it became an ASHRAE Standard.

ABOUT THE AUTHOR

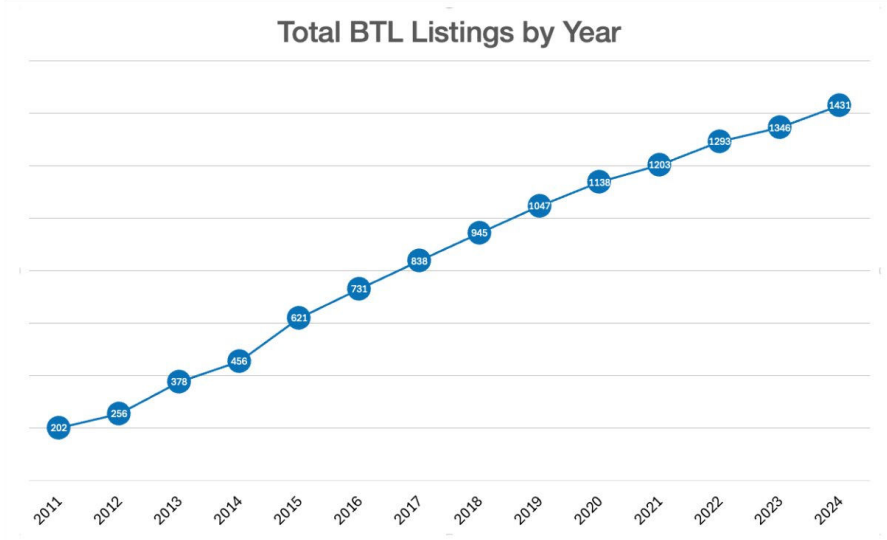
Emily Hayes began work with BACnet International in 2014 as BTL-Coordinator, coordinating BTL Testing at the BTL Lab. In 2017, Emily took over leadership of the BTL Working Group as chair. Additionally, she led the transition from the BTL Listing Program to the BTL Certification Program. She became BTL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

Independent testing and certification maintain the integrity of the standard, that which has transformed the industry with its inoperable capabilities. Since 2000, BACnet Testing Laboratories has operated the compliance testing and global certification program and is committed to successfully implementing the BACnet Standard. BTL Certification lowers integration costs and risks, assures independent testing and interoperability assurance in a multi-vendor environment, improved product quality and performance, and greater buyer confidence and opportunity to bid for manufacturers.

To learn more about the BTL Certification program, visit btl.org or email btl-manager@bacnetinternational.org.



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

Are you using BACnet products that have achieved

BTL Certification?

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 to be 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 1,375 products from over 225 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.

Less Integration Risk

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

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.

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

Data Center Trends: Insights from the Edge

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As we enter 2025, the data center industry is undergoing a profound transformation. This evolution is driven by cutting-edge technological advancements, ambitious sustainability goals, and the relentless demand for data processing and storage. From the integration of AI and machine learning to the pursuit of enhanced energy efficiency, the landscape is rapidly shifting. Here are the key trends shaping data center management this year:

AI and Machine Learning Integration

AI and machine learning are poised to transform data center operations. AI-driven tools are being developed to optimize energy consumption, predict equipment failures, and enhance security. These technologies will enable data centers to operate more efficiently and reduce downtime (Data Centre Magazine, 2024).

One notable initiative is The Stargate Project, a joint venture by OpenAI, SoftBank, Oracle, and MGX. Announced in January 2025, this project aims to invest up to $500 billion in AI infrastructure in the United States by 2029. The Stargate Project will build ten data centers in Abilene, Texas, and expand to more states, creating over 100,000 jobs. This massive investment underscores AI's perceived importance in future data center management (Data Centre Magazine, 2024).

Sustainability and Energy Efficiency

Sustainability remains a top priority. The industry focuses on reducing its carbon footprint through renewable energy sources, advanced cooling techniques, and energy-efficient hardware. Innovations like liquid cooling and immersion cooling are becoming more prevalent, helping manage the heat generated by high-density servers (EUR-Lex, 2024).

Recent developments in the EU Energy Efficiency Directive (EED) introduced new sustainability compliance reporting requirements for data centers. The European Commission adopted a Delegated Act in March 2024, establishing a common rating scheme for data centers. This act mandates data center operators report key performance indicators (KPIs) such as energy consumption, power utilization, temperature set points, waste heat utilization, water usage, and renewable energy use to a European database. These measures aim to increase transparency and promote energy efficiency across the industry (EUR-Lex, 2024).

Edge Computing Expansion

With the rise of 5G, low latency satellites, and other high speed communication technologies, edge computing is gaining momentum. Data centers are increasingly built closer to the data source to reduce latency and improve performance. This trend drives the development of smaller, modular data centers that can be quickly positioned in various locations (Uptime Institute, 2021).

A significant development is the integration of miniature edge data centers within cell towers. These micro data centers enable data processing and storage at the edge, reducing latency and improving service delivery. To manage these distributed locations effectively, Data Center Infrastructure Management (DCIM) software is essential. DCIM tools help monitor and control these remote sites, ensuring optimal performance and reliability (Uptime Institute, 2021).

Enhanced Security Measures

As cyber threats become more sophisticated, data centers invest heavily in security. This includes advanced encryption methods, AI-based threat detection, and robust access control systems. Ensuring data integrity and protecting against breaches are critical for maintaining trust and compliance (TechTarget, 2024).

Recent notable cybersecurity breaches include:

- Richmond University Medical Center Data Breach: In December 2024, bad actors gained access to files on its computer network, impacting approximately 674,033 individuals (TechTarget, 2024).
- Change Healthcare Ransomware Attack: In February 2024, UnitedHealth-owned Change Healthcare suffered a ransomware attack, causing massive disruption in the U.S. healthcare system. The attack prevented many pharmacies and hospitals from processing claims and receiving payments for weeks (TechTarget, 2024).

Hybrid and Multi-Cloud Strategies

Organizations adopt hybrid and multi-cloud strategies to enhance flexibility and resilience. This approach allows businesses to leverage the strengths of different cloud providers while maintaining control over critical data and applications. Data centers evolve to support these complex environments, offering seamless integration and management tools (Data Center Dynamics, 2022).

Examples include:

- Netflix uses a multi-cloud strategy to ensure high availability and performance, leveraging AWS for primary infrastructure and Google Cloud for analytics and AI workloads (Data Center Dynamics, 2022).

- Airbnb employs a hybrid cloud strategy, utilizing AWS for most operations while maintaining some on-premises data centers for specific needs (Data Center Dynamics, 2022).
- Spotify uses Google Cloud for data processing and analytics, while also leveraging AWS for other services, demonstrating a multi-cloud approach (Data Center Dynamics, 2022).

Digital Twin Technology

Digital twins are virtual replicas of physical data centers that allow for real-time monitoring and simulation. This technology optimizes operations, predicts maintenance needs, and improves overall efficiency. By creating a digital twin, data center managers can test scenarios and make data-driven decisions without disrupting actual operations (Mission Critical Magazine, 2020).

Examples include:

- IBM's digital twin technology integrates with their AI and IoT platforms to provide comprehensive monitoring and predictive maintenance for data centers, reducing downtime and improving operational efficiency (Mission Critical Magazine, 2020).
- Microsoft uses digital twin technology in their Azure platform to simulate and manage data center operations, enabling better resource allocation and energy management (Mission Critical Magazine, 2020).

ABOUT THE AUTHOR

Michael is responsible for marketing strategy and execution to ensure that Nlyte retains its market leadership position for data centers globally. He orchestrates Nlyte's global market messaging, plans and executes SEO/SEM, administers lead generation, conducts product launches, and manages Nlyte's social media presence.

Michael has worked in the building automation and controls industry for nearly two decades and serves as a member of the board of directors of BACnet International, and its Marketing Committee chair.
Connect with Michael on LinkedIn:
https://www.linkedin.com/in/mrwilson

Integration of Building Automation Systems with Data Center Equipment

The integration of Building Automation Systems (BAS) with data center equipment is on the rise, primarily enabled by the ASHRAE BACnet protocol. BAS allows for centralized control of a building's systems, such as HVAC, lighting, and security. When integrated with data center equipment, BAS can optimize energy use, enhance cooling efficiency, and improve overall operational performance (ASHRAE, 2022).

The ASHRAE BACnet protocol facilitates seamless communication between BAS and data center management systems, improving thermal management. For instance, BAS can adjust cooling systems based on real-time data from servers, ensuring optimal temperature and humidity levels. This level of integration helps reduce energy consumption and operational costs while maintaining the reliability and performance of data center equipment (ASHRAE, 2022).

The Road Ahead

The data center industry stands at the cusp of significant transformation. From my vantage point, I see a landscape rich with innovation, challenges and opportunity.

The integration of AI and machine learning is set to revolutionize data center operations, and drive efficiency and reduce downtime. Sustainability remains a critical focus, with advancements in cooling techniques and energy-efficient hardware leading the charge. The rise of edge computing, fueled by high-speed communication technologies, is pushing data centers closer to the data source, enhancing performance and reducing latency.

Security measures are becoming more sophisticated to combat evolving cyber threats, ensuring data integrity and compliance. Hybrid and multi-cloud strategies are providing organizations with the flexibility and resilience needed to navigate complex environments. Digital twin technology offers new ways to optimize operations and predict maintenance needs.

Finally, the integration of Building Automation Systems with data center equipment, enabled by the ASHRAE BACnet protocol and other emerging protocols, is improving thermal management and operational efficiency.

These trends are not just shaping the future of data center management – they are redefining it. As technology continues to advance, data centers will play an increasingly vital role in supporting the digital economy and meeting the growing demands of businesses and consumers alike.

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Michael R. Wilson
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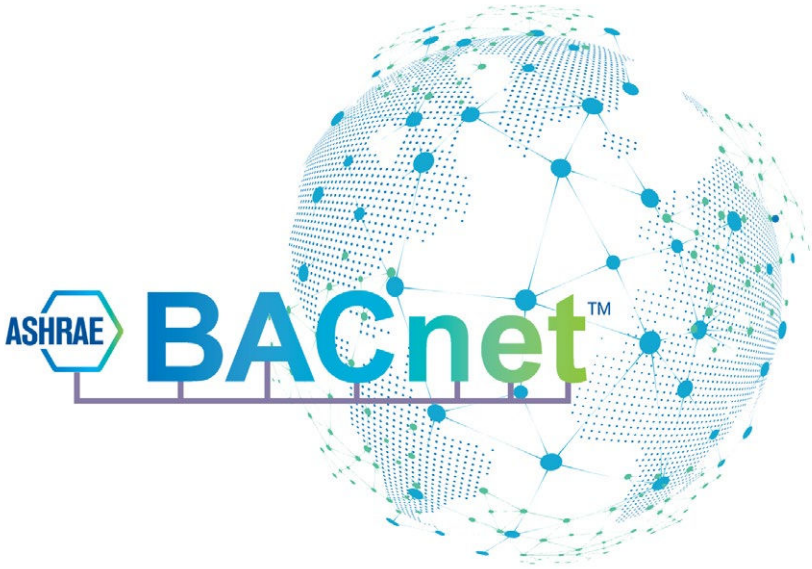
BACtology and the Future of Semantic Interoperability in Building Automation



A Semantic Leap Forward for BACnet

As the industry pushes toward more intelligent, interoperable building systems, BACnet is taking a major step with Addendum CT, also known as BACtology. This new development defines BACnet content as semantic RDF data, unlocking powerful new capabilities for data exchange, analytics, and integration with cloud and AI platforms. Discover how BACtology positions BACnet for the next generation of smart building innovation.

Big news is emerging from the world of BACnet with the release of ASHRAE Standard 135-2024 Addendum CT – informally known as BACtology - for Publication Public Review. This important milestone marks a new chapter in the evolution of BACnet as a foundational technology for smart buildings, digital twins, and Building-IoT ecosystems.

BACtology: Introducing Semantic BACnet Content

Addendum CT defines a method for expressing BACnet content as RDF data – a major step toward enabling semantic interoperability across domains and platforms. This means that BACnet can now speak a language understood not only by other building systems but also by modern semantic web technologies and AI-driven applications.

BACtology allows BACnet objects to be described as structured, queryable datasets, connecting them into knowledge graphs that support machine-readable automation, advanced analytics, and intelligent operations.

Why Does This Matter?

Traditionally, interoperability in building systems has focused on protocol-level integration. But as smart buildings evolve, there's a growing need to move beyond syntax to the meaning of the data itself. That's where semantic technologies – ontologies, linked data, RDF triples – come into play.

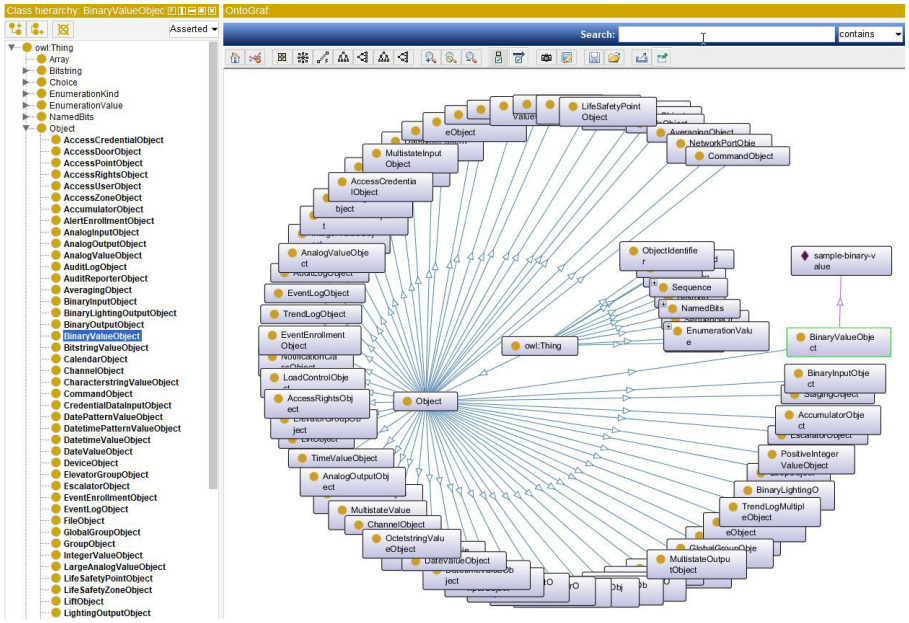
BACtology positions BACnet as a semantic-ready protocol, enhancing its ability to integrate with:

- ASHRAE 223P
- SAREF
- HBES
- Brick Schema
- RealEstateCore
- DigitalBuildings
- Project Haystack
- …and many others

This cross-domain alignment is essential for achieving true interoperability across smart city infrastructure, energy systems, and digital building platforms.

ABOUT THE AUTHOR

Salvatore Cataldi has been with Belimo since 2018 and leads multiple initiatives within the company on conceptualizing the Belimo Digital Ecosystem. Beyond Belimo, he assumes leadership roles in various digital standardization committees, advocating for interoperability and the adoption of standardized protocols to enhance building automation and control systems. He consistently showcases his dedication to advancing the industry through collaborative endeavors and innovative solutions.



Unlocking AI-Ready Building Systems

By representing BACnet data as RDF triples, and supporting formats like RDF/XML, JSON-LD, and N-Triples, BACtology enables seamless data exchange with cloud platforms, digital twins, and semantic analytics engines.

This not only simplifies data integration but also amplifies the value of existing BACnet deployments – making them more adaptable to emerging AI applications and data-driven services.

A Foundation for the Next Decade of Smart Building Innovation

BACtology is not just an addendum – it's a paradigm shift for the BACnet community. It strengthens the protocol's relevance in a world where data meaning and machine-to-machine understanding are central to value creation.

Looking ahead, we can imagine a future where building intelligence is shaped by the seamless collaboration of multiple layers – from control networks and technical systems to AI-powered management agents, energy optimization engines, and occupant-centric models. In this context, BACnet, empowered by BACtology, becomes a crucial enabler: not as the central brain, but as a trusted provider of semantically structured, machine-readable data. Through alignment with ontologies such as ASHRAE 223P and SAREF, BACtology allows BACnet devices to contribute rich, standardized descriptions of physical assets, functions, and operational states into unified data ecosystems. This ontological interoperability opens the door to cross-domain reasoning, context-aware automation, and collaborative intelligence across building, energy, and urban systems – ultimately supporting the vision of buildings that can understand, adapt, and act within an integrated digital environment.

What can you do?

The Addendum is currently in public review as part of ASHRAE Standard 135-2024, with feedback invited from industry experts, innovators, and stakeholders. The importance of participating in this development will resonate long after its completion.

Whether you're working in design, operations, integration, or product development, BACtology lays the foundation for smarter, more connected, and more intelligent building systems.

Let's shape the future together – one semantic triple at a time.

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Salvatore Cataldi
Senior Product Lead | Belimo
Salvatore.Cataldi@belimo.ch | www.belimo.com

Cybersecurity in Building Automation Systems: Protecting your Assets

© Gilbert

In today's digital age, cybersecurity has become a critical concern for all industries, including building automation systems (BAS). As BAS evolve to integrate more advanced technologies, the need to protect these systems from cyber threats becomes increasingly important. This article explores the cybersecurity risks associated with BAS, best practices for securing these systems, and emerging trends in the industry.

Understanding Cybersecurity Risks in BAS

Building automation systems have undergone significant evolution over the years. From the early pneumatic systems of the 1900s to the modern BAS with Building Internet of Things (BIoT) integration, these systems have become more sophisticated and interconnected. However, this increased connectivity also expands the threat landscape for potential cyberattacks.

Cybersecurity in BAS involves protecting systems, networks, and programs from digital attacks. These attacks, known as cyberattacks, are malicious attempts to breach information systems to access, change, or destroy sensitive information, extort money, or disrupt normal business processes. Notable examples of cyberattacks include the Stuxnet attack on Iranian PLCs in 2011, the 2021 US water utility hack, and the 2013 Target data breach.

Common types of cyberattacks include SQL injection, phishing, man-in-the-middle attacks, denial-of-service attacks, DNS tunneling, malware, and zero-day exploits. According to the IBM 2024 Cost of a Data Breach Report, the average cost of a data breach has risen significantly, with the industrial sector experiencing the highest increase. The report highlights that the longer it takes to identify and contain a breach, the more costly it becomes.

Approaches to Mitigate Cybersecurity Risks

To mitigate cybersecurity risks in BAS, it is essential to implement a comprehensive strategy that addresses both operational technology (OT) and information technology (IT) environments. OT is the hardware and software that monitors and controls equipment, systems, and processes. Examples include SCADA systems, PLCs, and BAS DDC systems/controllers. OT generates the data processed by IT. IT focuses on managing electronic data and information systems. It involves the use of computers, software, and networks to gather, store, process, and share data securely and efficiently. IT is essential for business operations, decision-making, and tasks such as managing email, finance, and human resources. Examples of IT include desktop/laptop computers, mobile devices, and software applications like Enterprise Resource Planning (ERP) or Customer Relationship Management (CRM).

Key strategies for mitigating cybersecurity risks include network segmentation and isolation, asset management and visibility, regular updates and patch management, access control and authentication, and data protection.

1. Network Segmentation and Isolation: Implementing strict network segmentation helps prevent lateral movement of threats and contains potential damage. Adopting a Zero Trust model, which verifies every user, device, and connection within the network, is also crucial.
2. Asset Management and Visibility: Conducting thorough asset inventories to understand both OT and IT environments fully is essential. Maintaining an accurate, up-to-date inventory of all assets enables effective risk assessment and prioritization of critical systems.
3. Regular Updates and Patch Management: Implementing a strong patch management process ensures that all systems receive timely updates. For OT systems, testing updates and patches in a controlled environment before deployment minimizes network downtime and prevents operational disruptions.
4. Access Control and Authentication: Controlling network access using identity and access management tools and enforcing strict identity verification are vital. Applying the principle of least privilege and implementing multi-factor authentication for both IT and OT systems enhance security.
5. Data Protection: Safeguarding critical data in both OT and IT environments is crucial. Storing OT data in protected repositories segmented from corporate environments and open internet access, implementing robust encryption and access controls for sensitive IT data, are key measures.

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Best Practices for Securing BAS

Securing BAS requires collaboration with the client's IT department to understand their policies and network management procedures. The ideal approach is network separation, where the user network and the BACnet network are physically or logically separated. Using Virtual Local Area Networks (VLANs) and ensuring that the BAS server has different IP addresses for each network are effective strategies.

When connecting BAS to the internet, it is essential to avoid permanently exposing the BAS server or the BACnet network. Instead, users should access the BAS server through a secure VPN connection. Implementing BACnet Secure Connect (BACnet/SC) provides a secure way of communicating over the internet without the need for VPNs.

Emerging Trends and Technologies

The field of cybersecurity in BAS is continuously evolving, with new trends and technologies emerging to address the growing threats. Key trends include:

1. Integration with Cloud Computing and AI: Modern BAS are increasingly integrating with cloud computing and artificial intelligence (AI) to enable remote monitoring and smart analytics. This integration enhances the ability to detect and respond to cyber threats in real-time.
2. Centralized Data Management: There is a movement towards more centralized data management in BAS, allowing for better data analysis and actionable insights. This trend also necessitates robust cybersecurity measures to protect the centralized data.
3. Interoperability: Buildings are becoming more interoperable, with data being normalized, semantically tagged, and accessible by multiple devices and cloud-based applications. This interoperability expands the threat area for potential cybersecurity threats, making it essential to implement comprehensive security measures.
4. Compliance with Worldwide Frameworks and Regulations: Cybersecurity is not just a technical issue; it is also a legal and regulatory matter. Compliance with frameworks such as the NIST Cybersecurity Framework, ISO 27001, and European Union regulations is crucial for ensuring the security of BAS.

Conclusion

As building automation systems continue to evolve and integrate more advanced technologies, the importance of cybersecurity cannot be overstated. By understanding the risks, implementing comprehensive mitigation strategies, and following best practices, organizations can protect their BAS from cyber threats and ensure the safety and security of their assets. Cybersecurity is not just a technical issue; it is also a legal and regulatory matter that requires compliance with worldwide frameworks and regulations.

ABOUT THE AUTHOR

Ken Gilbert is a Solutions Consultant for Automated Logic. In this role, Ken works with specifying consulting engineers and ALC factory-authorized dealers with industry trends as well as “what is new”, and developing project solutions including specifications, sequences of operations, points lists, and flow diagrams.

Ken brings significant industry experience to ALC, having served in various sales, engineering, and consultative roles. Ken graduated from the Georgia Institute of Technology with a Bachelor of Science in Industrial Management and completed his MBA from the University of Georgia in 2023. Ken is a LEED AP actively involved with ASHRAE and BACnet International. Ken, his family, and two dogs reside in the Atlanta area.

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Ken Gilbert
Solutions Consultant | Automated Logic Corporation
ken.gilbert@carrier.com | www.automatedlogic.com

KTC Designated as Fourth "Recognized BACnet Testing Organization"

BACnet Testing Laboratories (BTL) is pleased to announce that the Korean Testing Certification (KTC) Institute has been appointed as a Recognized BACnet Testing Organization (RBTO), one of four such organizations worldwide.

BTL hosted a designation ceremony on Tuesday, February 12th, in the BACnet International booth during the 2025 AHR Expo in Orlando. The ceremony was attended by BACnet International President and Managing Director Andy McMillan, Sung-il Ahn, President of KTC, Bong-Soo Lee, Managing Director of the Machine Convergence Business Division, Dae-Kyung Kang, Center Manager of the Mechanical Materials and Components Center, Emily Hayes, BTL Manager, and Michael Osborne, BTL Technical Advisor.

"We are happy to have a new RBTO to support independent BACnet compliance testing. We look forward to a beneficial partnership with KTC in testing BACnet products and ensuring the BACnet Standard is correctly implemented before achieving BTL Certification," states President McMillan.

BTL Certification provides users with confidence that BACnet products have been independently tested in accordance with the industry-accepted test package. This helps to minimize costs and risks associated with system integration. To achieve BTL Certification, products must be successfully tested by a recognized, independent test organization and submitted for formal certification. The four "recognized BACnet Testing Organizations" are, in addition to the KTC, the BTL Lab in Pune, India, MBS GmbH (Krefeld, Germany) and TÜV SÜD Industrie Service GmbH (Munich, Germany).

© BACnet Testing Laboratories

BACnet International President and Managing Director Andy McMillan presents Sung-il Ahn, President of KTC, with a plaque to honor KTC's designation as an RBTO. Pictured from left to right: Dae-Kyung Kang, Center Manager of the Mechanical Materials and Components Center, Bong-Soo Lee, Managing Director of the Machine Convergence Business Division, Sung-il Ahn, President of KTC, Andy McMillan, BACnet International President and Managing Director, Emily Hayes, BTL Manager, and Michael Osborne, BTL Technical Advisor.
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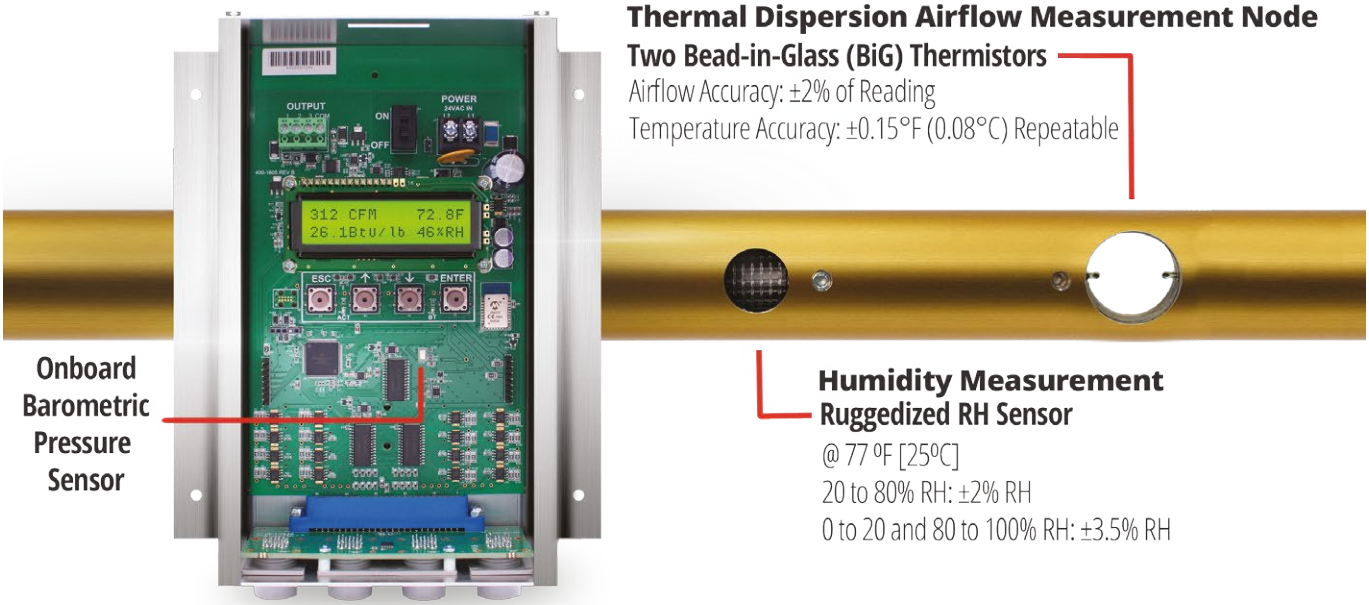
Mary Catherine Heard
Marketing and Communications Manager | BACnet International
marycatherine@bacnetinternational.org | www.bacnetinternational.org

Validate and Control Dehumidification with Patented Airflow Measurement Device

US Patent Nos. 12,066,199; 12,066,205
CA Patent Nos. 3,069,531; 3,169,641



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Highlights from the 2025 AHR Expo in Orlando, FL

BACnet International exhibited in the Building Automation Pavillion at the 2025 AHR Expo. © BACnet International

BACnet International had another successful AHR Expo, thanks to its corporate members, volunteers, and supporters. This year's show drew 50,807 attendees from the H-VACR and building automation industries to the Orange County Convention Center in Orlando, Florida. This year's show featured 95 exhibiting BACnet International Corporate Members representing over 800 BTL Listed products.

The BACnet International booth, located in the AHR Expo's Building Automation Pavillion, was well attended by visitors interested in the BACnet Standard, membership opportunities, free BACnet education from The BACnet Institute (TBI), and the benefits of BACnet Testing Laboratories (BTL) testing and certification programs.

During the show, the BACnet Institute, BACnet International's online learning environment, unveiled its newest education course, BACnet Cybersecurity. Registered account holders can gain an overview of BACnet Secure Connect and its significance in enhancing the security of interoperable building automation systems. Upon course completion, participants can earn 0.1 Continuing Education Credit (CEU) credit and 1.0 Professional Development Hour (PDH).

BACnet International hosted four educational sessions during the show. The sessions included:

- BACnet 101: An Introduction to BACnet, presented by Edward Tom, Product Manager, Drives, Yaskawa America, Inc.
- BAC to the Future, presented by Nate Benes, Director, OT & Engineering at the University of Nebraska
- BACnet Web Services, presented by Coleman Brumley, Chair of the SSPC 135 Committee and Principal I/O Sub-Systems Engineer at PassiveLogic
- Lighting with BACnet, presented by David Fisher, President of PolarSoft, Inc.

Attendees learn about the basics of the BACnet Standard during BACnet 101. © BACnet International

These recorded presentations can be found in The BACnet Institute's Resource Library.

Session attendees gain an understanding of BACnet Webs Services and why they matter in the technological sphere. © BACnet International

During the second day of the show, BACnet Testing Laboratories held a designation ceremony in the BACnet International booth to appoint the Korean Testing Certification (KTC) Institute as the newest Recognized BACnet Testing Organization (RBTO), one of such four organizations worldwide. BACnet International President and Managing Director Andy McMillan presented KTC President Sung-il Ahn with an honorary plaque to mark the beginning of a beneficial partnership.

KTC President Sung-il Ahn (left) and BACnet International President and Managing Director Andy McMillan (right). © BACnet International

Prior to the show's commencement, BACnet International hosted its annual leadership dinner and awards ceremony to recognize several members of the BACnet community for their efforts and volunteerism in promoting the BACnet protocol worldwide. Several individuals were honored by BACnet International and BACnet Testing Laboratories.

Patrice Hell, Quality System Software Test Engineer for Sauter, was presented with the BTL Pillar Award for providing BTL with a B-AWS for BACTOR candidates and contributing multiple work items for Test Package 26.0.

Patrice Hell received the BTL Pillar Award.
© Nelson Photography

The BACneteer Service Award is presented to an individual who has gone above and beyond in service to BACnet International's goals and initiatives. This year's award was given to Kent Gorrie, Website Operations Manager at Reliable Controls. Through his expertise in web development, Kent has been integral in designing, maintaining, and improving the BTL Listing of Tested Products and providing invaluable technical support in the association's projects.

The BACneteer Trailblazer is presented to an individual who has been innovative in furthering the evolvement and market adoption of the BACnet Standard. This year's award was presented to Coleman Brumley, Principal I/O Sub-Systems Engineer at Passive Logic and Chair of the SSPC 135 Committee. Coleman has been instrumental in strengthening the partnership between the BTL-WG and the SSPC 135 Committee.

Kent Gorrie received the BACneteer Service Award.
© Nelson Photography

The BACnet Lifetime Achievement Award is presented to an individual who has dedicated their career to promoting and advancing the adoption of the BACnet Standard. This year's award was given to Steven Bushby, Group Leader, Mechanical Systems and Controls at the National Institute of Standards and Technology. Steven was one of the first advocates of the BACnet protocol and is credited with developing and leading early BACnet testing efforts. He has also served as the Chair for the SSPC 135 Committee.

Coleman Brumley is congratulated by President McMillan for receiving the BACneteer Trailblazer Award. © Nelson Photography

"BACnet International is proud to recognize the talented and dedicated individuals who have contributed to the BACnet community through their service and expertise," stated President McMillan. "The BACnet Standard and its adoption would not be where it is today without the efforts of many individuals, including those we recognize this evening."

Steven Bushby receives a standing ovation as the BACnet Lifetime Achievement Award recipient.
© Nelson Photography

BACnet International looks forward to the AHR Expo next year, February 2nd – 4th in Las Vegas.

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Mary Catherine Heard
Marketing and Communications Manager | BACnet International
marycatherine@bacnetinternational.org | www.bacnetinternational.org

Energy Valve Reporting Capabilities Improve Transparency for Accurate Tenant Billing

© Arboleda

Belimo's Energy Valve has been instrumental in helping the Arboleda complex achieve both energy efficiency and accurate tenant billing.
© Arboleda

Arboleda Complex Reduces Energy Usage with Belimo Energy Valve

Arboleda, a multi-use development located in San Pedro Garza García, Mexico, represents a forward-thinking approach to sustainable and efficient building management. Developed by CREO, this property includes retail shops, a signature hotel, restaurants, apartments, and office buildings. Central to the success of Arboleda is the integration of the Belimo Energy Valve, which has been instrumental in helping the complex achieve both energy efficiency and accurate tenant billing – two critical goals for the long-term management of the property.

Type of building
Mixed Use
Project
New Construction/Retrofit
Sector
Commercial/Residential
Products
Energy Valve

Project Overview and Motivation

At the core of Arboleda is the district cooling system, which provides chilled water to tenants across the property. This system, with a substantial capacity of 6,500 tons, plays a critical role in maintaining comfort throughout the buildings. It employs 1,500 Belimo Energy Valves to manage chilled water and an additional 500 for heating within the apartment units. The energy-efficient management of these systems is a top priority for Arboleda, and the Energy Valve has proven to be the ideal solution.

Alan Quiroga Gamboa, PhD, of controls contractor DOT DCD discussed the integration of the Belimo Energy Valve into their energy efficiency strategy. "Our sequences with the Energy Valve are configured by GPM, not by flow pressure, and this automation process saves between 40 and 65% of pump energy per building," he explained. Traditionally, buildings require multiple pumps to maintain adequate water pressure for cooling. Alan added, "Now, with this sequence, we started using just one pump achieving the same comfort for the whole building." Each pump is typically a high-consumption unit of around 60 horsepower, making this reduction in pump usage a key driver of energy savings.

But the operational savings extend beyond reduced pump energy. One of the critical features of the Belimo Energy Valve is its ability to maintain and dynamically manage the Delta T the difference between supply and return water temperatures – which is key to optimizing the efficiency of the cooling system. At Arboleda, the Delta T values achieved by the Energy Valve range between 10°F and 16°F, ensuring that the system operates at peak efficiency. By optimizing Delta T, the valves reduce energy waste and ensure that the chilled water system runs as designed, minimizing unnecessary strain on the system and lowering energy costs.

"We now have 60% more occupants than when we started, but we are paying less in power now," Alan shared, emphasizing the impact of the Energy Valve's integration. By maintaining optimal Delta T values and improving the overall system performance, the Energy Valve has also contributed to Arboleda's sustainability initiatives. Most of the buildings in the complex have achieved LEED Gold certification, a testament to the high efficiency of the systems in place.

While most buildings at Arboleda were equipped with Belimo Energy Valves from the start, competitor valves used in some areas were later swapped out because they failed to deliver the

The Belimo Energy Valve is an IoT cloud connected pressure independent valve that monitors coil performance and energy consumption while maintaining Delta T.
© Arboleda

From left: Javier Machuca, Sales Director at SENSA, mechanical contractor; Piotr Grodzicki, Arboleda Property Manager for Residential and Commercial at CREO; Alan Quiroga Gamboa, PhD, CFO of controls contractor DOT DCD.
© Arboleda

correct reporting data needed for proper tenant billing. In contrast, the Energy Valve provided accurate and comprehensive reporting along with improved control over chilled water flow and energy consumption. This transition has greatly enhanced both system performance and tenant satisfaction. "The consumption readings weren't accurate," which led to widespread tenant complaints, Alan recounted. "We decided to take off all the old valves and replace them with Energy Valves. Now it's clear that everyone is paying for what they're actually using." This shift not only improved billing accuracy but also fostered greater trust among tenants.

DOT DCD's proprietary app has been instrumental in delivering the real-time feedback provided by the Energy Valve through an intuitive dashboard where building owners and tenants can easily access analytics and verify their billing. The app utilizes the EV's ability to measure energy usage down to the gallon, allowing Arboleda to bill tenants accurately based on their actual consumption. This transparency has not only minimized billing disputes but also empowered tenants to monitor and manage their own consumption more effectively, resulting in far fewer complaints.

Piotr Grodzicki, property manager for Arboleda's residential and commercial divisions at CREO, highlighted the importance of clear reporting. "Our customers and tenants really appreciate Energy Valve's reporting capabilities and the visibility it offers. End users have access to all the analytics they need to review their chilled water consumption and ensure that they are being billed correctly," he said.

As the Arboleda project progresses, the success of the Energy Valve installation continues to create opportunities for expansion. The complex is currently operating seven of the twelve buildings outlined in its master plan, with 500 additional Energy Valves set to be installed as the remaining buildings come online. This ensures that as Arboleda grows, the Energy Valve will continue to provide the transparency and efficiency needed to manage the cooling system effectively, accurately bill tenants, and keep the system running at peak performance.

The Belimo Energy Valve has been a cornerstone of the Arboleda's success in achieving energy efficiency and transparency in tenant billing. By providing accurate, real-time data and maintaining optimal Delta T values, the Energy Valve has significantly improved the performance of the district cooling system. Where competitor valves failed to provide the necessary accuracy and control, the Belimo Energy Valve has excelled, reducing energy consumption, improving tenant satisfaction, and helping the complex meet its sustainability goals.

BELIMO
marketing@us.belimo.com
www.belimo.com

Achieving Demand Control Ventilation Based on Occupancy

© La Fourche Gazette

© Houma Times

Efficient ventilation is a key challenge for schools, requiring a balance between maintaining indoor air quality (IAQ) and optimizing energy efficiency. At South Lafourche High School and Thibodaux Middle School in Louisiana, fluctuating occupancy levels – particularly in classrooms and gymnasiums – highlighted the need for a more innovative approach to ventilation. Tasked with enhancing the HVAC systems at these schools, Castagnos Goodwin Utley (CGU) Engineers implemented a cutting-edge solution to ensure both energy savings and compliance with ASHRAE standards.

Background on the Schools

South Lafourche High School, located in Galliano, Louisiana, serves students from several coastal communities. Established in 1966, the school accommodates over 1,100 students in grades 9–12. After a two-story addition in 2000 and a renovation of the outdoor air handling units in 2016, the district sought to ensure the building's ventilation system could meet new demands – especially with many rooms remaining empty most days – without wasting energy.

Thibodaux Middle School serves grades 6–8 in nearby Thibodaux, Louisiana. Spaces such as the gymnasium, where occupancy can shift rapidly during events or physical education classes, posed a unique challenge for maintaining proper IAQ without incurring high energy costs.

The Ventilation Challenge

Proper ventilation is crucial in schools to protect the health of students and staff and ensure occupant comfort. Proper pressurization is also crucial, especially in humid climates, to ensure no biological growth or moisture damage. However, traditional CO_2-DCV often falls short in large-volume spaces and spaces where occupancy changes quickly. This is due to sampling errors, CO_2 sensor lag in response, or sequences that do not consider the ventilation rates. The result can be over-ventilation, wasting energy, inefficient ventilation, impacting air quality, and not complying with the codes.

Robert Utley of CGU Engineers recognized the limitations of CO_2-based systems, particularly in dynamic spaces like gymnasiums. Additionally, compliance with ASHRAE Standard 62.1, which sets ventilation requirements based on actual occupancy, required a more precise approach.

© EBTRON, Inc.

© Robert Utley, CGU Engineers

There were several key questions raised:

- How can ventilation systems adapt to real-time changes in occupancy?
- Can airflow be dynamically managed to reduce energy consumption while ensuring compliance with IAQ standards?

Introduction to EBTRON

Paul Trammel, Sales Engineer at Product Engineering, introduced Robert Utley to EBTRON's advanced airflow measurement solutions. Recognizing their potential, Paul invited Robert to EBTRON's Bring-A-Guest (BAG) event. This event provided Robert with hands-on technical demonstrations and in-depth knowledge about innovative solutions for real-time airflow management. The event also facilitated collaboration with HVAC professionals, including engineers, architects, and contractors, helping Robert develop the best strategy for the schools' unique challenges.

Implementing a Dynamic Airflow Solution

CGU Engineers implemented a strategy combining occupancy counters and airflow measurement devices at both schools. This approach allowed ventilation rates to be dynamically adjusted in real-time, ensuring optimal IAQ while minimizing energy consumption.

- Occupancy Counters: Installed at entrances to classrooms and gyms, these devices provided real-time data on the number of occupants in each space.
- Airflow Measurement Stations: These stations allow precise control over ventilation rates and limit the minimum and maximum ventilation required for IAQ and energy efficiency.

In gymnasiums, where occupancy could shift from a handful of individuals to hundreds during events, this system was particularly effective. By integrating the solution with the building automation system (BAS), the HVAC system automatically adjusts ventilation and temperature based on occupancy.

"The integration of EBTRON's occupancy counters and airflow measurement devices allowed us to create a system that dynamically adjusts ventilation based on real-time occupancy," said Robert Utley, Principal at Castagnos Goodwin Utley Engineers. "This approach ensured compliance with ASHRAE standards while significantly reducing energy consumption. It was particularly impactful in areas like gymnasiums, where occupancy levels fluctuate dramatically, enabling us to maintain comfort and air quality without unnecessary energy costs."

Key Results

South Lafourche High School

- Installed 54 occupancy counters across classrooms and shared spaces.
- Adjusted ventilation rates dynamically, ensuring no under- or over-ventilation while reducing energy waste.
- Conducted annual system accuracy checks to maintain performance.

Thibodaux Middle School

- Installed eight occupancy counters in key areas, including the gymnasium.
- The gym now adjusts ventilation based on real-time occupancy, efficiently accommodating fluctuations from a few students to the entire school population.
- Additional energy savings were achieved through a Variable Refrigerant Flow (VRF) system.

Thermal Imaging Occupancy Counter.
© EBTRON

High Sensor Density Multipoint Airflow and Temperature Measurement Monitoring Device. © EBTRON

The Benefits of Real-Time Ventilation

Utilizing occupancy counters in South Lafourche and Thibodaux schools demonstrated the importance of integrating real-time data into ventilation strategies. Relying on CO_2-DCV without real-time measurement of airflow or a fixed ventilation rate leads to potential IAQ problems or wasting energy in spaces with unpredictable occupancy. Combining occupancy counting with precise airflow measurement ensured both schools could:

- Provide adequate ventilation for health and comfort
- Avoid the cost of over-conditioning outside air
- Maintain compliance with IAQ standards

By tailoring ventilation to actual occupancy in real-time, buildings can achieve significant energy savings without compromising air quality or occupant comfort. Airflow measurement devices and occupancy counters helped both schools become more sustainable by ensuring the health of students and staff and validating compliance with ASHRAE standards.

Broader Applications

This case illustrates the use of counting people for demand control ventilation and climate control. However, these counters could also be used for traffic counting in restrooms and dining areas, especially within the education, restaurants, and nursing home central areas for people counting and cleaning optimization. In addition to controlling proper ventilation, real-time data can be used to schedule cleaning staff efficiently, thereby minimizing labor costs while maintaining high standards.

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University Custom Demand-Response

The Grand Canyon University campus in Phoenix, Arizona. © Grand Canyon University

BACnet compatibility and system flexibility facilitated application integration

Partner: Grand Canyon University, 3300 W Camelback Rd, Phoenix, AZ 85017
Technology: Tridium N4, S4 BACnet Ecobee Integration, GCU Developed Demand-Response application, Ecobee thermostats, Distech controllers, Carrier controllers, Mitsubishi controllers
Customer: GCU self-supported integration and development
Project Size: 250 Ecobee thermostats

About the Customer

Grand Canyon College was chartered on August 1, 1949, with 16 faculty and approximately 100 students in Prescott, Arizona. In 1951, the college relocated to a 90-acre tract in West Phoenix. In May 1984, college trustees voted to prepare for a transition to university status for the school's 40th Anniversary.

The university grew its campus student body from fewer than 1,000 students in 2009 to over 25,300 campus students in 2022. GCU's non-traditional student body increased from approximately 22,000 students at the start of 2009 to over 86,000 online and evening cohort students in Fall 2022. In Fall 2023, GCU had over 77,000 bachelor's-level students, over 35,700 master's-level students, and over 5,400 doctoral-level students.

To support this vigorous growth, the university invested over 1.7 billion dollars in full-time faculty, improved technology infrastructure, new facilities, and programmatic expansion in areas such as engineering, computer science, and IT. The university has been able to self-fund these investments with only nominal increases in tuition for non-traditional students, all while not increasing campus tuition in 15 years. This continuous growth is expanding the need for proactive facility management services, a move towards embracing smart building technologies, and associated energy management initiatives.

Customer Requirements

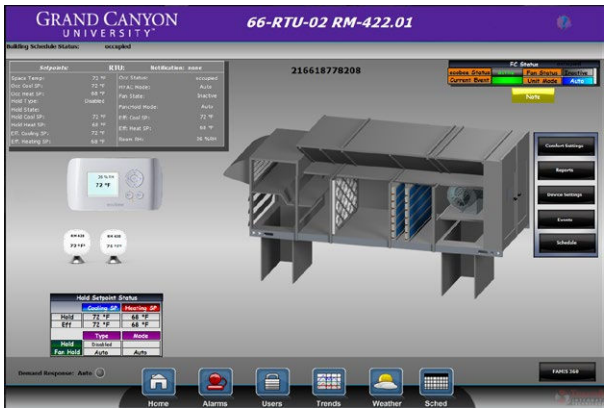
GCU previously invested in installing Ecobee WiFi thermostats in many of their commercial and administrative buildings. As a result, they experienced greatly improved energy efficiency and end-user acceptance of the technology. The installed base of Ecobee thermostats of various models is currently at 250.

- The Ecobee thermostats were accepted by the end users for their aesthetics and functionality.
- The Ecobee thermostats provided effective control of the mechanical equipment they were connected to.
- The Ecobee SmartBuildings Portal was part of the campus environment and operational procedures, but its capabilities needed to be expanded.
- Campus buildings were instrumented with BAS control technology from different manufacturers. The campus-level solution must accommodate the unique needs of each building environment.
- They needed a unified user interface and campus control logic. Integration into the existing Tridium BAS was mandatory.
- One of the main driving factors was the need to implement a customized demand-response algorithm reflecting the greatly varied uses of GCU buildings and the temperature extremes in the Phoenix region.

Overall Solution

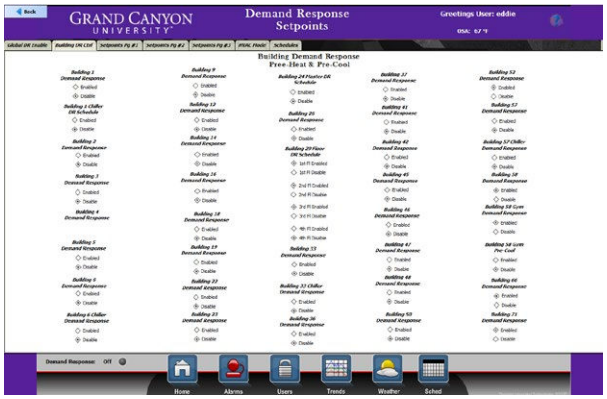
GCU committed to using Ecobee WiFi thermostats a long time ago. They were also making substantial use of the Ecobee SmartBuildings portal. The university was looking to expand on this early success by using thermostats designed for the light commercial marketplace in this large university campus. They now wanted to go to the next level.

- GCU wanted a unified BAS user interface and system level control environment based on Tridium for their Ecobee, Distech, Mitsubishi, and Carrier systems.



Ecobee thermostat and sensors displayed in the RTU.
© Grand Canyon University

GCU's custom demand response application, global view.
© Grand Canyon University



Another look at GCU's custom demand response application, building view.
© Grand Canyon University

- GCU wanted to implement a customized demand-response algorithm that reflects the uniqueness of the GCU campus, existing infrastructure, and the varied usage of campus buildings.
- GCU was looking for technology to help them achieve these expanded needs.

When S4 Integration Solutions (S4IS) approached GCU about being the Beta test site for our S4 BACnet Ecobee Integration, it was a perfect opportunity to address the above needs with minimal risk and minimal disruption to current operations.

GCU Developed Demand-Response Application

GCU Energy Management / Controls Office developed their unique demand-response application within the Tridium environment. It includes the following features, many of which go beyond what commercially available demand-response applications could offer.

- The application's graphical user interface is standardized. The details unique to each building's infrastructure are handled by application logic.
- The application is integrated into the Tridium BAS calendaring system. Demand-response events can be scheduled in advance of the actual event.
- Depending on the severity of the event, actions can be scheduled on a global campus level or for individual buildings.
- Minor events result in a setback being applied to each area.
- Major events have the flexibility to completely shut down mechanical systems.
- When events are anticipated to be longer lasting, the algorithms implement pre-heating or pre-cooling to minimize the impact on occupant comfort.
- The S4 BACnet Ecobee Integration enabled the demand-response application to control spaces with Ecobee thermostats as if they were open BACnet technology.

Beta Test Site Selection

GCU provided a unique and almost perfect environment for a Beta test site:

- A large installed base of Ecobee WiFi Thermostats
- An academic environment supportive of experimentation and learning
- The ability to start out simply and expand the integration as confidence improved
- In-house technical skills and flexibility to work closely with S4IS during the Beta test
- A clear intention of making the Beta test successful and moving to a production environment

The Integration Process

The integration process was very intuitive. S4IS delivered the S4 BACnet Ecobee Integration product hosted on an industrial PC. Installation and setup were orchestrated by the S4IS Setup Wizard. The wizard requested the Ecobee SmartBuildings credentials for GCU, and presented the default properties for the system, TCP/IP, Ecobee, and BACnet/IP with the ability to customize those properties to meet the project requirements. When

the wizard completed, each building and thermostat in the GCU Ecobee SmartBuildings service was published as a local BACnet/IP device. Bringing these devices into Tridium was straightforward using standard device discovery capabilities.\

Success

All 250 Ecobee thermostats are now integrated into the GCU Tridium BAS environment which provides uniform access to all BACnet devices on campus. The custom demand-response algorithm has been developed in Tridium and is being rolled out to all buildings on campus incrementally.

The overall value received from the S4IS solution included a reduction in operations and training costs due to having a unified interface and procedures. The custom demand-response algorithm provides maximum cost savings when the utility requests demand reduction actions while minimizing the impact to student and administration comfort.

During the Beta test process, we discovered that Tridium applications liked to work with the BACnet priority array in a unique way. S4IS adjusted our product to accommodate this unique situation.

About Grand Canyon University Facility Operations

James Kossler, Vice President Facilities Planning & Organization, oversees campus development, facility management and construction, environmental health and safety, transportation and emergency management. The Energy Management/Controls office within Facilities Planning and Organization is responsible for deployment and support of all HVAC technology, associated controls, and value-added applications. For more information, contact Eddie Gazzaniga, Office Phone (602) 639-8339, email edmund.gazzaniga@gcu.edu

About S4 Integration Solutions

S4 Integration Solutions provides the enabling gateway technology to upgrade and/or transition legacy or proprietary building automation systems in commercial buildings (including multifamily housing and multitenant facilities) to BACnet-based smart building technologies, including the introduction of 3rd party value-added applications like demand-response, analytics, energy management, and fault detection and diagnostics (FDD) to meet customer requirements.

To discuss your integration project with S4 Integration Solutions, contact Steve at sejones@s4integrationsolutions.com or call (801) 621-1970.

S4 INTEGRATION SOLUTIONS

S4 Integration Solutions
sejones@s4integrationsolutions.com
www.s4integrationsolutions.com

New Cybersecurity Course now available on The BACnet Institute (TBI)

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THE BACnet INSTITUTE

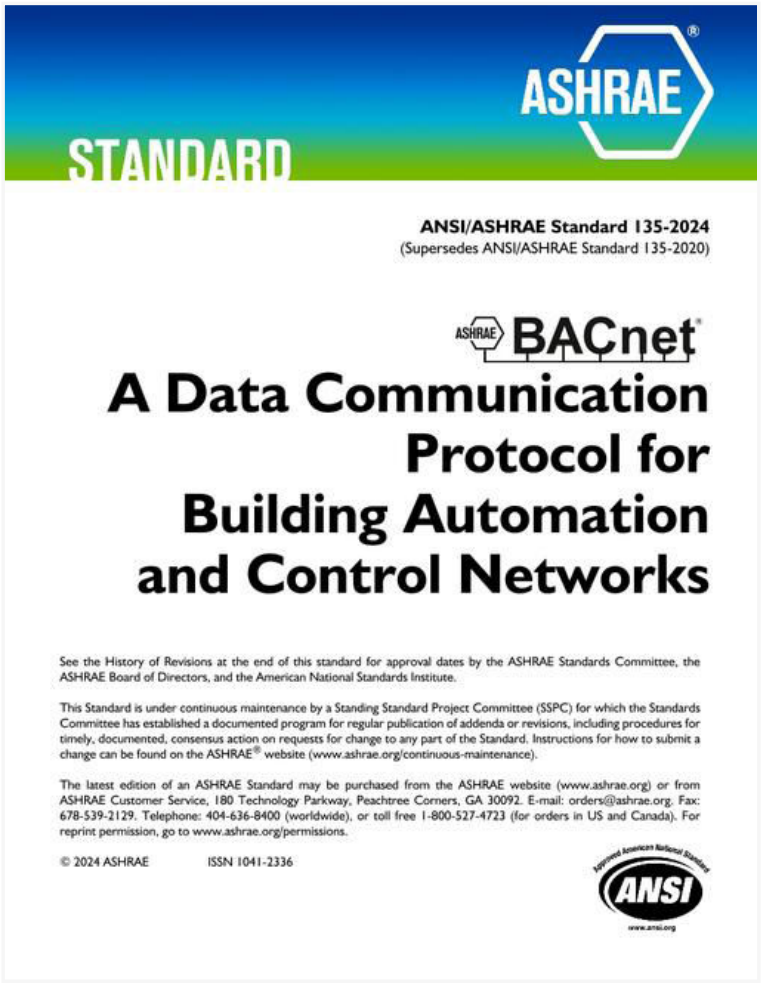
Courses • Resources • Community

The BACnet Institute (TBI) is pleased to announce that BACnet Cybersecurity has been added as its newest course option for BACnet learners. The BACnet Cybersecurity course provides an overview of BACnet Secure Connect (BACnet/SC), focusing on its significance in enhancing the security of interoperable building automation systems. Participants will gain an understanding of how BACnet/SC differs from existing security measures, its technical aspects, and its interaction with other BACnet devices. This course also addresses the cybersecurity challenges and future strategies for improving BACnet security. This course also places BACnet/SC in the context of the larger building automation cybersecurity landscape.

TBI is an online learning environment that serves as a central source for globally relevant information and education related to Building Automation System implementation. It offers a wide breadth of FREE resources in different languages and levels of expertise for key professionals within the buildings industry. These resources not only cover the basics of a BACnet-base system, but topics such as interoperability, devices, specifying, networking, and security. While registration to TBI is required, it is free for all users.

For more information on The BACnet Institute, visit https://thebacnetinstitute.org/

SSPC 135 Committee Updates


STANDARD

ANSI/ASHRAE Standard 135-2024
(Supersedes ANSI/ASHRAE Standard 135-2020)

BACnet

A Data Communication Protocol for Building Automation and Control Networks

See the History of Revisions at the end of this standard for approval dates by the ASHRAE Standards Committee, the ASHRAE Board of Directors, and the American National Standards Institute.

This Standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the Standard. Instructions for how to submit a change can be found on the ASHRAE® website (www.ashrae.org/continuous-maintenance).

The latest edition of an ASHRAE Standard may be purchased from the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 180 Technology Parkway, Peachtree Corners, GA 30092. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

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Coleman Brumley, Chair of ASHRAE SSPC 135 (BACnet Committee).

What's new in BACnet 135-2024?

Staying true to the 4-year publication cycle, ANSI/ASHRAE 135-2024 (aka the BACnet standard) was published at the end of 2024 and is now available for purchase from ASHRAE. The 135-2024 content spans several addenda to ANSI/ASHRAE 135-2020 as well as various included errata. Specifically, 135-2024 includes 17 addenda to 135-2020 and changes the protocol revision to 30. The addenda covers several key concepts, including BACnet/SC, Authentication and Authorization, Color and Lighting, Network Port Object Improvements, Device Proxying, and an Energy Services Interface.

In addition, the following addenda are available for public review. Stakeholders can access the review materials on the ASHRAE Standards Addenda site.

Addendum 135-2024ct

Addendum 135-2024ct introduces the BACnet Resource Description Framework (RDF), a standardized approach to structuring BACnet content for seamless exchange with Semantic Systems. Known as “BACtology”, this framework introduces the ability to structure BACnet content in consistent formats like RDF triples, which is enabling technology that supports integration with advanced applications like digital twins and analytics engines.

Addendum 135-2024cu

This addendum marks a advancement in BACnet technology with the introduction of a new device class: the BACnet Directory Server. Additionally, it establishes standardized mechanisms for querying these servers to identify devices and objects available on a BACnet network.

For more information on the BACnet Committee and Standard, visit www.bacnet.org.

New to the BACnet International Community

Member of BACnet International

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.

Silver to Gold Member

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Samsung SDS offers cloud based digital transformation service with distinguished cloud technology and rich experience in various industries. We are recognized by global consultants such as Gartner, IDC and Frost & Sullivan in their lists of Managed Cloud Services, Cloud Security and AI Industry as cloud service specialized company supporting digital innovation of clients.

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Learn more about membership opportunities with BACnet International.

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Socomec

Founded in 1922, Socomec is an industrial group with a workforce of 4,200 people. Our core business – the availability, control and safety of low voltage electrical networks with increased focus on our customers' power performance. In 2023, SOCOMEC achieved a turnover of $906 million.

1 rue Westhouse
Benfeld, 67230
France
www.socomec.com

Hong Kong Productivity Council

The Hong Kong Productivity Council (HKPC) is a multi-disciplinary organization established by statute in 1967 to promote productivity excellence through the relentless drive for world-class advanced technologies and innovative service offerings to support Hong Kong enterprises. As a nationwide leader in innovative, market-driven research and development (R&D) internationally, specializing in leading technologies and all-rounded manufacturing services, HKPC promotes new industrialization in Hong Kong and the Greater Bay Area and facilitates the development of new productive forces, leveraging innovation and technology (I&T), as well as bolstering Hong Kong to be an international innovation and technology center and a smart city.

HKPC Building
78 Tat Chee Avenue
Kowloon
Hong Kong
www.hkpc.org

Techcon

21F-23F, Tower A
Tsinghua Tongfang Hi-tech Plaza No. 1
100083, Beijing
China
www.technovator.cn

Expand your BACnet Knowledge

THE BACnet INSTITUTE

Courses • Resources • Community

ACCREDITED IACET PROVIDER

The BACnet Institute (TBI) continues to grow. There are now over 13,000 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 215 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.
- NEW! BACnet Cybersecurity - provides an overview of BACnet Secure Connect (BACnet/SC), focusing on its significance in enhancing the security of interoperable building automation systems.

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.

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.

BTL Test Package 26.0

The current BTL Test Package is 26.0. This test package includes testing up through Protocol Revision 26 of the BACnet standard (ANSI/ASHRAE 135-2020 plus addenda: cd)

BTL Test Package 26.0 includes testing up through BACnet Protocol Revision 26. 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 23 or less may test with either Test Package 26.0 or with BTL Test Package 23.3-v2. Products claiming Protocol_Revision 24 or greater must test with BTL Test Package 26.0. The Transition Period will end April 30, 2025. All product entering BTL Testing as of May 1, 2025, 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

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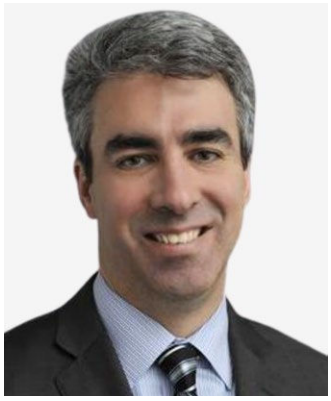

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Honeywell International

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Belimo

Robert Hemmerdinger
Delta Controls

Tim Skell
ABB

New BTL-Listed Products, October 1, 2024 - March 31, 2025

Manufacturer	Product Name	Model
Badger Meter	Dynasonics TFX-500w Flow Meter (BTL-31267)	Dynasonics TFX-500w Flow Meter (DW-)
Belimo	6-Way-EPIV (BTL-31295)	EP015R6+BAC, EP015R6+BAC-HH1, EP015R6+BAC-HH2, EP015R6+BAC-HHM, EP015R6+BAC-BNL, EP020R6+BAC, EP020R6+BAC-HH1, EP020R6+BAC-HH2, EP020R6+BAC-HHM, EP025R6+BAC, EP025R6+BAC-HH1, EP025R6+BAC-HH2, EP025R6+BAC-HHM, EP015R6V+BAC, EP020R6V+BAC, EP025R6V+BAC EP050P6+LRX-E, EP050P6+LRTX-E HH1, EP050P6+LRTX-E HH2, EP075P6+LRX-E, EP075P6+LRTX-E HH1, EP075P6+LRTX-E HH2, EP100P6+NRX-E, EP100P6+NRTX-E HH1, EP100P6+NRTX-E HH2
EnOcean	SmartServer-IoT (BTL-31306)	72201R-240, 72201R-248, 72220-A, 72220-P
Honeywell	Honeywell TC300 Thermostats (BTL-31296) Honeywell TR100 Wall Module (BTL-31300)	TC300B-G, TC300C-G, TC320B-G, TC320C-G, TC320C-N TR100-T-G, TR100-TH-G, TR100-THC-G
IMI Hydronic Engineering	TA-Smart I TA-Smart-Dp I TA-Smart Fail-Safe (31308)	322231-00015, 322231-00020, 322231-00025, 322231-00032, 322231-00040, 322231-00050, 322231-00115, 322231-00120, 322231-00125, 322231-00132, 322231-00140, 322231-00150, 322231-01265, 322231-01280, 322231-01290, 322231-01291, 322231-01292, 322231-01365, 322231-01380, 322231-01390, 322231-01391, 322231-01392, 322231-01465, 322231-01480, 322231-01490, 322231-01491, 322231-01492 322232-00015, 322232-00020, 322232-00025, 322232-00032, 322232-00040, 322232-00050 322232-01265, 322232-01280, 322232-01290, 322232-01291, 322232-01292, 322232-01365, 322232-01380, 322232-01390, 322232-01391, 322232-01392 322233-00015, 322233-00020, 322233-00025, 322233-00032, 322233-00040, 322233-00050, 322233-00115, 322233-00120, 322233-00125, 322233-00132, 322233-00140, 322233-00150, 322233-01265, 322233-01280, 322233-01290, 322233-01291, 322233-01292, 322233-01365, 322233-01380, 322233-01390, 322233-01391, 322233-01392, 322233-01465, 322233-01480, 322233-01490, 322233-01491, 322233-01492

Manufacturer	Product Name	Model
iSMA CONTROLLI S.p.A.	nano EDGE ENGINE series (31312)	RAC18-IP, VAV14-IP
Mircom Engineering	OpenBAS NX Series (BTL-31256) "	OpenBAS-HV-NX10P, OpenBAS-HV-NX10L, OpenBAS-HV-NX10D, OpenBAS-HV-NXSF, OpenBAS-HV-NXHALF, OpenBAS-HV-NXCORE, OpenBAS-HV-NX4AO, OpenBAS-HV-LEARN, OpenBAS-HV-NXVAVAP, OpenBAS-HV-NXVAVA, OpenBAS-HV-NXVAVP, OpenBAS-HV-NXVAVX, OpenBAS-LC-NX12R, OpenBAS-NWK-NXSMS
Quantum Automation	QA-iCON64-B-RTR/B-SCHUB (BTL-31293)	Application Software Version: 1.0 Firmware Revision: 1.08.00
Reliable Controls	RC-FLEXair-M® (BTL-31314)	RCFA-M-12-F, RCFA-M-12-A-F, RCFA-M-33-A, RCFA-M-33-A-F, RCFA-M-34-A, RCFA-M-34-A-F, RCFA-M-35-F, RCFA-M-36-F
Rockwell Automation	FieldBus Communication Option Device (BTL-31282)	20-750-USC-XT
Scheider Electric	SpaceLogic Living Space Room Unit (BTL-31305)	SLPBLC2, SLPBLCV2, LPBLCVX, SLPBLCX, SLPBLX2, SLPBLXX, SLPBTC2, SLPBTCV2, SLPBTCVX, SLPBTCX, SLPBTX2, SLPBTXX, SLPBXC2, SLPBXCV2, SLPBXCVX, SLPBXCX, SLPBXX2, SLPBXXX, SLPSLC2, SLPSLCV2, SLPSLCVX, SLPSLCX, SLPSLX2, SLPSLXX, SLPSTC2, SLPSTCV2, SLPSTCVX, SLPSTCX, SLPSTX2, SLPSTXX, SLPSXC2, SLPSXCV2, SLPSXCVX, LPSXCX, SLPSXX2, SLPSXXX, SLPWLC2, SLPWLCV2, SLPWLCVX, SLPWLCX,

Scheider Electric	SpaceLogic Living Space Room Unit (BTL-31305)	SLPWLX2, SLPWLXX, SLPWTC2, SLPWTCV2, SLPWTCVX, SLPWTCX, SLPWTX2, SSLPWTXX, SLPWXC2, SLPWXCV2, SLPWXCVX, SLPWXCX, SLPWXX2, SLPWXXX, SLPBTCVP2, SLPBXCVP2, SLPSTCVP2, SLPSXCVP2, SLPWTCVP2, SLPWXCVP2
	SpaceLogic™ Touchscreen Room Controller (BTL-31270)	SXWTRC3500B00X SXWTRC3500B00W SXWTRC3500B00WA SXWTRC3500B11X SXWTRC3500B11W SXWTRC3500B11WA SXWTRC6500B00X SXWTRC6500B00W SXWTRC6500B00WA SXWTRC6500B11X SXWTRC6500B11W SXWTRC6500B11WA
	EcoStruxure Fire Operation (BTL-31284)	ES, FDP221, FDP252, FDP292
Signify	Philips Dynalite Ethernet Gateway – Supervisor (BTL-31285)	PDDEG-S
Wago	Controller PFC100 (BTL-31277)	750-8110, 750-8111, 750-8112, 750-8112/0025-0000
	Compact Controller 100 (BTL-31240)	751-9301, 751-9401
Wago	Touch Panel 600 (BTL-31241)	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
Xylem	Hydrovar X (BTL-31304)	HVX+, HVX

Calendar of BACnet International Events

2025	Event	Location
October 14th – 16th, 2025	PlugFest Interoperability Workshop	Durham, New Hampshire

Journal of Building Automation 27

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

The Journal of Building Automation is posted to www.bacnetinternational.org and distributed to all members.

Editor

TEMA Technologie Marketing AG

Hans Symanczik

Responsible according to the press law

Burtscheider Markt 24

52066 Aachen, Germany

Phone: +49-172 4160537 | Fax: +49-241 92780-890

URL: www.bacnetjournal.org

Publisher

BACnet International
2900 Delk Road
Suite 700, PMB 321
Marietta, GA 30067
Phone: 770-971-6003 | Fax: 678-229-2777

info@bacnetinternational.org

Advertising
TEMA Technologie Marketing AG
Phone: +49-241-88970-801 | Fax: +49-241-92780-890
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