

BACnet Middle East



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BACnet is ISO 16484-5. The most successful communication standard in building automation has a global market coverage of 64%. Source: BSRIA 2021

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Cooling the Future – Efficiency and Security Go Hand in Hand

In the Middle East, cooling is not a luxury – it's a necessity. District cooling systems make cities livable and businesses possible, but they also consume enormous amounts of energy. That's why the region has become a global frontrunner in efficient cooling technologies. Yet true efficiency goes beyond saving energy – it's about protecting it.

The more connected our systems become, the more we rely on secure communication between every sensor, controller and management platform. A single manipulated value can disrupt an entire optimization chain. The challenge is clear: only when automation networks are both efficient and secure can they deliver sustainable results.

This is exactly where BACnet/SC (Secure Connect) comes into play. By integrating IT security directly into building automation, it ensures that the data driving our energy systems remains authentic, encrypted and trustworthy. In district cooling networks, hospitals or data centers, this protection makes all the difference – keeping comfort stable and operations reliable.

Energy efficiency and cybersecurity are no longer separate goals. They are two sides of the same coin. With BACnet/SC, the BACnet community offers the technology and expertise to achieve both – enabling the Middle East to lead the way towards a future where cooling means comfort, stability and sustainability.

Tobias Plath

MBS GmbH, Member of the Board of
Directors of BACnet Interest Group Europe
Convener Marketing Working Group



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Smarter Airports with Battery-Free Wireless Sensors

Bridging BACnet and Wireless EnOcean Technology

Airports are complex infrastructures where facility managers face significant challenges in maintaining high levels of passenger comfort while keeping energy use in check. Varying occupancy patterns across terminal zones – gates, lounges, baggage claim – require flexible, real-time environmental data to support optimal HVAC and lighting. Battery-free wireless sensors, integrated with BACnet-based building automation systems, provide an efficient, scalable solution for these challenges.

Scalable Sensing for Smart Terminals

Continuous monitoring of indoor environmental quality demands extensive sensor deployment – particularly across high-traffic public buildings like airport terminals. A conventional approach using wired or battery-powered sensors becomes cost-prohibitive due to installation labor and maintenance needs.

For example, Heathrow's four main terminals span over 540,000 m². Ensuring comfort and air quality in such a space requires dense sensor coverage – typically one CO₂ sensor per 2500 m², plus temperature, humidity, illumination, and motion detection. Roughly 400 multi-sensor devices would be necessary, each traditionally involving either extensive wiring or periodic battery replacement.

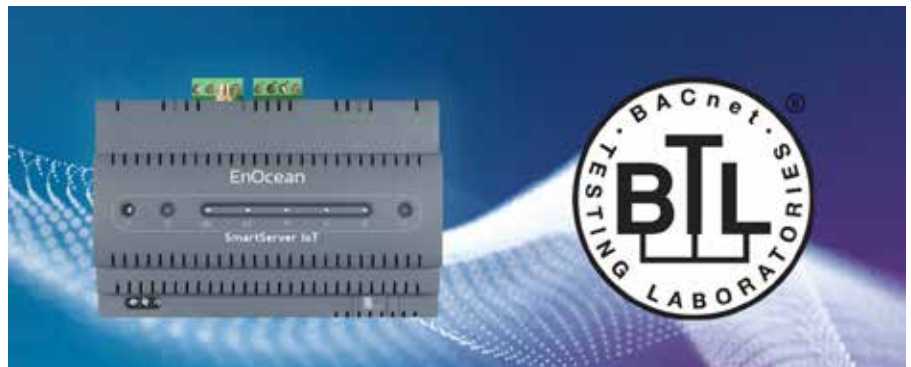
To address this challenge, multi-functional, battery-free wireless sensors powered by ambient energy sources offer a compelling alternative. With a pair of devices providing integrated temperature, humidity, CO₂, light, and occupancy detection, each pair minimizes the number of units needed while maximizing data coverage.

Energy Harvesting: No Wires, no Batteries

These sensors use indoor solar cells to harvest energy from ambient light enabling permanent operation without external power or batteries. Data transmission is wireless and can be easily integrated with BACnet-based systems, ensuring seamless integration into existing building management frameworks.



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SmartServer IoT © EnOcean

Installation becomes dramatically simplified: sensors can be adhered directly to walls or ceilings, eliminating the need for wires or battery maintenance. The result is a future-proof sensor infrastructure that is highly adaptable to spatial reconfigurations or operational shifts – ideal for dynamic environments like airports.

Integrating with the BACnet Network

The EnOcean SmartServer IoT integrates battery-free sensor data into the existing BACnet building management system. Each sensor appears as a digital twin with location and key values like CO₂, temperature, and humidity. These BACnet objects behave just like those from wired devices,

making integration seamless. The SmartServer also supports semantic tagging with standards like Project Haystack or Brick Schema to simplify use in analytics and optimization tools.

Conclusion

Battery-free wireless sensors represent a transformative technology for large-scale facilities. By harnessing energy harvesting and BACnet integration, airports can significantly improve passenger comfort while achieving demonstrable energy savings. These next-generation sensing technologies will play a critical role in making airports smarter and greener spaces.



Rich Blomseth

Director of Product Management at EnOcean
www.enocean.com

EnOcean
 Sustainable IoT

Energy Management and Building Automation at the University of Rostock with Qanteon

The University of Rostock covers all areas of a comprehensive university with its range of subjects and, with over 160 buildings and building complexes, has numerous special features, particularly in teaching and research. The University of Rostock relies consistently on comprehensive building automation to ensure the safe operation of its buildings and associated infrastructure.

In addition to modern measurement, control, and regulation technology at the field level, this includes DDC controllers at the automation level and a powerful management level. Among other things, with the BACnet Advanced Operator Workstation Qanteon from Kieback&Peter. Qanteon is an innovative software solution that enables classic building automation with integrated energy management to operate all properties efficiently, reliably, and above all safely and transparently.

Building Automation for a Wide Range of Requirements

The requirements for building technology at the University of Rostock are very diverse:

- Event rooms must be prepared quickly and flexibly for conferences, presentations, and receptions.
- Lecture halls and seminar rooms require reliable and quiet air conditioning that adapts to changing occupancy. The focus here is not only on temperatures, but also on CO₂ levels in the auditorium.
- Laboratories require precise temperature, humidity, and air quality control to ensure safe and stable working conditions. The University of Rostock has a complex variety of S3 laboratories with airlocks and clean rooms for animal experiments, as well as a vibration-free laser testing laboratory.
- Administrative areas with continuous assurance and documentation of workplace guidelines.

The university's own data center poses a particular challenge. As a communications hub, high-performance computing cluster, and service provider for all areas of the university, 100% availability is essential. This requires not only highly trained personnel, but also special



Laboratory at the University of Rostock

expertise in building automation, among other things, to ensure safety-related conditions and automated processes in emergency operation.

Thanks to networked building automation, all these scenarios can be monitored and controlled centrally. The system reacts automatically to utilization, time of day, or outside temperature, ensuring that only as much energy is consumed as is actually necessary and that supply security is guaranteed at all times.

Qanteon as a Central Hub for Operations and Energy Management

Qanteon combines energy management and building automation in a single system. It automatically collects consumption and generation data for electricity, heating, cooling, and water via the BACnet protocol and visualizes it in a clearly structured interface.

The integrated analysis functions reveal potential savings and enable targeted optimizations. This has already resulted in noticeable energy savings in individual parts of the building – while maintaining a consistently high level of comfort.

In addition to the numerous analysis options, a special feature is the automatic creation of reports, e.g., in the form of invoices, and their automatic

dispatch. The University of Rostock uses this tool for the fully automated billing of co-supplied institutions, enabling immediate and transparent billing of material and media requirements.

Dashboard and benchmark views allow property users to be directly involved in the transparent and immediate analysis of "their" property's requirements. A friendly competition between users regarding the energy requirements of their buildings can be a positive side effect of the benchmarking process.

Support in Everyday Life – Stationary and Mobile

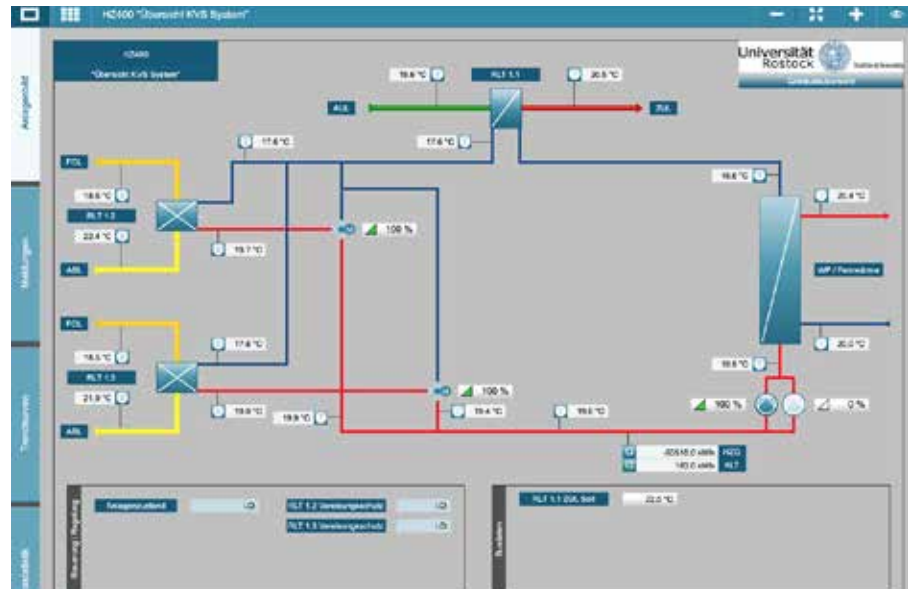
A particular advantage is the combination of stationary operation and the mobile Qanteon Readme app.

There are still meter reading areas that, even with modern infrastructure, can only be recorded manually due to low consumption values, unfavorable locations, or high investment costs. With the Readme app, we use house and building technicians to record meter readings directly on site, which are then automatically synchronized with the system. This saves time, reduces walking distances, and minimizes sources of error in manual (handwritten) recording.

Qanteon automatically reports deviations, peak loads, or critical values so that measures can be taken immediately. In addition, the system supports compliance with energy management standards such as ISO 50001 and provides all necessary evidence and key figures.

Conclusion

The long-standing collaboration between the University of Rostock and Kieback&Peter shows how classic building automation and modern energy management complement each other perfectly, how weak points are analyzed jointly, and how solutions are created that both serve the University of Rostock and advance Kieback&Peter's software development. A current example of this is the joint development of the integration of LoRaWAN components and the security strategy developed for this purpose. In the future, the University of Rostock will continue to do everything in its power to ensure



intelligent control systems for teaching and research, to guarantee high security standards in data communication and processing, and at the same time to present energy costs transparently and reduce energy consumption wherever possible.

Building management technology is at the heart of property management and is subject to constant change and external influences. As the University of Rostock, it is therefore a constant challenge for us to help shape and develop these systems.



Exterior view of Rostock University – new and old main buildings

© all pictures: Peter Wickboldt



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Office and Manufacturing Facility, Energy Efficiency through Automation



© ABB

As demand for increased energy efficiency and modernization has ramped up in the HVACR industry, manufacturers of HVACR equipment or components must also expand their capacity to keep up with that demand. While having outgrown their existing manufacturing facilities, the new 270,000 square foot ABB variable frequency drives (VFDs) factory in New Berlin, WI looked to increase production output through improving manufacturing efficiency. This brand new facility includes advancements on the production floor in automation with smart-tools and robotics, as well as office space, training rooms, and research labs. With this variety of building environments, the design of the HVACR system focuses on many aspects used to reduce energy consumption and maintain occupant comfort.

Building Construction and HVACR System

The previous office space and factory were used to showcase various HVACR equipment and drives controlled with a building automation system over BACnet. The decision was made to invest in a new facility and location that could accommodate current demands and be capable of supporting future growth. The new facility is also meant to be a showcase for HVACR equipment, operations and integration, so presentation and open access to visitors was at the forefront of the system layout.

With new construction comes innovative opportunities as well as overcoming challenges. The

building started as a common, tilt-up construction style warehouse. After the shell was complete, phase 1 started with the 2-story office area, training rooms and lab spaces built inside. Phase 2 was primarily the production and manufacturing space in the same shell building as well as connecting to an adjacent warehouse. Finally, phase 3 included research and development testing labs, services and medium voltage manufacturing all within the same structure.

The office space includes a separate HVACR system from the production and R&D areas. The office space central plant includes the following equipment:

- WaterFurnace 6-pipe, ground-sourced chiller with 150 tons of capacity
- Chilled water, hot water and condenser water loops with N+1 redundant Taco pumps
- Nortek (Ventrol) air handling unit with 12 fan array designed for 60,000 CFM
- Building pressure relief fans with Baldor EC Titanium and Super-E motors
- All fans and pumps are controlled with variable frequency drives, including ACH580, ACH180 and integrated motor drive EC Titanium.

The manufacturing production area has a separate HVACR system from the office area as well as R&D. For the factory space, 12 AAON rooftop units are spread over the area of the building to serve a variety of production lines. Each unit is individually controlled and operating to its own space temperature. All the RTUs are DX cooling coils, 2-stage compressors, electric heat and outdoor air economizing following the

same electrification focus as the office HVACR system.

Finally, the R&D area includes office space as well as labs and testing chambers. The HVACR system in this area is separate but similar to the main office area and uses the same equipment (chiller, AHUs, pumps, RTUs) as the rest of the building but scaled down for the smaller area. This system allows R&D teams to not only have an isolated environment but also to apply and test future releases of both hardware or software in real-world conditions on active equipment.

The 6-pipe chillers are capable of simultaneously cooling and heating by supplying chilled water and hot water to either the air handlers, the VAV boxes for reheat, or to the geothermal field. This 6600-gallon geo-exchange system allows the heat removed from the chilled water to be used for heat recovery or stored in the geo-loop rather than rejected to the outdoor atmosphere. During the Wisconsin winter months, the chilled water is sent to the geo-loop and draws heat back out of the ground. By storing heat energy rather than rejecting to the atmosphere, ABB reduces energy consumption in the heating months by not burning fossil fuels or using electric heat.

One air handling unit provides air to the office areas and lab spaces. This AHU utilizes 12 fans with IE5+ ultra premium efficiency EC Titanium motors each with their own VFD. Redundancy and efficiency were paired in this design and the drives' user control panel features were utilized during the system commissioning. After taking occupancy for phase 1, many employees mentioned audible noise from the air vents. Not having full access to the building automation system yet, ABB set out to use the VFDs' control panel interface to understand what was happening. By using data in the drives, presented as a graphical trend on the control panel, ABB identified that the fans were shutting off and turning back on then ramping up to recover the duct static pressure. It was discovered the Start Command from the BAS was intermittently dropping out due to a loose wire. During troubleshooting, the team discovered that the Start Command digital input as well as the Status feedback relay output on all 12 VFDs were each run as a series loop back to the AHU controller. When one or more loose wires were discovered on the status outputs, this was the cause of the



BAS stopping and starting the fans. Providing this information to the controls contractor, they were able to revise the programming and use the BACnet point BVO running status for each drive status, providing a better design of the fan array.

Finally, to help offset the electrical demands of the facility, 332 kW of solar panels are also installed on the building roof. After the first year of operation, the solar system generated 413 MWh of power for the facility, saving approximately 640,000 pounds of CO₂. Through the integration of the BAS, a future phase of the project will combine data from the integrated power meters with the power factor correction capabilities of active front end drives to further improve building energy efficiency.

Redundant Equipment Benefits

The office area central plant design includes N+1 pumps programmed from the BAS to rotate operation and provide redundancy in case of any failure or planned down time for maintenance. To further take advantage of this design, ABB's R&D group can test new firmware versions in a live system before release. For example, when a new addition to the BACnet/IP fieldbus adapter was ready, the adapter was applied to drives in the mechanical room for real world verification and testing, before making it available to the

public. In a case like this, ABB confirmed the new firmware did not negatively impact the network and existing devices as well as working with the BAS to discover the new BACnet/IP points and confirm they were reading as expected.

BACnet/IP Connectivity

Tying together all the HVACR equipment, lighting controls, monitoring and alarms is the ABB Smart Buildings INTEGRA building automation system connected to each piece of equipment over BACnet/IP. Ring topology was implemented looping around the building from the supervisor panel through the chiller plant and AHU, to the VAV boxes and terminal controllers, out to the production area RTUs as well as the R&D space. While the final design may work with many devices all interconnected, this topology leads to difficulties during the phased construction.

For example, with two links of the BACnet/IP cabling leaving the supervisor's rapid spanning tree protocol ethernet switch, the phase 3 R&D area was incomplete with devices not installed closing the link in the ring. Several production area RTUs have needed additional commissioning and when these units have been shut down, many other devices go offline as well. While this may be common during the construction process, phase 2 included ramping up manufacturing production. It was becoming more critical for the HVACR equipment to be online, not only for occupancy but also production quality control.

As a lesson learned on the project, an ideal opportunity for BACnet/IP and a phased construction would have been to implement several network rings. Each phased construction

HVACR system is isolated by the area it serves. Phase 1 could have had its own BACnet/IP ring, phase 2 its own as well as phase 3. As each area had been completed, all devices could have been discovered and commissioned with the redundancy of the BACnet/IP ring. As the following phases were added, each would have its own ring to connect to the supervisor. As issues arise from the construction or commissioning process, only areas involved would have been exposed, leaving the existing networks unaffected.

While it is inconvenient for the facilities team working to understand where issues are to trace down with the single ring network, the advantages of the multiple BACnet/IP ring topology could have been leveraged to make the system more robust during construction, commissioning and possibly future expansions.

Building Analytics

With the focus on energy and operational efficiency, the building's design roadmap is to showcase and leverage analytics to continuously optimize the building's performance. Using the BAS and equipment communicating over BACnet/IP, the monitoring data, trends, active setpoints, energy consumption and more is continuously collected to understand how the building is operating. From the chiller's geo-loop energy meter, to the building's electrical power meters, energy data available from the VFDs, the lighting system occupancy sensors, the VAV zone temperature sensors and the rooftop solar energy being produced, the information will be used to adjust temperature or pressure setpoints and occupancy schedules to reduce energy needs without negatively impacting office space comfort or production area requirements.

This new building was designed to accommodate ABB's current needs and future growth, as the products manufactured in this facility support the HVACR industry's demand for efficiency and sustainability. From the flexible workspaces in the offices, the adaptable production area utilizing advancements in automation, and the efficient HVACR systems with BACnet integration, the building meets today's demand while being flexible to tackle tomorrow's challenges.

ABOUT THE AUTHOR

Starting with ABB in 2022, I have been working in the HVAC industry since 2015. My background has been HVAC equipment and Building Automation System design, programming, implementation, startup, commissioning, training and support. With ABB, I am an HVACR Application Engineer and I support our Channel Partners with complex drive applications and answer questions assisting with variable frequency drives in the HVACR market.



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Technical Monitoring – The Key to Digital Energy Efficiency

From regulatory requirement to intelligent building optimization

In today's world, energy efficiency is no longer just a cost factor – it has become a core component of sustainable corporate strategy. As a result, building owners and planners are increasingly turning their attention to comprehensive monitoring solutions. evon is currently developing a powerful, standards-compliant, and fully integrated solution for technical monitoring of building systems – designed to seamlessly integrate with its established building management system and meet current regulatory requirements. The solution is in the final stages of development and testing and will soon become part of evon's product portfolio.

Legislation as a Driver of Innovation

Across Europe, regulatory requirements for buildings and technical systems are becoming increasingly stringent. Leading the charge is the European Union's Energy Performance of Buildings Directive (EPBD 2024), which must be implemented by all member states by May 2026. Its goal: a digitally enabled, energy-efficient building operation through mandatory monitoring and control systems. On the national level, the pressure is also growing. Germany's

new Energy Efficiency Act, the VDI Guideline 6041 on technical monitoring in facility management, and the AMEV Recommendation No. 178 all set clear expectations for quality assurance and performance tracking throughout the building lifecycle – from planning and construction to ongoing operation. The result: building owners, planners, and integrators are actively seeking solutions that not only meet regulatory requirements but also deliver tangible added value.

Monitoring with Substance and Purpose

evon pursues a consistently integrated approach with its Technical Monitoring solution, which can be seamlessly embedded into existing Building Management Systems (BMS). Visualization, alarm management, dashboarding, automated trend analyses, and legally compliant documentation are comprehensively covered by a standardized library.

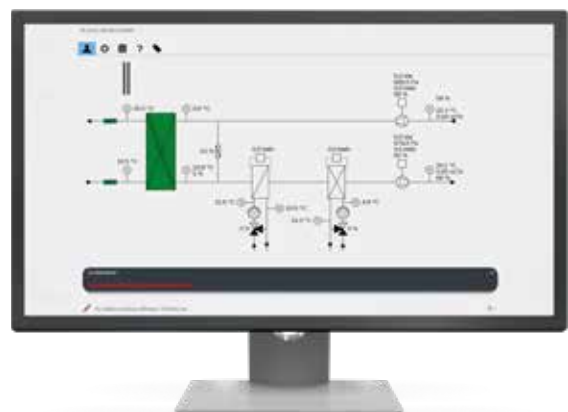
evon does not view Technical Monitoring as a bureaucratic obligation, but rather as an intelligent tool to increase operational transparency, sustainably optimize energy consumption, and reduce operating costs in the long term. Continuous data analysis enables early detection of inefficiencies and faulty system behavior. Energy and operational data can be

evaluated automatically, with a standardized interface structure ensuring a consistent and comparable data basis.

Unlike conventional solutions that implement technical monitoring as a separate solution and only access data from the building automation system via external interfaces, evon's monitoring is fully integrated into the central building management system. This eliminates media discontinuities, providing unrestricted access to all relevant data and functions. As a result, data acquisition, analysis, and visualization are consolidated within a single platform, ensuring maximum transparency, high efficiency, and intuitive operation.

ABOUT THE AUTHOR

evon is an Austrian software company based in St. Ruprecht an der Raab. For over 15 years, evon has been developing manufacturer-independent, hardware-neutral, and user-friendly automation software for building automation, industry, and traffic management. As part of the SPIE group of companies, evon combines local innovation with global expertise and long-term stability. True to its motto: "We increase your success – because we live and breathe digitalisation."



Screenshot from evon's technical monitoring
© evon GmbH

BACnet & BACnet Secure – Communication Standards Built for the Future

evon's technical monitoring offers full support for the BACnet protocol and complies with all specifications of the BACnet/SC Secure Connect standard. By integrating BACnet/SC, the system enables secure, encrypted, and reliable communication – a critical requirement for use in safety-sensitive and highly connected infrastructures. This ensures the solution is fully aligned with both current and future needs in smart building automation.

As a certified BACnet Advanced Operator Workstation (B-AWS), the solution meets all normative requirements, ensuring cross-vendor interoperability, standards compliance, and long-term investment security.

From Obligation to Opportunity: Monitoring as a Strategic Investment

evon's technical monitoring solution clearly demonstrates that what begins as a regulatory obligation can evolve into a valuable strategic asset – for operators, investors, and planners alike.

With high-quality, continuously analyzed operational data, new opportunities emerge

for predictive maintenance, resource-efficient operation, and the achievement of ambitious sustainability goals.

Learn more about the upcoming features and wide-ranging applications of evon's technical monitoring system.



Hartmut Henzler

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KMG Clinics: Centralization and Modernization of Building Automation Based on BACnet/SC – A Project with Vision



Aerial view of KMG Clinic Güstrow © KMG Clinics

With the goal of establishing future-proof, centrally controlled building automation, KMG Clinics launched an extensive digitization and modernization project in 2020, which is expected to be completed by 2026.

The hospital group operates six hospitals and several rehabilitation facilities in Germany, including locations in Güstrow, Sonderhausen, Plau am See, Luckenwalde, and Wittstock (Dosse), which have already been successfully modernized.

Focus on Security of Supply and Integration

A particular challenge was to modernize the existing systems while the clinics remained in operation – without compromising the essential functionality of critical infrastructure such as fire alarm systems or safety-related building

management technology. Thanks to our BACnet-based building management software enteliWEB, we were able to seamlessly integrate a wide variety of existing systems.

Our manufacturer-independent solution enables central monitoring and control of all systems, regardless of their origin. With our comprehensive platform and integrative software functions, we were able to offer decisive advantages. The user-friendly interface and integrated energy management functions were particularly appreciated.

Support from Top Management

From the outset, the project was actively supported by the management of KMG Clinics – not least in order to achieve the ambitious company-wide climate targets. The consistent implementation of the central strategy, together with reliable project partners such as SI-Building Automation

GmbH and EliteBuildingArchiTec Germany GmbH, enabled a rapid return on investment and led to significant savings in energy consumption and a measurable reduction in CO₂ emissions.

Holistic Approach for Maximum Efficiency

The project focused on a holistic system approach: Building automation was consistently networked with IT structures to achieve maximum efficiency and transparency. In the course of this, outdated systems – some of which were over 30 years old – were replaced, central functions were standardized, and new components were implemented to enable predictive maintenance. Our modular product family proved to be a key tool for sustainable modernization, as it offers maximum compatibility and scalability for both retrofit projects and new installations. This enables the clinics to respond flexibly to future requirements in the areas of energy efficiency and regulatory compliance.

Inventory as the Key to Success

One of the biggest challenges was the detailed recording and analysis of the existing systems. Due to missing or outdated documentation, it was essential to accurately record the actual conditions. Under the direction of the hospital management and in close coordination with the engineering firm EliteBuildingArchiTec Germany GmbH and the construction department, a comprehensive concept was developed and translated into a structured service specification – the basis for sustainable and trouble-free implementation.

Securely Networked with BACnet/SC

From the outset, particular attention was paid to IT security. The new communication structure is based on the BACnet/SC standard (BACnet Secure Connect), which enables secure data transfer between the locations and the central data center through TLS-based encrypted communication.

Our BACnet/SC-enabled controllers played a central role in this, ensuring both the highest security requirements and maximum performance. The system was supplemented by proven BACnet/SC routers from Krefeld-based MBS GmbH – with the result that Güstrow is now considered the largest BACnet/SC-based property in Germany.

Digital Access for Maximum Responsiveness

Thanks to the early integration of the IT department and technical facility management, daily operations were also taken to a new level. Technical support is now more efficient than ever: tablets with access to a secure WLAN technology network allow location-independent access to the building management system – and thus significantly faster response times in the event of a malfunction.

System openness as a success factor

With our system partner, SI Building Automation GmbH, KMG Clinics had an experienced partner at its side who can look back on a wide range of projects with a wide variety of manufacturers.



Control cabinet in Germany's largest BACnet/SC-based property © Tino Erler, SI-Building Automation

As an independent system integrator, SI-Building Automation GmbH selects the optimal components for each project, ensuring maximum flexibility and high investment security.

Future-Oriented Perspective

Based on the project experience, the first training courses in BACnet/SC are already being held to prepare additional specialists for secure network communication in the building automation environment.

Quote from Frank Niemann, Managing Director of Service Companies Technology at KMG Clinics:

“Our energy efficiency reports show significant energy savings for the modernized automation areas. This in turn has led to reduced operating costs, which are important for all clinics today.”



Marco Weyer

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Distech Controls Equips the Grand Palais with BACnet/IP Eclipse Solutions

Distech Controls' Eclipse™ BMS modernizes the iconic Grand Palais, Paris, for the 2024 Olympic and Paralympic games. These solutions enhance heating, cooling, and occupant comfort while improving energy efficiency.

Distech Controls Inc., an innovative leader in intelligent buildings, has installed its Eclipse Building Management System (BMS) at the Grand Palais, Paris, providing a comprehensive solution that addresses heating and cooling production as well as occupant comfort.

An emblematic monument in the heart of Paris, the Grand Palais was built for the 1900 Universal Exhibition and has been a cultural centre ever since. Its 77,000 m² of floor space regularly hosts a variety of exhibitions and fairs. The Grand Palais underwent its first major restoration since 1900 to host the fencing and taekwondo sporting events in its mythical Nave for the Paris 2024 Olympic and Paralympic Games. As part of the renovation, a number of Distech Controls solutions have been installed to deploy a BMS and improve the monument's environmental performance.

A BMS that provides exemplary environmental performance

The Eclipse solution from Distech Controls provides air treatment for the Grand Palais, in the Nave and adjoining galleries. The ECY-S1000 connected modular controllers are linked directly to a weather station, enabling a night-time free cooling system to be activated when conditions are right. In fact, as soon as the air outside is colder than inside, the Nave's glazed windows open to let in outside air, ensuring natural cooling and air renewal, which in turn leads to significant energy savings. The Eclipse solution also includes ECY-S1000 connected modular controllers for cooling computer cabinets and distributing cold.

The DC Space solution has also been deployed in the Grand Palais offices. This multi-business management solution enables occupants to easily adjust their comfort settings (lighting and blinds) using Uniwave's sleek Allure remote controls. Finally, the Palais d'Antin, which is home to the Palais de la Découverte science museum,



Facade of the Grand Palais, avenue Winston Churchill.
© Patrick Tourneboeuf at Tendence Floue for the Grand Palais, Paris 2024



View of the Nave during construction.
© Laurent Kronental for Chatillon Architectes 2024

is also equipped with Distech Controls solutions, to guarantee the continuity of the BMS system throughout the Grand Palais building.

Involved in the construction and renovation of many of the buildings hosting the Paris 2024 Olympic and Paralympic Games, Distech Controls manufactured nearly 7,500 of its products in Canada and France to meet the needs of each venue and contribute to the environmental performance.

Solutions installed

- Eclipse connected controllers for terminal units – ECY-PTU-207
- Eclipse connected modular controllers – ECY-S1000
- Eclipse connected controllers for HVAC equipment – ECY-303
- Uniwave Allure occupant remote controls
- Multi-touch capacitive displays with IP connectivity – Horyzon-C7 and Horyzon-C10



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Artificial Intelligence in the Field of Building Automation

The term “AI – Artificial Intelligence” is increasingly associated with buildings and building automation. The question is: what is it, where do its tangible benefits lie in this field, and how does the building infrastructure need to be adapted to realize those benefits?

Today's building automation systems in the main operate ‘statically’ in response to fixed time programs or simple control parameters. Room temperature control is based on a preset temperature that is the same throughout the day. Lighting is operated manually, with switches, or on the basis of simple presence switches. None of this is truly ‘intelligent’. The new dimension that AI can add into the building automation environment is to use autonomous analysis of the data as a basis for optimized operation. Thus, the heating and cooling dynamic of rooms, weather forecasts, predicted room occupancy during the course of the day can all be factored into the operation of the heating.

Similarly, cleaning schedules can be based not only on the current actual values in terms of the

intensity of use of kitchens, canteens and toilets and other areas, but can be based on predictions drawn from an analysis of usage patterns in the previous days and weeks. This kind of forward-looking building management can be applied in almost every area of building services, leading to increased energy efficiency, reduced operating costs, improved space utilization and other advantages.

All this – and much more – is possible when data on building system status and conditions is intelligently evaluated. This requires intensive processing of large amounts of data, with many variables to be considered. Artificial Intelligence (AI) offers many new, tailor-made solutions which are eminently suited to efficient building management.

“Building Automation”, “Smart Building” and “Cognitive Building”

Initially, “Building Automation” was comparatively “unintelligent”. Systems were programmed to follow a set of simple rules, allowing for quick system start-up and subsequent ease of maintenance.

The “Smart Building” typically builds on this classic building automation with flexible IT-based management systems. These offer unrestricted programming using modern IT languages and tools, easy integration with other IT systems such as workspace/room reservation systems or data banks, and data visualization for facility managers and for “ordinary” users.

The growing assimilation of sensor-generated data into the IT-based management level opens the way for more advanced data processing solutions to come into play – such as AI tools. This is the pre-condition for the implementation of any prognosis-based form of building management. The sophisticated processing of sensor-generated data makes the Smart Building into a “Cognitive Building”. (Fig. 1)

AI-Learning Process

The first step in any Artificial Intelligence process is system learning. This can take three forms.

- Unsupervised Learning
- Supervised Learning
- Reinforcement Learning

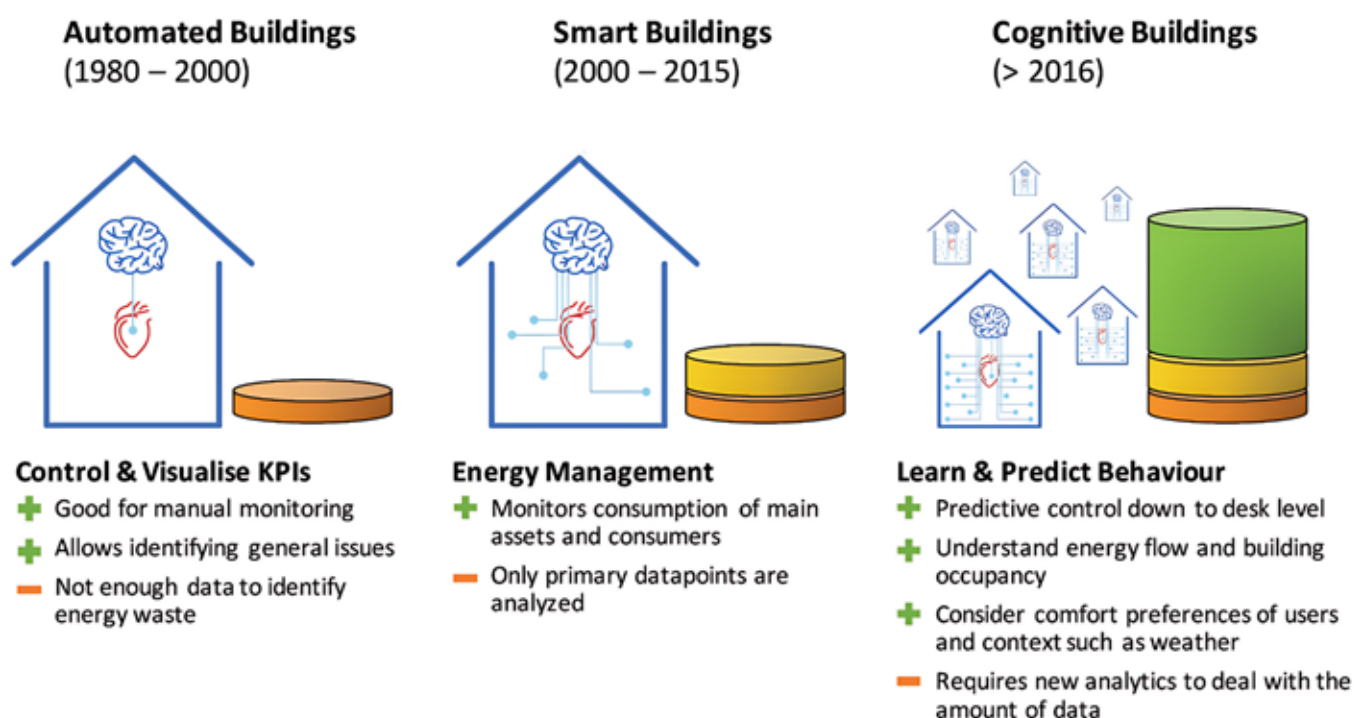


Fig. 1: Building Automation – Smart Building – Cognitive Building (source: IBM)

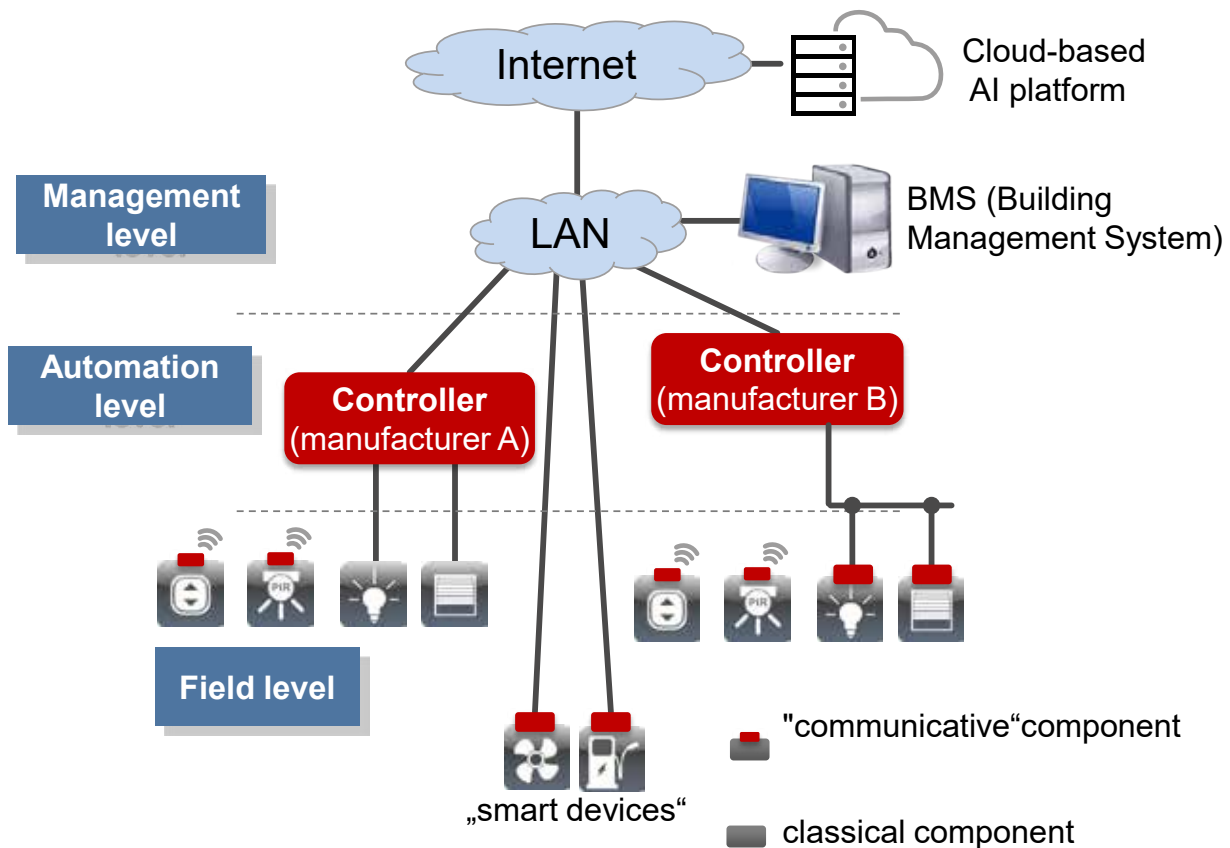


Fig. 2: Linking building automation with a (cloud-based) AI platform

“Unsupervised Learning” is used when large quantities of data must be processed and categorized. This grouping enables the recognition of deviations from norms and interdependencies. For example, sensor data from identical circulation pumps can be grouped. If data from one pump or group of pumps deviates from the norm, there may be a defect, and a human engineer can be sent to investigate.

“Supervised Learning” often makes use of neural networks. They consist of entry and exit nodes as well as further nodes in the intermediate layers. Mathematically weighted relationships exist between the diverse nodes (neurons). In order to optimize these relationships, the neural network is subjected to a training phase with known input and output patterns. In the field of building automation, for example, a neural network can “learn” the current consumption profiles of different appliances and which appliances are active when. This information can be used to avoid “spikes” in building energy consumption, by shutting down some appliances and extending the operation time of others.

Another form of Artificial Intelligence is represented by processes that autonomously determine which actions are appropriate in a given situation. They emulate human behavior whereby different solutions are tried in order to

determine the best way forwards in a hitherto unknown situation, and conclusions drawn retrospectively. The learning task becomes more challenging when feedback is given much later and hinges upon events in the relatively distant past. This is true in a human context, and equally true in computer environments.

The best-known example in this category is “Reinforcement Learning”. Consider the issue of determining the optimal start and stop times of heating to achieve a comfortable temperature when the building opens. At the simplest level, the learning algorithm receives the value from the room temperature sensor and can act on the actuator on the radiator. By a process of trial and error, the algorithm can determine the necessary lead time. However, this simple example ignores the fact that, for instance, the speed of heating also depends on the outside temperature, so the reading from an exterior temperature sensor needs to be considered. Instead of providing a pre-set target temperature, the algorithm may be given evaluations (good/OK/cold) during the day and must learn in response to this feedback.

In addition, the algorithm can be provided with an additional rating every month based on the overall energy cost: encouraging efficient behavior and discouraging inefficient responses. A “stable” response that balances comfort and

efficiency can be established, but exploration should continue to accommodate changes in behavior and the environment.

It can be seen that these three approaches are complementary. The learning method should be chosen depending on the task in hand – each has its merits.

Concrete Applications

Many diverse AI-based applications are available in the field of building automation. They can be broadly categorized as follows:

- Optimized facility management: needs-based control of heating plants, circulating pumps, lighting etc. (as opposed to control on the basis of simple parameters or by timer).
- Optimized utilization of spaces and infrastructure: capacity analysis and forecasting, e.g. for meeting rooms, canteens, pantries, transit areas, toilets and parking spaces as well as the provision of information in the short term (for building occupants) and in the long term (for facility managers, e.g. in form of advice on building restructuring).
- Load management: forward-looking operation of electrical systems in order to avoid (costly) peak loads.

- Precautionary maintenance and optimized servicing: analysis of failure probability, timely maintenance and consequential avoidance of technical failures.
- Employee-oriented value-added services: mobile devices can – for instance – be used to generate space utilization forecasts, view canteen usage intensity, request parking space availability and preferred workspace location or select individual meals.
- Compensation of skilled-staff shortages: making effective use of facility maintenance staff in managing the building's technical systems.
- Focus on meaningful sensor data: generate as much data as possible from as few sensors as possible – reducing redundancy, cutting investment and operating costs.

Demands upon System Architecture

An AI platform is indispensable for the introduction of intelligent learning processes such as those described above. This can be either cloud-based or server-based. Cloud-based server farms offer more processing power, and cloud-based AI frameworks offer a broader range of features, so this currently represents common practice.

The AI platform is built on a Smart Building infrastructure, and all technical systems should ideally be connected to a BMS (Building Management System). The BMS must be able to govern the building facility and room automation systems.

Requirements for Building Infrastructure

AI-based processes require high computing power and are therefore best run on a dedicated AI platform. This can be cloud-based or run on a server in the company's own data center. Due to the higher computing power of cloud-based server farms and the currently greater scope of services offered by cloud-based AI frameworks, this option is shown in Fig. 2.

This figure also shows that a smart building must be in place as a basis for the use of AI-based processes. It is important that all building services in this smart building are connected to a building management system (BMS) for communication purposes. In many cases, building automation is still implemented in such a way that room-side and system-side automation are operated separately from each other as respective island systems. This must be converted into a holistically networked installation.

It must also be ensured that a BMS can also control room and system automation. In many cases, the specific behavior of, for example, room-side bus systems and system-side controllers is hard-coded and cannot be influenced by the BMS. This ability to influence must be guaranteed, which means that all controllers and systems must be connected to each other for communication purposes. This requires a powerful and standardized TCP/IP-based protocol, with BACnet/IP and BACnet/SC being particularly suitable options.

In addition, it must be taken into account that the AI platform requires as much data as possible from a wide variety of sensors for effective operation. Wiring the required number of sensors would be very complex and expensive, especially in an existing building. Radio-based sensors are a good solution here, ideally battery-free and maintenance-free energy harvesting sensors such as those with EnOcean technology.

All of this information can then be used to create cloud-based digital twins and further improve the monitoring of activities, the working environment, augmented reality, productivity, and the health and safety of building users.

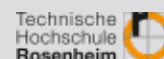
Conclusions

AI-based processes enable a broad range of applications in the field of building automation. The concrete benefits anticipated from AI-based solutions should be clearly defined before implementation, since this plays a determining role in the choice of learning process and its modelling, as well as in the choice of AI platform and the type, number and location of the energy harvesting sensors needed to supply the data inputs.



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Converting BAS Devices into Cloud-Connected Assets

In a building automation system (BAS), integrating cloud computing with IoT technologies enables scalable, remote monitoring and control of systems, such as HVAC, lighting, and security. However, systems integrators often face challenges in determining the data transfer method to the cloud and accessing the data once it's resident in the cloud. This article explains how BACnet Edge controllers can leverage proven security protocols, such as SSL/TLS encryption, and open Internet of Things (IoT) messaging protocols, such as MQTT, to enable secure cloud connections to software-as-a-service (SaaS) platforms. With this configuration, users can upload data to the cloud for remote access, dashboard visualization, trend and performance analysis, alarm notifications, and monitoring from any location. Additionally, this connection converts BAS devices which are attached to the controller into cloud-enabled assets, allowing for centralized management and remote supervision across multiple sites.

Today's modern BAS platforms rely on data from the equipment, including devices at the "edge" of the network, to optimize building operations. Cloud connectivity gives facility managers mobile and global access which streamlines system management. "Cloud computing" and "IoT" are common industry terms, but there is still a fair

amount of confusion about their meaning and on-site applications.

Cloud computing is the delivery of computing services over the Internet. Cloud computing services – including storage, networking, databases, virtual machines, and other IT infrastructure – are offered by providers, such as Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform (GCP), usually for a fee. Cloud services also expand the traditional IT offerings to include Internet of Things (IoT), machine learning (ML), and artificial intelligence (AI).

IoT refers to a network of physical devices that are embedded with sensors, software, and network connectivity. These devices, also known as "smart objects," can collect and share data and automatically make decisions or trigger actions based on the data. IoT protocols enable these smart objects to communicate with each other and with other internet-enabled devices. For a BAS, these IoT devices can consist of thermostats, lighting systems, access control systems, and energy meters.

Large BAS systems often rely on a cloud specialist to configure scripts and settings that enable users to access cloud-pushed data.

For smaller systems, users can incorporate a cloud-connected BACnet controller, such as Contemporary Controls' BASpi-Edge, with a Software-as-a-Service (SaaS) solution, such as Microsoft's Azure IoT central as shown in Figure 1.

The BACnet Edge Controller acts as a smart bridge between a BAS (that uses BACnet protocol) and the cloud. It connects to BACnet devices, such as HVAC systems, lighting controls, sensors (temperature, humidity, occupancy), and access control systems. For devices that do not support BACnet, such as Modbus chillers, boilers, or HVAC units, a gateway can bring them into the BAS, making each device appear as an individual BACnet device. The controller collects data from these devices and pushes it to the SaaS platform.

The controller can also send commands back to the connected devices. The SaaS platform enables users to access and format the data via dashboards, alerts and notifications, historical data analysis, and remote-control capabilities.

The following steps provide a simple overview how a BACnet Edge controller can leverage SSL/TLS encryption and MQTT protocol to transmit and receive data using a SaaS platform.



Figure 1: A Cloud-Connected BACnet Controller Uses SaaS to Exchange Data Over the Internet.

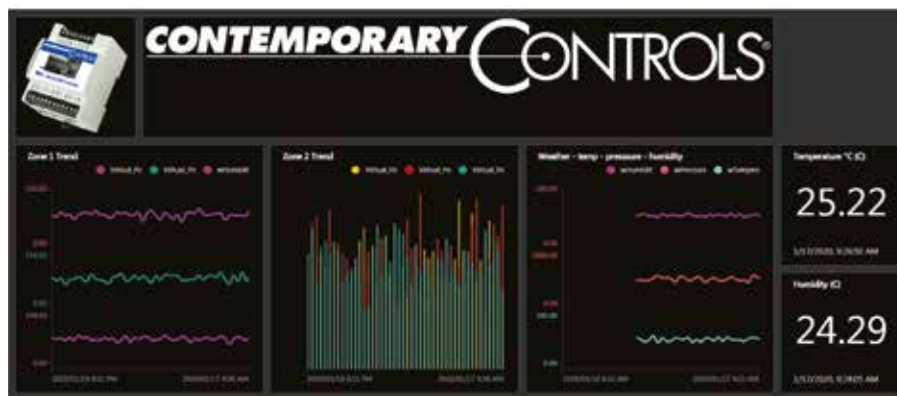


Figure 2: The IoT Central Dashboard displays real-time data from the BACnet controller.

1. **Data Acquisition:** The controller polls BACnet devices for data, such as temperature, status, energy usage. The controller may filter, normalize, or aggregate data locally to reduce bandwidth and improve efficiency.
2. **Secure Communication:** The controller uses MQTT messaging that is encrypted using TLS/SSL to ensure secure transmission and connection to the cloud.
3. **Outbound Connection:** The controller initiates outbound connections to the SaaS platform, which avoids firewall issues and simplifies setup.
4. **Cloud Upload:** The controller sends data to the SaaS platform, where it's stored, visualized, and analyzed.
5. **User Access:** Systems integrators or building managers log into the SaaS dashboard via web browser or mobile app to view data, set alerts, or send control commands.
6. **Command Execution:** If the SaaS sends a command, such as "decrease temperature," the controller receives the command and relays it to the appropriate BACnet device.

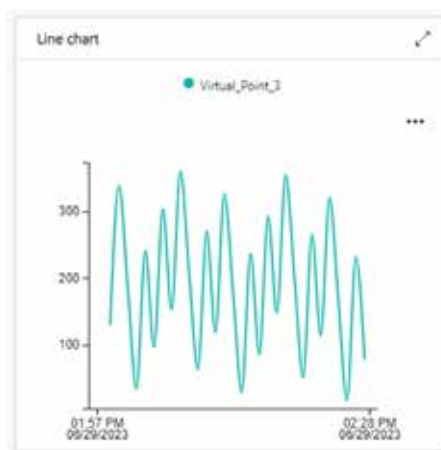


Figure 3: Users can graph controller data, shown here as a one-hour graph.

At Contemporary Controls, we use Azure IoT Central to access cloud data sent from the BASpi-Edge controller. To connect this controller, a "device" must be created in IoT Central (one per controller). This device will have three parameters – ID scope, Device ID, and key – that must be added to the controller's cloud configuration webpage from the IoT Central account.

Once configured with these three parameters and the points to push to the cloud have been selected, the data from the BASpi-Edge will be in the IoT Central "device." The points being pushed to the cloud can be internal BASpi-Edge data, data read from other BACnet devices, or data written to the BASpi-Edge from the BAS.

Next, an IoT Central dashboard must be created for this "device" to view the data Figure 2. The IoT Central dashboard displays the data sent to the IoT Central account by the controller. Users can also view the current value of a point on the BASpi-Edge.

Users can graph data from the BASpi-Edge, showing one hour's worth of data (as shown in Figure 3) or 30 days' worth of data. Users can also control virtual points in the BASpi-Edge from IoT Central. These virtual points would then be applied to the controller's Sedona wiresheet logic.

With Azure IoT Central, many users can access an account with different permission levels, so that some can only view the data, while others can make setting changes to the IoT Central dashboard. Azure IoT Central provides a collection of services and features, with a lower threshold for setup and configuration, to get started with cloud connectivity. IoT Central does have its limitations, but if those limitations impact a project, the IoT Central features can be expanded for an additional cost.

Integrating a BACnet Edge controller with a SaaS platform offers a secure and efficient framework for modernizing building automation systems. Additional devices with different protocols that include MQTT support can be integrated into the cloud for a more holistic view of the facility. By utilizing trusted security protocols and open IoT messaging standards, this solution enables secure and seamless cloud connectivity, real-time data access, and centralized control. It converts traditional BAS devices into cloud-enabled assets, giving systems integrators and building managers enhanced visibility, remote supervision, and data-driven insights across multiple sites.

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CONTEMPORARY CONTROLS

Secure HTTPS Provides Enhanced Security in a Building Management System

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 web servers 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.



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

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, 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



Digital certificates verify ownership and authenticity to ensure that communication occurs with authorized devices.
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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/openssl-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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How to Protect Building Automation – Today and Tomorrow



Cybersecurity threats are increasing.

Building automation increasingly faces unprecedented security challenges – especially in critical infrastructure. Fortunately, the BACnet Secure Connect standard (BACnet/SC) addresses both current and future cybersecurity needs. Dr. Alina Matyukhina, CSO and Global Head of Cybersecurity at Siemens Smart Infrastructure Buildings, explains how.

With the increasing digitalization of building systems, cybersecurity has become a pressing issue for facility management as operational technology (OT) systems face a growing number of incidents. According to projections, cyberattacks on businesses, consumers, governments, and devices will occur every two seconds by 2031.

This threat is compounded by the rapid growth of Internet of Things (IoT) devices in smart buildings, which are expected to reach more than three billion by 2028. Robust security measures are required, especially for critical infrastructure, such as hospitals, airports or laboratories. However, traditional building automation protocols were not designed to address today's cybersecurity challenges.

Adding Critical Security Features to the Standard Protocol

BACnet, which is used in more than 70 percent of the world's building automation systems, has adapted to these challenges with its Secure Connect (SC) upgrade. Launched in late 2019, the BACnet/SC enhancement maintains the solution's open, flexible nature while adding crucial security features.

As an additional data link layer, BACnet/SC can be seamlessly integrated through BACnet routers, allowing existing systems to be upgraded without any extensive infrastructure changes. The protocol supports communication with earlier versions of BACnet, ensuring backward compatibility as well as providing enhanced security features for newer installations.

The protocol uses WebSocket Secure (WSS) with TLS 1.3 to allow for encrypted, bug and tamper-proof communication of devices. It also implements a hub-and-node architecture to ensure high availability in critical environments. Certificates for authentication provide multiple protection layers: The first one is an individual so-called Operational Certificate (OC), which



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BACnet/SC – a solution to enhance cybersecurity in critical infrastructure.

is unique to the device and used for authentication processes as well as for encryption and decryption of traffic. The second, so-called Root Certificate, is project-based and identical across all project devices, regardless of respective manufacturers. In addition, BACnet/SC requires a single Certificate Authority (CA) in order to sign and validate certificates across all devices. All of these features significantly increase security while maintaining compatibility with existing BACnet systems.

Compliant and Certified Solution for Cyberthreats

Another important asset, BACnet/SC, aligns with the new Network and Information Security 2 (NIS-2) EU standard that came into effect in October 2024, aimed at critical sectors such as healthcare, energy, transportation, banking, and digital infrastructure. The directive requires organizations to implement encrypted communications, device authentication, cybersecurity policies, and other cybersecurity measures. BACnet/SC allows organizations to set up a building automation system that meets the NIS-2 requirements.

To prove that the necessary cybersecurity measures are in place, Siemens products have received IEC 62443 certification through verification by TÜV Süd. The independent label not only covers the products but also the entire development process.

BACnet/SC Application in Critical Infrastructure

An excellent example of the capabilities of BACnet/SC in critical infrastructure is the Oberwart Hospital in Austria. Healthcare facilities naturally require exceptionally high standards. Patient safety and operational continuity depend on secure and reliable control of environmental conditions, such as air flow or room temperature, as well as building access systems.

Oberwart Hospital, which opened in May 2024, partnered with Siemens Smart Infrastructure to implement comprehensive building automation with sophisticated cybersecurity measures. Their system manages building controls via 41 new-generation controllers, 360 individual room controllers, and eleven fire damper control systems monitoring 1,400 devices, while communicating securely through BACnet/SC. This implementation ensures precise control of critical environments such as operating rooms and sterile areas, where maintaining specific environmental conditions is critical to staff and patients' health and safety.

Future Ready with Simple Firmware Updates

In addition to new constructions such as Oberwart Hospital, organizations can implement BACnet/SC in existing facilities without the need for a disruptive "rip and replace" approach. Instead, building control system upgrades can be achieved through firmware updates, making it a sustainable, efficient, and long-term solution. This reduces both costs and operational disruption.

The implementation of BACnet/SC represents a significant step forward in securing building automation networks. As the industry continues to evolve, BACnet/SC's foundation in established and innovative Information Technology (IT) security principles ensures its ability to adapt to new challenges. At the same time, it maintains the interoperability that has made it the industry standard.

Oberwart Hospital provides a blueprint for facilities of any kind and size seeking to improve the security of their building automation. As cyberthreats won't stop, such forward-thinking implementations will be key to protecting critical infrastructure in the years to come.



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SIEMENS

BACnet Testing Laboratories: Maintaining the Integrity of the BACnet Standard



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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. 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.

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 BACnet 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. In 1993, Bushby established the NIST BACnet Interoperability Testing Consortium which 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.

"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 1998, BACnet Interest Group North America was formed. The following year, the BACnet Manufacturers Association (BMA) was established by manufacturers recognizing the need to expand BACnet product testing. The BMA formed BACnet Testing Laboratories in June 2000 and created the BTL Mark that is still used today. 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.

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

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 from manufacturers and distributors.



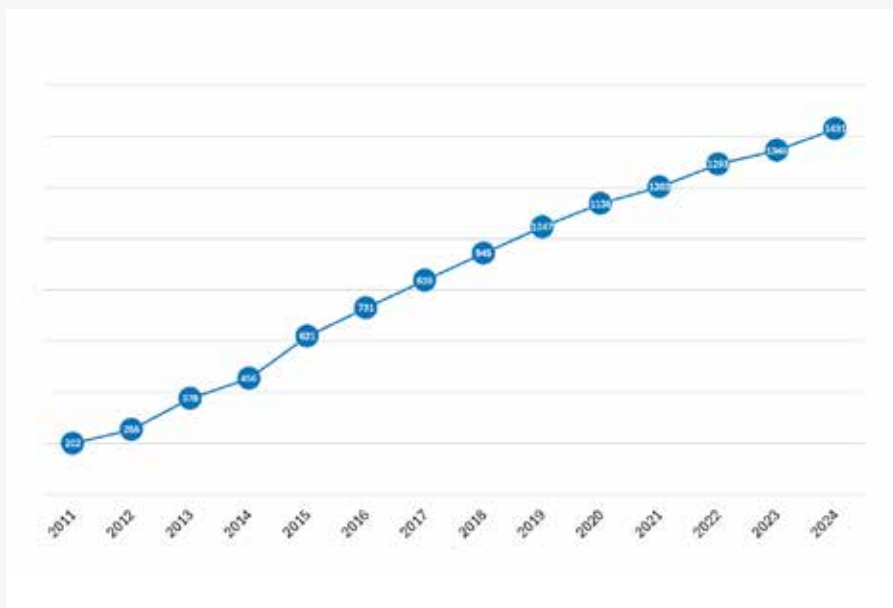
The BTL Mark provides users with confidence that a product has passed the industry standard BACnet conformance tests conducted by a recognized, independent testing organization.

© BACnet Testing Laboratories

The Integrity of the BACnet Standard

Independent testing and certification maintain the integrity of the standard. Since 2000, BACnet Testing Laboratories has operated the compliance testing and global certification program and is committed to ensuring successful implementation of 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.



Total BTL listings by year.

© BACnet Testing Laboratories



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

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Trends in Building Automation / Building Automation and Smart Buildings



The Evolving Landscape of Smart Building Automation

The global smart building automation market is seeing a paradigm shift in terms of how technology is being put to work beyond achieving energy efficiency, comfort, and safety. It is addressing new aspects of property management, connectivity, asset management, intuitive user interface, data security, reporting of building performance, etc.

The community associated with the smart building automation industry is frequently finding new ways to address the dynamic and fast-changing requirements of modern buildings. But they are often overwhelmed and challenged due to a wide variety of market requirements and a lengthy wish list from customers. The task becomes even harder with the frequent introduction of new products and services by different brands, leaving the installers and system integrators uncertain about which solution is best suited for their project.

The Power of Standardization

This is the exact situation where the power of standardization comes in handy in solving the challenges of the building automation market and making life easier for all stakeholders.

BACnet (Building Automation and Control Network) addresses precisely such issues by providing a global data communications standard for building automation and control networks. It provides a vendor-independent networking solution to enable interoperability among equipment and control devices for a wide range of building automation applications.

This unified data communications infrastructure of BACnet for intelligent buildings has been implemented across a huge installation base worldwide, offering flexible interoperability among thousands of products from multiple manufacturers of BACnet-compliant devices.

From Hardware to Human Interaction

We are seeing the advent of software solutions managing complete building services at a rapid pace. Clients now clearly differentiate between the management side and the implementation side. Across all major markets, there is a growing emphasis not only on hardware reliability and performance, but also on how occupants interact with the building.

The Three Layers of Building Automation

Modern building automation systems can broadly be segmented into three layers:

1. Field Device Level
2. Automation Level
3. Management Level

Field Device Level: Ensuring Synergy and Compatibility

At the field device level, synergy between hardware components is essential. BACnet provides a wide selection of high-quality products covering diverse application areas. However, some projects require integration with systems that use proprietary protocols.

Example: A Hotel Building

Applications such as lighting, HVAC, and access control may rely on BACnet, while the Property Management System (PMS) often uses a proprietary communication protocol. Since the PMS contains crucial guest information, it must be integrated into the holistic automation design.

NETxAutomation solutions and services are designed to address such heterogeneous integration challenges in projects of diverse profiles.

Automation Level: The Core of Cross-Integration

At the automation level, smart integration ensures the field device efforts translate into an effective management layer. This is where true interoperability happens – products from different protocols and topologies are linked to deliver the full benefits of automation.

This layer can be imagined as a kitchen, where various “ingredients” are combined by the “chef” – the integrator – to create a tailored customer experience.

Management Level: Centralized Control and Visualization

The management level translates technical system features into a user-friendly building interface. It acts as a dashboard for the automation system, offering:

- Central monitoring and visualization
- Device control and scheduling
- Building performance reporting
- Historical data and trend analysis
- Alarm management and notifications

This layer ensures that building operations are transparent, efficient, and easy to maintain.

The Impact of IoT and Cybersecurity Initiatives

Recent developments in the Internet of Things (IoT) have significantly influenced building automation. While IoT integration brings exciting opportunities, it also raises concerns regarding cybersecurity, data protection, and sustainability.

Initiatives such as the Cybersecurity Acceleration Program launched by BACnet International are helping manufacturers and integrators increase customer confidence in connected systems.

Towards Higher-Level Networking and Cooperation

The industry is now exploring symbiosis through higher-level networking – combining local intelligence with cloud-based systems to meet new demands in connectivity, cybersecurity, and emerging technologies.

This evolution allows buildings to reach new levels of efficiency, where resource consumption optimization and interoperability go hand in hand.

Integrating Core Services with Emerging Technologies

Key building services in the BACnet ecosystem – such as lighting, HVAC, access control, security, alarm management, and energy management – merge seamlessly at the management level, while also welcoming new platforms like IoT.

This results in buildings that are:

- Efficient
- Sustainable
- Upgradable
- Well-managed throughout their lifecycle

The Next Frontier: Artificial Intelligence in Building Automation

Artificial Intelligence (AI) is emerging as a transformative force.

We can define the future equation as:

(IoT + AI) × Cloud = Future (with BACnet as the foundation)

Software-driven intelligence will dominate the next era of building automation – simplifying life for operators, enabling predictive maintenance, and offering new life-cycle value for installers.

The BACnet standard remains the cornerstone for ensuring interoperability, reliability, and future-proof design.

Trends Shaping the Future

We see these positive trends accelerating across all sectors – commercial, hospitality, infrastructure, and industrial:

- A strong preference for open, interoperable devices using global standards
- Widespread acceptance of headend software solutions for centralized control
- Increasing alignment of mid- and enterprise-level projects with BACnet-based practices

Today's trends are rapidly evolving into tomorrow's global specifications.

NETxAutomation's Commitment to the Future

At NETxAutomation, we are committed to staying aligned with BACnet standards and continuously adapting to the evolving needs of our customers.

Our strategy focuses on:

- Listening to customer feedback
- Observing industry developments
- Adapting products and integration methods
- Promoting openness and regional customization

By doing so, we aim to achieve 100% customer satisfaction and ensure long-term sustainability in the smart building automation field.

ABOUT THE AUTHOR

Paul Furtak is the CEO of NETxAutomation Software GmbH, one of the leading providers of innovative software for building automation. NETxAutomation develops and distributes software for building management and central building control, consisting of reliable server systems, shading controls, visualisations, and energy reporting systems.



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NETx
AUTOMATION

Scott Ziegenfus Named Chairman of ASHRAE SSPC 135

Scott Ziegenfus, a seasoned leader in building automation and lighting controls, has been named Chairman of ASHRAE SSPC 135, the committee responsible for the BACnet standard. With over three decades of experience and a deep commitment to interoperability and innovation, Ziegenfus brings a unique perspective rooted in real-world applications and a vision to modernize the standard for the next generation.

A Career Built on Integration

Ziegenfus's journey spans leadership roles at Lutron Electronics, Hubbell Lighting, and currently Current Lighting, where he serves as Vice President of Customer Experience, Technical Services and Customer Facing Software. His work has consistently focused on bridging systems – lighting, HVAC, access control – through open protocols and seamless integration.

His involvement with BACnet began over 15 years ago, culminating in roles as Vice Chairman, Secretary and Convener of both the Protocol Services Working Group and the Data Modeling Working Group. These positions have given him a front-row seat to the evolution of BACnet and the challenges faced by engineers implementing it.

BACnet: A Living Standard

Since its first publication in 1995, BACnet has undergone continuous, transformative upgrades. Far from being a legacy protocol, BACnet is a living, adaptive standard that rivals any modern communication protocol in flexibility, scalability, and relevance.

"BACnet has evolved from a pioneering protocol into a modern, adaptive standard that meets today's complex integration and cybersecurity demands," says Ziegenfus.

Timeline of Key Milestones

- 1995 – First publication of ANSI/ASHRAE Standard 135
- 2003 – BACnet becomes ISO 16484-5
- 2004–2015 – Expansion to BACnet/IP, BACnet/WS, and wireless protocols



Scott Ziegenfus, Chairman of ASHRAE SSPC 135

- 2012 – Introduction of 54 standard objects for modeling diverse building systems
- 2015–Present – Focus on cybersecurity, semantic tagging, and application profiles

These milestones reflect BACnet's ability to adapt to emerging technologies and integration needs, making it a cornerstone of smart building infrastructure.

A Vision for the Future

Today, the BACnet standard spans 1,527 pages – a testament to its depth, but also a barrier for new engineers. Ziegenfus's vision as Chairman is to:

- Optimize and organize the standard for clarity and usability
- Modernize its structure to reflect current system design practices
- Create pathways for new engineers to adopt and implement BACnet more easily

"My goal is to make BACnet more accessible, more intuitive, and more powerful – for

everyone," Ziegenfus explains. "We need to ensure that the next generation of engineers can engage with the standard without being overwhelmed by its complexity."

Lighting Industry Leadership

Ziegenfus is the first Chair from the lighting industry, a milestone that reflects the growing importance of lighting systems in building automation. He credits Current Lighting for their continued support as he takes on this leadership role.

Conclusion

With a career rooted in practical applications and a passion for open standards, Scott Ziegenfus is poised to lead BACnet into its next chapter. His vision promises a more streamlined, modernized standard – one that empowers engineers and integrators to build smarter, more connected environments.

BACnet Standard 2024 Released

The BACnet community continues its commitment to innovation and interoperability with the publication of BACnet Standard ANSI/ASHRAE 135-2024 and the latest protocol revisions 29 and 30.

The updates, now available on www.bacnet.org, represent a significant step forward in building automation and control systems, further reinforcing BACnet as the leading open communication standard. The release of BACnet 2024 integrates new features and refinements that respond to industry needs for enhanced security, interoperability, and efficiency. Some notable improvements include:

- Advanced Cybersecurity Features – Strengthened protection against evolving digital threats,
- Expanded Interoperability – Enhancements ensuring smooth integration with diverse building systems,
- Optimized BACnet Secure Connect (BACnet/SC) – Further refinements to secure device communication,
- Performance Upgrades – Improved system responsiveness and data exchange efficiency.

Protocol Revisions 29 and 30: Driving Future-Ready Building Automation

The new protocol revisions provide crucial updates that align BACnet with modern IT infrastructures and the increasing demands of smart buildings. These revisions are particularly relevant for sectors that require higher resilience, security, and reliability in building automation, including:

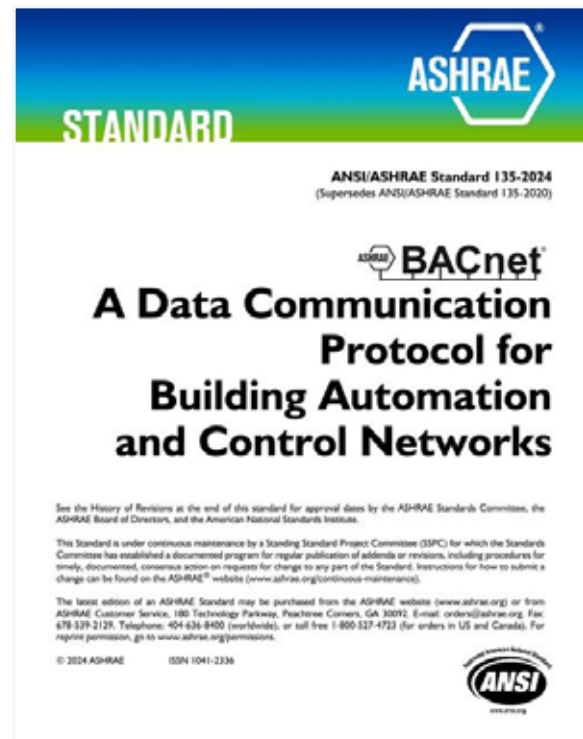
- Commercial real estate and facility management,
- Healthcare and critical infrastructure,
- Industrial and manufacturing environments.

A Unified Standard for the Future

With the publication of ANSI/ASHRAE 135-2024, professionals across the building automation sector now have access to a consolidated reference that incorporates the latest technical advancements. This version serves as a comprehensive guideline for engineers, facility managers, and integrators, ensuring that BACnet implementations remain at the cutting edge of automation technology. For more details on these updates, visit www.bacnet.org/news.



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



News from SSPC 135: New Leadership, Standards Progress, and Global Alignment

The ASHRAE Standing Standard Project Committee 135 (SSPC135), which governs the BACnet protocol, continues its mission to develop and maintain interoperable and future-proof solutions for building automation systems.

At the most recent plenary meeting on May 2nd, 2025, in Fort Lauderdale, Florida, the committee elected a new leadership team:

- Chair: Scott Ziegenfus (Hubbell Lighting)
- Vice Chair: Salvatore Cataldi (BELIMO Automation AG)
- Secretary: Nathaniel Benes (University of Nebraska)

This leadership transition follows the successful tenure of Coleman Brumley, whose contributions were formally recognized by the committee.

Key milestones since the last report include the publication of ASHRAE 135.1-2025, which introduces several critical updates and test corrections.

The public review of Addendum 135-ct is complete. It defines a way to convert BACnet data into RDF (Resource Description Framework), a W3C standard that works like a universal dictionary for machines. This makes BACnet information usable by semantic systems such as digital twins and analytics.

A particularly significant development is the approval of ASHRAE 223P for its first public review. This proposed standard adds a semantic interoperability layer for describing equipment interconnections – a move that has been warmly received by both ISO TC205 and CEN TC 247 as an essential complement to existing communication standards.



Scott Ziegenfus, Chairman of ASHRAE SSPC 135



Salvatore Cataldi (BELIMO Automation AG)



Nathaniel Benes (University of Nebraska)

Calendar of BACnet Events

Date	Location	Event	Information
2025 / 2026			
December 09-11, 2025	Berlin, Germany	BACnet Certificate Exchange Summit – Hands on BACnet/SC, Developer Workshop	BIG-EU Office, info@big-eu.org
January 31-February. 4, 2026	Las Vegas, NV, USA	ASHRAE Winter Conference	www.ashrae.org/conferences/2026-winter-conference
February 02-04, 2026	Las Vegas, NV, USA	AHR Expo	www.ahrexpo.com
March 08-13, 2026	Frankfurt/M, Germany	BIG-EU at Light + Bulding 2026	light-building.messefrankfurt.com/frankfurt/de.html
June 08-09, 2026	tba	BIG-EU Spring Meeting; June 08, 2026 AB/EB; June 9, 2026 – Spring Meeting	
June 10–12, 2026	tba	Plugfest 2026	
June 27-July 01, 2026	Austin, TX, USA	ASHRAE Annual Conference	www.ashrae.org/conferences/2026-annual-conference-austin
September 23–25, 2026	Frankfurt/M, Germany	38. GLT Anwendertagung	
November 02-03, 2026	tba	BIG-EU Autumn Meeting 2026: November 2, 2026 AB/EB; November 3, 2026 – General Meeting / Elections	

More BACnet Publications Worth Reading

BACnet Europe Journal 43 – 09/25



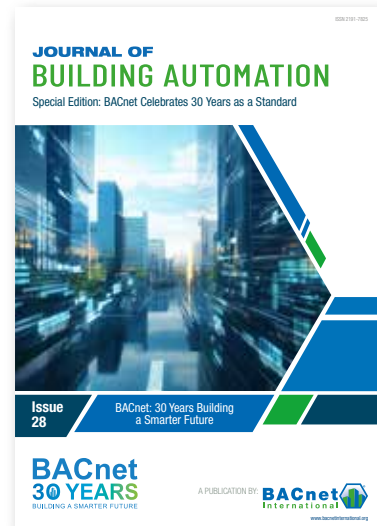
[bacnetjournal.org/bacnet-journale/
bacnet-europe-journal](http://bacnetjournal.org/bacnet-journale/bacnet-europe-journal)

BACnet France Journal 18 – 09/25



[bacnetjournal.org/bacnet-journale/
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Journal of Building Automation



bacnetinternational.org/journals

Editorial Notes

BACnet Middle East Journal ISSN 2190-944X

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

Distribution

This Journal can be ordered free of charge by partners, members, media representatives and friends of the BACnet Interest Group. Order the BACnet Middle East Journal by email from: bacnetjournal@tema.de

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