MMC March 23, 2022 Webinar – Getting the most out of your Building Automation System (BAS) – Question and Answer

Webinar Sponsors

Questions from the Audience

1) Can you comment on the ASHRAE 36-2018 standard that references BAS sequences? We are seeing owners use this as a reference for review of design BAS sequence design

To date, we have not seen much mention of this ASHRAE standard in our correspondence with the Mechanical Engineering Community. To understand why, we think that you must look at the way projects are developed and procured. In the typical model, the BAS vendor only really becomes part of the construction process after a successful bid to a tender. At this point, the Mechanical Consulting Engineer may have already developed the sequences, as they are required for the tender package. During the BAS shop drawing review process, the mechanical engineer is looking for their sequences to be adhered to. In a perfect world, the Mechanical Consulting Engineer would have had the discussion with the owner as to their desire to either incorporate or not incorporate this standard into their design. If possible, if you are currently partnered with a BAS vendor, it would be a great idea to involve the vendor in the sequence of operations discussion, as well as the general design review, as early in the project as possible.

2) Can you comment on the engineering community having an appreciation of a BACnet discovery? (as they often write BAS sequences without regard to what BACnet readable / writable data points may or may not be available)

We are going to assume that this question refers to 3rd party packaged equipment being supplied complete with a factory installed and programmed BACnet controller, such as a Roof Top Unit for example. We think that it would be great for the Mechanical Engineering Community to engage with the vendors of these packaged products to have the discussion as to whether the items in their sequences of operation can be adhered to in the provided controller. There are many instances where we as BAS vendors will encounter a situation where items in a sequence cannot be accomplished when integrating to a packaged unit's controller. This could be for many different reasons, however, some of the more common are that the point simply does not exist or, the point exists and is not writeable. In our experience, right or wrong, the BAS vendors are typically the ones figuring out the solution to these integration challenges, usually when the equipment is already delivered to site.

3) How do we get the engineering design community to write BAS sequences that are easily understood by BAS Contractors in providing a physical solution?

For the most part, it's not like the sequences being presented are difficult to understand or flawed in any serious manner. The reality is that there is probably room for improvement with regards to the points that will be available via integration (e.g., BACnet) versus the need for physical points to be included by the BAS vendor, creating a hybrid of both. Another item that can go a long way in providing clarity in a design is to ensure that all points required to meet items in a sequence of operations are either defined as to be supplied with the 3rd party packaged equipment, or to be supplied by the BAS vendor. This is important as it is very likely that a BAS vendor will not have physical I/O available on a system that was requested to be connected via BACnet (e.g., packaged RTU, boiler plant gateway).

4) Any experience regarding portfolio wide BAS systems vs stand alone per building? Advantages/disadvantages?

In general, we believe that having all your BAS systems integrated into one common platform really has no operational disadvantages. It allows for an easy and convenient way to log in to one interface and be able to navigate across all your systems. It allows for one common location where alarms can be generated and the connectivity of the systems to be monitored. In most cases, even if there is a communication issue with a site to the central interface, there will still be some way to interact with the system at the local site, which would most likely be similar if the building were stand alone. The one non-operational disadvantage would be cost. It may not be financially reasonable to move to an enterprise level solution if you have say two small buildings, but this hesitation is far less of a problem when you really look into the life cycle costs of the system. In this day and age, and current availability of cost-effective modular products for BAS systems, there is no reason to install a stand-alone system, especially one that does not have the capability to communicate portfolio wide. The features these BAS systems provide are important from an operational efficiency perspective and absolutely critical in our journey to a low carbon world when you consider the total costs of ownership, particularly when managing a portfolio of buildings – it is future proofing. We would encourage you to have this discussion with your BAS vendor to determine the best solution for your specific scenario.

Moderator Questions for Adrian Cecchetto, Account Manager, Setpoint Building Automation

1) BACnet

What are the challenges you see in the field when dealing with equipment that is not native BACnet, but rather requires a gateway for integration?

- Native BACnet controllers provide an easy way to interoperate with the equipment.
- Typically, these types of controllers have fully fleshed out point descriptors for the BACnet objects, as well as the proper supporting documentation.
- When the device is a gateway, the gateway itself will most likely be a BTL listed device, however, the objects may not be properly created, e.g., 1000AI5 - Native BACnet Controller = Supply Air Temperature, Gateway = AI5
- There is nothing wrong with a gateway as long as the manufacturer using the gateway implements good practice in creating the BACnet objects.
- The equipment startup tech needs to be proficient in configuring the communications side as well.

Given BACnet has been around for a while, are you seeing more equipment manufacturers adopting native BACnet or are there still quite a few of them still not adapting and requiring the need for a gateway/translator.

- The majority of equipment manufacturers are supplying either their own controller, or a rebranded controller, with a decent level of descriptors and functionality. This however does not mean that all points are available. Points must be made available by vendor.
- In the devices we see with a gateway installed, there is typically a significant investment in time required by the BAS vendor to configure the device parameters, and then troubleshoot communication issues.
- E.g., Return CO2 or AFS on packaged RTU.

What equipment types are ahead of the curve and have been fast adopters of BACnet? And what equipment types have been laggards in adoption and are still presenting quite a bit of difficulty (i.e., RTUs, boilers???)

- I have found that Chillers, RTUs, and the major players in the VFD industry have typically been the leaders in BACnet integration.
- Laggers seem to be the boiler manufacturers or any smaller piece of equipment where it seems like they are offering a BACnet gateway to meet a spec requirement vs actually engineering a proper solution.
- Now seems to be a time where things are continuing to get better.

2) Security

In this age of hacking and then being held ransom, what are the IT departments of the clients demanding in terms of security? Do they welcome encryption BAS communication given the "open" nature of BACnet and the goals that protocol was trying to achieve?

- We have found that the security requirements vary from owner to owner.
- Some basic IT best practices can go a very long way in securing the BAS network.
  - VLANs to segregate BAS controllers from the rest of the network
  - VPNs with 2FA/MFA to secure a remote connection to a BAS central server
  - The use of B/VPN to encrypt the BACnet packet at the transport layer, especially if the packet will be transferred over the internet but can also be used internally as an added layer of protection.
  - B/VPN can also be used as a way to simplify the entire BACnet network architecture.

How have BAS companies addressed this – The use of encryption? Other (i.e., LDAP – Lightweight Directory Access Protocol)

- Some vendors have created their own 256-bit encrypted B/VPN software.
- Other vendors are adopting the new ASHRAE BACnet standard BACnet/SC (BACnet Secure Connect).
- Other technologies widely used in the IT world like LDAP, to simplify the management of credentials in an organization. This allows for the BAS to follow the same credential requirements as set out by the organization and allow for a better user experience through SSO (Single Sign-On).

3) Trend Logs and Data Ownership

With an emphasis on analyzing, optimizing and monitoring building systems these days to achieve and sustain deep energy efficiency and emissions reduction, there is a strong need have trends and data storage archiving solutions, data ownership is an important topic. What are typical solutions you recommend and why? (i.e., Server or similar that is managed by IT groups with complete data ownership

- I like to see solutions where the trend data collected by the BAS is stored in an industry standard database, like a Microsoft SQL database, stored on a client server (on prem or cloud).
- This is important for many reasons:
  - Makes the data easily managed by IT groups for storage, backups, disaster recovery.
  - Creates a situation where you the owner owns the data. If for some reason you have a breakdown in your relationship with the FDD or BAS provider, the data does not go with that relationship.

With Fault Detection and Diagnostics (FDD) at the forefront for those wishing to use their BAS, what considerations should building managers be looking for in a BAS to ensure ease of implementing an FDD systems?

- BACnet native system architecture
- 3rd Party FDD providers can then easily map the objects to their database.
- Depends on what the FDD provider requires as far a name. This could be an easy change for some vendors or a horrible change for others.

4) Technical Support Services

What % of your clients attend expert level training?

- I would say around 15-20%

Why do you think it is important to offer this type of training? Some BAS manufacturers don't want to train their customers too much for fear of losing service work.

- Manufacturers may also be worried about operators modifying operational code, which could then lead to equipment damage and possible liability. The old saying "with great power comes great responsibility" is relevant here.
- It's important because you want to empower your clients and give them the necessary tools to succeed. Far too often a system is labelled as "not good" or "not user friendly". With a small amount of training, many of those issues can be resolved.
- At the end of the day, the BAS should really be "your BAS in your building, vs the vendors BAS in your building".

5) Documentation

How important do you feel documentation is, specifically the following?

1. Network diagrams

- Basic network architecture diagrams and a complete network device list are crucial pieces of information when trying to troubleshoot a communication issue with the system.

2. Shop drawings including sequences of operation
   - Sequences are vital in understanding what the operating parameters of the specific system are. Without a documented sequence, you have nothing to compare current performance to.
   - Updating them after any changes are made
   - Updates are important for both reasons above. They also allow for new operating staff to better understand what equipment is part of the system, and how that equipment is to operate.

What issues have you run into when this is lacking and what are the repercussions for the building owner?

- The main issues for the owner are when key personnel that "know" the system leave, both on the owner side and the BAS vendor side.
- In the event of a catastrophic failure (either the hardware or software) of the BAS, without documentation you are rebuilding from scratch. This will increase the cost of both operational downtime and money.
- One example could be when the owner wishes to entertain the replacement of the system. Savings could be had by using existing infrastructure, however, if there are no good documents to base a replacement strategy on, this becomes very difficult.

6) Service Level Agreements (SLAs)

What proportion of your service clientele uses a combination of defined preventative maintenance (PM) scope of work (i.e., annual calibration, operational verification of end devices etc.) and block hours versus just block hours?

- We have been advocating for a defined scope of work service model for some time now.
- All of our service clients have some form of defined scope of work with blocks of hours for things like remote troubleshooting support.

For those clients that have a well-defined comprehensive scope of work in their BAS SLAs, what are your observations regarding the # of demand service calls versus those that just buy block hours?

- Hard to say since things happen that are out of everyone's control, for example a flood which damages a BAS controller.
- I would say that clients with better defined SLAs tend to have a much smaller rate of on-demand calls for things like sequence of operation or software/hardware related issues.
- Gives us an opportunity to review the reasons that equipment is placed in manual control. If this is a consistent problem, the root cause needs to be identified and resolved.

Do you have any clients that have regular meetings on the progress of their BAS PM and if so, what is the typical frequency of these meetings?

- Currently some of our clients meet with us on a regular basis, however, the frequency is directly related to the type of operation (Healthcare, Data Centre, Multiple site portfolios, vs. office tower), and the complexity/size of the installation.

Moderator Questions for Paul Bergquist, Business Development Manager, SkyFoundry

1. How long have you been selling FDD?

- The development of our product started in 2009 and became commercially available in late 2010. So almost 12 years. I personally have been involved with this type of software (FDD / Analytics) for more than 10 years and for nearly 25 in the BAS and systems integration business.

2. How has the uptake been over the last 5years?

We have seen a tremendous amount of uptake growth over the past 5 years. Certainly, some parts of the world and certain markets adopt new technologies faster than others.

However, the conversation with owners and operators is really beginning to change.
Owners and operators have become more familiar with the value of data analytics and its impact on their operations.
So over the last 5 years, the conversations have changed from a more general education about the power of data and analytics to more sophisticated applications and use cases.

3. What type of building owners are using this type of software?

Really all types, but in general the ones that are adopting this type of software are the ones that really care about the operations of their facilities and their energy consumption, unfortunately, the reality is that is not everyone.

We see the software is used across all types of facilities. All types of buildings and equipment systems.

Commercial office buildings (owner-occupied, REITs)
Government agencies and municipalities
Data Centers
Laboratories
Industrial facilities and processes
Multi-site Retail and Quick Serve Restaurants
Higher Education
Indoor Agriculture
Entertainment/Hospitality (Casinos, Shopping centers, Hotels)

other users:
(Facility Management Service Providers)
(Energy Engineering, Commissioning, M&V)
(Utilities (demand response load management))

4. With all this data and faults being triggered, are you noticing building owners using 3rd parties to analyze the data a process it or is much of this being done in house?

We see BOTH and it really depends on the organization. Some orgs have their own automation techs, increasingly they have energy managers and managers responsible for ESG Environmental, Social, and Governance). Most typically we see a blend on most projects.

5. What are the key things to consider in FDD software?

Things to consider:
Can the software be installed in the cloud, or can it be on-premise?
Is it customizable? Is it programmable or are you stuck with set FDD rules, reports, visualization?
Does the software support an open and accepted semantic data modeling standard?
What comm protocols does it natively support and will I need additional hardware or gateways to communicate with your systems.

As far as the things that drive the cost of implementation:
- What data do you have?
- Where is it located?
- How will you connect to it? Open protocols, Web API, database integration, Flat file.
- Will you need to add devices/gateways to connect to the data
- How well documented is it?
- Do you know your way around the data? Are you familiar?
- What is the scope of your project (you could just do meters or dig into HVAC equipment)
- What FDD or analytic rules do you want to implement, what KPIs, what reports?