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BACnet[®] is in a “Family Way”

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It probably happened when you weren't looking. You probably didn't notice it at first when it was just starting to show in Addendum 135-2012*a1*, but now with the 2016 publishing, it is too big to ignore that BACnet is in a *family way*. It really is like a new birth in the way we specify and think about BACnet and systems. Specifying BACnet with not only building management systems, but also with lighting systems, physical access control systems, life-safety systems, and soon elevator systems is changing dramatically. This fundamental shift is all happening because of the new “family” approach in BACnet device profiles.

Starting with Addendum 135-1995*d* and through the 2012 publishing of the BACnet standard, device profiles provide the fundamental relationship between which devices control and which devices obey. Very little change happened between the first publication and the 2012 publishing of the BACnet standard regarding device profiles in specifying BACnet equipment. Yes, in Addendum 135-2008*l* the Advanced Workstation (B-AWS) was added, but it was all based on the premises that a device was one type and all rooted in HVAC automation.

Remember, the standard development organization of BACnet was ASHRAE, and almost the entire standard was originally written with HVAC systems in mind. The BACnet committee's first official meeting was in Jan. 1987, and the BACnet standard did not have its first official publication until June 1995, eight years later. Other systems were not a primary consideration until much later. A good example of that was the Lighting Application Working Group, which did not have its first meeting until 2001, 14 years after BACnet's first meeting. When it came to device profiles, other systems such as fire systems, physical access control systems, or lighting systems adopted functionality to fit the existing HVAC-based device profiles.

From the beginning of the BACnet committee, many of the founders, who still participate in the standard today, such as H. Michael Newman, David Fisher and Steven Bushby, had the goal that BACnet would be a protocol for

not only HVAC systems and building management systems but all building automation systems, such as fire, physical access control, and lighting.

To help accomplish that goal over the years, life-safety objects, access control objects, and lighting objects have been developed specifically for systems other than HVAC. However, when it came to device profiles, there was much debate if the current device profiles should encompass all objects (and possibly become too heavy-weight) or make optional everything that was added specifically for fire, physical access control, and lighting. However, optionality did not encourage implementation of these industry-specific objects and services for other systems and did not encourage BACnet as the primary building control protocol.

Another option was realized with Addendum 135-2012*a1*, which put forth the concept of device profile families to allow a way to incorporate and identify additional functions like gateways, BACnet routers and BBMDs through device profiles. Addendum 135-2012*a1* divided the known device profiles into two families: operator interfaces and controllers.

Operator interfaces were composed of B-AWS, B-OWS, and B-OD, while controllers were B-BC, B-AAC, B-ASC, B-SA, and B-SS. A third family was added called “miscellaneous,” which included BACnet routers (B-RTR),

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gateways (B-GW) and broadcast management devices (B-BBMD).

The addendum stated, “Devices that claim multiple device profiles shall only combine capabilities from different device profile families, allowing one profile to be claimed per family, with the exception that multiple profiles may be selected from the ‘Miscellaneous’ family. For example, a device may claim the B-BC, B-RTR, and B-BBMD profiles, but a device may not claim both the B-BC and B-SS profiles.”

This concept of families was new—that a physical device could support multiple BACnet device profiles. It was realized that this concept could be expanded to include device profiles designed for specific systems.

Keeping the traditional operator interfaces and controllers families, Addendum 135-2012*bc* added a family of physical access control operator interfaces and access control controllers. For life-safety, such as with fire systems, this addendum also introduced families of life-safety operator interfaces and life-safety controllers.

Finally, Addendum 135-2012*be*, currently in the public review process, adds lighting to the mix, with new families of lighting operator interfaces, lighting controllers, and lighting control stations.

The new landscape for device profiles categorized into families looks like:

- **Operator Interfaces**—composed of B-AWS, B-OWS, and B-OD.
- **Lighting Operator Interfaces**—composed of B-ALWS and B-LOD.
- **Life Safety Operator Interfaces**—composed of B-LSWS and B-LSAP.
- **Access Control Operator Interfaces**—composed of B-AACWS, B-ACWS, and B-ACSD.
- **Lighting Control Stations**—composed of B-ALCS

TABLE 1 Growth of BACnet families.	
SINGLE FAMILY DEVICE PROFILE THROUGH 2015	
TRADITIONAL DEVICE PROFILES (HVAC)	
BACnet Advanced Operator Workstation (B-AWS)	Operator Interfaces
BACnet Operator Workstation (B-OWS)	
BACnet Operator Display (B-OD)	
BACnet Building Controller (B-BC)	
BACnet Advanced Application Controller (B-AAC)	
BACnet Application Specific Controller (B-ASC)	
BACnet Smart Actuator (B-SA)	
BACnet Smart Sensor (B-SS)	
CONTROLLERS	
DEVICE PROFILE FAMILIES ADDED 2016	
LIGHTING DEVICE PROFILES (IN 2ND PUBLIC REVIEW, HAS NOT BEEN FINALIZED)	
BACnet Advanced Lighting Workstation (B-ALWS)	Lighting Operator Interfaces
BACnet Lighting Operator Display (B-LOD)	
BACnet Advanced Lighting Control Station (B-ALCS)	Lighting Control Stations
BACnet Lighting Control Station (B-LCS)	
BACnet Lighting Supervisor (B-LS)	Lighting Controllers
BACnet Lighting Device (B-LD)	
LIFE SAFETY DEVICE PROFILES	
BACnet Advanced Life-Safety Workstation (B-ALSWS)	Life-Safety Operator Interfaces
BACnet Life-Safety Workstation (B-LSWS)	
BACnet Life-Safety Annunciator Panel (B-LSAP)	Life-Safety Controllers
BACnet Advanced Life-Safety Controller (B-ALSC)	
BACnet Life-Safety Controller (B-LSC)	
ACCESS CONTROL DEVICE PROFILES	
BACnet Advanced Access Control Workstation (B-AACWS)	Access Control Operator Interfaces
BACnet Access Control Workstation (B-ACWS)	
BACnet Access Control Security Display (B-ACSD)	Access Control Controllers
BACnet Advanced Access Control Controller (B-AACC)	
BACnet Access Control Controller (B-ACC)	
MISCELLANEOUS DEVICE PROFILES	
BACnet Router (B-RTR)	
BACnet Gateway (B-GW)	
BACnet Broadcast Management Device (B-BBMD)	
BACnet Access Control Door Controller (B-ACDC)	
BACnet Access Control Credential Reader (B-ACCR)	

and B-LCS.

- **Controllers**—composed of B-BC, B-AAC, B-ASC, B-SA, and B-SS.
- **Lighting Controllers**—composed of B-LS and B-LD.
- **Life-Safety Controllers**—composed of B-ALSC and B-LSC.

- **Access Control Controllers**—composed of B-AACC and B-ACC.

- **Miscellaneous**—composed of B-RTR, B-GW, B-BBMD, B-ACDC, and B-ACCR.

The concept is like going to a restaurant where the menu allows you to order from each column to have exactly what you want. If you only want the soup from Column A, that is fine. Or, or if you want the entire meal, you can order from each column. This allows those systems that want to narrow their scope to do exactly that. A workstation can concentrate solely on a traditional HVAC-based device profile, and that would be perfectly acceptable. But, if that workstation wants to be everything to every system, it can also do that.

Now, this does not mean that a traditional Advanced Workstation (AWS) can't control physical access control or lighting. It simply means that access control or lighting systems incorporate the basic, more traditional BACnet objects and services to interface and does not implement those more advanced objects and services made specifically for the needs of access control or lighting.

An unexpected benefit is that this family concept makes it easier for building automation systems like lighting and physical access control to use BACnet as their primary protocol regardless of if they are connecting to a building management system or not. A lighting system, for example, can have its main software display as a lighting operator interface device profile, and lighting keypads as lighting control stations device profiles. This concept opens BACnet to becoming the fundamental open protocol to be used by all building systems.

What is the next group of families? Elevators. Addendum 135-2012*aq* adds objects specific to elevators. History tells us that once the objects and services (if any specific services are needed) are established for a particular system, then the BACnet interoperability building blocks (BIBBs) and device profiles for that system come soon after.

This new family approach will help BACnet become the predominant building system protocol for all building systems, not just for HVAC. This allows for specifying BACnet in each system and between systems, leading to seamless machine-to-machine (M2M) integration, and that is the goal in an IoT world. ■

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