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BACnet Developers Q & A

By Steve Karg, Member ASHRAE

Over the years while being involved in the BACnet committee and developing BACnet products, I have fielded questions about BACnet product development. Some of those questions are answered by the official BACnet Testing Laboratories "Implementation Guidelines". However, some questions are beyond the general scope of that document.

Question: Why does Multi-state Input object Present_Value property not accept a value of zero? What is up with this filter?

Answer: In addition to Present_Value, the multi-state value has a property called State_Text, which is a BACnetARRAY[N] of CharacterString:

From the BACnet standard, ASHRAE 135-2012:

> 12.18.4 Present_Value
> This property, of type Unsigned, reflects the logical state of the input. The logical state of the input shall be one of 'n' states, where 'n' is the number of states defined in the Number_Of_States property. The means used to determine the current state is a local matter. The Present_Value property shall always have a value greater than zero. The Present_Value property shall be writable when Out_Of_Service is TRUE. Any local modification to the value of the Present_Value when the Number_Of_States property is changed is a local matter.
> ...
> 12.18.12 State_Text
> This property is a BACnetARRAY of character strings representing descriptions of all possible states of the Present_Value. The number of descriptions matches the number of states defined in the Number_Of_States property. The Present_Value, interpreted as an integer, serves as an index into the array. If the size of this array is changed, the Number_Of_States property shall also be changed to the same value.

A BACnetArray element 0 returns the number of elements in the array:

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> ...
> A "BACnetARRAY" datatype is a structured datatype consisting of an ordered sequence of data elements, each having the same datatype. The components of an array property

> may be individually accessed (read or written) using an "array index," which is an unsigned integer value. An index of 0 (zero) shall specify that the count of the number of data elements be returned. If the array index is omitted, it means that all of the elements of the array are to be accessed. An array index N, greater than zero, shall specify the Nth element in the sequence. When array properties are used in BACnet objects, the notation "BACnetARRAY[N] of datatype" shall mean an ordered sequence of N data elements, each of which has that datatype. The datatype of array element 0 is Unsigned. If the size of an array may be changed by writing to the array, then array element 0 shall be writable. If the value of array element 0 is decreased, the array shall be truncated and the elements of the array with an index greater than the new value of array element 0 are deleted. If the value of array element 0 is increased, the new elements of the array, those with an index greater than the old value of array element 0, shall be created; the values that are assigned to those elements shall be a local matter except where otherwise specified. Where the size of an array is allowed to be changed, writing the entire array as a single property with a different number of elements shall cause the array size to be changed. An attempt to write to an array element with an index greater than the size of the array shall result in an error and shall not cause the array to grow to accommodate the element. Arrays whose sizes are fixed by the Standard shall not be resizable.

Therefore, the Present_Value state cannot have a value of 0 since the Present_Value, interpreted as an integer, serves as an index into the State_Text array.

Question: We have been questioned whether our BACnet device is native or non-native. I have no idea what this term means, and there is no mention of it in the BACnet protocol standard. Could you shed any light on this terminology?

Answer: There is small mention of "Native BACnet Systems" in the following article: http://www.bacnet.org/Bibliography/ASH-3-98/ASH-3-98.htm "New and existing installations use BACnet for all aspects of communication, including workstation, field panel, custom application controller and unitary controller communications and are commonly referred to as native BACnet systems."

The BACnet committee debated "Native BACnet" vs "BACnet Gateway" for many years, and even tried to nail down the definition. The proposal "DMF-034" by David Fisher initially defined "Native BACnet Device" as "a BACnet device that uses BACnet for communication. A BACnet device may also provide gateway functionality and still be described as a Native BACnet device." The subsequent debate in committee changed the definition to "a BACnet device that uses BACnet for communication. A Native BACnet Device represents a grouping of physical and logical inputs and/or outputs whose value and status are represented as BACnet object properties. The physical measuring inputs and/or actuation outputs are intended to be part of, or in close proximity to, the BACnet device. The totality of input/output hardware is considered to be a single Native BACnet device so long as the detached input/output hardware cannot be used or sold by itself for any other purpose." The committee debated the proposal, but there was still not consensus on where a vendor draws the line between the BACnet stack and its connection to its I/O or other object property values and behaviors. The discussion was tabled in 2007.

Therefore, there currently isn't any standard definition of the term "Native BACnet". There is a standard definition of a BTL listed device, however, and that is the only standard type of BACnet device defined.

Editor's Note: Marketers Rush In Where Engineers Fear to Tread
An anonymous member of the BACnet International Marketing Committee defines 'native' as a product, which was conceived, designed and produced to communicate via BACnet versus products, which may add BACnet communications to an otherwise proprietary platform.

Question: I need to be able to detect whether a point is writeable or not, but can't find a definitive reference on how to detect this in the BACnet standard. It does state what properties are required to be writeable/readable/optional, but it does also state:
"Such R (Readable) or O (Optional) properties may also be writeable at the implementor's option unless specifically prohibited in the text describing that particular standard object's property that vendors can still choose to make it writeable."

Answer: Unfortunately, there isn't an easy way to know if a point is writable, other than asking the vendor to provide you a list of points in some easy to use format. Someday there may be XML files referenced by the device which will show which properties are writable, but that is still in discussion.

The accepted way to determine writababilty, at the moment, is to read the property value, write the same property value back, and see if there are errors indicating the property is not writable.

About the Author

Steve Karg is a Senior Engineer at WattStopper, in Birmingham, Alabama. He has been an active member of ASHRAE SSPC 135 (BACnet) since 2001, and convenes their Lighting Applications working group. He wrote an open source BACnet Protocol Stack hosted on SourceForge.net, and continues to help maintain the BACnet decoder in Wireshark.