

OT PROTOCOL PRIMERS

BACNET

BACKGROUND

BACnet, “Building Automation and Control Network” is a data communication protocol developed by ASHRAE and adopted by ANSI in 1995. BACnet enables interoperability of building monitoring and control products made by different manufacturers. In 2003, BACnet was also adopted as ISO 16484-5. [1]

BACnet, Standard 135-2020, is available to purchase online: <https://www.techstreet.com/ashrae>.

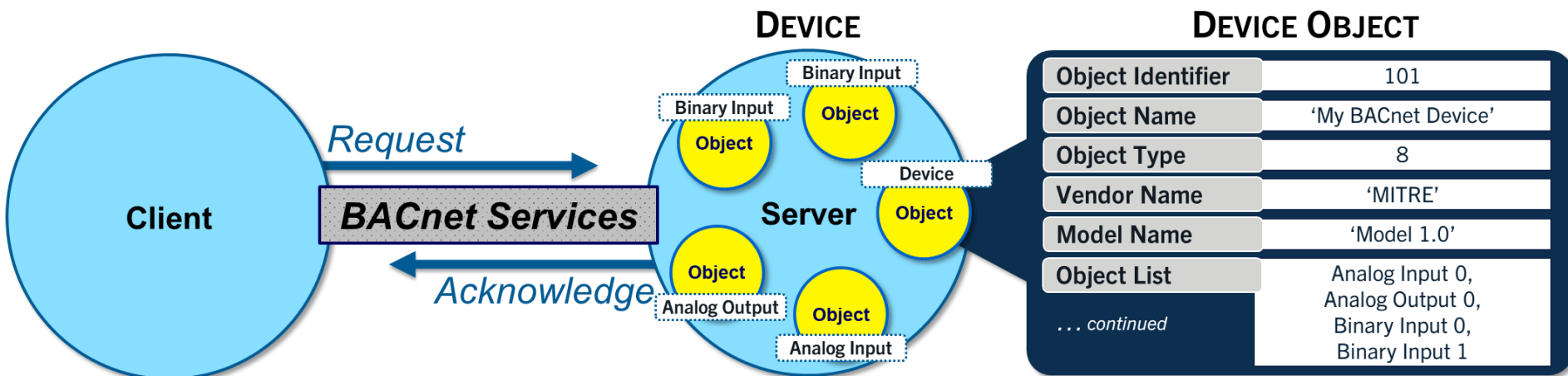
The protocol is used in a variety of building systems products including Heating, Ventilation, Air Conditioning (HVAC), Lighting, Fire and Life Safety, Access Control, and Elevators. [1]

FUNDAMENTALS

- BACnet follows a traditional client/server model. [1]
- BACnet supports transport over different network types: SC, IP, IPv6, MS/TP, ARCNET, Ethernet, Point-to-Point, LonTalk, and Zigbee [1]
- BACnet/IP uses UDP port **47808** by default. [2]
- BACnet supports encrypted communication when Secure Connect (BACnet/SC) is used. [1]
- BACnet leverages an object-oriented model for describing process controls and devices. [1]

COMMUNICATION

The BACnet protocol exposes data as standardized **objects**. A BACnet device will manage multiple objects, each defined by a series of **properties**. The protocol provides **services** that allow users to interact directly with BACnet objects and their properties. [1]



SERVICES

The BACnet protocol defines over 40 different services that span a variety of functions. Some of the most utilized services are listed below by category. Reference the specification for a complete listing of all objects, properties, and services. [1]

OBJECT ACCESS

Read Property
Read the value of one or more properties stored in a BACnet object.

Read Property Multiple
Read the value of one or more properties stored in a BACnet object.

Write Property
Write the value of one or more properties stored in a BACnet object.

Write Property Multiple
Write the value of one or more properties stored in a BACnet object.

FILE TRANSFER

Atomic Read File
Read the contents of a file on a BACnet device.

Atomic Write File
Write to the contents of a file on a BACnet device.

DEVICE MANAGEMENT

Who-Is
Identify any BACnet devices present on the network.

I-Am
Identify BACnet devices that contain a specified object.

Who-Has
Identify BACnet devices that contain a specified object.

I-Have
Identify BACnet devices that contain a specified object.

[3]

OBJECTS

Object	#	Description
Analog Input	0	Sensor input
Analog Output	1	Control output
Analog Value	2	Analog control parameter
Binary Input	3	Switch input
Binary Output	4	Relay output
Binary Value	5	Digital control parameter
Device	8	BACnet device
File	10	Data file
Group	11	Object grouping

[3]

PROPERTIES

Property	#	Description
Object Identifier	75	Unique numeric id of the object
Object Name	77	Name of the object
Object Type	79	BACnet object type (e.g. <i>Analog Output</i>)
Object List	76	List of all objects on device or in group
Property List	371	List of all properties within the object
Description	28	Text-based description of the object
Present Value	85	Current value of the object
Units	117	Unit of measure associated with object value
Status Flags	111	Flag that indicates the device or object health

*The BACnet standard defines required properties for each object

[3]



REFERENCES

[1] BACnet International. (2019). *Introduction to BACnet For Building Owners and Engineers*.
https://s3.amazonaws.com/media.mycrowdwisdom.com/bacnet/resources/IntroductiontoBACnet_10072019.pdf

[2] Internet Assigned Numbers Authority. (2024). *Service Name and Transport Protocol Port Number Registry*.
<https://www.iana.org/assignments/service-names-port-numbers/service-names-port-numbers.txt>

[3] Mueller, H., Karg, S., Lischka, H., & Kraemer, F. (2010). *packet-bacapp.c*. Wireshark.
<https://github.com/wireshark/wireshark/blob/master/epan/dissectors/packet-bacapp.c>