

# ENGINEERING UPDATE

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## UNDERSTANDING BACNET: HOW AND WHY IT WORKS



*An example of Fan Filter Units in a cleanroom on a BACnet system. The BACnet router's MS/TP port links to the BACnet Commissioning Tool and the Fan Filter Units, and the Ethernet port connects to an IP switch that services the Web Server and the building's local area network (LAN).*

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Building Automation and Control Network (BACnet) protocol is used to control HVAC system equipment and other equipment within a building. Using BACnet allows end users and operators to monitor the HVAC equipment through a graphical interface. It provides live, real-time data for all zones connected to the BACnet network. For example, a building operator could see if a boiler is operating in heating mode or if an air conditioner is cooling the building.

BACnet is a form of communication used between multiple controllers, allowing them to communicate with each other in a building. BACnet is known as an “open-source protocol,”

which means that any controllers using BACnet can communicate with one another, regardless of who manufactures them.

Before BACnet existed, every protocol was proprietary, meaning that only certain controllers could communicate with each other on a certain platform. This limited the different types of controllers that could be used in a building and forced building owners to repeatedly use the same controller brand. ASHRAE has developed the BACnet standard to eliminate this issue, and continues to evolve as new technologies arise.

BACnet is the most popular type of open source protocol used in Building Automation Systems, having been used around the world and specified in

tens of thousands of buildings.

BACnet is not only limited to HVAC, but can be used to monitor other systems like lighting, fire detection or energy monitoring. These unrelated systems can easily communicate with one another through BACnet, even though each segment of the network operates independently.

BACnet communication between devices uses Master/Slave Token Passing (MS/TP), where a packet of information known as a “token” gets passed from one controller to the next. When a controller has the token, it can supply information to the master controller on the BACnet network. If there is no information required from the controller, the token moves on to the next controller in line.

The “baud rate” of the network determines how fast the data passes along the network. Faster baud rates increase the response time. It is important to note that all devices on a BACnet network segment must run at the same speed.

MS/TP continually scans for and adds any new devices that may have been added to the network, allowing the new additions to share information, and expand the network as needed. In most cases, the controllers are “server only” meaning they can provide BACnet data to another controller on the network when asked. In other cases, a controller can act as a “client” and can request information from the server devices on a network. An example of a “client” controller would be a front end building management system (the “client”) requesting information from a VAV box controller (the “server”).

As controllers share information on a network, a polling strategy can be implemented to intelligently control the equipment in a building – for example, when a rooftop controller polls for information from multiple VAV box controllers. Requesting data like Room Temperature and Setpoint helps the rooftop controller determine if it needs to run in heating, cooling or neutral mode, which leads to long-term energy savings.

When using a BACnet front-end system, you can access the system remotely via a web browser. Setting up trends and alarm notifications can help troubleshoot the system and save on energy costs.

There are a few key points that you need to know about BACnet networks and how to set them up correctly.



Using BACnet allows end users and operators to monitor the HVAC equipment through a graphical interface

### 1. WIRING THE DEVICE OR CONTROLLER

A typical wiring scheme is to use a three-wire daisy chain connection over MS/TP BACnet, also known as RS485 communication. This three-wire daisy chain wiring is simple and easy to implement.

### 2. SETTING THE CONTROLLER ADDRESS

Each controller needs a unique MAC address, like a unique number for every house on a street, to identify where the data is coming from. Just like your cell phone needs its own number, duplicate addresses are not recommended.

### 3. GATHERING POINT DATA OR INFORMATION

When you use a web server or front end system, you can collect points and data to help troubleshoot and monitor the system. Points like room temperature, set point, damper position, airflow, etc.

### 4. BTL CERTIFICATION

Even though BACnet is an open-source protocol, everyone should follow the rules set out by ASHRAE. BACnet Test Laboratories provides BTL certification to systems complying with ASHRAE standards.



Price supports BACnet system design and commissioning with a variety of system accessories

I hope this helps you understand BACnet and how it works with HVAC equipment in buildings. If you have any questions about how to leverage the advantages of a BACnet system in your next project, please contact [controls@priceindustries.com](mailto:controls@priceindustries.com).