

# Smart Bidding for BACnet® Systems

By **Grant Wichenko, P.Eng.**, Member ASHRAE

**B**ACnet has provided owners with new and better methods for managing multiple buildings. Before the advent of BACnet-based direct digital control systems, owners tried to select a few vendors of proprietary products, or they installed the same DDC system in all buildings. Restricting competition to a few systems simplified the work of the maintenance department, but created political problems for public sector owners such as military bases, school boards, universities or other taxpayer-funded organizations, who must maintain open competition.

Most owners allowed the mechanical contractor (who normally employs the DDC vendor as a subcontractor) to carry the low controls price from a group of vendors designated as approved equals.

This satisfied the need for competition but resulted in several proprietary systems to be installed on base or in a school district, but it meant the owner had no control over product selection.

If the owner opted for the multivendor solution but wanted a common front end, one vendor or an independent third-party front end vendor would be selected to provide a proprietary interface to the other vendors.

The owner now had to pay the front end vendor to map in the points from a new DDC system to the common front end.

BACnet has eliminated all this additional, frustrating work for owners. Now, owners can select BACnet-based systems that can talk to each other (or interoperate) on a common BACnet internetwork.

Yet, even with BACnet, many owners still want to see only a few systems in the multibuilding campus or school district because this will simplify maintenance and training. But, they also want control over which systems are installed.

Normally, DDC contracts are awarded on the basis of a low bid. This assumes all DDC systems are approved equals. While this assumption is valid when selecting hot water pumps or cast-iron boilers, it is hard to apply to DDC systems.

Each DDC system vendor offers a range of panels and front end software that can start and stop pumps or modulate valves. The issue is that every vendor provided a wide range of features that was often different from another vendor's product offering.

The standard specification approach of approved equals will not work because often Vendor A offers a particular feature desired by the consultant and the owner, which Vendors B and C do not offer. This feature may come at a price and, under a low bid arrangement the vendor with the desired feature set, may not be the low bidder.

The most popular solution for consultants is to provide a sequence of operations specification. The argument is that if the vendor can meet the sequence, then that is all required. No need exists to specify the system architecture (i.e., BACnet compliance, the graphical user interface, panel memory requirements etc.). This same consultant would not in the heating system specification, for example, specify a 1,000,000 Btu/h (293 kW) output device without stating if the contractor is to provide a cast-iron boiler, a copper tube boiler or a bunch of house furnaces, as the means of providing the heating requirement.

Readers are referred to ASHRAE's Guideline 13, *Specifying Direct Digital Control Systems*, for information on how to specify DDC systems properly.

The author has designed a process for selecting DDC system vendors for multibuilding owners who wish to have BACnet-based systems installed. This process is particularly suited to public sector owners accountable to a taxpaying public who expect an open and fair bidding process.

The author's firm has selected key clauses from its DDC system specification and has assigned a score to each of these clauses. The scoring system has 35 specification clauses as minimum mandatory requirements that all prospective bidders must meet and 61 specification clauses that are scored. BACnet compliance represents about 30% of the total score.

An example of a minimum mandatory requirement is that the vendor must support selected data sharing (BACnet Interoperability Building Blocks) BIBBs. Support for the trending, alarming and scheduling BIBBs are a scored item.

The minimum mandatory requirements and the scored items in the specification are selected based upon a detailed assessment of the owner's requirements. The score represents how close a DDC vendor's product comes to meeting the owner's ideal DDC system.

The next step in the process is to invite DDC vendors who have met all the minimum mandatory requirements to provide a one-on-one demonstration of their products. The one-on-one interviews allow the vendor to show proprietary features and to clarify the scores claimed.

The vendors also are invited to participate in a BACnet PlugFest ([www.bacnetassociation.org](http://www.bacnetassociation.org)), which allows prospective DDC vendors to connect their equipment on a common

## BACnet Implementation Case Study 1

The Keewatin Patricia District School Board has used the DDC vendor selection process described here since 2000. Mr. Kim Carlson, the director of facilities found the process to be extremely successful. "We have saved hundreds of thousands of dollars in construction costs with BACnet-based systems that have been installed on a competitive basis," says Carlson. "We have had the same three vendors for the past five years. The relationship between my staff and the vendors' staff has been extremely positive." The Board recently awarded an energy performance contract to a controls contractor for putting in DDC systems in 12 schools. The contractor was not one of the three approved DDC vendors but was required to install DDC systems from these three vendors only. Carlson notes that "once we complete this performance contract, all but a few schools

will have BACnet-based systems. We were one of the early adopters of the scoring system, and we are very happy that we took this step. We are working to develop a one-page summary Web page to be created by one of the vendors that will show the comfort and energy data for each school. This Web page will be accessible to our principals and key administrators over our Board's Intranet." Now that virtually all the systems are BACnet-based, the Board plans to have one vendor provide all the trending and energy reporting. The Board also has used BACnet to integrate a chiller into the school network. Carlson plans to require that any new equipment, such as chillers, be BACnet compliant. The Board will eventually migrate these BACnet systems to XML. All three vendors now offer or will soon offer this migration path.

BACnet Internetwork and show how they interoperate. The PlugFest permits the owner to see that a vendor can show demonstrate compliance to the various BACnet BIBBs in a live demonstration (see the sidebar). Readers can also go to [www.appin.com](http://www.appin.com) to see a slide show of the 2002 BACnet PlugFest organized by the BACnet Interest Group—North America (BIG-NA).

The author's firm and the owner then meet to score each vendor's proposal. There are normally two reviewers beside the firm's staff who have attended the demonstration. Each reviewer scores the proposals independently. The three vendors meet to agree upon the score for each vendor.

The owner picks the top three or four highest scoring vendors to be approved vendors on base or on campus for a fixed period (usually three to five years). While each vendor receives a debriefing and the item-by-item score, only the composite score for the vendor is publicly released.

DDC vendors must provide information from their published documentation (a user's guide) or through the demonstrations, to prove their compliance to the mandatory and scored specification items. It is very time consuming for the owner and the vendor, but the reward for this effort is that the top three or four vendors become approved vendors for all jobs on base or in the school district for the three- to five-year period.

From the owner's perspective, this approach provides a level of certainty of who will be the suppliers over the contract period. It is worthwhile for the owner to have key maintenance personnel take factory training on these systems as it is likely that one vendor will have more than one system installed.

Vendors now have the opportunity to bid on work knowing

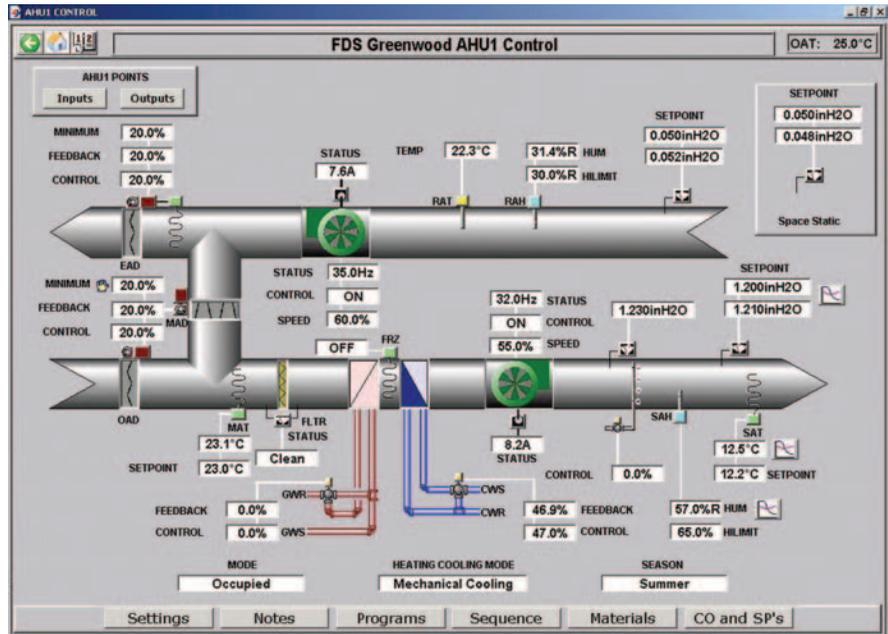


Figure 1: Graphical design user interface for an air-handling unit designed to the graphic standard.

that the competition is limited to the approved vendors. The vendors also become familiar with the owner's requirements (e.g., the security procedures for outside Internet access on a military base). Most importantly, all of this installation and warranty/maintenance work is done on a competitively priced basis, so the purchasing department's requirements for an open bidding process are met.

The owner may decide to use the scoring system strictly as a screening tool to identify prospective vendors. Under this option, jobs are awarded on a low bid from the approved vendors. The firm's preferred approach is to award jobs on a split between the vendor's score and price (e.g., 60% price and 40% score). While awarding on low price is a simpler approach, this latter option allows jobs to be awarded on the basis of best value instead of on low price. All vendors upgrade their products on a continuous basis. Vendors have

## BACnet Implementation Case Study 2

The Greenwood Air Force Base in Greenwood, NS, Canada, has used the author firm's DDC system scoring process since 2003. The firm worked with Defence Construction Canada to design the specification and the scoring system. In this project, 11 DDC system vendors attended the initial bidder's meeting. Eight vendors submitted credentials. Two vendors did not make the minimum mandatory requirements. Six vendors attended the BACnet PlugFest. The base selected four vendors as approved vendors for the five-year contract period. For more information on Defence Construction Canada's Best-Value Procurement approach, go to [www.dcc-cdc.gc.ca/documents/publications/dcc\\_at\\_work\\_Feb\\_05\\_e.pdf](http://www.dcc-cdc.gc.ca/documents/publications/dcc_at_work_Feb_05_e.pdf).

Several DDC jobs are underway that involve various levels of system integration. Some jobs involve integrating BACnet-based equipment such as a chiller and computer room air conditioning into the base-wide BACnet internetwork. One proprietary DDC system will be converted to BACnet and one of the approved BACnet vendors will be responsible for providing Web access to this system. The base is networking two chillers together with BACnet. Other chillers on base may be added to the BACnet internetwork on base to simplify chiller maintenance and remote troubleshooting. Options for integrating trending, alarming and scheduling are also under consideration.

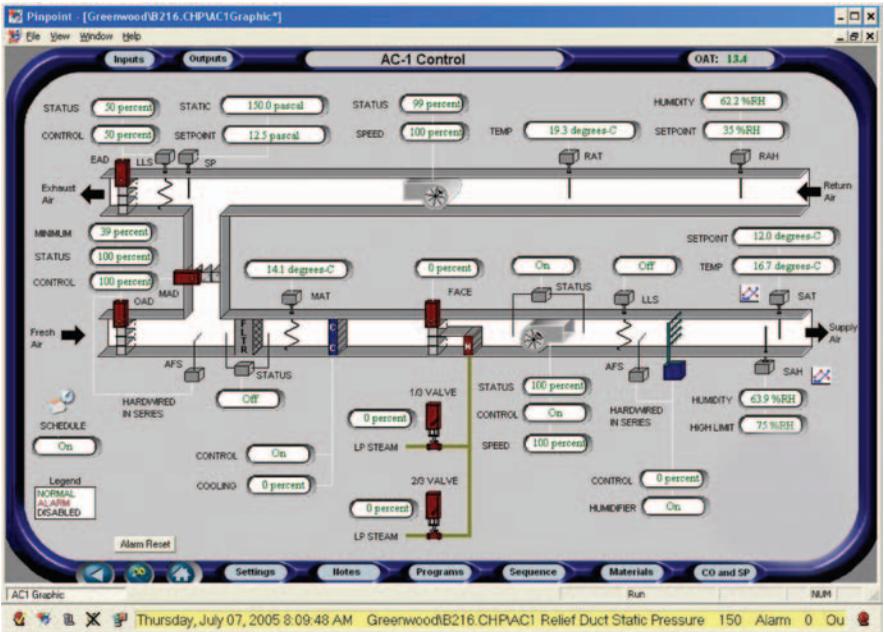


Figure 2: Another vendor's air-handling unit graphic designed to the same graphic standard.

the option of requesting a revision to their technical scores as they release new versions of the product. Thus, an incentive exists to keep current and to offer the latest product to the owner. To date, the firm has used the scoring system on jobs in a defined geographical area. Local capabilities to install and maintain the product represent less than 5% of the points score. This same process can be applied nationally or globally if the owner has facilities across the country or around the world.

The firm has used this process since 1993, long before BACnet was popular. Now with BACnet/IP, vendors and owners have the option of having these systems interoperate on a common wide area network (WAN) on base or on campus. This leads back to the issue of having a common front end to all systems on the WAN. BACnet will permit the owner to select one vendor as the front end of choice. This form of system integration can be done more easily than before BACnet existed.

This approach places one vendor at an advantage over the other approved vendors on every job, as this vendor will get a sole source contract to create graphics regardless of whether this vendor wins the job or not. Owners generally want each job to stand alone, so a clear line of

contractual responsibility exists between the owner and contractor for each job.

The firm has set a graphical design standard and a point-naming convention in the specification, so the graphics for an air handler look and operate the same way to the user (Figures 1 and 2 are graphics created by different vendors. The graphics present the same information to the user). The firm allows a DDC vendor to create graphics for another vendor for specific BACnet-based terminal equipment.

BACnet allows for system integration at the front-end level as well as at the field panel level. The vendor with the best trending and report capabilities can take on this task for all buildings on the internetwork. Another vendor may have an excellent scheduling system. The third vendor may have the best two-pane Windows® Explorer-style view that does not require graphics. The owner can use one vendor's system to do all the trending and another to do all the occupancy and holiday scheduling. This allocation of network-wide responsibilities is possible if all the systems are BACnet-based.

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