

Building Controls: Yesterday, Today, and Tomorrow

By Dick Starr

In 1985, a Japanese company named Nintendo released a video gaming system in the U.S. The system was different than other gaming systems because it was designed to look less like a video game console and more like something that would fit in with other home entertainment devices.

Throughout the late 80's and early 90's, Nintendo sold over 62 million systems. That kind of saturation would mean that the majority of adolescents between 1985 and 1995 have either owned or played a Nintendo gaming system at some point. Hence the term - the Nintendo Generation.

Back in 1995, when I wrote the article "Building Controls: Yesterday, Today, and Tomorrow," for *Contracting Business Magazine*, I made some predictions. One of those predictions was that the Nintendo generation would slowly assume a role in the end user's HVAC chair.

Do More For Less

I predicted that by the year 2000, the Nintendo kids would be a big part of the HVAC workforce. Custom tailoring a building to meet the end users needs would be done with the philosophy: "do more for less." The Nintendo kids are used to the "plug and play" mentality. They are part of a generation who were also exposed to computers and common software platforms such as "Windows" or Macintosh operating systems. Users will just not tolerate systems that are difficult to use or navigate. They want graphically friendly screens

that don't require an engineering degree to operate. Building owners want to be able to have rank and file staff look at a graphic and determine whether or not there's a problem, without having a whole lot of training.

As I predicted in my previous article, the Nintendo kids of today want nothing to do with proprietary, non-integrated systems. They see a building that delivers functionality using an integrated network of intelligent communicating devices that all "speak" a common language or protocol.

When I wrote the original article, ASHRAE's BACnet (Building Automation Control NETWORK), was a stalled effort at creating a common language, and a company called the Echelon Corporation was promoting an umbrella networking technology called LONWORKS.

That company was also promoting a universal protocol called LonTalk that uses neuron chips so the same power lines can be used by HVAC, lighting, security, and fire/life safety systems. Today we're finding that most controllers are using software that works with either ASHRAE's open protocol BACnet or the open protocol LonTalk.

Let's Talk

In order for systems to be successfully integrated, there has to be some cooperation between the manufacturers that make the control systems. Whether you're a controls manufacturer for HVAC, fire alarm, or security systems, you need to know a little bit about the 'other guy' and the 'other guy'

How It Started: A Look Back

(The following paragraphs are excerpts from the original article that I wrote in 1995.)

Mini-Computer

In the early 70's a large mini-computer was the centralized host that performed all the building automation functions. There were two main drawbacks to this set up. Extensive and expensive wiring was required to "home-run" every sensor and actuator back to the host, and if the central host went down, the entire building automation system stopped working.

Microprocessors

In the late 70's, microprocessors were introduced. This changed building automation architecture because now limited intelligence could be distributed throughout the building via local controls panels. This greatly reduced control system wiring costs. However, all control decisions were still made at the host, which continued to be the weak link in the control chain.

Direct Digital Controls

The early 80's saw the emergence of direct digital controls (DDC). These systems provided automatic control of a condition or process by a digital computer. The digital computer replaced the local loop control system in every respect.

A typical HVAC pneumatic control loop consists of a pneumatic temperature sensor, pneumatic receiver controller, and a heating or

cooling valve. In this system the sensor provides a signal to the controller, the controller provides an output that positions a valve to create the correct duct temperature in the supply air stream.

A DDC system replaces this loop with an electronic temperature sensor and a microprocessor replaces the receiver controller. The output from the microprocessor modulates an electronic valve actuator.

Hybrid Systems

Commonplace during the "pre-acceptance period"

has to know a little bit about you so that the information can be properly networked and shared.

Legacy control systems still require gateways to talk with other systems, and gateways aren't always a slam-dunk kind of answer. Be sure the gateway device that you use is true, tried, and tested. When you

try to integrate the system, the factors of service, reliability, and repeatability come in to play. It's necessary that you're really confident in the gateway device.

Figure 1 is an example of a Tridium system integration project we recently completed. It had vintage 2008 Siemens LON controllers on one side of the building, and a 1995 Johnson Controls Metasys system on the other side of building.

The owner wanted one platform that would connect both systems. After the HVAC control system was successfully complete, IT personnel wanted to know if we could use the Tridium system to perform a daily/weekly/monthly/yearly Power Utilization Efficiency (PUE) calculation, so they could see how efficient their server room was.

This required us to monitor incoming power, monitor computer room power, subtract computer room power from incoming power, subtract the computer room air conditioner (CRAC) units and lights from computer room power to get the calculation. Hence, the integrated system allowed the owner to enhance his own sustainability objectives well beyond HVAC.

of DDC was the hybrid application. It allowed the conservative specifier to test the DDC waters without worrying about the less-than-perfect reputation that electronic actuators had back then. Besides, many retrofit applications already had an air compressor as the pneumatic power supply. So a pneumatic actuator would power the final control element but the DDC furnished the signal to the device.

To accomplish this, the interface between the two

languages (pneumatic and electronic) required an interpretive device called a transducer. The transducer takes the digital signal and converts it to an analog (pneumatic) one.

In the early days, hybrid systems were heavily promoted by the major controls manufacturers because they produced pneumatic actuators. As long as the building had pneumatic controls, it made life difficult for the newer controls manufacturers that produced only electronic systems.

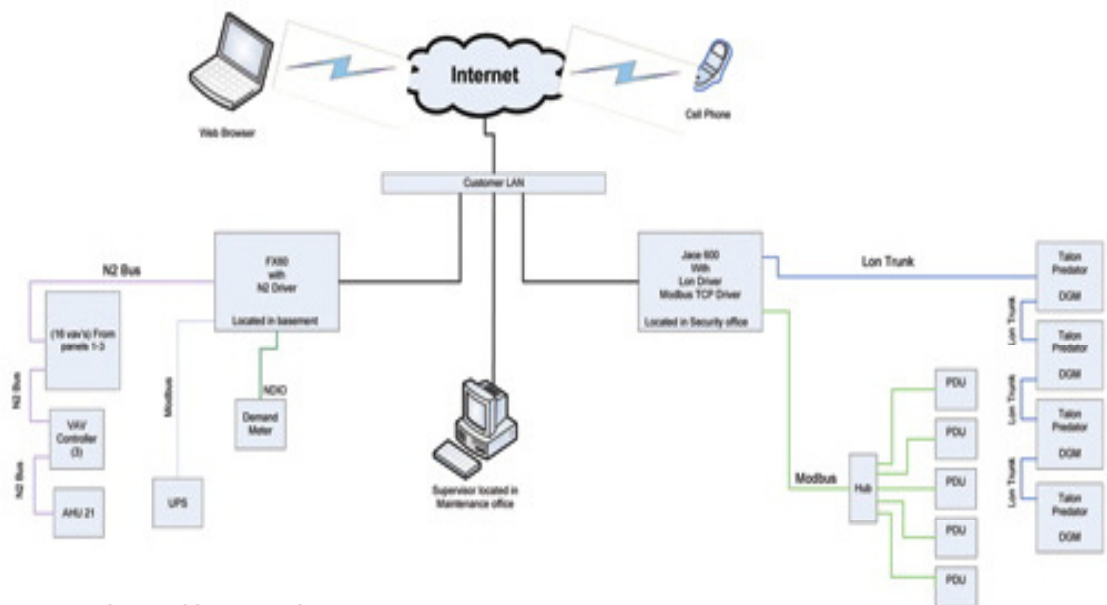


Figure 1: Tridium Building Control System Integration System Overview

What's Next

For a company to be successful in this industry and in this economy, you need a specialty. Big companies are getting bigger because of mergers and acquisitions and they don't have the mobility to do what smaller independent companies do. Our specialty is mechanical service, air and water balancing, and building control system integration. Having those three skill sets makes us pretty unique in our marketplace.

I'm seeing a world of cooperation with both wire and wireless communications technology. Getting a good signal will be key to the success of this happening. Anyone with a cell phone knows that there are still issues getting a signal in certain places. Wireless is still being perfected and it's become an issue not only in HVAC but in the healthcare industry too. The healthcare industry is very demanding when it comes to communication.

One of the largest patient bed makers in the healthcare industry has adopted an intelligence agreement with a systems integrator to put together a smart patient bed. It'll use the same technology as network controllers in the HVAC industry. When a patient checks in to the hospital, all their information will be available throughout the hospital's network. The bed will have interconnectivity with the whole system. If we need to turn on the air conditioning in that patient's room or verify that negative pressure exists, we can do so from a computer. We can adjust the HVAC for an occupied room or unoccupied room. We are seeing industries outside of HVAC starting to connect to the network so we can share information. And this is just the beginning. 🏠

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