THE STATE OF IP-BASED AV CONTROL SYSTEMS

WHAT MAKES A GREAT ONLINE CONTROL SYSTEM? SIMPLICITY, CONSISTENCY, FLEXIBILITY AND SECURITY.

By Tim Kridel

True story: A company has three completely different control system touchpanels within a stone's throw of one another. There's one brand in the CEO's office, another in the adjoining executive conference room and a third in the nearby boardroom. "This CEO of a Fortune 500 company has to deal with three completely different interfaces within 10 steps of his office," says Scott Walker, president, CEO and a founding principal of Waveguide, an AV integrator and consultancy. "It's ridiculous."

It's also common, and a drag on the bottom line of any enterprise with a similar hodge-podge of control system products. For example, the IT department—which often is in charge of AV these days—has multiple products to support, while everyone from executives to rank-and-file employees waste productivity as they muddle through different control interfaces, depending on which room they're in.

Those hassles and costs highlight just one aspect that CIOs and IT managers need to consider when specifying a new control system or an expansion of an existing one. The payoff can be significant. For example, a consistent, highly intuitive user interface (UI) can eliminate the need to have an operator in every conference room or auditorium when there's a presentation or videoconference.

"That's been our message for years: People can use the full set of services available in a room much more effectively with a system like ours," says Joe Andrulis, AMX vice president of global marketing. "They can focus on the business of the meeting rather the technology in the room."

WHICH USER INTERFACE?

Part of the challenge to designing a great control system is that there are so many

hardware choices. Touchpanels are the most common choice of UI, but control systems also can be run from PCs and VoIP deskphones.

Twenty-six percent of enterprises are using or planning to use tablets such as the iPad, according to a recent Forrester survey of 2,300 IT executives in North America and Europe. That trend is a major reason why most control system vendors now offer apps that turn Android and Apple tablets into touchpanels. Most of those apps also can run on smartphones.

Whether it's a tablet, smartphone, PC or VoIP deskphone, using hardware that the enterprise already has is one way to save a lot of money. But there are a few caveats.

Do all employees have those devices? For example, unless every single employee has a company-issue tablet, then the control system will require at least some touchpanels. The savings still can be significant, but to avoid a confusing hodge-podge of UIs, make sure that the touchpanels and tablets at least share the same graphic design and style elements.

Can the hardware handle it? "As the phone becomes more of a significant technological spend in a room, you've got horsepower there that can be leveraged," says Waveguide's Walker. "It's the question of whether it's the right form factor, the right resolution, the right capabilities. There's something to be said for a purpose-built product." In the case of a tablet or smartphone, another issue is whether they require a dedicated mount so they're angled in a convenient position during a presentation or videoconference.

Does it create distractions? When a PC, tablet or smartphone is the touchpanel interface, users might be tempted to surf the Web or check email during boring parts of the meeting. Those other applications also consume memory and processing power, perhaps to the point that the device crashes, leaving the user with no AV control until the reboot finishes.

SIMPLICITY AND CONSISTENCY

Regardless of the hardware choice, the UI has to be user-friendly. That's a relative term. Ideally the integrator designing the control system should begin by assessing the client's culture.

"A software development company and a law firm are very different in terms of the users' capabilities, technical understanding and so on," says Byron Tarry, general manager for system design and integration at AVW-TELAV, a Canadian integrator. "An integrator shouldn't be just slapping together the same old touchpanel for every customer and expecting that touchpanel to meet the needs of every organization."

THE PROS AND CONS OF IP CONTROL

PROS:

* No distance limitations
* No port number limitations
* Allows centralized control
* Reduces troubleshooting and response time
* Monitoring and management of energy and infrastructure costs
* With PoE, GUIs minimize cabling and power consumption
* It's simple to add or remove devices (scalability)
* Devices can be located anywhere there's a network connection
* Bi-directional control

CONS:

* Dependent on the network
* Security
* Potential bandwidth bottlenecks

At some companies, the best UI might have a Q&A menu format: What do you want to do? A PowerPoint presentation? A videoconference? An audioconference? Other companies might prefer more graphics, such as touching a projector icon to choose the content source. It's also possible to configure the system so that, for example, plugging a laptop into a table- or panel-mounted jack triggers the control system to turn on the projector and drop the screen.

One common pitfall is to overwhelm users with too many options. For example, J. Scott Christianson, owner of Kaleidoscope Videoconferencing, remembers a room where users had to select the source for each of the four monitors. If that weren't enough, each time they wanted to change a source, they had to select each output and then make the switch.

"It was an extremely flexible system, and any combination of inputs to output could be achieved," Christianson says. "But from the user perspective, the room was completely non-functional and was the most avoided room on campus. They just wanted a button that said, 'start presentation' [or] 'use document camera.'"

Control system projects often are additions to existing control systems rather than new "greenfield" deployments. That can be an opportunity to implement a standard UI across old and new touchpanels, even when they're from different vendors.

That's what integrator Graybow Communications Group did for a health care company with offices scattered around the United States. Graybow ported the UI from one manufacturer's touchpanels to another vendor's product.

"The coding is different, but for the most part, all control systems essentially do the same types of functions," says Erik Nelson, Graybow systems programmer. "It's very rare that you run across something that you can do only in AMX or only in Crestron."

The result is that all of the client's UIs look and act nearly the same in every city.

"[They] have a standard presentation room that looks the same in Hartford as it does in Chico," Nelson says. "That makes life a little easier, especially for the traveling trainers. They learn the room once."

When specifying a control system, it helps to get a copy of the software rather than assuming that the integrator/consultant will hang onto it or that the programmer who wrote will still be around. That ownership provides flexibility in the future

"People don't now how to write a decent RFP for this," says Waveguide's Walker. "They don't know how to ask for a copy of the as-built code."

That's one way that enterprises wind up with disparate UIs and control vendors.

"'I'll just set you up with a new touchpanel. You'll like it,'" is how Walker describes what the new integrator/consultant often says. "CIOs should look at this and say, 'We need one control platform.' That's taking a very IT approach to this, which is the good thing about IT taking over AV."

THE BRAINS OF THE OPERATION

As with the UI, there's a growing selection of choices for the IP control system processor—or processors, as is increasingly the case. Besides having the processors on premises, another option is to have them sitting in the cloud. (For an examination of the potential for cloud-based control processors, see our feature in this Guide called Cloud-y Days Ahead.)

Although processors are constantly getting faster—and thus more capable of handling multiple programs and control panels simultaneously—having just one, big processor isn't necessarily the best architecture. IP-based control opens the door to a much better solution.

"We're becoming bigger fans of distributed processing, where you have more, smaller processors doing fewer things, and they're networked together," says Waveguide's Walker. "That allows you to leverage code modules better. It allows for there to be fewer bottlenecks."

One option is to have a large processor in a central location working in conjunction with multiple, smaller processors distributed around a facility or facilities. That design can be particularly useful for a room with a flexible configuration, such as the ability to be subdivided into multiple rooms.

"I had an AMX NI-4100 that oversaw all of the room combining," says Graybow's Nelson. "It was in an equipment room nowhere near the rooms themselves. Each of the rooms had a small AMX NI-900 processor that would drive the switcher and [the rest of] the small subrack of equipment in each room.

"The main program ran in the large processor, which oversaw all of the smaller processors. It kind of directed traffic."

In an ideal scenario, the processors could use an IP connection to control every projector, display, screen and other component.

"Not everything is IP-controllable—yet," Nelson says. "We're very close to getting there. But you still have a hard time finding, for example, an IP-controllable volume control."

Another consideration is security. Because an IP-based processor is a networked device, security policies are critical to ensuring that it doesn't create a back door for hackers. There's a lot at stake, such as unauthorized access to a videoconference between board members discussing a potential merger.

"Those are very real issues as control processors start to move onto the network," says AMX's Andrulis. "Before, they were secure because they were unreachable. Any serious manufacturer that's putting out network-based control processors needs to take that into account and have security that can measure up to the standards that the IT world holds itself up to."

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BEYOND AV

IP-based processors also play a key role in enabling the control system to interact with a variety of non-AV systems, particularly lighting, shades, room scheduling and HVAC. One common reason is to improve energy efficiency, which may be required for achieving LEED certification for a new building.

At the most basic level, the control system could automatically lower the shades, dim the lights and throttle down the HVAC's blower when a presentation begins. At a deeper level, it could work with the enterprise's meeting scheduler and HVAC systems to automatically adjust the temperature before and after every meeting.

"A touchpanel should be more than a convenient way to put a remote control on a slick panel," says Waveguide's Walker. "It should use the native intelligence in its processor to understand where people are, when meetings are about to occur, and what kinds of conditions need to be set before, during, and after meetings."

Coordinating HVAC operations is a typical example. The human body produces an average of about 400 BTU of heat per hour. By knowing how many people have RSVPed for a meeting, the control system would know how many degrees to adjust the room's AC. That automation saves money by reducing the chances that an attendee will manually lower the temperature, forget about the change, and then leave the room ice cold and empty the rest of the day.

Those scenarios illustrate why it's smart to start a control project by soliciting input from more than just the AV and IT staff. For example, by including the head of facilities management and its sustainability director (if the company has one), it's easier to avoid winding up with a system where turf wars limit interoperability, or situations where someone says, "Why didn't we think of that?"

The good news is that with IP-based control, it's possible to design a control system with enough flexibility to support some level of interoperability for the future.

"Select systems that are clearly designed with the expectation that they will have to interoperate with unknown systems in the future," Andrulis says. "That's not as hard as it sounds. It's by building-in industry standard methods for data exchanges and service requesting such that when the day comes when you're asked to have your AV system all of a sudden request lighting control—versus controlling lighting independently—there's a method for doing that."

TYPES OF CONTROL SIGNALS

HERE ARE SOME OF THE MOST COMMON AV CONTROL SIGNALS:

Digital Data is usually transmitted using one of the EIA recommended standards. RS-232 is still the most common control signal type in AV. It's bi-directional, so it can send signals from a control processor to an AV device, and return feedback from the device to the control processor. RS-232 needs to be configured for proper speed and other connection parameters. Another type of digital data is RS-422, which uses a balanced connection that allows increased distance capacity due to common mode rejection. RS-485 is the multi-drop version of RS-232. Unlike RS-422 which requires four conductors, RS-485 can implement linear topologies using only two conductors.

Radio Frequency is most commonly used on interfaces like touchpanels and tablets. RF is very susceptible to potential interference issues, so testing is required. This signal type can be bi-directional.

Ramp voltage is a steadily changing voltage. It can be used for adjusting projector lenses, pan tilt zoom features on cameras, or volume controls.

Contact Closures and Relays are binary controls—they are either open or closed, on or off. A closed relay passes a signal and an open relay stops a signal.

While not technically a control signal type, Ethernet is now the primary means of network connection for AV devices and systems.

Format	Application	Signal Type	Maximum Distance	Connector
RS-232C	Bi-directional control of devices.	Digital data over twisted pair	50 feet (15 meters)	DB-9, DB-25
RS-422	Bi-directional control of up to 10 devices.	Digital data over twisted pair	2,000 to 6,000 feet (600 meters to 1,830 meters)	DB-9, DB-25
RS-485	Bi-directional control of up to 256 devices.	Digital data over twisted pair	4,000 feet (1,230 meters)	DB-9
RF	Popular user interfaces, CHF/UHF, bi-directional. Subject to frequency conflicts.	Radio frequency	300 feet	N/A
IR (wireless)	Uni-directional, requires direct line-of-sight.	Optical infrared	40 feet (12 meters)	N/A
IR (wired)	Uni-directional	Optical infrared converted to electrical	50 feet (15 meters)	Captive screw
Variable Voltage	Analog data control, servo motors, lights, PTZ cameras.	Electrical voltage	Depends on wire length and characteristics	Captive screw
Mechanical contact closure	Binary (on/off), low voltage interfaces, interlocks.	Electrical voltage	Depends on wire length and characteristics	Physical contact

Interoperability also raises another set of security concerns, including whether it creates back doors into HVAC and other systems. Often, the solution is to keep the systems at arm's length from one another by using the service interfaces that are increasingly common in control, HVAC and other enterprise platforms.

For example, it might be convenient to have the control system's touchpanel be able to open a secure door. To balance convenience and security, the control system would present its request to the security system's service interface, but it would leave it up to the security system to decide whether to open the door.

And just as a good control system can eliminate the need for an AV operator in every presentation and conference, it also can free up other staff.

"The processor can make the decision that it's after 5:00 p.m., and the occupancy sensor hasn't been tripped, so turn off the lights," says Graybow's Nelson. "A lot of times, [enterprises] are not aware that it can do certain housekeeping things that used to require a guy running around, or that would result in additional lamp costs and other wear and tear on the equipment."

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