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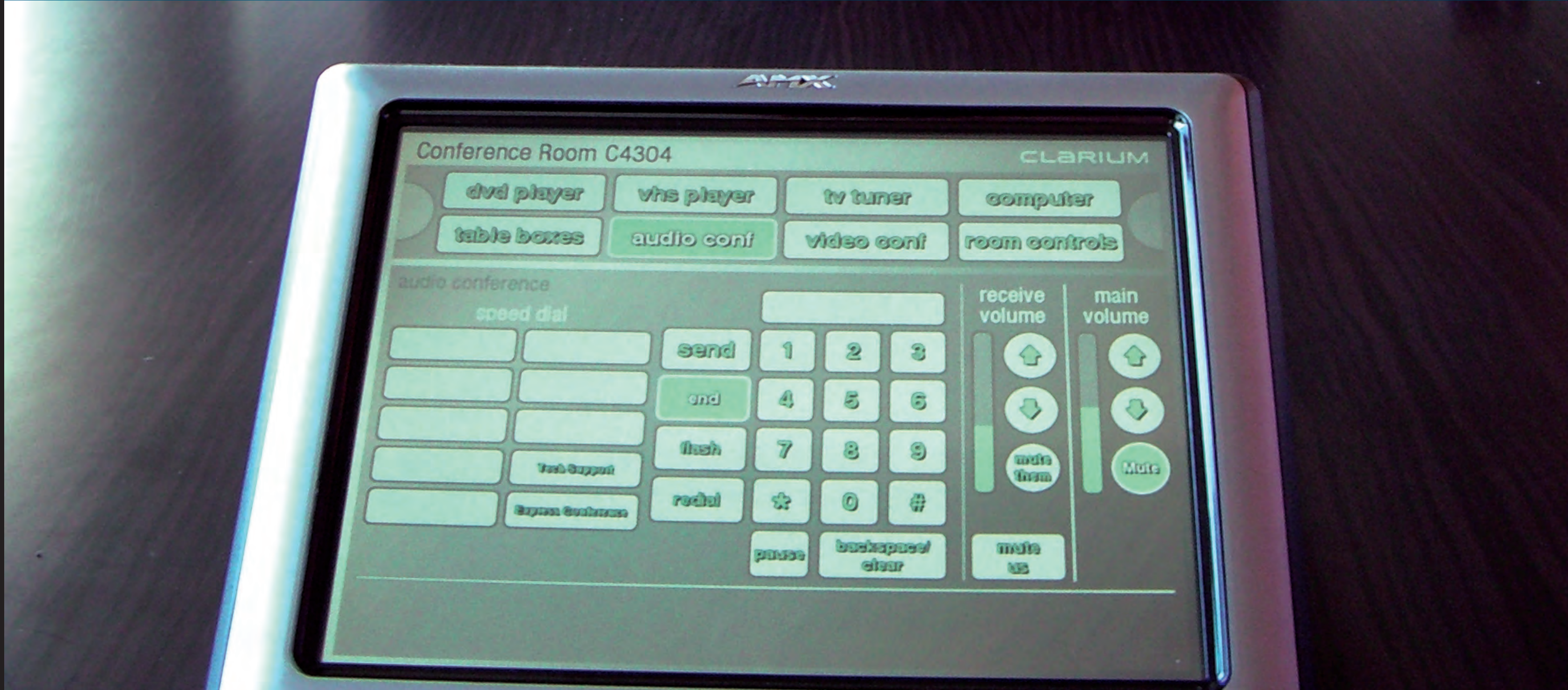
THE TECHNOLOGY MANAGER'S GUIDE TO IP-BASED AV CONTROL

from the editors of AV TECHNOLOGY

Featuring:

- HISTORY AND TRENDS OF AV CONTROL
- ELEMENTS OF AN IP-BASED AV CONTROL SYSTEM
- CLOUD CONTROL: IS IT HERE? IS IT COMING?
- WHO'S WHO PRODUCT COMPARISON CHART
- HOW TO VERIFY AN IP ADDRESS

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EDITOR'S NOTE

[**Margot Douaihy**, managing editor, *AV Technology*]

TECH MANAGERS DO IT ALL

IT and AV—what were once clearly defined industries are now blurred together. More and more tech managers are transporting AV information over their IP networks and using ethernet ports for system management and control. With digital video, the task of achieving synchronous network delivery of both video and audio from multiple sources to multiple displays in high definition is no small feat, as both AV and IT teams learns every day on the job. Facility directors and end-users hold critical roles in the IP-based AV control ecosystem, which is why we've decided to take a closer look at the topic.

Our special *Technology Manager's Guide to IP-Based AV Control* explores the origins of AV control, the migration to the network, user interfaces, and how to verify an IP address. We share key insights from Evolve Technologies' Dave Sobel and Control Concept's Steve Greenblatt. We investigate cloud systems and the (arguably inevitable) evolution of AV control into the cloud. We examine the pros and cons of IP control of AV and offer a definitive comparison chart of available solutions. The pages in this guide are an essential primer for tech managers looking to increase their understanding of IP-based control and how it can impact a facility's bottom line.

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THE ORIGINS OF ONLINE CONTROL

by Mark Mayfield

The Ethernet's original purpose was simply to find a way to connect computers to printers.

In the late 1990s, AV on the network became a reality. Suddenly, video projectors were sprouting RJ-45 connectors. In 1999, InFocus introduced the model LP 755, claimed to be the first network projector. By 2005, nearly every major projector manufacturer was offering a network option. Lamp life could be monitored, projectors could be turned on or off, and theft could be minimized—all because the projector was on the network.

Once the projector was allowed to join the network, AV manufacturers began to Ethernet-enable every sort of AV device. IT managers began to view AV devices as "network appliances," just like printers or other IT assets.

In an industry not generally known for common standards, AV professionals could finally agree on one thing: acceptance of IP control could open the door for a whole new category of "convergence" products, a more sophisticated level of systems integration, and possibly even, peaceful co-existence with IT. Just six years ago, InfoComm International estimated that more than 80 percent of all AV products were either based on IT networks or capable of working on them. Today, that number is most likely nearing 100 percent. The language of networks is Ethernet, and the most commonly used protocol is TCP/IP.

IP is part of the TCP/IP family of Internet protocols. Inside the TCP/IP standard there are several protocols for handling data communication:

TCP (Transmission Control Protocol) for communication between applications

UDP (User Datagram Protocol) for simple communication between applications

IP (Internet Protocol) for communication between computers

ICMP (Internet Control Message Protocol) for errors and statistics

DHCP (Dynamic Host Configuration Protocol) for dynamic addressing

TCP is a connection-oriented, reliable protocol that breaks messages into segments and re-assembles them at the destination station. It also re-sends packets not received at the destination. "Connection-oriented" means that the protocol establishes and maintains connection during a transmission. As soon as the data transfer is complete, the session is torn down.

IP is considered "connection-less", which means that it doesn't occupy the communication line between two computers. IP reduces the need for network lines, so each line can be used for communication between many different computers at the same time. With IP, messages (or other data) are broken up into small independent "packets" and sent between computers via the Internet. When an IP packet is sent from a computer, it arrives at an IP router. The IP router is responsible for "routing" the packet to the correct destination, directly or via another router. The path the packet will follow might be different from other packets of the same communication. The router is responsible for the right addressing, depending on traffic volume, errors in the network, or other parameters.

TCP/IP is simply TCP and IP working together. TCP takes care of the communication between the application software and the network software. IP takes care of the communication with other computers. TCP is responsible for breaking data down into IP packets before they are sent, and for assembling the packets when they arrive. IP is responsible for sending the packets to the correct destination.

Telnet is a network protocol used by many AV devices for communication. It runs on the Internet or a LAN for bidirectional interactive text-oriented communications, using a virtual terminal connection, and it's transmitted using TCP. Telnet runs on the client computer, connected to a server on the network. Commands are entered through the Telnet program and executed as if they were being entered directly on the server console. This enables control of the server and communication with other servers on the network. Even outside of AV control, Telnet is a common way to remotely control Web servers.

IP CONTROL VS. IP SIGNAL DELIVERY

IP control, strictly speaking, is nothing more than using a network interface to control an electronic device.

Until recently, AV content on corporate networks has been an issue of contention between IT and AV professionals. The bandwidth requirements of video content have forced network administrators to view it with caution, since their primary concern is network uptime and reliability. The concern was easy to understand, since Ethernet, with its collision detection access method, was never intended to handle sustained, bandwidth-intensive multimedia delivery. But it handles the short, bursty AV control signals as well as it does common office applications.

Recently, better compression technologies have spurred the development of more robust, higher capacity networks, especially in corporate, government, and education. Instead of dividing AV and IT, demand for video over the network may actually be helping the formerly-siloed cultures of AV and IT to come together.

Mark Mayfield is an independent consultant specializing in marketing strategy, market analysis, and communications for the AV industry.

Source: Cisco Networking Simplified, Second Edition

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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."

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

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."

Tim Kridel covers telecom, IP, and AV innovations for numerous publications. Reach him at tim@timkridel.com.

CLOUD-Y DAYS AHEAD

IS AV CONTROL GOING TO THE CLOUD?

by Mark Mayfield

The definition of cloud computing has, until recently, been as translucent as the gaseous cluster of water vapor molecules after which it is named.

To help add shape to the issue, the National Institute of Standards and Technology released a draft document in January 2011, titled "The NIST Definition of Cloud Computing." It begins with the definition:

"Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

As part of its definition, NIST also defines three service models, including Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). Saas is the capability to use the provider's applications running on a cloud infrastructure, where the applications are accessible from various client devices through a thin client interface such as a web browser (e.g., web-based email). Platform as a Service (PaaS) refers to the capability to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages and tools supported by the provider. Cloud Infrastructure as a Service (IaaS) allows the capability to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, deployed applications, and possibly limited control of select networking components (e.g., host firewalls).

In the IT world, cloud computing is here today, and most experts predict significant expansion. Gartner is projecting rapid growth in public cloud services worldwide, with revenue growing from $68.3 billion in 2010 to $102.1 billion by 2012 and $180 billion by 2015. Somewhat more conservatively, IDC predicts that public cloud IT spending will grow from $21.5 billion in 2010 to $72.9 billion in 2015. While Gartner focuses on revenue, which allows for the inclusion of new business model growth, both firms expect the cloud market to grow at over five times the rate of traditional IT products.

But is AV going to the cloud? It depends on whom you ask. Many would say that it already has. Any time you access music,


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DVX - 3150HD - SP
Main Amp Output
VOLUME: 50
MEDIA DISTRIBUTION
VIDEO SCALING
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video or other AV content that's hosted on a server that you don't own, that's cloud AV access. Cloud AV is already well entrenched in the consumer AV world. Do you use NetFlix? That's cloud-based AV access. So is YouTube. Apple's iCloud allows users to stream images and other types of media to other devices, primarily manufactured from Apple. And Amazon's Cloud Player is all about storage and streaming of music—all you do is "reserve" as much cloud storage as you need.

But what about cloud-based AV control for out of the home applications? If the current trend of consumer technologies migrating to commercial applications continues, it's probably already on its way.

"Today, I can control devices in my home today over the cloud, using my iPhone or iPad," says Dave Sobel, CEO of Fairfax, VA-based Evolve Technologies. "As commercial AV moves closer to the IT model, it's only logical that this type of control will extend to AV systems in the workplace." Sobel cites figures from CompTIA, which projects that 20% of businesses will have fully cloud-based IT services by the end of 2012. It's no big stretch to envision that commercial AV devices and systems—already considered part of the IT infrastructure—aren't far behind.

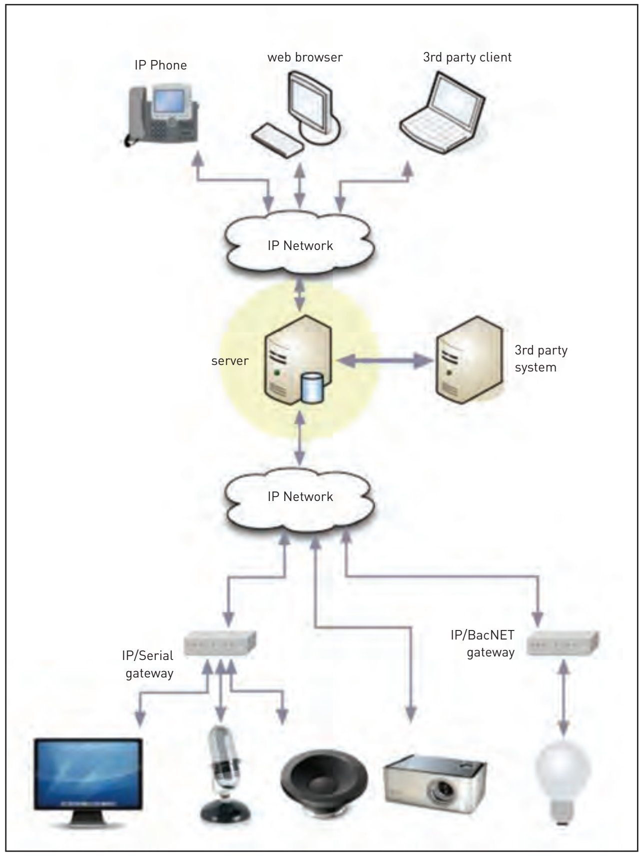

ILLUSTRATION COURTESY OF CLOUD SYSTEMS

A cloud-based AV control system uses software installed on a network server, which is accessible anywhere on the network.

Not everyone agrees with Sobel's assessment, including Steve Greenblatt, president of independent programming firm Control Concepts. "At this point, I think it's pretty far off," he says. "A lot of people had been thinking, for years, that you wouldn't need anything more than a computer in a room to control an AV system, but AV systems have really gotten a lot more complicated than that. I think cloud-based control would be some time in the future."

One of the problems with the idea of cloud-based AV control is that, for many AV devices, you still need a dedicated control processor to perform basic functions, like projector on/off, audio system volume levels, or camera pan/tilt/zoom. Serial commands delivered by IR or RS-232 and simple contact closure signal is still the most common way to control many AV products. But, most control processors today are software-configurable, so it's logical that as these devices become more like IT appliances, the software that drives control functions could be accessed via the cloud.

AMX has announced a cloud-based systems configuration tool that allows AV technicians or IT professionals to easily configure an AMX system by using a step-by-step, wizard-based approach. Rapid Project Maker (RPM) is stored on AMX servers, so users never have to worry about "who owns the code" or what happens if an on-premise system should fail. It's always there, "in the cloud"; no additional software is required. Once configuration of an AV control system is complete, the code is downloaded to the on-premise controller, and it's ready to go.

But just as configuration moves to the cloud, is it feasible that the control processor itself could disappear as an on-premises piece of hardware, and become a cloud-based IaaS function?

That's what Oakland, CA-based Cloud Systems is betting on. "We are completely independent of hardware-based AV control systems," says Cloud's chief finance and operating officer Cheryl Blain. One of their core products, atmospherics 2.3, is a software-based tool that allows network administrators to take control of any IP-addressable device, anywhere on their network, without a dedicated AV control processor. "A deployment would involve taking the licensed atmospherics software, installing it on a server, and configuring it through the administrator interface. Just add the devices you want to control. It's a simple as adding a printer to your network." The company creates and provides drivers for many AV devices to work with several different interfaces that are already part of the enterprise landscape, including the Cisco Cius tablet and the Cisco IP phone. In addition, you can access atmospherics from any web browser.

Cloud-based AV control has several hurdles to overcome before it can become mainstream. Device driver availability (does a driver exist?) and network access for AV devices (does it have an Ethernet port?) are two issues. A third issue may be more thorny: acceptance of the idea of less hardware, more software. In the IT world, this issue is all but resolved. But the business model of most traditional AV integrators and manufacturers is built on hardware-based, on premise systems. Technology managers looking to move to a more cloud-based AV and IT infrastructure should carefully explore the "as a Service" intentions of their AV suppliers.

Sources: Trends in Cloud Computing 2011, published by CompTIA, and National Institute of Standards and Technology.

WHO'S WHO IN THE MARKET: SYSTEM COMPARISON

AV/IT convergence has evolved to the point where most AV product manufacturers are realizing the benefits of IP-based control, and there are many choices available. Since many AV endpoint devices are equipped with an RJ-45 jack for Ethernet, IP control can be as simple as connecting the device to your network and running the appropriate software on a network server. Then, IP control is simply a matter of loading the appropriate drivers and control software onto a network server, and accessing the device. For AV devices that aren't Ethernet-enabled, several companies offer interfaces that convert RS-232, IR, Serial and other control signals to IP.

Another common approach is to provide IP control for a hardware-based AV control processor, which then connects to the endpoint AV devices. The processors themselves offer various configurations of control signal functionality, but can be controlled by a web server or mobile device. A more recent trend has been to combine control, signal processing, switching and other functions into a single hardware device, which is controlled via the network. This approach simplifies design by reducing the number of separate AV boxes, also minimizing space and power requirements.

TABLE: 5-COMPARISONCHART

Hardware	Software	Mobile device support?	
ALTINEX, WWW.ALTINEX.COM			
CP500-100, CP500-110	AVSnap	Web browser, iPhone, iPad	
AMX, WWW.AMX.COM			
ICSLan, Enova DGX 16, Enova DVX-3150HD	Resource Management Suite, RMS Enterprise, Rapid Project Maker	All platforms	Proprietary
AURORA MULTIMEDIA, WWW.AURORAMULTIMEDIA.COM			
WACI NX	T.R.A.C.S, YIPI, WOWE, WPC, Link	All platforms	Open
BARIX, WWW.BARIX.COM			
Barionet product line	Barionet	n/a	
BITLOGIX, WWW.BITLOGIX.COM			
SDS5110N, PS110, PS410	NetControl 2.0	All platforms	
CALYPSO SYSTEMS, WWW.CALYPSOSYSTEMS.COM			
ION-LT2	Maestro, Encore!	n/a	
CLEARONE, WWW.CLEARONE.COM			
VIEW product line	StreamNet	All platforms	
CLOUD SYSTEMS, WWW.CLOUDSYSTEMS.COM			
(software-only solution)	atmospherics 2.3, atmos-room control	Android	Open
CRESTRON, WWW.CRESTRON.COM			
CP3 3-Series Control System, MC3 3-Series Control System	Core 3, RoomView, Fusion, e-Control, Crestron Mobile Pro	Apple iOS, Android	Proprietary
EXTRON, WWW.EXTRON.COM			
IP Link, TouchLink	Global Viewer, GV Enterprise	Apple iOS	Proprietary
FSR, WWW.FSRINC.COM			
FLEX-LT150, 200 or 300	Flex Software Suite	Android (coming soon)	
GLOBAL CACHE, WWW.GLOBALCACHE.COM			
GC-100	GC-IRL Learner Utility, Discovery & Setup Utility	n/a	Open
HIGH RESOLUTION SYSTEMS, WWW.HRSCONTROL.COM			
UDC-400	Universal Device Control Software	All platforms	
NETSTREAMS, WWW.NETSTREAMS.COM			
DigiLinX product line	StreamNet	All platforms	
PIVOD, WWW.PIVOD.COM			
(software-only solution)	Director, Showcase	All platforms (via web browser)	
SP CONTROLS, WWW.SPCONTROLS.COM			
Networked Room Controller	RoomTouch	Apple iPad	
VITY, WWW.VITY.COM			
Maxinitro	PC-2-MATY	Apple iOS, Android	

HOW TO VERIFY AN IP ADDRESS

THE ESSENTIAL HOW TO...

by Mark Mayfield

Every website, URL, computer, or AV device on the Internet has a number that uniquely identifies it—its IP address. The IP address is the key to routing schemes used on the Internet. Assigning IP addresses to AV devices and controllers is the role of the IT network administrator. This is usually done in one of two ways: by configuring the device with a specific address or by letting the device automatically learn its address from the network. Dynamic Host Configuration Protocol (DHCP) is used for automatically assigning an IP address. DHCP can save time and administrative effort, and also conserve IP addressing space. Most networks use DHCP to automatically assign an available IP address to a device when it's connected to the network. On the other hand, devices that aren't likely to be moved around from location to location, like servers, routers, and switches, may be assigned a fixed address. This is called static addressing. In either case, keeping track of and verifying IP addresses can be critical when makes changes to the control system or troubleshooting problems.

USING COMMAND LINE PROGRAMS

One method of verifying an IP address is to open a DOS command prompt and use one of these command-line programs. These can help quickly verify the network status and settings of a device. These methods will require a laptop computer and an RJ-45 cable.

PING

Ping is a test procedure used to verify if a device is active.

A ping test checks to see if the target device is online and accepting active connection.

At the laptop:

1. Click on "Start," and select "Run."
2. Type "cmd" in the box and press enter.
3. When the command window and the prompt appears, type "ping" and the IP address of the target device.
4. As the ping program displays the results, look for the "Reply from..." response. This indicates that the target device is active.
5. Be careful to make certain that if you receive a reply, it is actually the correct device. Confirm that

correct IP addresses are assigned to the correct devices.

If the ping program returns the message "Request timed out," there could be several possible causes:

- The target device is not physically connected to the network.
- The target device is not powered on.
- The target device does not have the correct IP address assigned to it.

Be aware that firewall protection settings on many computers may be highly restrictive, and prevent the ping attempt from getting through.

IP CONFIGURATION

Another command line program is IPCONFIG. This is a Microsoft Windows console application that displays all current TCP/IP network configuration values and refreshes DHCP and Domain Name System (DNS) settings.

1. Click on "Start," and select "Run."
2. In the box, type "cmd" and press enter.
3. When the command window appears, at the prompt type, "ipconfig/all."
4. As the program displays the results, one of the entries will be the IP address and MAC address. To display all available commands using IPCONFIG, type "ipconfig/?".

VERIFYING THE IP ADDRESS OF A CONTROL SYSTEM

To verify the IP address of a control system CPU device, the installer can typically connect to the CPU according to the manufacturer's recommendations. Another option may be to select a menu option on the front of the CPU that will display the IP address on the LED screen.

If that option is not available, a second method is to connect to the CPU using an RS-232 null modem cable or a USB cable, and use the "HyperTerminal" program. HyperTerminal used to be bundled with Windows XP, but it is no longer available with Windows Vista or Windows 7. HyperTerminal Private Edition is available at www.hilgraeve.com.

1. Connect one end of the RS-232 cable to the PC and the other end to the proper connector on the back of the unit.

IPV6

When the 32-bit version of IP addressing (IPv4) was developed in the 1980s, it was unimaginable to think that there would be more that 250 million devices requiring discrete IP addresses. Web access was conceived as a feature of computing devices, not telephones, household appliances, and AV devices—not to mention the millions of mobile devices around the world that didn't exist back then. Although DHCP IP address assignment helps by reusing and reassigning IP addresses, the number of static IP addresses available using IPv4 is expected to be exceeded soon, if it hasn't been already.

Enter IPv6. The 128-bit addressing scheme allows 1015 <superscript "15"> endpoints, or 340,282,366,920,938,463,463,374,607,431,768,211,456 IP addresses. Beside the sheer quantity of available IP addresses, IPv6 is expected to offer:

More efficient routing
Reduced management requirement
Improved methods to change ISP
Better mobility support
Multi-homing
Security
Scoped address: link-local, site-local and global-address space

IPv6 was tested on June 8, 2011, when Google, Facebook, Yahoo!, Akamai and Limelight Networks joined with over 1,000 websites for a 24 hour global-scale trial of the new IP addressing scheme. The vast majority of users were able to access services as usual, but in rare cases, users experienced impaired access to participating websites during the trial.

2. On the laptop, open HyperTerminal – Start > Programs > Accessories > Communications > HyperTerminal.
3. Create a new connection: name the connection template and select an icon.
4. Select connect > Com1, 38400, n, 8, one, and none. The connection speed may vary. If you are using a USB to serial adapter, you may need to verify which COM port is being utilized for the device. On most PC computers, this can be acquired from control panel/ system/ hardware/ drivers/ COM and LPT ports. The COM port will be listed next to the device.
5. Power on the CPU.
6. Once the boot routine has ended, press the ENTER key at the command line to show the choices available.

After connecting to the CPU, read the owner's manual to learn how to access the communications or configuration menus to obtain the IP address.

USING AN RJ-45 CABLE

If the installer knows the IP address of the device, a straight-through RJ-45 cable can be connected to it, and the web-based interface can be accessed. However, some devices may require a crossover cable that can be terminated T568A on one end and T568B on the other end.

VERIFYING THE IP ADDRESS OF OTHER DEVICES

Videoconferencing units typically have a configuration menu that can be navigated to by using a remote control. IP phones also have a menu option for displaying the IP address assigned to the device.

Many videoconferencing codecs use ISDN lines to connect to remote sites. Think of these as unique phone lines. If ISDN lines are used in the system, then you need to verify the SPIDs (Service Profile IDentifiers). Similar to verifying IP addresses, most VTC codecs have a remote control menu-driven interface for locating the SPID and IP numbers already entered in the system. SPID numbers tend to be 14 digits long and usually end in "0101." Be sure to document any incorrect numbers or addresses.

Most major videoconferencing manufacturers provide a test site, or "loopback site" to call. These test sites may be located in the address book of the codec, or on the company's website. The test site has continually looping content with video and audio. After connecting, confirm that the remote site's video can be seen and the audio can be heard. If there are problems, confirm that the volume is not muted, and that the display device is set to the input for the VTC.

Source: InfoComm International, "AV Installation Handbook Second Edition: The Best Practices for Quality Audiovisual Systems."


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