ITAV REPORT

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DIGITAL SIGNAGE GOES TO SCHOOL: UHD NETWORK INFORMS STUDENT BODY

REPORT: AV IN MEDICAL

SCARIEST ISSUE... NETWORK SECURITY & THE AV SYSTEM

TRICKY TRENDS TOWARD UBIQUITY:

IS CONVERGENCE WORTH THE AGGRAVATION?

A Supplement to SOUND & COMMUNICATIONS

WAVELENGTH

When we use the term "convergence" in *IT/AV Report*, the dictionary definition doesn't really seem to fit ("the act of converging and especially moving toward union or uniformity"). True, information technology and audio/video definitely are coming closer together—but on the other hand, there will *never* truly be "uniformity."

That just can't happen because their messages are just too divergent. And they have survived for a long time as independent entities, which makes that "convergence" even more difficult. So, we have what we might call a "conundrum" that, by dictionary definition is "a question or problem having only a conjectural answer." Another, more accurate definition would be, "an intricate and difficult problem," which gives us more hope.

That is, in fact, why we publish *IT/AV Report*. If this all were easy, we (you and I, dear reader!), would not have to expend so much time, energy and financial resources trying to figure out what this is all about. And companies such as Weinstock Media Analysis and others wouldn't be expending their time, energy and financial resources researching what we are seeing today, and trends for the near and distant future. *And*, manufacturers wouldn't be buying these reports—because *they* would have the answers.

Of course, for "true convergence," we probably need control systems that are not competing. This is by no means a new argument. At this point in our industry's development, we have several systems that basically do the same things. Granted, they each have features that make them special, and fulfill the needs of different clients, but the next burst of major growth won't happen until we can get everyone on the same page in this area.

Perhaps one thing that may help move this along is the change in approach that Peak Audio/Cirrus Logic is taking with its CobraNet. Until recently, companies had to pay lofty fees to buy a CobraNet license. However, the company has decided that it wants this to become the standard for the transport of multichannel audio and control data, so has opened it up to the industry and eliminated license fees.

David A. Silverman

According to the company, Peak Audio "believes that a network carrying audio and data between products of many manufacturers best serves the industry." This certainly is a good move for everyone, and should serve as a positive example to other companies with proprietary standards.

The AV industry as we know it today is healthy and thriving. The IT industry, whether hard-wired or wireless, is also quite healthy. However, they are still relatively far apart in the overall scheme of things. Which is why you are reading these pages, isn't it?

We will continue to champion the process. Enjoy this issue.

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TRICKY TRENDS TOWARD UBIQUITY

By Neal Weinstock

Based on vast evidence, we are true believers here in the convergence of IT and AV. You knew that, of course. But just because we're believers doesn't mean we're boosters. It must be reported that everything about this IT/AV convergence trend is not smooth, happy and profitable. There may be fortunes to be made on converged systems, but there will also be fortunes lost. It's a tricky trend.

It must be reported that everything about this IT/AV convergence trend is not smooth, happy and profitable.

Most of our features in this issue clearly discuss those complications. For example, network security is a lot tougher now that a company LAN and, by extension, the internet, is connected to your AV deployment. We've got a story about that. See "The Scariest Issues in IT/AV All Involve…Network Security and the AV System."

Even for the stories in this issue that don't seem to focus on the new challenges of convergence, the need for tough decision-making is just below the surface. For example, some of that evidence that makes for true believers came from Weinstock Media Analysis' new study, "The Market for AV Technology in Health Care." We found growth of 19.6% in that market overall, with systems integration taking a huge part of all AV spending. See the report beginning on page 6.

So far so good, right? But "systems integration" in health care AV is *really* integrative. The growth is all in AV that gets built into clinical systems for surgery or diagnostics, or into overarching information systems for the entire hospital, clinic or health system. This can't be an easy field to break into for the typical AV systems integrator with experience in boardrooms and concert halls (although they also need boardroom systems in health care). And the news gets tougher. As we did our

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medical-industry research, the sneaking suspicion grew that systems integration for AV in other areas may also be getting like this: far more integrative with the organizational goals of the client industry, far less like systems integration for other vertical markets.

Is this integration specialization a result of the convergence of IT and AV? Oddly enough, yes. For as AV functionality gets written into multi-function chips (a process that the semiconductor industry refers to as "integration," after all), and into software running alongside other software on standardized computer systems, and as previously large and expensive AV processes get commoditized into cheap components, all these supply trends allow users to get AV built into the products they use exactly the way they want to use them.

Korea's Minister of Information and Communications, Daeje Chin, said it better than we could in our piece on "The New CPU Era": "Nanoelectronics will truly lead to a ubiquitous information society, where electronics enables new information-based services for consumers, and becomes invisible to everyday life."

'Nanoelectronics will truly lead to a ubiquitous information society, where electronics enables new information-based services for consumers, and becomes invisible to everyday life.'

—Daeje Chin

Invisible can mean harder to see and understand, even for the people who build the systems.

What do nanoelectronics mean for AV systems? Maybe that you'll be able to build a network for a particular customer's needs out of reprogrammed PlayStations. Certainly it seems as if you'll someday be able to plug high-quality audio and video devices directly into standard Ethernet or wireless networks, and get plug-and-play workability out of the box along with system management capabilities from a cell phone. Both threats and opportunities are implicit in this.

Are we feeling the threat yet from all of these changes? Maybe a franchise agreement can help. We'll cover this subject in a future issue of *Sound & Communications,* but probably a contract for a really big digital-signage system would help more. See Dawn Allcot's report, "Digital Signage Goes to School," about Webpavement's and Magenta Research's technology at the University of Houston.

Neal Weinstock is the founder and president of Weinstock Media Analysis, a market research firm in professional audio and video since 1993. He helped found BridgeCo, a Swiss maker of audio networking semiconductors, and served as its vice president marketing strategy and business development. He has authored two books on computing and design, edited magazines including TV World, and has written hundreds of articles.

REPORT: AV IN MEDICAL

By Neal Weinstock

Weinstock Media Analysis recently finished a humongous study of "The Market for AV Technology in Health Care." We interviewed more than 3800 people in various areas of health care, in order to come to the first real quantitative understanding of how AV technology is integrating into the medical environment. A number of policy-oriented studies of technology in health care have been done in recent years, but we couldn't find any that focused on AV tech, and we also couldn't find any that quantified purchasing of tech gear or that strove to understand the market for technology as a *market*, rather than as a public good. Maybe understanding health trends as a public good is more important to the world at large, but is there not a place for those who simply want to make a buck (while making something good and useful)?

So our work was cut out for us.

And, coming from a background in the more general AV business, we were pretty well shocked by what we found out.

Stereotypes True?

The stereotypes may be true about the health care system being starved for funds, and about doctors being way behind the times in terms of computer use for patient records, but we found an industry that is already huge, at $872.3 million in purchases of AV in the US in 2004, and that is growing faster than the wildest dreams of people in most areas of AV: projected compound annual growth over the next five years of 19.6%.

And perhaps most interesting, this area of the AV business is an integrator's dream. Systems integrations for teleconferencing and AV systems in operating theaters are among the largest segments of the business, at $296.5 million in 2004. And we found numerous integration specialists who are able to support multimillion dollar businesses focusing only on healthcare.

Medvision's portable surgery AV system in use.

Critical Differences

That said, there are some really important differences between systems integration in AV for health care, and systems integration in other areas of AV.

The greatest growth in medical AV systems involves technologies that are being integrated into other medical systems, both clinical and general-IT. For example, "minimally invasive surgery," such as endoscopy and laparoscopy, is all about video shot by tiny cameras and watched by the surgeon on displays in the operating room. For another example, radiol-

This industry is already huge, at $872.3 million in purchases of AV in 2004, and is growing faster than the wildest dreams of people in most areas of AV: projected compound annual growth over the next five years of 19.6%.

ogy is shifting to digital systems using high-quality cameras and displays, from its traditional reliance on x-ray film. But these are systems integrated by the companies that dominate health care equipment manufacturing, such as GE, Siemens, Stryker, Karl Storz, and also by a few companies that have branched over from their film and video areas of expertise, such as Eastman Kodak, Agfa-Gevaert, Philips, Pentax and Olympus.

"OK," says the AV systems integrator, "I don't have to do those apps. I'll focus on integrating systems for shooting videos of surgical procedures, and for teleconferencing systems for teaching and for doctors' consultations."

And, indeed, we measured the markets for those two apps as roughly half of the overall AV business in health care. But we also found that operating-theater systems and teleconferencing systems are integrating rapidly with the clinical devices that use video, so the leading systems integrators for operating theaters and teleconferencing are now Stryker, Karl Storz and Olympus. This probably does not much please the manufacturers of the teleconferencing codecs, displays, cameras and other devices that go into these systems: A Sony or Tandberg would rather sell direct or through smaller integrators, instead of through these industry powers that maintain a goodly amount of pricing control. Nonetheless, integrators that aren't tied to device manufacturers must be content with smaller systems or with systems involving less added value beyond that built into the equipment by its manufacturer.

Finding a Niche

Still, plenty of systems integrators are finding ways into lucrative health care business. For example, Simon King's company, Medvision, competes with the likes of Stryker, Olympus and Karl Storz in operating room AV integrations by offering its own (patent-pending) systems integration on a cart.

"We integrate all the video components in the OR [operating room]," said King, "for less than $100,000. And you can roll it around from one OR to another." Stryker, in particular, "does a fixed solution for $200,000 and up for each OR. Many hospitals have multiple ORs outfitted with the Stryker solution, but we think we'll have a large market among smaller hospitals or for the third or fourth OR in a large institution."

King had just installed his first such system at Johns Hopkins when we spoke in February. His company combines equipment sales with event productions for medical apps.

The power of the large equipment suppliers in medical systems also affords opportunities for smaller companies, as subcontracting systems designers and installers. We found several systems integrators/installers with annual revenues in the $20 million to $80 million range with business plans essentially based on following GE Medical or Siemens Medical around and building the integrated systems that they specify.

But another wrinkle in the game of systems integration and installation for medical AV is the tremendous growth in power of IT consultants these days. This has come about first in government hospitals, and now is spreading to all of health care.

IT/AV: Power to the Consultant

Outside of the Veterans Administration hospital system, which lately has become a beacon of digital modernity in health care, hospitals and doctors' group practices have been slow to digitize their information systems. In the last couple of years, however, following the successful lead of the VA, they have begun to install their first non-paper filing systems or to upgrade computer systems that, in some cases, date from the 1970s.

As we were doing our research,

AV Technologies in Health Care: Growth Rates per Application

Based on 2004 US$ Sales, In US$M and Percentage

Category	2004 US Sales	5-Year Projected CAGR
Operating Theaters	282.2	17.0%
Tele-Education	227.2	18.2%
Radiology	192.7	22.6%
Endoscopy/Laparoscopy	160.1	17.7%
Tele-Consultation	141.1	20.2%
Total	872.3	19.6%

President Bush took up the issue of the benefits of digitizing patient records in several speeches. A push is clearly on to attempt to gain efficiencies through modernizing IT systems in health care. But hospitals and medical groups don't have enough IT specialists. Although most hospitals, at least, have an IT administrator or two, they likely are to be overwhelmed (as they told us) by the demands of maintaining balky old systems. Meanwhile, the "IT administrator" at a clinic or physicians' group practice most likely is one of the physicians or nurses who happens to be technically inclined.

So IT consultants are very much needed. And the biggest of the consultancies have been very much hired in the last few years by the big upgrade budgets in the military and VA health systems. So Bearing Point (which used to be KPMG), Accenture (used to be Anderson), SAIC, CACI, Lockheed Martin and other high-powered, usually government-oriented consultancies now have the experience that hospitals and medical groups across the country require to build modern patient record systems with good security guarantees. And everybody wants these patient records to be available to medical personnel wherever necessary, so the record systems must interact with, if not be fully networked with, clinical devices and teleconferencing systems. In other words, what the consultants say should be bought usually gets bought, in AV as well as general IT.

In other words, health care is shaping up as the ultimate IT/AV convergence market, and that convergence is particularly empowering the consultants.

Smoldering on the Launch Pad

"Telemedicine is smoldering on the launch pad," said Simon King. It has been smoldering on that launch pad for roughly a decade. When's lift-off?

We believe that lift-off is actually happening in 2005. "Telemedicine" has been a buzz word for so long that nobody even quite agrees about what it means, but it certainly includes all uses of videoconferencing. That's been a problem in health care; insurers were unwilling to pay for remote doctoring, so patient-doctor meetings via teleconference caught on only in extremely remote communities.

Another view of surgery in progress using Medvision's integrated AV system.

In recent years, telemedicine also includes non-video internet communications, especially remote monitoring of patient health. Today, to some extent because of the combination of data with AV teleconferencing (and thus better remote information available to the doctor), and to a larger extent because costs have come down, value propositions have now been proven, and insurers are starting to pay for teleconferencing visits. So telemedicine growth is beginning to accelerate again after many flat years.

These days, telemedicine is a mix of long-distance consultation between many physicians, patient consultation with remote doctors, distance learning for medical students and remote monitoring of patient wellness (typically including blood-pressure readings, diabetes checks, etc.). It may bring doctors in contact with patients hundreds of miles away, or merely interrupt the entertainment programming on their hospital room TV for a clinician to answer a question or two.

And it offers probably the biggest opportunity of all for AV systems integrators to jump in the medical game, because telemedicine systems are the least integrated with clinical technologies, the most like standard AV systems in use in other apps.

We cover IT/AV here, we don't puff it. The hard facts:

- Medical is the biggest growth area going now.
- Your systems integration business, focused on other markets, probably doesn't have the expertise to address integrations with clinical systems, where the biggest growth is, within health care.
- Sucking up to those big consulting companies seems like the best strategy for a small company to get subcontracts and systems integration work, especially for telemedicine.

THE UNIVERSITY OF HOUSTON-DOWNTOWN EMPLOYS A DIGITAL-SIGNAGE NETWORK TO CONVEY IMPORTANT INFORMATION TO A BUSY STUDENT BODY.

DIGITAL SIGNAGE GOES TO SCHOOL

By Dawn Allcot

Digital signage offers several significant advantages over its paper and plastic forebears. Moving images are about five times more likely than a static image to attract a passerby's attention. It's much less costly to reprogram a sign server with new graphics than it is to have new signs printed. And digital signage offers great flexibility, allowing the user to display multiple images per hour, minute or even every few seconds.

Is it surprising, then, that digital signage has finally hit the world of education?

Same Benefits

"The same benefits that make it attractive to other user groups also make it attractive to clients in the field of education," stated John Moezzi, business development manager for Atlanta GA-based Webpavement Digital Signage. "The ability to quickly convey a message to your users is a need that transcends any one industry." He added that the greatest interest in digital signage in the educational arena exists at the university level, where bulletin boards in the student center traditionally announce upcoming university events, student organization meetings and other campus news on little slips of paper. Who, in today's world of digital technology, has time to stand around reading little bits of paper tacked on a wall? [In addition, some schools are banning paper signage for safety reasons as well. See "Digital Signage Replaces Bulletin Boards," *Sound & Communications*, May 2004.—Ed]

Freelance journalist Dawn Allcot covers the AV and music industries.

The University of Houston's downtown campus.

Not the busy commuter students at the University of Houston's Downtown (UHD) campus, certainly. Part of the University of Houston System of higher education, which includes four universities and two multi-institution teaching centers, UHD is one the first colleges to incorporate digital signage as a means of communicating with the student body.

"There is a need, on our campus, to connect activities with the faculty and the student body," said Steve Cachia, UHD's AV supervisor and engineer. The downtown campus is a commuter college, where many students attend night classes or fit credits in between their daily work schedules. There's not a lot of meandering around between classes, congregating in the student union or spending extra time on campus outside of class. That means there's also not a lot of time to keep track of student activities, yet the students still have a desire to absorb the full college experience, including extracurricular clubs and activities. "We have to get the information to the students rather than them having to go and get it," Cachia said. "Our student body is constantly on the move."

What better way to get information to a student body constantly on the move than with "moving" signage?

High Traffic Areas

Large-format NEC300 and NEC4000 LCD displays are placed strategically in high-traffic areas across the campus. Displays are situated in the main lobby, on the third floor, which houses the administration and reservations offices, and in the hallways. The cafeteria has three displays mounted from the ceiling, making it easy for students to

catch up on campus happenings while they grab a bite to eat.

Cachia said the positioning of the large-screen displays was chosen with great care. "We wanted the right locations in terms of constant visibility," he said. "Safety was also a consideration. We didn't want the signs blocking evacuation corridors or mounted in places where they would block the flow of foot traffic."

The content on the screens incorporates current activities at the university, as well as segments that Cachia said "show a little bit of the flavor of the university." Rather than stagnant text displays, the signage uses moving video designed to catch the attention of passersby. Right now, the content is used for university activities and promotions, but the potential exists for the signs to display outside advertising messages, as well, allowing the university to derive income from the signage. "The idea is to eventually create timeslots for companies. There is the potential to sell advertising," Cachia said.

Uncharted Digital Territory

Because UHD is at the forefront of digital-signage technology in the educational arena, there were few blueprints for the school to follow when planning the installation. Traveling this uncharted territory meant Cachia had to do his homework before selecting the appropriate technology to meet the university's unique needs. "We spent a great deal of time can-

WEBPAVEMENT GROWS ITS SIGNAGE BUSINESS

Digital signage is not just for retail applications anymore.

As government facilities, educational campuses and corporate venues turn to digital-signage solutions to convey information and advertising to employees, students and visitors, Webpavement LLC in Atlanta GA stands at the forefront of this trend. The recent installation of a digital-signage network at the University of Houston-Downtown is just one example of a Webpavement client outside of the retail realm.

Robins Air Force military base, Kellogg, Inc., and Pfizer, Inc., have all installed Webpavement Sign Server, Sign Administrator and Sign Host for their digital-signage applications. Pfizer's corporate research and development facility uses the system to keep the company's 3000-plus employees at that location informed about general corporate news and information while they are in the break rooms, hallways and even the workout center. A stock and news ticker runs across the bottom of the screen, providing additional up-to-date information.

Other recent clients include Bank of America Military Bank, which installed Philips iTV wall and ceiling-mounted systems in its branches across the United States, and the Palm Beach County Convention Center, which is using LCD and plasma displays powered by Webpavement software for advertisements and convention-center information. The system can also be used to display emergency messages if the need arises.

Webpavement provides both hosting and turnkey digital-signage solutions, as well as Webpavement Kiosk, which is designed to provide clients with unattended kiosk management. The company took home a Digital Signage Award in the DIGI Awards ceremony held at this year's NSCA Systems Integration Expo in Orlando FL [for details about the competition, see the News section of *Sound & Communications*, April].

vassing the digital-signage landscape for the right products," he said.

Cachia was looking for a turnkey solution that would support a variety of media formats, including RealMedia, Adobe, Flash, PowerPoint, DVDs and more. He didn't want users to be tied to proprietary formats. He chose Webpavement's solution because "there weren't many other options available that met these needs."

Webpavement provides a broad array of digital-signage solutions, from digital-signage software to software and hardware packages, hosting services or a fully managed digital-signage network. UHD opted for a software and hardware package that included two Webpavement media players, the company's Sign Server software and also Sign Administrator software. The Sign Administrator provides the ability to display dynamic tickers across the bottom of the screen, which can be used to display news headlines, weather reports, stock prices and similar data.

Like so many projects related to the dissemination of information, the digital signage at UHD would not be possible without a combination of IT- and AV-based solutions. Although Moezzi said that most of his customers are IT professionals, and he doesn't usually deal with the AV integrators who work with his clients, audiovisual equipment does play a role in digital-signage installation. In the case of UHD, the school's AV professional, Cachia, handled even the IT aspects of the installation project.

The VGA display and audio are transmitted across Cat5 cable via an AV transmitter and receiver from Magenta Research. The AV transmitter converts the information to digital signals, allowing it to cross wider distances without the signal deteriorating. Although the use of Cat5 (or UTP) cable for digital-signage applications may seem to be an "old school" solution to a 21st century technical challenge, according to Magenta Research, it has been shown to work more effectively than the alternative delivery options—wireless technology, Ethernet on UTP or IP delivery—and is rapidly

UHD's digital-signage system informs students about the weather across Texas.

'As we train the faculty, a large part of it is preparing them to be comfortable with the software and psyching them up to use it.'
—UHD's Steve Cachia

UHD's signage mounted above an interactive kiosk in a typical configuration.

becoming a favored solution for digital-signage data transmission.

The amount of bandwidth required for wireless technology to deliver a quality signal makes it cost prohibitive, Magenta claims in a white paper. Ethernet over UTP is also costly, the company claims, because a computer and software program are required at each display. Delivery over IP suffers similar problems, in addition to a deterioration of quality when streaming video over IP.

In this application, Magenta Research's MultiView 450A Tx transmitter supports high-quality video reproduction at distances of up to 450 feet across Cat5 cable and offers EQ matching for optimum fidelity even at these long distances. The MultiView 450 ARx receiver supports RGBHV, RGsB, NTSC, PAL, SECAM, Y/C and component video, providing the flexibility UHD was looking for. The flexibility of the MultiView products, which include a daisy-chainable receiver, enabled them to fit the footprint of the university, even with the displays spread out across the campus.

Easy-to-Learn Software

At the heart of the Webpavement system is the E-Server, a web-based scheduling program that operates across UHD's existing Local Area Network (LAN). "It slides right into their existing IT infrastructure," Moezzi said. This was an important factor in selecting the Webpavement products. "They wanted to bring the technology in-house, so they would have complete control of it. Almost all of our larger customers do that."

The university wanted the end users—faculty and administration—to be able to program content quickly and easily, from anywhere on campus, via the college's existing IT infrastructure. The university did not want to have to install and update client software.

Security was also important. Because users access the Sign Server's graphical user interface through the UHD's LAN, it is password-protected and secure behind the school's firewall. "That was central to their decision," Moezzi said. [See "Network Security and the AV System," on page 20.]

Cachia and Albert Holden, the university employee responsible for content creation and multimedia management, were trained by Webpavement staff during the selection process, prior to the purchase of the equipment. "The training curve was minimal," Moezzi said. "It's very intuitive." Cachia agreed: "I played with it for a few months and learned the software."

Through the Sign Server, which is accessed via Internet Explorer, users upload content and schedule media for playback at specific times and within specific zones. The media players query the server and play content at the designated times. The displays are operated via an AMX controller and can be programmed to turn off at specific times, for instance weekends or evenings, and turn on every morning when the university opens.

Tapping into the Potential

As easy as the Webpavement digital signage is to use, Cachia faces many of the same training challenges that AV engineers and IT professionals encounter when introducing new technology to non-technical end users. "There's a lot of untapped potential with this system," Cachia said, "but we're getting there."

As the school's IT engineer, it is his duty to set up a training team that will get end users more comfortable with the software. "As we train the faculty, a large part of it is preparing them to be comfortable with the software and psyching them up to use it," he said. The training won't be on content creation, which lies in Holden's domain, but in operating the web-based scheduler. "We're trying to make it so they don't have to work too hard to get the content up there," Cachia said.

The software and hardware infrastructure is in place. Now it's just up to the university's faculty to take advantage of it all.

Cachia reported that, so far, he is happy with the capabilities of the Campus Screen Network, but only time will reveal the system's full potential. Although UHD is at the forefront of digital signage technology, it's only a matter of time before other universities and even elementary, middle and high schools follow suit. After that, who knows? We've already seen some digital signage replacing the old-fashioned bulletin board at church.

THE NEW CPU ERA

By Neal Weinstock

Semiconductor technology is moving from the era of microelectronics to a new age of nanoelectronics. In other words, the dimensions of the transistors on chips are now getting down to less than 100 nanometers (nm)…in new chips under development, not in anything commonly used at the moment. But, in the way of the electronics business these days, some of the first nano-chips off the assembly line are meant for highly graphics-intensive consumer-electronics applications.

So, although you may have read any number of "thumb-suckers" (as journalists call long, thoughtful stories) or sci-fi epics about nano-tech computers injected into human bodies or blasted into outer space, please note that the first major nano-app for a CPU (central processor) is IBM's, Toshiba's and Sony's Cell microprocessor, meant for Sony's PlayStation 3 in 2006.

Woody Allen once told of a scientist whose earth-shattering discovery was, "How to miniaturize anything, merely by making it smaller." What does this nano-trend portend for those who would maximize our industry by making it bigger?

Power and Heat

Sub-100nm technology promises to allow chips with billions of transistors, or roughly 100 times the approximate 10 micron size and maybe five million transistors, where most processors are today. Then, of course, there's Intel's new Itanium, with 1.7 billion transistors. That's the monster right now, the first sub-100nm chip, too.

So the good news, first, is that Moore's Law continues: Processing power should continue to double every 18 months or so for at least another decade or two. There is, however, also more complicated news than that.

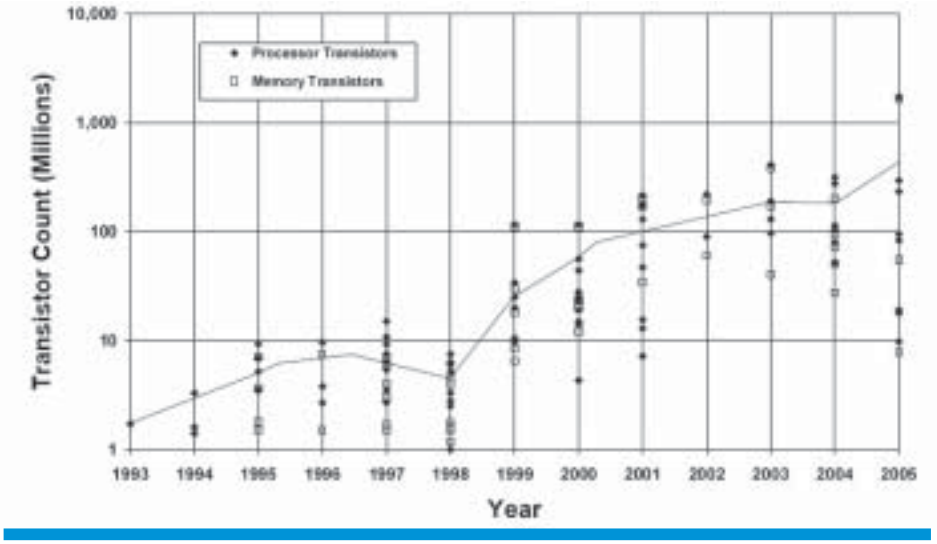
First, let's look at power and heat issues. Circuits as tiny as are now being developed must function with much lower power per transistor, or at most 1.2 volts. Thus, we need some innovation in power handling, or else these chips are going to burn themselves up. Indeed, the current generation of CPUs—especially those from Intel—are already running extremely hot.

Reduced-instruction-set (RISC) design has allowed the more recent CPU efforts from AMD (the Windows- and Linux-compatible Athlon and Opteron chips) and IBM (the PowerPC used by Apple) to get greater yields, lower costs and far more efficient operation than Intel's flagship Pentiums. This is because the Pentium, a huge, complex chip near the end of its design cycle, uses a tremendous amount of power.

Though lots of marketing and other factors enter in, a chip-level determinist would say that lower power usage is slowly translating into a market-share advantage in finished products for AMD and IBM: Both Apple's PCs and AMD-powered PCs are growing in share, and Intel's imperium has lately been showing some cracks.

But if low-power requirements must be met for large-scale CPUs, then they will also be met for smaller chips. That means we'll have Athlon- (if not Opteron-) grade intelligence in wireless, portable and network-powered devices in relatively short order. One implication: Power over Ethernet (POE) delivers only about what it takes to power a light bulb now, but more efficient devices located throughout the network will allow such applications as VOIP (voice over IP) and video cameras for teleconfer-

Chip Complexity



ISSCC line graphs show chip complexity, speed and power requirements moving in lockstep until this year, where suddenly there's a discontinuity; power requirements go down with the new designs.

encing to function without requiring any connection to separate power supplies. Another implication: lots more applications and longer times between charges for mobile devices.

Faster ADCs

Nano-devices also require higher-speed analog-to-digital conversion (ADC) than general-use semiconductors have required before. This is an easy thing to provide; it just isn't done normally because it isn't needed for most apps.

In fact, the only commonly used ADCs that now offer the kind of response needed for a great many devices in the future are used to convert analog audio to digital in professional filters and preamps. These kinds of chips have been the province of Analog Devices, Cirrus Logic and a few other companies. The coming of truly high-speed ADC to mass-produced CPUs and network processors may help those established ADC makers. Or it may take away some market from them as audio designers are able to employ programmable logic chips from an IBM or AMD, and for the same price (and in the same space on a board and at the same or lower power) perform ADC as well as other functions.

This may be a boon for companies such as Apogee Electronics that specialize in ADC filtering. Or it may take their business away, because an Apple Computer suddenly would get high-quality ADC for free, along with other chip functions the company is used to paying its pennies for.

A personal aside: When this author's former company built an IEEE 1394 chip, we were audio guys and so thought it would be a good deed for audio people to put really fast ADC into the chip. So, for example, that 1394 port on an Apple could do all the conversion required to sample a really great microphone, without need for an extra few thousand dollars for an Apogee filter. But our chip would have cost Apple an extra $10 or so, over the standard, and otherwise excellent, Texas Instruments 1394 chip. So, no sale.

But you can now buy that ADC/1394 functionality in inexpensive breakout boxes from M-Audio and other companies, at a sixth to a tenth the cost of the preamps you used to need, plus other functions built in. And the same functionality now comes from TI and from Wavefront Semiconductor, as well as my old company, BridgeCo. Lesson for all things based on semiconductor hardware: Unique supply opportunities don't last long, and most of the eventual benefit of an innovation goes to mass users.

New Services

There will be some new services, too, because of faster ADC wrapped into programmable devices. Just as the author was in the business of putting fast ADC (and other stuff) onto a single chip for 1394 networks, so Cirrus's CobraNet, Gibson Electronics' MaGIC, Digigram's Ethersound and others are in the business of putting fast ADC (and other stuff) onto specialized adaptations of Ethernet for carriage of media. Faster ADCs available for "free" (and along with POE) on a really cheap Ethernet MAC and Phy may make some big changes in these companies' business plans.

"You can think of it as a FireWire chip with all this crazy I/O on it," said Wavefront VP Bob Moses, speaking of his own chip but also speaking for the general design trend. "Or you can also think of it as an I/O solution that supports FireWire, in addition to all these other formats."

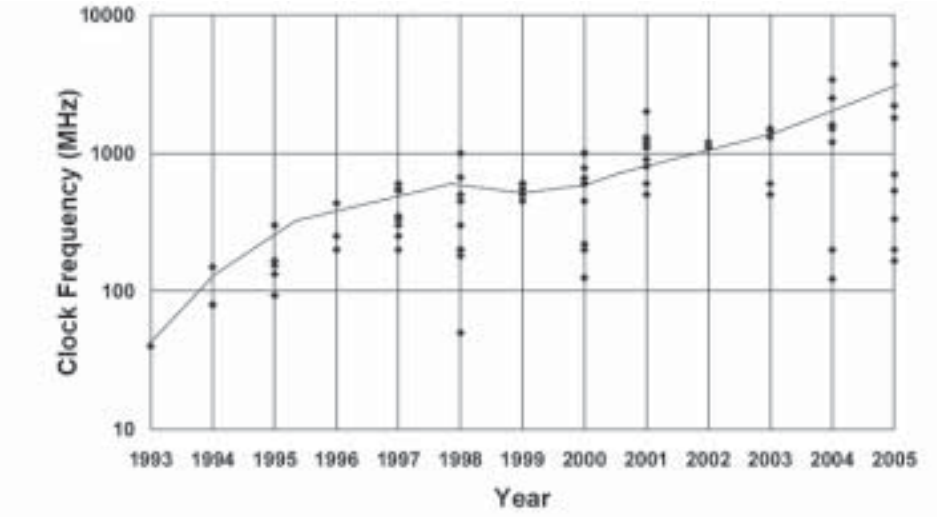
Faster ADCs with built-in networking looks to be a trend led by audio, and followed by lots of other applications. Faster ADCs on network processor nano-chips mean higher transmission rates for communications; they are likely to allow usage of higher-bandwidth, previously unusable wireless spectrum, and also more efficient usage of the wired links and wireless spectrum already in use today.

It is likely, for one example, that these faster chips will enable 100 or more channels of WiFi-like transmissions over the same frequencies allowing only eight channels today. More channels means more simultaneous uses, which in turn means either more different devices or devices that effectively can make the network seem like it has much higher bandwidth. In other words, look for multiple channels of good-quality, hi-def video over the unlicensed frequencies now used for 802.11.

Basketball and Multicore

Intel may seem to have gotten a little negative coverage so far in this story, but the company is going to come back in the second half based on multiple players scoring from three-point range. (Sorry, this is being written during the Final Four NCAA Basketball championship.)

Clock Frequency



To continue this ridiculous basketball analogy, Intel has been the chip industry's Michael Jordan-led Bulls of the 1990s. The company piled on one championship chip generation after another based on what seemed to the world to be a monopoly of power. But this seeming monopoly was really about having both the best CPU ever and capitalizing big-time on the very subtle failures of competitors.

Motorola slowed down investment on its 68000 line (used in the Macintosh) and Apple fell behind Wintel for that and other reasons. AMD screwed up a couple of generations of direct competitors. HP, IBM and Sun Microsystems made mistakes, too. Meanwhile, though, just like the Bulls, Intel kept basing its team around an aging superstar. You don't draft somebody new to replace Jordan or the Pentium, not while they still can play. And then, suddenly, they can't play. Or maybe they decide to play baseball instead.

The Pentium's development life is at about the point Michael Jordan was at in 1999: not done yet, but flying shorter with every jump shot. And nobody will make CPUs this way again; Intel half understood this when designing the follow-on CPUs after Pentium, Xeon and Itanium. But only half understood because, after all, you don't entirely abandon what has been your greatest success.

Slower to Move

So Intel was slower to move away from complete instruction-set (CISC) architecture, it was slower to move to 32- and then 64-bit computing, and most telling, it was slower to move to multicore processing. In other words, for Intel, the CPU remained one CPU, pushed for faster and faster clock speeds in order to attain higher performance. At the same time, AMD and the PowerPC conclusively demonstrated that dual-core processors—basically, two processors on one chassis—could perform as well as a hot Pentium IV, even as well as a multithreading Xeon, and run cooler.

Also at the same time, computer-game software firms proved to consumers just what the benefits could be of multiple processors, as they took advantage of machines with additional, specialized graphics processors from NVIDIA and others to deliver movie-like real-time 3D graphics.

The computer game-makers saw the huge sales numbers piled up by better graphics and began to think about planning game devices from the start around multiple processing cores. Microsoft began building its next-generation Xbox around IBM's dual-core PowerPC. Arch-rival Sony also went to IBM for its own next-gen processor.

Together with Toshiba, they came up with the Cell, the first generation of which is to have four cores, each able to process independently, each with its own high-speed I/O. The basic design is said to be able to ramp up toward any number of massively parallel cores.

Intel does not intend to be left behind. The company claims its Itanium (now with two cores) will also ramp up toward any number of cores. The multicore game is just beginning.

And so is the optical computing game. Optical computing—using lasers and mirrors instead of electronics—has been the wave of the future for roughly a decade already. A number of the highest profile optical chip efforts aimed at the telecoms market, and were left high and dry when that business imploded a couple of years ago. Perhaps the best-known optical chip now is TI's DLP projector microdisplay.

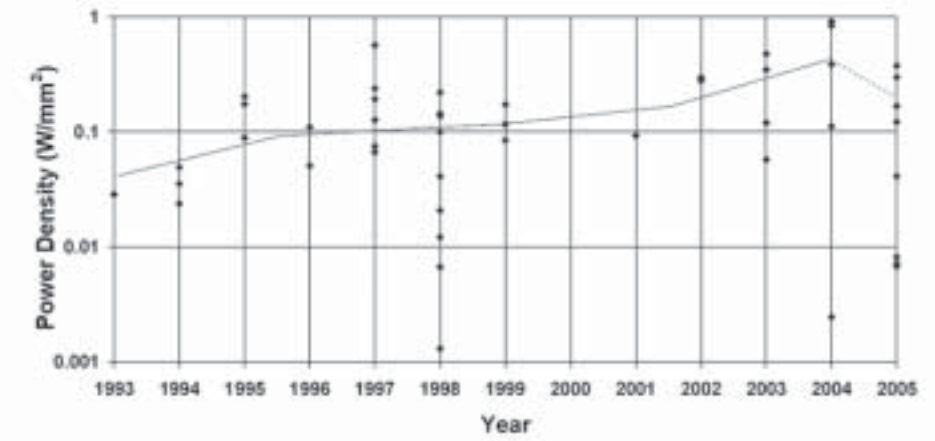
But optical computing is resurfacing again, with some new efforts announced that mix optics and electronic componentry. Leading the way has been Intel, which clearly hopes to leapfrog to leadership in a new generation. Also a leader is a start-up, Luxtera, which bases its technology on work done at the California Institute of Technology and partners with Freescale (formerly Motorola) for manufacturing. Luxtera announced its first product, not deliverable for another year, in late March.

Intel's and Luxtera's chips contain both traditional electronic circuits and super-thin pathways for lasers, and promise to combine the low-cost manufacturing of traditional semiconductors with the high performance of optical circuitry in networking. Both promise inexpensive 10-gigabit networking.

Luxtera CEO Alex Dickinson said, "Ten gigabits is the tipping point. Ten gigabit networks have been expensive. We'll bring the cost down radically and help make it ubiquitous. That's our opportunity."

"Nanoelectronics will truly lead to a ubiquitous information society," said Daeje Chin, Korea's Minister of Information and Communications, as he opened the IEEE's International Solid State Circuits Conference in San Francisco in February. It will be a society, "where electronics enables new information-based services for consumers, and becomes invisible to everyday life."

Power Density (W/mm2)



NETWORK SECURITY AND THE AV SYSTEM

By Neal Weinstock

The alliance of AV and IT isn't an unalloyed good. When AV systems were wholly built of analog electronics, or later of digital systems that were discrete and proprietary and therefore didn't connect to other information systems, network security was something we simply didn't have to worry about. Even now, mention the word "security" with regard to AV systems, and most people think of the pirating of copyrighted music and movies. That's surely a major issue, and we covered it in *IT/AV Report*, Volume 3 #1 2005 (See "Digital Rights Management for IT/AV Integrators" by Scott Lehane). But maybe all of the scariest new issues we face as integrators of AV and IT systems are in network security of a radically different sort.

For a couple of examples, what would you do if…

- Hackers get into your digital-signage network and, instead of showing ads for paying clients, they show those ads we get in email all the time for "herbal Viagra?" And what if those ads are illustrated? Or what if the hackers simply aim to bring your system down, perhaps just because they want to show they can do it? Or perhaps worst of all, they get paid by your competitors to show *their* ads on *your* network?
- The "hackers" are your own employees or students, and use your network to launch spam or spyware or "denial-of-service" (DOS) attacks on somebody else?

Incoming hacks, spam or public slander on your displays or audio system can be big problems. But outgoing nuisances may be far worse; there may be some huge monetary liabilities involved if one of your network insiders uses your system to mess with somebody else's privacy.

Dognoodle's "Blue Screen of Death" website calls this, "One of the most notorious screens ever." It was found in Australia.

Far-Fetched?

Are these examples far-fetched? Well, we've actually never heard of a case of digital signage being hacked to show either porn or spam. But signage systems have probably been hacked simply in order to bring them down. There are now several internet sites devoted to public "blue screens of death (BSOD)." (See www.dognoodle99.cjb.net/bsod, www.flickr.com/photos/jkparker/986910 and www.drbrad.org/flight-info.html for a few examples.) Those BSODs may have gotten that way by the usual process of gunked-up software, driver conflicts or too little RAM, but the *schadenfreude* (German for "joy at others' misfortune") exhibited by those websites seems to indicate that some purposeful hacking has, at least sometimes, been involved.

Why? Maybe it's about feeling put-upon by Microsoft Windows. Or by some airline that lost your baggage. Or by signage that's too in-your-face. Or maybe it's about showing how those Windows-based signage systems aren't as robust as your own Linux-based systems. It doesn't take all that much self-justification to motivate antisocial behavior these days.

In fact, it's hard to escape the conclusion that digital signage and PA systems are far more attractive targets for certain types of miscreants than is plain old email. After all, embarrassing somebody powerful in public is much more fun than embarrassing lots of powerless people in private.

And then there's the problem of viruses in converged IT/AV systems. In August 2003, about 3000 Bank of America ATMs running Windows XP Embedded were hit by the "Nachi" worm. It managed to render most of the automated tellers useless, and took weeks to clean up. These ATMs weren't directly connected to the internet, but were hooked up to the bank's own internal network. This allowed the virus to spread, probably from some user or departmental server within the company, onto the

ATM network. Why were BofA's ATMs running Windows instead of the usual secure and proprietary network used for ATMs? Because BofA wanted to quickly program its ATMs to show advertising in-between transactions.

Think this is so different from the way digital-signage systems are programmed?

Double Doors, Like My Living Room

Using software from such companies as Webpavement [see "Digital Signage Goes to School" on page 10], Scala, Clarity Visual Systems (formerly Coolsign's software unit), etc., users typically use a computer on their company LAN to design graphics and text messages, and put videos in order for showing on digital-signage networks. Users typically may want to download images, audio, video or word-processing files from the internet, or receive such files via email, and then insert them in signage.

A gorgeous signage concept ruined by network error. (Courtesy of Dognoodle's "Blue Screen of Death" website.)

If a virus or worm infects that file, it can be passed on to the sign. Then, just as with an infected Word or JPEG file in your PC, the most likely results would be endless load time or system crash when you try to bring up the file, or maybe the launching of an auto-dialer or the hijacking of your internet browser. And, of course, some viruses have more exotic results, such as, perhaps in the near future, being aimed at getting on public displays and showing ads for competitors. If the LAN or PC used to program the signage system or IP audio network is not secure, neither is the AV system.

In other words, the IT-based audio or video system should sit behind double doors from the cold, cold world out there…just like my living room. Open the second only after closing the first, when it's winter time. If the system administrator leaves the first door open (the LAN's gateway to the internet), he or she may still have had the presence of mind to put a firewall in front of the signage or PA system.

But sometimes, when I move a big piece of furniture in, both of the doors to the house are wide open, and you can feel the draft in the living room.

Crossing the Firewall

Firewall hardware, firewall software, anti-virus subscription software, anti-adware and anti-spyware subscription

Quoth the Sys Admin, 'Nevermore!'

We had a huge adware infection spate on our little eight-PC, single server LAN at Weinstock Media Analysis (WMA) not long ago. "Spate" because we kept getting re-infected with quaint and curious variants of the "tri" and "about:com" or "coolweb" or "CoolWWWSearch" browser start hijackers and pop-up blights.

There Came a Tapping

For those few readers who may not have gotten these infections, we'll describe them now. (If you're among the 99% of the world who *have* been infected, you may skip the remainder of this paragraph.) Most of these "malwares," "adwares" or "spywares" live to take over the start or search page in Internet Explorer, delivering users to a paid search page instead of one's chosen home or search option (or one's unchosen options, in the majority case of those who keep Microsoft's default settings on MSN and MSN Search). If you search for the word "the" in Google or MSN Search, you will get billions of choices. If you search for "the" in the about:com search page, you will find listings for herbal Viagra. "Tri" also provides pop-up ads for helpful items such as herbal Viagra at any time when Internet Explorer or Microsoft Outlook is running and there is a functioning internet connection.

For a while there, we fixed one variant and got infected with another within hours, if not minutes. Neither our hardware firewall, nor our software firewalls, nor Symantec's Norton Internet Security software running on a couple of the PCs, nor Alwil Software's Avast! Antivirus on the others, nor the previously helpful Spybot Search and Destroy and Ad-Aware programs, prevented these infections—and none of them was able to treat the infections once we had them, even though they claimed to treat them and afterward proclaimed our systems fixed.

While I Pondered, Weak and Weary

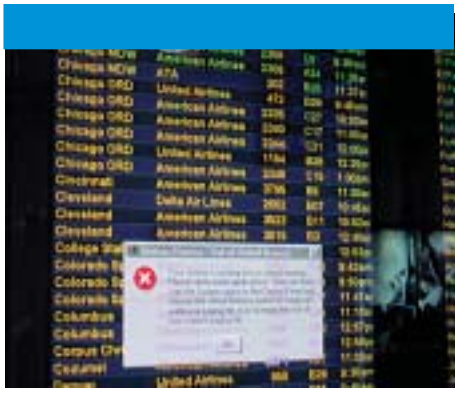
So we got serious. We made sure everybody on the LAN stopped using Internet Explorer. We went looking for new anti-spyware programs, got recommendations from our ace code-writers at WMA's allied software company, Practicing Musician, and downloaded and tested several. Luckily, this was the very day that Microsoft, having just purchased anti-spyware-maker Giant Software, made available its renamed, Giant-written, Microsoft AntiSpyware Beta1.

This didn't actually fix anything either, but it was the only program to notice precisely when an infection entered the system, and so we found out that incoming HTML email, always from some unaware sender with a large email receiver-base such as a newsletter, was infecting us through Microsoft Outlook. (At which point in the telling, certain friends say things

software: These are the bars on our cages, keeping us locked up so the bad guys can't come in. We hope.

Digital-signage and PA systems typically are not connected to the internet, but there's usually a single connection to a company LAN for getting information into the AV system. And that's the weak link. It should be guarded by a hardware firewall, but that may not help all the time. [See sidebar, "Quoth the Sys Admin, 'Nevermore!'"]

Teleconferencing applications, such as distance learning, boardroom systems, etc., are inherently much more complex. They are ever more likely to be partly a private network, partly on various connected LANs, partly on PCs joining the conference over the internet. Teleconferencing complexity also extends to the codecs themselves, which must traverse firewalls in multiple ways. Tandberg, Polycom and others have some technologies for getting AV codecs through firewalls. Tandberg, in particular, recently announced that it plans to offer its technology as a standard. But one reason the company is doing this is that teleconferencing traffic is so complex that it tends to get messed up by most firewalls, unless they are administered by people on all ends of the conference who *really* know lots and lots about router configuration. So people shut off their firewalls for their teleconferences. Bingo for hackers, malware and virus perpetrators.



Let's say you're going to Colorado Springs...(from www.drbrad.org).

Some greater understanding of just what a firewall is, and what various kinds of firewalls can do, can help prevent all that bad stuff from happening.

Just What Is the Firewall?

The word "firewall" comes from those asbestos curtains you may have seen in old theaters. Footlights used to be burning candles and, later on, carbon filament lights burned really hot while film used to be made of silver nitrate and was highly flammable. Firewalls did what their name implied.

Now they're software, though they may be a very limited software set written into some spare MIPS in a router or other specialized hardware device. Hardware firewalls tend to be effective with little or no configuration (if you expect to do a lot of configuration, you're likely running a software firewall, even if it runs on its own dedicated "hardware firewall" processor), and they can protect every machine on a local network. Software running on one machine only protects that machine. So if you have a network

such as "That's why I use Eudora," or "That's why I use a Mac." But these systems, too, can and have been compromised; they're merely less enticing than the more widely used software. And Outlook is widely used for good reason; I couldn't imagine weaning myself off it.) Then, simply searching for the most recently modified files on any infected PC gave us multiple names for suspect DLL, XML and HTML files, but just a few typical locations.

Of course, getting rid of the suspect files didn't accomplish anything, because any single PC on the LAN that got re-infected would infect all the others, and also because corrupted Windows registries would re-create the nasty files if they weren't also all fixed. That's when I called Microsoft for help, and discovered that, in a PR effort inspired by fear of losing a point or two of their 85% market share, spyware help is now free in Redmond. I got a very bright, high-level support tech on the phone after two days wait for a scrupulously kept appointment, and we worked together for several hours to use Microsoft AntiSpyware Beta1 to fix our PCs. When that didn't work, my very bright new friend, said, "Oh screw it, don't tell anyone I said to use this, but let's download Hijack This!"

Throw It Into Safety Mode

Take each PC off the LAN, throw it into safety mode, delete all suspect files, run Hijack This! to edit the Windows registry, restart, then get the LAN back up. Total fix-up time for eight PCs: about two hours. Two hours later, another email newsletter would bring in another infection. The real end to several days of wasted time only came a couple of weeks later, once Norton and Alwil and Microsoft AntiSpyware caught up to the bad guys and automatically delivered antidotes that actually work.

Though this flurry of malware was our most extreme problem in a while, it followed the pattern we've seen in each major infection over the last few years: royal pain for a week or so, then eventually our anti-virus vendors catch up to the problem and it goes away. And just which anti-virus vendors have been involved hasn't seemed to change that pattern.

And yet I wasted a bit more time, in honor of this article. Curious to see if any of these malwares would infect digital signage that gets programmed with a web browser interface, we purposely re-infected a PC and used it to program a display running, successively, three of the more common signage software systems. We got pop-ups on two out of three. It seemed to be fair to alert the vendors to the problem, not to sandbag them by naming names here. We're told the problems are being addressed.

with at least several PCs on it, you'll either have a firewall built into your router, or one next to your router. And you may also have software firewalls on any PC.

Firewalls are intended to allow only "safe" traffic through. How do they tell what's safe? There are some basic rules that can be programmed into hardware, and usually these are the best we can do for keeping out spam (which is not much). For the ever-changing threats of viruses, spyware and other Bad Stuff, however, software has to be reprogrammed continually with the addresses of nasty sites, and with understanding of nasty applications that may be in IP packets.

How do firewalls handle all this? The different types of firewall implementations include packet filtering router, stateful packet inspection, address translation and application proxy. Let's review the most important:

- **Packet Filtering Router (PFR):** Filtering in the router either blocks or allows a packet through based on the addressing information in the packet. For example, we know the originating IP address of each packet. If it is coming from a server that's been responsible for a lot of spam, it can be blocked. Unfortunately, sophisticated spammers like to "spoof" addresses, so this type of filtering is likely to shut off lots of legitimate traffic.

A bit more sophisticated, the port that the packet wants to use is a common part of the address. We think of each node on a network as one device with its own door, but it's really a device with more than 65,000 possible ports. A number of ports have typical uses, such as the default port for SMTP (Simple Mail Transfer Protocol) traffic (Port 25), which is exactly why lots of emails carrying spam and viruses want to use Port 25. Unsophisticated users tend to have bare-bones PFRs that block a number of ports associated with spam or viruses, but the spam and viruses still get through because they use Port 25. Unless the somewhat sophisticated system administrator stops them by blocking Port 25, in which case he also blocks all email for his network, necessitating that the very sophisticated sys admin also must reconfigure email settings for a different port.

SBC, one of the world's largest ISPs, recently shut off Port 25 for all its subscribers without telling them, in order to cut down on spam. Any of its customers with its own email server (that is, most businesses and institutional customers) was therefore left without email until they figured out the problem. This is a case of PFR bringing the fine tradition of telephone service into the 21st century.

A Spanish ticket kiosk. (Courtesy of Dognoodle's "Blue Screen of Death" website.)

Your sign's true message (after it's been hacked or brought down by a virus): First Class gets information, not you other people. (Courtesy of Dognoodle's "Blue Screen of Death" website.)

Confirms everyone's idea of government service. (Courtesy of Dognoodle's "Blue Screen of Death" website.)

More Advanced Technique

- A more advanced technique, **Stateful Packet Inspection (SPI)**, looks at additional characteristics such as a packet's origin *(e.g.,* Did it come from the internet or from the local network?) and whether or not incoming traffic is a response to existing outgoing connections, such as a request for a web page.
- **Network Address Translation (NAT):** An NAT firewall separates the internal IP address from the external address, with the firewall responsible for translating the addresses. Say the internal network uses a 134.134.160.xxx IP number, and the external network uses a 192.102.198.xxx IP number. If someone from the internet wants to get to the system at 134.134.160.118 (which is an internal network number), he must go through the firewall at the external address (somewhere in the 192.102.198.xxx range). The firewall will replace the incoming address (the 192.102.198.xxx) and reroute it back

to 134.134.160.118 system. In the process of address translation, the firewall can find out a lot about the packet and its content. Which leads us to application proxies (often implemented together with NAT).

- **Application Proxy (AP)**: The AP knows what kind of content is in the packet that is being sent. The proxy looks at the packet, and if it knows it is one that is allowed though, it gives it a pass. As with other applications, there are different kinds of application proxies.

A vendor of AV applications should either provide its own AP or provide enough information about its app so firewall specialists can develop an AP for that AV app. AP is really the beginning of responsible and sophisticated firewalling for any specialized application or network, and that most emphatically includes AV apps.

In fact, at a minimum, teleconferencing vendors must tell routers and firewalls some information about their packets' application payload, because audio and video traffic must be prioritized in order to work properly on a busy LAN.

Common Protocol

H.323 is the most commonly used videoconferencing standard protocol, for example. SIP is gaining competitive ground rapidly, but the problems it poses for firewalls and routers are less resolved so far, so let's focus on H.323 for now. An ITUR (International Telecommunication Union recommendation) for "visual telephone systems and equipment" (as the ITU says) over packet-based networks, H.323 provides a non-guaranteed, but prioritized, level of QoS (quality of service). H.323 is complex, uses dynamic ports and includes multiple UDP ("user datagram protocol") and TCP ("transmission control protocol") streams. UDP offers little error correction and is meant mainly for broadcasting information from one to many. TCP is used much more often with IP because it enables two hosts to establish a connection and exchange streams of data; it's about a two-way conversation, and has good error correction.

Dynamic ports cause enough problems for PFRs to basically cause sys admins to shut them off for H.323 conferences: The PFR would have to open all the ports from 1024 to 65535 to accommodate H.323's dynamic port assignment. This would defeat the purpose of the firewall.

To get around the shortcomings of H.323 traffic through the firewall, vendors want to implement an AP. The application, of course, is H.323. An H.323 proxy is able to determine that it is OK to allow the packets through, thus giving a connection through the firewall. The way H.323 proxies goes around the firewall is actually to establish two connections: one to the caller, then one from the recipient of the call. The call information is transferred from one side to the other, changing whatever information is necessary to make the connection happen. These changes include the UDP port address and TCP address. The H.323 application has to be proxy-aware for this to work.

Because H.323 (and, more recently, SIP) must use APs to get any protection at all, once you have a properly functioning AP firewall running, the videoconference is unlikely to be affected by viruses or malware. Just follow the recommendations for firewalls from your videoconferencing equipment vendor and you should be OK.

This is not to say, however, that individual PCs logging into a videoconference, either via H.323 or through some internet portal to a predominantly H.323 conference, will always carry AV properly. In fact, quite the reverse is now often true. The individual PC is quite likely to be so infected with adware and spyware these days, as well as RAM-eating applications that load automatically on startup even though the user never or seldom uses them (such as Real and Quicktime players, and various companies' picture viewing and music software), that the PC runs too slowly to present the conference's video in anything close to real time. Sys admins have to scrub users' PCs conscientiously.

Bottom Line

Finally, why do firewalls frequently not protect signage or PA systems that get their content from a LAN? Three main reasons:

- The virus or malware is something new that has not yet been defined by the anti-virus or anti-spyware provider, and it sneaks through.
- The firewall either isn't sophisticated enough to see attempts to infiltrate the network, or else the sys admin isn't looking at its reports about those attempts and taking appropriate port-closing, SPI, NAT or AP action in response.
- Inexpensive firewalls, especially those meant for home networks, typically treat any kind of traffic traveling from the local network outward as safe. If a LAN is compromised by the common problems listed above, so will be the files passed on to the signage or PA system when programming it.