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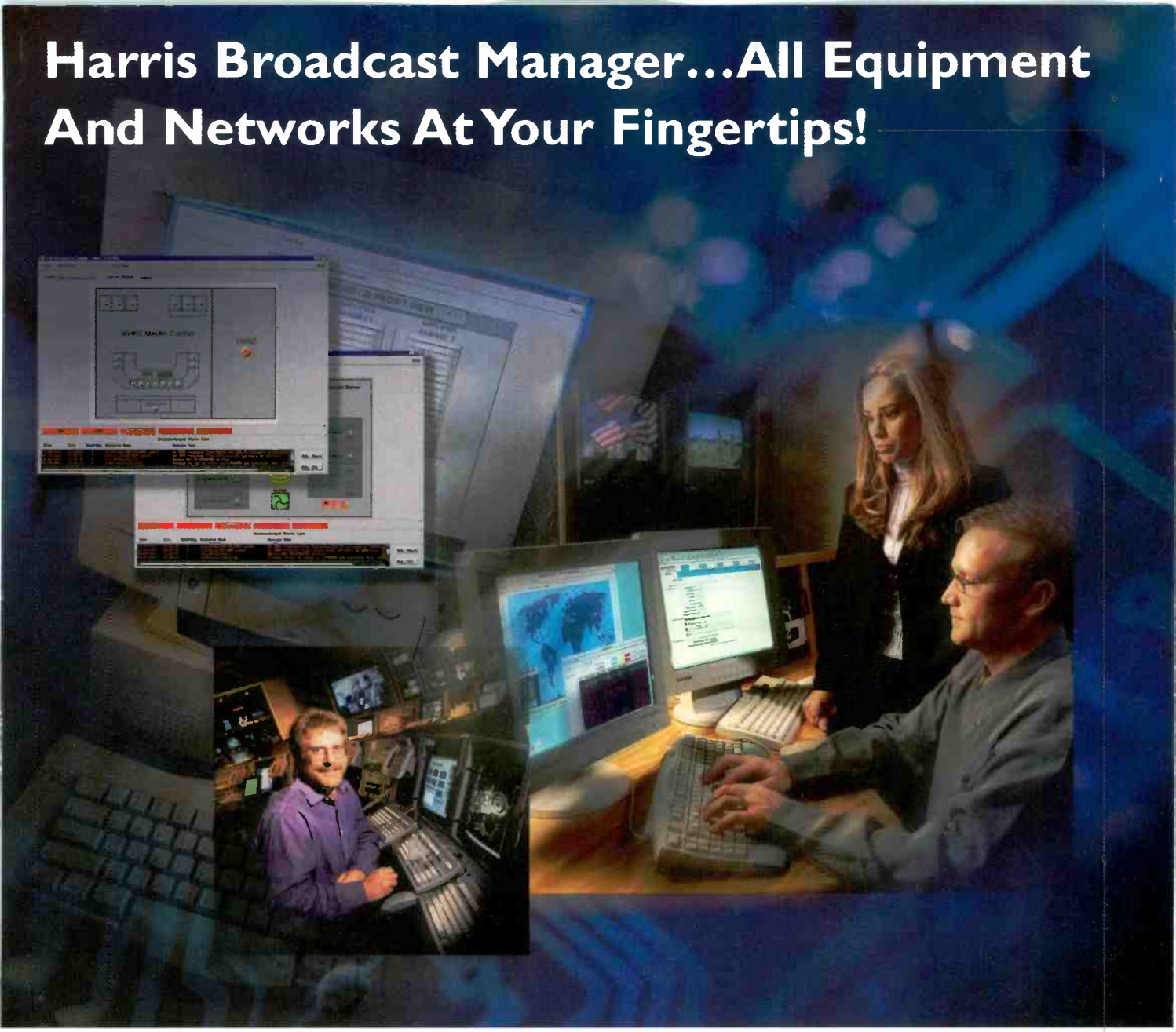

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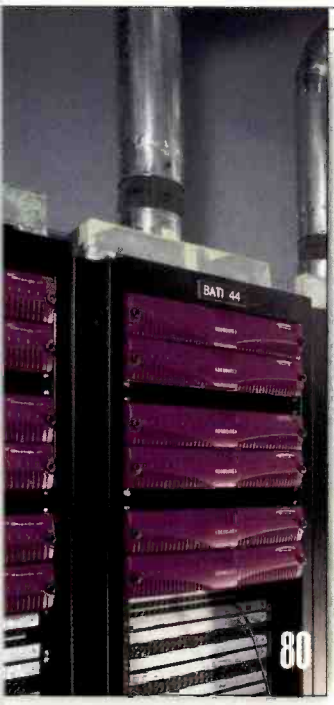
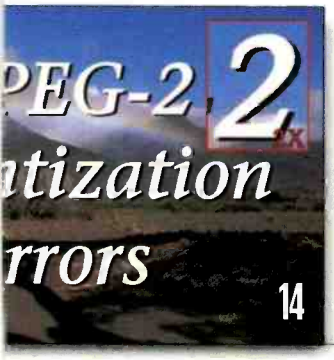


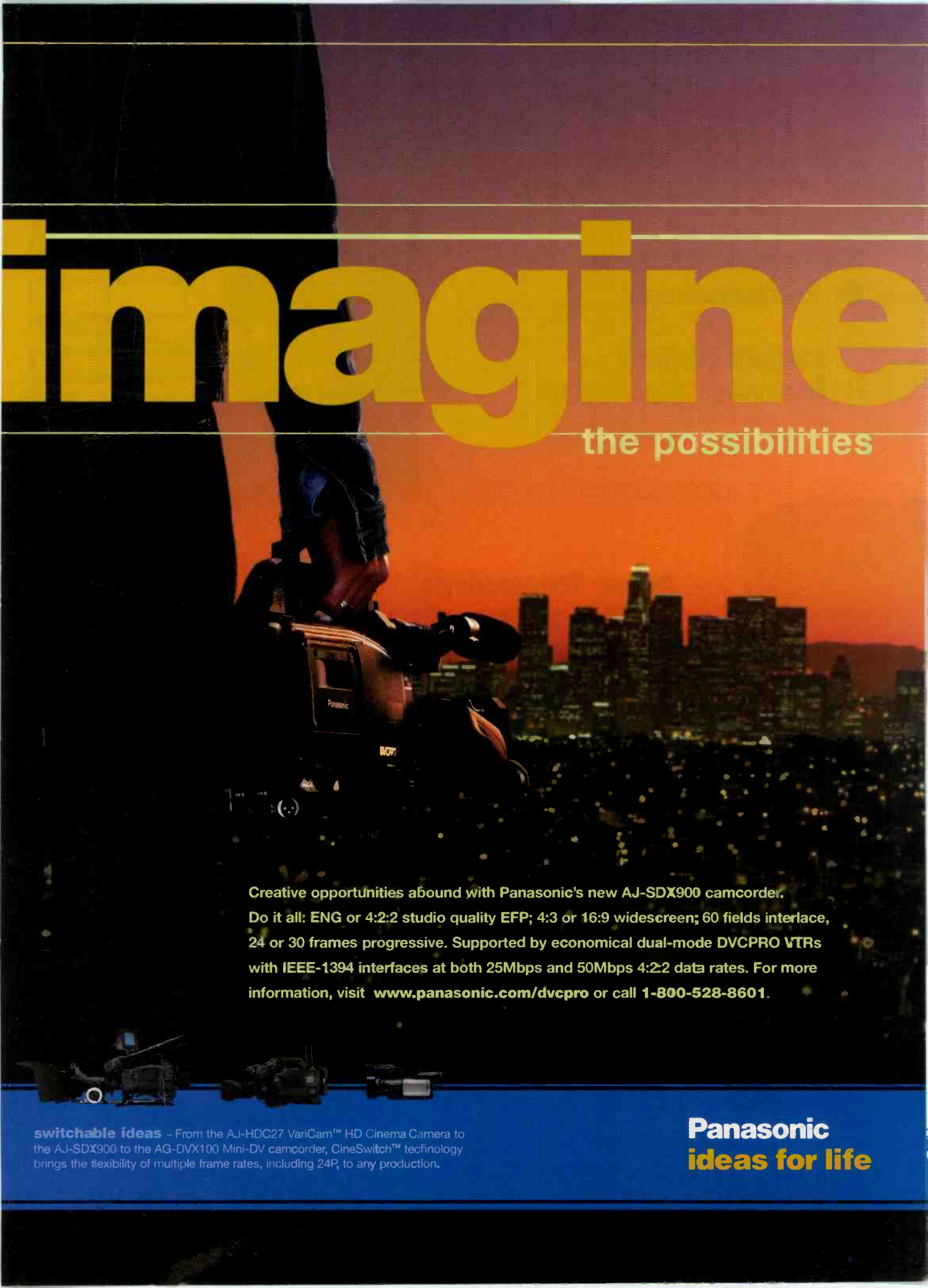
BEYOND THE HEADLINES

DIGITAL HANDBOOK



ON THE COVER: Lower East Side Studios' (LES) audio post-production facility in Manhattan, NY, specializes in audio for video format. The 6000-square-foot facility features two identical large audio control rooms, each with its own ISO/vocal overdub booth, a central machine room (CMR) that houses shared audio/video equipment, a third studio for future development, and several client lounges. Photo by Robert Wolsch Designs.

(continued on page 6)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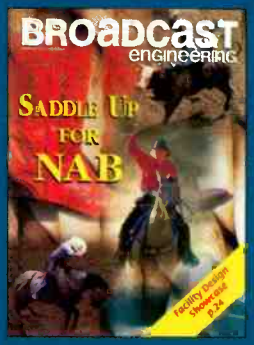

Name the last year the NAB convention was held outside Las Vegas and where it was held. Correct entries will be eligible for a drawing of the new *Broadcast Engineering* T-shirts. Enter by e-mail. Title your entry "Freezeframe-February" in the subject field and send it to: bdick@primediabusiness.com. Correct answers received by April 17, 2003, are eligible to win.

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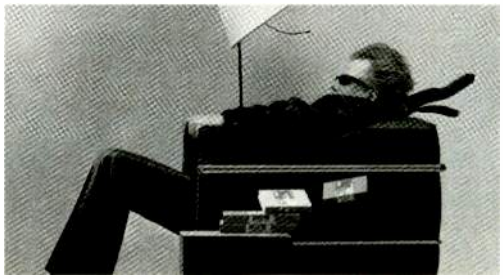

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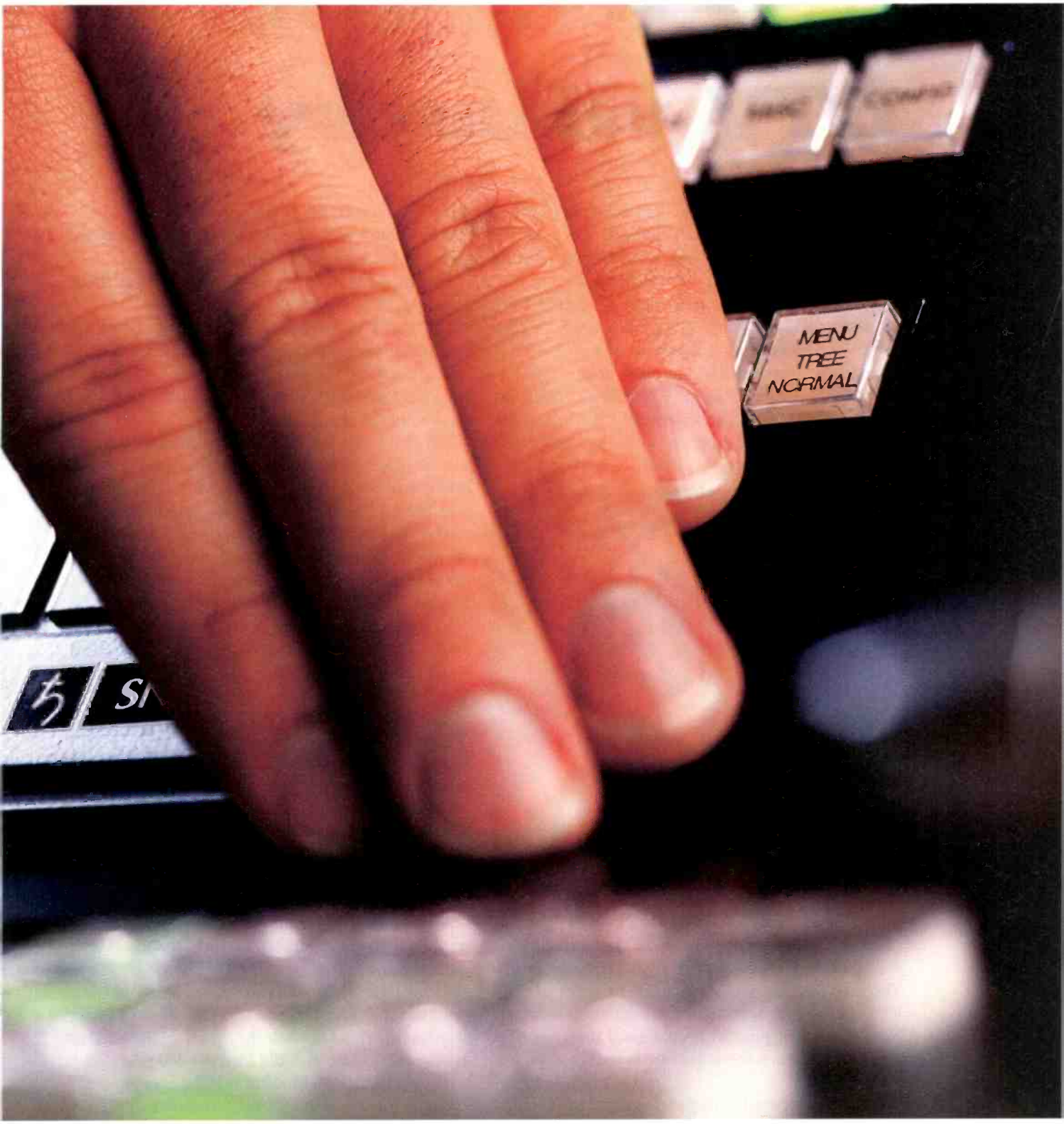

The first with file transfer over Ethernet? The first with an HD RAM recorder for creation and playback of bumps and stings? Perhaps it's the first switcher to be used in 24p episodic production? The first to be used in 720p production? Or maybe the first HD switcher to be used on a regular scheduled live sports production?
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DTV wizardry

It was a dark and stormy night. Rain pelted me as I stumbled up the unlighted and rocky path. I again asked myself, "Why am I out here on such a crummy night?" Then I remembered.

Always looking for the latest news on digital TV, I received a tip in my e-mail saying that a new DTV chip had been discovered, one that claimed to make DTV reception easy and reliable. The secret behind this new chip was credited to the great Wizard Seetooths, master of the FOX cult. The wizard lives way up in the Californo mountains, hence my trek towards the wizard's cave at this ungodly hour.

As I neared the mountain's peak, a flash of lightning reflected off the opening of a small cave partially hidden behind an outcropping of rocks and heavy brush. The cave opening was surrounded by relics of time long ago – VHS tape machines, Plumbicon cameras. Near an ancient pine lay an old quad machine. The cave opening was surrounded by mounds of worn out VHS cassettes.

As I moved forward, I stepped on a small tree branch. It broke with a crack. I froze.

"Halt, who goes there?" roared a voice from behind the cave's dark entrance. I almost jumped out of my skin at the bellowing from beyond. "I said, who goes there?" demanded the voice.

"It is I, editor of the famous magazine *Broadcast Engineering*. Who are you?" I asked.

"I am the great Wizard Seetooths, knower of all things broadcast," the voice replied.

"Oh great Wizard Seetooths," I said, "I've heard that you have solved the DTV reception dilemma. It is true?"

"Yes, it is true. I've solved all DTV reception problems, large and small, with my new Philips chip. Now, away with you," he shouted.

"But sir," I pleaded, "could there be some mistake? You see, others now dispute the IEEE report and your predictions. Even Philips has said it has no plans to manufacture the DTV receiver chip as you claim."

"Those are lies, all lies. Now away with you, peon," boomed the wizard. "I've said these things so they must be true. It works, trust me it works" continued the wizard. "Now beat it before I cancel my subscription to your magazine."

Having come this far, I tried again, "But Mr. Wizard, I implore you, the tests were merely theoretical. Shouldn't at least a prototype chip have been developed before you claimed such predictable results?"

Suddenly, the Wizard's voice boomed even louder from behind the cave opening, "I've solved the DTV reception problem. Trust me, it works. Now get out of here before I turn you into a mere pixel."

Suddenly, a strong wind whipped across the mountain. Lighting flashed. As if by magic, the dark curtains hiding the cave opening parted and I was able to see behind them. There was the Wizard Seetooths frantically stomping his feet and waving his hands. Smoke bellowed from a fire at his feet as he yelled into a microphone, "480 is truth; 480 is truth. 1080i and 720p are lies, damned lies."

By now I'd heard enough and quietly backed down the mountain trail away from the wizard's cave. As I turned to go home, I could still hear the wizard shouting, "Trust me, the chip works. Wait, did I tell you 480 rules? Come back, there's more. Did you know HD causes pimples?"

Must be the altitude, I thought to myself.

Brad Dick
editorial director

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Diamonds or HD?

Brad,

I surveyed the gals in our office – no one would opt for high-definition television over a one-karat diamond ring. Maybe the CEA needs to clarify that the three Cs – color, cut and clarity – are top-notch and then ask the question again.

CHRISTINE JELLEY
MCG SURGE PROTECTION

Brad,

You need a survey to realize these facts? Nice article. And yes, I have been using screwdrivers and climbing towers for years.

STEPHANIE R. KOLES

Will digital work?

Brad,

I have been reading your magazine and editorial comments for some time and have enjoyed your sense of humor and insight regarding this digital conversion. I just don't see it happening as seamlessly as the transition to color.

The other night (late night) I was watching a show about Kate Chopin on my local public TV station WGBY and the program started to break up – little squares appeared and disappeared all over the screen. It was obviously a digital problem that I have never encountered before. I stayed with the program, not so much because of interest in it but more to see if they could clear up the problem. The squares increased in number until there were lines of what looked like out-of-place puzzle pieces. The sound started to break up, and finally the screen went blank except for the station tag in the lower right corner. They never showed the end of the program, and the next program did the same thing. Finally, I shut off the TV and went to sleep wondering: Is this what the digital future holds for us?

MIKE RIVERS

Digital does work

To the editor:

I would just like to comment on my perception of the accuracy of your article in the weekly Web newsletter for Dec. 30, 2002, "DTV transition still going through the (slow) motions."

I am the chief engineer at NBC affiliate WPSD-TV in Paducah, KY. We serve western Kentucky, western Tennessee, southern Illinois and southeast Missouri.

In May 2002, the elbows started flying around our area. As of now, we have the ABC (WSIL) at full power from Harrisburg, IL; FOX (KBSI) at full power from Cape Girardeau, MO; PBS (WKMU and WKPD) from Murray, KY, and Paducah, KY; and CBS at over half power (KFVS – Cape Girardeau, MO).

We are on with just under 5kW ERP. We are only 135 feet in the air with our antenna. At first, it was like a science project, with just a few viewers. That, however, is changing. With our reduced power, we are received in about a 30-mile radius.

The ATSC format appears to be VERY robust. We do have monitoring equipment and have made field tests. This digital stuff is going to float, and float well. Our owners can't stand the fact that we are lagging behind. We are located on the New Madrid fault, and because of that, we intend to keep our low-power Harris Ranger transmitter as a standby for emergencies. We purchased the Harris Flexicoder encoding system. This encoder (or any other for that matter) is a big chunk of the cost of going digital. Anyone who is on the air has invested in their future.

In fact, I have been working feverishly over bids for a new, 1MW transmission system for us. I received my e-mail version of your publication while I was working on the bids and didn't really have time to write this letter. But the article seemed very biased. Not to mention the fact that the author's name didn't appear anywhere near the article.

Anyone who is on the air has invested in their future.

The article also failed to mention the requirement that was placed on CEMA last year to provide ATSC tuners in sets, starting in 2004 (for big screens).

Anyway, although I've sent in an opposing opinion, I wouldn't have done so had I not been provoked into thought by your publication. Keep it up.

JOEY D. GILL
WPSD-TV

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DeVolution

BY CRAIG BIRKMAIER

In a world where standards for consumer electronic products have evolved continuously in recent decades, there remains a bastion of stability: *broadcasting*.

Audio has evolved from mono to hi-fi to stereo to quadraphonic to surround sound. Meanwhile, AM radio continues to thrive more than 80 years after commercial service was initiated, and FM radio has been with us for more than 50 years.

The story for television broadcasting is much the same. NTSC and PAL continue to dominate the television landscape nearly five decades after the launch of color TV broadcasts. These analog video compression standards have endured the test of time, even as video acquisition, recording and display products have evolved beyond their limits.

As testament to the entrenchment of 525/625-line interlaced video, the transition to digital television has been driven primarily by the digital encoding (compression) of these legacy video formats using a standard finalized in 1995 – MPEG-2 MP@ML (Main Profile at Main Level). NTSC and PAL have evolved into digital standard-definition TV (SDTV) delivered primarily by DBS and cable. Meanwhile the transition to digital high-definition TV broadcasting (HDTV) has languished as the consumer electronics industry has used the DTV transition to develop an HDTV beachhead via DVD and DBS. Now the cable industry is embracing HDTV as a premium niche service.

Since 1995, hundreds of millions of MPEG-2-enabled products have been sold. Last October DVD players passed the 100 million-unit milestone. DBS and digital cable set-top boxes account for another 100 million MPEG-2 decoders, and tens of millions of PCs can now decode MPEG-2 video streams.

So, given the historic longevity of broadcast standards, why are some people, including this author, suggesting that MPEG-2 is growing old? That NTSC and PAL compression will likely outlive MPEG-2?

In time, however, consumers learned to see the Achilles' heel of MPEG-2 compression.

Adapting to change

For decades, broadcasters have worked relentlessly to improve the delivered quality of their product, while the consumer electronics industry has done the same with television display technology. A major reason for the emphasis on evolutionary improvements in video quality was the inflexibility of analog video compression standards. The entire broadcast pipe could only be used to carry one program, but it still took many decades to reach the point where that pipe became the limiting factor in delivered image quality.

Digital video compression changed the rules of the game, despite the protests of broadcasters. In the early '90s the battle cry among broadcasters was: "We won't use no stinking compression." The industry seemed oblivious to two realities:

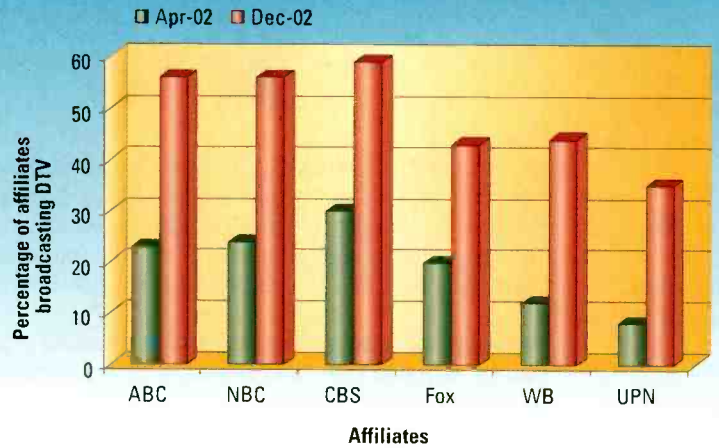
1. Their success was based on the use of an analog compression standard that squeezed three 6MHz (or greater) RGB signals into one 6MHz channel. And dare I mention the use of interlace, which added another 2:1 compression hit?

2. Two-thirds of their viewers no longer relied upon terrestrial broadcast reception; they had moved on to cable in order to get improved video quality AND improved programming choice.

FRAME GRAB A look at the issues driving today's technology

Delivering digital

Coverage area expands as more affiliates broadcast DTV



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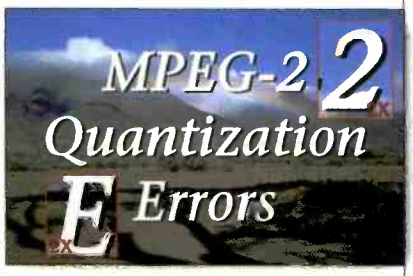
In 1995, DirecTV proved that MPEG-2-based digital video compression was a viable way to deliver television programming – hundreds of channels of television programming. And they tested the *theory* that consumers are primarily interested in improved video quality. While broadcasters toyed with the possibility of delivering digitally compressed HDTV in one 6MHz channel, DirecTV learned just how hard they could push the limits of digital compression to deliver a multiplex of programs in one 6MHz channel.

MPEG-2 compression enabled an entirely different way of looking at video quality. By removing redundancy from video streams and using prediction techniques to improve compression efficiency, it became possible, *on average*, to deliver what appeared to be better picture quality. In time, however, consumers learned to see the Achilles' heel of MPEG-2 compression.



MPEG-2 codes reference frames and differences from predictions using the Discrete Cosine Transform (DCT), applied to 8x8 blocks of samples. The DCT coefficients are then quantized. Excessive quantization can cause distortion of high frequency edges and blocking artifacts, as illustrated in this example.

With analog compression, delivered image quality is relatively constant, with the amount of information in the picture varying considerably to maintain the quality, using more or less of the channel. Digital compression utilizes the channel far more efficiently, but it can break down when there is too much information for the allocated bit rate. The average bit rate requirements may be relatively low, but peak bit rate requirements can spike to two or three times the average when there is high information content (too much fine detail or rapid action).

When the MPEG-2 standard was created, there were

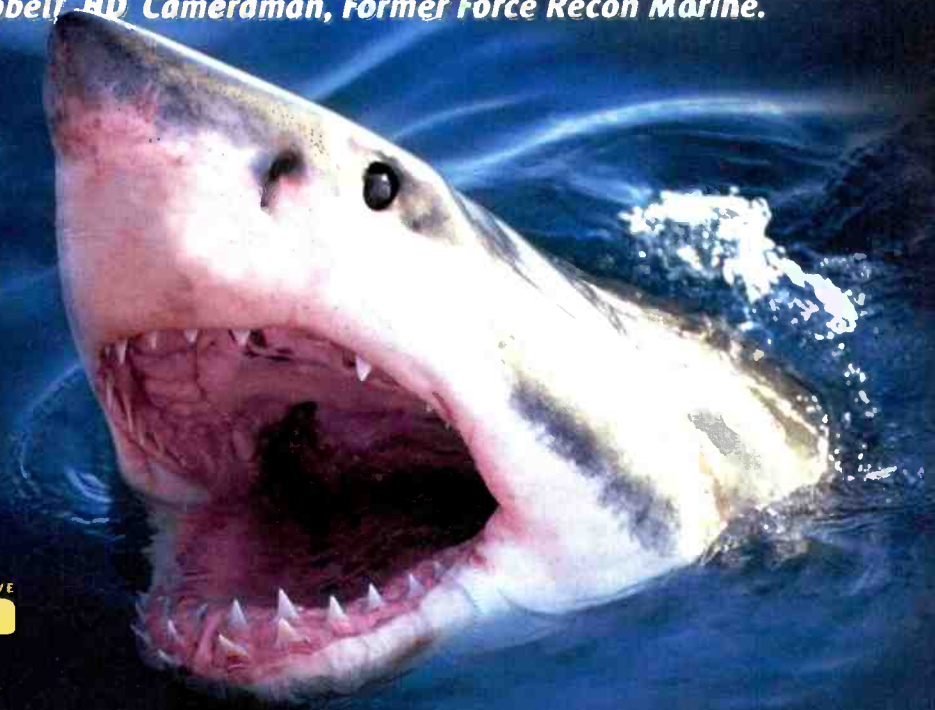
It has taken only eight years to fully exploit the encoding tools in the MPEG-2 standard.

significant concerns about computational complexity, especially for HDTV encoders. The standard was designed to limit the complexity of the mass-produced decoders, defining the syntax of the compressed stream to be encoded. It was assumed that encoders would evolve to improve delivered image quality, just as analog video equipment evolved to fully utilize the NTSC and PAL pipes.

And this is exactly what happened. The DBS system operators have replaced their MPEG-2 encoders many times in

"With No Second Chances Canon HD Lenses Are First."

Tom Campbell -HD Cameraman, Former Force Recon Marine.



HDxs DIGITAL DRIVE DD

Tom Campbell doesn't mince words when he talks about having the right equipment for the job. As a former member of the U.S. Marine Corp's Elite Force Recon Unit, he understands first hand about the importance of getting it right the first time. That's why when he became an HD cameraman, he chose Canon HD lenses "the finest lenses available to guarantee perfection at getting the shot the first time." From the 11X wide-angle to our 40X with built-in image stabilization, Canon HDxs lenses have you covered.

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fewer than eight years. Each new generation has improved the delivered image quality for a given bit rate. For the most part, however, each new generation has been used to reduce the bit rate needed to deliver minimally acceptable image quality so that more programs could be delivered.

As unlikely as it sounds, it has taken only eight years to fully exploit the encoding tools in the MPEG-2 standard. In other words, it doesn't get much better than this.

Meanwhile, video compression technology has continued to evolve rapidly, driven by the need to deliver acceptable image quality at much lower bit rates via the Internet and wireless telecommunications devices. At the same time, Moore's Law has relegated the perceived complexity of MPEG-2 encoding to the scrap heap of computer history. Today's ASICS, microprocessors and memory chips provide four to five times the computation resources available for the same cost in 1995.

The factor that has not changed in such a dramatic fashion over those years is access to bandwidth. The demand for more content is growing faster than the bandwidth available to deliver it. DBS needs more capacity to deliver local-into-local broadcast programming to more markets. Cable needs more capacity to offer video-on-demand services to digital cable subscribers. And broadcasters need a business model that is competitive with the multichannel subscription services it relies on today to reach 85 percent of U.S. homes.

There are two ways for these industries to adapt to the rapid pace of change in all that is digital:

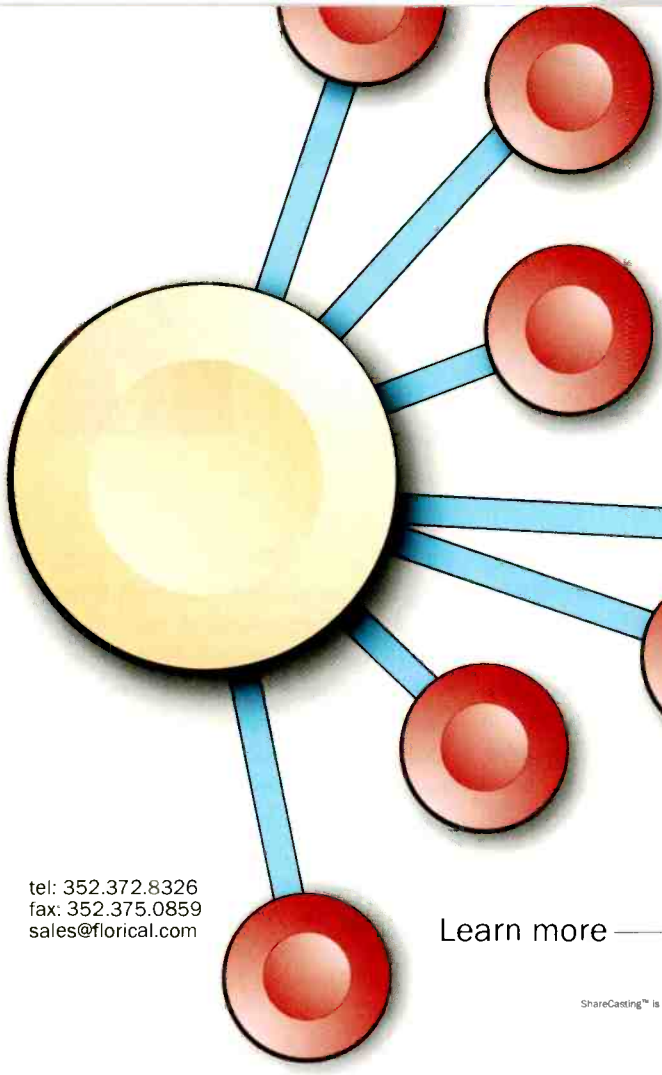
1. Use more efficient modulation schemes that cram more bits into the same amount of spectrum.

2. Use more efficient video compression to reduce the bit rate needed per program.

A variety of next-generation video compression algorithms are vying for the opportunity to replace MPEG-2. Proprietary codecs from Microsoft and Real Video have been pushing the envelope in the PC-based streaming video markets. And the Joint Video Team of the ISO (MPEG) and ITU have just finished work on a standards-based codec that will become the MPEG-4 Part 10 (ISO) and H.264 (ITU) standards. In March we will examine the technology behind these new codecs, and the prospects for their deployment as a replacement for MPEG-2, and in proposed enhancements to the ATSC standard. BE

Craig Birkmaier is a technology consultant at Pcube Labs, and hosts and moderates the Open DTV Forum.

SEND Send questions and comments to: cbirkmaier@primediabusiness.com



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Spectrum management initiative may impact broadcasters

BY HARRY C. MARTIN

The Commission's Spectrum Task Force has taken its first stab at rewriting the FCC's spectrum policies, releasing its report in late November. The report, and the supporting working group studies, advocate a revolutionary approach to spectrum management and contain proposals that may impact negatively on television stations.

The task force recommends that the Commission move away from the current "command and control" regulatory scheme, where the Commission specifies the type of services that may be offered by its licensees, and instead utilize a new model under which spectrum owners would have flexibility in terms of the services they provide. This new model, however, would not apply in the area of broadcasting in light of the public interest obligations imposed by the Communications Act. Indeed, the task force wants to dilute TV broadcasters' spectrum rights even as it denies them the spectrum use flexibility it recommends for other services. For instance, the report suggests that in high-density urban areas, where spectrum demand is greatest, the Commission should consider licensing digital television stations on single frequencies but with multiple low-powered transmitters, an approach possible with DTV but not analog transmissions. The task force sees this scheme improving DTV coverage but also as a means to free up TV spectrum for new services.

An outgrowth of the task force's report is a Notice of Inquiry adopted on Dec. 11, 2002, that calls for comments on permitting new services within the TV broadcast spectrum. While any such proposal is a long way from adoption, current TV licensees must remain aware of the possibility that the pressures being felt by the FCC to accommodate new technologies may ultimately cause the erosion of their current exclusive spectrum rights.

Dateline

May 1, 2003, is the DTV buildout deadline for noncommercial educational television stations.

FCC to crack down on fee delinquents

The FCC has proposed new rules that will significantly upsize the downside of trying to stiff the Commission when it comes to paying regulatory and other fees. In particular, the FCC has proposed to withhold action on any application filed by anyone who is delinquent on any filing fees, regulatory fees or other debt owed to the Commission.

The FCC has proposed to withhold action on any application filed by anyone who is delinquent on any debts owed to the Commission.

The so-called "red light" rule would have a couple of safety provisions to prevent major hardship or unfairness. For example, it would not apply if the delinquent payment is being challenged or in emergency situations, nor would it apply to fines imposed by the FCC that have not been enforced in court.

Still, the proposal has some scary elements. For example, the FCC proposes to be able to rescind actions on granted applications – even years after their approval – if it discovers that it was owed money at the time the application was granted. This could substantially erode the concept of "finality." Historically, once the Commission has acted, it has 40 days within which to rescind or modify its decision. If it does not act within that time frame, and if no one seeks reconsideration or review of the decision, then the decision becomes "final" and the parties subject to the decision can move ahead safe in the knowledge that the Commission's decision will remain the same.

But under the concept that the FCC has proposed, parties would never be able to say for sure that an action had been final because the Commission would reserve the right to rescind any action at any time in the future should it determine that money was owed by the applicant at the time of the action.

It also is unclear from the proposed rules whether the taint of delinquency for old debts can spread from the delinquent payor to innocent parties who own the station in the future. For example, if a station owner sells it without paying regulatory fees for several years, would the FCC apply the red light rule to the new owner? Clearly, aggressive enforcement efforts against payment delinquencies will likely be a source of significant confusion and uncertainty. BE

Harry C. Martin is an attorney with Fletcher, Heald & Hildreth PLC, Arlington, VA.

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xDSL VOD
for the masses

BY PER LINDGREN AND CHRISTER BOHM

According to Cahners In-Stat Group, over 23 million households worldwide will subscribe to video over xDSL by 2005. Already, we have seen independent operating companies (IOCs) and ILECs starting to implement triple-play services (voice, Internet, broadcast TV, video on demand, near video on demand, etc.) over xDSL.

Cable MSOs, starting to offer triple-play services, have become serious contenders. Telecom operators need to challenge this threat, and have realized the potential business opportunity in offering new and existing services over a single infrastructure.

The challenge lies in continuing to cut costs on the traditional services while enabling new video services with high quality. When a subscriber has purchased a film, they expect that it will be delivered with full quality, otherwise the service will not be successful. TV/video, and especially video on demand (VoD), can seriously degrade the performance of the telecommunications infrastructure. VoD requires a lot of capacity in the network and can easily represent over three-fourths of the traffic in triple-play networks. In today's IP data networks, no resources are allocated before a video stream is set up, and resources are not fixed to certain users as they are in telephony networks. Instead, a temporary overload situation could occur if several users are up at the same time, resulting in quality distortions for many users. To avoid this, providers have overprovisioned their networks as much as six or seven times, resulting in low margins and long payback times to implement these services.

Enabling quality of service (QoS) in IP networks, even when the majority of the traffic is real-time video, has become the new, real challenge when building triple-play access networks. Without putting restrictions on the engineering of the network (such as the number of hops, topology, etc.), it is possible to get as low as 10 percent to 20 percent utilization in the telecommunications network when trying to maintain the QoS needed for video services. However, new innovative approaches combining the best in IP and TDM networks can offer 100 percent QoS in combination with more than 90 percent utilization (see Figure 1). Since this dramatically reduces CAPEX both in terms of equipment and fiber/WDM infrastructure, the ROI improves dramatically.

With TDM QoS, the quality for the video streams is guaranteed, as in the telephony network, and is not affected by other traffic, e.g., when a neighbor starts downloading large amounts of material over the Internet. By combining this with an optical control plane, a very cost-effective QoS IP solution for triple-play networks is achieved. The control plane, for example using generalized multi-protocol label switching (GMPLS) allows e.g., the VOD server to initiate a channel for the requested video, on demand. This simplifies provisioning and makes it possible to get higher utilization of the resources. GMPLS is being standardized as a common control plane for multi-vendor, multi-layer networks. With GMPLS you can control your network from packets, over TDM channels down to wavelengths and fibers.

To conclude, the convergence between voice, video and data service is posing both a threat and an opportunity to the telecom operators. In order to not lose business to cable operators and satellite providers, it is a road most need to take. To overcome the QoS bottlenecks in this migration, new innovative approaches using GMPLS-like control planes and TDM IP QoS are being increasingly used for enabling triple-play networks with VOD over xDSL. BE

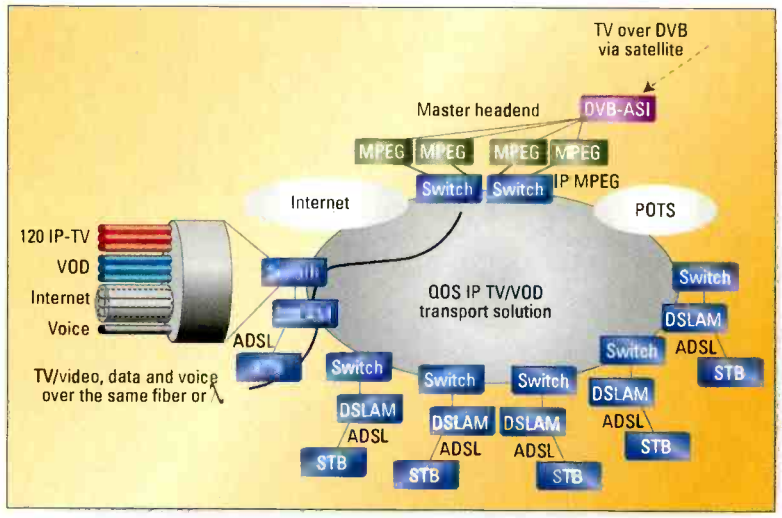

Figure 1. This QoS solution enables video, data and voice transmission over one fiber to provide high-quality VOD and video-related services.

Per Lindgren is vice president of business development, and Christer Bohm is chief technical officer, of Net Insight.

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The digital video synchronization concept

BY MICHAEL ROBIN

As discussed in our January 2003 article, composite analog NTSC and PAL signals use the horizontal and vertical blanking intervals to carry horizontal, vertical and chrominance synchronizing information. Early digital video formats, including the $4F_{sc}$, continued this legacy approach to synchronizing video signals. The complete analog video signal is sampled, resulting in a digital representation of the original composite analog signal.

The dominant SDTV digital video standard, Rec. 601, introduced a trailblazing concept of treating video signals. The analog luminance (E'_Y) and color-difference (E'_{B-Y} and E'_{R-Y}) signals are band-limited and separately sampled. The sampling frequencies are identical for the two scanning formats 525/60 and 625/50. The resulting digital representations, Y, C_B and C_R, are subsequently time-division multiplexed into a parallel or serial datastream for distribution or processing. Using the preferred sampling strategy (4:2:2) and number of bits per sample (10), the resulting parallel data rate is 27Mwords/s. Because the component digital signal carries no analog type sync information, the quantizing range is extended, resulting in superior SNR and picture quality.

Revisiting Rec. 601

The analog video signal is sampled at a multiple of the horizontal scanning frequency. As a result, the sampling instants are vertically aligned on a line-by-line and field-by-field basis. This is known as orthogonal sampling.

The dominant SDTV digital video standard, Rec. 601, introduced a trailblazing concept of treating video signals.

In the 4:2:2 format, the E'_Y sampling frequency is twice that of each of the E'_{B-Y} and E'_{R-Y} signals. As a result there are twice as many Y samples as there are C_B and C_R samples.

The number of Y samples per total line is equal to f_S/f_H, where f_S = 13.5MHz and f_H is the horizontal scanning frequency. Given the slightly different values of f_H, the number of Y samples per total line is 858 (numbered 0 to 857) in the 525/60 standard and 864 (numbered 0 to 863) in the 625/50 standard. Given f_S = 6.75MHz, the number of samples per total line for each of the C_B and C_R signals is 429 (numbered 0 to 428) in the 525/60 standard and 432 (numbered 0 to 431) in the 625/50 standard.

There are 720 active Y samples (numbered 0 to 719) and, respectively, 360 each C_B and C_R samples (numbered 0 to 359) in both standards.

The horizontal blanking duration is 138 clock intervals (numbered 720 to 857) in the 525/60 standard and 144 clock intervals (numbered 720 to 863) in the 625/50 standard.

The combined (multiplexed) number of Y and C_B/C_R samples per total line (words per total line) is 1716 (numbered 0 to 1715) in the 525/60 standard and 1728 (numbered 0 to 1727) in the 625/50 standard.

The digital active line accommodates 720 Y samples, $360C_B$ samples and 360 C_R samples in both standards, or a total number of 1440 words per active line, numbered 0 to 1439.

Rec. 601 and video synchronization

The Rec. 601 digital standard does not provide for the sampling of the analog sync pulses. The digital sync information is carried by the timing reference signals (TRS). Two TRSs are multiplexed into the datastream on every line immediately preceding

FRAME GRAB

A look at tomorrow's technology

HD shows slow growth

2008 forecast shows 51 percent still without HDTV service

U.S. HDTV forecast: 2008 (Total HDcapable displays installed: 33.4 million)	
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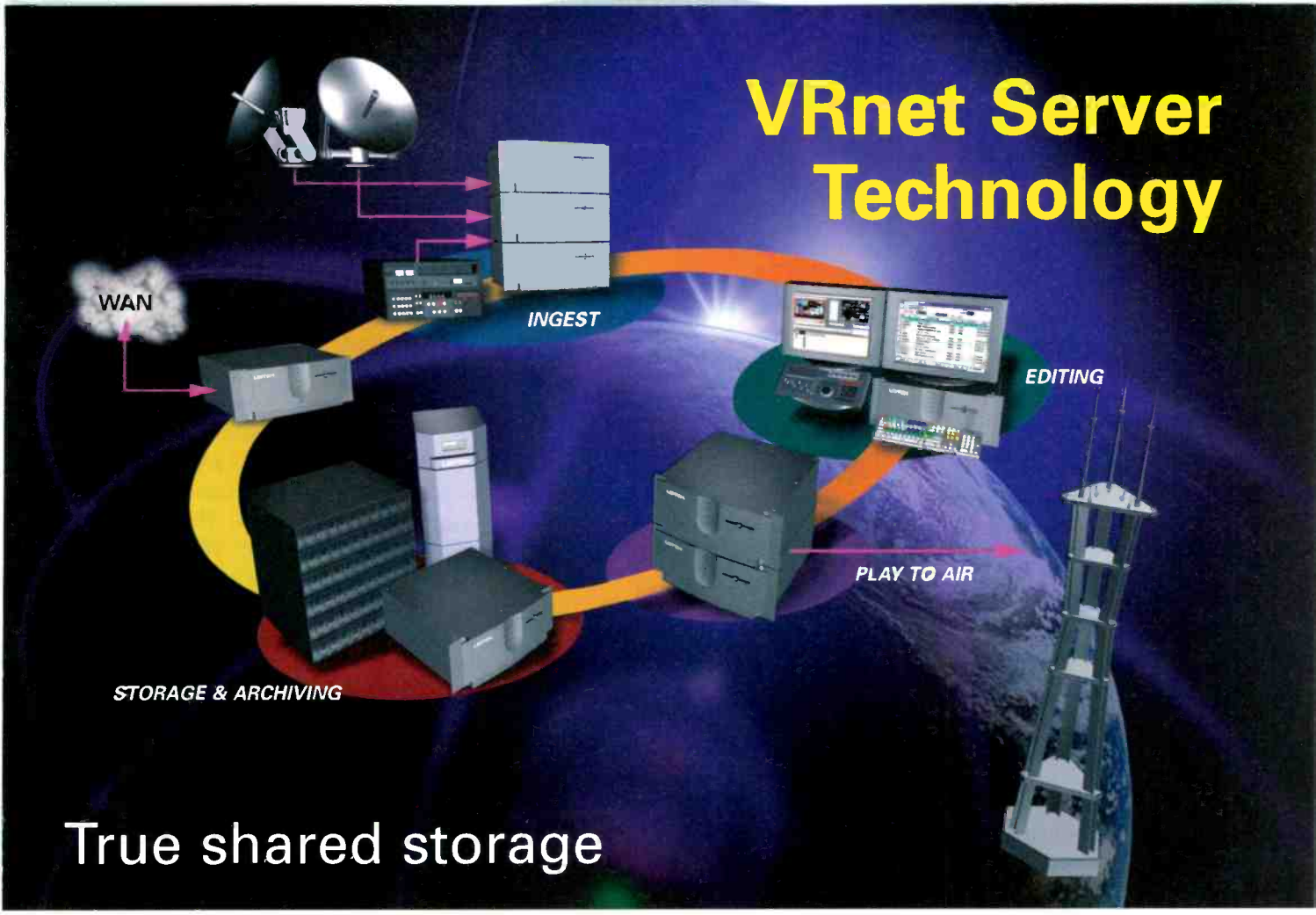
Cable HDTV	27%
Satellite HDTV	14%
No HDTV service	51%

Source: Strategy Analytics *www.strategyanalytics.com*



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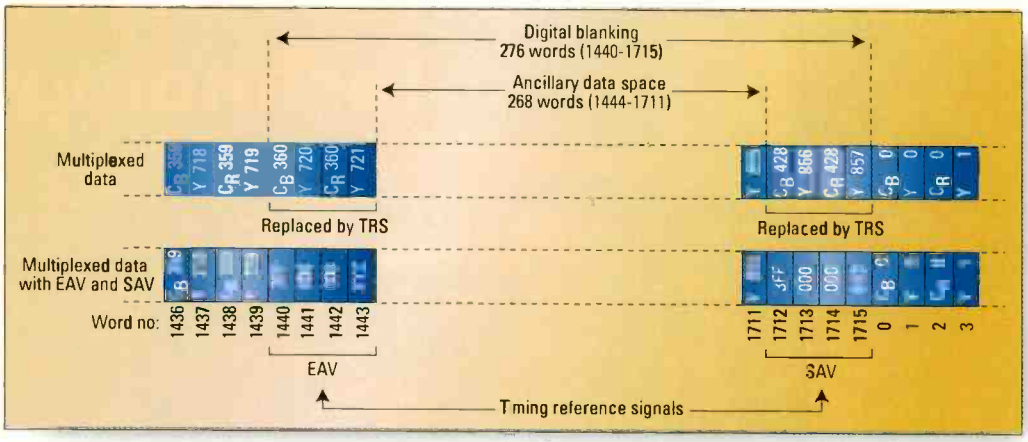


Figure 1. Details of the 525/60 scanning standard horizontal blanking interval showing the composition of the 4:2:2 digital data multiplex and the position of the timing reference signals, EAV and SAV

and following the digital active line data. Eight data words in the horizontal blanking interval are reserved for the transmission of TRS.

The TRS is a sequence of four 10-bit words identifying the end of the active video (EAV) and the start of the active video (SAV). The digital signal levels carried by SAV and EAV are unique values that cannot be assumed by the video signal.

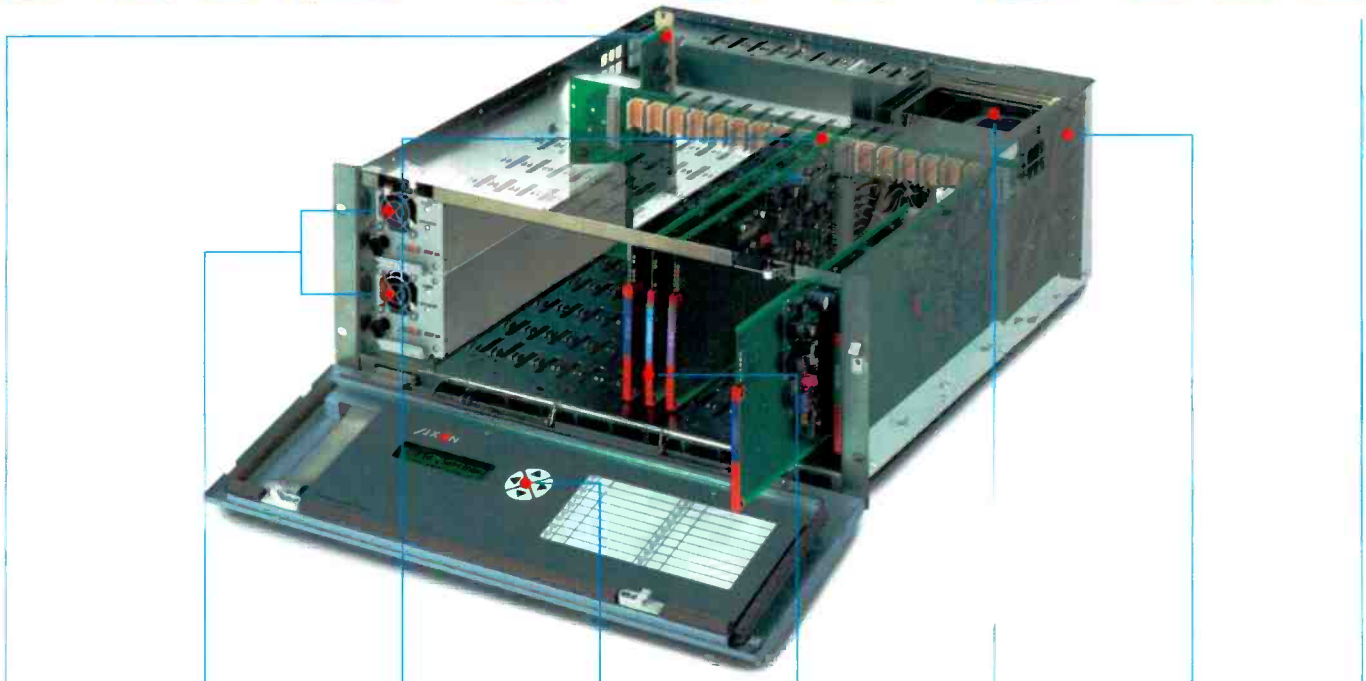
The position of the TRS in the data multiplex is shown in Figures 1 and 2 for the two scanning standards. As shown in Figure 1, in the 525/60 format the words numbered 1440 through 1443 are reserved for the transmission of EAV. Words 1712 through 1715 are reserved for the transmission of SAV. As shown in Figure 2, in the 625/50 format the words 1440 through 1443 are reserved for the transmission of EAV. Words 1724 through 1727 are reserved for the transmission of SAV. The EAV and SAV signals retain the same format during the field blanking interval.

Each TRS consists of a four-word sequence. The sequence of four words can be represented, using a 10-bit hexadecimal notation, in the following manner:

3FF 000 000 XYZ

The first three words are a fixed preamble. The 3FF and 000 hexadecimal values are reserved for timing

THE FUTURE



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identification. They unambiguously identify the start of EAV and SAV sync information as the values 3FF and 000 cannot be assumed by the Y, C_B and C_R signals.

XYZ represents a variable word. It contains information defining field identification, state of vertical blanking and state of horizontal blanking. It is evident that the TRS carries a large amount of information which may or may not be used, depending on the circumstances. The unused blanking space can be used to carry ancillary data such as 16 digital audio channels, timecode or other information. BE

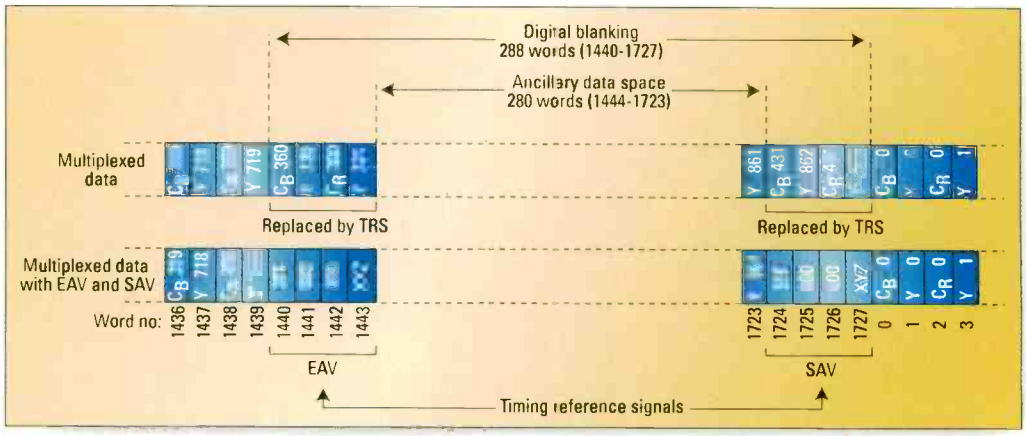
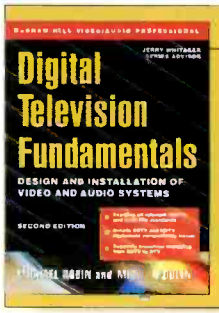


Figure 2. Details of the 625/50 scanning standard horizontal blanking interval showing the composition of the 4:2:2 digital data multiplex and the position of the timing reference signals, EAV and SAV

Michael Robin, a fellow of the SMPTE and former engineer with the Canadian Broadcasting Corp.'s engineering headquarters, is an independent broadcast consultant located in Montreal, Canada. He is co-author of Digital Television Fundamentals, *published by McGraw-Hill.*

SEND Send questions and comments to: michael_robin@primediabusiness.com



The Second Edition of Michael Robin's book may be ordered directly from the publisher by calling 800-262-4729. It is also available from several booksellers.

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Computer networking for beginners: Part II

BY BRAD GILMER

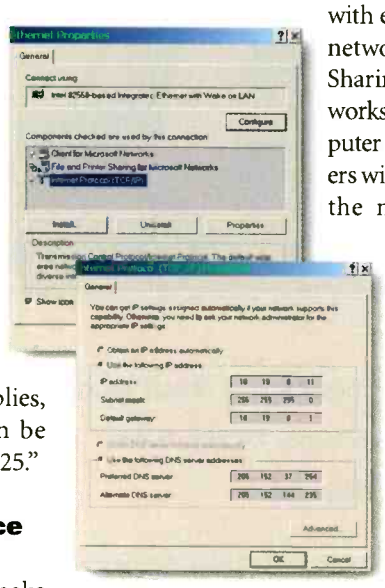
Last month, we discussed the IP structure of our sample network. Using private address space for our local network 10.19.8.1–254, and subnet mask 255.255.255.0, we are able to build a network for our office and supply Internet connectivity to our users.

To access computers on the Internet, we could enter the IP address for each computer directly (66.281.71.198, for example). But it would be a lot easier just to enter www.yahoo.com instead. When you enter a uniform resource locator (URL) such as for Yahoo, your software goes out to a domain-name-service (DNS) server to look up Yahoo to find the IP address associated with that name. Your ISP designates the DNS servers you assign to each workstation. In our example network, we will use 205.152.37.254 and 205.152.144.235.

Register now

VeriSign (www.netsol.com) is a governing body for DNS servers on the Internet. It is also one of a number of domain registrars available on the Internet that register domain names. You can go to VeriSign's site and register a globally unique name on the Internet. To register a domain name, you need the IP addresses for the DNS servers that will house the information for your domain. If you do a "WHOIS" lookup for "cisco.com" on the VeriSign site, you find that there are two DNS servers associated with the domain: NS1.CISCO.COM (128.107.241.185) and NS2.CISCO.COM (192.135.250.69). These two DNS servers house all the information regarding cisco.com.

When you enter "www.cisco.com" in the address line of the Web browser on a workstation, the local workstation queries the ISP's DNS servers 205.152.37.254 and 205.152.144.235 for the IP address of the Web site. One of the ISP's DNS servers then asks VeriSign, "Where can I find information about 'cisco.com'?" The VeriSign server replies that such information can be found at 128.107.241.185 or 192.135.250.69. The ISP's DNS server then asks one of the Cisco servers, "Where can I find 'www.cisco.com'?" The Cisco server replies, "www.cisco.com can be found at 198.133.219.25."



The Ethernet Properties and Internet Protocol Properties windows can be used to assign IP information and enter information for each workstation.

Assigning device addresses

The final step to make this all come together is to assign IP addresses to our various network devices. For our example, we will use Windows 2000. Other versions of Windows are similarly configured. Various versions of UNIX and MAC operating systems all come with TCP/IP; they can be configured using the same information concerning IP address, subnet mask, gateway and DNS server.

To assign the IP information to the Windows 2000 computer, select "Start," "Settings" and "Control Panel." In the "Control Panel" window, open "Network and Dial-Up Connections." This will bring up a list of all the network connections on the PC. Highlight the "Local Area Connection," right-click the icon and select "Properties." The computer will display the top window shown in Figure 1.

"Client for Microsoft Networks" allows our local computers to communicate with each other on the local network. "File and Printer Sharing for Microsoft Networks" allows the local computer to share files and printers with other computers on the network. Neither of these services uses the Internet, but you might need them if you want your computer to share information on a local network. The final choice in the list is "Internet Protocol (TCP/IP)." Highlight "Internet Protocol (TCP/IP)" and select the "Properties" button. This will bring up the bottom window shown in Figure 1.

Enter the IP information as shown in the bottom window for each workstation. Remember that each IP address must be unique on the network. The subnet mask, default gateway and DNS server will be common to all workstations.

In our network, we are configuring the IP addresses of each workstation manually. Each workstation will always have the same IP address. Some networks use Domain Host Control Protocol (DHCP) to assign IP addresses automatically. To use DHCP, you must have a DHCP server running on your

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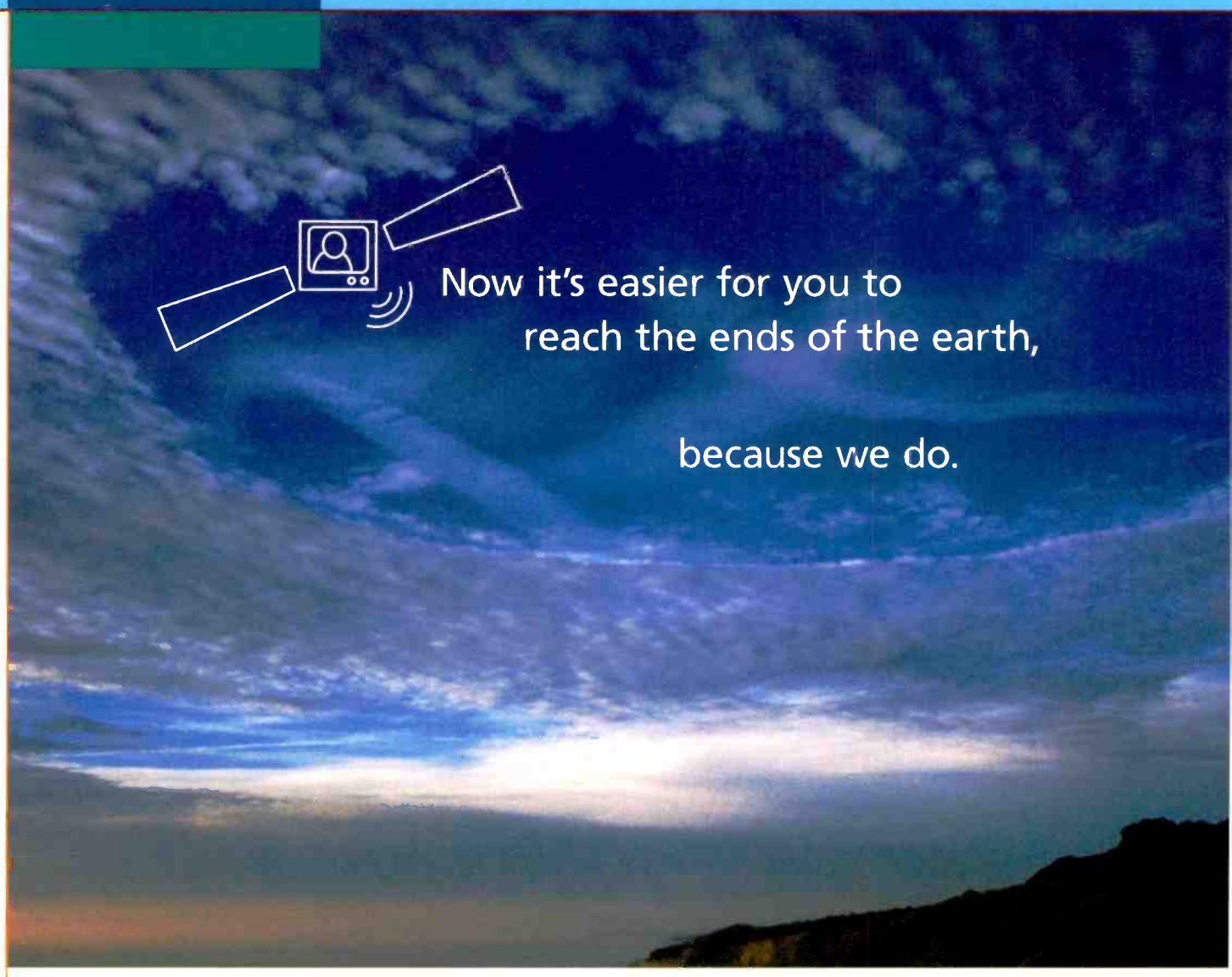

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network. If your network supports DHCP, then you can choose to "Obtain IP address automatically." DHCP will then automatically assign your computer an IP address the next time you log on to the network.

The router

Our example network uses a router to connect to the Internet. The router's job is to send all traffic not intended for the local network out to the Internet. The type of router you need depends on the type of Internet connection you use (i.e. cable, xDSL, modem, etc). For cable or xDSL connections, a dual-Ethernet router will handle the task. The router that we will use in our example is a Linksys BEFSR11 dual-Ethernet router. Refer to the documentation specific to your router for directions on how to access the router's configuration tool. The Linksys router uses a Web-based configuration tool.

The router configuration is divided into two parts, LAN and WAN. The LAN side of the router should be connected to the local network. The WAN is connected to a modem that is supplied by your Internet-service provider (ISP). The LAN IP address is taken out of the IP addresses that we allocated to our local network (10.19.8.1). The subnet mask of this address should match the subnet mask of the other workstations on our network. The WAN address will come from your ISP; most ISPs will assign an IP address to you automatically. On the router control page, select "Obtain IP Address Automatically." This will assign all the necessary information to the router (IP address, gateway and DNS server) to access the Internet.

You may need a username and password or other configuration information from your ISP to access the Internet. You should be able to enter this information into your router through the configuration tool. Once you have the router configured, you should attempt to connect to the ISP using the configuration tool.

At this point, your network should be up and running, with a working connection to the Internet. Go to a workstation and open a DOS window by selecting "Start," "Run" and "Command." Then type "ping 10.19.8.1." You should see a series of lines saying, "Reply from 10.19.8.1: bytes=32 time < 10ms TTL = 60." This means your workstation can successfully see the router. At this point, you should be ready to surf the Web with your new network. BE

Brad Gilmer is president of Gilmer & Associates, executive director of the AAF Association, and executive director of the Video Services Forum.

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Saving
shot data

BY MICHAEL CAPORALE

Choosing film parameters used to be fairly simple: Just pick an emulsion. With this one choice you could specify the film speed, graininess, resolution, color rendition, latitude and color temperature. But modern professional video cameras offer a range of parameters that were previously unavailable. Producers who now work in video must select frame rate, shutter percent, gain, gamma, pedestal, black stretch, knee point, knee slope, dynamic level, saturation, color correction, white balance, matrix table, filters, camera setups, memory-card setups, number of users, and many other parameters, all of which affect the outcome of the image. I own such a camera. And, after purchasing an upgrade for it, I suddenly felt the weight of all those small decisions.

The camera is the Varicam (AJ-HDC27F), the updated version of the "27V" DVCPRO HD camcorder. With the upgrade, Panasonic has introduced new options that add functionality to programming the camera.

Shooting pains

My first project after receiving my upgrade, a feature-length film with a "reality" dimension to it, provided an interesting test for the new technology. It required me to shoot at least half the film in a controlled situation and half in a run-and-gun documentary (ENG) style. I had one prep day, during which I created four programs that I stored in the camera for the production.

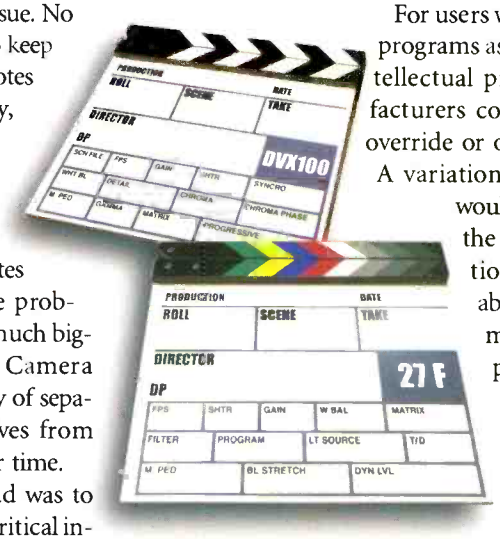
Three months later, I had to get some pickup shots on that first movie and match the look of the previous shots. Good thing I stored the programs. I'm safe. Or am I?

Memory problems

How could I possibly remember all the choices I had made and recover them later? Even selecting one of the 12 programs I had stored didn't help, since I had made numerous tweaks during production. In addition, on run-and-gun assignments I don't get a camera assistant, so keeping extensive notes on each shot is impossible. On small indie productions it's pretty much the same. On a properly crewed production it's less of a problem, but it's still an issue. No one is trained to keep those kinds of notes and, ultimately, doing so is very time-consuming.

I thought good camera notes might solve the problem, but it's so much bigger than that. Camera notes have a way of separating themselves from the masters over time.

One idea I had was to track the most critical information on a dry-erase slate. The information would then be on the tape and could not get separated from the images. Figure 1 shows mock-ups of the camera-specific slates I use. But I would really prefer a system that is passive and transparent, especially for the larger, menu-heavy broadcast and HD cameras.



Recording shot data on tape using camera-specific dry-erase slates is more reliable than writing camera notes, but the slates are cumbersome.

A little help, please

I'm calling on manufacturers to consider this problem and develop solutions that track this data for us. I have it on expert advice that there are several workable possibilities:

1. Record the data through a camera port to a PDA that can be attached to a printer for archiving printed data and also can be used in the field by assistants.

2. Broadcast this data to a slate that will be photographed to tape. The slate will thereby remain with the images for all to see and use in future shoots.

3. Store the complete files on the metadata track of the videotape itself and provide users with a way to upload that information from tape to a camera for replication.

For users who regard their programs as proprietary intellectual property, manufacturers could provide an override or on/off function. A variation on this theme would be to make all the pertinent functions user-assignable to a "my page" menu. This would put all the variants on one, easily accessible menu. Users could select the page for storage or broadcast to the slate or cabling to the PDA without the need to store a lot of other data. This would also facilitate speedy access of the most used data from a single page. Currently, modifying the look of the camera is very time-consuming. All the variables exist on many menu pages, each with submenus. I'd like to be able to access the items that matter most to me all on one page and archive that information for later retrieval.

One method might have advantages over another. But clearly, users need some way of managing this data. BE

Michael Caporale is a director of photography for 24p digital cinema.

Competitive Television THROUGH TECHNOLOGY Summit

For Stations, Groups & Networks

An In-Depth Look at How Technology Solutions are Driving Marketplace Competitiveness

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Letter from the Publishers

New technologies and solutions offer television station management a competitive edge in their own market. From centralizing operations, moving to an IT-based infrastructure, and converting the station to digital, executives find many advances that offer the benefits of operating efficiencies and potential income enhancements.

One of the primary editorial missions of both *Broadcasting & Cable* and *Broadcast Engineering* magazines has been to provide television executives with the information they need to incorporate the latest developments into their operations. It is clear that today, choosing the right technology is crucial to the business success of station groups and networks.

The Competitive Television Supplement is a special project focused on educating television station and network owners, management and engineering talent on how technology solutions are driving marketplace competitiveness.

This supplement reflects a Competitive Television Summit held February 11th and 12th in the Washington, DC area. More than 80 television executives joined 12 leading equipment providers to discuss, explore and find solutions which will improve their competitiveness.

We hope this special effort provides insight that is helpful to the readers of both magazines, as they strive to make their enterprise more competitive.

Regards,

Dennis Triola
Publisher
Broadcast Engineering

Lawrence Oliver
VP/Group Publisher
Broadcasting & Cable

Contents

Specialized facilities have less glamour but more potential

In Centralcasting, Less Seems to be More

IN 2001, centralized operations seemed to be a trend destined to be like the DVD player: it would catch on quickly and redefine an industry. Instead, the centralcasting concept has run into some snags that have given it the seeming relevance of a pet rock: it appeared to be a good decision at the time but is currently in the back of the closet.

Fortunately, the reasons for the downturn in centralcasting's attractiveness has more to do with distractions than with conceptual problems.

"The federally mandated conversion to digital has been a technological and economic distraction for broadcasters over the past couple of years," says Dave Polyard, OmniBus Systems vice president, sales and marketing. "In addition to a struggling economy, engineering departments are faced with how to meet the FCC requirements while at the same time looking at major workflow changes like centralized operations. Centralized operations will happen once there is room in the budget for it and once certain bandwidth issues are resolved."

Some groups, like NBC and Sinclair, have moved forward with centralized operations this year in an effort to improve at least one aspect of their operations. NBC is currently rolling out a centralized graphics plant and earlier this year created centralized station hubs, while Sinclair's News Central facility promises to redefine the way the company distributes and gathers news content.

Leitch's Agilevision can insert local content into centralized streams.

The disparate interpretations of centralcasting are one of the hurdles facing the implementation process. Stan Moote, Leitch vice president, says the concept of centralcasting used to mean centralization of all production facilities with programming moved to the remote sites for transmission. This is no longer the case.

"Centralcasting is a bit of a red herring," says Moote. "For some operations it is ideal but for others it is not—hence the disconnect."

In fact, Al Kovalick, CTO Broadcast Solutions, Pinnacle Systems, says that centralized operations for a specific area are currently supplanting centralcasting which usually involved a station's entire operations system. Centralized operations in different areas, like traffic or graphics, have taken root.

"It's all happening, but no one method gets all the press these days," he says.

Centralization does seem to be gaining popularity in some news operations. The challenge is to allow a very small production crew to direct multiple shows that share only certain segments.

"Perhaps two stations use the same weather and sports but have different lead-ins," says Parkervision's Matt Danilowicz. "Our system allows for the easy intermix or breaking out of segments across multiple, simultanous shows, but we're still looking for a customer who wants to take on this challenge."

There is, however, some commonality. James Frantzreb, senior product marketing manager, Avid Broadcast and Workgroups, says centralized operations require a robust and fast distribution network for analog video and especially digi-

Avid's Unity For News is at the heart of Sinclair's News Central operation.

tal video media and metadata. Sinclair is using Avid's Unity for News system within its News Central facility, with the server sitting at the hub and acting as the central repository for the content. This shows that products specifically designed for centralcasting aren't necessary but that, as Frantzreb explains, the products do need to be network-savvy and support inter-facility production or distribution using IP and existing network links.

"This means design for realtime media and metadata exchange, and support for industry standard formats, networking protocols, and media and metadata exchange standards like MXF, OMF, and AAF," he says. "It's fair to say that with this type of infrastructure and capability, centralcasting is supported as a matter of course; it's just one of your options."

Along with being network savvy products also need to be scalable.

"It is difficult to make products suitable for centralized operations, unless they are designed around the principles of distributed operations and are inherently scalable," says Andy Newham, OmniBus Systems product manager, transmission. "Many broadcast solutions on the market today were not designed for this environment and they need to be re-engineered to work with this operational model."

This means the support of large numbers of channels, without creating high staffing demands for the monitoring and system management of those channels, Newham explains.

"Our system, for example, can monitor large numbers of channels, allowing full system control of all associated devices and features from one interface," he says. "The centralized operation product must also be able to cope with the complex demands of regional opting in and out of centralized transmission from the various supporting channels."

Jon Hammarstrom, vice president, worldwide sales and marketing for Encoda's Automation Products Group, agrees there is a need to support remote control and communications. He says scalability is important—in this case, the ability to handle multiple channels. Without this feature the desired improvements in operational efficiency and capital expenses use won't be realized.

Even with the facilities in tune with each other on the inside, there are still problems on the outside. Connectivity costs—and even the ability to connect—top the list of concerns. Moote, who points to his company's Agilevision product as a solution for inserting local content into centralcasted streams, says that the last-mile connectivity is often more costly than the long-distance connection that gets the content from the hub to the last mile.

Eric Fankhauser, vice president of advanced product development, says the existing infrastructure available from ILEC's (Incumbent Local Exchange Carriers) is typically DS3 at 44.736Mb/s. Monthly costs for DS3 start at $1,000-$2,000 and increase from there depending on distances involved and number of lines leased.

"Using a DS3 channel does require signal compression as broadcast video signals typically range from 140Mb/s (NTSC) to 1.485Gb/s (uncompressed HDTV)," he explains. "This signal compression will reduce quality in these contribution feeds."

Fankhauser adds that if the user needs multiple channels for multiple video feeds, the costs add up quickly.

"In the end, high ongoing costs associated with last mile connectivity take a significant bite out of cost savings of centralcasting," he says.

For those who do make the move to centralcasting, Fankhauser points to the Evertz FacilityLINK Broadcast Fiber Optic Interface Platform as a

If a group's current traffic systems differ across the group then it would be difficult to bring them under a centralized operation without investing in a group-wide system.

way to allow any type and number of signals to be transmitted between clustered facilities.

Further compounding the last-mile cost is that centralcasting reduces one of the major benefits of being part of a station group: the ability to recognize cost savings from volume discounts. Often the provider of the last mile connectivity will be different for each of the stations, meaning each deal needs to be negotiated (and subsequently renegotiated) on its own. This consequence drives costs skyward and can result in pressures down the line when the time comes to renew deals or simply assess the financial health of the connectivity provider.

All of these factors have an impact on the ROI, negating many of the benefits that make centralized operations attractive in the first place.

"There must be an improvement in operating efficiency or increased revenue generation to provide the ROI and there are more subtle concerns than the physical and fiscal challenges involved," says Hammarstrom.

Hammarstrom says that most of Encoda's clients have multiple properties in a variety of markets. He also introduces another wrinkle: intrinsic value specific to a properties location, staff or management experience

Starz Encore uses Omnibus to handle its multichannel operation.

"It is often difficult to make the move to centralize an all-or-none proposition," he says. "Many broadcasters are still watching the early adventurers with trepidation."

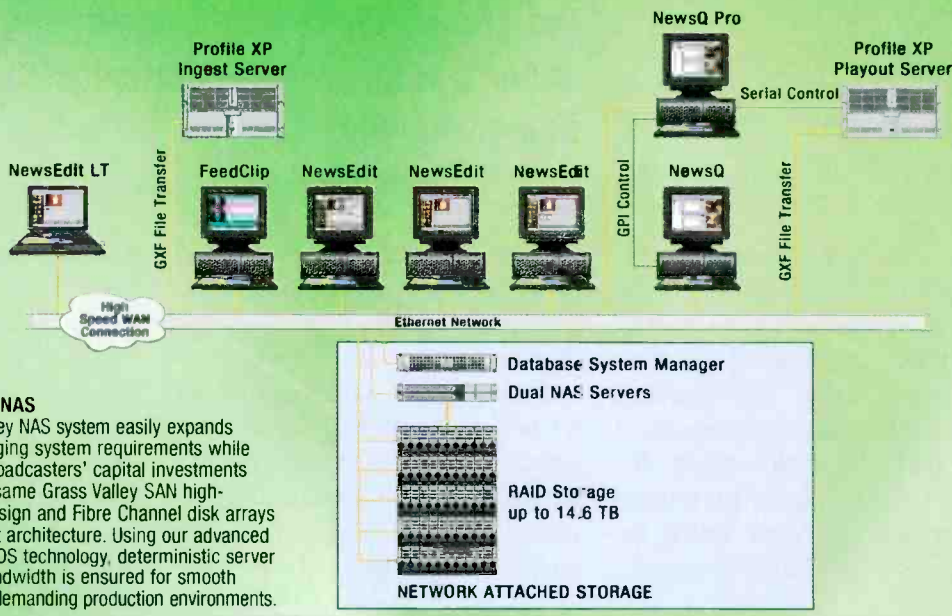
Newham believes the major inhibitors are the start up costs and some organizational issues relating to transfer of control.

"There is some sense of security about having local control, and there needs to be significant trust to be developed before local control is replaced," says Newham. "It's got to be proven to work."

One daunting aspect of centralization is end-to-end monitoring. Geoff Hillier, Harmonic's convergent systems division director of product marketing, says that Harmonic's products for centralcasting are in two main areas: content distribution/transmission and network management. The company's DiviCom family of encoders and remultiplexer systems provide content compression and distribution interfaces for content distribution. "Distribution networks supported include cable, terrestrial broadcast, satellite, ATM and IP over Ethernet," says Hillier. "The Harmonic network management system provides control and monitoring to manage the end-to-end centralcasting operations."

Hammarstrom has some recommendations for those taking the cautious approach. First, consider phased or regionalized implementation. Also, consider centralizing playout in one city and ingest in another to take advantage of the intrinsic value provided by their current properties, staff or capital investment. And finally, consider outsourcing options that allow a trained staff to operate the facility from day one while also using established large-scale transmission facilities for consolidation of operations.

"There are still a lot of options and the ROI analysis is quite complex," he adds." As with all opportunities of this nature, not everyone will profit from this kind of a change."



Grass Valley NAS
The Grass Valley NAS system easily expands to meet changing system requirements while preserving broadcasters' capital investments by using the same Grass Valley SAN high-availability design and Fibre Channel disk arrays in an Ethernet architecture. Using our advanced NewsShare QOS technology, deterministic server and client bandwidth is ensured for smooth workflows in demanding production environments.

SUCCESS = RATINGS + EFFICIENCY

Broadcasters are facing the realities of a tough economy and an increasingly competitive business environment. They must meet the challenges of multi-format requirements, repurposing and globalizing content, increasing production quality—and creative freedom, all while delivering on the bottom line.

In this environment, the keys to success are workflow and capital efficiency, having the right content, and superior production value. The objective? Increased ratings value. For as broadcasters well know, the difference between being ranked number one or number three in a market can literally mean millions of dollars in revenue. That's especially true with news—cost per ratings points in news are even higher than in other programming.

There is no one-size-fits-all solution that will deliver more competitiveness and higher ratings for every broadcaster—each operation has its own unique infrastructure and applications requirements. In some instances, a centralized approach to preparing and distributing content makes sense, in other situations geographic requirements call for a distributed approach. Products that can flexibly fit within a broadcaster's business model are key.

From cutting in half the number of playout channels needed for multi-format broadcasting to driving more affordable digital news production, the Grass Valley line of products from Thomson Broadcast and Media Solutions features a combination of multi-format architectures, innovative software and standard components to drive new efficiencies and price/performance levels for broadcasters.

Here's how ...

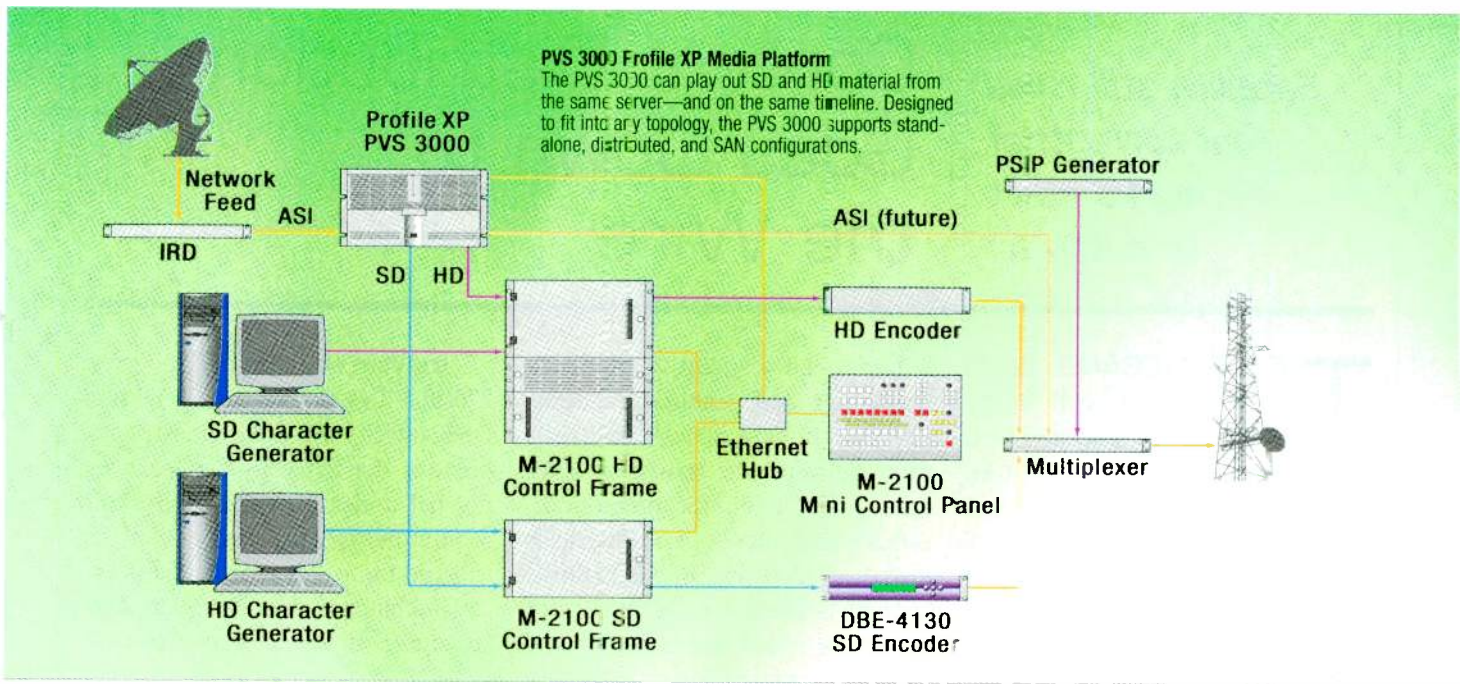
The Grass Valley Digital News Production Solution touches the entire news production process, from field editing and low-resolution editing at a journalist's desktop through high-end story finishing and automatic playout in a user-definable timeframe.

Already known for its ingest, editing, and playout components, the Grass Valley Digital News Production solution has recently expanded. Key new products, including the software-based NewsEdit™ SC nonlinear editor and the Grass Valley Networked Attached Storage (NAS) drive more affordable digital news production—especially for small- and mid-market broadcast news operations.

Network Attached Storage

Leveraging a state-of-the-art IT infrastructure to provide unprecedented, entry-level, shared-storage pricing the new Grass Valley NAS system can easily expand to meet changing system requirements while preserving broadcasters' capital investments.

The NAS system leverages the high availability and proven workflow-improving capabilities of the Grass Valley Open Storage Area Network (SAN) and makes them available in an Ethernet architecture. In fact, it uses the same Fiber Channel array as the SAN system and translates it into Ethernet connectivity, giving customers an extremely affordable entry point for shared storage.



Providing fast, centralized access to everything from incoming feeds to archived clips, the NAS system lets editors access multiple video files in multiple video formats, including DV50. It scales to 14.6 terabytes and provides CIFS-based applications support for Grass Valley FeedClip™ interactive feed capture system; the NewsEdit, NewsEdit LT, and NewsEdit SC systems; and the NewsQ manual playback system.

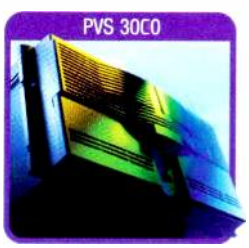
The NAS system is also enabled by the new Grass Valley Cohera™ common storage architecture which features advanced Grass Valley NewsShare™ QOS technology. Debunking the myth that NAS-based storage approaches offer an unreliable quality of service, NewsShare technology provides deterministic server and client channel bandwidth, which is key to ensuring smooth workflows in demanding news production environments.

Software-Based Nonlinear Editing

Based on the NewsEdit nonlinear editor, the fastest hard-news editing system on the market today, the software-based NewsEdit SC system combines cuts-only edit bay capabilities, traditional A/B Roll Suite transition functions, and storage and network connectivity options to create a highly cost-effective editing toolset for journalists.

The NewsEdit SC system supports DV25 media, offers tight DV camcorder integration, and features up to four channels of audio, internal storage, and a variety of networking options. Using it, editors can trim clips with frame accuracy, add basic transitions and audio tracks, and complete deadline-pressured assignments with ease.

Like the popular NewsEdit nonlinear editor, the NewsEdit SC system lets a field journalist see an edit while it's being made—there's no time wasted going back and reviewing completed segments. This capability makes the NewsEdit SC system twice as fast as other nonlinear editors. The NewsEdit SC system can also edit directly from videotape



to disk via a 1394 (FireWire) connection and RS-422 control.

Cutting Playout Channels Needed for Multi-format Programming in Half

Answering the call for more cost savings through digitization, the Emmy® award-winning Profile® line has added another industry first: a server that can handle standard- and high-definition (SD and HD) materials in the same frame and in the same timeline, significantly reducing broadcasters' costs of upgrading to HD.

It's called the PVS 3000 Profile XP Media Platform.

Leapfrogging current server offerings which can provide simultaneous SD and HD capabilities only through a combination of external multiple devices, the PVS 3000 Profile XP Media Platform can play out SD and HD material from the same server—and on the same timeline and in the same server package.

Among its key features, the PVS 3000 offers HD vertical ancillary data support for captioning and iTV data, as well as support for SMPTE 334M, 291M, and EIA-708A standards. It also supports data bridging to seamlessly convert between SD VBI data and HD ancillary data.

Designed to fit into any topology, the PVS 3000 supports standalone, distributed, and SAN configurations. It's also available as an upgrade package for existing Profile XP Media Platform users.

SEE US AT NAB 03 Booth SU7059
www.thomsongrassvalley.com

Satellite still rules but terrestrial networks start to catch on

Content Distribution Goes Down to the Wire

THE BROADBAND boom which brought with it the potential of a nation wired on something other than Starbucks ended about two years ago. But even with the glory days behind us, broadcasters are using wide-area networks, T1 lines and other terrestrial-based services as a way to deliver traditional content outside of satellite and Federal Express.

"There is no doubt that the role of satellites is under constant attack from other networking technologies," says Stan Moote, Leitch senior vice president. "As SAN (storage area networks) and NAS (network attached storage) environments are fully integrated into broadcasting systems and the time taken to transport media across a public network becomes a non-issue, LANs (local area networks) and WANs (wide area networks) will be used."

While at first glance this technological attack seems like a full-on assault, the reality is that differences in content requirements guarantee satellite delivery won't go the way of the dinosaurs anytime soon. Companies like Pathfire, which uses satellites to deliver IP-packeted content to video servers across the country for networks like NBC and CNN insure the satellite's future for the time being.

There are two characteristics indicating whether content is suitable for satellite or terrestrial distribution: point-to-point vs. point-to-multipoint and realtime vs. non-realtime. If time allows, non-realtime delivery via terrestrial fiber (used most often for promotions, syndicated content or non-live news feeds) is adequate. But if realtime content is being sent or hiccups in quality or speed are unacceptable, then satellite is still the preferred method.

As for point-to-point and point-to-multipoint, Joe Fabiano, CTO of IP-satellite delivery provider Pathfire, says point-to-point distribution can more easily switch over to terrestrial networking, but point-to-multipoint distribution will remain on satellite until robust terrestrial broadband connectivity is available to all stations at an affordable price.

Fabiano says he believes it will be three or four years before the telecommunications companies find a high enough concentration of business demand to justify the cost of deploying fiber.

Eric Fankhauser, Evertz vice president of advanced product development, says even with fiber already in the ground costs remain high. One of the biggest hurdles is the telecom tariff.

"It's currently cheaper to get a 270Mb/s TV1 service than a 45Mb/s DS3 service from a telco, and that's because the 270Mb/s service does not fall under the same telco tariff requirements and hence can be charged for at a lower rate," he says.

Fankhauser adds that telco tariff structures for services such as DS3 are still based on the voice model, making them very expensive when used for video or data transport.

Encoda's traffic and management systems help broadcast organizations like BSkyB get a handle on content distribution.

The use of dark fiber, which the telcos could light up for video transport services, isn't always an option since as in some regions a Public Utility Commission (PUC) has restricted access.

But Fankhauser does see developing technologies like CWDM (Coarse Wavelength Division

Joe Fabiano of Pathfire

"IP and FTP are core technologies for our product line and are increasingly so for many other companies across all industry segments. Broadcast engineering departments are already successfully using these technologies and the rest are likely to follow shortly."

Joe Fabiano, Pathfire

Multiplexing) making a difference.

"CWDM can help lower the cost of last mile connectivity significantly," he says. "But the telcos need to offer the required infrastructure for this technology."

This leaves the hope for lowered connectivity costs in the hands of telco competitors. Unfortunately, many competitive local exchange carriers (CLECs) ran into financial troubles in the recent telecom trainwrecks.


Harmonic's encoders can package MPEG video into an IP-based stream.

"It's a basic Catch-22 situation where the telcos say the price for fiber will come down once more stations use it, while many independent broadcasters can't afford it," says Mike Cronk, Thomson Grass Valley vice president and general manager, server and digital news production. "We expect the situation to change in the next year or so, when many broadcasters will be using some type of fiber-optic distribution system–whether it's their own or one rented from the local telco."

Satellite delivery will be the most cost-effective method of distribution for a number years, according to Tim Slate, Omneon vice president of marketing, who says the use of compression and efficient modulation schemes has made satellite even more attractive.

"For multicast and broadcast of real-time content that requires guaranteed latency and on-time delivery, satellite is still the leading method for distribution," he says.

But he quickly adds that as broadband IP infrastructure becomes more widespread and lower in cost, it will gain the added benefit of guaranteed delivery with error detection and retransmission ultimately reducing operational cost.

"This will alleviate the need to verify content at the receiving site," Slate says. "The question of when broadband will become widely available and cheap from end-to-end remains."

The consensus places that estimate at three to four years, with some local spots still subject to technical shortcomings or high cost. Even then, there's little doubt of satellite's viability as a transmission method, especially with the need for HDTV distribution.

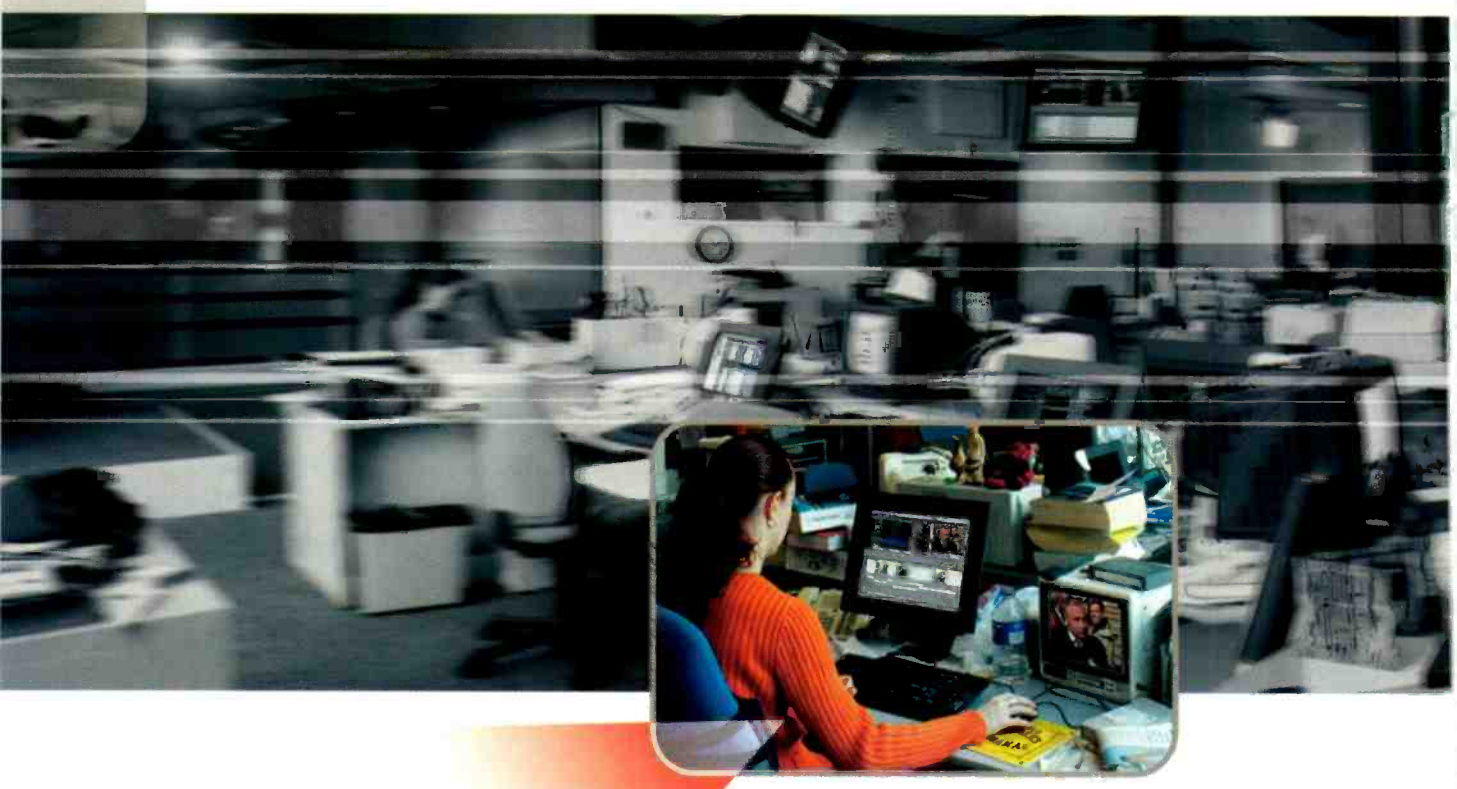
"HD triples the bandwidth required for distribution," says Fabiano. "And, as the quantity of HD content grows, it will serve to lengthen the viability time for satellite-based distribution. Additionally, this greatly increased bandwidth requirement for HD further exacerbates the last-mile problem for terrestrial networks."

Another factor in satellite's favor is consolidation. As groups buy more stations, use of satellite distribution of files will be more cost-effective than other methods.

"I would like to see a satellite service where I send files as needed and only pay for the bytes sent," says Al Kovalick, CTO, Pinnacle Systems broadcast solutions. "The idea of paying for hours instead of bits may change and would be a good model to compete against the telcos."

Fiber could, however, find its place in the world of HD. Fankhauser says one situation where fiber could be used to trans-

Vortex™—Networked News



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creativity

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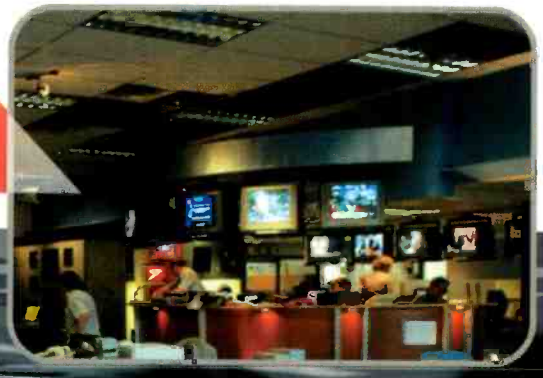

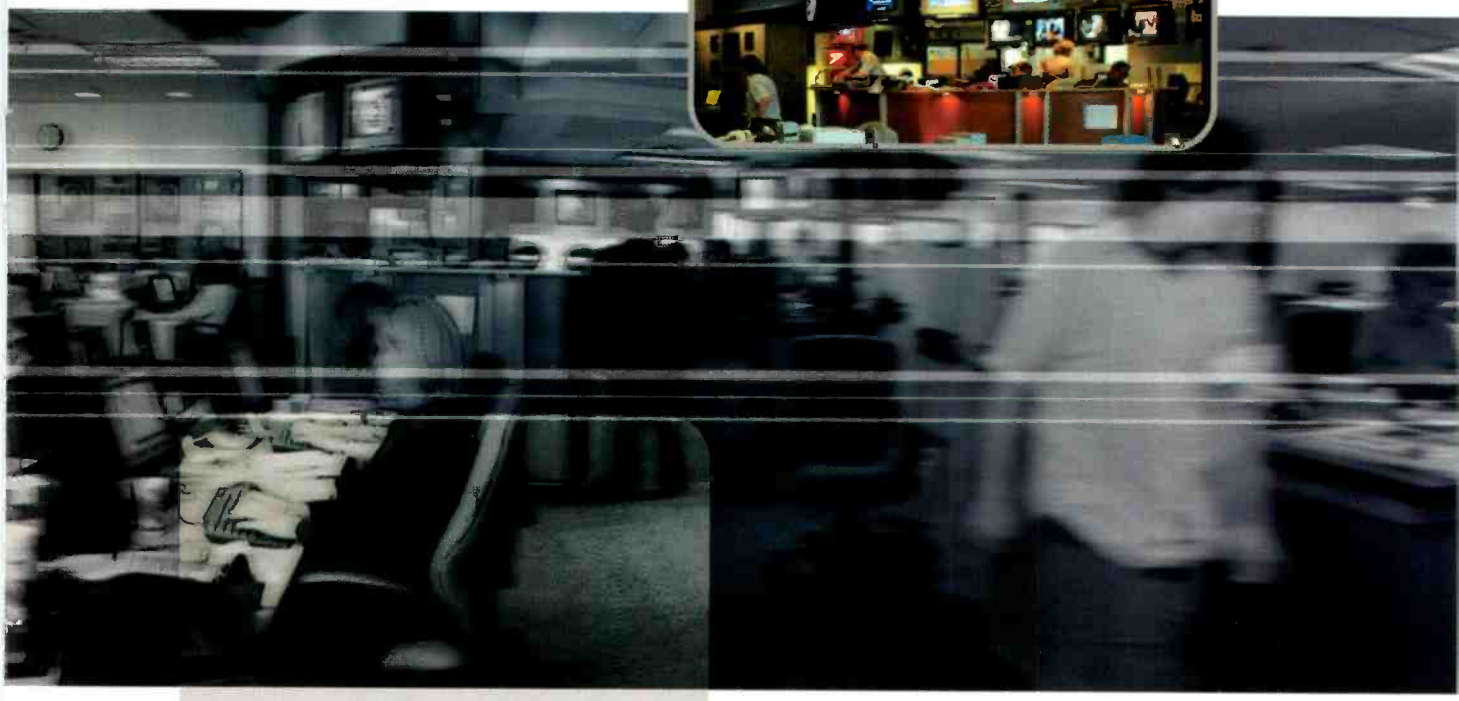

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Thomson's NewsBrowse system is an example of how access to content and the way it's distributed is changing both inside and outside a station.

mit an HD signal is a sports event.

"In this case, the native 1.485Gb/s HDTV signal can be sent back full bandwidth via fiber optics," he says. "Where dark fiber is not available, the HD signal can be lightly compressed and transported back to the broadcast center over a 270Mb/s TV1 telco service." Evertz recently released a product that performs this compression of HD signals into a standard 270Mb/s TV1 format.

Kovalick adds that non-realtime file transfer over DSL could occur for HD content and, depending on the length of the material, could actually be practical.

Another attractive feature of LANs and WANs instead of satellite is that they are bi-directional, a factor that could lead to a competitive advantage. For example, the Sinclair station group's News Central operation uses its WAN to connect stations in 40 markets to one another and to a central hub. Transmission speeds via FTP can hit three-times real-time, with a four-minute report transmitted at 8 MB/s received in roughly 14 minutes.

Full connectivity among the stations is still to be completed, but one can envision a local station in Rochester calling a far-flung station across the country and requesting additional footage for a news story, even going so far as to request that fresh footage be shot.

"The drive for FTP and IP distribution will come from content providers," says Andy Newham, OmniBus Systems product manager, transmission. "The use of multi-format, multi-purpose content will make IP their prime mechanism for content distribution and the use of other technologies will not necessarily make economic sense for them."

But Newham says this trend will take time, especially because broadcast engineering departments need to make sure they understand the implications of the technology.

"Step cautiously," advises Newham. "Although FTP and IP are very mature, there are still immature standards relating to digital rights and digital asset management that mean they are not yet ready for a full embrace."

But there is little doubt that it's worth of at least a tentative hug. Each year NAB conventions features more and more products integrating IP and FTP technologies.

"IP and FTP are core technologies for our product line and are increasingly so for many other companies across all industry segments," says Fabiano. "Many broadcast engineering departments are already successfully using these technologies and the rest are likely to follow shortly."

Adds Sony vice president of technology and products Hugo Gaggioni, "TCP/IP technologies are very important and are very much at the forefront of our product designing decisions. Each broadcaster must evaluate the introduction of IT (or other technologies) according to its own analysis of improvements to its operational workflow."

Gaggioni says there are cases where it is financially and operationally justifiable to continue to endorse more traditional technologies and workflow.

Another area that is seeing new distribution models is VOD.

"In realtime applications, Harmonic's systems can package the MPEG video into an IP-based stream," says Geoff Hillier, Harmonic's convergent systems division director of product marketing. "For the transport of a pre-encoded stream in a VOD applications, Harmonic enables operators to transport streams across a digital DWDM/Gigabit Ethernet network and then at the hub or regional headend level convert the stream to a traditional HFC transport (i.e., QAM)."

He adds that broadcast engineers should evaluate where IP technology can be applied to enhance their current distribution of content.

"Over time more facilities will have access to high-bandwidth last-mile connections, so last-mile issues will slowly be mitigated as stations upgrade," says Kovalick. "But this will take time and we don't see any magic bullet for the last-mile problems."

DTV transmission opens up savings and operational efficiencies

Bit by Bit, the Digital Conversion is Happening

Parkervision's CR4000 is designed for networks or large market stations.

THE ARGUMENT for converting a television station plant to digital begins with improved picture and audio quality, eased operations and greater flexibility, but in the end it's all about one thing: return on investment (ROI).

"Local broadcasters, the major networks, and independent station groups are making their decision based on cost and operational savings," says Bruce Lane, Thomson Broadcast director, technical support.

Lane is unabashed in saying the move is driven by ROI, saying it begins with network devices that make it easier to collaborate. Other factors include SAN environments that make production faster, allowing a station to get more programming on the air (increasing ratings) more quickly than ever (increasing ratings even more).

"There are several competitive advantages to making a move to digital," adds Stan Moote, Leitch senior vice president. "First of all, digital signals that move through a facility are not subject to the degradations that analog signals suffer. The overall signal quality improvements will also help to differentiate one station from the other."

In addition, because digital products are much more sophisticated than their analog predecessors, a station can simplify and consolidate many of its processing operations, freeing up resources to concentrate on new business opportunities.

It's this sort of logical assessment that makes the move to digital seem like an easy one. Throw in the government-mandated digital conversion of transmission facilities to digital and it seems like an even easier sell. Cap it off with the ever-falling cost of digital gear and who could say no?

Many broadcasters, as it turns out, can say just that or at least they can say "not yet." The reason for hesitance is pretty simple: the capital needed to recognize improved ROI isn't available or is being spent on the addition of digital transmission capabilities.

"I don't see any obstacles other than the current financial conditions of the industry," says Hugo Gaggiano, Sony vice president of technology and products. "And even that is questionable. Equipment costs and features are at their best from end-user perspectives but there's a paralysis in purchasing decisions because economic expectations for the industry [haven't been met]."

Nearly 750 broadcasters have already implemented digital transmission facilities, and most of them view the expenditures as a cost of doing business. It's the savings realized in master control that can make an engineering department the best friend to a station's CFO.

Eric Fankhauser, Evertz vice president of advanced product development, says the equipment needed

NEWS. Sony has it down

The future of the newsroom is digital, nonlinear and server based. This revolution in workflow enables you to produce more while spending less. And it is appearing nightly at the many stations that have stepped up to Sony's NewsBase™ system. No newsroom system offers better hooks to acquisition and ingest. No system better anticipates the nonlinear and high definition future. And certainly none is more comprehensive than what you see here: Scny's NewsBase system.

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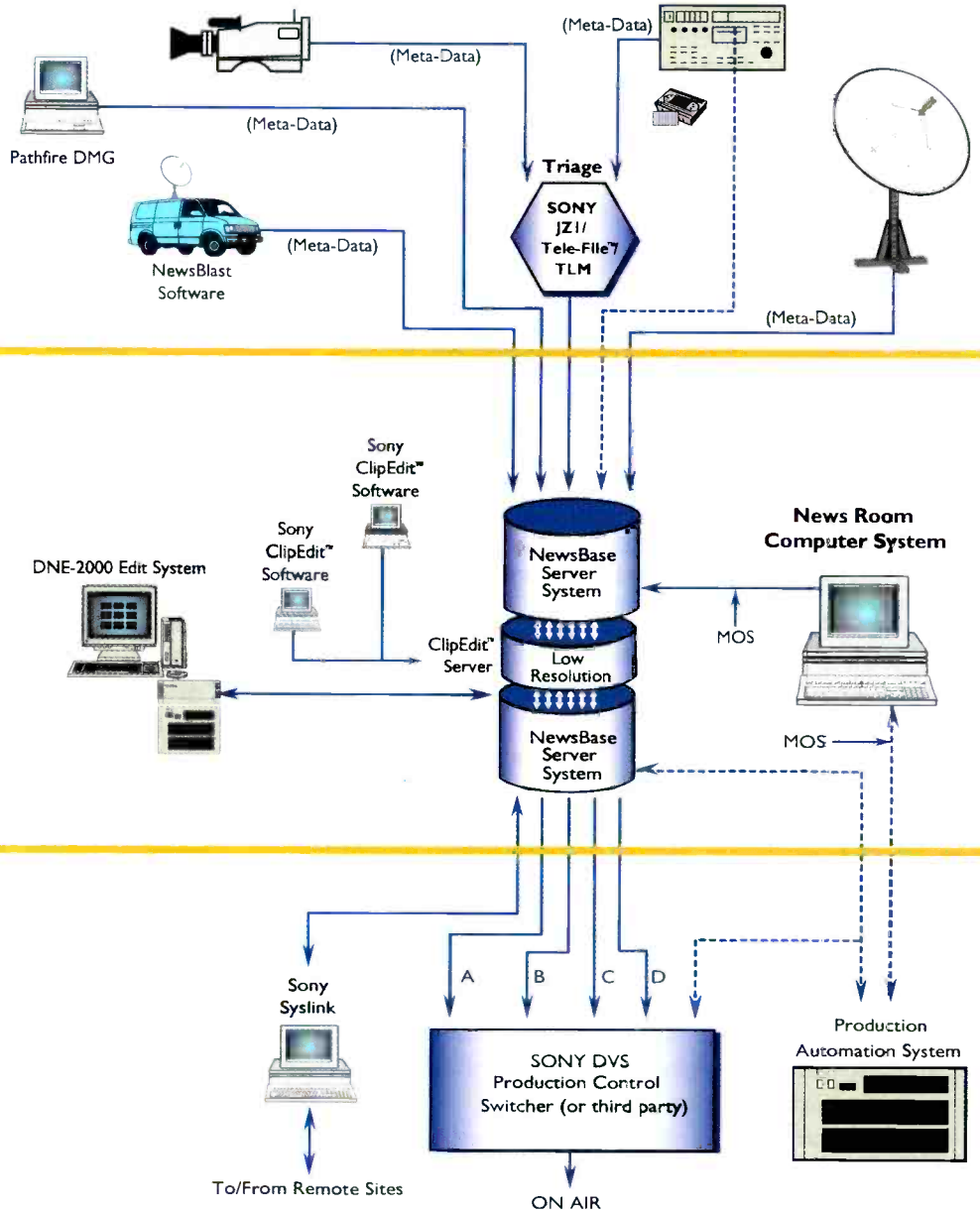

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"Because most facilities and plants have been designed around a 300-meter cable reach, significant building and equipment location changes are needed to accommodate HDTV." ***Eric Fankhauser, Evertz***

for master control conversion includes signal conversion gear for analog-to-digital needs, upconversion to HD, and then downconversion to SD or NTSC for monitoring HD feeds.

To make sure that a conversion to digital is best for a station's operations, it is valuable for a station to review their current and potential business models," says Geoff Hillier, Harmonic's convergent systems division director of product marketing. "Research might include the viability of single versus multichannel operations, the ability to sell advertising based on this decision, and whether they will simply pass-through network feeds or become a point of local program origination."

A perfect example of the type of master control products that can cut costs are Parkervision's equipment. All of which is designed to give one operator greater control over the equipment used to play out newscasts and other content.

"If the station is converting from analog to digital our solutions will afford the station an immediate improvement on air in terms of picture quality and reliability," says Thomas McGowan, Parkervision vice president of sales and marketing, video business unit. "In most cases workflow will increase without increasing headcount."

But products like those from Parkervision also introduce a cultural shift in station operations, and can thus prove contentious. Introducing equipment that may result in staff cuts can leave employees feeling threatened. And when the new equipment requires retraining, those with seniority can become anxious.

"The pervading culture is often among the biggest obstacles when

Sony's HDCAM camcorders will play an important role in broadcasters' conversion to DTV

making a conversion of this scope," says Jon Hammarstrom, vice president, worldwide sales and marketing for Encoda's Automation Products Group. "A great many parts of an organization are being affected by product and technology choices usually limited to engineering."

Hammarstrom says the conversion can actually impact everyone at a station, from sales to editorial. And that means making sure everyone buys into the concept before it is put in place.

"Even if the ROI is justified, success will depend on the people involved," he says.

Encoda is involved with traffic and billing software for a multitude of industries, including broadcast. It's products are digital by definition, and Hammarstrom says Encoda's systems help realize efficiency across engineering, operations and IT through the automation of metadata collection and distribution coupled with flexibility for local ads sales.

"Digital technology provides tremendous opportunities to improve work flow," says Moote. "To realize gains the technology has to be embraced by the complete organization. Frequently old work practices are maintained, eliminating the value of new technology."

The newsroom is one such problem area. Staff in a digital newsroom tend to have expanded duties, with reporters editing and working on graphics. James Frantzreb, senior products marketing manager, Avid Broadcast and Workgroups, says that perspective, reference, preparation and training are the keys to effectively digitizing the newsroom.

"Broadcasters should talk to other [stations] and see what has worked and what hasn't," he says. "Smooth installations are well-planned, with ample time for pre-installation, installation, training, trials, and switch-over."

One factor that will definitely spur the conversion to the digital newsroom is the falling cost of non-linear editing systems. Frantzreb says that the cost for an NLE is less than that for a tape-based system.

"Remaining obstacles have more to do with budgets, business needs (e.g. competitiveness), and inertia than any technological or logistical barrier," he adds.

Elements broadcasters should expect from a vendor include "best practices" guidelines for workflow and personnel deployment, as well as training for staff.

"In our experience, improvements are immediate and clear: work gets done more smoothly, more quickly, many fewer errors are made, production quality is better, and even the signal looks better," he says.

One new development from Avid that will impact news operations even further is its NewsCutter Post-to-Web feature. Many TV stations have successful Websites and this product, according to Frantzreb, will make it easier to get content from the newsroom onto the Web.

"With better management of media assets, broadcasters will be able to serve up archives on demand and conceivably earn revenue in the process," he says. "We're investing in next-generation content management technology that will extend these benefits even further."

Another part of the news conversion is the move to a digital tape format. DV video in a number of flavors and bitrates has taken hold of the professional video industry and is making continued gains in the broadcast market. When it comes to digital production formats, Gaggioni recommends component digital video formats that are at least 50Mbps or higher.

"If a station does any production work they must make sure to provide the highest-quality picture possible in case up-conversion to HD is needed. In addition, equipment should be able to handle metadata. Metadata's creation, updating and databases are very important."

The Leitch Opus dual-effects master Contol is upgradeable to HD.

Once master control and news have made the transition, digital infrastructure components, such as routing, jump into the spotlight. Fankhauser says the technologies are added as needed, but the existing analog infrastructure stays in place as the majority of broadcasting is still analog.

The infrastructure market has expanded beyond conventional video and audio routers to include IP routers, Ethernet LANs and IP-based WANs. Andy Newham, OmniBus Systems product manager, transmission, points out that while conventional routers are carefully engineered to work within broadcast tolerances, insuring quality output every time, the same can't be said of these new types of routers.

"There is no doubt that shortcomings can be addressed, but realtime performance [required by broadcasters] is probably not at the top of the vendors' priority lists," he says.

Distance of cable runs is also an issue when considering the inclusion of HD in the digital conversion.

"Analog video and 601 signals can travel up to 300 meters over existing coaxial cable, but HD is limited to 100 meters," he says. "Because most facilities and plants have been designed around a 300-meter cable reach, significant building and equipment location changes are needed to accommodate HDTV."

He recommends using fiber optics technology, if possible. A product like Evertz' fiber transport platform can allow any type of signal used in the broadcast industry to be transported over fiber.

The simple reality of the conversion to digital is that even if a station doesn't have a grand plan for conversion, they are most likely getting there by default. Moote says that capital investments today are primarily for digital equipment.

"In budget-constrained facilities, digital islands are created and they are bridged into the existing analog facility," he says. "In many cases, the customer tries to include as many digital product as possible within their projects."

Of course the use of the word digital does not automatically mean better quality.

"The premise that 'digital is better' is true up to a certain point," says Moote. "However, any signal converted from analog to digital can only be as good as the equipment that conducts the conversion."

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Multicasting shows promise but currently finds few on-air believers

Stations, groups on the hunt for DTV-related revenues

MULTICASTING provides the pretty revenue while HDTV provides the pretty pictures.

Over the years there have been numerous debates over HDTV–from which modulation standard to use, to which resolution to transmit, to the long-standing debate best known as the HDTV chicken-and-the-egg conundrum: should DTV programming drive DTV set sales or should DTV set sales drive DTV programming?

The government's mandated roll-out of DTV broadcasts has settled most of these debates, particularly the last one: as it stands now, calendar dates will determine how much DTV programming must be offered, not the number of DTV viewers or DTV set penetration. The NAB will be pushing for the transition to be driven by consumer HDTV adoption rates, but it's becoming increasingly clear that both the FCC and Congress have little interest in giving broadcasters a reason to move back the 2006 deadline.

In many ways HDTV is an example of the adage"be careful what you wish for." Broadcasters lobbied for the spectrum so they could offer digital broadcasts. Then they got it, and now they have to figure out how that digital spectrum is going to turn into new revenues.

There is a difference in how the networks can realize profits from HDTV and DTV and how a station can do it. CBS executives say that their current sponsorship deals for HDTV sports programming do in fact generate HDTV-related revenues. But an executive from another network holds that those revenues are too small to get excited about.

For local broadcasters, revenue-generating sponsorship of HDTV local news is probably a pipe dream. This leaves multicasting as the primary potential source for revenue, but even that is a difficult proposition.

"So far it has been very difficult to establish the business models to support such multicast operations," says Sony vice president of technology and products Hugo Gaggioni. "More specifically, multi-program transmission has shown to be difficult to support in terms of original content different from what the cable or satellite services offer."

Bill Powers, Thomson Broadcast vice president, strategic accounts, says a broadcaster's ability to program a secondary channel needs to be at a cost that is low enough to justify the marginal revenue dollars.

Using Harmonic encoders a station can statistically multiplex both HD and SD streams for multi-channel broadcast operations.

"Capital Broadcasting Group's stations WRAL and WRAZ in Raleigh are good examples of how broadcasters are embracing digital

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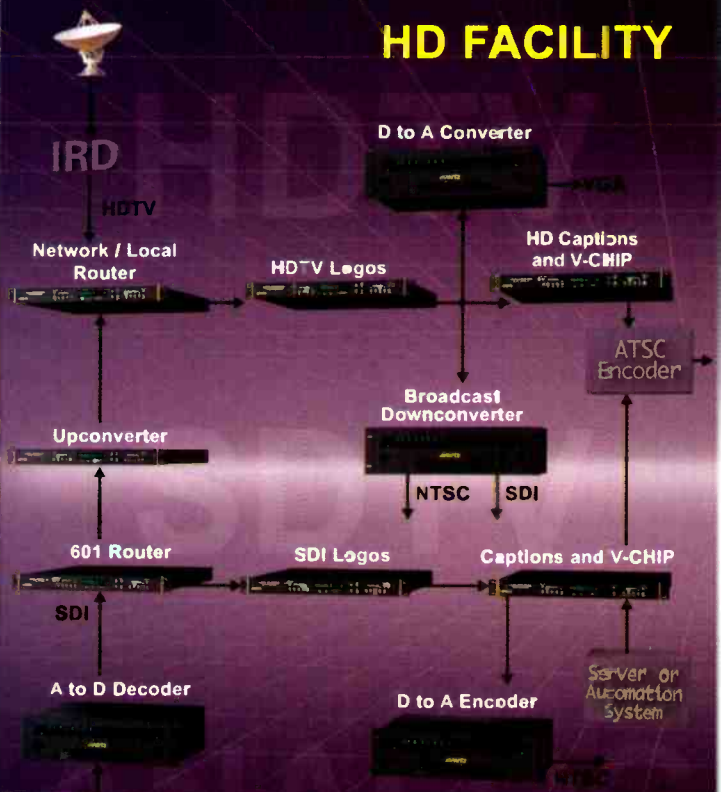

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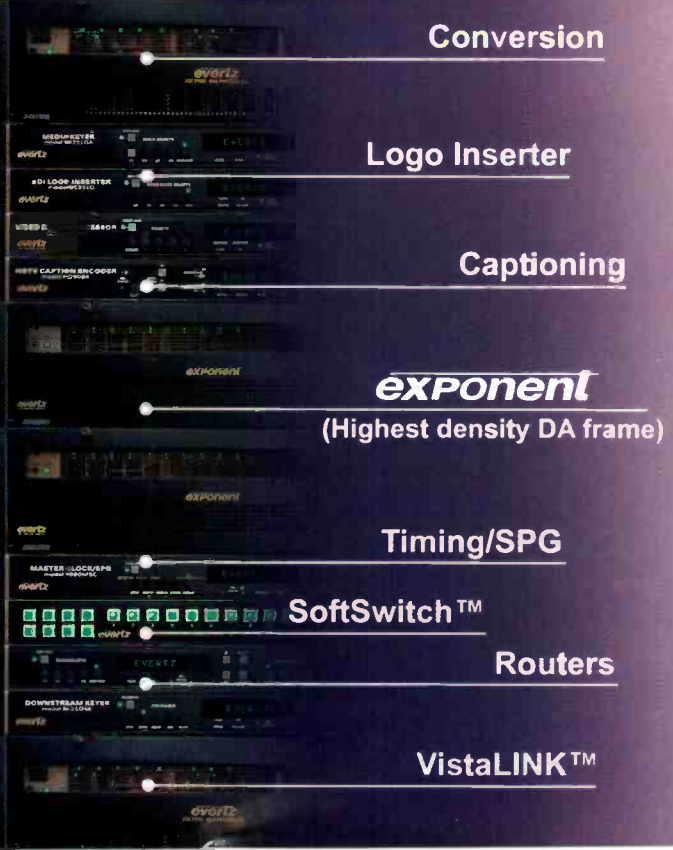

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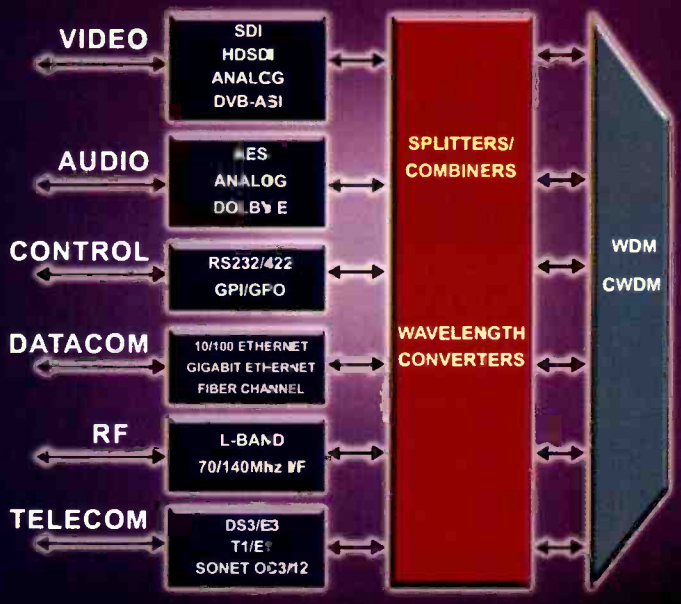

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Pinnacle's MediaStream server can be used for multicasting.

to deliver more programs with higher-quality video and audio as well as increase advertising and other revenue generating options," says Geoff Hillier, Harmonic's Convergent Systems division director of product marketing. Both stations use Harmonic's DiviTrackXE system to statistically multiplex high definition (HD) and standard definition (SD) TV programs

"Many have done multicasting and backed out when they found it didn't produce substantive revenue," says Powers. "Those in the middle have an easier time justifying multicasting as a low-cost means of increasing exposure of their brand."

Andy Newham, OmniBus Systems product manager agrees, adding that a weather channel or a 24-hour news network are the low-hanging fruit and thus not necessarily the most attractive for advertisers. Instead he thinks high-involvement channels, such as local sports, are more likely to generate the viewing behavior sought by advertisers.

But one factor that may work in favor of a 24-hour newschannel is the influence of 24-hour cable news networks.

"Some stations will wrestle with the concern that such re-transmission may erode viewership of their primary newscast," says ParkerVision's Matt Danilowicz. "But then again, the cable news networks are already proving that appointment-based viewing is rapidly fading away."

Stan Moote, Leitch senior vice president, says the difference will be in the scale of the gear.

"For example: video servers are larger scale, master control switchers operate in tandem using both automation and control panel assignments allowing flexible operations," he says.

The degree of local branding will also impact operations.

"If a station wishes to send out four feeds with local station logos, time of day, etc., they will need four times the number of logo inserters in master control as in regular broadcasting," says Eric Fankhauser, Evertz vice president, advanced product development. "A simpler approach could involve pass-through of national feeds and branding of local feeds."

Fankhauser adds that a combination approach, broadcasting HD during primetime and multicasts during non-primetime, increases the impact on master control.

Another issue that becomes more difficult with the introduction of DTV is monitoring of the signals. Newham says even if third-party content distributors provide the feed, the broadcaster must still make the delivery monitoring decision. He adds that the OmniBus Colossus transmission system is a potential solution for delivering medium-to-large systems for multi-channel, multi delivery automation and control systems across large numbers of channels.

All of these issues have made the area of multicasting one of little action today. PBS stations in markets like New York are multicasting children's channels but the reality is that of the nearly 750 stations on the air digitally most are simply passing through HDTV content.

"No one is beating down our doors to be first in their market to multicast," says Al Kovalick, Pinnacle Systems CTO, Broadcast Solution. "After all, only certain types of programs are conducive to multicasting and sports is the likely first candidate."

The multichannel capabilities of video servers will be an important enabling technology for multicast facilities. Products from companies like Pinnacle, Leitch, Avid and Thomson Grass Valley are all typical of the kind of systems available.

"Our Profile XP Media Platform video server is widely used throughout the industry, and broadcasters can use add-on channels to drive multicasting streams," says Powers.

Al Kovalick, CTO Pinnacle Systems, says that his company's MediaStream servers are being sold into multicasting operations for sports and even horse racing applications.

"One aspect that requires some customization is the selection of which camera to broadcast on, say, one of four channels," he says. "And our DekoCast on-air realtime compositor and keyer is being used to give additional information to each signal in a multichannel bundle."

The Conversion To Digital - Inside The Control Room

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"Broadcasters will be replacing SD equipment with HD as they prepare to purchase new equipment to replace older SD devices...and studio production, news and field ops will be slow to change."

Hugo Gaggioni, Sony

While multicasting may hold the better business opportunities, it's the high-quality video and audio associated with HDTV that has a better chance of grabbing and keeping viewers' attention. Unfortunately, when it comes to using HDTV technology to gain a competitive edge, the real advantage is to be found in more cost-effective content production. One bit of good news is that the cost of HD production gear continues to fall.

"On our side of the business, competition among equipment manufacturers has already driven HDTV production down to about what it cost to produce analog NTSC broadcast video only a few years ago," says Powers. "Producers and broadcasters have already voiced expectations of being able to produce HTDV at a cost comparable to standard definition digital television."

Gaggiano agrees. The cost of HDTV equipment has fallen very, very fast, he says, and Sony's HDCAM format is a perfect example. Some models of HDCAM cameras carry a retail price in the same range as an NTSC camera five or six years ago.

For manufacturers like Sony the challenge is convincing station management to budget as much for cameras as they did six years ago. Today's DV-based formats, like Sony's DVCAM format, provide tremendous bang for the buck, with stations turning to these lower-cost alternatives as replacements for older cameras, particularly for news operations.

"It's a natural progression," says Gaggioni. "Broadcasters will be replacing SD equipment with HD as they prepare to purchase new equipment to replace older SD devices. The areas of sports, documentaries, arts and made-for-TV movies are already changing to HD production values. But studio production, news and field ops will be slow to change."

Powers says this disparity is primarily due to the fact that local broadcast competition is almost completely a battle between news departments, an area where HD does not significantly enhance the viewing experience.

"Everyone's managing to the bottom line, and that typically means controlling or lowering operating expenses and restricting capital expenditures," he says. "They're looking to develop models that help them control the cost of running the business or things that directly enhance a station's ability to compete in the market."

Manufacturers are also looking for products to compete in the market, and those efforts could help both manufacturer and broadcaster thrive.

"Broadcasters and manufacturers alike are all pressing against the envelope of technology," he says. "Faster, better, more cost effective."

But faster, better and more cost effective requires a lot of development effort.

"In the end, producing new HD equipment is a big effort for manufacturers," says Kovalick. "In addition, HD compression for production formats like Sony HDCAM, Panasonic D5 and other formats is non-standard."

The small number of HDTV sets in a marketplace means the transition to HDTV will not result in any new advertising revenues—one of the major reasons some broadcasters, particularly Fox, are opting to send out content at 480p resolution. With no return on investment today, why not wait to make the investment until tomorrow, when viewership is not only larger but also measurable by Nielsen?

Nielsen has laid the technical groundwork for DTV and HDTV measurement in some of its new metering technologies, to be deployed in 2004. And one thing can be said for HDTV owners: they are an enthusiastic bunch, and they have already shown loyalty for networks that offer HDTV content.

Of course, when all broadcasters offer HDTV programming such that viewer loyalty will be moot and once again programs will be judged by quality of the content rather than the image. After all, it's been a while since viewers have lauded a program for being in color.

"The growth of HDTV facilities is increasing slowly," adds Moote. "This means that any investment will be recovered over a longer length of time than before. However, the benefits of being amongst the first to support broadcasters in their transition to HDTV will pay for itself in the long run."

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Integration of IT into broadcast engineering poses cultural challenges

Is This IT?

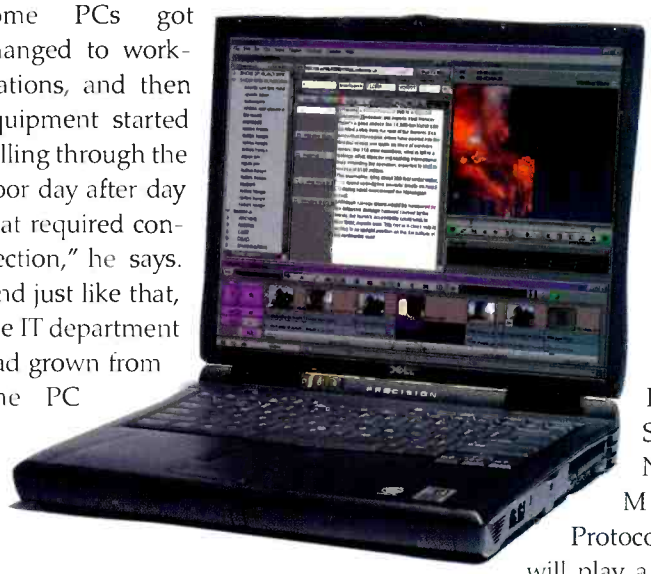
IT WASN'T too long ago that a broadcast station's engineering department was dominated by men and women who shared one thing in common: when discussing their childhoods they invariably noted something along the lines of, "I was always taking things apart to see how they work and it drove my parents crazy."

Today's engineering departments are beginning to hear a different childhood story, one that is told by those who have grown up with IT and computer network infrastructure. The difference is that instead of taking apart things like toasters, radios and TVs, they spent their childhoods getting into software programs to study code and learn programming.

That difference in storytelling is leading to a difference in the engineering environment. For one, many older, traditional broadcast engineers say it's difficult to find young, up-and-coming broadcast engineers. Those who may have studied broadcast engineering in college found themselves becoming involved in IT, lured by the promise of becoming a start-up millionaire. More importantly, the use of solid-state technology in devices like radios and TVs makes the exercise of opening up electronics goods to see how they work a waste of time. So the inquisitive young engineering mind has nowhere to go but to a computer.

"In today's television station there has to be a good IT man, because everything new has some form of networking capability," says Tom McGowan, Parkervision vice president of sales and marketing for the Video Business Unit. He tells the story of a chief engineer who told him his station's IT department began with one PC, then another one. Soon someone said let's hook the first one to the other one.

"Along the way some PCs got changed to workstations, and then equipment started rolling through the door day after day that required connection," he says. And just like that, the IT department had grown from one PC to a vital part of the station infrastructure.



Avid's Newscutter has moved into the field thanks to laptop PC's.

Jon Hammarstrom, vice president, worldwide sales and marketing for Encoda's automation products group, says that historically IT and engineers have been identified as the independent keepers of their respective technologies. Today they are required to work together to make a new process succeed.

"The managers will become more business influencers than technology influencers and share that responsibility to make their companies successful," he says.

The upside of IT is that it introduces a new level of scalability and cost savings compared to traditional broadcast systems. It also introduces a new concept: the use of computer protocols like IP (Internet Protocol), FTP (File Transfer Protocol) and SNMP (Simple Network Management Protocol), all of which will play a role in packetizing, transferring and monitoring content distributed via an IT infrastructure.

Eric Fankhauser, Evertz vice president of advanced product development, says his company's VistaLINK allows network-enabled products to be monitored from anywhere in the world.

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Pathfire's digital store-and-forward platform improves distribution efficiency, brings immediate benefits to news and programming professionals and enables stations to easily integrate with their existing play-to-air and newsroom editing systems

Pathfire's Digital Media Gateway (DMG) platform is connecting networks, studios and other content providers to broadcasters throughout the country such that news and syndicated content can be received and integrated into the station workflow in an efficient and standardized manner.

Pathfire's Digital Media Gateway network is growing daily with servers now installed at more than 75% of broadcast stations across the country. By mid-2003 most stations will have DMG servers installed and will be able to access a variety of content from a growing number of content providers – all through a single platform.

Expanding Digital Efficiency throughout the Station

Pathfire has been working closely with numerous stations to ensure the Digital Media Gateway (DMG) system fits into a variety of station's workflow schemes. In response to station input, Pathfire has developed several peripherals and interfaces for the DMG to integrate into a variety of station environments.

For example, with the addition of the optional DMG 640 News Connect Module, broadcasters can now select a single clip or a media list and add it to the play-to-air server or the newsroom editing system with a digital file transfer directly from their DMG desktop client interface.

Similarly, the optional DMG 620 Syndication Connect Module allows stations to drag-and-drop syndicated content directly to downstream systems or play-to-air equipment, eliminating the need to dub to tape.

While the basic DMG Platform brings immediate digital efficiency to broadcast stations and provides significant workflow improvements, Pathfire's optional enhancements enable stations to easily integrate with existing downstream systems and equipment.

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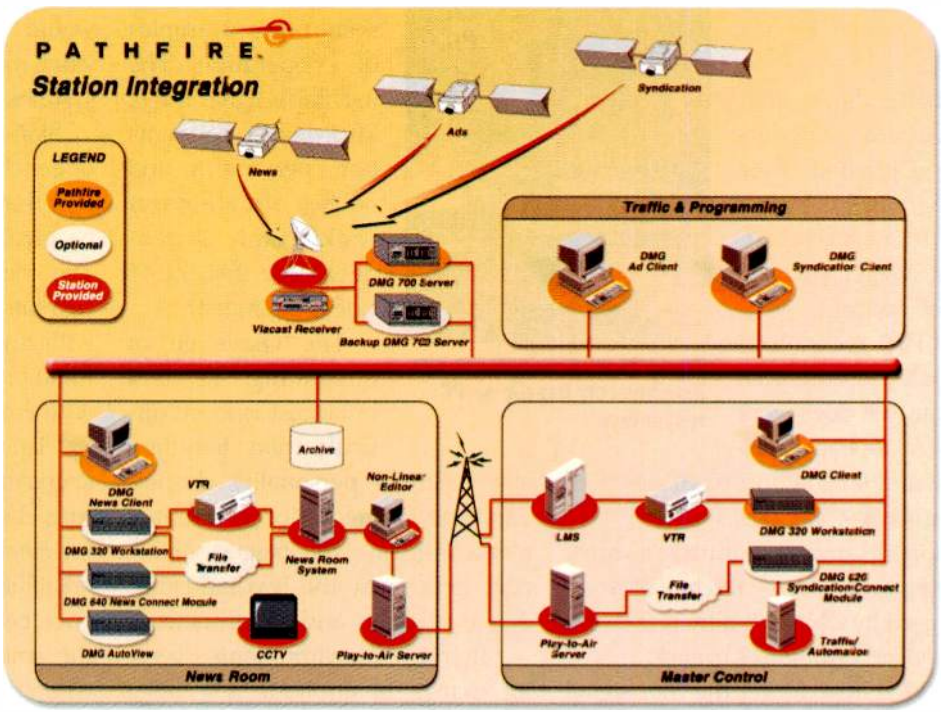

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"The typical IT department works with hardware that is a blank slate... But broadcasters typically purchase hardware that has software very tightly integrated into the gear."

Mark Hilton, Thomson Broadcast

"When a problem exists an alert is sent through the network, in effect acting as an engineer's eyes and ears," he says.

Tim Slate, Omneon vice president of marketing, says that Omneon has already incorporated standard IP networking technology using both FTP and SMB (Server Message Block, a protocol for sharing files between computers) into its server products.

"Broadcast engineers should approach networking technology just as they approach any other technology," he says. "Take the time and effort to learn how it works and combine that knowledge with what they already know about real-world broadcast."

Slate says that once both are understood, it will become apparent what works, what doesn't, and when you need to be careful.

Products from companies like Omnibus rely heavily on PC technology.

"The technology should be embraced because it does work when applied properly, and it can improve efficiency of your facility," he says.

One example is Pinnacle's Vortex Networked News-which will soon be used by CNN. It's almost 90% IT-based, according to Kovalick.

"We chose to get the SDI signal onto Ethernet as soon as possible," he says. "Almost every operation an editor needs can be done in realtime or non-realtime over a well controlled Ethernet network."

The use of Ethernet networking has accelerated the move from tape-based operations to the use of video servers that handle content as computer files. Computer-based nonlinear editing systems, newsroom systems, and automation systems only add to the trend toward IT, and away from traditional broadcast.

"Broadcasters have or are becoming IT-savvy because they must," says James Frantzreb, senior product marketing manager, Avid Technology broadcast and workgroups. "While we've seen some instances of friction, we have seen more examples of cooperation. The inevitable dynamics of knowledge, generation, personality and politics are always at work, but it is definitely true that the IT side is ascendant."

The challenge of integrating IT and broadcast is more difficult than handling any potential personality clashes. Tim Slate, Omneon vice president of marketing, says the biggest difference is the way the two industries define reliability and performance.

"In most IT environments a service outage of an hour is a huge annoyance but, in most cases, not catastrophic," he says. "An outage of just a minute in a broadcast environment could mean a loss of revenue in the hundreds of thousands of dollars."

Mark Hilton, product marketing manager, Thomson Broadcast & Media Solutions, Signal Management Solutions, agrees, adding that traditional TV engineers are more concerned with uptime and reliability than IT engineers.

"While it's a nuisance to reboot an e-mail server, it typically does not directly impact the company's revenue stream," he says.

Slate says that the concept of delivering video as data is still a bit of a foreign concept to the IT world, especially when considering a system like a newsroom operation that would have simultaneous streams of video routed to and from the storage systems and application platforms.

Stan Moote, senior vice president of Leitch, says that there is no question that both IT and broadcast will be involved in broadcasting plants. The trick, however, is to allow for two sets of IT groups: one that deals with on-air operations and a more traditional IT department that works with email or billing systems.

"There's one IT culture that just keeps things going and another that runs things at the three or four 9's [of reliability, within reach of 100% reliability]," he adds. "The key difference between these two cultures is the amount of dollars that get lost when the IT infrastructure fails."

Al Kovalick, Pinnacle Systems CTO, Broadcast Solutions, agrees,

INNOVATIVE THINKING LEADING EDGE TECHNOLOGY

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OMNIBUS SYSTEMS provides broadcasters worldwide with comprehensive automation and asset management solutions that address every area of a television facility and deliver wide-ranging customer benefits and cost-savings across the full spectrum of operational processes.

More than **100 major** broadcasters around the globe now deploy substantial and individually tailored OmniBus configurations. These both enhance automation - from acquisition and recording through low- and high-resolution editing, media asset management and playout to final archiving - and facilitate the development of new business initiatives.

With group headquarters in Windsor, **UK**, and further offices in **Germany**, **Asia** and on the East and West coasts of the **USA**, the company now employs approximately 150 people worldwide.

The holder of the **Queen's Award for Enterprise** (Innovation) - the most prestigious prize available to UK-based industry - OmniBus controls hundreds of products from scores of different manufacturers around the world and has formed close technological partnerships with many industry leaders.

"We believe that television is not simply a numbers game," says Dave Polyard, OmniBus' Vice President Sales and Marketing, North America. "It's a creative medium full of talented people whose skills and ideas should be enhanced, rather than hindered, by software solutions.

"We ensure that automation never stifles imagination or ambition. But we also realize that cost savings and efficiencies are similarly very important so we aim to provide the kind of technology that keeps the accountants smiling, too.

"By combining innovative thinking with leading-edge IT technology and proven broadcast techniques and equipment, OmniBus' 'best-of-breed' solutions offer significant tangible benefits in terms of value for money and flexibility of working."

The OmniBus philosophy has always been to give people the right tools to improve the way they do their jobs rather than replacing those jobs with technology, adds Polyard.

To this end, OmniBus offers sophisticated and scalable broadcast solutions to every aspect of station production, post-production and transmission.

Key applications include:

Transmission: OmniBus has been providing play-to-air solutions since 1995. From single-channel playout with regional commercial splits to true multi-channel and from conventional tape-based playout operations using stand-alone cart machines to a mixture of tape and disk or exclusively disk-based, these are all areas where OmniBus has proven expertise.

OmniBus interfaces to virtually every broadcast VTR, most cart machines and the vast majority of broadcast video servers and can mix and match interfaces and applications for perfect playout solutions.

Newsrooms: Control of the news process is a key application area in more than 75 percent of OmniBus installations around the world.

OmniBus assists and automates the ingest of all media, provides browse and on-line full-resolution editing functionality as well as sophisticated access to archive media via the Internet for remote users as well as both manual-assist and fully-automated playout.

Asset & Workflow Management: OmniBus believes in maximizing existing resources. Unlike many complex approaches, OmniBus alone is focused on delivering the correct data and the data analysis tools in the right place at the right time. Operational efficiency is driven by the OmniBus architecture to automate simply the movement of media and tasks between users and offer a scalable, active solution. OmniBus asset management delivers appropriate tools to each user at the desktop, as opposed to a fully featured and unmanageable toolkit to all users.

Infrastructure: A fundamental area of the OmniBus offering, the company has a strong track record of major installations worldwide and is scoped for significant development over the coming year. OmniBus' integrated infrastructure is widely regarded as a leading solution by other vendors and has attracted project partnerships with industry leaders.

For more information visit www.omnibus.tv

Norwegian national broadcaster **NRK** has installed 12 OmniBus systems all configured as separate domains but interlinked via the Internet through GAMMA (Global Asset & Media Management Applications). This integration allows the news regions across the country to exchange video clips, graphics and data between the sites. OmniBus also provides a fully automated news playout operation at each facility.

Time Warner Cable selected OmniBus to supply station-wide news automation, asset and media management and workflow management systems for use in a number of its 24-hour local news channels across the US. Its flagship station - NY1 in New York - uses OmniBus to fully automate its continuous news output integrating third-party graphics automation and newsroom systems.

Offering 13 full-time, commercial-free entertainment channels to more than 67 million subscribers across three time zones in the United States, the **Starz Encore Group** implemented OmniBus' Colossus multi-channel content delivery system to manage the delivery of 36 fully-mirrored channels of pay-per-view movies. OmniBus is also managing media acquisition and providing global media and asset management.

Interstar, a commercial channel in Istanbul, has implemented OmniBus to control media ingest, provide on-line editing for the preparation of sports - primarily soccer - highlights packages and to provide six channels of automated playout using Columbus. Playout is from a combination of traditional tape-base cart machines, stand-alone VTRs and video servers for the delivery of interstitial material.

OmniBus worked with **ERTU**, the Middle East's largest broadcaster, to build the most advanced newsroom in the region. ERTU transmits news and entertainment in Arabic, English and French via 20 channels to a total viewing audience of around 60 million people in Egypt and around the world. The OmniBus system forms the operational hub of a fully-redundant server infrastructure at the Cairo facility and integrates with the ENPS newsroom system.

OMNIBUS SYSTEMS LIMITED

Omneons Media server system expands IT's role in engineering.

adding, "Younger CE's understand IT and appreciate what each technology is best suited for. We suggest that the business IT network at a facility and the broadcast production IT network be completely isolated to preserve each others best features. Its all about education."

The difficult part for broadcast management is being able to afford the higher-end IT types within a broadcast plant.

"Broadcasters and broadcast-equipment manufacturers all talk about SuperBowl or primetime ad revenue and the reliability required," he says. "The same is true for many IT infrastructures."

What is also true is that IT infrastructures, properly implemented, can result in competitive advantages for a broadcaster. A digital newsroom means a story can get on the air much more quickly and also be repurposed more easily.

Hilton says that virtually all of Thomson's new Grass Valley-brand products support some sort of IT interface or use IT networks as their primary means of distributed operation.

"Encore, our latest-generation control system, is completely based on a distributed IT network with applications and hardware components are dispersed over LAN/WAN infrastructures," he says.

"With the right digital infrastructure in place, the cost and operational advantages are very compelling - even dramatic," says Frantzreb. "Without the linear process dependency of linear video workflow, work now happens in parallel."

The other advantage is that the IT culture is one of continual technological progress. "There are advantages to workflow innovation (better cost-efficiencies, newer and faster operations) of IT-based products," says Sony vice president of technology and products Hugo Gaggioni. "But still there must be specific R&D, and engineering investments to manufacture IT-based equipment that fully satisfies the broadcast requirements."

On the flip side IT-based products often seem to be introduced on a whim, with upgrades occuring as frequently as the latest boy band. In and of itself this represents a big change from broadcast. Andy Newham, OmniBus Systems transmission product manager, adds that the traditional TV broadcast environment usually has a doctrine of frozen format standards. Omnibus will begin moving its products in the IT mainstream this NAB when it introduces a new range of news and transmission products based on the .NET architecture.

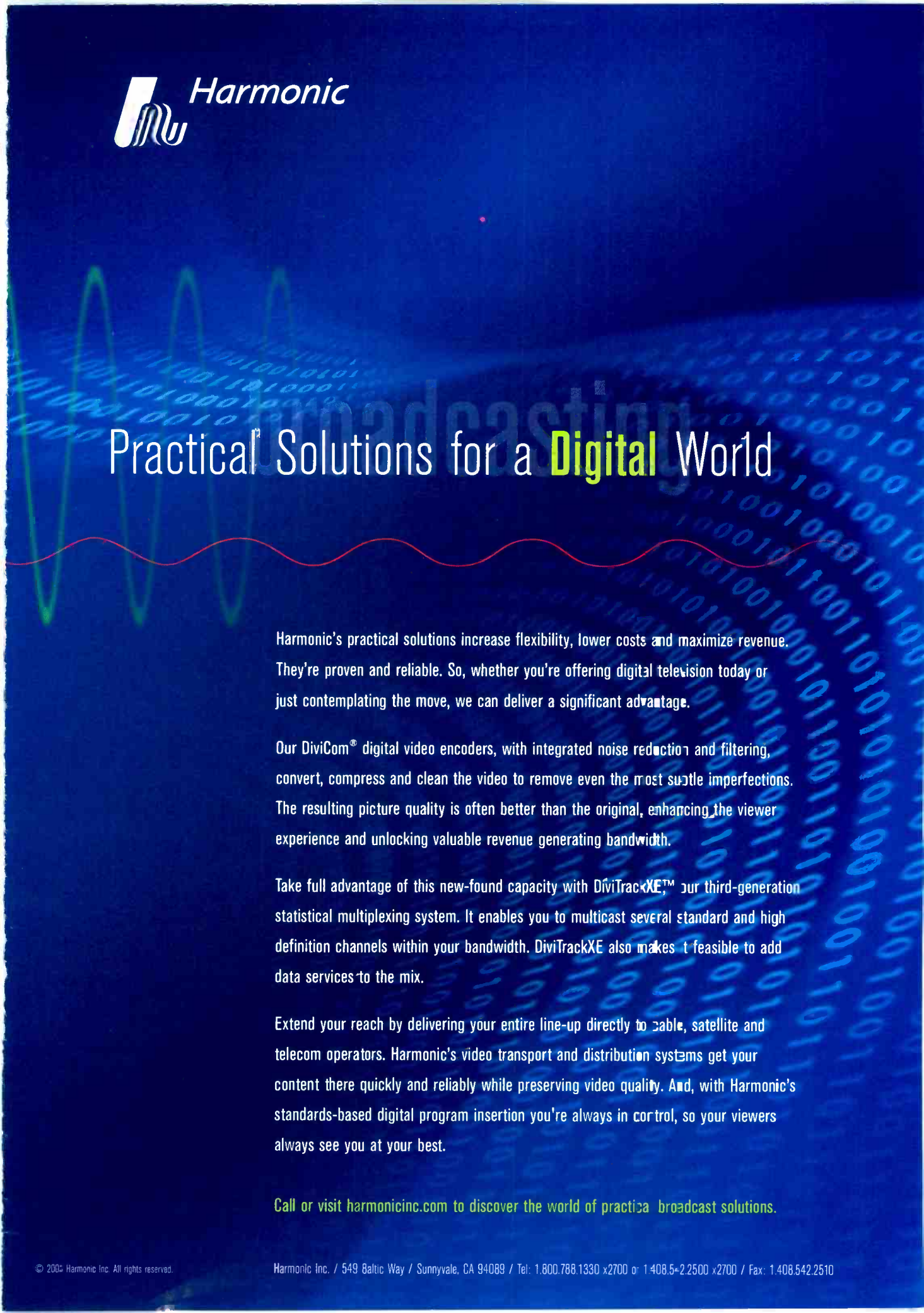
"The benefits to the broadcaster includes a more cost effective operation with greater flexibility and scalability of content and distribution, while providing a solid level of redundancy that can protect against fallibility of users and technology," says Newham.

One difficulty all broadcasters have begun to mention is the increased costs associated with the constant development of functions and features. Broadcasters find themselves buying software licenses and then needing to invest in yearly upgrades and service plans."

Manufacturers can no longer obtain an adequate return building custom hardware—not when it competing against manufacturers who are getting close to the same results with standard platforms like PCs and Windows-based applications," says Matt Danilowicz of ParkerVision.

"Whether IT infrastructure is cheaper than broadcast comes back to the four 9s of reliability," says Moote. "Both broadcast and IT segments are enjoying improvements in the speed of technology and the reliability of products. And prices are dropping. But that said, broadcasters are beginning to realize that software is a key component and not as cheap as originally thought."

Regardless of which is cheaper or better, IT is here to stay.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No matter the application technology must help the bottom line

In the End, ROI Matters Most

THE ARTICLE concerning the conversion to digital laid out the challenges of the balance between technical innovation and fiscal responsibility. In reality, those challenges are actually part of the technologies and techniques found on every page of this supplement. So how can the case for investing in technology be made when budgets are short?

"Technology can be used to provide productivity enhancements and cost reductions, improving the bottom line," says Stan Moote, Leitch senior vice president. "Technology is improving the quality and reliability of industry-standard components, enabling these to be incorporated into broadcast equipment and operations, reducing the cost of ownership."

Larry Kaplan, Omneon president and CEO, says the adaption of mainstream information and networking technologies in video applications is making it possible to build a shared infrastructure capable of supporting multiple program services at the same time. This sort of applications quickens the pace of capital return.

"It enables more efficient use of capital equipment, simpler operations and lower operating expenses," he says. "New applications and services can be added much more quickly and less expensively to an existing infrastructure."

It also allows for easier repurposing and distribution. And even though the use of streaming video can currently be desribed as little more than a trickle, that doesn't mean that it won't emerge as a viable content delivery platform for broadcasters within five to 10 years.

"Technology is becoming more affordable and less of a risk... both elements play a key role in the ROI calculation process."

"Content distribution will range from subscription-based streaming services to SDTV and HDTV," adds Kaplan.

The biggest impact driving ROI may actually have less to do with revenues going up than with equipment costs coming down.

"Technology is becoming more affordable and less of a risk," says Jon Hammarstrom, Encoda's Automation Products Group vice president, worldwide sales and marketing. "Both elements play a key role in the ROI calculation process."

Both Hammarstrom and Geoff Hillier, Harmonic's Convergent Systems Division director of product marketing, mention IT-based systems as a key to those falling prices. Hillier says the cost of the hardware will be reduced in rough proportion to the number of users, and there are far more IT users than broadcast users. That means costs will drop quickly and significantly,–all the more reason for IT-based systems to continue to find a place in the broadcast plant.

"Using an infrastructure that takes advantage of traditional IT products will allow the hardware cost to decrease faster," he says. "One example of this is using CAT5 cable rather than Coax in the physical infrastructure."

And finally there is the least obvious ROI: return based around workflow and efficiencies. Parkervision's Matt Danilowicz says technologies like those offered by his company will deliver a comparable and–with appropriate time and training, a more flexible and even higher-quality newscast.

"Stations are increasingly understanding the importance of re-allocating staff savings to more local coverage and more journalism to produce a better product," he says.

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PATHFIRE
Enabling Digital Media

Eliminating
that nasty ghost

BY DON MARKLEY

The problem of ghosts in the picture resulting from impedance mismatches has been discussed in this column in the past. However, there still seems to be some misunderstanding concerning the cause of such ghosts. In addition, the transition to DTV has brought up some new problem areas.

Kerry Cozad of Dielectric and Bob Plonka of Harris have both presented papers discussing the problems of VSWR in the digital antenna system at IEEE Broadcast Symposiums. Copies of these papers can be obtained from IEEE.

In all television antenna systems, the problem of VSWR can be considered to be caused by at least three separate areas. First, and probably most significant, would be any mismatch between the transmission line system and the antenna at the input to the antenna. A signal reflected from that point will travel down to the transmitting equipment, be reflected in part and travel back to the antenna. This twice-reflected signal is then radiated as a signal delayed in time from the original. The radiated reflected signals appear in the receiver as ghosts of the original signal.

It is widely accepted that a VSWR at the input to the antenna of 1.05 or less, representing a reflection of no more than 0.03, will result in acceptable performance regarding ghosts.

The next problem would be the elbow complex connecting the transmission line to the base of the antenna. In some cases, as where the antenna is stacked or is a member of a group of antennas, there may be more than one set of elbows involved, along with another complex at the bottom of the tower. A significant mismatch in the elbow complex just under the antenna can cause a ghost just as significant as one caused by the antenna mismatch. Elbow complex mismatches at the tower base would not be expected to result in ghosting but will have an impact on the load seen by the transmitter.

There is no ghost in the DTV picture.

The antenna and the elbow problems both have relatively simple solutions. The elbow complex(s) should be assembled at the factory and tuned for proper operation on the channel(s) involved. This often involves the installation of tuning slugs. Changing slugs in the field is usually not advisable. For a large complex, it is better to have the work done at the factory in a more controlled environment.

The third and final contributor to the system is the transmission line itself. Normally, that is not a problem if all connections are made properly and if the line hasn't been damaged during shipping or installation.

The mismatch problem at the antenna is resolved in two distinct ways. First, the antenna should be tuned at the factory for a VSWR at visual carrier of 1.05 or less. The visual carrier frequency is the most important, as there is the greatest power level at and immediately adjacent to that frequency. Then, after installation, variable fine matching slugs at the antenna can be adjusted when the antenna checkout is completed. This advice applies to analog systems. We will get to digital systems in a bit.

Modern network analyzers allow the VSWR at the antenna itself to be determined. The transmission line can be gated out of the measurement, allowing the antenna to be seen by itself without the effects of other VSWR contributors. Second, analyzers make use of a fast Fourier Transform to convert the frequency domain representation to a time domain response. The measurement is taken over an adjustable width of frequencies. For evaluating the antenna, a narrow band of frequencies (either 6MHz or 12MHz) is used. For the transmission line system, bandwidths of 100- to 400MHz are used for coaxial cable. The wider bandwidths are much more accurate in pinpointing the exact location of a discontinuity but are useless when looking at the bandwidth-limited match to the antenna. The narrow bandwidth tests accurately represent the antenna but show other discontinuities as broad

FRAME GRAB
A look at the consumer side of DTV

Staying connected

More households are acquiring multiple cell phones

U.S. households with cell phones			
	2001	2002	Change
Homes with one cell phone	30.6%	32.0%	+4.0%
Homes with two cell phones	17.8%	24.2%	+36.0%
Homes with three cell phones	5.1%	9.9%	+95.0%

SOURCE: Mediamark Research www.mediamark.com

peaks in the response, making it difficult to exactly locate the problem.

So, here is the normal drill. The initial measurement usually consists of looking at the VSWR at the input to the transmission line. The next measurement is normally a narrowband look at the system, hopefully showing a nice flat transmission line with only a mismatch at the antenna. The antenna tuners are then adjusted to optimize that match. Then, wideband measurements are made to confirm that the transmission line system has no problems with bad connections, dents, etc. If that first narrowband measurement shows a problem in the transmission line, that problem should be addressed before attempting to optimize the antenna match, since a bad spot in the line will affect any signal passing that point. In the case of the type of measurements being discussed here, that signal must pass the bad spot twice before a measurement can be made – causing significant errors. The final measurement is the VSWR at the input to the transmission line.

Up to now, the entire discussion has been about analog systems. In digital systems, there is no major energy contributor as in the analog visual or aural carriers. Rather, the energy is mostly spread across the entire channel within the limits specified by the mask filter. Also, there is no ghost in the DTV picture. As is well known, the signal is either there and perfect or it is gone. However, the reflections from the antenna are still terribly significant. VSWR problems contribute to the bit error rate. When the bit error rate exceeds the threshold, good-bye picture. Therefore, it still is necessary to reduce the VSWR and associated reflections to the greatest extent practical. Furthermore, the presence of VSWR in the system will impact the correction process in the transmitter itself, something unknown in analog systems.

The result is the need for some new standards of evaluation. The whole channel must be carefully treated. While it may be possible to have the VSWR exceed 1.1 or so at some point in the channel, the average value of the VSWR should be held to some reasonable value. In the meantime, lacking any other standard, the only reasonable approach is to continue adjusting and tuning for the best possible overall response. BE

Don Markley is president of D.L. Markley and Associates, Peoria, IL.

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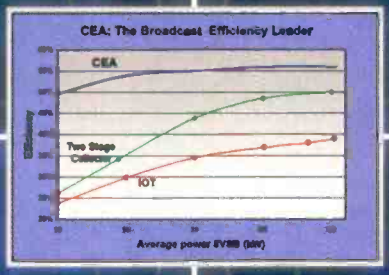

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The audio production control room at WNET, New York

Control room acoustics

By John Storyk

If there is one trend that the professional audio industry recognizes, it is the arrival of fully integrated digital-based broadcast and production facilities. Broadcast-industry control rooms (i.e., those used in radio, television, audio post production, etc.) are, of course, no exception. Much conversation continues over workstation wars, format battles, etc. But, almost everyone agrees on the basic premise that broadcasters need to listen to audio in acoustically accurate environments. In fact, the standards for such environments have been better defined during recent years and address newer issues such as surround sound. In this article, we visit the criteria used to design such environments.

Acoustical criteria

We can think of any critical listening environment in terms of two primary categories of acoustical requirements: sound-transfer acoustics and internal room acoustics. Of course, finished design solutions often integrate both of these categories, but let's look at them separately to understand them more thoroughly.

Sound-transfer acoustics

Production environments need to be quiet. But they often generate quite a bit of noise themselves and disturb surrounding spaces (including adjacent suites). Sound-transfer acoustic design deals with these issues. The goal is to create quiet spaces with typical noise-criteria (NC) values of 15 to 25. A noise-criteria value is a single number that actually represents an algorithm of eight values of octave-band quietness measurements, weighted to reflect human hearing more accurately. The lower the NC value, the quieter the room. Rooms with open microphones typically require an NC value of 15. An NC value between 20 and 25 is acceptable in post-production environments. Knowing the requirement is one thing; achieving it is quite another. Typically, acoustical engineers and architects design the boundaries of the room "container" (the floor, walls and ceiling) to deliver the required NC value. Naturally, the room's quietness most often is a function of the surrounding environments and good design of the HVAC system. A quiet space is easier to accomplish in a quiet environment (i.e., one with quiet neighbors). For example, in preliminary design, it would be unwise to place an iso/vocal booth (which requires NC15) next to a large mechanical room. Most studios with microphone rooms have similar sound-isolation concerns because the most bothersome noise is often generated from the control room itself.

Mainstream acoustic-isolation design in the United States typically uses the "room within a room" design method, employing decoupled floors, walls and ceilings. This method takes into account two important principles: mass and decoupling. Mass refers to density of the room's boundary surfaces (floor, walls and ceiling). Decoupling refers to the process of isolating the boundary surfaces from the surrounding structure.

Decoupling walls is simple to understand and relatively easy to achieve. It involves using separate stud systems and multiple layers of gypsum board (sometimes sandwiched with stiff materials, such as vinyl or soundboard) separated by a small air space, and then repeating the process. But decoupling the floor and ceiling is more complex since, of course, they cannot really "float." The best isolated floor is one that has separate concrete slabs. This is usually possible in new construction and in slab-on-grade construction. When this is not possible, it is best to use built-up decoupled flooring systems with the inner partition built on top of this flooring. Isolated (decoupled) ceilings come in two primary flavors: lid or suspended construction. A lid system will usually provide better results since the lid simply is not touching the other elements of the room. But lid systems are limited by the width and depth of the room as well as height (since spanning

structural members become very deep as the width and length increase). Often, the ability to get long ceiling joists onto the site will determine whether you can use the lid isolation system. If you're designing larger rooms or rooms with more

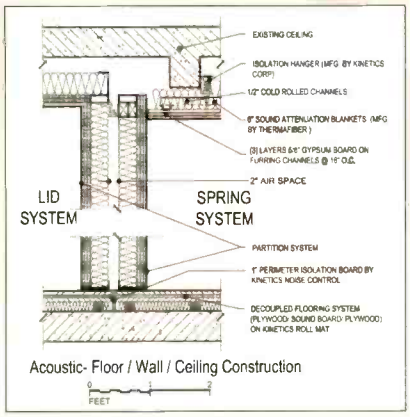

Figure 1. This drawing shows variations in floor, wall and ceiling systems for typical isolation sytems, including the difference between ceiling hanger and lid systems.

complex ceiling profiles, you need to install a system of isolated hangers. With this system you must pay careful attention to the selection and exact spacing of these hangers so that the loading is evenly and correctly distributed throughout the system. You can achieve the required boundary-surface mass by using multiple layers of gypsum board for the walls and multiple layers of plywood and gypsum board for the floor (see Figure 1).

Two remaining sound-transfer issues we must consider are room penetrations (doors, windows, conduits, etc.) and HVAC layout. It is ironic that we spend so much time and money on complex, stiff, thick, expensive boundary systems only to make a great number of holes in them. How we organize and detail these penetrations usually determines whether we achieve a successful acoustic-isolation system. Sound behaves very much like water in that it can leak through the smallest of openings. Multiple wall systems entail multiple window frames and glass panes that need to be isolated to avoid resonance and sound leakage. Constructing isolated doors requires the same attention to detail. The quietness of a room is often limited by the quietness of its HVAC system. For example, designing a room to have an NC value of 20 (which is quite quiet) would require designing an HVAC system with an NC value of 20 or lower. There are several important components and techniques you can use to minimize HVAC sound transfer:

1. Use large ducts to create lower-than-normal airflow speeds;
2. Use lined ducts to reduce machine noise traveling down the ducts;
3. Mount heavy equipment with springs and/or mass dampening pads; or
4. Minimize room penetrations as they pass through the sound boundary container.

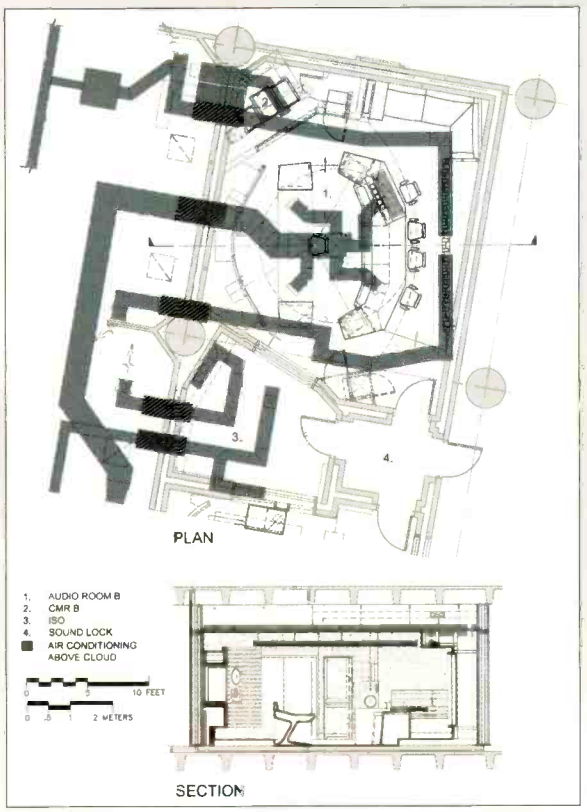

Figure 2. This figure shows the complex ductwork required for the audio production control room at WNET in New York.

For example, Figure 2 shows the complex ductwork required for the audio production control room at WNET in New York.

Remember, site selection is critical. And keep in mind that political solutions for quietness control are often the best ones. A quiet space is easiest to accomplish when you locate it next to quiet neighbors. Designing a small vocal iso booth to be NC15 at 63Hz may not be the best way to spend your money, since you probably won't be recording any information at that frequency in such a room. Also, try to avoid lightweight structures. Slab-on-grade sites are usually superior.

Internal room acoustics

Internal room acoustics is the study of how sound is propagated in an enclosed space. Small-room acoustics in stiff boundaries (these are the spaces we are typically dealing with) concerns several different criteria and issues. We can control internal room acoustic behavior by controlling room size and shape as well as surface treatments. Think of a small room as two separate rooms that behave differently at higher and lower frequencies. At mid and high frequencies (above 200Hz), we can treat sound a bit like rays of light, which travel in straight lines. At these frequencies, a

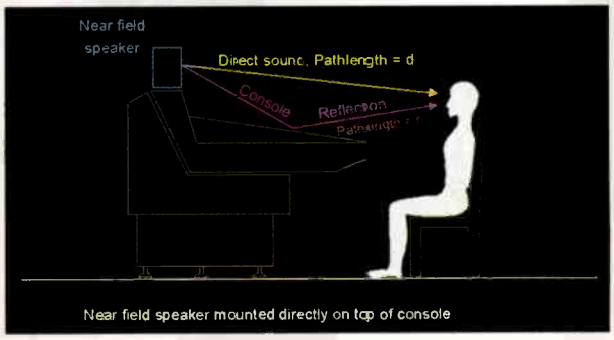

Figure 3a. This drawing shows the path of the direct sound and the path of the reflected sound as it bounces off a large production console.

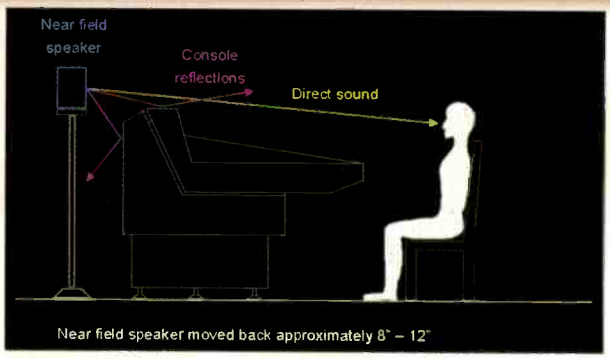

Figure 3b. By simply re-positioning the near-field speaker, the reflection goes away, eliminating the interference and its disturbing frequency response.

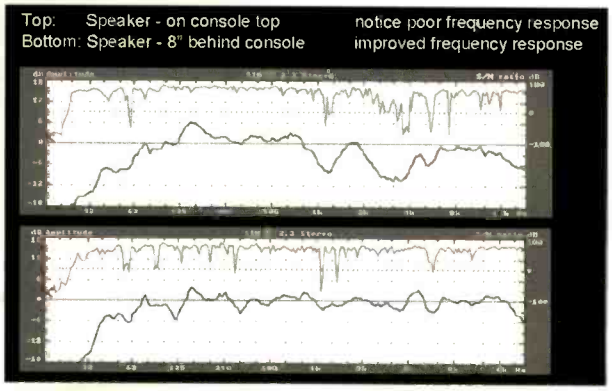

Figure 3c. These graphs show the frequency response at the operator's listening position for each placement of the speaker.

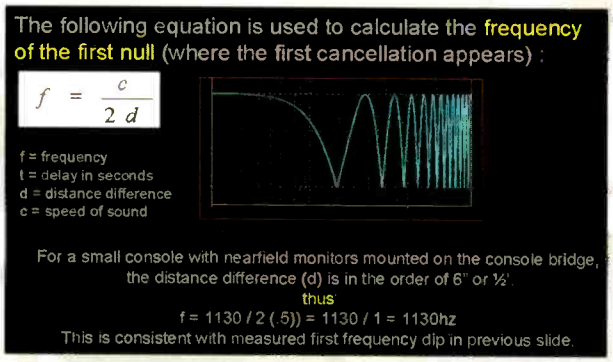

Figure 3d. This figure shows how to calculate the frequency of the first null created by the comb-filter effect.

room's reflection patterns can affect sound perception at a critical listening position. For example, Figure 3a shows two paths taken by sound emanating from a near-field speaker mounted on a production console. One is a direct path to the console operator; the other is an indirect path reflected off the console. The reflected sound arrives at the operator's listening position just a few milliseconds later than the direct sound, and at a dB level not that much lower than the direct sound. The two sounds interfere with one another, and the result is a disturbing frequency response for the operator. Figure 3b shows that, by simply re-positioning the near-field speaker, the reflection goes away, eliminating the interference and its disturbing frequency response. Figure 3c shows the frequency response at the operator's listening position for each placement of the speaker. Notice that when the speaker is placed on top of the console, the frequency response at the operator's position (shown in the top graph of Figure 3c) is similar to that created by a comb filter. Figure 3d shows how to calculate the frequency of the first null created by this comb-filter effect.

At lower frequencies, however, sound is less directional and thus reflection control becomes less relevant. At these frequencies, the ratio of raw room dimensions and the position of speakers and listener are more significant. The overall dimensions of the room will effect the natural distribution of eigentones (standing waves). Since the rooms that we are dealing with typically have stiff boundaries because of their sound-isolation requirements, there is little chance for the low frequencies to be absorbed. The surface treatments that we most commonly associate with audio rooms (i.e., acoustic foam, acoustic panels, etc.) are relatively thin. They can convert mid- and high-frequency sounds to heat, but they have little effect on lower frequencies, which simply arrive at the stiff boundaries and reflect back into the room.

A common misconception is that standing waves are bad. Standing waves always exist in a closed environment. What we strive to do is to space these frequencies as evenly as possible. Think of standing waves as an indication of a room's ability to resonate – to "ring out" or reinforce tones naturally. You can imagine that if the proportions of a room are chosen correctly, then there will be a more natural spacing of the tones and the room will tend to reinforce lower-frequency tones more evenly. This is a good thing. The opposite, of course, would be harmful and tend to cause uneven frequency response at a critical listening position – not a good thing for audio playback.

So, the first step in room acoustic design (after making sure that all equipment and furniture fits) is program satisfaction. Try to choose a room shape that will space (organize) the low-frequency eigentones as evenly as possible.

By the numbers

A story about room design and standing waves comes to mind. I received a phone call one day from a student with what he thought was a simple question. He said, "I have a 20-foot by 20-foot room that I want to use as a control room for my new studio. What should I do to make it sound good?" That's a big question. Half of me wanted to explain that this was not really a one-sentence (or one-concept) answer, but my other half accepted the challenge of trying to give him a simple answer. After a minute of thinking, I answered,

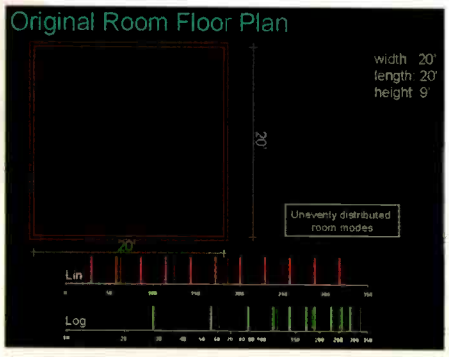

Figure 4a. This drawing shows a 20-foot by 20-foot room plan and its modal distribution.

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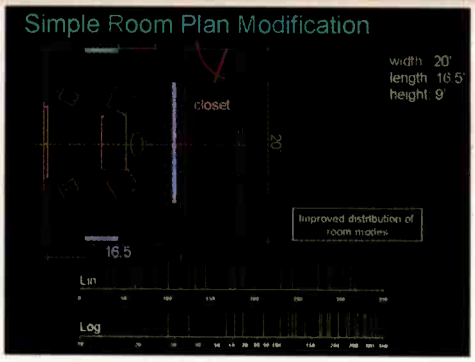

Figure 4b. This drawing shows a 16.5-foot by 20-foot room plan and its modal distribution. Note that as frequency rises, modal packing becomes so dense that eigentone analysis is no longer important. At that point we are more concerned with "ray acoustics," i.e., reflection control.

"Build a closet." He probably thought I was joking, but I still believe this was a realistic answer. The square room (20 feet by 20 feet) is almost the worst possible shape you can have. The only thing worse would be a 20-foot cube. Width and length of identical dimensions will, of course, cause many of the lower-frequency eigentones to be identical, resulting in harsh frequency anomalies – a pileup of energy – as well as voids at other frequencies (see Figure 4a). These frequencies are not that hard to calculate (f = 565/ room dimension). Multiplying this value by 2, 3, 4, etc. gives you the frequencies for that particular dimension. Doing the same for the two other primary dimensions and then listing the frequencies will easily give you this distribution.

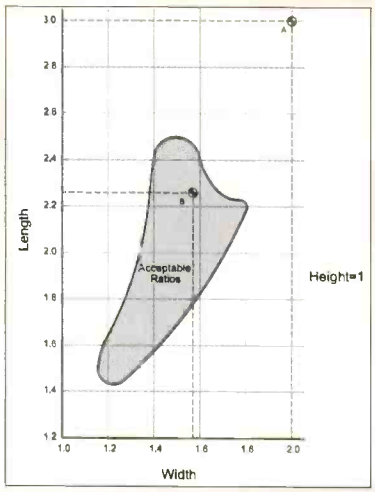

Figure 5. This "pictogram" of acceptable room ratios was first published by Newman, Bolt, Beranek in 1957.

By building a closet in the room, he could, for example, create a listening room that was 20 feet wide and (more or less) 15.5 feet deep – a much better room ratio (see Figure 4b). He also would end up with a closet for storage, and possibly a good location for noisy equipment and other devices. Notice that I suggested that 20 feet should be the width of his room. This is because by having the side walls further away from the listening position, you improve mid- and high-frequency reflection control. You can easily analyze room ratios by

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Centralized and distributed broadcasting

By Michel Proulx

A year ago, centralized broadcasting practically monopolized trade publications, industry gatherings, and the boardrooms of station groups, networks and equipment manufacturers alike. Centralized broadcasting is simple in concept: a single location controls multiple stations over a given geographic region. The degree of control at the main facility can vary depending on the objectives of the network or station group.

Now, 12 months later, the subject of centralized broadcasting has somewhat lost the spotlight, but consolidation projects continue as station groups and networks work to streamline operations and save costs while working on models to offer new and more diverse services.

Degrees of centralization

There are a number of models for centralized broadcasting, but they all have the same basic objectives: take advantage of economies of scale and increase productivity through collaboration. Rather than having every station in a broadcast group duplicate all functions at the local level, the group can consolidate certain key functions: such as graphics, traffic, sales and archive management. Likewise, rather than investing in highly priced digital equipment at each individual site, a central facility can, in many cases, house the core infrastructure. Thus, remote stations can function with a smaller equipment investment and with a smaller operational staff. In certain cases, this may help with the transition to digital because it can free some stations from having to make the capital investment in new equipment. The number of functions and amount of equipment a particular broadcast group centralizes depends on the structure and objectives of the group.

There are many different scenarios for consolidating operations. The two models that represent polar opposites on the continuum are the centralized-playout

Above photo: Signal distribution and monitoring equipment plays an important role at Maison Radio Canada, the origination facility for the centralized broadcasting of the Canadian Broadcasting Corporation's French-language services across Canada. Photo courtesy Miranda.

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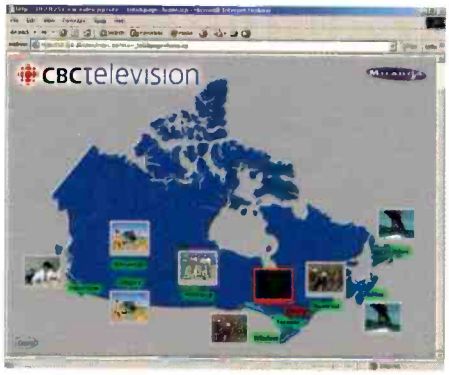

Figure 2. The main status page of the CBC's centralized monitoring of remote operations features a national map with alarm and off-air video display capability streamed back from each location via a TCP-IP network.

model and the distributed-playout model. In the centralized-playout model, the central facility carries out as many functions as possible. In the distributed-playout model, most functions remain at the local level, with only some management and control activities transferred to the central facility.

Centralized-playout model

In the centralized-playout model, a central location houses most of the equipment and functions (see Figure 1 on page 90). The central facility handles all network program reception, syndicated program ingest, commercial insertion, master control, branding and presentation switching functions, and all monitoring. Essentially, the central facility streams a ready-for-air signal to each of the stations in the centralization. Other than originating local news and the like, the remote stations have few on-air functions beyond moving the ready-for-air signal out to the local transmitter for broadcast. They

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file-transfer non-live local content such as commercials, taped programs and promos to the central facility for playout. Live local content such as news is either switched in locally under remote control from the central facility, or, in some cases, backhauled to the central site. The central site then switches it in master control and sends it right back to the local station, fully integrated with other programming and commercial elements.

Pros and cons

The main benefits of this model come from the co-location of most of the technical infrastructure, and in the simplicity of the automation and content management. Automation is simpler because all playout and air devices are located within the same facility.

In fact, the operations and technical infrastructure of such a central facility are similar to the multichannel origination facilities operated by specialty channel providers, DBS and other multichannel originators. The technology for multichannel server, automation and highly integrated master control for these types of operations has existed for years. Since this model centrally locates all equipment and media, it easily achieves redundancy and protection.

The disadvantages of this model lie in the cost of distributing the ready-for-air streams to each of the individual stations from the central location, as well as with the risk involved in relying on these communication links. The key new system element is remote monitoring to allow the central facility to monitor not only what it is sending, but also what each of the remote cities is actually airing. Such centralized operations use remote signal telemetry and streaming video over standard IP networks extensively to provide remote monitoring.

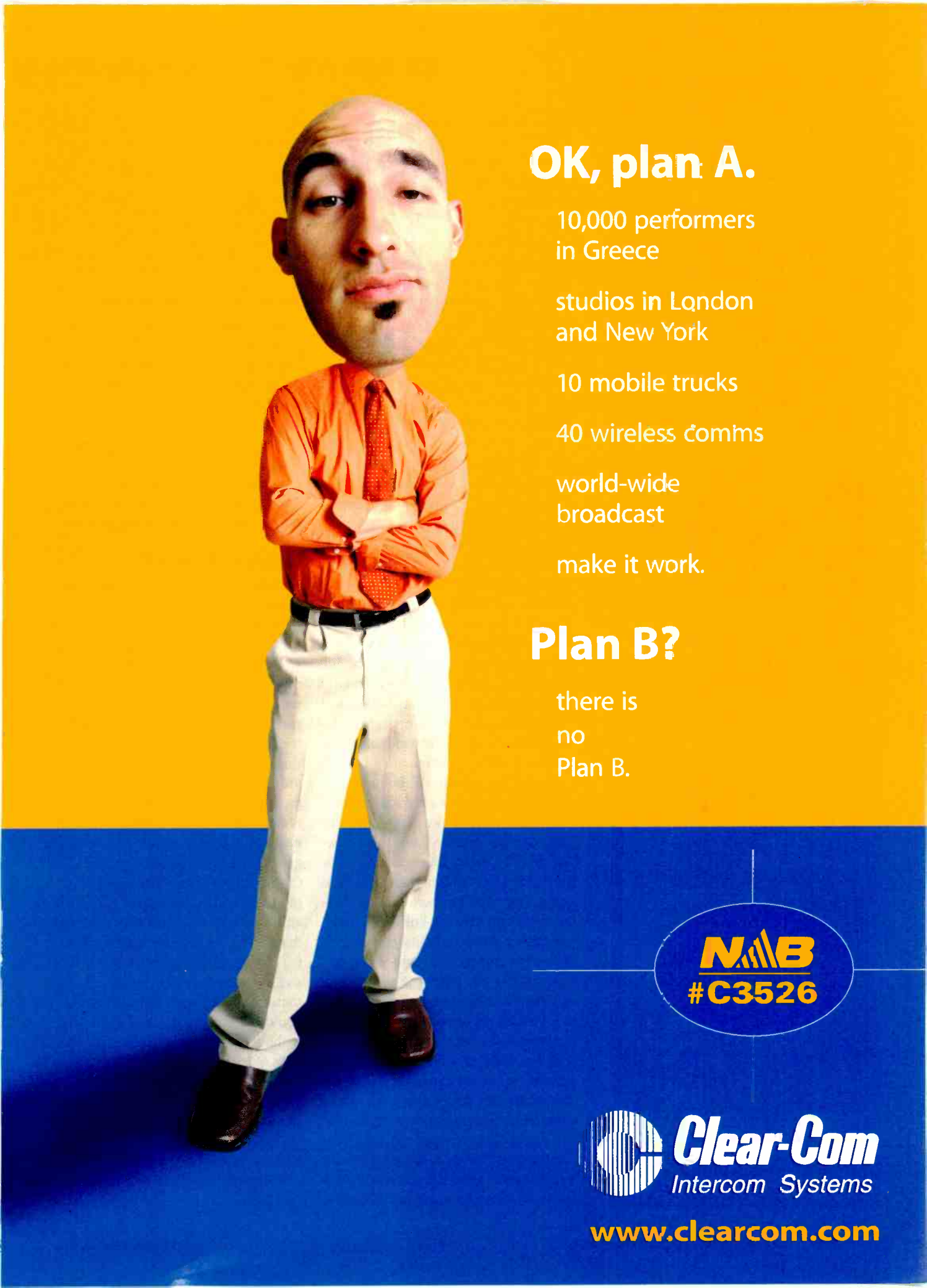
Centralization at the CBC

Canadian broadcasters have chosen the centralized-playout model for practically all of their consolidation projects in the past two years. Originally employed by regional networks that operated four to six stations in a single provincial region, the model has now been deployed on a national level as well. The Canadian Broadcasting Corporation (CBC) has recently completed an important consolidation project, centralizing all of its English-language network operations in Toronto. The French-language network Radio Canada will soon do the same, consolidating its operations in Montreal. The two centers are linked and, in the event of a catastrophic failure at either center, will be able to act as backup with a reduced number of feeds.

The CBC has deployed a fully centralized model and uplink, mainly using satellites. It is a multiplex of 15 ready-for-air streams to regional centers located throughout the country. The system streams local programming, news and special events from each regional center to Toronto through a combination of telco lines and satellite return paths (see Figure 2). A network command center (NCC) was constructed in Toronto to integrate and monitor the 19 English-language services. One of the most important reasons the station decided to loop local programming through Toronto and distribute a ready-for-air signal by satellite was so it could eventually feed isolated transmitters serving remote communities by satellite, thereby reducing operating cost. The principal enabling technology for this system was the compression and multiplexing technology to uplink 15 streams on a single multiplex.

Distributed-playout model

The centralized playout model described above has all but fallen out of favor in the United States in the past year. U.S.-based groups who studied the model were not able to balance the cost savings of consolidating master-control operations against the high cost of operating the real-time video links required to stream ready-for-air streams to each remote station. In some cases, especially in smaller cities where reduction of local infrastructure makes most sense, there may not have been sufficient telco access. In addition to lack of sufficient cost savings, U.S. group owners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were concerned with the risks of removing master control and master-control operations from the local station and relying exclusively on those distribution links to get the final signal to air.

Workflow element	Live ?	Location
Traffic automation data preparation and data entry	No	Can be centralized if common automation and traffic systems used at all facilities
Commercials	No	Commercials ingested centrally and pushed to local file servers. Traffic and automation-related metadata is created centrally
Graphics and promo creation	No	Centrally created and pushed to local servers
Syndicated programs	No	Centrally downlinked, QA's and ingested commercial insertion points indentified, automation and traffic system related meta data created centrally
Local newscast	Yes	Produced and inserted locally

Table 1. Non-live content can often be created or ingested at a central location and then transferred to local stations, while live content is often produced locally.

U.S. group owners have instead opted in increasing numbers for the distributed playout model, which falls toward the opposite end of the spectrum of consolidation models. In the distributed-playout model, most of the equipment and the primary station functions remain at the local station level (see Figure 3). Some content creation, ingest and preparation, traffic, and automation can be centralized, but the local station generates the final, ready-for-air signal. While the central station can push some material to the local stations using file transfers, playout to air occurs from the local station server. Master control and the responsibility for ensuring continuity in the programming – particularly during sporting events and other live events where break points cannot be predicted – is left in the hands of a local master-control operator.

Among the benefits of the more distributed approach is a reduced reliance on distribution links. High-capacity links are still required; but these links are now carrying files transferred in non-real time, rather than real-time streaming video. The performance characteristics on network links are less demanding, the availability of network providers and methods are wider and the costs lower. Losing the link for a moment does not take the signal off the air. Instead, the temporary loss of connection may require a resend of a file or small portion of a file. There are now modern protocol extensions designed specifically for this purpose that allow the resend to happen automatically and transparently to the users. Another advantage of the distributed-playout model comes from the fact that the local stations remain whole and somewhat autonomous. In addition to being safer, it is beneficial within the context of changing ownership rules and the lifting of restrictions on duopolies. A station that is still whole and autonomous can be sold or traded more easily.

Among the disadvantages of this model is an increase in the complexity of the automation and content management and distribution, because server and other on-air elements are distributed.

Where's the beef?

While studying the costs of their consolidation options, group owners analyzed workflows and operations in all of their facilities. In analyzing the workflows at the individual stations, they realized that there were more significant costs in non-live but daily tasks such as production, graphics creation, traffic management, ingest and QA, than in master control. Moreover, they found that if they looked at all of the group facilities, there was a great deal of duplication in those daily tasks. They recognized that many people were ingesting the same content, performing QA, cataloging operations and entering the metadata necessary for traffic and automation. Group owners saw that they could generate significant savings by consolidating these time-intensive, repetitive operations on non-live material. They concluded that they could get the most possible benefit, without incurring the telco cost and the risks of total centralization.

The key is to consolidate non-live portions of the workflow and to leverage content distribution from centralized servers to servers at individual stations using file-transfer techniques over terrestrial or satellite networks. (See Table 1.)

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20 ☐ TV Station (including Networks & Low-Power TV)
26 ☐ Combination TV & Radio Station
39 ☐ Cable (including Networks)
45 ☐ Telecoms
29 ☐ Recording Studio
30 ☐ Teleproduction Facility/Independent Program Producer
40 ☐ Post-Production Facility
50 ☐ Streaming Media — Network Provider/ISP/IDC/Telco, Internet Content Provider/Web Publisher, Services, Software Provider
31 ☐ Microwave, Relay Station or Satellite Company for TV and Cable
33 ☐ TV Consultant (Engineering or Management)
46 ☐ Systems Integrator
34 ☐ TV Dealer or Distributor
35 ☐ Other (please specify): _____

3 Which of the following best describes your title? (Check only ONE box.)

A. Company Management:
01 ☐ Chairman of the Board
02 ☐ President
03 ☐ Owner
04 ☐ Partner
05 ☐ Director
06 ☐ Vice President
07 ☐ General Manager (other than in charge of Engineering or Station Operations)
08 ☐ Other Corporate/Financial Official

B. Technical Management & Engineering:
09 ☐ Technical Director/Manager
10 ☐ Chief Engineer
11 ☐ Other Engineering or Technical Title

C. Operations & Station Management/Production & Programming:
12 ☐ Vice President Operations
13 ☐ Operations Manager/Director
14 ☐ Station Manager
15 ☐ Production Manager
16 ☐ Program Manager
17 ☐ News Director
18 ☐ Other Operations Title
99 ☐ Other (please specify): _____

4 Which statement best describes your role in the purchase of equipment, components and accessories? (Check only ONE box.)

A ☐ Make **final decision** to buy specific makes, models, services or programs
B ☐ **Specify** or **make recommendations** on makes, models, services or programs
C ☐ Have **no part** in specifying or buying

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5 Which of the following types of equipment will you be evaluating for purchase in the next 12 months? (Check ALL that apply.)

1. Audio Products
1A ❑ Audio consoles/mixers
1B ❑ Digital audio workstations
1C ❑ Distribution amplifiers
1D ❑ Headphones, headsets, intercoms
1E ❑ Telephone interface systems
1F ❑ Magnetic tape, audio
1G ❑ Microphones
1L ❑ Monitors (speakers)
1J ❑ Recorders, players
1K ❑ Switchers, routing
1N ❑ Audio Processing

2. Video Products
2A ❑ Camera heads, tripods, pedestals, booms, dollies
2B ❑ Cameras; lenses
2C ❑ Graphics, titling, effects
2D ❑ Nonlinear editing systems
2F ❑ Editing controllers, systems
2G ❑ Frame synchronizers, time base correctors
2H ❑ Lighting systems
2T ❑ Magnetic tape, video
2J ❑ Monitors (picture, studio quality)
2K ❑ Recorders, players
2L ❑ Robotic camera controls
2M ❑ Signal processing
2N ❑ Signal routing, distribution
2W ❑ Standards, format & scan converters
2P ❑ Still store systems
2Q ❑ Switchers, production/ master control
2R ❑ Storage/video servers
2S ❑ HDTV Equipment
2V ❑ Virtual Sets
2X ❑ MPEG compression/ encoding systems
2Y ❑ Projection systems
2Z ❑ DVD systems

3. Test & Measurement Products
3A ❑ Analyzers, audio, video, RF
3B ❑ Audio, video signal generators
3C ❑ Waveform, vectorscope monitors
3D ❑ Digital signal testing

4. Miscellaneous Products
4A ❑ Battery packs, chargers
4B ❑ Cabinets, racks, consoles
4C ❑ Cables, connectors
4D ❑ Carts, cases (equipment, shipping), tools

5. RF Products
5B ❑ Exciters
5C ❑ Fiber optics
5E ❑ Power amplifiers, cavities
5F ❑ Receivers
5G ❑ Remote production vehicles, program relays
5H ❑ Satellite T/R components, electronics
5P ❑ STL/ENG components, electronics
5J ❑ Switches, RF coaxial
5K ❑ Transmitters
5L ❑ Antenna systems, towers
5M ❑ Transmitter, remote controls
5N ❑ Tubes
5Q ❑ Weather, radar RF products
5R ❑ Cable/set top/CA systems

6. Automation & Computer Products
6A ❑ Accessories/peripherals
6E ❑ Automation systems
6H ❑ Business automation
6T ❑ Commercial insertion systems
6K ❑ Machine control
6L ❑ Newsroom automation
6P ❑ Record/playback automation
6Q ❑ Software, engineering
6R ❑ Software, production, planning
6X ❑ Video interface cards
6Y ❑ Networking products
6Z ❑ Digital asset management

7. New Media/Internet
7A ❑ Encoding products
7B ❑ Internet service providers
7C ❑ ecommerce technology
7D ❑ Content creation systems

8. ❑ System integration/ engineering services

9. ❑ None of the Above

6 What is the budget for equipment and services you are evaluating for purchase in the next 12 months? (Check only ONE box.)

1 ☐ Less than $24,999
3 ☐ $25,000 - $99,999
5 ☐ $100,000 - $299,999
6 ☐ $300,000 - $499,999
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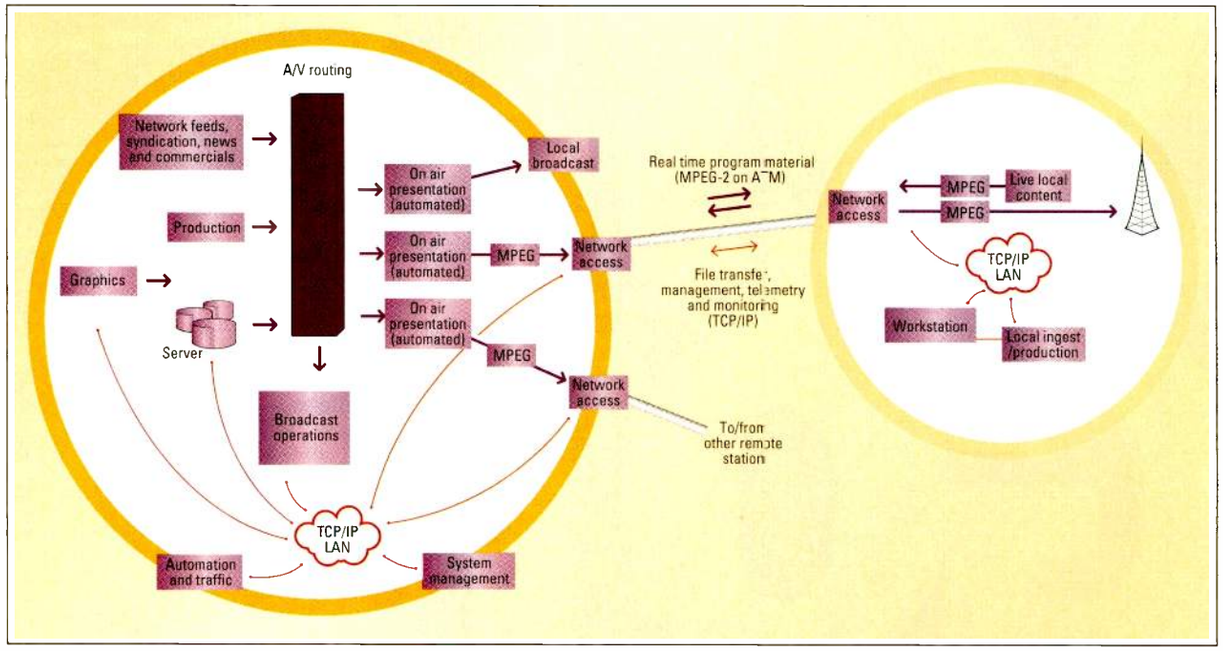
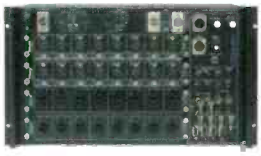


Figure 1. In the centralized-playout model, a central location houses most of the equipment and functions.

Handling syndicated programs is an excellent example of a time- and labor-intensive process that is repeated (duplicated) at dozens, if not hundreds, of TV stations every day. Each facility does the same thing: It aims the dish, tunes the receiver and records the show's content. Once the station checks the recording for errors and quality, it reviews the recording to identify commercial-break insertion points and usually produces a promo clip based on excerpts from the show. The station then transfers the program and promotional materials to a server or cassette and enters metadata required by the automation and traffic systems. This same linear process is performed dozens of times each day. By contrast, a consolidated operation using the distributed model can perform this process at one location and, after ingest and QA, can file-transfer the material to multiple servers in multiple cities. If a large number of stations are involved, then the file transfer can be accomplished over satellite using IP over MPEG-2. Satellite-based delivery bypasses the limitations of currently deployed WANs in terms of capacity and ability to handle multiple receive points (multicast). Broadcast groups need not tackle the consolidation of syndicated programs on their own. Modern video-service providers have begun to ingest and prep syndicated programs and deliver them by satellite to edge servers acting as electronic mail boxes located at local TV stations. The Holy Grail is to have material arrive at a facility and have the metadata automatically formatted for the local station's automation and traffic systems so that material can be directly transferred to a station's server and inserted in the lineup with minimal operator intervention. By offering a standard way of specifying metadata, MXF, a new standard soon to be approved by SMPTE, promises to facilitate such direct transfers.

Hyper local news

The Sinclair Broadcast Group recently detailed some of its centralization plans in a series of press releases. Sinclair's thinking has been to use the advantages of both models (real-time streaming and store-and-forward of files) while minimizing the disadvantages of both methods. With an eye on consolidation, Sinclair built a 15,000-square-foot produc-



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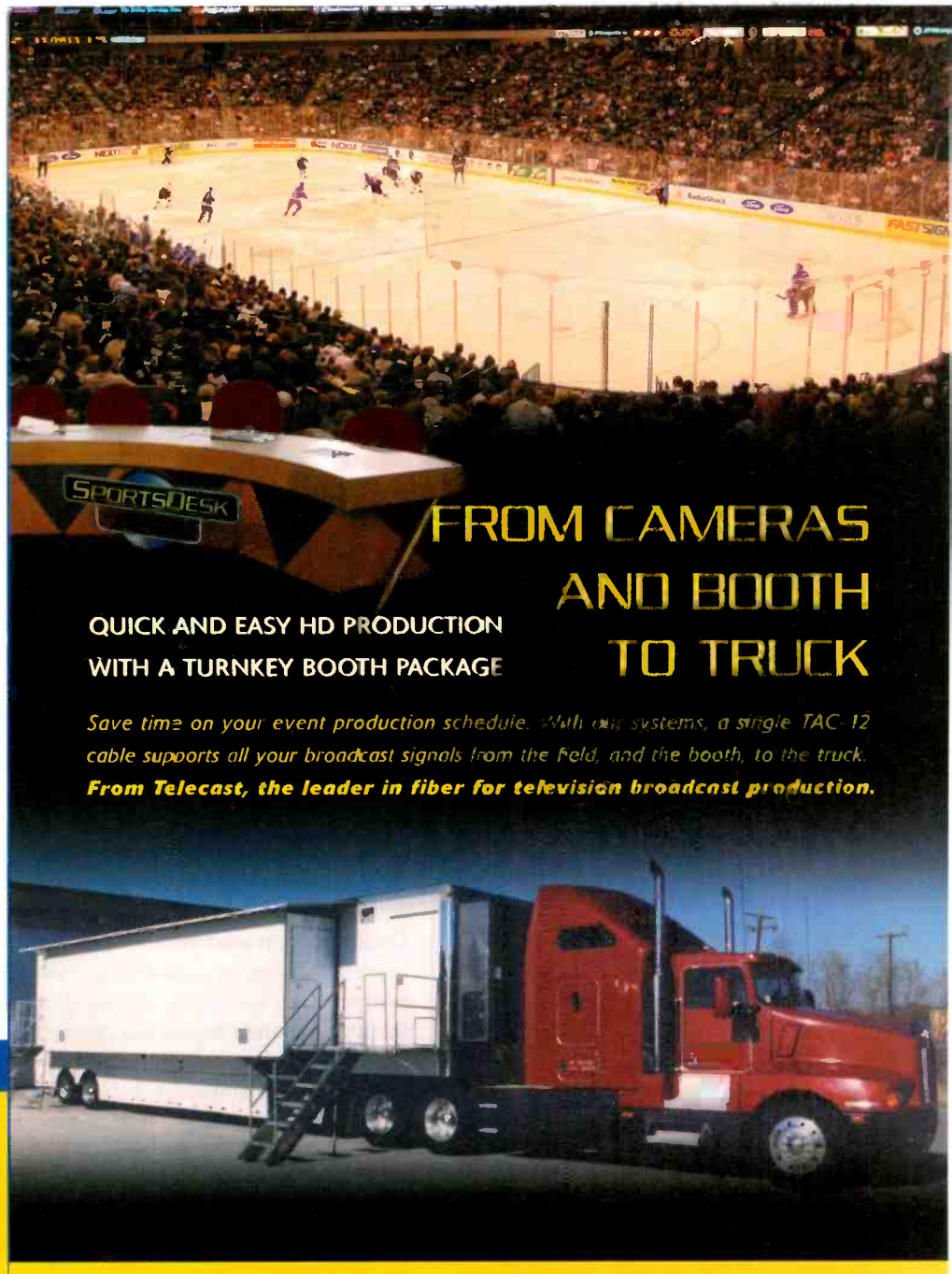

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tion facility at its corporate headquarters in Baltimore. Here, both live and non-live material is produced for its stations. It broadcasts live national news out to its client stations in real time over satellite, while it file-transfers near-real-time material like the weather and other non-time-sensitive content over the Sinclair WAN to the stations for insertion. Sinclair is continuing to build out the distribution network, and it plans on linking all 40 of its stations to this network.

Among the many tasks the group chose to consolidate, the most unusual and interesting was consolidating local weather reports for some of its stations to its centralized production facility in Baltimore. On-air weather talent in Baltimore produce multiple "local weather" segments. These segments are file-transferred to the local stations using Telestream clip mail boxes (like an e-mail message with a large attachment), where they are inserted into the news. It does this on a near-real-time basis. This arrangement has allowed the group to upgrade and improve its ability to deliver local weather to its stations. And the cost savings in consolidating the use of expensive weather equipment and graphics systems is considerable.

Although we think of the weather report as presented live from the studio of the station, Sinclair maintains that it matters little whether the studio is in the local market or it is hundreds of miles away. What is important is the quality of the data and the professionalism of the presentation. Sinclair has partnered with Accuweather to provide this data. Under these circumstances, weather is a perfect candidate for consolidation. The company will be able to keep up with the latest advances in weather graphics and presentation techniques without having to continuously upgrade equipment at each local station.

Looking ahead

At the heart of the distributed playout model lies the important notion that non-live material does not have to be handled as a real-time, synchronous video stream; it can be treated as a file instead. Files are easier to deal with than streams. They can be transferred asynchronously across a wider range of networks. In this case, asynchronous translates into two important concepts: 1) the transfer can happen slower or faster than real time, depending on the link and, 2) the transfer can be achieved without the need for operator intervention. Like an e-mail, once initiated, a file transfer just happens. Computers at both ends take care of the details. The network constraints are simplified and the workflow becomes nonlinear – two important ingredients for dramatic simplification of the overall process.

Until recently, exchanges based on file transfers were not practical for many reasons. First, legacy video servers usually were proprietary boxes; the only way to place content on the server was to stream it in through one of the server's video ports. Second, networks linking video servers, particularly WANs, were not fast enough or consistent enough to handle large video files. Third, it was not possible to transfer files between servers from different vendors because even though they may have used common compression formats, they did not use consistent file headers. It was also not possible to transfer transparently any metadata describing the attributes of the file from one server to another, unless of course both servers were from the same vendor.

But the situation has been changing rapidly lately, and the barriers listed above have started to disappear. Several factors have converged to make file-based operations across geographies and across server platforms a reality. These factors include recent advances in storage technology; high-capacity, wide-area data networking over land-based lines or satellite; acceptance of MPEG-2 as a universal compression format; and the emergence of MXF, an important new metadata exchange format. Simplification of infrastructure and de-linearization of the workflow will have a major impact on TV facilities and on the way they distribute TV content.

In the context of centralization and consolidation, the simple fact is that

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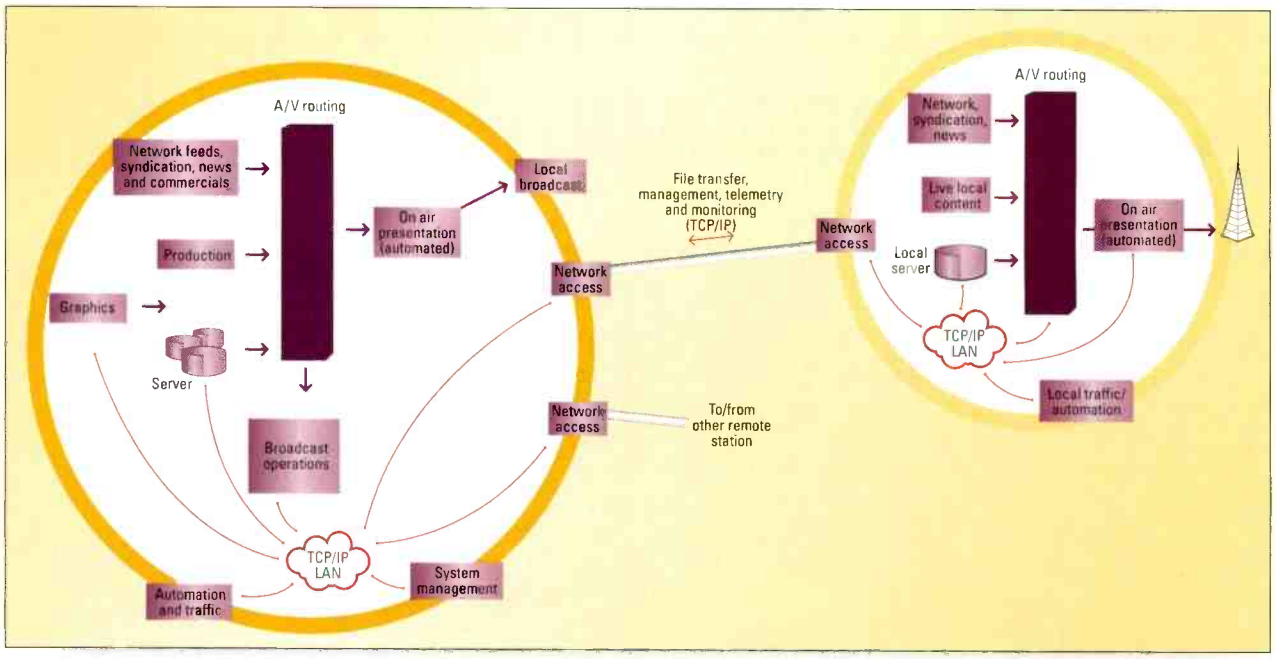

Figure 3. In the distributed playout model, most of the equipment and the primary station functions remain at the local station level

most material aired by local TV stations is not live. (By popular estimates, less than 20 percent is live.) This ratio means that broadcasters can fully leverage the simplified workflow and infrastructure surrounding file-based operations.

At the moment, there are two chief disadvantages to the distributed-playout model: the cost of putting complex server systems at each and every facility, and the complexity of content distribution and remote automation. Proponents of the centralized-playout model maintain that it is simpler to manage the operation when all of the equipment and the media are in one place. Well, video servers are no longer complex or expensive. Consider what some are calling an edge server: a low-cost, highly integrated box that incorporates video server and switching functionality. This is a stand-alone device that can be remotely controlled and whose content can be remotely loaded through signaling and data embedded in the network signal feeding the station.

As for the complexity of media distribution and automation, all that remains is for TV automation systems and media asset management systems to evolve to the same level as they have in other file-intensive industries. Once this happens, users will no longer have to worry about where to put that material and from where it will be played out. The content and the intelligence to play it will be truly distributed. Having simplified the entire operation, we will be able to leverage our systems to further specialize our advertising and programming without incurring any additional cost or complexity. BE

Michel Proulx is vice president of product development at Miranda Technologies.

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CanWest Global
Toronto

BY BOB BURNS AND JOHN MCEWEN

CanWest Global Communications is an international media company that owns, operates and/or holds substantial interests in conventional television, specialty cable channels, newspapers, out-of-home advertising, radio networks and Internet portals in Canada, New Zealand, Australia, Ireland and the United Kingdom. The company's main audio control room recently underwent a significant expansion as part of a larger project to enhance the organization's live news capabilities. Global News has a strong commitment to live news, and it was quickly determined that a stronger audio console was needed to support the increased news coverage. The studio had been functioning with a 14 year-old outdated, analog board with limited resources that had developed numerous intermittents that were affecting the on-air product.

Henry Brown, Senior Audio Operator at CanWest Global, works at the facility's new Wheatstone TV-80 console.

The installation team was challenged with the task of moving the old board out and finding a new board that would accommodate the facility's increased requirements. An additional goal was to anticipate the growth of its news services, including a morning show and increased network responsibility. A search-and-evaluation process was launched that brought numerous broadcast console manufacturers to the facility.

After studying our options, Wheatstone was our favorite for this application, but we wanted the audio engineers operating the equipment to be involved in the final decision. Wheatstone was the operators' choice as well, so following the lead of our sister station BCTV in Burnaby, BC, we chose a Wheatstone TV-80 audio console. BCTV recently installed the console to support its "Sports Page" program.

A tour of Wheatstone's facility in New Bern, NC, increased our comfort level. Wheatstone arranged to have a TV-80 available so we could become familiar with its performance and operations.

Our next challenges were time and space. We were in the middle of a serious upgrade that needed to be accomplished in short order. In addition, we had to remain on-air during construction, which we did with a side-by-side temporary console while we removed the old one. The cutover had to be seamless. We formulated a strategy that required some extra effort but proved extremely effective. Using Styrofoam and cardboard, our staging department fabricated an exact copy of the control room, including all the equipment.

The console was placed in the "mock" studio when it arrived, enabling our operators to train in an artificial but realistic environment, familiarize themselves with the console, and address all operational issues prior to going live with it. It served as a kind of dress rehearsal and helped minimize the learning curve.

The "mock" environment also gave us the opportunity to maximize the design of the room. We were able to perfect the layout and obtain the look we wanted before anything was bolted down and wired in the new studio.

Because of our significant increase in live news production, the console's dedicated IFB mix-minus buses were attractive features for us. The upgrade has resulted in a huge live news element, including a helicopter program, a microwave truck, a satellite truck and fiber hookups. We now produce between six and 10 live remotes in each half-hour program, and the ample mix-minuses have given our reporters the ability to communicate with the station as well as the ability to hear each other. This feature strengthens the reporters' participation in the newscast, an invaluable tool for a news-intensive broadcaster in the highly competitive market of Toronto.

Using Styrofoam and cardboard, our staging department fabricated an exact copy of the control room, including all the equipment.

The console offers a sturdy mechanical design capable of sending two stereo master and two mono master feeds to the network if necessary. We can create more stereo or mono outputs simultaneously than we usually need with its available group, masters and aux outputs.

The console has created a stronger audio environment for CanWest's news operation. BE

Bob Burns is director of technical services, and John McEwen is a technical producer, for CanWest Global.

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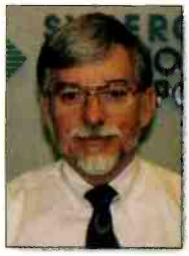

Over the last 10 years, two major technical advancements have spurred interest in fiber anew. HDTV occupies about 1.5Gb/s in transmission, and sending a signal with such high data rates is more practical when the transmission medium performs well at very high frequencies. SMPTE 292 works only to about 90 to 120 meters on coax, but it can be transmitted for kilometers on fiber. This applies to fiber-optic camera cable as well, though there is considerable industry concern about using fiber-optic camera cables in field production due to concerns over repair issues. Other high data rate signals, such as high bit rate compressed and uncompressed video (up to 360Mb/s), similarly suffer poor performance at long transmission lengths, i.e., more than 300 meters.

Fiber is a natural solution, and the development of more cost-effective hardware is spurring a surging interest in fiber equipment for delivery between buildings (or within a large facility) and as a connection to video interconnection companies. There has been a new class of equipment designed to transport SMPTE 259, SMPTE 292 and DVB-ASI (compressed MPEG-2). Like any new technology, it helps to understand the way it works and where the limitations are.

As with coax, fiber equipment is specified for a total loss budget for the "cable." We generally do not think of the loss budget for coax, but look on the specifications sheet for your favorite cable. See the loss in dB/100 feet? That defines the loss of the medium, just like the similar figures for fiber. One difference is that the loss in fiber is not frequency-dependent, as most fiber used for video purposes carries a single frequency. To the loss in the cable, you must add the loss in the connectors, which cannot be as low as the loss in a BNC, but can be below 0.1dB. Add them up and subtract the loss from the absolute launch power, and then you get the power received at the far end of the medium. As long as there is margin left for the receiver to work properly, all should be well. Fiber links are never planned with the theoretical minimum loss, partially because the variance in the quality of installations can have an important effect on the total link budget.

Telecast Fiber Systems' camera-mounted CopperHead combines digital and wavelength multiplexing to send all ENG signals in both directions on a single fiber strand.

Multimode fiber allows the beam to bounce back and forth across as it passes down the length of the fiber. There is some loss, though the fiber itself is larger in diameter and a bit more robust. Single-mode fiber has lower loss and is often lit from a laser source instead of a diode with wider dispersion and lower power. As a result, single-mode fiber provides much lower loss per Km and longer transmission distances. It is also more expensive and difficult to install.

The development of more cost-effective hardware is spurring a surging interest in fiber equipment.

Unlike coax, fiber can be illuminated from both ends, making a single strand capable of duplex transmission. To do this, the two ends use frequency diversity and optical hybrids to connect both the sending and receiving devices to a single strand. An ENG link using this approach would be very small and cost-efficient, though the loss in the hybrid somewhat reduces the distance that can be achieved.

The data transmission industry works with much higher bandwidths (data rates) than conventional video links. The implementation of high-bandwidth fiber services for telephony and data common carriers has proceeded at dizzying speed. One carrier provided a sample to me of an array of fibers arranged in a flat cable, stacked into a square bundle and encased in what looked like PVC. I thought it was perhaps 100 fibers, but it really was more than 850 in a "cable" less than 2.5 centimeters thick. That's one way to increase bandwidth.

Another is to use frequency division multiplexing on a single fiber. Send many light beams of slightly varying wavelength down one fiber and they won't interfere with each other. Modulate each one separately and that bundle of 800 fibers can carry thousands of signals.

Fiber finds lots of other uses in television. Get familiar with this technology because it won't be that long before your router and audio console have fiber connections on them. As consumer devices raise the manufacturing volume, we are likely to see more cost-effective and ubiquitous fiber-optic solutions in television. BE

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using a very well-known industry "pictogram" of accepted room ratios, first published by Newman, Bolt, Beranek in 1957 (see Figure 5). Using the pictogram involves three basic steps:

1. Divide all room dimensions by the height (making the height equal to 1).
2. Plot width and length on horizontal and vertical scales.
3. Determine acceptability by noting whether plot is in or out of the "zone."

There is no one perfect room ratio. If there were, we would all know it and thus not have to deal with this problem. Also, there are often situations in which architectural restrictions such as columns, height limitations, etc. would thwart your attempts to create a room with well-distributed eigentones. If you can't create a room with a well-distributed lower-frequency eigentone balance, then you should use carefully placed low-frequency absorption to minimize these buildups. But accomplishing this with thin materials is tricky. You can use membrane absorbers or Helmholtz resonators. You can achieve even better low-frequency absorption efficiency by adding air space behind more typical broadband absorption materials.

Summary

1. Remember that site location sometimes can be the most important part of designing a quiet room.
2. Try to create a room-plan layout with room ratios (width, length, height) that create acceptable low-frequency eigentone distribution.
3. Use geometry and well-applied surface treatments to distribute mid- and high-frequency "rays" to eliminate time anomalies that can create harsh frequency functions.

All this must be accomplished without sacrificing the architectural goals of the room: ergonomics and room layout. We will discuss this aspect in an article next month. BE

John Storyk is a principal owner of the Walters-Storyk Design Group.

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TECHNICAL DIRECTOR: KMOV is looking for a Technical Director, minimum 3 years experience including proficiency with digital video production switchers, audio consoles, robotic cameras and Chyron. Send resume to Joe Miller, KMOV-TV, One Memorial Dr., St. Louis, MO 63102, jcmiller@kmov.com or fax 314-621-1726. KMOV is an equal opportunity employer.

Professional Services

For Sale

Help Wanted

At Panasonic Broadcast & Television Systems Company, our success depends on every single employee's contributions - because the more we grow as individuals, the more we grow as a company. Right now, we have the following opening in our Secaucus, NJlocation: **Camera Engineer** Job code: 8162/CP In this position, you will manage technical issues in the Production Camera Product category and communicate directly with key customers to gather information on potential product enhancements, technical improvements, industry trends, service issues, and quality control issues. You will also provide support for key sales presentations as well as post-sales customer support. We will rely on you to maintain product knowledge through direct customer contact including product positioning, competitive analysis, customer usage, and new technological developments. Qualifications: • Bachelor's degree in Engineering required, postgraduate work helpful. •10 years' broadcast engineering experience, preferably with experience in the film/HD production/postproduction environment. • Detailed in-depth understanding of modern television camera design/imaging technologies. • Thorough understanding of the operational requirements for cameras in various environments. • Strong interpersonal and communication skills. In addition to an environment that's as innovative as our products, we offer competitive salaries and superior benefits. Please forward your resume, including job code **8162/CP** and salary requirements, to: **Panasonic-HR3A-5, One Panasonic Way, Secaucus, NJ 07094; Fax: 201-392-6007; E-mail: patelc@panasonic.com Panasonic** We are committed to creating a diverse work environment and proud to be an equal opportunity employer (m/f/d/v). Pre-employment drug testing may be required. Due to the high volume of response, we will only be able to respond to candidates of interest. All candidates must have valid authorization to work in the U.S. Thank you for your interest in Panasonic Broadcast & Television Systems Company, a subsidiary of MEI.

WTNZ-TV, a Raycom Media station, has an opening for an **Assistant Chief Engineer** in Knoxville, TN. The successful candidate will posses 5+ years experience in all facets of television broadcast maintenance, solid knowledge of UHF television transmitters and RF systems. Candidates must possess above average computer, technical and people skills, be able to work in an "on call" status and assume the duties of Chief Engineer when called upon. SBE certification preferred. Qualified candidates should send your resume and salary requirements to: Tom Theilmann, WTNZ-TV, 9000 Executive Park Drive, Suite D-300, Knoxville, TN. 37923. Or fax to (865) 691-6904. No phone calls please. EOE

Help Wanted

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A license to cheat

BY PAUL MCGOLDRICK

It would really rankle an American to have to go down to the post office once a year and write a check for $175 to buy permission to use his own television receiver. This is not a cultural thing at all – it rankles people in the UK, where everybody has to do just that. The "TV Licence" (British spelling) is a holdout from the theory that any use of the spectrum, either transmitting and/or receiving, makes the user into a "station" and its location should therefore be authorized with a bit of paper. Now, of course, it is just a tax. But it is a tax for a purpose.

The first Radio Licence was issued in 1922 at an annual cost of 10 shillings (two dollars at that time) and stayed at that level until 1946 when the first TV Licence (including radio) was issued for £2. Contrast that with today's price tag of £112 for a color TV license and £37.50 for monochrome. The money that is raised pays for the BBC's programming on six TV channels, network radio services, and all the regional TV and radio production and engineering costs. The anachronism is that it is not a license to watch BBC programming: It is a license to watch UK TV.

The separation of church and state between the BBC and the UK government has always been a cornerstone of the corporation – although there have been some really interesting shades of gray there over the years – and the original decision to fund the BBC from a license fee meant that the authorities could say that taxpayer money was not being used... an interesting exercise in logic. For many years the monies were collected by the post office and handed to the BBC through the home office. In 1991 the BBC took over the unpleasant task of collecting the fees itself and created the TV Licensing Authority to at least distance itself in name.

This group employs 1700 people to collect monies, issue licenses and enforce the law. Five hundred of those employees work away from the headquarters and the vast majority are inspectors who look to identify what averages about 1000 license evaders every day. With over 23 million licenses in force (end of 2001), and all but 136,000 at the $175 level, there is clearly a very large amount of money involved. And with the number of households known to be over 26 million, the TVLA is very interested in the three million who are not licensed.

The UK's "TV Licence" is a holdout from the theory that any use of the spectrum makes the user into a "station"... and therefore should be taxed.

When you buy a TV, STB or a computer TV card, the retailer has to report the sale to the TVLA. If that buyer's address is not in the database he gets a letter. Even if you don't buy a product you are likely to get a letter anyway, often a lot of letters, because the authority just doesn't seem to believe that anyone can do without television. Second home? Get another license. Student at college? Get another license. Rent a room in someone's house? Get another license. Use TV at work? Get another license. Operate a hotel? Get a license for the first 15 receivers and then another license for every five more (that's over $3000 a year for a 100-room hotel.) Legally blind? You still need a license but you do get a 50 percent discount – such generosity.

So, after you buy that new TV with cash and give a false name and address, how do they catch you? If you are not in the database as being licensed, your residence may be visited by an inspector looking for the telltale flicker of a CRT, or you may be driven past by the all-scary "Detector Van"! It used to be that the post office would announce when one was going to be in an area and, magically, licenses would be bought in bulk. But did the vans even work? Yes, they did; picking up the TV's local oscillator, the operators could even tell the residents which channel they had been watching, and the equipment is now so sensitive that there are handheld units in service.

You don't need a license if you don't connect a TV to an antenna, cable or satellite receiver and just use it to play back pre-recorded tapes or DVDs, nor if you only watch satellite TV originating outside the UK. But how do you prove it?

The PC user with a TV card has been the most popular target in the last 18 months, but an even sorrier situation has arisen with a decision that a broadband user who is streaming video from the BBCi Web site also needs a license. But don't worry if you are streaming BBC television news in the United States, they are only going after UK users.

At the cost involved for the licenses (and the UK isn't the only country to have this system for funding the "public" broadcaster), there is inevitably going to be cheating or evasion. Those that propose taxing the Internet in some way should look at this as a cautionary tale... but that's another column. BE

Paul McGoldrick is an industry consultant based on the West Coast.

SEND Send questions and comments to: paul_mcgoldrick@primediabusiness.com

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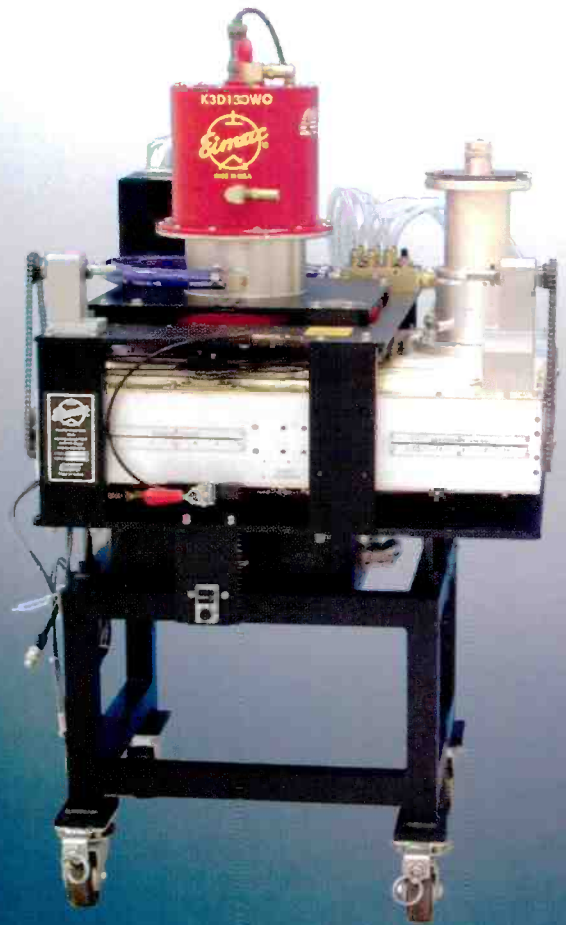

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