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THE JOURNAL OF DIGITAL TELEVISION



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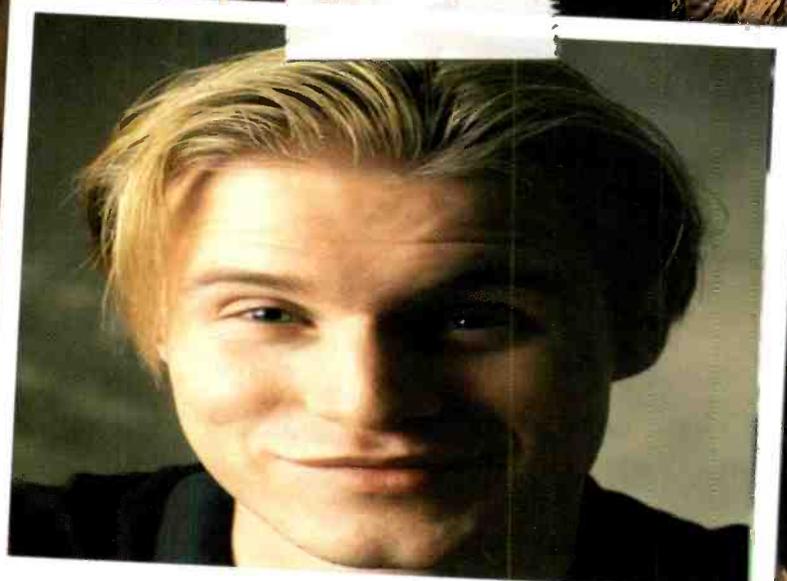


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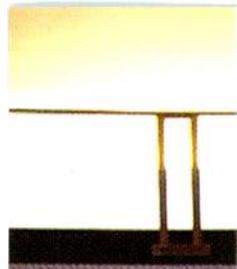
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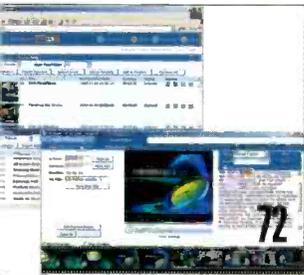
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# true colors

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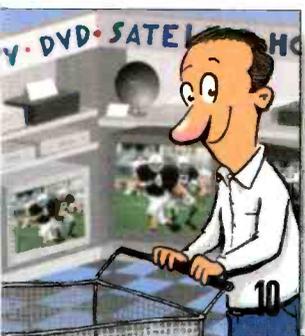
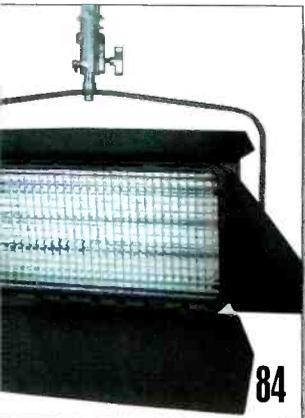
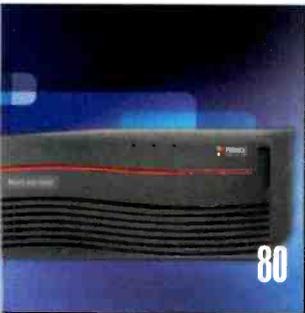
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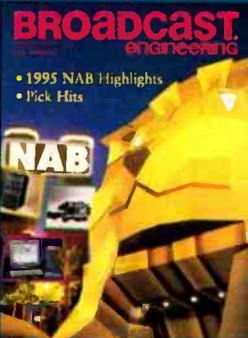
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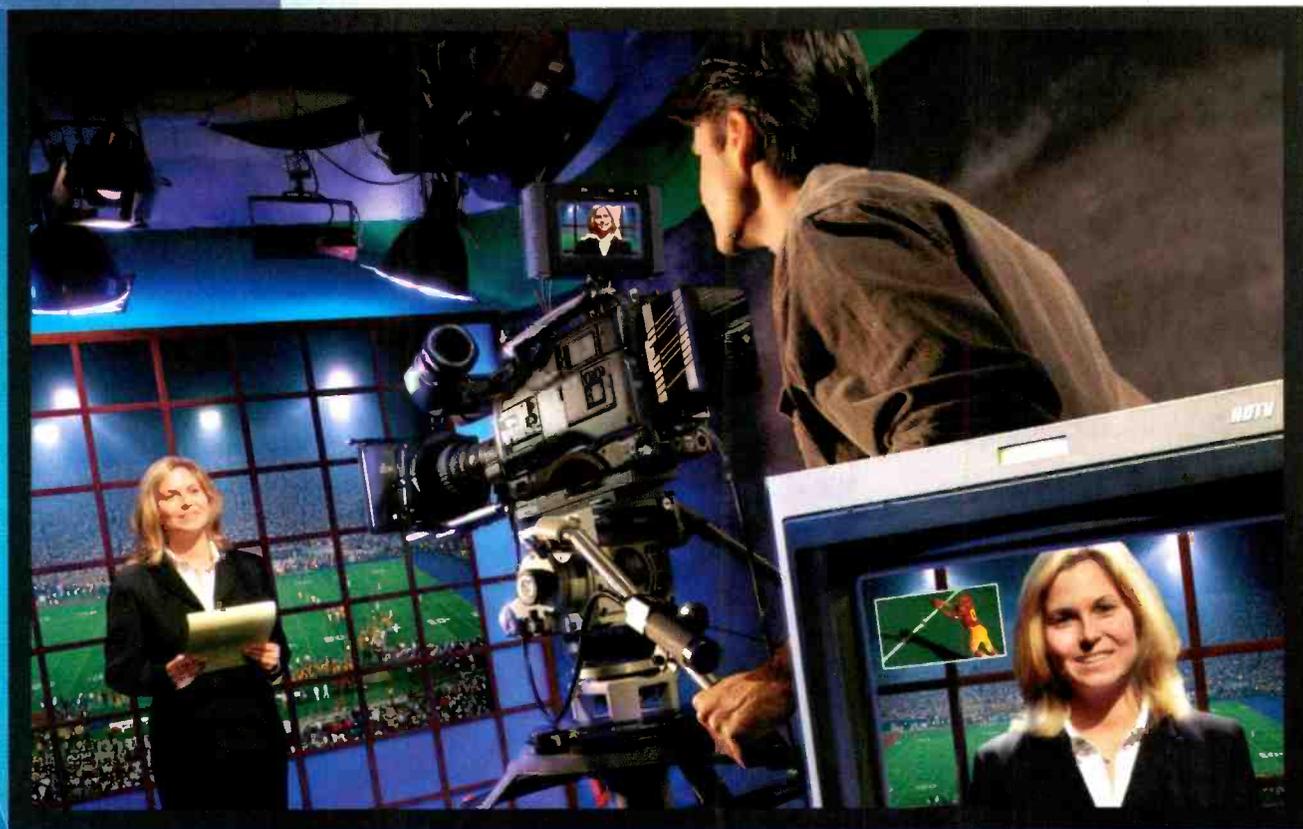
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Name this workstation



Name the "nonlinear AV workstation" introduced by Panasonic at NAB1995. Correct entries will be eligible to win a *Broadcast Engineering* T-shirt. Enter by e-mail. Title your entry "FreezeFrame-February" in the subject field and send it to: [bdick@primediabusiness.com](mailto:bdick@primediabusiness.com). Correct answers received by April 17, 2004, are eligible to win.

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## HDTV toy store

**F**or those of you who still don't believe in HDTV, go ahead and turn the page, because you're not going to like what I'm about to write. For the 95 percent of *Broadcast Engineering* readers who are open-minded enough to realize that HD is our future, read on.

The 2004 Consumer Electronic Show (CES) has just closed, and one of the two loud themes shouted from every corner was that HDTV is the future. The other



CES theme was home networking, but that's another story. I'm on the mail list of key professional newsletters, which ensures that I receive information on developing trends and themes. In the 19+ years I've been at *Broadcast Engineering*, I've never received so many CES releases on a single technology. I've never received so many press releases from such a wide range of companies announcing support or products for a single technology, or describing such a range of new products and applications as I have this year. I'm talking about HDTV.

At last count, I'd received more than 75 announcements on new HD-centric products and applications from this year's CES — everything from new LCD and DLP HD monitors to dual-receiver HD sets, HD DVRs, HD home networking products and new HD silicon solutions.

One of the more interesting themes is the range of HD PVRs being offered. Many will store up to 120 hours of

SD-quality material or up to 16 hours of HD material. For HD program junkies, it means you'll now be able to watch your favorite HD programs on your schedule.

The VOOOM channel has announced its HD service, which includes 39 channels of high-definition programming. Twenty-one of these channels are completely commercial-free. In addition, subscribers receive 88 channels of digital SD television feeds.

DIRECTV is also offering additional HD programming. The satellite company just announced a deal with CBS to carry the HD feeds from WCBS-DT in New York and KCBS-DT in Los Angeles. The appropriate affiliate (East or West Coast) will provide CBS network HD feeds to customers that have subscribed to local service from CBS-O&O stations. FOX is expected to provide its programming on a similar basis.

The DISH Network announced a package that includes a 16:9 HD monitor, an HD satellite TV receiver, a satellite dish, home delivery and standard professional installation, all for less than \$1000. A package of HD channels, including ESPN HD, Discovery HD Theater, HDNet and HDNet Movies is available for \$9.99 per month or \$109.89 annually. Other HD feeds include CBS, HBO, Showtime-HD and DISH-On-Demand pay-per-view HD movies. Customers can add the provider's new HD DVR for \$600. The recorder provides 25 hours of HD storage or up to 180 hours of SD storage.

And, if that's not enough to excite your HD nerve endings, how about an HD DVD recorder? LG Electronics introduced the world's first Blu-ray recorder with built-in DVR. The recorder comes equipped with a 200GB drive, an IEEE-1394 connector, the prerequisite DVI with HDCP Hollywood protection, and built-in ATSC and NTSC tuners. Add a TV guide subscription and the viewer is fully equipped to record and store his favorite HD movies and network feeds.

So, for those few old dogs out there that still think HD is a solution looking for an application, I've got news for you. That killer app has arrived.

*Broad Dick*  
editorial director

Send comments to: • editor@primediabusiness.com • www.broadcastengineering.com



# The widest range of multi-image display processors

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32



**Kaleido-K2**  
32-input, advanced modular multi-image display processor

10



**New Kaleido-Alto**  
10-input, highly affordable multi-image display processor

4



**Tango**  
High quality, SDI quad-split processor

- ➊ **Kaleido-K2 32-input, modular multi-image display processor** – an advanced, ultra robust processor designed to simplify the most demanding HD/SD broadcast monitoring requirements, with full integration with Miranda's master control switching and infrastructure monitoring systems. *Now also features a Dual Head (dual display) output option, and integrated multi-display and router control by mouse.*
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## Reducing noise

Mr. Robin,

I read your October article entitled "Digitizing audio," and have a question on the SNR formula for digital audio. We have two different audio levels (one very low and the other higher), and the quantization error is higher for the lower audio level. Should we associate the same discrete levels to both signals (increase the number of bits for the lower signal) in order to have the same SNR?

Also, in this case, does SNR refer to a reference audio level (i.e. a 0dBm test tone) or to the different audio levels (considering each audio level has the same discrete quantizing intervals)?

TIZIANO COLOMBO

Mr. Colombo:

The analog-to-digital conversion is characterized by two inseparable processes: sampling and quantization.

The sampling process consists of a pulse amplitude modulation (PAM) process, where a sequence of pulses occurring at constant time intervals  $T=1/F_s$  (where  $F_s$  is the sampling frequency) modulated by the sampled signal. PAM is essentially a distortionless process as long as the sampling frequency is higher than twice the sampled frequency and no aliasing occurs. PAM results in a sequence of pulses whose amplitude is

proportional to the sampled analog signal at the sampling instant.

The quantization is a pulse code modulation (PCM) process that helps represent the amplitudes of the successive samples of the analog waveform with binary integers. In this process, an infinite number of possible pulse amplitudes is reduced to a finite number of discrete levels,  $Q$ , according to the expression  $Q = 2^n$ , where  $n$  is the number of bits per sample. This is a nonlinear process. It is essentially a sample-and-hold where the instantaneous approximate values, with an uncertainty of  $\pm Q/2$ , also called quantizing error or  $Q_q$ , are held in memory until the next pulse arrives.

Depending on the original analog audio signal amplitude,  $Q_q$  is perceived as noise or distortion and noise. With large signal amplitudes  $Q_q$  has a random character and is perceived as noise. In digital systems the signal-to-noise ratio (SNR) is measured with respect to the highest possible digital signal level, known as 0dBfs or zero dB Full Scale. This noise is the result of the  $Q_q$  so it exists only in the presence of an audio signal. As the level of the analog signal is decreased, the  $Q_q$  becomes less random and the effect is a distorted representation of the analog audio signal.

## Color bars

Dear Michael:

I was wondering why we use only NTSC color bars now, instead of 100 percent color bars. Why do we have 100 percent color bars?

*Michael Robin responds:*

NTSC and PAL transmitters get overloaded with 100 percent colors bars; so, since the early years of color television, 75 percent color bars have been used, sometimes with the white bar level raised to 100 percent. Digital video equipment, including digital

distribution networks and digital transmitters, can accept 100 percent color bars, so there is no problem. The problems appear when NTSC or PAL transmitters are fed with 100 percent color bars from a digital signal source. This raises a different question altogether: Why do we use color bars? In the good old days, color bars were transmitted shortly before the beginning of the daily transmission to allow the viewer to adjust the notoriously unstable NTSC receiver to obtain pleasing colors. To reduce the problems of program interchange, videotape recordings had a "leader" consisting of a 75 percent color bar signal to allow adjustment of Quad VTRs or, later, UMATIC and Betacam VTRs. With digital equipment the need to use a color bars signal is restricted to the adjustment of the A/D and D/A converters for maintenance purposes. So here one would use a 100 percent color bars signal, since the digital equipment is designed to carry 100 percent color bars. In the year 2003, I cannot see the need to transmit on-air color bars.

BE

## December FreezeFrame:

Q. What unique feature was introduced on the Ikegami DNS-11 and DNS-101 cameras at the 1995 NAB convention?

A. A removable hard disk storage module from Avid called the CamCutter.

## Winners:

David Budwash  
Roberts Yent  
James Allen, KTBC-TV

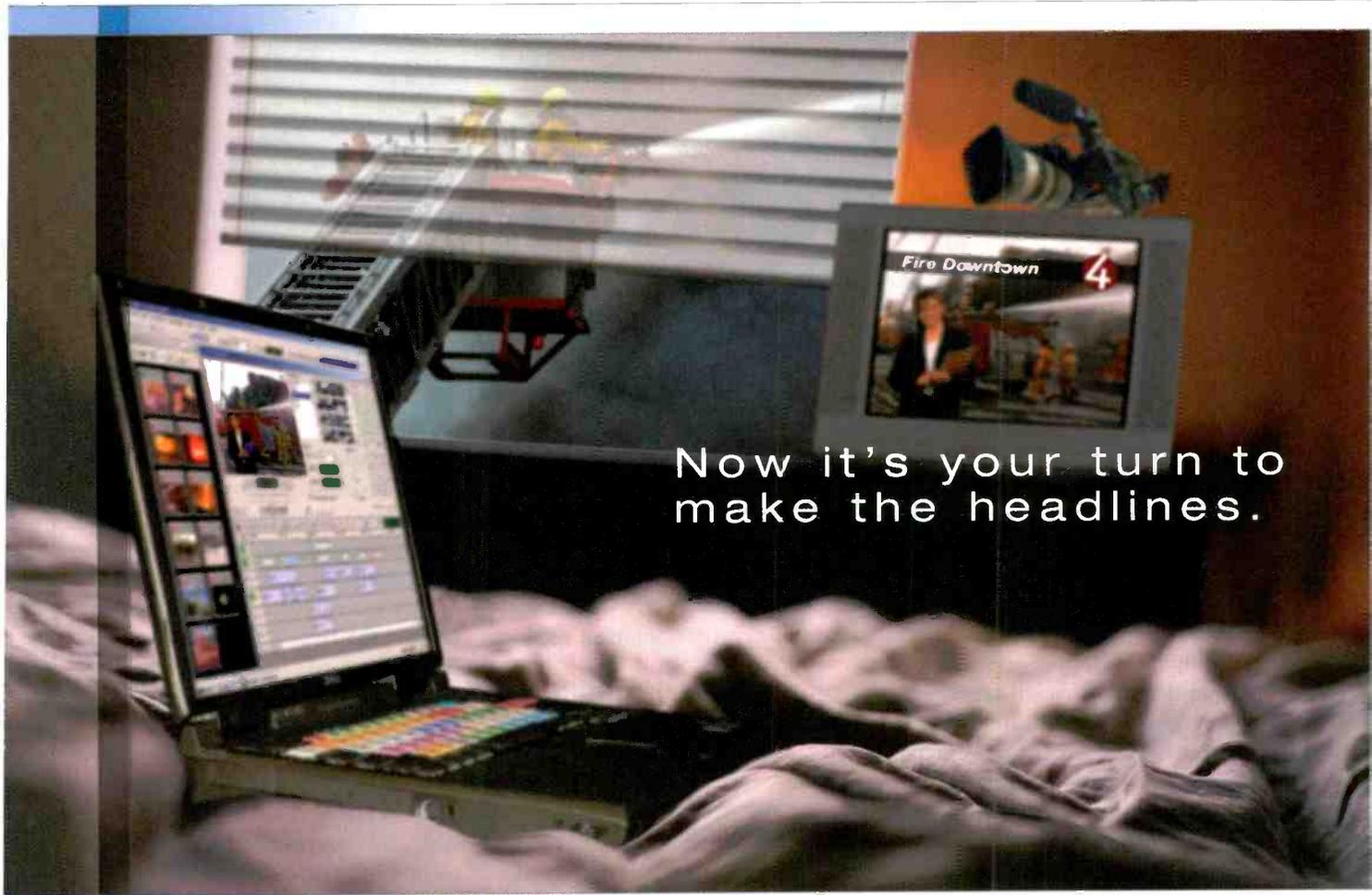
## Test your knowledge!

See the FreezeFrame question of the month on page 6 and enter to win a Broadcast Engineering T-shirt.

Send answers to [bdick@primediabusiness.com](mailto:bdick@primediabusiness.com)

# AFFORDABILITY THROUGH INNOVATION

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To find out more visit:  
[www.thomsongrassvalley.com/newsproduction](http://www.thomsongrassvalley.com/newsproduction).



## A new perspective on interoperability?

BY CRAIG BIRKMAIER

There's a hot new topic in the broadcast industry: digital workflow. If you are planning to attend NAB2004, it might be a good idea to spend some time familiarizing yourself with digital-asset-management terminology before you hit the show floor. Perhaps then you will be able to grasp the digital-workflow concepts that vendors will be pushing. Better yet, you might be able to determine which vendors are embracing the spirit behind the development of emerging digital-workflow standards and those who see this as yet another opportunity to lock you into their proprietary solutions.

This column will examine the history behind efforts to develop digital workflow solutions for broadcasters and other creators of digital media content. In March we will examine the implications of the emerging digital

workflow standards covered here, especially as they relate to multi-channel operations. Consider this column, and the Web resources that accompany it, as your introduction to digital workflow.

If you take the time to understand the fundamentals, you just might discover that broadcasters share the responsibility, with equipment vendors,

for the glacial pace of progress in the development of an appropriate digital workflow for the future of digital television. By no small coincidence, this parallels the slow pace of progress with the transition to terrestrial digital broadcasting.

Why? Because most broadcasters think that the forced march from analog-to-digital transmission will not change the underlying business model of TV broadcasting; one linear-program stream delivered to one big stick. Multicasting is beginning to garner some attention; however, most broadcasters are still focused on trying to capture the largest audience possible

**Products that support emerging digital workflow concepts and standards simply do not exist . . . yet.**

with one program, rather than fragmenting their audience via multicasts.

Most broadcasters who have built new facilities to support the digital transition have built digital clones of the old analog plant. The most dramatic change has been the shift from tape-based to disk-based servers for commercial insertion and, for a few, program playout. Downstream of the server things look the same; everything is converted to digital baseband, integrated via a master control switcher, and then fed to an MPEG encoder for emission coding. Most facilities have chosen house format for both SD and HD, and they convert everything to those formats.

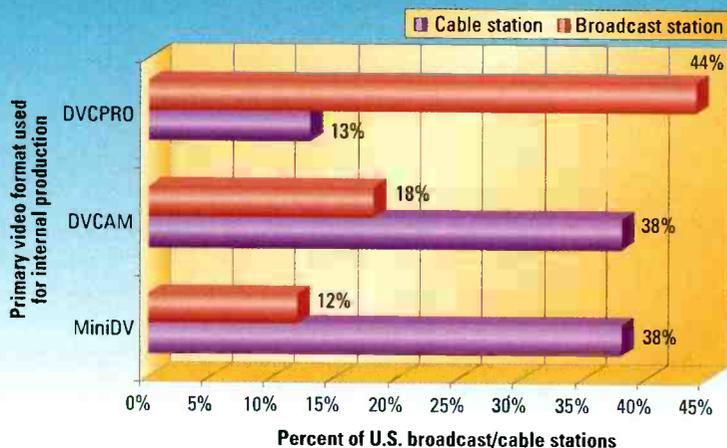
It would be easy to blame the customer for the lack of innovation and misunderstanding of the opportunity at hand. However, even those broadcasters who do see the opportunity to transform and revitalize terrestrial broadcasting via new digital-broadcasting techniques have had no means by which they could pursue them. Products that support emerging digital



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

#### Behind the scenes

#### Broadcast and cable split internal production among formats



SOURCE: TrendWatch

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workflow concepts and standards simply do not exist ... yet.

### Historical perspectives

As a starting point, it may be helpful to consider when digital-workflow concepts first appeared on the radar screen. As a journalist, I started writing about these concepts more than a decade ago. As a consultant and participant in the development of digital-workflow standards, I have been bringing vendors and end-users together to facilitate progress since the early '90s through OpenStudio and OpenDTV conferences and forums.

It is not surprising that the stimulus for change came from the world of information technology, which was revolutionized in the '80s by the personal computer, and in the '90s by the proliferation of TCP/IP networks, and their interconnection through the Internet. Desktop audio begot desktop video and transformed the tools used for video production. This created the opportunity and the need to manage digital assets, as opposed to rooms filled with source tapes, EDLs and program masters.

By 1997, however, the industry began to address the need for digital-workflow standards. Much of this work has taken place within the Society of Motion Picture and Television Engineers (SMPTE), in collaboration with the European Broadcasting Union (EBU). The PromPEG Forum has also played a key role in the development and promotion of digital-workflow standards. At NAB2004 these organizations will be promoting the Material eXchange Format (MXF), which became a SMPTE standard late last year, and the Advanced Authoring

Format (AAF), which is tightly linked with MXF.

Vendors of computer-based video-production tools have leveraged IT-based solutions, creating a parallel digital workflow with limited connectivity to traditional broadcast equipment and signal-distribution infrastructures. Many vendors are turning to Extensible Markup Language (XML), a standard developed for the Internet for storing information that describes the actual media content. This descriptive information is called metadata, while the actual media is called essence media.

Meanwhile, a new category of broadcaster has emerged. For the most part, the content delivered by these broadcasters cannot be received via analog or digital-terrestrial broadcasts. These broadcasters operate networks delivered by cable and DBS in the United States and around the world. They all share a common problem: the need to manage assets that will be distributed via multiple network feeds from a network operations center (NOC). In many cases, multiple versions of these assets must be maintained in order to deal with differences in what is considered acceptable content in various global markets, as well as different languages and differences in formats (PAL, NTSC and, now, HD).

In parallel, these organizations typically have an extended presence through Internet portal sites, thus many assets must also be repurposed for the Internet. Increasingly, these organizations are using their IT infrastructure to manage the parallel digital workflows in their in-house video networks.

One of the most advanced NOCs in the world is in Atlanta, the home of the



**All content for the Turner Broadcasting System's NOC is processed through ingest facilities where assets from Turner studios and outside vendors are digitized to the house MPEG-2 formats for SD and HD.**

Turner Broadcasting System (TBS). Turner also operates a separate NOC for CNN in Atlanta. Ron Tarasoff provided an extensive preview of the new Turner Entertainment Group NOC in the March 2003 issue of *Broadcast Engineering*, (a link to that story is included in the Web resources listed in this column). The center became operational in August 2003 and now feeds 22 channels, half of which reach international audiences. By the time this article is published, another international network will be operational, and in May 2004 Turner's first HD network (TNT-HD) will begin operations.

Planning for the center began about the same time that the SMPTE began work on digital-workflow standards. Turner engineers have been active participants in the development of these standards, but they did not stop there. Together with other organizations such as Discovery Networks, Turner turned the tables on manufacturers and hosted a series of "Perspectives" conferences to educate vendors about their requirements and larger market opportunities.

One of the biggest hurdles Turner had to overcome was the perception that the market opportunity was too small for most vendors to embrace. Traditional broadcast customers were not looking for comparable solutions; most still are not. But several companies, including

## Web links

An introduction to MXF and AAF

[www.snellwilcox.com/knowledgecenter/mxf\\_aaf.html](http://www.snellwilcox.com/knowledgecenter/mxf_aaf.html)

Metadata, MXF and other AV terms for digital media

[www.casbaa.com/doc/MXF\\_Metadata\\_Technology\\_Primer\\_2003-1019.pdf](http://www.casbaa.com/doc/MXF_Metadata_Technology_Primer_2003-1019.pdf)

A metadata dictionary

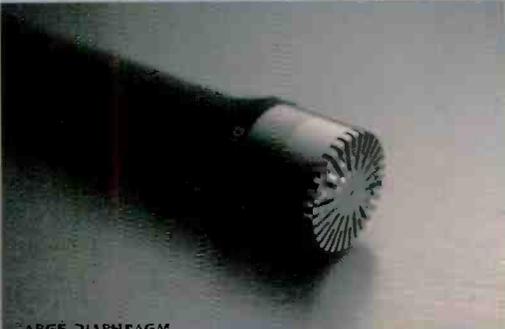
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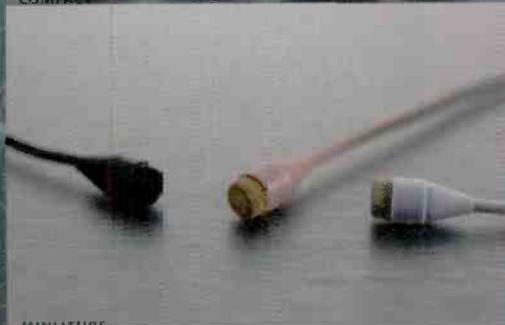
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Snell & Wilcox and Pinnacle, paid close attention and have become key suppliers to Turner. Engineers from both companies played a major role in the development of the MXF standard. Links to two Snell & Wilcox documents about MXF and AAF are included in the Web resources for this column.

Despite this extensive effort by Turner, it was not possible to procure products that supported these emerging standards in time to build the new NOC. Turner developed its own asset-management software and chose vendors who were committed to supporting these standards in the future through product upgrades. Thus, the new facility has parallel IT network and digital audio/video-network infrastructures that do not interoperate well.

All content for the NOC is processed through ingest facilities where assets from Turner studios and outside vendors are digitized to the house MPEG-2 formats

for SD and HD. In addition to the high-quality essence media, proxy videos are created that can be streamed over the IT infrastructure. This is used to maintain metadata and manage the digital-media assets stored on the MPEG-2 servers.

**What can MXF do?**

According to a paper written by Dave Monshaw, of IBM Digital Media, MXF is a versatile file format that can help the broadcaster perform a number of tasks. For example, MXF can wrap itself around any compression format, store cuts-only EDLs and the material they act upon, and wrap up a playlist of files and store the synchronization information. It also can store files in a streamable format, which allows viewing while transferring between heterogeneous equipment, and store simple finished works with metadata.

The perceived differences between the IT and digital video network

infrastructures that existed when work began on the MXF standard have narrowed as both have evolved. Protocols now exist to handle file transfers over SMPTE 259-M networks, and IT networks now can handle real-time streaming of compressed sources. And new hybrid solutions, such as IEEE 1394, have been designed to support real-time streaming, as well as direct attachment of hard disks and transfers of streams/files from camcorders and 1394-equipped VCRs. Typically, 1394 connections are localized to a workstation, but the next generation IEEE 1394b specs will support higher transfer speeds and the longer cable runs needed for broadcast facilities. **BE**

*Craig Birkmaier is a technology consultant at Pcube Labs, and he hosts and moderates the OpenDTV Forum.*



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## Broadcasters seek modified DTV must-carry rights

BY HARRY C. MARTIN

**A** new DTV must-carry proposal was recently presented to the FCC by the National Association of Broadcasters and Association for Maximum Service Television (MSTV). The new proposal would allow a station to elect must-carry for either its analog or digital channel and to elect retransmission consent for the other channel during the transition. Or, a station could elect to retransmission consent for both channels. The cable industry opposes the new proposal.

The new proposal also would require cable systems to install technology by Jan. 1, 2006 that would pass through the digital channel to digital television sets and downconvert the digital channel for reception on analog television sets at no additional charge on the

analog basic-cable tier. If a cable system failed to do so, stations could elect must-carry for both their analog and digital channels during the transition. Upon delivering the digital channel to both digital and analog sets, a cable system could cease carriage of the analog channel. Cable operators reportedly see this portion of the plan as a back-door attempt to obtain dual must-carry.

Broadcasters argue that the new proposal alleviates cable's First Amendment concerns about required carriage of two channels from a single station. They further state that the proposal would protect smaller stations, which might be less likely to select digital carriage during the transition, and their viewers. Broadcasters also argue that the proposal would provide an incentive for cable operators to upgrade their systems. If stations elect must-carry for their digital channels, cable operators argue that cable systems would be forced to also carry their analog channels because most subscribers rely on analog cable service. Broadcasters responded that cable systems would be free to choose between carrying both channels or upgrading their technical facilities to reach all subscribers. They argue that this would be a business decision without First Amendment concerns.

The FCC is expected to issue a rule-making decision in early 2004 that permanently rejects dual carriage of analog and digital channels after the DTV transition. The current effort to obtain carriage rights during the transition is seen as an effort to salvage at least something from the DTV must-carry proceeding.

### How to navigate the electronic filing system

The FCC has several electronic systems for filing applications and reports. The system used for CDBS, which is located on the FCC Web site, [www.fcc.gov](http://www.fcc.gov). All licensees must have an FCC registration number (FRN), which can be obtained electronically through the commission registration system (CORES). Here are a few tips for navigating the FCC's filing systems:

**CORES:** Determine if you already have an FRN. If you paid regulatory fees this year, or have filed any applications or paid any fees since December 2001, you should have at least one FRN. In the CORES system, click on the search button and select advanced search. Type your TIN into the box marked "TIN" and search. If your TIN has been used to register an FRN, it will show up with this search. You also may call the FCC's CORES help desk (877-480-3201, Mon.- Fri., 8 a.m. to 6 p.m. ET).

If you have your FRN but do not have a password, you need to call the help desk to get a new password.

**CDBS:** You need a CDBS account number and password, and an FRN and its password to file on CDBS. If you plan to pay electronically, or if you would like the computer to generate your 159 forms, you need the employer identification or social security number of the paying party. If you lose your account number or password, you may open a new account. **BE**

### Dateline

Television stations in D.C., Maryland, Virginia and West Virginia must begin their pre-filing renewal announcements on April 1, 2004, in preparation for renewal application filing on June 1, 2004. Other television stations' renewal application filing dates in 2004 are:

August 1

North Carolina, South Carolina

October 1

Florida, Puerto Rico, Virgin Islands

December 1

Alabama, Georgia

Also on April 1, stations in Delaware, Indiana, Kentucky, Pennsylvania, Tennessee and Texas must place their annual EEO reports in their public files.

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



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# Component video basics



BY MICHAEL ROBIN

**C**omponent video describes a system in which a color picture is represented by a number of video signals, each of which carries a component of the total picture information. In a component video facility, the analog component video signals are processed separately. Ideally, encoding into a transmission format occurs only once: prior to transmission.

All color television systems use the principle of additive colors with green, blue and red (GBR) as primary colors. GBR signal amplitudes are best described using a color bars signal representation. In this article, we will make

reference to a standard set of color bars with well-defined characteristics. They feature a full-screen sequence of vertical bars showing the saturated

primaries (green, blue, red) and their complements (magenta, yellow, cyan) as well as black and white. The active line is thus divided in eight equal parts. The first is occupied by a luminance reference white bar, i.e. a white bar of a standard amplitude. The last bar is a black bar; that is, it is black level only.

Waveform	NTSC-related	NTSC-related with setup	SMPTE 253M
<p>Green signal</p>	714.3mV	714.3mV	700mV
Peak video	714.3mV	714.3mV	700mV
Setup	0mV	53.57mV	0mV
Blanking	0mV	0mV	0mV
Sync	-285.7mV	-235.7mV	-300mV
<p>Blue signal</p>	714.3mV	714.3mV	700mV
Peak video	714.3mV	714.3mV	700mV
Setup	0mV	53.57mV	0mV
Blanking	0mV	0mV	0mV
Sync	-285.7mV	-285.7mV	-300mV
<p>Red signal</p>	714.3mV	714.3mV	700mV
Peak video	714.3mV	714.3mV	700mV
Setup	0mV	53.57mV	0mV
Blanking	0mV	0mV	0mV
Sync	-285.7mV	-285.7mV	-300mV

Figure 1. Analog component GBR signal characteristics for 100 percent color bars

## The GBR component signals

GBR component signals are essentially three monochrome video signals, each representing one of the primary colors. Possible sources of GBR signals include cameras, telecines, composite video decoders, character generators and graphics

systems. Figure 1 presents several sets of GBR signals encountered in practice. The signal amplitudes are typical of 100 percent color bars. All signals are shown with sync added. Some sets of signals have sync added to the green component only, whereas others carry sync on a separate (fourth) wire.

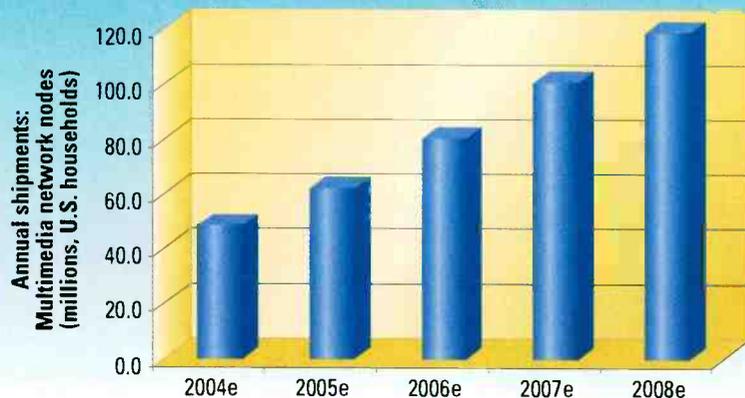
The distribution channels need to have identical bandwidths, gains as well as controlled (small) differential delays with respect to the reference (green) signal. Loose channel gain and frequency response tolerances result in corrupted (colored) whites. Differential delays result in poor registration, leading to funny-paper-like colored-fringe pictures. GBR component

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signals have limited applications in a teleproduction environment, mainly because there are no GBR component video VTRs available on the market.

### The Y, B-Y, R-Y component video signals

Y,B-Y,R-Y signal components are linear combinations of signals representing the three primary colors: green, blue and red. Possible sources of Y,B-Y,R-Y signals are cameras, analog component videocassette recorders and composite video decoders. GBR signals are combined to form a full bandwidth luminance signal (Y) and two narrowband color-difference signals (B-Y and R-Y). Because the human eye relies on luminance to convey picture detail, much less resolution is needed in the color information. Some savings in bandwidth can thus be obtained by using color-difference signals. One-half or one-quarter of the Y bandwidth is usually acceptable, depending on the application. Y, B-Y and R-Y component analog signal outputs are available with most contemporary analog cameras.

The mathematical expression for the luminance component is:

$$E'_Y = 0.587 E'_G + 0.114 E'_B + 0.229 E'_R$$

where E represents a voltage, and the prime sign indicates that the signal has been gamma-corrected.

The chrominance information is conveyed by two of the primary signals minus the brightness component. These signals are known as the blue color-difference and red color-difference signals. They are:

$$E'_B - E'_Y = -0.587 E'_G + 0.889 E'_B - 0.299 E'_R$$

$$E'_R - E'_Y = -0.587 E'_G - 0.114 E'_B + 0.701 E'_R$$

There have been limited attempts at standardizing analog component video signals in North America. Currently, a number of de-facto proprietary "standards" coexist, making interconnection of equipment difficult. The difficulties

typical of 100 percent color bars. Normally, the Y signal has sync added. The color-difference signals are bipolar and symmetrical about the reference axis.

The first column of Figure 2 shows the characteristics of NTSC-related signals as would be obtained at the output of an NTSC decoder. Note that the color-difference signals have unequal p-p amplitudes as determined by the scaling factors in Figure 1.

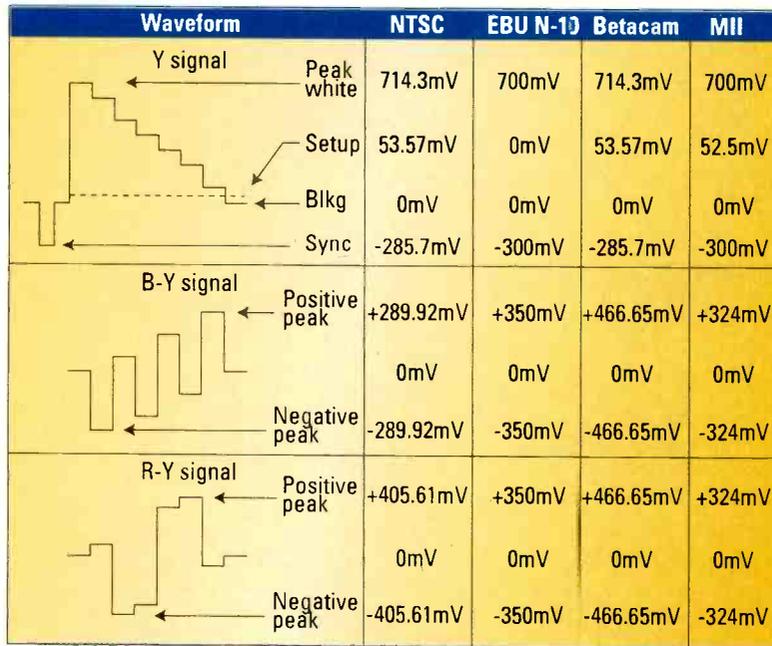


Figure 2. Analog component Y,B-Y,R-Y signal characteristics for 100 percent color bars

encountered are mainly due to the non-standard scaling factors of the color-difference signals. These are scaled in amplitude by suitable multiplication factors. The scaling factors depend on the application. Table 1 shows the various scaling factors used. The scaled color-difference signals are identified as  $E'_{B-Y}$  and  $E'_{R-Y}$  to avoid confusion.

Figure 2 shows the typical waveforms of Y,B-Y,R-Y signals encountered in practice and their characteristics. The signal amplitudes are

encountered in practice and their characteristics. The signal amplitudes are typical of 100 percent color bars. Normally, the Y signal has sync added. The color-difference signals are bipolar and symmetrical about the reference axis.

The third column of Figure 2 shows the signal amplitudes of signals typical of Sony Betacam VTRs and related products marketed in North America. The fourth column of Table 1 lists the color-difference signals scaling of the

North American versions of the Betacam component analog VTR format as well as the component analog outputs of color cameras of Japanese manufacturers marketed

Signal	NTSC/PAL	EBU N-10	Sony Betacam	Panasonic MII
$E'_{B-Y}$	0.493	0.564	0.75	0.522
$E'_{R-Y}$	0.877	0.713	0.95	0.66

Table 1. The color-difference scaling factors

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in North America. Note the 933mV p-p color-difference signal amplitude and the 714.3mV (including setup) p-p luminance signal amplitude (ignoring sync). It is to be noted here that the same products marketed in 625/50 countries have scaling factors as per EBU N-10 and signal characteristics as shown in the second column of Figure 2. The same products marketed in Japan are similar to the North American version except that the luminance signal has no setup.

The fourth column in Figure 2 shows the signal amplitudes of signals typical of Panasonic MII component analog VTRs marketed in North America. The fifth column in Table 1 lists the color-difference signals scaling of the North American version of the MII component analog VTR format marketed in North America. Note the 648mV p-p color-

difference signal amplitude and the 700mV (including setup) p-p luminance signal amplitude (ignoring sync). It is to be noted here that the same products marketed in 625/50 countries have scaling factors as per EBU N-10 and signal characteristics as shown in the second column of Figure 2. The same products marketed in Japan are similar to the North American version except that the luminance signal has no setup.

### Potential problems

Both component analog recording formats feature analog composite and analog component in/out ports. The composite in/out ports are mutually compatible. Consequently, connecting equipment using analog composite NTSC signals should cause no problems other than the unavoidable accumulation of analog NTSC impairments.

The color-difference scaling factors are different in the four standards discussed above. Strictly speaking, these "standards" and their component analog in/out ports are signal-level incompatible. An ideal approach is the normalization of the component analog signal levels in the component analog signal distribution path to EBU N-10 specifications and the use of signal level adaptors to match the component analog inputs and outputs of non-standard equipment. **BE**

*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, and recently translated into Chinese and Japanese.*



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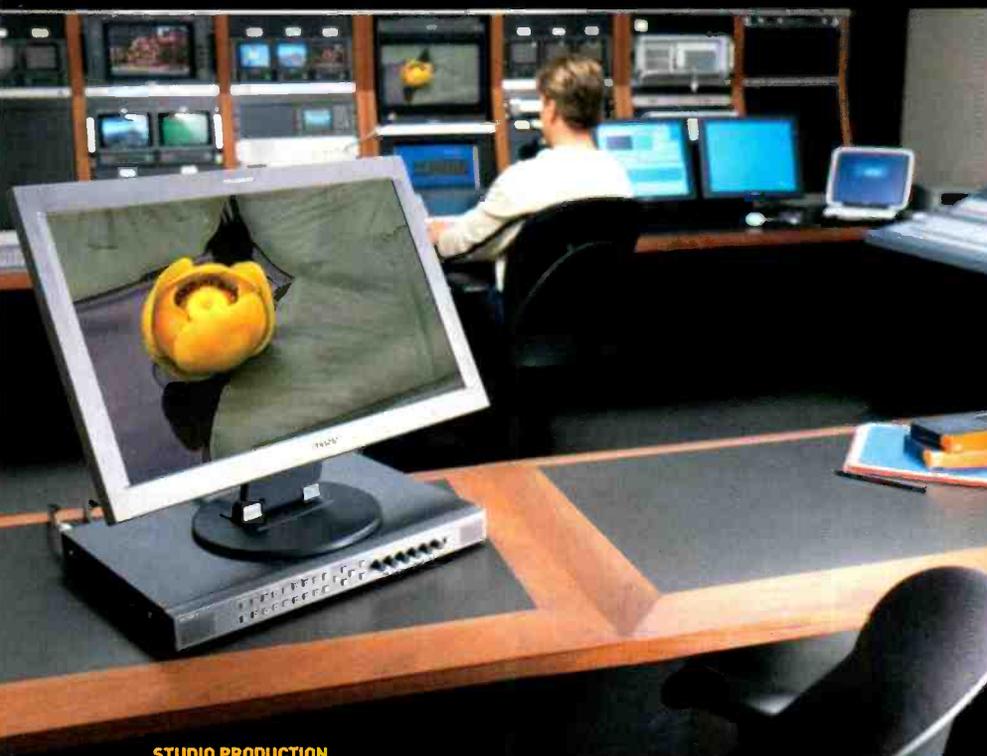
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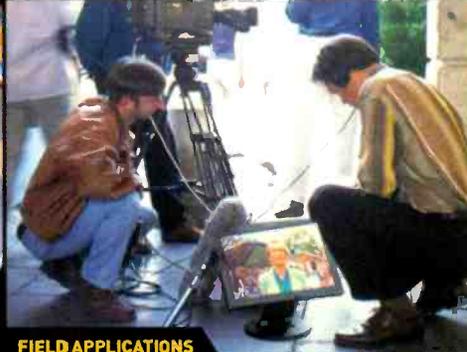
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## Video networks for broadcast

BY BRAD GILMER

Last month's column covered basic networking. This month we will look at the requirements for video networks for broadcast and how you can use technology to meet these needs. Planning a video network for broadcast can be a little trickier than planning for a conventional network. If you are designing a conventional business network, the traffic, applications and band-

width requirements are well-known; people have been building these types of networks for years. But, if you are building a network for broadcast, things are not as clear. Most broadcast facilities include some post production. Just how much of the network is used for post can greatly affect the design of the network; the files moved around in post tend to be large. Broadcast facilities also frequently include news applications. If the news workflow supports server-based editing and collaborative workflow, then the network requirements can be quite demanding. If, on the other hand, your broadcast facility is still primarily tape-based, then a phased approach that allows you to expand capacity as network demands increase may be best.

Engineers who design video networks for broadcast might do well to start with a list of requirements for their facility. Some possible considerations are: number of simultaneous connections, mix of clients and servers, video application types, criticality of network, age of connected devices, operating

### Number of connections

Consider the maximum number of network-interface cards (NICs) you expect to have connected to the network at one time. Include all desktop computers and servers of course, but you might also want to include temporary connections for laptops, demonstra-

tion equipment and special-event requirements. The number of connections needed, and how widely they're distributed, will determine the number of switches needed (see Figure 1).

### Mix of clients and servers

It is important to know the mix of clients and servers because servers will require high-bandwidth connections.

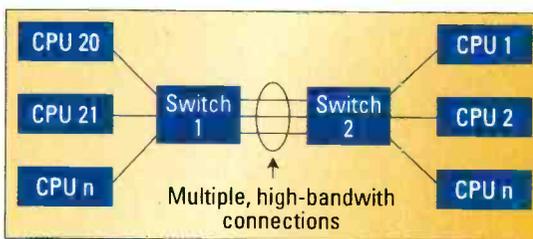


Figure 1. Networks with a large number of simultaneous connections may require two or more switches. Note the high-bandwidth connection between the switches.

In conventional networks, there are many clients and a few servers. Broadcast networks may be the same, but the number of servers can be higher. Also, the placement of central servers in your network topology is critical if you are to avoid bandwidth bottlenecks.

You should also think about whether the client-to-server ratio is likely to change radically in the near future, so you can plan accordingly.

### Video application types

We are fortunate to have a wide variety of network-aware video applications available these days. Many do not significantly impact network performance. However, if you have a news department that wants to use a centralized storage facility with network editing, you must take into account the extra demand these applications will place on your network. Opening video files across a network for editing requires a huge amount of bandwidth, especially if multiple clients are involved. You may be better off keeping the content local, and only exchanging edit information across the network.

### Criticality of network

When building a broadcast video network, one of the most important issues to be addressed is the criticality of the network. It is easy to say, "Of course this network is critical; it serves my broadcast facility." But are you willing to pay 10 or 20 times more for your network? If you use off-the-shelf, consumer-networking hardware, costs can be extremely low. But, if you use so-called enterprise

hardware from top-of-the-line manufacturers, the costs can be staggering.

To make an informed decision, you must know what functionality and reliability you get for an order-of-magnitude price increase. Generally speaking, a step up to enterprise technology gets

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you 1) greater throughput through switching components, 2) better remote monitoring, 3) advanced failure and automatic recovery features, and 4) higher-quality components. While these features may be critical to you, bear in mind that you may be able to purchase 10 or 20 backup switches for the price of an enterprise switch.

Situations will vary, and there are some facilities that absolutely need the features that more-expensive device provides. You will need to make that decision.

### Age of connected hardware

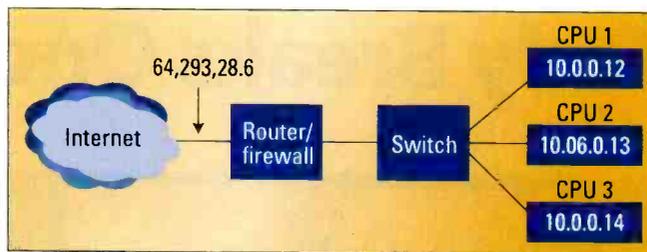
What is the age of the computers you are connecting to the network? Are they all older computers with 10Base-T NICs? Do they have NICs at all? Is it realistic to connect these computers to the network, or would it be less expensive and less problematic to purchase new computers that are network-ready? The time and effort required to get old computers ready to connect to a network may exceed the value of the computers themselves. It is now possible to buy powerful computers for under \$500, and older network-ready computers are available on E-BAY and from local sources at low cost.

### Flexibility of network hardware

These days, Ethernet hardware has advanced to the point that a single piece of equipment can support 10Base-T, 100Base-T and Gigabit Ethernet. The equipment can auto-switch between these different technologies without any user configuration, and you can mix different speeds without any problem. This is good news because your new network will be able to support old equipment as well as your newest high-speed server. The price of Gigabit switches has also started to drop dramatically.

### Operating systems

It is a fact that some operating systems are easier to connect to a network



**Figure 2. An Internet router/firewall uses network-address translation to hide the true IP address of your computer from the outside world.**

than others. Also, it is well-known that particular versions of operating systems are prone to networking difficulty. Without getting into specifics, the author has had good networking experiences with Windows 95, 2000 and XP. He has also found various forms of \*NIX including Red Hat and Free BSD to be extremely stable networking platforms. Mac OS9 and OSX also seem to be stable and reliable.

### Equipment lifetime

When planning your network, you should be realistic about how long the equipment will last. You should face the fact that, the day after you purchase network components, something else will be available that is faster, less expensive and has more features. Networking hardware remains functional for a long time. The author still has some old pre-Ethernet networking cards that work just fine, but they certainly are not usable today. So go ahead and purchase new equipment when you need to and don't look back. Use old equipment when it makes sense, and throw out old technology if you suspect it will be more trouble than it's worth.

### Internet connectivity

An increasingly key component of any video broadcast network is Internet connectivity. The author has found that people are of two minds on the subject, and the issue seems to be driven by user requirements. On one hand, there are many times when people need access to the Internet as part of their normal work processes in a broadcast facility. On the other

hand, broadcasters are justifiably worried about security issues that come with an Internet connection. It might be simple to say that Internet connections should never be permitted on video networks for broadcast. But with the advent of commercial and program delivery over the Internet,

the increasing use of the Internet in group-station environments through virtual private networks, and the general ubiquity of the Internet in everyday workflows, it seems that outlawing Internet connectivity altogether may not be practical.

In your network planning, you should think about whether your Internet connection will be persistent (always available), or whether it on-demand (only available when required, or when someone in the facility enables it). In most cases, you will find that the demand for Internet connectivity will be so high that it may be easier to plan on a persistent connection from the beginning, even if this goes against your intuition from a security standpoint.

Given this need, your plan should include getting someone in your facility up to speed on firewall and router configuration, network-address translation (NAT), port-address translation (PAT) and other network-security issues (see Figure 2). Classes on these subjects are widely available, and well worth the investment. That said, in any plan including an Internet connection, you must include a firewall and proper anti-virus protection to keep people with malicious intent from causing problems on your network. **BE**

*Brad Gilmer is executive director of the AAF Association, executive director of the Video Services Forum, and he is the president of Gilmer & Associates, a consulting firm.*



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## HDV transforms sitcom budgets

BY L. T. MARTIN

**W**hen producer Ron Greenwood and co-producers Leslie Taylor and Roger Dragsdorf put together their original budget to cover shooting the pilot of their upcoming sitcom, "Hollywood Alive," they calculated the cost of producing it in high definition would come in at around \$1.5 million. However, by deciding to tape this 3-camera shoot with JVC's new JY-HD10U cameras, the producers were able to bring the total production costs down to only \$150,000.

When JVC introduced its JY-HD10U camera in June 2003, it was greeted with some understandable skepticism, especially when the professional videographers saw its \$4000 price tag. Based on JVC's consumer-level GR-HD1 camera, the JY-HD10U manages to squeeze a 16x9 high-definition signal onto a standard mini-DV cassette by using an HD version of MPEG-2 compression (MP@H-14). Although

the specifications for the HDV format formulated by a consortium of Canon, Sharp, Sony, and Victor of Japan (JVC), include recording the 720 scanning lines (progressive)/1280 horizontal pixels 720p format (60p, 30p, 50p, 25p), and the 1080 scanning lines (interlace)/1440 horizontal pixels 1080i format (60i, 50i), JVC's first

recording technologies, but he was well aware that the necessary ancillary equipment such as dollies, cranes, matte boxes and follow-focus systems did not yet exist for the smaller format cameras. When JVC announced its hand-held JY-HD10U at NAB2003, Shuster recognized its potential and began designing add-on production

**A JVC JY-HD10U with lens and sticks can be had for less than \$1000 for the same time frame.**

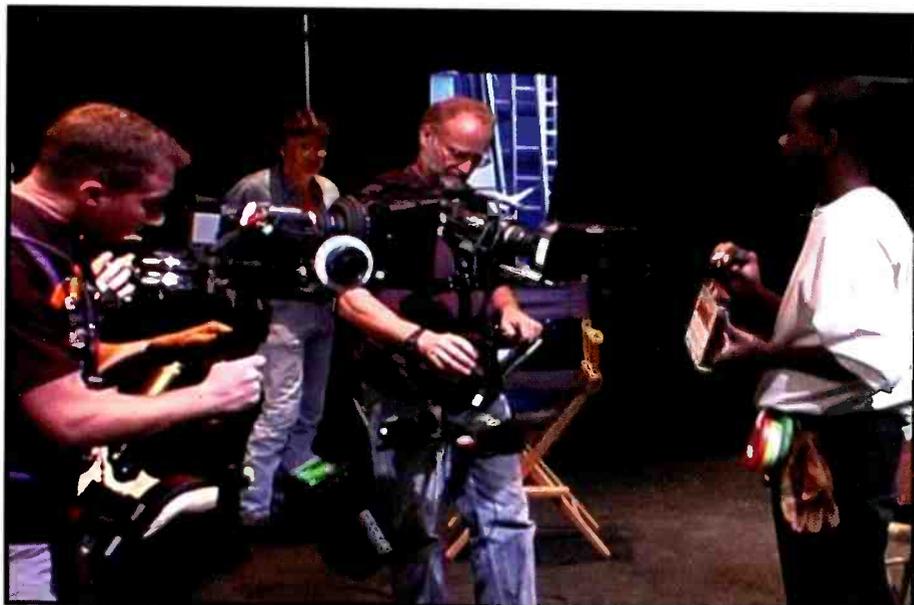
HDV camera uses a single-imaging chip to record 720/30P high-definition images.

Robert Shuster, the executive producer of "Hollywood Alive," is the corporation manager of Hollywood Studio Rentals, a house that specializes in DV equipment. He has long-awaited an alternative to HDCAM or D-5

gear that would outfit the camera for professional production applications. By the time Greenwood brought the production to him, Shuster had designed add-on gear for pulling focus, lightweight body mounts and mini cranes that would adapt the HDV camera for the kind of studio shoot most crews were familiar with.

The rate card speaks for itself when comparing weekly camera-rental charges between conventional HD equipment with the new HDV format based on a month-long shooting schedule. Recognizing many variables, a Panasonic VariCam package, including a lens tripod, head and battery rents, for around \$3000 a week from most Hollywood equipment providers, while a similar Sony CineAlta camera set-up usually goes for \$4000 to \$5000 a week depending upon configuration. A JVC JY-HD10U with lens and sticks can be had for less than \$1000 for the same time frame. Given the ability to shoot with a smaller crew, the lack of specialized technicians, and comparable savings on body mounts, smaller dollies and cranes can leave a lot of budget left over.

Posting the HDV footage proved



The JVC JY-HD10U camera works well with a smaller crew, such as the group of technicians who worked on the 3-camera set of "Hollywood Alive."



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straightforward thanks to the Aspect HD plug-in software that Cineform created to prepare the short Group of Pictures (GOP) MPEG-2 high-definition footage for editing in Adobe Premiere 6.5. Aspect HD uses wavelet compression to convert the HDV transport stream into Cineform's own visually loss-less proprietary CFHD

format based on the Windows AVI file structure. CFHD increases 19Mb/s HDV bandwidth to roughly 6-10 Mb/s, allowing two simultaneous real-time HD channels from a 7200-rpm hard drive. Hollywood Studio Rentals set up an edit bay based on a single Pentium 4 processor Windows platform with RAID array storage that

could handle up to six HD streams at the same time, while Aspect HD provided an enhanced video pipeline with improved HD transitions, effects and motion control over those available from Premiere by itself. The final version will be converted to either D-5 or HDCAM, depending upon their client's submission requirements.

Of course, there were obstacles to overcome when pioneering the implementation of a new recording technology. HDV is less forgiving when maintaining definition in brightly lit areas than other HD formats and directors have to tailor their lighting schemes to accommodate the MPEG-2 recording's requirements. Crews accustomed to more robust HD equipment had to adjust to the light weight of the JY-HD10U camera, and the new follow-focus controls and matte box equipment designed by Hollywood Studio Rentals took some getting used to. But the look of the HDV footage, even before color correction, while not satisfying the ideals of HD purists should easily fulfill the expectations of a television audience weaned on videos and DVDs.

Greenwood and Taylor don't necessarily expect the pilot for "Hollywood Alive" will actually see broadcast. So far, it is more of a vehicle to demonstrate the story lines, the character mix and their own ability to bring such a project to fruition. But several technologies exist to convert the HDV 720P/30 images to other HD delivery formats, and tests are under way to demonstrate HDV's validity as the original source for ultimate over-the-air transmission.

With HDV making inroads into documentaries and independent features, as well as being ideal for entry-level HD ENG applications, the cost advantages of using a camera such as JVC's JY-HD10U are starting to let producers put their money on the screen rather than into equipment rentals.

*L. T. Martin is a freelance writer and post-production consultant living outside of Los Angeles.*



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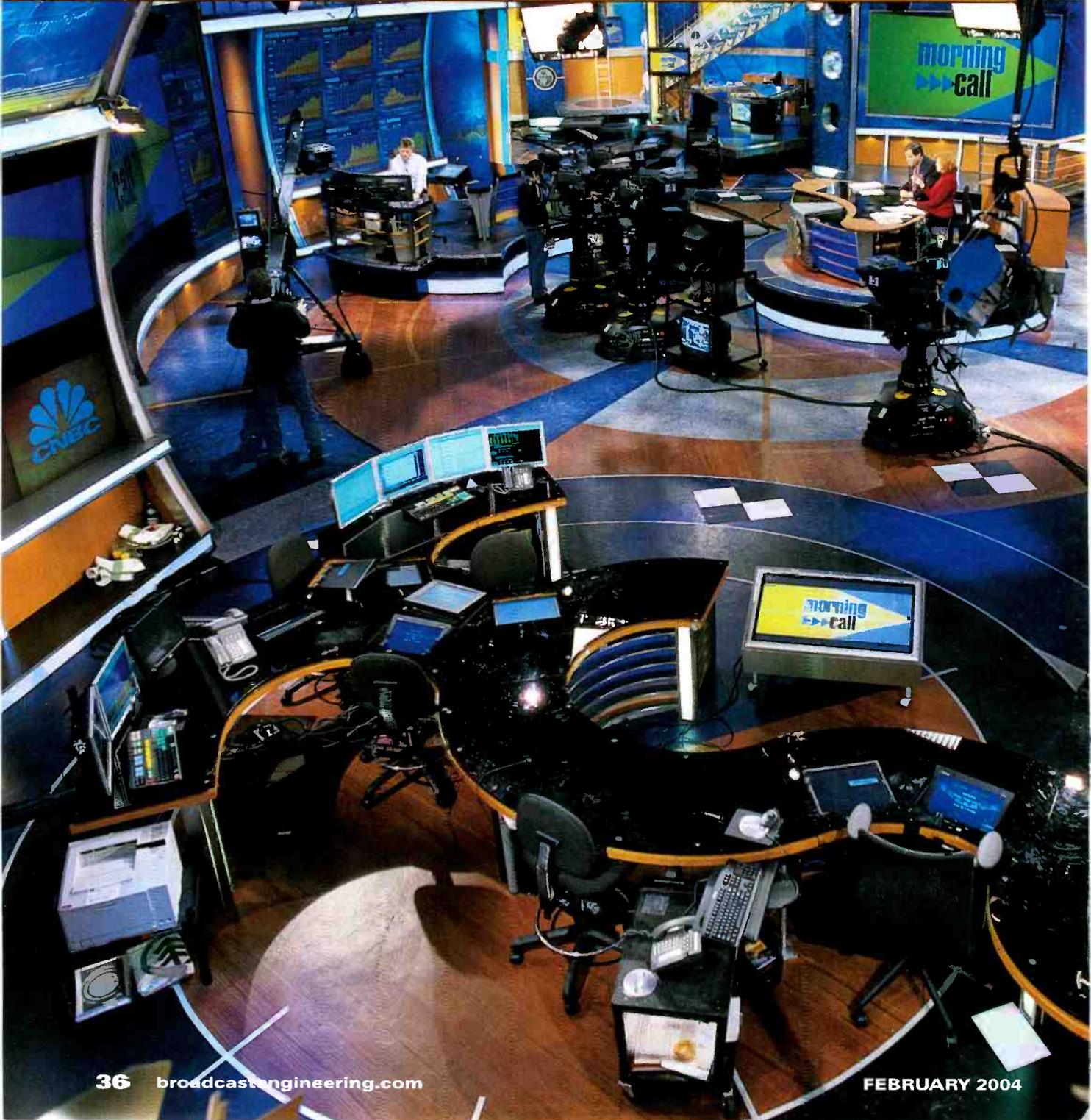
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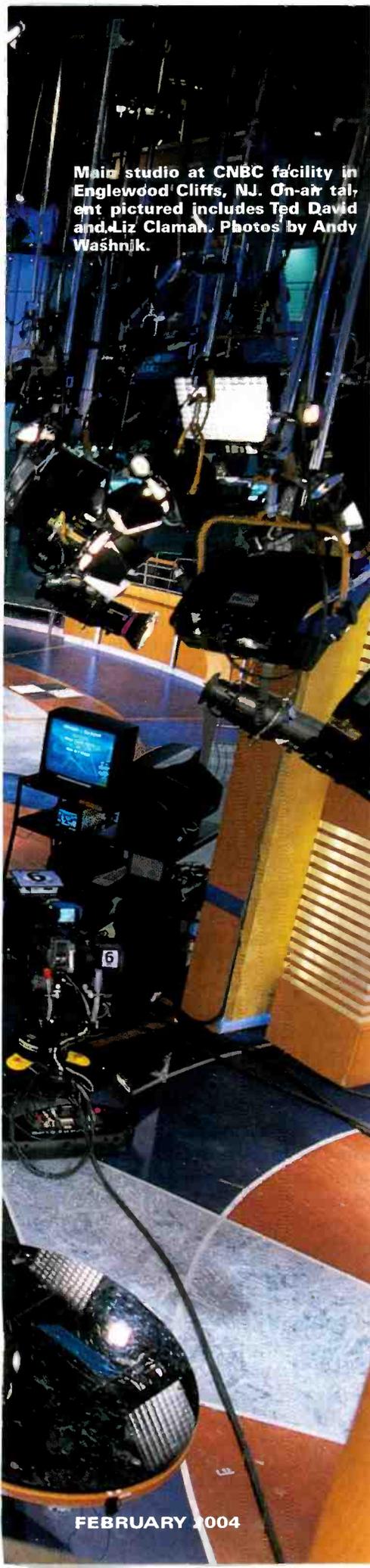
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# CNBC'S

## new network broadcast operations

By Michael Grotticelli





Main studio at CNBC facility in Englewood Cliffs, NJ. On-air talent pictured includes Ted David and Liz Claman. Photos by Andy Washnik.

**O**n Oct. 13, 2003, the operation of CNBC, NBC network's cable business channel, switched over from its existing Ft. Lee, NJ, broadcast center and went live from a new multimillion-dollar CNBC World Headquarters broadcast facility in Englewood Cliffs, NJ.

Building a new facility from the ground up provided the network with a unique opportunity to rethink traditional operations models and incorporate future-proof technology. CNBC took a close look at all of its production processes and eliminated non-essential steps in order to develop a completely new workflow based on today's need, according to Peter Smith, vice president of advanced technology at the NBC network.

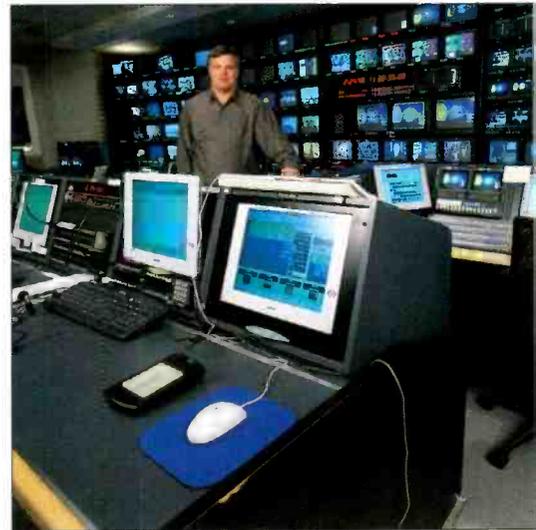
Non-traditional suppliers to the industry provided much of the groundbreaking technology in use at the new 355,000-square-foot facility.

The new CNBC building features an efficient workflow design that includes a massive signal-routing matrix; computer-based, state-of-the-art satellite operations facilities; three fully networked audio/video control rooms; a shared, open, storage-area network for editing and graphics creation; and a comprehensive archiving system. This design offers the flexibility for growth as more NBC properties are launched.

### **The project team and the plan**

The plan for the new center was conceived in June 2000, as the network's Ft. Lee studios outgrew capacity at the height of the stock market boom. Architects HLW International designed the core and shell of the new CNBC global headquarters, while the Phillips Group (in New York City) designed the interiors. Sony Systems Integration and the Systems Group (in Hoboken, NJ) completed the electronic installation from February to October of 2003. All of this was completed under the supervision of Steve Fastook, now vice president of CNBC Technical and Commercial Operations, and the CNBC/NBC project team.

This project team was tasked with determining the innovative technical and ergonomic strategies that could work best for both the facility and the operation. This collaboration produced a document called the "Outline Guide for Design and Construction" (OGDC). It detailed a facility that



**Steve Fastook, vice president of CNBC technical and commercial operations in one of three new production control rooms that include a Sony MVS-8000 switcher and Grass Valley NewsQ Pro system for preview and access to all clips within the facility.**

would house contemporary digital systems that improved workflow, optimized space, and cut production time and costs.

The goal was to build a facility that would foster collaboration among its 300 to 400 employees, optimize productivity, and maintain the familiar and friendly work environment the staff already enjoyed. The new headquarters would also have to accommodate several existing production systems moved over from Ft. Lee.

### **IT and equipment room**

A large 461-rack central equipment room housing video and audio equipment and a vast array of IT gear not only hosts traditional functions such as user data, corporate e-mail, and business applications, but also powers all on-air data applications; including

the CNBC news ticker, charts and boards, and the 3-D Bug, all key components of CNBC's channel branding.

The equipment includes CLARiON and Celerra storage area networks, network-attached-storage products from EMC, and ADIC's i2000 tape library. These are all connected to the production environment via fiber and Gigabit Ethernet networks. Employees have full access to all assets from their edit stations and playback systems (no matter where they reside), which are managed by Thomson's Grass Valley ContentShare and EMC's AvalonIDM software. Leveraging these IT systems enabled the facility to build production clip storage and archival capacity for years' worth of material at a tremendous cost savings.

### Media management

In the digital news production system, Thomson Grass Valley's Web-based application, NewsBrowse, allows satellite operations and media operations staff to initiate both scheduled and "crash" server recordings on 16 channels of the server.

These 16 channels of ingest are part of a Thomson Grass Valley SAN that connects to eight NewsEdit nonlinear systems. Editors can cut content while recordings are in progress because the NewsBrowse application lets journalists see the material while it's being uploaded into the system. They do cuts-only editing at their desktop and create EDLs for the editors to use.



**Video editor Ann Marie Tarabocchia in one of several edit suites outfitted with a Grass Valley NewsEdit nonlinear system.**

Thus far in the new building, CNBC has had over 70 users logged on to the application simultaneously and plans to upgrade the system to accommodate more users in the future.

Once a news story is complete, editors transfer their finished files to redundant play-to-air Profile servers, accessible by all the control rooms. These servers use software that is linked to the Avid iNews "rundown." Archivists move material out of the SAN to an ADIC data tape robotic system that runs MC/Avalon software.

### Graphics

On an average day, the graphics department creates 300 to 400 images for air. In Ft. Lee, this was done using conventional legacy broadcast design hardware and video signal paths. Moving the channel to Englewood Cliffs presented the opportunity to improve the graphics hardware and infrastructure. A robust design environment was conceived that took advantage of a drag-and-drop delivery system.

In the new facility, hardware used for graphics creation changed from proprietary black boxes to desktop PC workstations running Adobe Photoshop and Adobe After Effects. This minimized training and introduced an opportunity for an overall change in the design workflow. It also allowed a reduction in the number of workstations, cut costs

and boosted productivity.

With this resolution-independent platform, artwork and animation can be created on one workstation. NTSC, PAL, SD and HD (720p, 480p 16:9) images can all exist on one hard drive and be worked on during a single session without reconfiguration or reboots. The end result is a much more efficient process of creating graphic elements.

### Production

The new facility has one 7000-square-foot studio that adjoins the newsroom and supports live programming between 5:00 a.m. and 7:00 p.m. Two smaller production studios serve prime-time programming and specials. There are 11 robotic cameras with expansion capability to 16.

Analog and digital video and audio signals that enter the building are immediately converted to SDI and routed through a Thomson Grass Valley Trinitex routing switcher, managed by an SMS-7000 control system. A full complement of Grass Valley modular gear is used for conversion, distribution and multiplexing of the various signals, while a series of Leitch Neo frame synchronizers align the incoming remote feeds.

Three digital production control rooms (with expansion space for a fourth) are built around Sony MVS-8000 switchers. Marshall LCD and Sony plasma flat-panel displays — some with built-in TV tuners — to monitor program feeds, available sources and on-air status are the centerpieces of the video system. Sony BVP-950 cameras, DVE systems and CRT monitors; Image Video under-monitor displays; and Hopewell Precision control room shelving round out the equipment ensemble.

Around the corner are two mini-control rooms, one for the CNBC World channel and another to feed the Panasonic AstroVision large-screen color monitor located in the middle of Times Square.

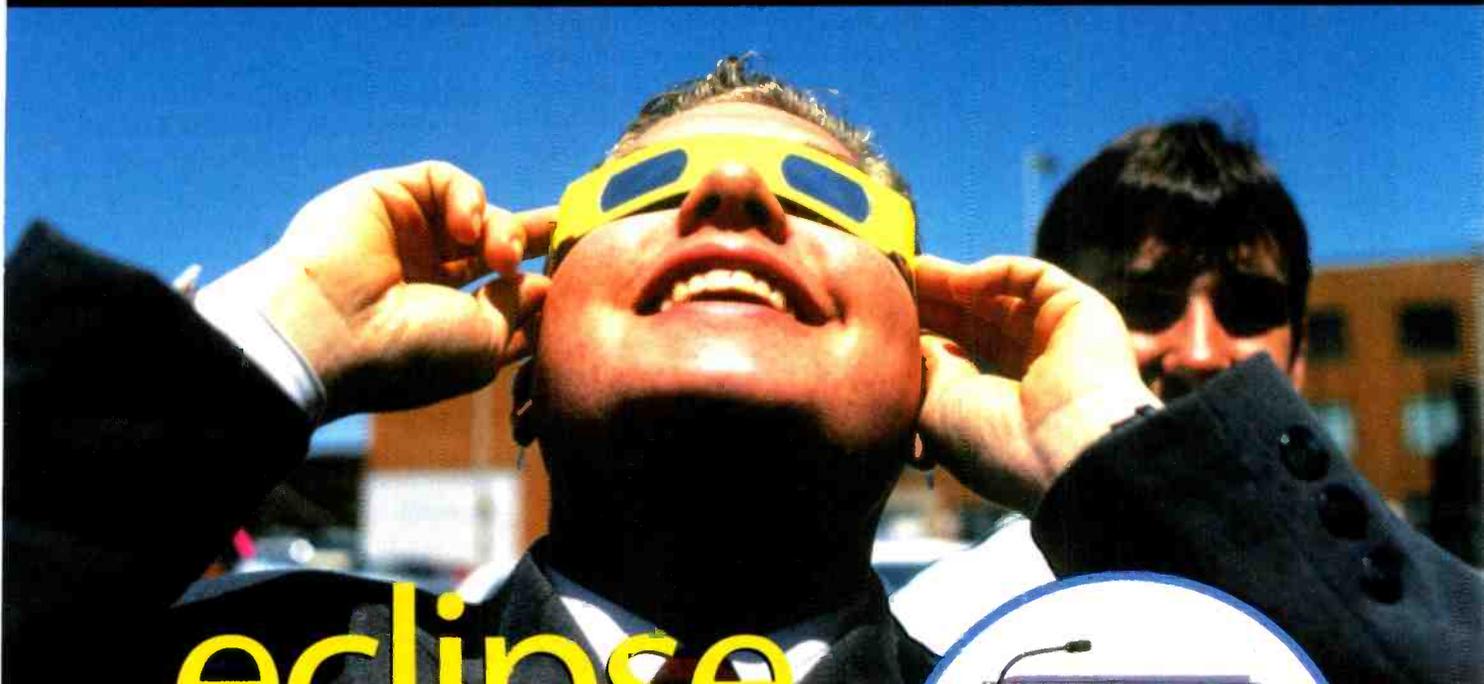
## Design team

### Architects:

HLW International  
Phillips Group  
Sony Systems Integration  
The Systems Group  
Craig Diana, CD Management group

### NBC/CNBC:

Peter Smith, VP, Advanced Technology  
Steve Fastook, VP, CNBC Technical and Commercial Operations  
Jim Starzynski, PE, NBC Adv. Tech.  
Eric Pohl, VP, NBC Engineering  
Pat Twomey, mgr., graphics Tech, CNBC  
Tony Alicea, dir. of IT on-air broadcast op., CNBC



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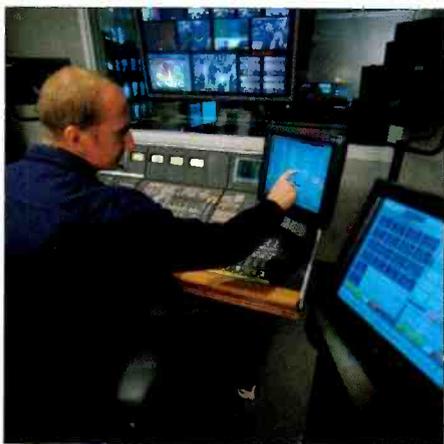


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**Audio**

The new facility is the first installation to network three Calrec Sigma 100 digital-audio consoles operating on Calrec's Hydra networking system, according to Jim Starzynski, principal engineer for NBC.

The audio control rooms share inputs and outputs among the consoles and the three studios. This maximizes production flexibility and efficiency



**Three NBC audio suites use Calrec Sigma 100 digital audio consoles and a Hydra networking system that eliminates the use of cart machines. Pictured: Senior audio engineer John Kerswell.**

and minimizes setup time, traditional cable runs and source distribution such as mic splitters and DAs.

In the audio rooms, a Miranda Kaleido-K2 video processor displays

multiple images of cameras and remotes from snapshots on a Sony 42-inch 16:9 plasma screen. Throughout the facility, audio is monitored on dozens of Genelec loudspeakers. A Systems Wireless 48-channel RF microphone system, with independent distribution, feeds talent audio to all three rooms.

The trend to share audio assets between NBC and its cable channel led to the company's first installation of a shared on-air digital audio storage system. An Enco central file server and three workstations replace individual cart machines. Browse capability is provided so staff can preview audio clips from their desktops. This allows producers anywhere in the company to use their PC speakers to preview audio clips for use in their edit packages, via the company's secure wide-area network. Once they've identified the desired clip, editors can drag and drop these files to their stories.

**Satellite operations**

The backbone of the satellite operations control center is a PC/server-based system with no buttons to push or knobs to turn. ILC was contracted to design and implement a customized version of their standard Maxview product to control up to 200 live remotes a day.

All of these remotes are handled from a simple ILC GUI on a Dell PC workstation. This user interface sends



**Alex Asaro in the satellite operations center at CNBC, using a custom ILC Maxview control panel and Grass Valley NewsBrowse system to handle dozens of feeds from around the world.**

messages to 18 satellite receivers, 62 frame syncs, the 512x1024 Trinx router and more, from seven workstations via a private LAN. The system is open-ended, requiring minimal programming to add features or new equipment.

Video, audio, time of day and signal identification are monitored on four high-resolution 67-inch Clarity Digital projectors fed by four Kaleido-K2 multi-imagers. This video wall can switch from its default 64 images to four full-frame 62-inch images, or anything in between.

**BE**

*Michael Grotticelli regularly reports on the professional video and broadcast technology industry.*

**Equipment list**

- ADIC i2000 tape library
- Thomson Grass Valley
  - ContentShare
  - NewsBrowse
  - NewsQ Pro
  - NewsEdit workstations
  - Profile servers
  - Trinx router w/SMS-7000 control system modular products
- EMC
  - AvalonIDM software
  - CLARiiON and Celerra storage area networks
- Leitch Neo frame synchronizers
- Avid iNEWS newsroom system
- Image Video under-monitor displays
- Adobe Photoshop and AfterEffects

- Sony
  - MVS-8000 production switchers
  - BVP 950 studio cameras
  - DVE systems and CRT monitors
- Pinnacle Systems FX Deko
- Hopewell Precision control room shelving
- Marshall LCD and Sony plasma flat-panel displays
- Calrec
  - Sigma 100 digital consoles
  - Hydra Networking system
- Enco central file server with DADPro32 Workstations
- Genelec loudspeakers
- Systems Wireless 48-channel mics
- ILC Maxview control System
- Clarity Digital projectors
- Miranda Kaleido-K2 multi-imagers



## Are You Betting Your VHF Station's Future on 1980's Technology?

Did you know that some major manufacturers' current VHF transmitter product lines are still based on technologies that were developed in the 1980s? While these products may have been cutting edge in their day, the times have certainly changed. This year at NAB Axcera will be introducing a new concept in VHF technology. Come to see the first VHF transmitter of the 21st century at NAB booth C8606.





# New York Network's broadcast center

By William F. Snyder

**A** New York Network's (NYN) new all-digital broadcast center, owned by the State University of New York (SUNY), serves the Empire State's educational institutions and government agencies, as well as private-sector clients.

The new facility, with a total contract value of \$10.6 million, features

multiformat (HD/SD) production switchers, video routers and cameras, as well as full HD connectivity, to provide a simple upgrade path to high definition. The facility was built by Sony Electronics' Systems Integration Center (SIC).

When the network was established in 1967, its mission initially was to serve New York state's

nine public television stations. When PBS changed to satellite distribution for its stations in 1978, NYN re-examined its purpose. Gradually it evolved into an interconnect for all 64 SUNY campuses — the State University Satellite Network (SUNYSAT).

A need for greater re-invention occurred just after 2000 when it became clear the network would have to move



**New York Network's new broadcast center includes space for three studios - one of which is used three days a week by the New York State Assembly's talk show productions.**

out of the capitol's Alfred E. Smith building, which was scheduled to undergo renovation. The relocation gave the network an opportunity to design a new facility from the ground up.

The network's new space features generously high ceilings, and its location inside the concourse of Albany's Empire State Plaza — a retail and government office complex — allows the

network's many anchors and interviewees easy access to subjects and sources.

NYN now includes three studios, three control rooms, master control, two non-linear edit suites, an announcer's booth, offices and support space, satellite uplinks, and field production facilities.

Studio A and B are each 30 feet by 30 feet and can also be operated as a

single 30-foot by 60-foot studio. A moveable wall insulates each studio from the other's sound. Studio A contains a set for standard talk shows, news programs and conferences. Studio B is a general-purpose space, often used for talking-head productions.

There is also a smaller 20x20 studio, which is occupied three days a week

## **The plant itself can handle 1.5Gb/s, so the upgrade path to HD is clear.**

by the New York State Assembly's talk show productions, which are distributed via cable throughout the state.

The broadcast center is equipped with seven Sony HDC-950 high-definition studio cameras — which were selected in anticipation of the network's eventual conversion to full HD operation. Five are located in Studios A and B and two are placed in the smaller studio. At present, their HD signal, visible only on the viewfinders and a handful of HD monitors around the facility, is being converted to SD before being passed through the plant. The plant itself can handle 1.5Gb/s, so the upgrade path to HD is clear.

The facility also has two BVW-790W ENG cameras for use in the field. The studio configurations are soft, allowing deployment of the studio cameras in the field as well.

In addition to cameras, Sony also provided decks, monitors, linear editing gear, audio gear, boards, switchers and a slew of back-room equipment. The facility's house videocassette standard is Digital Betacam, and the facility is equipped with 13 DVW-A500 VTRs.

The broadcast center runs nine channels. They include a 24-hour cable channel available to one million households statewide via Time Warner Cable; an occasional channel for videoconferences; a channel dedicated to the New York State

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Lottery, whose official drawings are broadcast in every market in the state four times a day; and a channel reserved for another 24-hour customer, soon to be announced.

In addition, six other channels are dedicated to New York state off-track betting, carrying images from racetracks across the state to betting parlors. These channels originate from a nearby uplink facility, where they are co-located with receivers and decoders. (The network is running an older MPEG-2 digital compression system



**A New York Network engineer works at the Sony MVS-8000 multiformat switcher with integrated digital multi-effects.**

for the uplink but is in the market for an upgrade.)

In the master control room there are six simultaneous playout streams. Three of these are allocated to channels 1, 2 and 3. The fourth is redundant protection channel for Channel 1. The fifth is used by the ingest operator (e.g., someone filing a tape into the server), and the sixth is used by master control as a utility review channel (e.g., to check incoming spots). The number of playout channels can be increased with the addition of decoder boards.

There are five record channels. One is allocated to the media ingest operator and the others are available for scheduling as needed — for example, to record a satellite feed. The number of record channels can be increased with the addition of encoder boards.

Two Pinnacle MediaStream 900 shared-storage devices are configured for up to 150 hours of storage at 8Mb/s with four channels of audio per stream. This capacity can be increased with the addition of more RAID storage.

Video ingested into the server but not required for playout within a certain time window is automatically transferred to archive storage, which consists of an ASACA "jukebox" containing 750 DVD drives, each of which can hold approximately 9.4GB of data — for a total of 4TB or 2000 hours of material. Harris Automation manages this transfer.

It also controls all aspects of the transmission of program channels. Once program schedules are entered into the automation software, the system first checks that the



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Western States - TEL: (818) 841 3000 EMAIL: [jschaller@audiospec.com](mailto:jschaller@audiospec.com)

requested video item is available on the server. If it is not, it attempts to transfer the video from archive storage. If archive storage does not contain the scheduled item, an alarm will appear on a screen in master control and also in the traffic office, allowing the operator time to address the problem.

At the scheduled time, the automation system will set the appropriate router crosspoints, execute the defined video transition by controlling

Miranda master control switchers, and start the server playing the scheduled program. Automation also controls the tuning of three satellite receivers and a dish controller, allowing the scheduling and automatic recording of satellite feeds.

Operators in master control can oversee the entire operation via computer screens, a monitor wall and quality-control stations, making sure the program is correct and the video and audio parameters are to spec. In the event of a scheduling error, an equipment failure, or a live program being over or under its scheduled run time, operators can make adjustments or, if necessary, take manual control of any part of the system.

The center's routing comprises gear including a PESA Tiger and a Sony HDSX 5800 router. The associated audio router is a PESA TDM-3000. Control room equipment includes a Pinnacle Deko character generator, a Graham-Patten 8000 edit mixer, a Yamaha console, a BKE-9400A linear editor and three DMX-R100 audio mixers.

The facility also includes three MVS-8000 multiformat switchers with integrated digital multi-effects, 264 monitors, (including seven BVM-D20F1U evaluation monitors), and systems from Avid, Evertz, Fujinon, Leitch and Vinten. About 110 miles of cable ties it all together. A Clear-Com intercom system is used throughout the facility, with 20 WRT-822 wireless mics and 40 EMC-77BC lavalier mics.

NYN is not a terrestrial broadcaster. All its transmissions are via satellite or fiber. An Iptek HBR-2500 OC-48 optical digital transport system connects the New York State Plaza production operations to the network's Ku



**Karl Diehl, NY network producer/director, at the controls of one of two identical Avid Composer suites at NYN.**

band uplink facility six miles away. Satellite feeds for recording and for monitoring the transmissions are sent back from the same facility. Two fully redundant fiber paths are used; they incorporate an automated self-healing system. In addition, DS3 lines, provided by Verizon and Worldcom/MCI, allow a 45Mb/s datastream connection to NY-1, the cable news channel in New York City, which provides cross-connects to all major media.

No major hardware problems resulted from the broadcast center's installation and construction. Some software bugs emerged as a result of the system's complexity, but these were resolved within a few months.

The network receives an annual appropriation from New York state of nearly \$600,000. Its mandate is to generate about \$3.4 million in revenue each year in order to meet its operating budget of almost \$4 million. So far, the network has accomplished that goal. Its major customers include the New York State Lottery and the state's off-track betting organization. Other public-sector clients include SUNY and the state Office of Children and Family Services. Private-sector clients include Albany area broadcasters and Time Warner Cable.

The RFP for building the broadcast center was written to ensure that the standard-def facility would have an easy upgrade path to HD. In a sense, NYN today is a standard-definition implementation of an HD plant, so that when the switch is made, no forklifts will be required.

**BE**

*William F. Snyder is executive director of New York Network.*

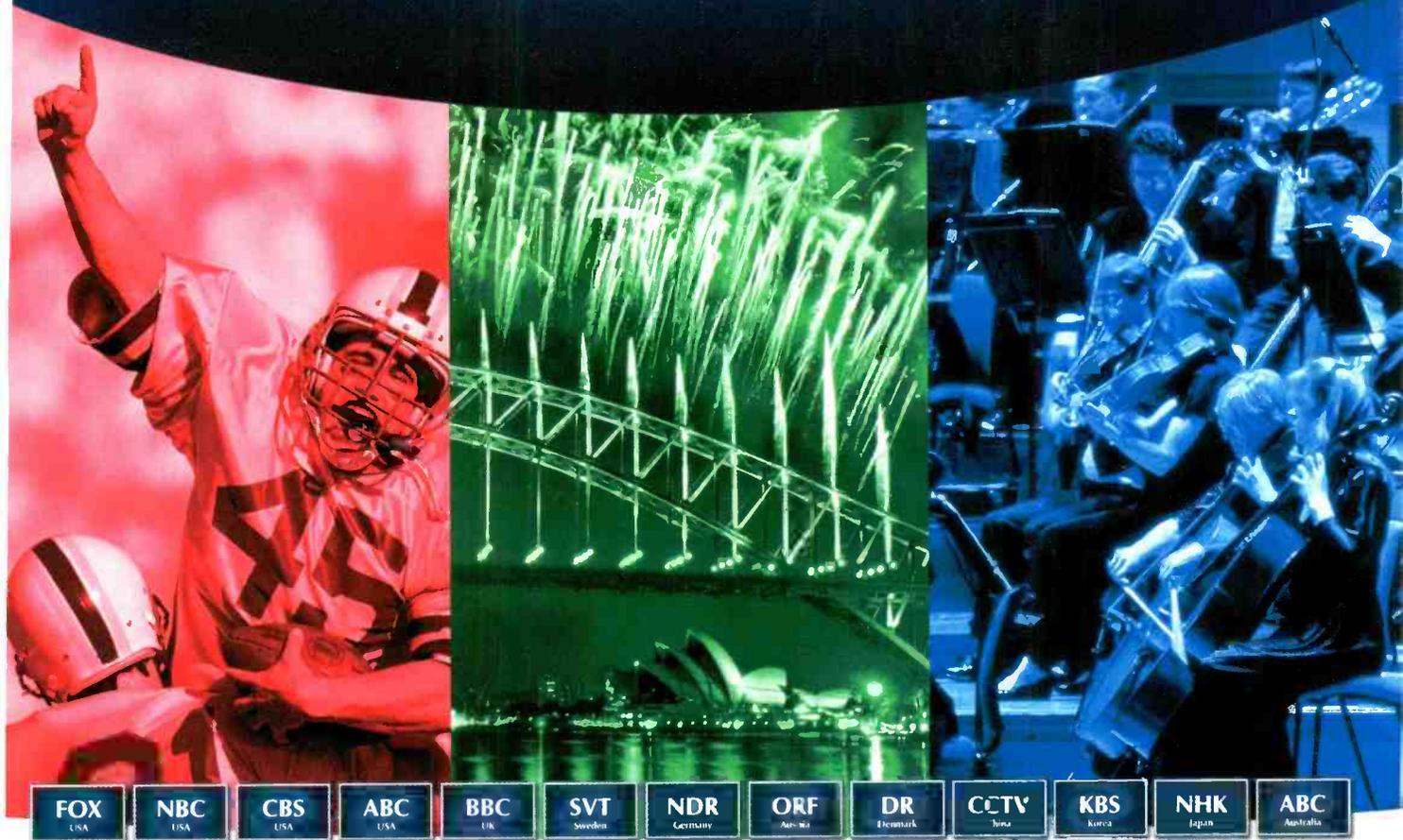
## Design team

New York Network  
William F. Snyder, exec. dir.  
Gary Talkiewicz, dir. of eng.  
Roy Saplin, dir. of admin.  
Dave Palmieri, engineer  
Lori Staples, prod. Specialist  
Richard Fortune, EIC (retired)  
Jacob F. Nowak, Jr., dir. of network services (retired)  
Sony SIC personnel

## Equipment list

ASACA archive storage  
Clear-Com intercom system  
Evertz D/A conversion  
Graham-Patten 8000 edit mixer  
Harris automation  
Iptek HBR-2500  
Miranda MC OXTPM2 switchers  
PESA  
TDM-3000 audio router  
Tiger router  
Pinnacle  
Deko CG  
MediaStream 900 servers  
Sony  
BKE-9400A linear editor  
BVW-790W ENG cameras  
DMX R-100 audio mixers  
DVW-A500 VTRs  
EMC-77BC lavalier mics  
HDC-950 studio cameras  
HDSX 5800 router  
MVS-8000 multiformat switchers  
WRT-822 wireless mics  
monitors

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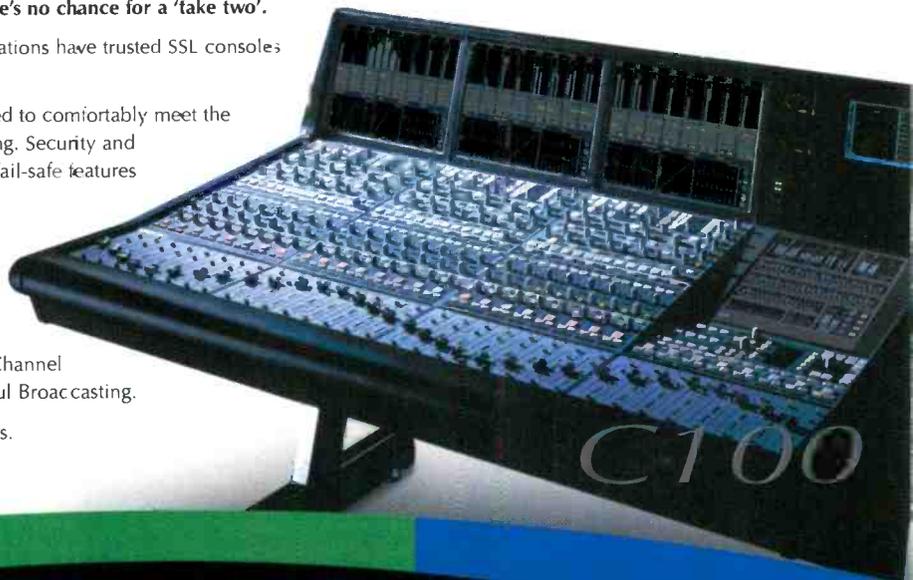
SSL's latest digital broadcast console, the C100, is designed to comfortably meet the needs of surround production and interactive programming. Security and performance are built in, with a host of redundancy and fail-safe features such as Self-Healing DSP.

The C100's freelance-friendly control surface makes for a short learning curve, and the ability to scale consoles also helps to meet your budget.

The C100 is already the first choice for respected broadcasters worldwide, including: NBA-TV • The Golf Channel  
Disney Broadcasting • Danish Radio & TV • NHK • Seoul Broadcasting.

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# High-power antennas



BY DON MARKLEY

Last month, we discussed peanut-whistle power for DTV. Specifically, we talked about facilities that have been operating with greatly reduced power under a special temporary authority to serve their community of license until they can get permission to operate at higher power. We covered the use of low-power antennas, and the fact that many facilities that use them are able to cover a greater area than anticipated.

## Radiation patterns

This month, it's time to move on to big antennas and higher transmitter-power output. To start, there is good news and bad news. The bad news is that there is absolutely no such thing as an omnidirectional antenna. That is, there will always be some variation in an antenna's radiation pattern as a function of azimuth. That variation

increases when an obstacle is placed in the antenna's aperture. When that obstacle is a tower, as in the case of a side-mounted antenna, the variation becomes significant. It is possible to calculate roughly the effect of the tower on the antenna's pattern, but you have to accept the fact that the pattern will never be as uniform as that of a top-mounted antenna. The good news is that this isn't usually a problem. While the side-mount antenna's pattern will vary, the effect of that variation is much less than you might expect.

## Size matters

Big, high-priced antennas have several

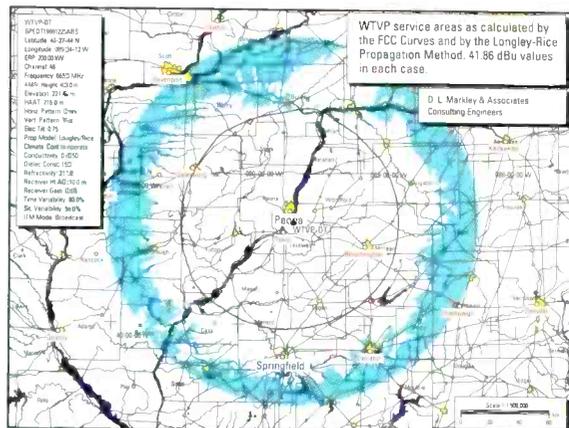


Figure 1. In this map of the service area for WTVP-DT in Peoria, IL, the clear area enclosed by the irregular, light-blue ring is the Longley-Rice service of 41.86dBu or more.

advantages, including robust structural characteristics, highly predictable pattern and low maintenance requirements. You can't top-mount lightweight antennas or use them to support other antennas. They require a tower leg or other support structure which, in turn, affects the pattern. But the big antennas can stand alone and support other antennas. Facilities often mount a UHF antenna on top of either a VHF antenna or another UHF antenna. Andrew even has a slot antenna that can be incorporated into the tower as a leg. Obviously, this requires a much more massive and robust antenna.

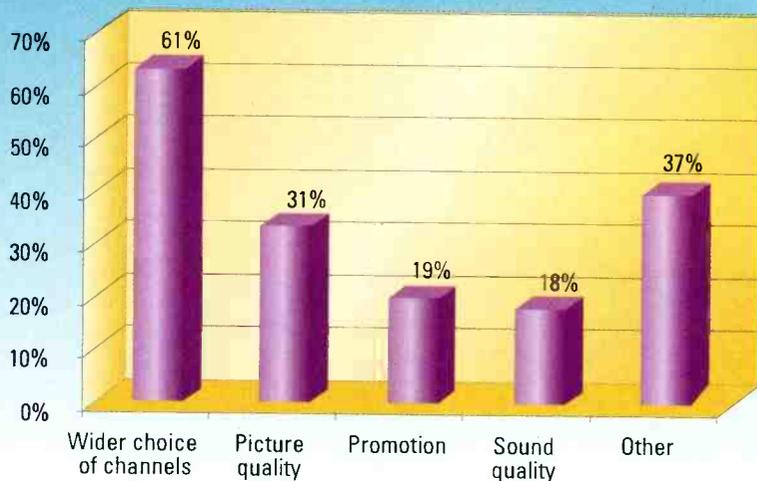
## The inside story

Large slot or traveling-wave antennas are fed internally with rigid transmission line. Being inside of the cylinder, the line is well protected from the elements. Many antennas of this type serve for over 30 years with no service to internal components. The most common failure mode is at the input, where the feed system is subjected to

## FRAME GRAB

A look at the consumer side of DTV

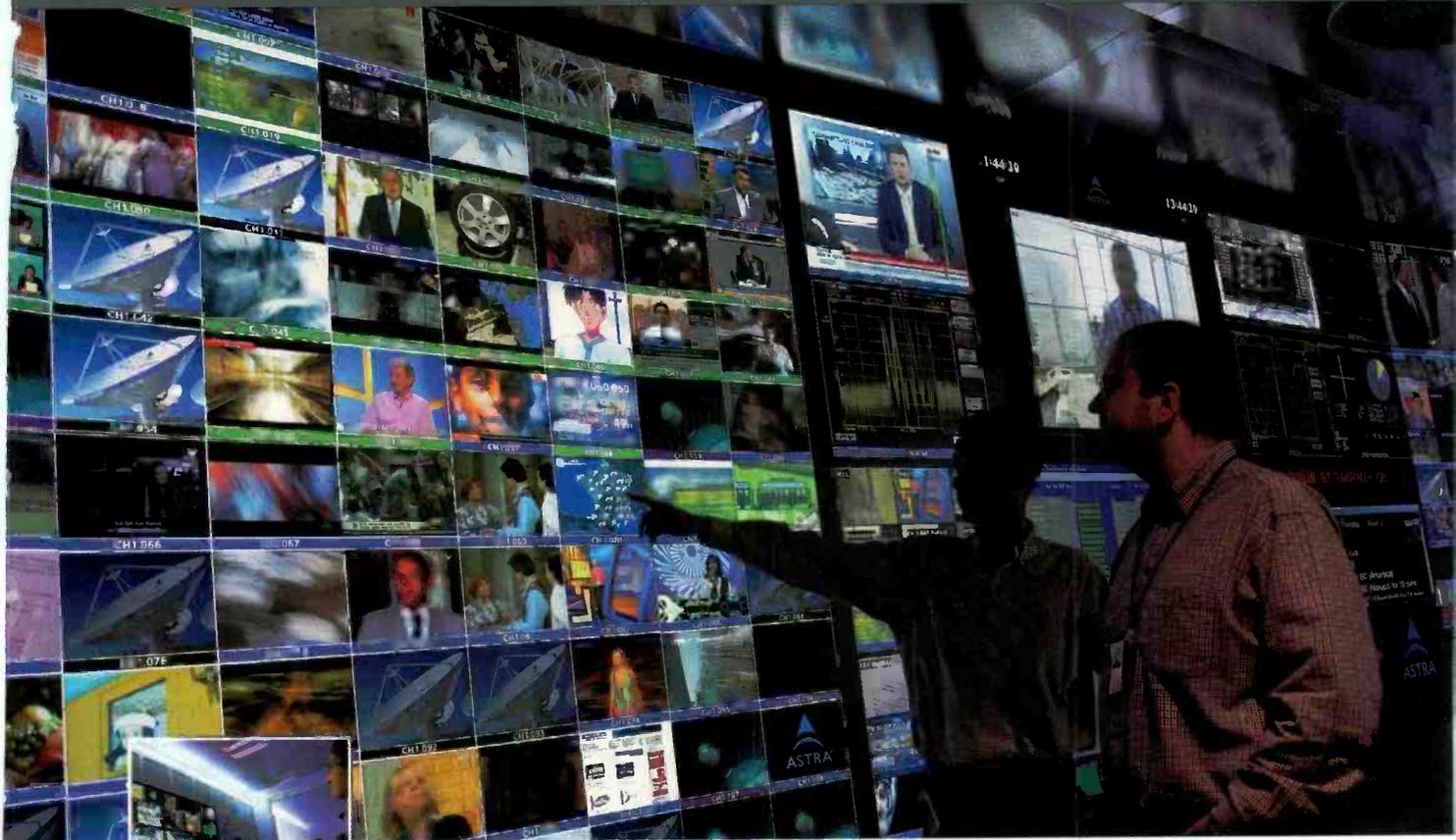
The lure of digital  
 Most choose a digital TV for more channels



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vibration and movement. Still, there are no flexible lines to be replaced and essentially zero external hardware to be serviced.

The big panel antennas, while using a pot full of lines, splitters, etc., offer the advantage of wide bandwidth to accommodate multiple stations. The components can sometimes be

serviced by having the technician climb up inside the antenna. In particular, RFS and Shiveley are marketing antennas that are serviceable from the inside. Panel antennas also offer the unusual advantage of allowing a different amount of beam tilt at different azimuth values. But, remember, electrically the big antennas don't of-

fer a great improvement over their lighter-weight cousins. The patterns available are similar, their gains are essentially the same and they will all provide good service within their mechanical or structural limits.

### Service contours

The question becomes one of determining just what you accomplish by going to a higher-power operation. As we discussed last month, DTV service is determined by use of Technote 101, the Longley-Rice propagation model. That method is not normally considered to generate a contour. Rather, it determines areas that receive the desired level of signal or more. Figure 1 is a map that shows the service area for WTVP-DT in Peoria, IL, based on both Longley-Rice and the FCC curves. The clear area enclosed by the irregular, light-blue ring is the Longley-Rice service of 41.86dBu or more. For comparison, the FCC F(50,90) contour is shown in black. The significant variation is caused by the even nature of the terrain once the signal gets well clear of the river. On the other hand, the map shows areas along the river, especially to the north, where the signal drops due to terrain blockage at the river bluffs.

The interesting thing here is that there isn't a lot of difference when changing from 100kW to 400kW. That is especially true where the terrain is the most even, as in the areas northeast of the site. Where the terrain is rougher, the difference becomes greater. This tends to agree with what is observed in actual signal reception. The higher power doesn't have as much effect in the distance to the edge of service as it does in filling in the holes in the service. That is something that doesn't show up much in the propagation calculations. But, higher power provides a more "solid" signal.

Remember what happened when Class A FM stations were all upgraded to 6kW (separations permitting)? Many expected it to make a huge difference in

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  - Ultra small, lightweight, switchable, Earphone-out w/level control.
- Note: Order cables specifically for your camera and battery configuration.**



The 1000URX receiver shown here with the Anton Bauer "Gold Mount", is designated the 1000URX-AB

**System prices start at \$1350 MSRP**

Bodypack transmitter (1000BT) with reduced current-drain for improved battery life, is available with Azden EX-503H, Sony ECM-44H or ECM-55H.

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OF SUCH SIGNIFICANCE IT COMPLETELY  
REDEFINES THE WAY WE WORK

**XDCM**  
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THE NONLINEAR WAY TO WORK  
FROM ACQUISITION TO ARCHIVE.

Think of the innovations that totally changed the workplace. Consider landmarks like Electronic Newsgathering, the one-piece camcorder, and the migration from analog to digital. Sony invented, launched or led the market in every one of these innovations. And now Sony introduces the next breakthrough in workflow. Presenting the XDCAM system.

Instead of merely recording a clip, the XDCAM system writes your content as a high-resolution data file, a low-resolution, frame-accurate "proxy A/V" version, plus metadata that can include your voice over scripts. Instead of tape, the XDCAM system records onto the Professional Disc media. Instead of searching along the length of a tape, you get nonlinear, split-second access. And in addition to real-time playback, you can view XDCAM files on a PC, transfer them via the i.LINK® interface or Ethernet, or even browse them and transfer the files around the office or around the world.

Experience the XDCAM system and you'll understand. It's a whole new way to work.



# THE XDCAM SYSTEM

IT DOESN'T SIMPLY RECORD CLIPS.  
IT WRITES **DATA FILES.**

**MXF**

1

Every time the XDCAM Professional Disc media records an audio/video clip, it writes your content as a data file. That makes a world of difference. Imagine your camcorder or deck connected to a PC, working as an external drive. Imagine editing without digitizing—because XDCAM files are already digital and directly compatible with selected nonlinear editors. Imagine using your PC to browse XDCAM files on a disc located on another continent. Then imagine transferring just the clips you need across the data network.

Your creative possibilities and workflow efficiency go way up. Your cost of ownership goes way down.

GET STARTED SOONER AND  
FINISH FASTER WITH **PROXY A/V.**

In the ongoing battle to beat deadlines, XDCAM production is your ally. For example, your office staff can start editing, even before the material arrives! The secret is the XDCAM system's "proxy" audio/video, a frame-accurate, low-resolution copy of the full-res A/V. Using MPEG-4 compression at 2 megabits per second, proxy A/V is an incredible tool for browsing, editing and transferring your footage over great distances.

You can zoom the proxy A/V into a nonlinear editor at up to 50x real-time speed and automatically paint a storyboard with thumbnail pictures. For example, transfer proxy A/V from the TV newsgathering van to the station, and your staff can immediately start scripting and offline editing. When the disc arrives, only the required clips get transferred—another time saver. Then full-res video is automatically conformed to your offline edit. And in an emergency, when your remote crews don't have access to a satellite feed, you can even play the proxy A/V to air! The MPEG-4 picture is vastly superior to a videophone.

2



# STEM. YOU'VE NE

## **METADATA: THE PERFECT PLACE TO STORE YOUR SCRIPTS.**

3

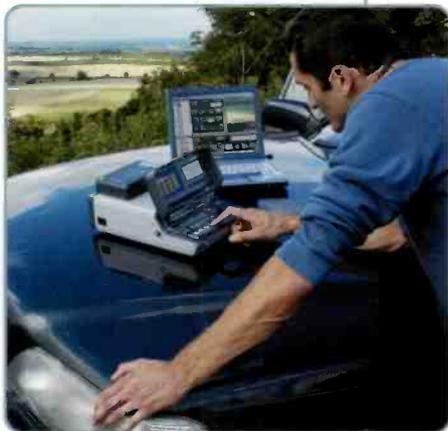
If you're writing voice over scripts in the field, you'll love the ample storage capacity of the XDCAM Professional Disc media. You can write a script on your laptop, transfer it to the camcorder via the i.LINK® interface and save that file in the metadata area of the disc! The script becomes a part of your disc, accompanying the A/V files everywhere from postproduction to archive!

Other metadata capabilities abound. Industry-standard Unique Material Identifiers—UMIDs—can distinguish each clip. Thumbnail pictures and essence markers identify each recorded scene. Automatic marks can flag filter changes, audio overshoots or video clipping. The result? Metadata enables journalists, camera operators, editors, producers and archivists to collaborate more effectively than ever before.

## **MXF MEANS INTERCONTINENTAL EDITING.**

Thanks to data networking, a producer in another time zone can browse the lightweight, low-res proxy A/V on a distant disc, identify the desired clips and then transfer just the selected

clips as full-resolution Media Exchange Format (MXF) files. The combination of proxy A/V and MXF is a breakthrough that enables you to shoot news in Moscow and edit in Atlanta. Your central casting operation can concentrate recorded assets in Dallas, while giving free access to sister stations in Houston, Seattle and Phoenix.



4





THAT TIME IS NOW

**XDCAM**™  
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Professional Disc™

# XDCAM INNOVATION.

## NOT JUST A DISC, A SYSTEM.



**PDW-530 CAMCORDER** offers your choice of DVCAM or MPEG IMX recording at 30, 40 or 50 Mbps. Features 16:9/4:3 switchable, Power HAD™ EX CCDs, 12-bit A/D flip-out LCD color monitor, picture cache recording, 60i or 30PsF capture, and even 24PsF with optional board.



**PDW-510 CAMCORDER** provides DVCAM recording at 25 Mbps. Features 16:9/4:3 switchable Power HAD™ EX CCDs, 12-bit A/D, flip-out LCD color monitor, picture cache recording, 60i or 30PsF capture, and even 24PsF with optional board.



**PDW-V1 MOBILE DECK** enables single-machine cuts-only editing, compact viewing on 3.5-inch (viewing area measured diagonally) LCD monitor and easy connection with Ethernet and i.LINK interfaces. Features up to 30x real-time transfer of proxy A/V.



**PDW-1500 COMPACT DECK** is a half-rack machine ideal for feeding nonlinear editors. Transfers proxy A/V at up to 50x real time. Supports DVCAM and MPEG IMX recording. Features Gigabit Ethernet and i.LINK interfaces.



**PDW-3000 EDITING RECORDER** offers a full panel with VTR-like transport and editing controls. Transfers proxy A/V at up to 50x real time. Supports DVCAM and MPEG IMX recording. Features Gigabit Ethernet and i.LINK interfaces.



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# SYSTEM SMART INVESTMENT.



And Sony continues to protect your half-inch tapes dating back to 1983! Fitted with our e-VTR kit, the Sony MSW-M2000 multi-format VTR will play all your Betacam, Betacam SP®, Betacam SX®, Digital Betacam® and MPEG IMX tapes—and convert them into MXF files, fully interoperable with the XDCAM system.

XDCAM decks also have the connections to work in your current infrastructure: analog composite, SDI, i.LINK SBP2 and i.LINK AVC interfaces, AES/EBU audio, analog audio, Ethernet, and familiar 9-pin control.

## LOWER YOUR TOTAL COST OF OWNERSHIP.

Not only will the XDCAM system save you money by allowing you to work more efficiently, it can also save you money on maintenance, service and support. For example, while a tape-based camcorder can have over 30 moving parts, the XDCAM camcorder has just two! You'll also benefit from smart self diagnostics, with network-enabled SNMP remote monitoring of equipment health.

9

## WORK NONLINEAR. WORK SMART. WORK SONY.

Clearly, the XDCAM system will make your work move faster than ever before. You'll take advantage of powerful production shortcuts and speed-ups. You'll benefit from compelling long-distance collaboration. And you'll be able to use your data network to access everything from breaking news to archival footage. When an innovation of this magnitude comes along, you've just got to experience it first hand. Speak to your Sony representative today to arrange a demonstration.



# THE XDCAM SMART INTEGRATION.

7

## NONLINEAR MEDIA AN ACCOUNTANT COULD ACTUALLY LOVE.

Sony's XDCAM system's Professional Disc™ media costs less than \$30 MSRP. So you can actually afford to archive

every disc! Just one disc has a total user data area of 23.3 Gigabytes\* in the same diameter as a DVD. That translates to 85 minutes of DVCAM® footage or 45 minutes of MPEG IMX™ material (at 50 Mbps). Based on accelerated testing conducted by Sony, the media can be re-recorded more than 1,000 times and lasts more than 30 years. It also enjoys the protection of a rugged, shock-resistant, dust-resistant cartridge.

Of course, recording on disc also means no more fumbling and hunting for video clips. No more searching for the end of the last recorded scene. No more recording over material because you're cued up to the wrong spot

\* A portion of user data area will be used for data management; therefore, total user area may vary.



10

(10)

8

## WHAT DO I DO WITH ALL MY VTRS AND TAPES?

The XDCAM system works beautifully with the VTRs you have now, because XDCAM products use the established DVCAM 25 Mbps or MPEG IMX 30/40/50 Mbps codecs. So you can continue using tape, secure in the knowledge that you can migrate into the optical world at your own pace and on your own schedule. XDCAM products also give you the choice of 60i interlace or 30PsF progressive video.

For cinematic production, you can even shoot in 24PsF with an optional board!

# VER WORKED SO

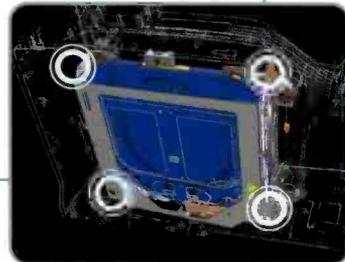
MXF works with a growing population of servers, hard disk recorders, e-VTRs and Xpri® nonlinear editors. MXF is an industry standard. It's won the announced support of a who's who of industry leaders, including Avid, Pinnacle Systems, and Thomson/Grass Valley Group.

5

## SHOOT WITH A NEW LEVEL OF CONFIDENCE.

Take the camcorder skiing, skydiving, offroading and speedboating. We already have. After all, we designed XDCAM acquisition to stand up to real-world conditions like splashes, salt spray, bumps, jolts, extreme vibrations and temperature changes. Internal dampers and a robust laser servo withstand the constant vibration of a helicopter shoot. Cache memory recovers from the big jolts you get when you pull the ripcord or your SUV rumbles over a log. In any case, there's no tape dropout, no tape flashing, no tape jumping. Oh yeah. There's no tape. *(Please refer to the operators Manual for recommended operating conditions.)*

**Effective shock protection includes internal dampers (shown), a robust laser servo and extensive cache memory.**

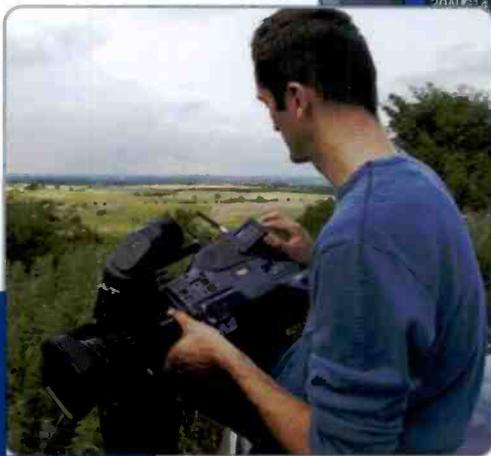


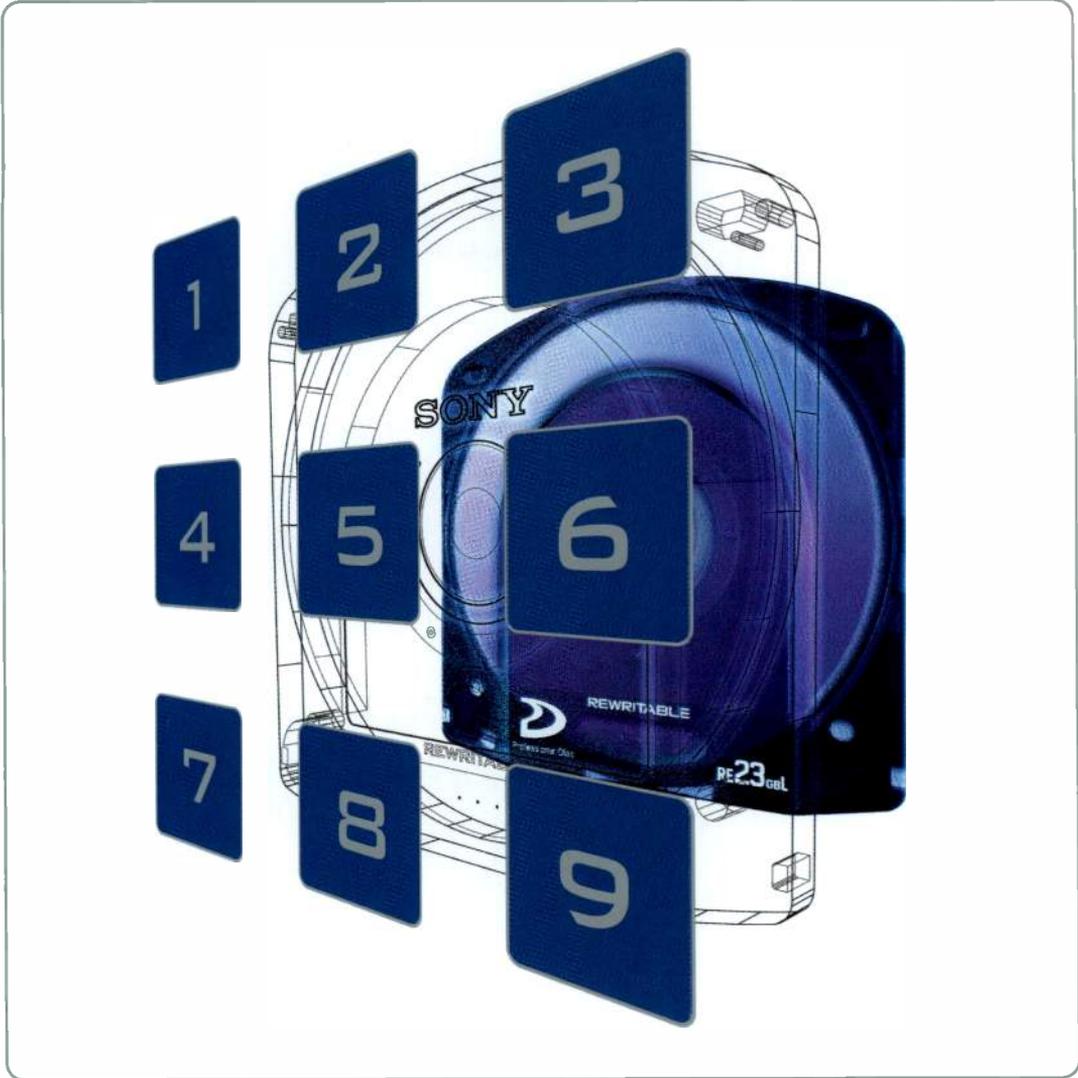
# SMART.

6

## EDIT RIGHT ON THE SPOT.

If you're on a deadline, the XDCAM system is a lifesaver. Each clip automatically generates a thumbnail. And every camcorder and deck can perform single-machine editing. All you need is a monitor, which is already built into the camcorders and the mobile deck! So you can flip out the camcorder's LCD monitor, access the scenes directly by thumbnail, make your selections and even re-order the shots. The entire sequence plays out seamlessly!







WLS-TV's newsroom in Chicago features technology from Digital News Technology solutions. Photo by Frank Pedrick of Pedrick Photography.



# Advances in news technology

BY JOHN LUFF

In 1933, the Communications Act opened the broadcast spectrum and required that broadcasters be licensed. At that time, there was not much need for broadcast news, at least in the eyes of the newspaper publishers in this country. But much has changed in the

last 70 years. Few people imagined that broadcast news would compete head-to-head with newspapers.

Nonetheless, it took decades for short, 15-minute news wrap-ups to become a staple of the TV program schedule. In the early years of television,

journalists were not too interested in becoming part of the news business. It offered no advantages to them, because news graphics were just still photos and the copy read much like radio had. But, as technology improved, news became an irresistible

# SHARPEST Detail



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## SE4000 MPEG-2 Contribution Encoder

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The SE4000 can be purchased with the minimum features at a very low cost, and can be easily upgraded to the most feature-rich encoder available today. The encoder can have BISS, DVB-8PSK, IF and L-Band outputs, and composite video input signal conditioning.

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siren's song to many journalists.

In no small measure, technology has driven the changes in broadcast journalism. A former network-news president, speaking to an international conference on broadcast news in the early '90s, described the immediacy of news and the effect technology has on the delivery of informed journalism to the

public. He noted how, at the time of the Civil War, it took weeks to receive the results of battles and compared that with how, by the time of the Gulf War, we were watching news as it happened



**Sony's XDCAM line of optical-disk products fulfilled the promise of affordable random-access record and playback technology long awaited by many large broadcasters.**

without the time for the journalist to reflect on the meaning and context of the story.

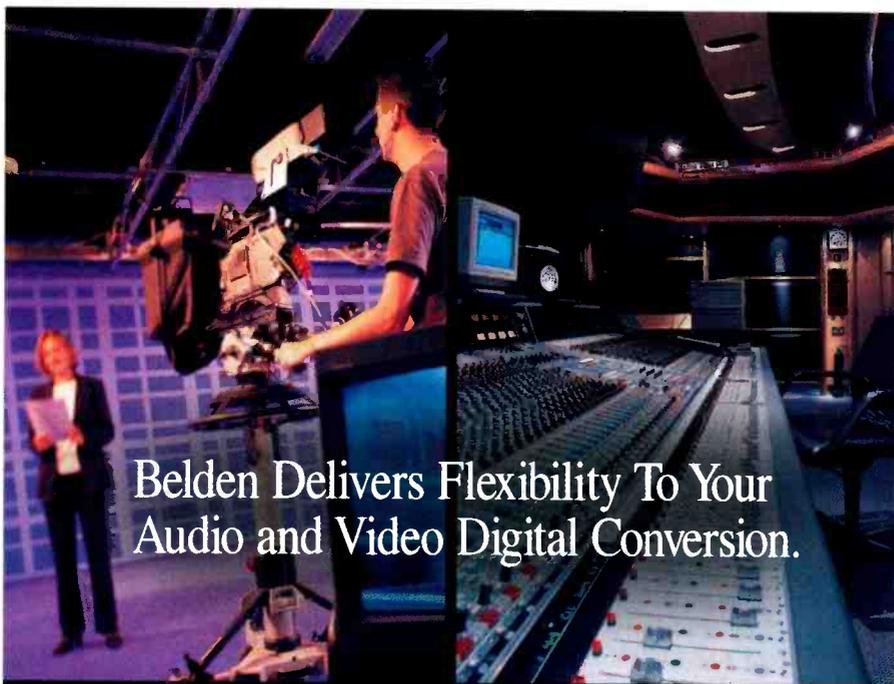
But news technology isn't stagnant; it keeps advancing. The ultimate goal of this advance is to facilitate the immediacy viewers have come to expect (indeed, demand) while freeing the journalist to recover the time to reflect and add context and meaning to their stories.

### Acquisition

Capturing stories is a fundamental part of the journalist's trade. Recently, journalists have seen a couple of dramatic advances in acquisition technology. Sony and Panasonic are starting to deliver highly evolved news-acquisition camcorders using new and exciting technology.

At last year's NAB, Sony introduced its XDCAM camcorder system. It uses an optical disk recorder to deliver 45 to 85 minutes of recording on a 23.3GB blue-laser optical disk. Optical-disk technology, which has been long promised by many manufacturers and long awaited by many large broadcasters, makes random access affordable. The Sony product line includes studio recorders, cameras, and nonlinear editing systems. The I/O of the studio decks is what you would expect from Sony, with SMPTE 259 and high-speed transfers between studio decks. Other features, including metadata transfer, thumbnail recording and shot selection in the camera, are natural for news acquisition.

Panasonic raised many eyebrows



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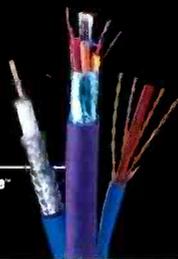
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**Panasonic's Professional Plug-in (P2) news-acquisition products have no moving parts and offer the promise of near instantaneous access to any shot recorded.**

when it introduced the Professional Plug-in (P2) recording technology for news acquisition. These solid-state-memory-based, professional video products record onto SD memory cards. They have no moving parts and offer the promise of near instantaneous access to any shot recorded. As the capacity of the SD cards increases, the technology holds the promise of HDTV recordings with no moving parts. A number of manufacturers of editing products have announced they will support direct import of the DV-based recordings on P2. This support is critical in enabling properly functioning integrated newsroom systems. The absence of moving parts, coupled with low-power-consumption cameras, should extend battery life considerably. P2 is not delivering yet, but Panasonic is taking orders for delivery this year.

After capturing the story, the ENG journalist must get the story back to the station as quickly as possible. Today, he or she can transmit the story from a microwave or SNG truck, or find the nearest high-speed data connection and forward a digital copy of the footage or completed story back to the newsroom.

Satellite-transmission technology hasn't seen any revolutions lately, but video compression has improved by leaps and bounds in the last few years. MPEG-2 can now deliver acceptable results for news at 5Mb/s and under. And, in the next year, we will see real-world use of MPEG-4 AVC (H.264)

codecs that will dramatically drop bit rates for all types of content. At such low data rates, live transmission over a T-1 line (1.544 Mb/s) will become routine. This will move terrestrial transmission into the real world for news backhaul. Imagine putting a T-1 into



the local courthouse and other common sites to allow a portable rig to transmit real-time or faster-than-real-time content. Soon, ENG journalists might be able to simply walk up to the nearest house and offer a few bucks to use the homeowner's DSL or cable modem to send content through vir-

compact transmission systems that will make suitcase ENG and SNG an affordable and commonplace tool.

A parallel development is the high quality and reliability of store-and-forward appliances like Telestream's ClipMail. Such devices allow variable-speed transmission that adapts to the circuit to which it is connected. They make the process of sending video no more complex than sending e-mail.

### **Editing**

You only have to think back to the Vietnam War to see how far news editing has come. During that period, cameramen were shipping film from field cameras from Saigon to New York, where editors cut the film into stories. The finished stories played on film chains. Asset management probably consisted of keeping track of the cans of completed stories on 3x5 cards, and

## **The ability to browse at the desktop in the newsroom is becoming an increasingly important function.**

tual private network (VPN) back to the station, or even connect for a live shot from any street without an antenna.

Low-bit-rate transmission systems gained considerable notoriety during the Iraq War when live shots were transmitted from moving vehicles half a

the outtakes likely hit the trash bin every day. Metadata was on yellow legal tablets that went to the script writers.

Today, the editing process can begin in the camera, where the videographer can mark shots for later use and record them to thumbnails for browsing. The recordings can have GPS location data; some new cameras also allow time code. When editors review them in a laptop, they can annotate the shots with considerable metadata, and the outtakes and usable footage stay together. The original footage and its metadata are always available during the editing process. Whether ingested at real time (as in a backhaul through satellite or microwave) or transferred at faster-than-play speed, the nonlinear news-editing environment offers the editor nearly instantaneous access to content as soon as it has been transferred, or, in fact, during a recording. Such rapid transfer can provide critical time for the journalist to plan the



**Store-and-forward appliances like Telestream's ClipMail allow variable-speed transmission that adapts to the circuit to which it is connected.**

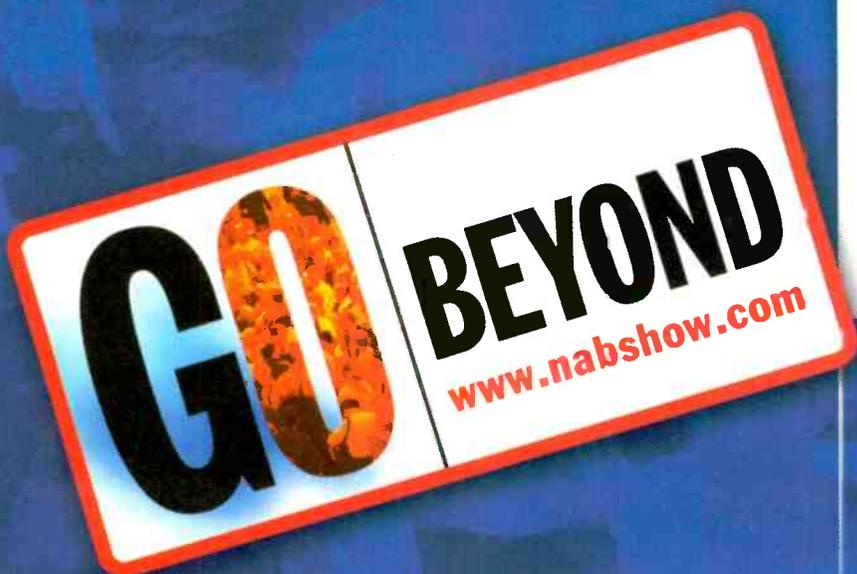
world away. H.264 will greatly improve the quality of such approaches and likely will spawn a crop of lightweight and

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completed slug so that it tells a valuable and accurate story.

Nonlinear editing for news is distinctly different from other nonlinear editing in that it must interface to content-management software to inform the producer as to what stories are in process, and whether or not the content has arrived. Also, the field material (transferred by various methods), along with file footage and live recordings, must all be available to a group of editors networked to a storage network. Keeping numerous people aware of what material is available is a complex job. Thus newsroom editing software can have many modules from several vendors. Different vendors can supply software for ingest, edit, browse, play to air, and asset management. All this software must interact with the newsroom computer system, which, in many ways, acts as a traffic cop and central repository of the metadata needed to tie all the pieces together successfully.

The ability to browse at the desktop in the newsroom is becoming an increasingly important function. It allows producers and journalists to understand the context of the pictures much more rapidly than ever before possible. Using the browse-level content, it is quite possible to do a rough-cut of a story and send the decision list to a craft edit bay for finishing. This can cut down on the number of craft editors required, saving considerable money — so long as the browse and rough edit is not outlandishly expensive.

The play-to-air function may be a system separate from the editing environment. If it is, the newsroom computer system must transfer the stories to the air server. To ensure the right stories are cued and played in the program, the newsroom system must be tightly tied to the air server. If it is part of a single storage network, the air server can draw on the output of the craft editors in a number of ways, including copying the content to a separate directory, or just playing from the current location. Name conventions matter; you must

take care to ensure that the content is connected to the newsroom-computer-system's slug for the story.

### **Newsroom computer systems**

The newsroom computer system is the brain, nervous system and heart of a news department. It is the brain in

edit wire copy for local use and then assemble the copy into a rundown. The same script could run the teleprompter. And all the staff members involved could share messages in the same system — neat and tidy. Of course, the computers were a bit clunky then, so the system ran with ASCII terminals hanging off one computer. That solved

## **MOS technology provides a standard communications protocol for newsroom computer systems.**

that it rationalizes all of the input and keeps it all in order. It is the nervous system in that it ties the technology together. It is the heart in the sense that, without it, the rest of the system grinds to a halt. The earliest newsroom computer systems started as a way to gather the newswires into sorted directories to make it easier for the various production and journalistic staff to find what they wanted. Sports stories went one place, business news another, etcetera. System designers added script-writing features that allowed editors to

the need to network everyone together.

As newsrooms became more automated, the newsroom computer system has evolved into a much more sophisticated environment. It can perform all of the same functions, but it has replaced dumb terminals with highly evolved networked systems featuring redundant servers, device control for production devices, interfaces to editing and browsing systems, and the ability to interface to affiliate news-distribution systems. It allows news staff to make and post assignments, preview stories, and interactively change rundowns right up to the time of air and during programs. Seamless browser interfaces allow staff to search for additional information for a story on line without complications.

New media features can be integrated into the newsroom computer system as well. The system can be the engine that publishes the Web version of station's output, integrating with Web authoring packages. In some cases, this interface uses media-object-server (MOS) technology.

In the past, newsroom-system software writers had to write specific device drivers for each and every device they wished to control. The onus was on the controlling device to understand the *lingua franca* of the production devices and, as necessary, change the driver to enable new features, or even maintain basic control as the device manufacturers changed their own code.



**Journalists prepare the news at the Inland California Television Network (ICTN), a highly automated, multichannel television network serving the San Bernardino Valley. Photo courtesy of Digital System Technology.**

But to speak to the devices they need to control and from which they need to receive status messages. MOS allows a newsroom system to write to a common platform. For instance, it can allow a system to use a standard language that all character generators understand, or a standard language that all video servers understand, and so forth. On the other side, the device manufacturer needs only to understand one method of interfacing instead of keeping up with many competing newsroom computer systems. This greatly simplifies the system architect's job.

### News content distribution

In the dark ages (a few years ago), each news-distribution agency, including broadcast networks like ABC, CBS, CNN and NBC, offered a real-time distribution rotation that the user had to record and edit as necessary. But in today's age of enlightenment, distinguished by the penetration of computers into the nooks and crannies of every business in the country (and wireless PDAs in the pockets of technocrats), we no longer need to roll tape at all. Most of the same services now offer either push- or pull-mode distribution that deliver the story to a local cache server on demand. From that point, the story can be pushed to tape at leisure, or moved using MXF or format conversion to an integrated newsroom nonlinear-editing system. The improvement is dramatic. Only the stories of interest are recorded, and there is no reason to roll tape at a time that might be inconvenient (or simply when the technician is not watching).

### The business

Broadcast news represents and important source of profit for owners. It also represents potential for losses if the market is overloaded with outlets, or when the expected volume of sales won't support the cost of producing high-quality news. Some broadcasters, notably Sinclair, have chosen to rework the local-news paradigm to one

that keeps local stories in the hands of local producers and journalists, but moves national stories to a central site where many stations can share the production costs. This is, in fact, a larger version of the regional-news consortiums that have existed for many years. The bottom line is what it always is: broadcast news is an asset

when, and only when, it makes money. Technology has made that much easier, but the newsroom staff must commit their creativity to running news as a business. **BE**

*John Luff is senior vice president of business development at AZCAR.*

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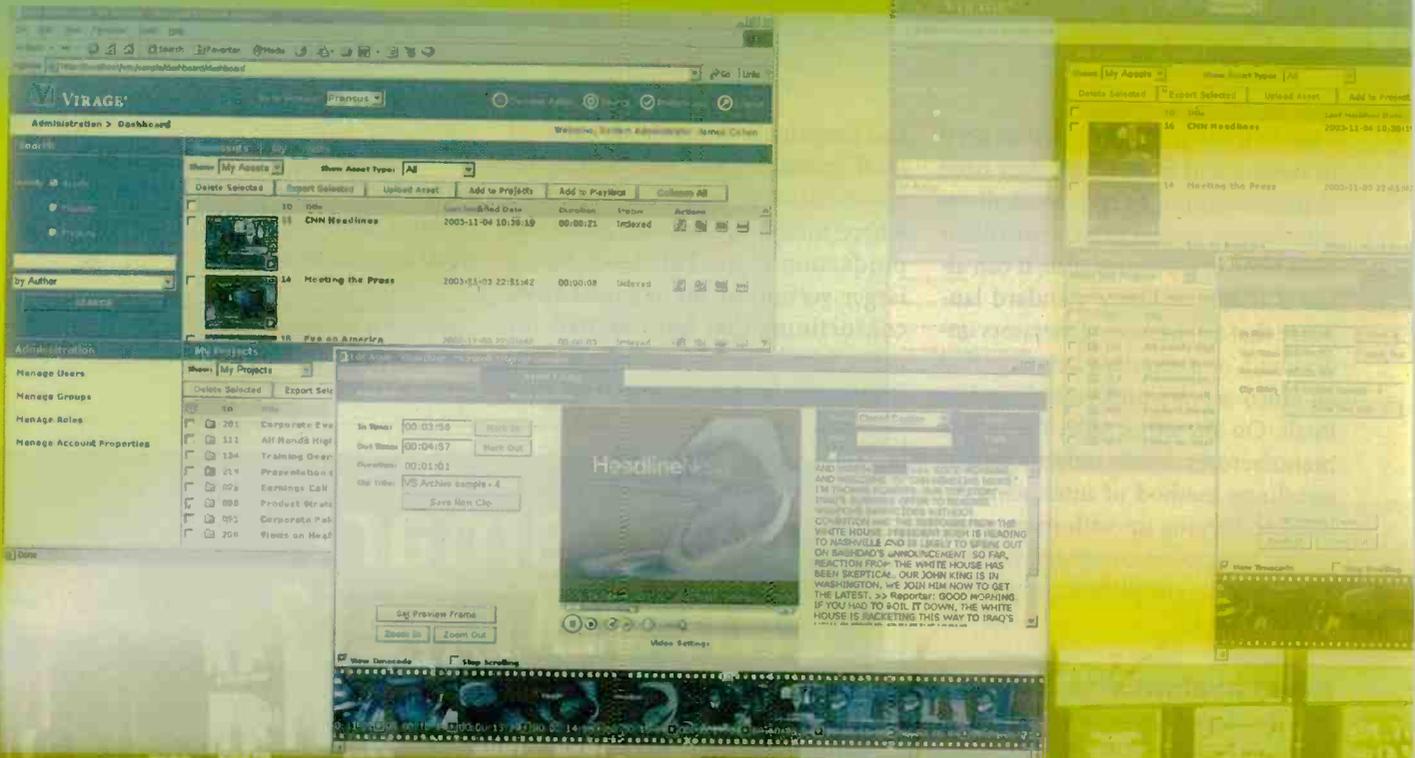
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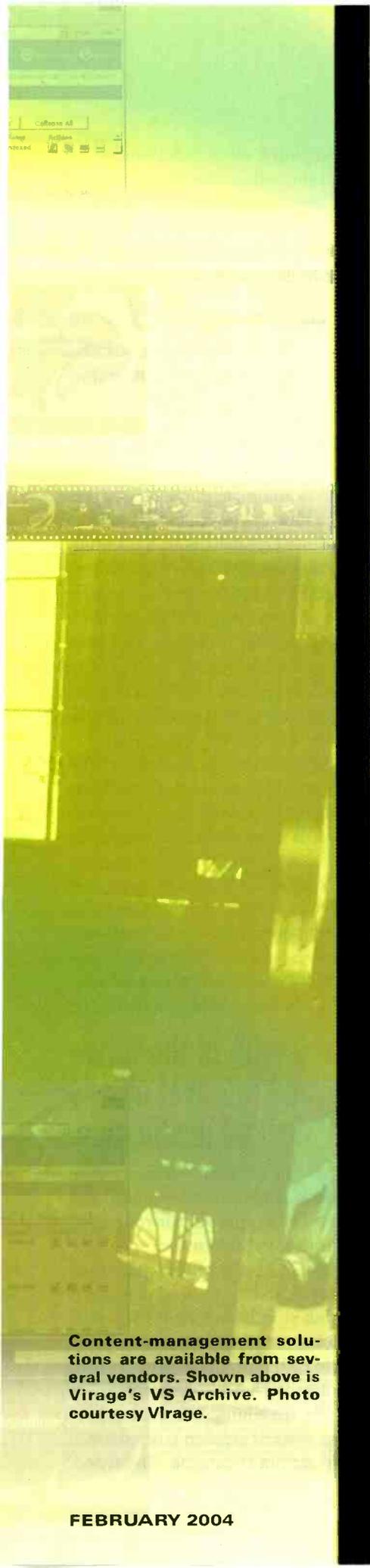
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# SPECIAL REPORT:

# Using metadata to manage workflow

BY PHILIP J. CIANCI



In today's world of digital media, metadata are inescapable. Metadata are pieces of information about other information — they are data about data. In a broadcast sense, they are descriptive information about program elements. In a tapeless world, metadata act as digital labels.

Media-industry terminology generally describes content as consisting of essence (video, audio, data) plus metadata (descriptive information about the essence). An asset is thought of as content and its associated rights (who owns and

## Creation

When creating graphics elements or ingesting programs, it is important to generate metadata that enables efficient authoring functions. Appropriate descriptive information such as time, date, location, talent, director, producer, etc. must be logged and associated with the newly created essence. Technical details pertinent to format conversion, color correction, equipment calibration, compression encoding, EDLs, transitions and steps taken in the editing process are all metadata that must

## Some metadata standards are open standards; others are proprietary. No one standard covers all phases of the metadata lifecycle.

controls the content). But, in this article, the scope of the term metadata includes rights-management information.

Broadly speaking, an asset's metadata comprise three distinct types of information: descriptions of the essence, technical parameters and rights obligations. Metadata provide the content descriptors used in media-asset-management (MAM) systems and, collectively, they enable indexed content storage and retrieval.

### Metadata lifecycle

Figure 1 on page 74 illustrates metadata's role in the production and distribution of programming for broadcast. The four phases in the lifecycle of metadata are (essence) creation, (program) assembly, (asset) distribution and (library) archiving. For each phase, the illustration lists associated open-standard metadata formats and offers representative examples of metadata attributes.

Various metadata standards are best suited to a particular phase in the production and distribution processes. Some are open standards, intended to be freely available and compatible with each other. Others are proprietary, used by groups of OEMs and offering a turnkey solution to MAM. But no one standard covers all phases of the metadata lifecycle.

be recorded for editing and assembly. Rights must be associated with particular elements so that individual contributors can receive production credits and royalty payments.

### Assembly

The assembly phase brings together all the elements (video, audio and logo) into a program and makes them ready for distribution. From this point on, there is little use for much of the metadata pertinent to editing the original source material into a program element. Technical data necessary for decoding at the consumer's receiver/decoder will be placed into the program stream. Creators' contributions and copyright information must be catalogued in this stage and distribution-rights management (DRM) must be activated before publication and ultimate loss of control.

### Distribution

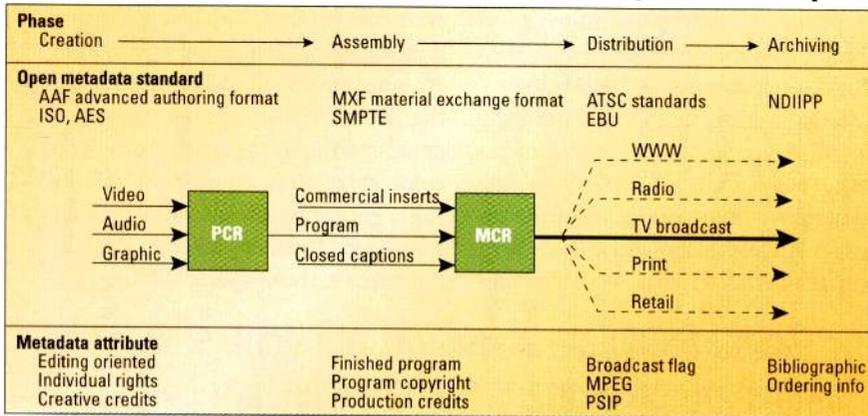
It's in a master control room (MCR) that the program, commercials, logos and other elements go to air as scheduled on the playlist. Each of the three primary types of metadata are now contained in a single program stream. Technical information is conveyed in the MPEG video or AC3 audio packets. Program descriptions are communicated by PSIP. Redistribution-rights

Content-management solutions are available from several vendors. Shown above is Virage's VS Archive. Photo courtesy Virage.

management is accomplished through the broadcast flag. All these packetized elementary streams are combined into a single transport stream. Transmission of the completed program can be

collection and long-term preservation of digital content. Appropriate metadata, attached at various times during asset creation and distribution, should be compatible with this public

- Simplified office functions — integration with back-office functions and event scheduling eliminates manual logging of content, avoids clerical errors and automates billing and royalty payments.



**Figure 1. The four phases in the lifecycle of metadata are (essence) creation, (program) assembly, (asset) distribution and (library) archiving. For each phase, the illustration lists associated open-standard metadata formats and offers representative examples of metadata attributes.**

through terrestrial, cable or satellite.

Individual program elements can easily be repurposed. For example, an audio clip can be used by radio or streamed on the Web. Individual video frames can be released in print. Clips or completed programs can be repurposed as streaming video over the Web. Video-on-demand services can offer previously aired programs over cable as pay-per-view service. These collateral distribution channels can provide added revenue to the program's creators.

### Archiving

The networked homes (and world) of the future demand instant access to, and retrieval of, any desired media item. Recommender systems that sift through available media metadata to find just the kind of asset you personally like and alert you to its availability are necessary to maximize your use and enjoyment of the abundant media choices. There are efforts underway to expand today's libraries to media libraries, which the media industry should support. The National Digital Information Infrastructure and Preservation Program (NDIIPP) is an effort by the Library of Congress to build a national infrastructure for the

archiving effort. Television broadcasts, after all, have historical value.

### Workflow enhancements

The intelligent implementation of metadata in a MAM system, along with improvements in a digital infrastructure, can increase workflow efficiency and offer other benefits such as:

- Instantly accessible content — everyone can access it as it is ingested.
- Streamlined asset retrieval — intelligent metadata facilitates searches and saves time. You don't have to

**The networked homes (and world) of the future demand instant access to, and retrieval of, any desired media item.**

physically track down content.

- Facilitated re-editing — the original edit decisions are stored in metadata and source material can be easily traced and retrieved.
- Facilitated file transfer — not having to reformat files saves a time-consuming step.
- Simplified rights management — DRM embedded in an asset can simplify content rights clearance and payment, save time and ensure full control over an asset's use.

### Issues

The following paragraphs address some issues associated with implementing metadata in the workflow-enhancement process.

*Element creation.* Capturing metadata properly can be a significant task. The key is to automate the metadata process as much as possible, beginning at the point of creation. Start by carefully analyzing workflow and metadata requirements. Remember to transfer those processes across all departments to help prevent problems with asset management. It is extremely important to understand how the metadata will be used and propagated through the creation and distribution process.

*Attribute naming conventions.* You must establish properties, attributes and naming conventions as mandatory standards throughout a facility. For instance, is a tag "home run," "homer" or "HR"? Your MAM search engine will need to know that each of these terms has the same meaning. Be consistent in your use of case, a "Home Run" may not be a "home run" across all platforms. Do not use illegal characters

such as / or @. Whatever convention you decide upon must be applied and enforced enterprisewide or your assets will be unsearchable and virtually lost.

*Flattening.* As elements are created and assembled, and the finished program is distributed, it is important to include some, but not all, of the metadata pertinent to each phase. This parsing of the metadata is known as flattening. For example, the editing information used during element creation is of no use to a viewer and can be discarded.

Conversely, copyright information is metadata that will have important uses after the program has left the control of the originator and should be persistent. So, while it's always possible to remove metadata, be sure you don't take out information that will be needed later.

**Platform and file interoperability.** Open standards vs. proprietary implementations are conflicting approaches to metadata standardization. Using different standards can result in an inherent lack of compatibility and cause difficulties when trying to create content with one vendor's application and then working on it with a different vendor's application. Even when different vendors implement the same metadata standard, problems with file compatibility still can occur. If you believe that multiple vendors may be involved in your solution, require them to demonstrate file transfer early.

**Digital rights management.** At the

heart of the matter is revenue generation, and the key to this is rights administration and enforcement. Rights management of program elements during program creation and rights management of a completed program after dissemination to the consumer are two separate issues. Prior to distribution, copyright is the responsibility of the program originator. Tracking the rights of creative contributors is a legal responsibility. The recently mandated FCC broadcast flag is intended to stop unauthorized copying and distribution of programming once it reaches the consumer. There is an added benefit when repurposing content to other platforms. Copyright metadata must be persistent through all phases of creation, assembly, distribution and archiving.

#### **A tower of metadata babel**

Broadcasters can choose from nu-

merous emerging metadata standards. But the interoperability of the available standards is in a developmental stage and has not been standardized. The goal for broadcasters is to coordinate metadata relevance through all phases of program creation, distribution and archiving. This will afford them the opportunity to realize new revenue streams through repurposing content.

For more information about ongoing metadata standardization efforts, visit the following Web sites: [www.smpete.org](http://www.smpete.org), [www.aes.org](http://www.aes.org), [www.iso.org](http://www.iso.org), [www.ebu.ch](http://www.ebu.ch), [www.pro-mpeg.org](http://www.pro-mpeg.org), [www.atsc.org](http://www.atsc.org), [www.digitalpreservation.gov](http://www.digitalpreservation.gov), and [www.aafassociation.org](http://www.aafassociation.org).

*Note: The reflections from Philip J. Cianci in this article represent his own opinions. Photos provided by vendors not necessarily associated with ESPN.* **BE**

*Philip J. Cianci is a broadcast media engineer at ESPN.*

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# SPECIAL REPORT:

## Troubleshooting digital video signals

By Michael Waidson

**T**he transition from analog to digital offers broadcast facilities many advantages to help maintain the quality of the video signal. Once a video signal is in the digital domain, it is immune to many analog phenomena that can diminish signal quality. But engineers need to change some of their familiar practices to cope with digital signals.

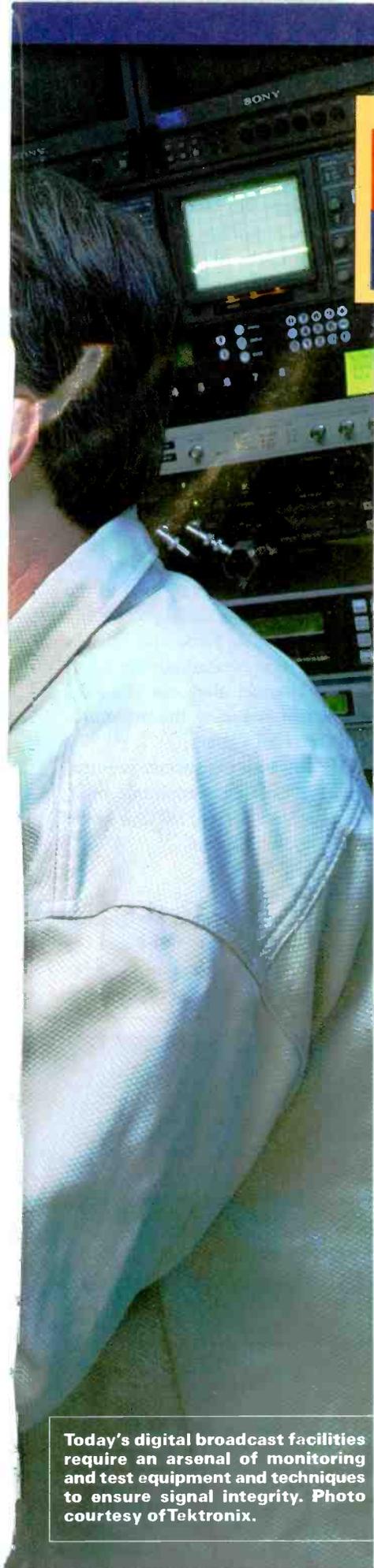
### Watch out for the cliff

Unlike analog picture signals, which experience gradual degradation, digital pictures can experience sudden degradation. If a transmitted digital

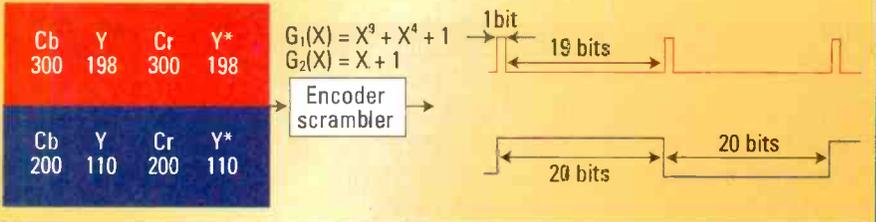
signal degrades beyond the point where you can guarantee its integrity, the received picture will likely disappear suddenly. This is called the "cliff effect." For example, the serial digital interface (SDI) signal is robust, but the fact that the clock is embedded within the datastream can be its Achilles' Heel. If, for some reason, the receiver is unable to recover the clock, it won't recover the video data and, therefore, it won't display the picture. At a digital television facility, it is up to the engineer to maintain the health of the signal and prevent it from falling off the digital cliff.

### Stress test

To qualify the installation of a system, you can use a test-pattern generator to apply specific digital stress-testing signals to the system. Figure 1 shows the SDI check field, a specialized, two-part test signal. One part of the SDI check field tests equalizer operation by generating a sequence of 19 zeros followed by a one (or 19 ones followed by a zero). This occurs about once per field as the scrambler attains the required starting condition and will persist for the full line until terminated by the end-of-active-video (EAV) packet. This sequence produces



Pathological test signal



**Figure 1.** The SDI check-field signal has two parts. One part tests equalizer operation; the other checks phase-locked-loop performance. In both parts of the test, Y occurs with the two chrominance components, while Y\* occurs separately.

a high DC component that stresses the analog capabilities of the equipment and the transmission system handling the signal. The other part of the SDI check-field signal checks phase-locked-loop performance with an occasional signal consisting of 20 zeros followed by 20 ones. This provides a minimum number of zero crossings for clock extraction.

**Error monitoring**

Error detection and handling (EDH) is based on inserting cyclic-redundancy-code (CRC) calculations for each field of video within the vertical ancillary data area. The signal generator sends separate CRCs for the full field and active picture, status flags, and other serial data through the transmission system. The deserializer

then recalculates the CRCs. If the recalculated CRC values are not identical to the transmitted values, this indicates an error. Therefore, you can use this method for in-service monitoring of the SDI signal. Most video equipment now supports embedding of EDH within the vertical ancillary data area. Various waveform monitors and SDI analyzers can provide



**Figure 2.** The video-status screen available with various waveform monitors and SDI analyzers can provide status reports of the EDH condition and can log errors.

status reports of the EDH condition and can log errors, as shown in Figure 2. These devices present typical error-detection data as errored seconds over a period of time, along with time since the last errored second. If the monitoring equipment reports that EDH errors are occurring often, this is an

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Measurement	Standard definition	High definition
Amplitude	800mv +/- 10 percent	(720mv-880mv)
Timing Jitter	0.2UI	1.0UI
Alignment Jitter	0.2UI at 1kHz	0.2UI at 100kHz
Rise,fall time	0.4 - 1.5ns	Less than 270ps
Overshoot	Less than 10 percent of amplitude	

**Table 1.** SMPTE measurement specifications for the SDI signal's launch amplitude, jitter, overshoot, and rise and fall times.

Today's digital broadcast facilities require an arsenal of monitoring and test equipment and techniques to ensure signal integrity. Photo courtesy of Tektronix.

Measurement	Standard definition	High definition
Amplitude	800mv +/- 10 percent (720mv-880mv)	
Timing Jitter	0.2UI	1.0UI
Alignment Jitter	0.2UI at 1kHz	0.2UI at 100kHz
Rise/fall time	0.4 - 1.5ns differ less than 0.5ns	Less than 270ps differ less than 100ps
Overshoot	Less than 10 percent of amplitude	

**Table 1. SMPTE measurement specifications for the SDI signal's launch amplitude, jitter, overshoot, and rise and fall times.**

calculates the CRCs. If the recalculated CRC values are not identical to the transmitted values, this indicates an error. Therefore, you can use this method for in-service monitoring of the SDI signal. Most video equipment now supports embedding of EDH within the vertical

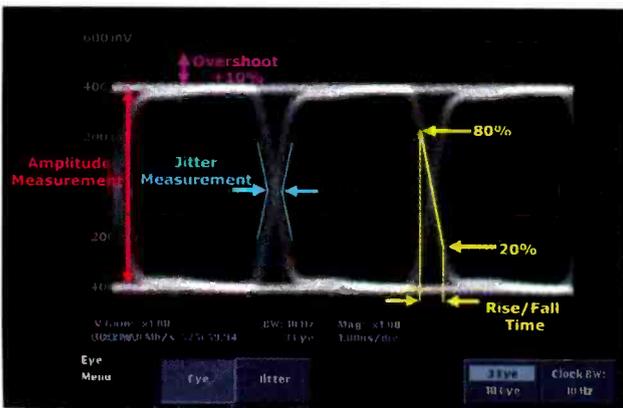
ancillary data area. Various waveform monitors and SDI analyzers can provide status reports of the EDH condition and can log errors, as shown in Figure 2 on page 77. These devices present typical error-detection data as errored seconds over a period of time, along with time

since the last errored second. If the monitoring equipment reports that EDH errors are occurring often, this is an indication that the SDI signal is getting close to the edge of the digital cliff. You should investigate the signal path further to troubleshoot the problem.

system, you'll need a waveform monitor that can display an eye diagram of the SDI signal. For accurate measurement, it is important to use a short length of high-quality cable. The monitor constructs the eye diagram by overlaying portions of the sampled datastream until enough data transitions are available to produce the 3-eye display, shown in Figure 3. On some instruments, it is also possible to correlate the eye display to data-word boundaries (10-word for SD and 20-word for HD). This feature is useful for detecting jitter patterns related to parallel-to-serial conversion.

A serial receiver determines whether a signal is a "high" or a "low" in the center of each eye, thereby detecting the serial data. As noise and jitter in the signal increase through the transmission channel, they can close the eye, thereby reducing the usefulness of the received signal.

SMPTE standards specify requirements for the launch amplitude, jitter, overshoot, and rise and fall time of the signal, as Table 1 shows.



**Figure 3. A waveform monitor constructs an eye diagram by overlaying portions of the sampled datastream.**

### Isolating the problem(s)

To isolate such problems within a digital

### Amplitude

Signal amplitude is important because of its relation to noise and because the receiver estimates the required high-frequency compensation

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**A letter from the publishers...**

New technologies and solutions offer television station management a competitive edge in their own market. From centralizing operations, changing to enjoy the benefits of an IT world, making money from multicasting and high-definition origination, 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 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 Feb. 10 and Feb. 11 in Atlanta. More than 100 top television executives joined leading equipment providers to discuss, explore and find solutions that 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 and successful.

Regards,

Dennis Triola  
Group Publisher  
*Broadcast Engineering*

Chuck Bolckom  
Group Publisher  
*Broadcasting & Cable*

**Contents...**

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 It's an IT world ..... 12  
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# The central question

*Opportunities abound for broadcasters who centralize operations, but they will face old-school challenges along the way.*

**T**o station, group and network managers, centralizing operations offers the long-term prospect of significant savings by cutting labor costs and expenditures for recurring consumables (such as tape), improving efficiency and building and maintaining a brand.

But the ultimate Nirvana for television management — one that includes everything from traffic and billing, to preparation and distribution of commercials, syndicated

**“The wide-area network is going to revolutionize how broadcast stations work.” - Al Kovalick, Pinnacle Systems**

programming and graphics, from the ultimate playback and transmission of content to home viewers, to log keeping and the inevitable make-good — remains illusive.

It's not that the pieces to pull off such centralization don't exist. In fact, many broadcasters currently have centralized one slice of group operations or another. But few have taken the plunge into creating what amounts to a “virtual television station” that is fed and cared for through a wide-area network (WAN) from a central “mothership” group headquarters.

Today, the main question of centralization is: How do stations move from the baseband-video culture

(where discrete operations such as news, management of satellite feeds, commercial and program playback are tied together and controlled from a master-control switcher) to a data culture (where programming content resides in files and discrete station operations exist virtually on a computer network)? Right now, the answer appears to be: one step at a time.

## You say you want a revolution

“The wide-area network is going to revolutionize how broadcast stations work,” says senior Pinnacle Systems fellow and strategist Al Kovalick. “Right now it's a little too expensive, but as it gets cheaper, there will be more centralized commercial preparation, syndicated programming preparation, graphics preparation and automation.

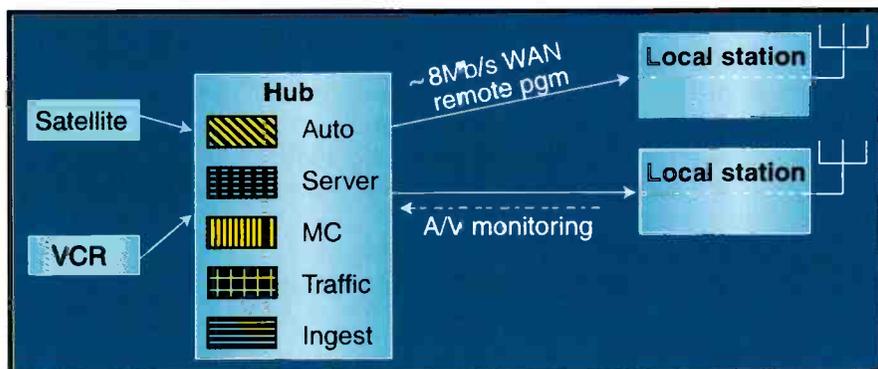
“I've gone to stations where there is nobody in master control, the graphics room or the content-

The model of a streamlined broadcast operation where group headquarters sends content and controls playout to satellite stations in local markets is “a grand view of the world to come,” according to Paul Turner, vice president of product marketing for Omneon. But station groups aren't quite ready to take the plunge.

“In reality, station groups are working with best of breed,” he explained. “The idea of centralcasting is very attractive. The manned station is a hybrid approach. The idea of moving material as data is becoming extraordinarily attractive to broadcasters, but physical playout is still manned.”

WANs impact centralization in two ways, according to Glen Sakata, director of sales for broadcast and telecom at Harmonic. “There are totally separate reasons to connect in a centralized system.

“One reason is business — that is, sharing traffic and skill sets,” he



**In the 100 percent centralcasting model, most programming originates from the hub “mothership” group headquarters and is sent to individual stations over a WAN. Drawing courtesy Pinnacle Systems.**

preparation area. It's happening today. Stations may be doing one or two, but not all of them, yet.”

said. “In one station, a certain skill set might be great, and in another station in the group it may not be

so good. On the other side of it, you might be sharing material — real-time material — and moving it to air in real time.”

According to Snell & Wilcox’s Joe Zaller, using WANs in broadcast can make television production more

efficient. “File-based facilities using networks are the key to dramatically improving workflow in the making of television programs,” he said. “Today’s production methods are wasteful and inefficient. The networked facility is the beginning of

a new era that will transform production processes.

“Wide-area networks also offer a centralized way to monitor and control an entire broadcast facility. Our company’s RollCall technology uses a network to control the entire facility’s ‘smart’ infrastructure from a single PC. The value of this network technology is immense, saving hours of engineering time.”

## What’s to centralize?

Opportunities abound for station groups to centralize operations.

### *Graphics creation*

Rather than relying on CG operators and graphic artists at individual stations, centralizing graphics production at group headquarters offers several advantages:

- Consistency in look and feel across all group stations
- Better quality control and greater accuracy: This approach limits points where errors can be introduced to one.
- Flexibility: Through the use of MOS in news systems, centrally generated lower-thirds can be updated by journalists, even during breaking news.
- Cost savings: Reduces redundancy of hardware and personnel

### *Program and commercial preparation*

Centralizing syndicated program and commercial preparation at group headquarters:

- Eliminates redundancies, such as taking down satellite feeds at designated time
- Reduces preparation requirements, such as marking in and out points, by allowing one central staff to do the work previously done at each station
- Transforms traditional push method of program distribution to a pull approach where satellite stations can download material at convenient times
- Saves in outlays for hardware and personnel

### *News production*

- Improved efficiencies in multiple areas, including presence of unlimited copies of source material
- Greater journalistic control over content
- Redistribution of redundant news resources to magnify news reach
- Improved cataloging and archiving
- Cost savings in personnel and equipment

### *Automation, traffic and billing*

- Centralized quality control and assurance
- Efficiency and cost-savings enhancements
- Automated billing on a groupwide basis for stronger centralized management control

## Central advantages

Centralizing and automating production and distribution activities offer benefits in several areas, including news, sports, graphics, and distribution of commercials and syndicated programming. While centralization in all these areas improves efficiency and cost savings, many of the benefits are specific to the individual task.

Centralized news operations can reduce news-staffing costs, tape expenditures, and the amount of time and money needed to manage satellite feeds. The work Dalet is doing for Prime Television in Australia demonstrates the benefits of centralization in news production.

“We provided a system with a single database hosted in Canberra, where Prime Television’s headquarters is located, that could hold storage at all of their broadcast sites,” explained Thomas Zugmeyer, product manager in charge of DaletPlus Media Library.

“We set up small servers at the remote bureau that uses journalists’ hard disks for content,” Zugmeyer explained, “and sent finished packages to bureaus to be produced and sent to the broadcast site where they need to be played out.

“So, basically, we are producing what they had done before when it was sent by satellite as DV. Now, everything is transferred as files over an IT network. They (Prime Television) is taking advantage of that to bring down costs.”

In graphics, centralization can reduce personnel, assure a consistent

look across an entire station group and improve accuracy. "Centralized graphics production minimizes mistakes," explained Turner at Omneon. "It guarantees a look and feel across the entire station group, and it does so without a graphics operator at each station."

Centralization of graphics lets a station group select its most talented artists to work from one location where they can create templates for promos and news graphics such as lower-thirds and station identifications. From their central location, the templates are sent as files to satellite stations, which complete them by inserting each station's call letters and network-affiliation logos or news titling.

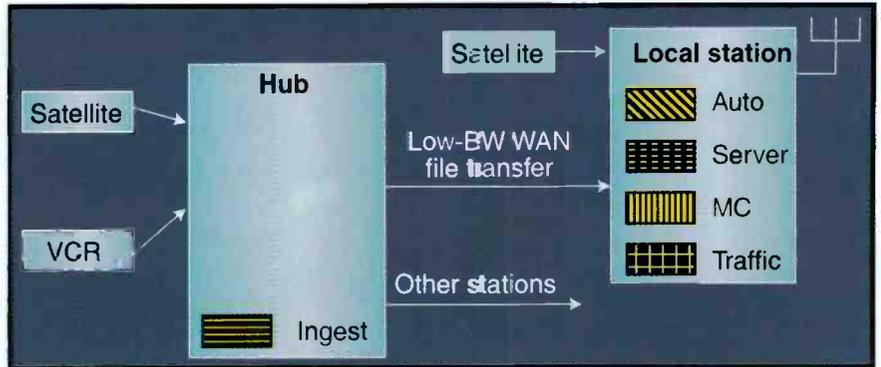
**"You look around and wonder, 'Why are we doing this? Why do we need 20 stations with all this equipment and all of these people?' " -Glen Sakata, Harmonic**

Centralized graphics are also easier for a station group to analyze in terms of workflow and use, said Bruce Lane, Thomson director of applications engineering.

"By centralizing," he explained, "it's possible to analyze the workflow to make sure you are as efficient as possible. Then you can look after the fact at graphics usage to analyze if you are providing too much or too little support.

"You can go back and do an analysis on a station-by-station basis. Because it is centralized, you can see who is using the graphics the most and determine which type of graphics are used most and why."

Given the number of commercials and amount of syndicated



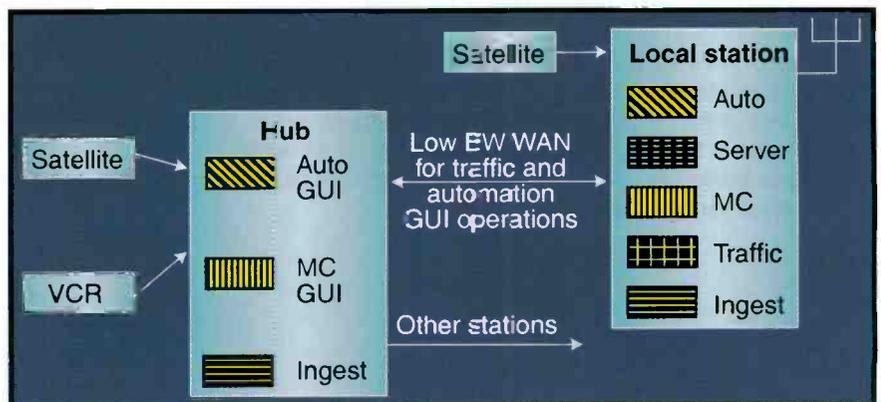
**In the centralized content aggregation model, most non-live content needed at individual stations is captured, prepared and given a quality control check at the "mothership" hub. Files are transferred to remote servers via a low-bandwidth WAN. Drawing courtesy Pinnacle Systems.**

programming that stations receive, it's no wonder station groups are looking to WANs to lower costs.

"The popularity of servers in broadcast environments is driving a desire to simplify the delivery of programming — syndicated, spot and news — into broadcast facilities," said Zaller of Snell & Wilcox. "Centralized delivery systems are born of need to simplify and smarten the ingest process — if for

played off that tape again. Once a single ingest is complete, it can be made available to everyone in the centralcast system."

"At your group's 20 stations, whenever they are going to download a show, you have 20 stations each with a satellite dish, each with a tape operator, all marking in and out points," said Glen Sakata of Harmonic. "That happens 20 times for each feed throughout the group.



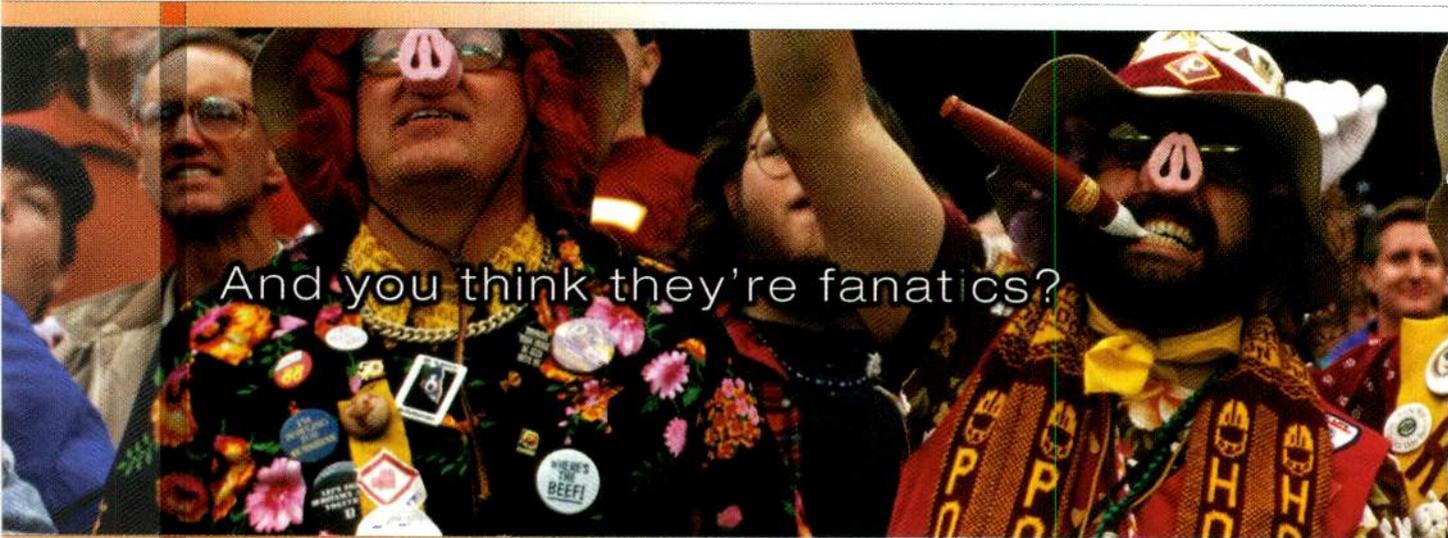
**In the centralized personnel model, the automation and master control systems of a remote station are operated by personnel at the WAN. Typically automation control hardware is at the local site and controlled remotely. The remote site has a person for ingest, preparation and quality control.**

no more reason than there are fewer people available to handle the inefficiency of multiple media formats.

"If you ingest once and store the content on a server and make it available to multiple outlets, you never have to do the same process again. So if a program or spot comes in on tape, it will never have to be

Harmonic's Sakata illustrated the efficiencies of centralizing syndicated program distribution by describing a hypothetical 20-station group licensed to broadcast the show on each station.

"You look around and wonder, 'Why are we doing this? Why do we need 20 stations with all this



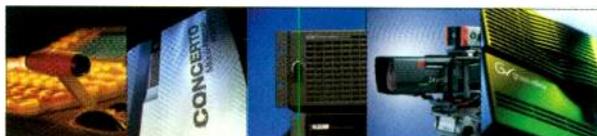
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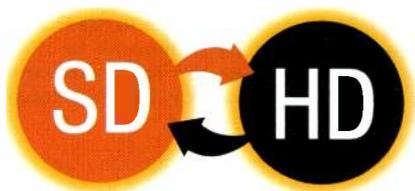
Every HD product with our name on it adheres to a common set of principles:

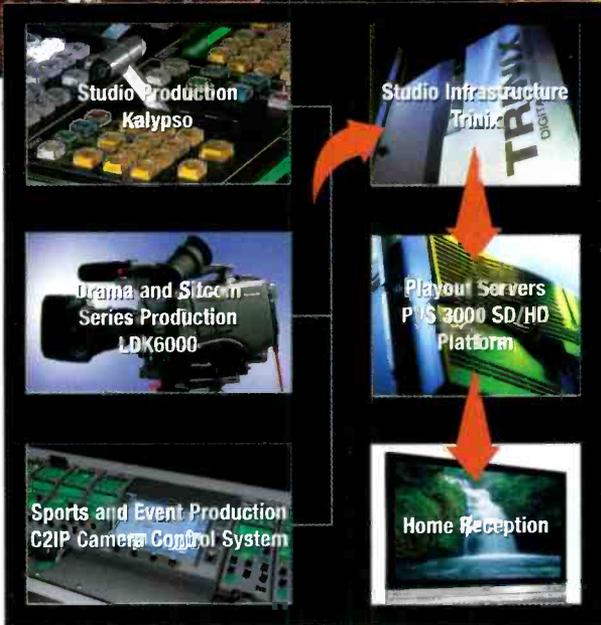
- It must support multiple formats, or be truly format and resolution dependant
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equipment and all of these people? We need two — one for backup. And two is a lot less than 20.”

As an alternative, distributing commercials and syndicated programming as files across a WAN allows a station group to post material when it becomes available. Individual stations can then download the content as scheduling allows, thus transforming a top-down push process to a pull operation that gives individual stations more control.

WAN distribution of commercials and syndicated programming is more robust than traditional methods and reduces the amount of quality control needed. “Distributing programming by file transfer cuts down on the amount of quality checking that’s required,” said Kovalick of Pinnacle Systems. “When you transfer video, say via satellite to stations, you have to do a lot of quality-assurance testing for dropouts. If there’s a problem, such as a rain fade in a satellite transmission, the video has to be re-transmitted. PBS is doing file transfer to stations, and they can allow for a 20-minute dropout. It’s built into the transfer protocol.”

The benefits of centralization are even touching the sports production slice of the broadcast business. Aside from the sports-highlight shows — which are scripted much like news programs and can benefit from comparable centralized control over content creation, storage and playout — live sports production is benefiting from centralized control and IT technology in some interesting ways.

“The thing about sports automation,” explained Turner of Omneon, “is that much of the statistical analysis is being generated through data mining. The ability of the graphics packages to go to databases and generate graphics in response is being exploited in sports production.

“ESPN owns a statistics database, as do the NHL, NBA and NFL. They all have their own. These guys have anything about any team and

anybody. The graphics systems are mining from these databases.”

Anyone who’s watched football recently is familiar with the on-screen results. “Now we are seeing the line-of-scrimmage marker and graphics zones that illustrate the kicker’s completion-success percentage from 20 yards, 30 yards and 40 yards. Those graphics are the result of data mining,” said Turner.

Box scores on Fox Sports and CBS Sports coverage are generated in a similar way. “The information comes literally and physically off the scoreboard at the stadium. They take that physical information that someone is feeding into the scoreboard and feed it back to CBS or Fox. A

computer constantly culls through that information and looks for changes, and the score box pops up. That is a good case of WAN-based connectivity,” said Sakata.

### **Remember the future**

One day in the foreseeable future, walking into a television station may be reminiscent of walking through a ghost town. Where once the master-control operator sat behind his board similar to a saloon-hall piano player calling the tunes, servers will flash their drive lights and whirl their hard drives. They will sit on the WAN taking in files containing commercials and programs, network feeds, local news stories, and

## **Approaches to centralization**

Centralizing broadcast operations means different things to different people. However, all centralization can be broken into three parts, or categories. Understanding a little of each can help in charting a path for a more-efficient, profitable future.

### *100 percent centralcasting*

Think network operations center (NOC) and satellite stations, or group headquarters and owned stations. In this model, most or all of the satellite stations’ programming (sans local news) comes from the NOC. There’s no master-control operator at the satellite stations; however, there is local news production. Considerations of using this approach include WAN costs and reliability, which can be enhanced with mirror servers.

### *Centralized content aggregation*

Nearly all non-live content used at satellite stations is captured, prepared and given a quality-control check at the NOC. Using a low-bandwidth WAN, content files are transferred to file servers at satellite stations. This does not require big servers and is easy to implement.

### *Centralized personnel*

Personnel at the NOC control all automation and master-control systems for the satellite stations. Typically, the real-time hardware needed for automation control is located at the NOC. At the satellite stations, a person is responsible for ingest, preparation and quality control. This means that personnel at the remote site, excluding news, are reduced to one.

Information courtesy of Pinnacle Systems senior fellow and strategist Al Kovalick.

run lists from station group headquarters and play it all back with cold precision.

Harmonic's Sakata prefers a more contemporary analogy for what is about to happen. "The stations doing centralization today and tomorrow are still basing everything on the operational paradigm of the past," he said. "There are no completely tapeless environments at TV stations yet.

"When all is said and done, when there really is a tapeless facility, there will be a dramatic shift in centralization. And it will be the same transition that occurred 10 to 15 years ago in radio. There is no tape in ra-

dio, and no people operating it. Most things are centralized.

"We've gone from master-control automation controlling separate tapes in separate tape decks to giant cart machines. The next step was to cache it into a video file server.

"All of that legacy will come to an end and move onto a different architecture, and it will look a whole lot more like radio," said Sakata.

Whether or not the transition to centralized operations actually goes that far, one thing is certain. Even in a time when the FCC has renewed its interest in reminding stations of their commitment to local-

ism and has organized a task force to assess how well broadcasters are serving their local markets, the technology of television will increasingly pull control over stations to a central, remote group headquarters.

Such consolidation of station operations at group headquarters could appear to fly in the face of the FCC push for localism, but it may bolster the position of broadcasters in serving their local community. It could free up financial resources and make them available for increased production of local news coverage, information services and public-interest programming. ●

## RollCall control is central to efficiency improvements at Turner, WTOL-DT

Wide-area networks offer a centralized way to monitor and control an entire broadcast facility. Turner Broadcasting in Atlanta and WTOL-DT in Toledo, OH, are two broadcasters that rely on the same technology to reap those rewards but on dramatically different scales.

Both use the Snell & Wilcox RollCall software and IQ input/output, control modules to direct their facilities' "smart" infrastructure, saving hours of engineering time.

At Turner Broadcasting, more than 7000 IQ modules are in operation, touching every aspect of Turner's operations for more than 20 networks. Despite the

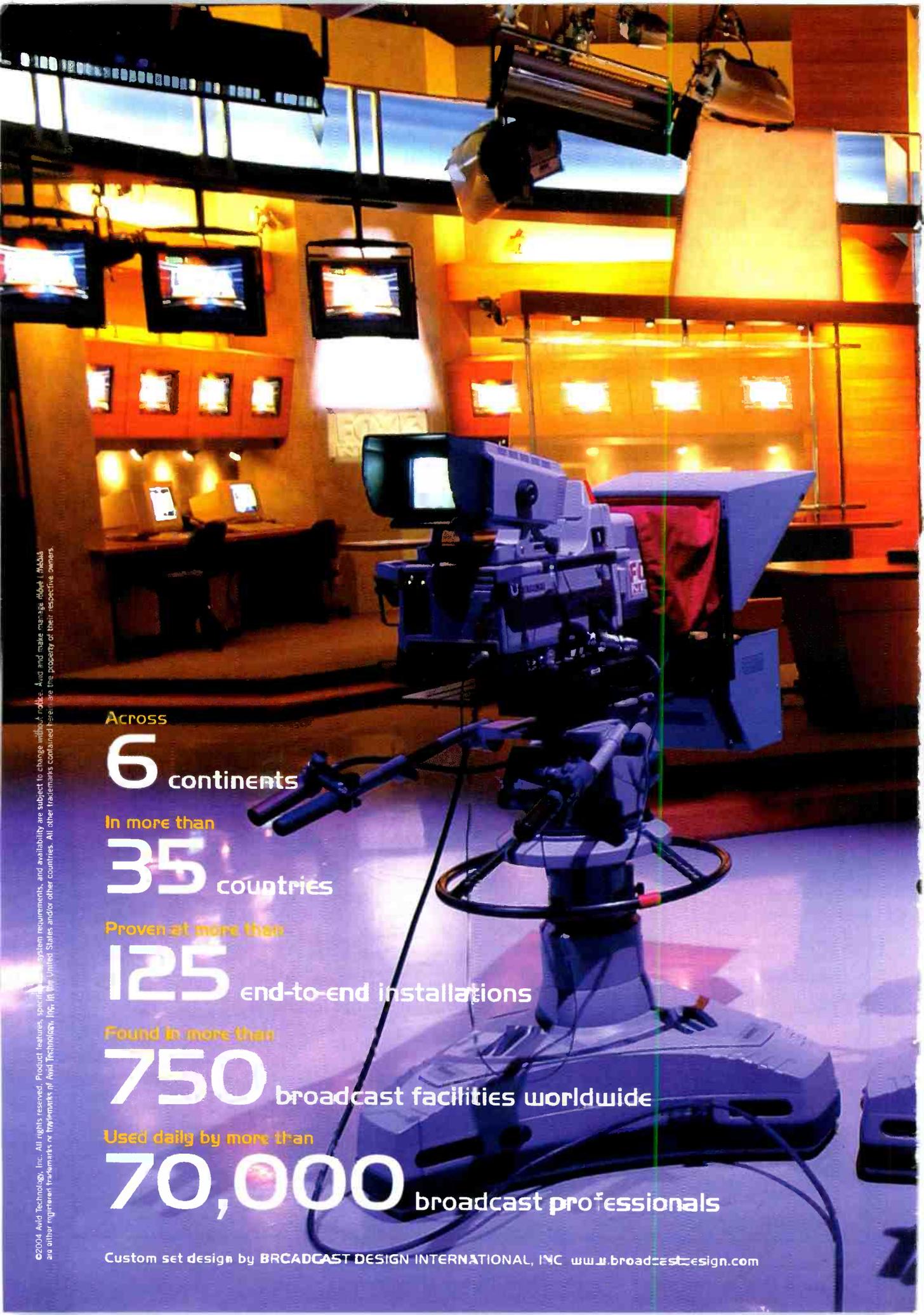
complexity of this system, all Snell & Wilcox equipment at Turner can be controlled centrally from a single computer with the company's RollCall control and monitoring software. The benefits Turner

realizes include greater efficiency, cost savings, time savings and improved operational efficiency.

The Snell & Wilcox digital infrastructure solution may be of even greater importance to small broadcasters. At WTOL-DT in Toledo, OH, a much smaller RollCall and IQ installation is used for digitization, monitoring and control. WTOL-DT has achieved similar results to Turner in terms of quality, reliability and efficiency gains.



**At Turner Broadcasting, Chuck Armitage uses one of more than 7000 IQ modules, allowing the Snell & Wilcox RollCall software to control and monitor equipment needed to keep more than 20 networks on the air.**



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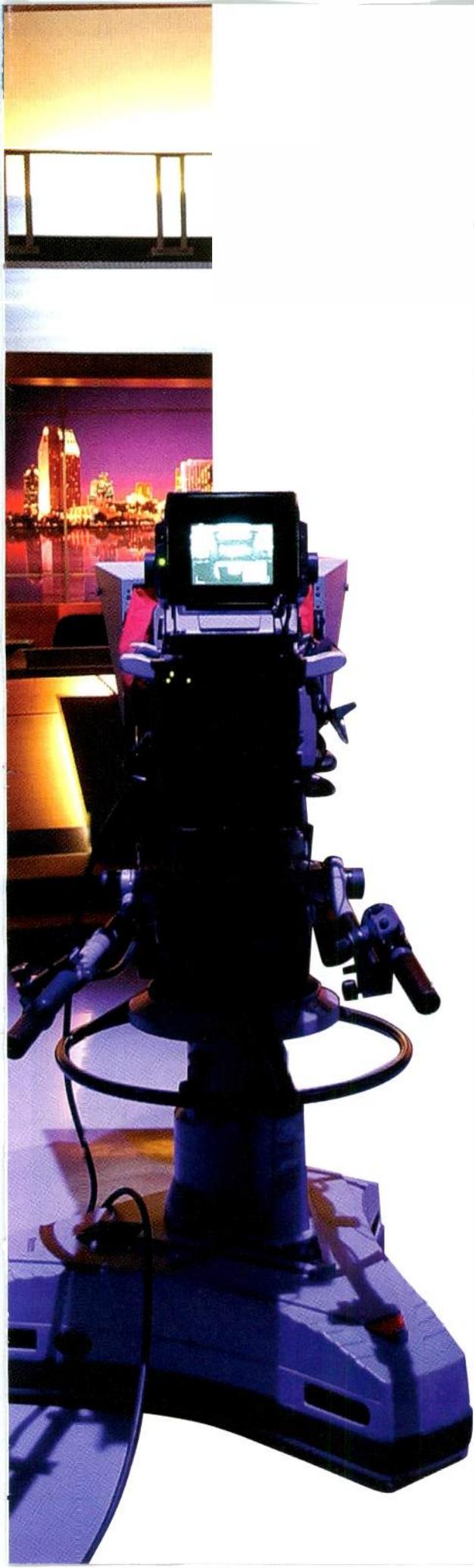
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# It's an IT world

*Television is on the cusp of a radical change due to IT, which offers unimaginable efficiencies in production, distribution, traffic and billing.*

It's funny how things can change in an instant. Take the Yucatan peninsula 65 million years ago. One day dinosaurs were lumbering along, munching away on the verdant landscape or, in some cases, each other.

The next day, a giant rock from space slams into what is today the village of Chicxulub, Mexico, in-

**"Where possible use industry available components to build your system."  
-Bruce Lane, Thomson**

stantly killing everything for hundreds of miles. Thanks to the millions of tons of debris thrown into the atmosphere, the repercussions of that cataclysmic event wiped out most of the life on Earth and restacked the evolutionary deck.

Fast forward to today's typical television station. Each day, CG operators, graphic artists, maintenance techs, tape-machine operators, billing staff and traffic managers lumber through station hallways to their offices or work areas. They do their jobs; they earn their pay; they eat their lunch. Then one day, the nemesis arrives—not in the form of a computer, a server, a network router or a WAN.

"Adoption of video over an IP connection completely changes everything at television stations," said Glen Sakata, director of sales for broadcast and telecom at Harmonic. "Two

years ago, this was on no one's radar screen. Now it's on everyone's."

Forget formats, think files. So long tape machines. Hello, file servers. Machine automation, gone. In its place, network controllers and routers. Bye, bye coax. Come right in, Ethernet—big, fat broadband Ethernet and Fibre Channel. Hasta la vista cassette labels. Hola metadata.

The IT revolution is upon the industry, and it is unleashing a titanic shift in how television will be done. To those who are curious and willing to adapt and evolve, the IT changeover at stations presents more than opportunities to improve efficiencies and realize cost

savings. It demands growth and develops leadership.

"Certainly IT will continue to grow in importance when it comes to the entirety of station technology," said Pathfire vice president of strategic broadcast solutions Steve Flanagan. "Even transmitters have IP addresses. The video engineers need to expand their knowledge base."

## Who's in charge here?

No one believes station operations will remain how they are. The question appears to be will IT swallow those operations whole, or will the station's existing technical staff



**IT-based infrastructure will touch every facet of station operation, including news production. Here one of several Grass Valley NewsEdit systems is used to assemble a story at WJAR-TV in Providence, RI.**

become the IT staff, as well?

"The best, most experienced technical managers will run the station, as they do now," said James Frantzreb, Avid Technology's senior product marketing manager. "The technology in place at stations will

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**"Project where you are going to be in two decades and put infrastructure in place that you can easily upgrade ..." -Joe Zaller, Snell & Wilcox**

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rely more and more on IT-type networking enabled for digital media, so knowledge of IT and proper IT infrastructure is certainly important. The broadcast engineering profession is steadily becoming more IT savvy, so perhaps you could say they will be the IT guys."

"There will be a gradual merger between engineering and IT," said Thomas Zugmeyer, product manager in charge of the DaletPlus Media Library. "If you talk today about a network to a broadcaster, he understands SDI baseband. But gradually, he will talk about Fibre Channel and Ethernet."

But in the view of Al Kovalick, Pinnacle Systems' senior fellow and strategist, placing control over technology in the hands of IT people is a fait accompli in some broadcast organizations already. "PBS is already this way. At the mothership in Alexandria, VA, the CIO runs the technical side of the house, and he is an IT guy," he said.

However, there is a cultural difference between the IT world and the broadcast world, according to Harmonic's Sakata, that should give broadcast engineers with IT knowledge comfort. "Quality of service of video has to be perfect, and a tradi-

tional IT guy can't get his hands wrapped around that," he said. In other words, at the end of the day in television there is a deliverable program that gets broadcast. "IT guys aren't used to operating in that mode," he said.

"The most successful stations," Sakata said, "occur when an IT group reports to the vice president of engineering and an us-vs.-them attitude is never allowed to take hold."

Regardless, for the IT transition to be successful broadcast engineers would be well-advised to go to school on IT. "Recognize that IT is a new technology for broadcasters," said Joe Zaller of Snell & Wilcox. "No traditional engineer is expected to be an instant IT expert. This transition will require re-education for many engineers. Choose a trusted manufacturer with proven expertise to help solve specific problems during a facility upgrade.

"Broadcasters should not see IT as a panacea but as a way to make them better at what they do. But they must recognize that broadcast requires real-time deterministic systems and IT cannot always promise and provide these. That's why Snell & Wilcox makes systems that are IT- and metadata-aware today — and work in real time as required by broadcasters."

### **Infrastructure**

Whether it's the IT department or the television engineer wearing the IT hat, the goal remains the same: developing an IT infrastructure that's robust enough to handle the demands of television, flexible enough to accommodate legacy equipment and secure enough to stave off malicious viruses and worms.

Building flexibility starts with optimizing for media, according to Avid Technology's Frantzreb. "You start with a media network, which is a network optimized specifically for handling digital video and audio, and supporting nonlinear workflow.

"High bandwidth, in terms of the ability to support multiple simultaneous high-resolution streams for a variety of different applications, is the single most important capability a media network should have — but by no means the only one.

"Unrestricted shared access to media is particularly important for broadcast environments. A real-time-oriented media-asset-management system is also a key infrastructure component for providing a variety of additional capabilities."

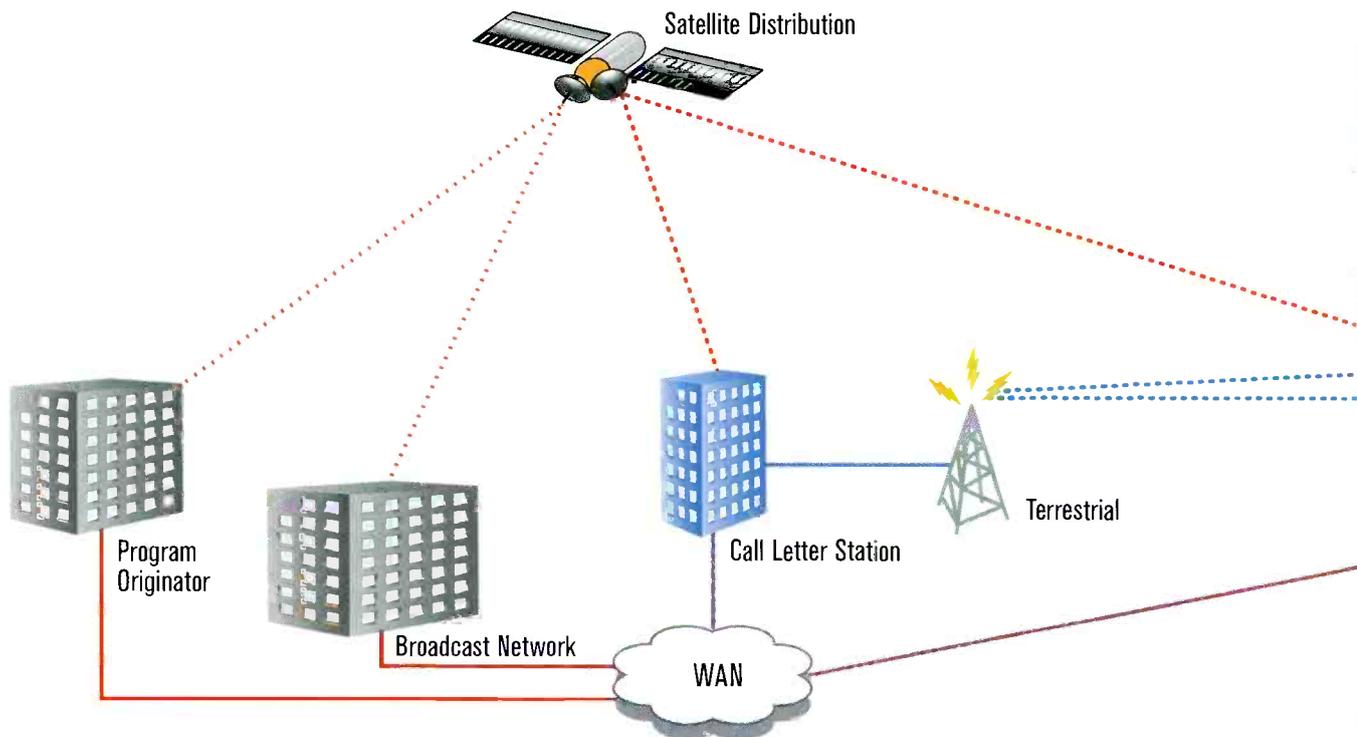
On an even more fundamental level, flexibility demands a re-orientation of attitudes toward television. "Embracing changing methodology of store-and-forward technology with delivery of digital assets allows deeper migration of content and metadata into the station, which streamlines workflow," said Pathfire's Flanagan.

On a practical level, Paul Turner, vice president of product marketing for Omneon, suggested bandwidth. "You need the biggest pipes possible," he said. "My advice to anyone putting in an IT infrastructure is to go for Gig-8 if you can afford it. Bandwidth is rather like hard drive size. No space goes unused. That is human nature. There are a lot of facilities running on 100Base-T for testing and moving low-resolution proxies. Gigabit Ethernet is endemic, and 10 Gigabit Ethernet and 100 Gigabit Ethernet are being contemplated. Gig-8 is not that expensive anymore."

Planning for the future should also be the aim of any infrastructure design. "Start with an open mind and plan on building a broadcast infrastructure that will last for up to 20 years," said Zaller of Snell & Wilcox. "Project where you are going to be in two decades and put infrastructure in place that you can easily upgrade for those future needs. If you are still SD today, plan for HD tomorrow. It costs much less in the end."

Finally, when considering IT infra-

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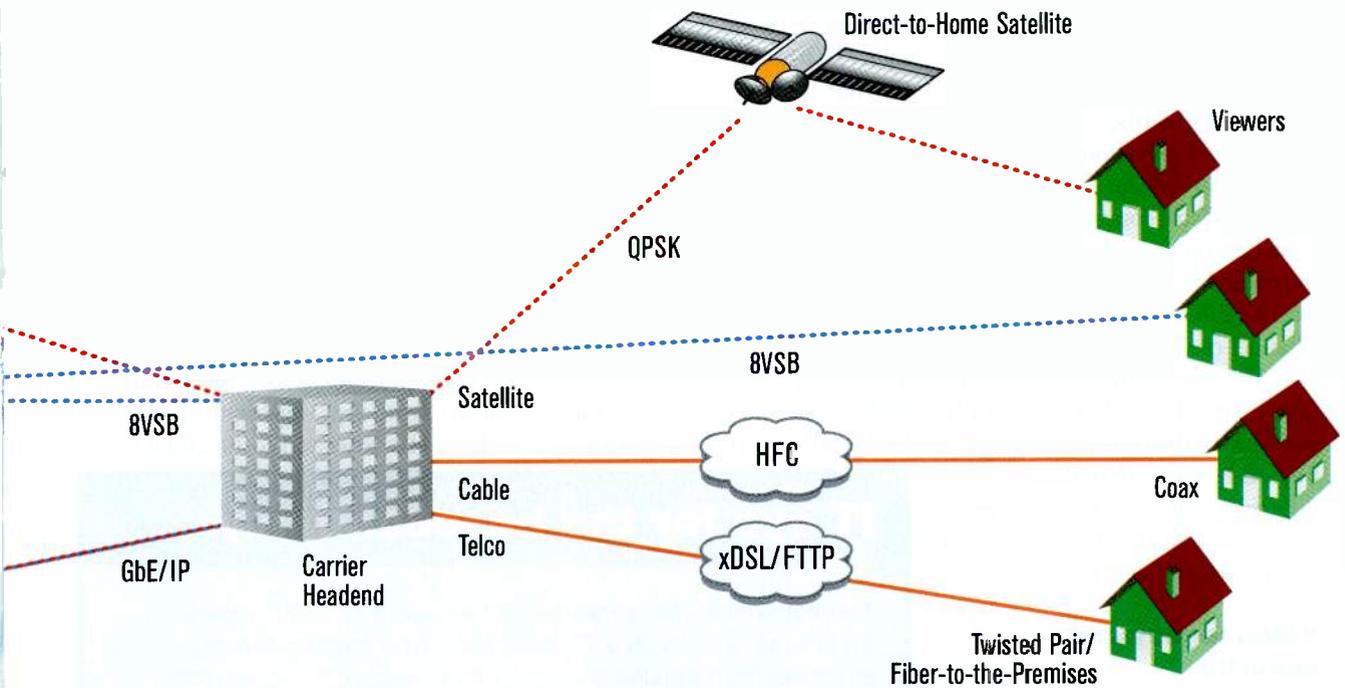
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structure remember to draw on the strength of broad industry acceptance. "Use and depend upon industry standards," said Thomson director of applications engineering Bruce Lane. "Where possible use industry available components to build your system. If you look at many of the products we build and support, we have Ethernet capability on Fibre Channel or Gigabit Ethernet.

"All of our products take advantage of products that are readily available in the consumer industry, but understand that there's a big difference between a \$50 Ethernet switch and what needs to be used in a broadcast facility."

### **Video legacy and security**

For the foreseeable future, IT and video technology will coexist, even if the role of baseband video wanes with each passing year. If a station were starting from scratch, its design would center on IT, said Dalet's Zugmeyer. "But that's not what broadcasters want because they have an installed base," he said. "They are not going to put all their eggs in one basket. The changeover to IT isn't going to happen overnight."

Accommodating legacy video equipment isn't difficult, according to Avid Technology's Frantzreb. "It is not hard for the synchronous signal and asynchronous file-based fabrics to coexist at a station. There are several crossover points, such as VTRs with asynchronous outputs, servers and control systems. Sometimes it makes sense to replace some legacy analog equipment with digital file-based systems."

That replacement will accelerate. "Right now it is a combination," said Pathfire's Flanagan. "Clearly it's headed in the IP direction. But it won't ever be 100 percent IP. There will be certain monitor wall functions that will remain baseband, but certainly for non-real time, everything will move to IP."

"There's always a speed vs. cost

trade-off as technology evolves," he said. "That is the kind of conundrum that has to be checked annually. Has the new technology been reduced in cost enough that it makes sense to use? You should have the fastest connectivity you can afford."

In the view of Snell & Wilcox's Zaller, discrete islands of technology will exist as the conversion unfolds. "There will long be analog islands, SDI islands, file-based islands," he said. "Build a solid infrastructure to bridge those islands. As your needs

change, adapt your infrastructure to accommodate new solutions.

"Islands will exist in broadcast plants for many years to come. The trick is to create an infrastructure that can easily adapt and grow with them. That's a key area of expertise at Snell & Wilcox.

"Snell & Wilcox has a long history of bridging these types of transition for its customers. Today, broadcasters are undergoing four transitions at the same time: analog-to-digital, SD-to-HD, baseband-to-file and tra-

## **IT eye for the baseband guy**

Tired of feeling like a baseband Neanderthal? Well, maybe it's time to update your IT essentials. And nothing is more essential than making sure your rock-solid SDI expectations are met with IT technology.

While SDI dominates frame-accurate switching between synchronized sources — and will for the foreseeable future — the benefits of using Ethernet in other non-live applications can be enjoyed without the worry of A/V data jitter resulting from LAN and WAN connections, disc latency, IP routers, data servers, and other sources.

Through the use of proper data buffering, IT equipment can deliver and process A/V data error-free in real time. With proper system design and the right equipment, the use of buffering will correct A/V jitter and go undetected by the end user.

Often three types of buffers are used:

- The look-behind buffer stores A/V material that has just been ingested. It is elastic, filling at a constant rate from the video input and emptying somewhat erratically as data is written to a storage array. As long as the buffer doesn't empty or overflow, all input data will be saved.
- The look-around buffer protects from access irregularities in applications, such as editing where a user needs to bounce back and forth between a narrow range of frames. A local buffer smoothes out the sluggishness that would be present if jogged frames had to come from a remote server. Such smoothing is essential when several users access the material across a WAN.
- The look-ahead buffer is used in signal playout devices. This buffer is filled with a few seconds of material prior to playout and empties at a regular rate.

Information courtesy of Al Kovalick, Pinnacle Systems fellow and strategist.

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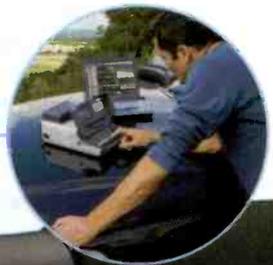
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ditional broadcast infrastructure to file-based infrastructure.

"The key thing to understand is that there is not one answer out there, since each broadcaster is at a

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**"To protect news editing systems from the hazards lurking on the Internet, limit port availability."  
-Bruce Lane, Thomson**

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different point on the continuum of transition. What broadcasters need is the peace of mind that they can make purchasing decisions today that will solve their immediate issues and also help them move toward the file-based future."

### Protection

Broadcasters contemplating IT may feel a little queasy about the prospect of a worm or virus gnawing at their content or knocking their commercials off the air. But they shouldn't, said Omneon's Turner.

"When was the last time you heard Bank of America went down because of a virus or worm?" asked Turner. "If you want to see 24-hour reliability, look at Wall Street. The technologies are out there to protect mission-critical operations. To an IT guy, this is no different than the normal workday issues in any computer network."

Isolating various LANs that are used at the station and reducing points of entry to the Internet to one are among the strategies to use, suggested Pathfire's Flanagan.

"We think that due to security and throughput concerns, for the time being the separate LAN has a good strong place," said Flanagan. "We don't want the general manager's secretary's PC to affect master control. We still



**The Turner Cartoon Network uses Snell & Wilcox RollCall terminal technology in the short-form ingest station to centralize control and monitoring functions.**

see a lot of separate LANs. There are business LANs and e-mail LANs and little connection between them.

"What we are seeing many broadcasters do is a single point of entry from the outside world with a very strong firewall."

"Keep the LANs separate," Pinnacle Systems' Kovalick added. "Get the news system isolated from viruses, and maintain really good quality of service. All of this segmentation is really great, but it doesn't mean you can't get files in and out. You just have to do it through gateways where there is a control."

In the view of Thomson director of applications engineering Bruce Lane, separate LANs will be used at stations for the foreseeable future. "Playback automation needs to talk to traffic," he said. "News editing needs to talk to the newsroom computer system.

"They will be on their own LAN, but through a facility router they

will be able to talk to each other. They will be limited to appropriate communication and provide appropriate protection against viruses and spy ware."

To protect news editing systems from the hazards lurking on the Internet, he advised, limit port availability. "Journalists need access to the Internet, but in no way do I want Internet with access to my news editing system. Through the use of IP routing, I very heavily limit port availability, whether it's one direction or bidirectional, the type of communication and the access."

Adequate protection of files from malicious worms and viruses will ensure that the product of the cataclysmic IT explosion at television stations will deliver improved productivity, lower overhead and greater profits, not a primordial soup of corrupted content, missed commercial playback and misgivings about the changeover. ●

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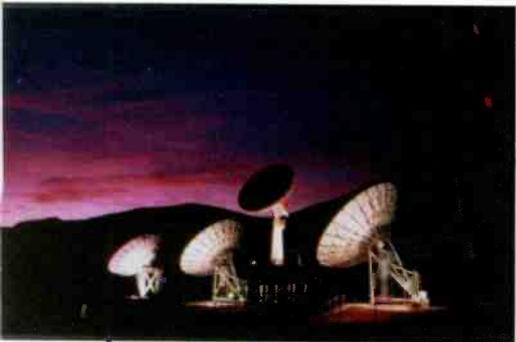
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# HD and me

*Six HD questions local  
broadcasters must consider*



**H**D is a personal thing, and with good reason, because it represents a significant investment in time, effort and money for broadcasters, viewers and government regulators.

Ken Ferree, chief of the FCC Media Bureau, recently interrupted his prepared statements before the

**“Many people, including myself, have noted that content is the key to consumer adoption, and let me say now that this has become very personal.” — Ken Ferree, FCC Media Bureau chief**

commission to express his attachment to high definition.

“This year, six million DTV sets are projected to be sold,” he said. “As an aside, that number should actually be 6,000,001, as my household made the DTV transition this past weekend.

“Many people, including myself, have noted that content is the key to consumer adoption, and let me say now that this has become very personal. I like my HD set, but there are only so many times that I can watch beautiful scenes of the Hawaiian Islands on Discovery HD. As a consumer, I want more and more

high-definition programming.”

At stations, too, HD is becoming a lot more personal as broadcasters begin to contemplate moving beyond passing through a network HD feed to actually originating local HD news and other programming. Pioneers, such as WRAL-DT in Raleigh-Durham, NC, have gained an intimate knowledge of what it takes to produce local HD programming over the past few years. But now as the number of network shows and sporting events distributed in HD grows and several million TV households actually own DTV sets, HD is about to get a lot more personal for the majority of broadcasters.

The following six “HD and me” questions and answers are intended to provide insight into succeeding

on a local level with HD origination.

## **Should I shoot widescreen SD until we're ready to transmit HD?**

In the view of Sony's Robert Willox, general manager of the content creation group, the only reason to shoot widescreen now is to archive material. “Shooting widescreen in standard definition means you'll have to resample video for 4:3,” he said. “So you'll end up with a lower-resolution product.

“HD cameras will eventually hit the cost point of higher-end SD cameras. It really becomes a capital call. When do you have enough DTV audience to warrant going widescreen? That's a really big decision for a news



**While HD requires more bandwidth, SES Americom is putting packages together to encourage local broadcasters to share the cost of uplinking high-definition remotes.**



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department. Widescreen gets you future-proofing and archiving.”

The way that Al Kovalick, senior Pinnacle Systems fellow and strategist sees it, widescreen is essential. “For me, digital television has four things: really good sound, Dolby 5.1, quality pictures, a 16:9 aspect ratio, and it might be HD,” he said. “If I invite friends over and they see the 16:9 and the clear picture, and they hear great sound, they will think it is HD. Three out of four isn’t bad.”

Initially, stations that shot 16:9 SD

**“It (HD origination) gives the local stations several advantages, including better quality and a perceived market leadership in these early days.”**  
**— Bryan McGuirk, SES Americom**

found that there weren’t many viewers, said Glen Sakata, Harmonic director of sales for broadcast and telecom. “That’s all changing now,” he said. “People are seriously looking at doing HD.”

“It’s a much better image for standard definition,” he explained, even if it is letterboxed a little to make the aspect ratio right. The 4:3 and 16:9 nightmare will continue for stations until the next-generation television set comes out with a decoder that looks at a flag embedded in the signal that tells what type of signal is present and automatically switches to the right aspect ratio.”

**What are the advantages of originating my local programming in HD?**

To Bryan McGuirk, SES Americom senior vice president for domestic sat-

ellite services, presenting HD demonstrates a commitment to leadership in the market. “It gives the local stations several advantages, including better quality and a perceived market leadership in these early days,” he said. “One notable example was KUSA-DT in Denver, which broadcast a local parade in HD. It really gave them per-

ceived leadership in the market. It blew me away that they did the whole thing in HD and promoted it.”

Sony’s Willox sees shelf life and stock life as the main reasons to originate in HD. “We have been working with people, such as Home Time. They are originating a show in HD and are just beginning to broadcast

**HDTV metrics**

Slowly, the industry appears to be emerging from the chicken-and-egg quagmire that’s slowed the development of high-definition television. Here’s a glance at some of the brighter spots.

**DTV unit sales**

Total DTV units sold in November 2003:	505,223
Total DTV units sold in December 2003:	640,443
Total DTV units sold in 2003:	4,100,000
Total DTV units sold in 2002:	1,925,000
Total DTV units sold since Q4 1998:	8,240,000

Source: CEA Market Research

**DTV unit sales projections**

2004	5.8 million
2005	8.3 million
2006	11.9 million
2007	16.2 million

Source: CEA Market Research

Estimated total U.S. TV households 2002-2003: 106 million

Source: Neilsen Media Research

**2003 DTV coverage of U.S. TV households**

Percentage served by transmitted DTV signal:	99.36
Percentage in markets with five or more DTV stations transmitting:	84.15

Source: National Association of Broadcasters

Number of stations transmitting DTV as of January 2004: 1129

Source: National Association of Broadcasters

U.S. households passed by HDTV service from local cable operator: 70 million

Source: National Cable & Telecommunications Association

Percent of top 100 markets with HDTV available via cable: 96

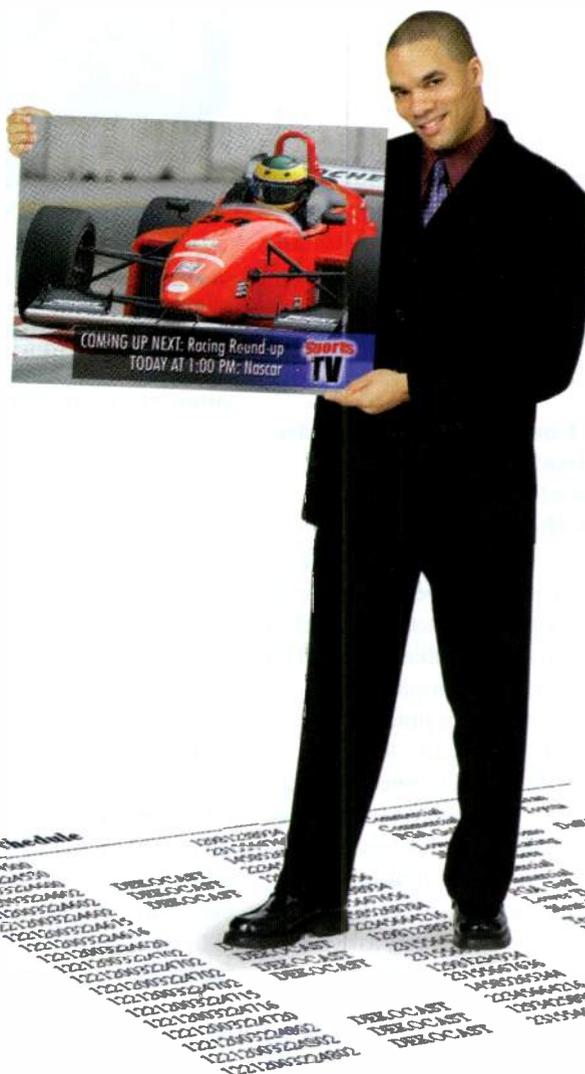
Source: National Cable & Telecommunications Association



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in HD. If you don't have clothes or cars, you have good shelf life, such as a home repair show. They have a safety factor of being able to produce competitively for NTSC and HD.

"If I were moving now from a BetacamSP and doing magazines or documentaries, I'd take a look at a new HD camera. The difference from moving from digital Betacam to HDCAM is a minor step. The only delta that exists is media costs."

"With SD, you are kind of stuck with the format that you shot it in. It's not as robust a signal to manipulate to other aspect ratios."

In the view of Paul Turner, vice president of marketing for Omneon, the advantage of HD origination is its draw to top-notch advertisers. "Some advertisers are drawn to stations with the highest-quality programming," he explained. "BMW is producing ads in HD. Why? They are an image-driven company. They want the cleanest, most pristine video they can get. The last thing they want is for those commercials to be played back from a U-Matic."

### **Will I be able to afford to originate HD if I'm in a market that's smaller than the top 10?**

There's a broad range of opinion, but the consensus seems to indicate that stations in markets smaller than the top 10 won't be able to afford HD origination for a couple of years.

"I don't think it is practical today," said Pinnacle Systems' Kovalick.

Omneon's Turner concurred. "It's a couple of years away. However, we do see it coming in the buying decisions stations are making today, based on the equipment capability now. The first things they ask you are 'Is it HD capable?' and 'Can I add HD?' That is driving the purchase decision right now. Customers are looking at a server and want to know if our system is HD-ready. Absolutely, it is in the machine right now."

In the view of Thomson director

of applications engineering Bruce Lane, HD origination will happen in phases for local news operations. "What you'll find is TV stations will transition to HD as it makes sense for their facility," said Lane.

"For a lot of broadcasters, the news studio makes the transition first and then field acquisition will follow. Studios will all be in HD, but the news stories shot in the field will be in 16:9 or 4:3 and upconverted to HD,"



**Among the recommendations from Sony on ways to economize on HD origination and production are to use the J-H3 as a seed machine for nonlinear editors and the HDW730 with 8MB of cache to reduce the amount of tape that might be wasted.**

he said. "Overall, the broadcast will still need to be downconverted to NTSC, but that's how they will roll out HD initially. Field acquisition and editing will follow to HD."

According to Sony's Willox, HD origination is a big concern in markets that might surprise some. "There are markets in the United States that you wouldn't expect, but all three affiliates are ready to go. Like Cleveland, they are very concerned about being ready to go HD when the parent goes. I was surprised that it's a big issue."

In the view of Harmonic's Sakata, there's a broad range of stations that can afford to originate HD programming — to a point. "Local origination of HD is practical in the top 30 legitimately," he said. "From there it will taper off, and after DMA 50 there will be a cliff effect."

### **How can I originate HD least expensively?**

Willox from Sony offered a number of tips on how to minimize HD origination costs. "We make a cache (memory) board for our camera that allows you to be constantly re-



recording audio, video and time code into eight seconds of RAM while the camera VTR section is asleep. It eliminates false starts because it's always recording to RAM and saves on tape and battery life."

Another area is repurposing lenses.

"There are a lot of high-end SD lenses made for Digital Betacam that can be recast to HD use," he said.

"We've introduced a line of VTRs that are not editors but can be seed machines to a nonlinear editing system. They are the models J-H1 and J-H3, which are significantly less expensive than HD-editing machines.

"Another money-saving tip is the MSWM series that will play back even the old SD Betacam formats and upconvert them to 1080i or 720p. That's built-in capability."

James Frantzreb, Avid Technology senior product marketing manager, noted that planning purchases today for HD production tomorrow can help. "Within about two years," he said, "we expect that local-HD origination will become very practical. It's now possible to buy reasonably priced professional nonlinear

*"We selected Omneon servers and shared storage for playout, and have since connected our production processes. Omneon is the one solution that fits our tight budget, meets all our requirements today and supports us as our needs change."*

**Helge Blucher**  
Vice President  
Detroit Public Television

Detroit Public Television operates on a very tight budget with limited resources. When it came time to select a media server, they needed a cost-effective solution that gave them both operational efficiencies and the flexibility to satisfy multiple requirements.

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**SES Americom is launching the AMC 10 and AMC 11 satellites this year to accommodate the growth in HD traffic it is anticipating.**

editing systems that are upgradeable to HD.

"Inexpensive media networks, such as the Avid Unity LANshare system, have the capability of — and can be qualified for — supporting a 7:1 compressed HD workflow, and we believe less-expensive acquisition and playback solutions will be in place within that time frame."

Sending live reports and special event coverage from the field can be costly; however, SES Americom works with stations on programs to share HD services to hold costs down for individual stations. "In HD, we see an opportunity to support HD in local markets," said SES Americom's McGuirk. "Because of the bandwidth of HD, I think they will be shared between affiliates in markets.

"The cost of HD satellite on a shared basis would allow all three affiliates in a DMA to share it, and we do anticipate at the local level that it makes sense to share."

This month, availability of HD

transponders will increase when SES Americom launches the AMC 10 satellite. AMC 11, which also has HD transponders, is scheduled to launch in May 2004.

### **What impact will HD have on the look of my news set and talent?**

It's amazing what four times the resolution of SD will pick up and display. It's not all pretty, according to Pinnacle Systems' Kovalick. "Many sets look cheesy in true HD," he said.

Omneon's Turner agreed. "Going HD technically is only part of the problem. The second issue is you can't get away with that piece of black gaffer's tape hiding a flaw on the set because it will show through."

However, shooting with the complete knowledge of what a higher-resolution system will capture isn't an unknown art, said Harmonic's Sakata. "All it means is that producers of HD will have to deal with the same thing

that filmmakers have always worked with," he said. "Artists know how to deal with the increased resolution."

"Most stations don't have lighting directors anymore," he said. "Most of the talent they used to need went away when CCD cameras came along. However, we are hearing of a lot of consulting companies popping up to address proper lighting, sets and makeup."

Camera technology also offers some solutions. "We have circuitry in our HD cameras that addresses this," said Sony's Willox. "It softens skin and puts negative detail in to strip resolution out of there. It's been done in SD for years. The circuitry reduces wrinkles out selectively, and the camera can be programmed for three different skin tones."

### **What can I do to promote HD in my market?**

This is a good-news, bad-news situation. The good news is that there are some things, such as on-air promotions, that local stations are good at that can be effective in promoting HD to an audience.

The bad news is that it appears that local stations don't have much influence over some of the most effective promotions happening.

"There's a synergistic triangle that can help to make HD a success," said Sony's Willox. "It's the network, the retailer and the manufacturer. Together, those three can develop that synergy."

"The networks can produce HD shows that manufacturers sponsor on-air, so the retailer can show the quality of HD — things like the bigger sporting events that get mass public attention."

Harmonic's Sakata agreed that the sports programming connection is important. "Some thoughtful marketing by the TV manufacturers and/or local broadcasters and sports broadcasters to push HD into bars and restaurants is occurring," he said. "It's not an accident bar owners are getting great deals on HD displays." ●



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# Re-thinking broadcasting

*How multicasting and datacasting could impact what a station does and where it makes its money*

**S**trip away all of the extras and the broadcast business model is pretty simple: Get a federal license to use a bit of spectrum for transmitting programming that attracts viewers to watch commercials that generate revenue.

Pretty cut and dried, really. Sure, there are a lot of complexities, such as acquisition, production, transmission, newsgathering and a little thing known as the station's obligation to serve the public interest, convenience and necessity. But, for the most part, the underpinnings of the business have remained the same for commercial stations since the service took off after the lifting of restrictions imposed during World War II.

Today, thanks to technical innovations such as DTV and the availability of technologies such as ATS receivers to supplement the broadcast service, television broadcasters

**"The problem with datacasting is that it is a technology in search of a workable business model."  
- Glen Sakata,  
Harmonic**

have the chance to expand and grow their business in ways unimaginable at the dawn of television service. DTV multicasting, which allows broadcasters to divide their digital channel allotment to transmit a

main channel and several subchannels, opens new programming and revenue opportunities. Additionally, datacasting, the broadcasting of digital data to intelligent receivers and players to provide information in an interactive environment, provides commercial and non-commercial stations with new, if largely untapped, possibilities.

"The problem with datacasting," said Glen Sakata, director of sales for broadcast and telecom at Harmonic, "is that it is a technology in search of a workable business model."

Al Kovalick, senior Pinnacle fellow and strategist, concurred. "A lot of companies have come and gone in datacasting," he said. "It's an uphill battle. If you are selling fruit for a living and someone says, 'I want you to sell integrated circuits, you have the trucks,' you'll say, 'I love the product but I don't know the business.' It's a lot like that for broadcasters with datacasting."

Datacasting is intrinsically different from broadcasting, according to Sakata. "There's a push vs. pull paradigm," he said. "Broadcasters can push all the data they want. It goes back to video over IP. It could be data or video, but it has to be persuasive enough for a consumer to want it."

For datacasting to succeed at a commercial television station, Sakata explained, it must enhance the availability of local information in a way that's not real-time.

"There are a number of video and data services that don't have to be delivered in real time, and if they don't it can be a data model. For example, airport schedules don't

have to be on a real-time video channel. They could be streaming," said Sakata.

While exploiting datacasting for increased revenue at commercial television stations is in its infancy, the technology has found a niche in the public-broadcast arena to supplement the efforts of teachers in the Los Angeles area.

"KLCS-DT creates programming and puts it on a server to be broadcast," said Paul Turner, vice president of product marketing for Omneon. "At the same time, low-bandwidth streaming proxies are available on a server. The station publishes them on a Web page, and teachers at the district can look at them and find something that emphasizes class content."

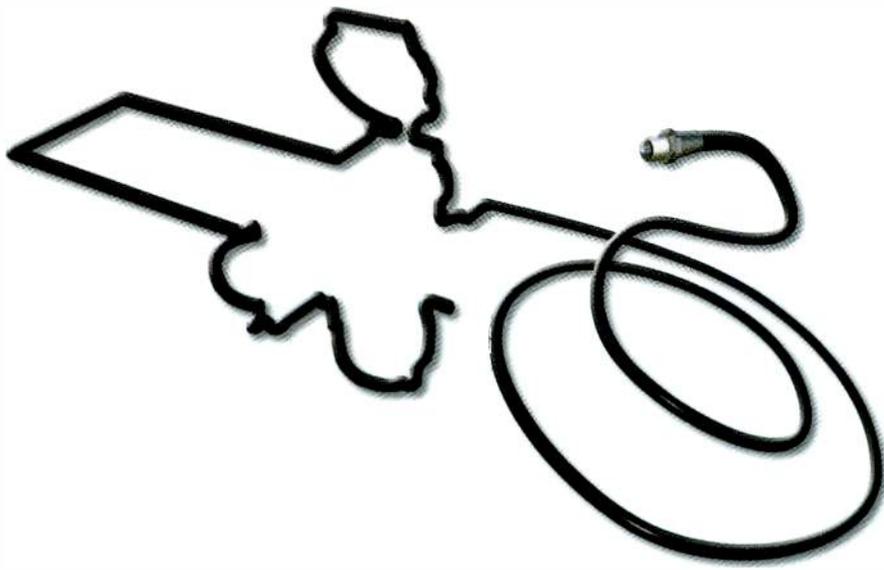
"They send in a request, and KLCS datacasts the material back to the local school. The station looked at dead-air time, and uses it to datacast to the school at night."

(For more information on the KLCS datacasting project, see the "Datacasting proves a success at KLCS-DT" sidebar.)

## Multicast mania

Perhaps multicasting is initially more attractive than datacasting to television broadcasters because it's similar to their existing business. Multicasting fits nicely into the programming-viewership-ratings-commercial-sales business model, and it lets broadcasters exploit their existing core production and transmission competencies to increase revenue.

Thomas Zugmeyer, product manager in charge of the DaletPlus Media Library said, "The challenge many



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broadcasters face is producing more with the same staff or same capital expenditure. Technology allows you to use more shared content by one station to rebroadcast it on another station, all from a central repository.”

Sakata from Harmonic agreed. “I’ll

always go back to the operational side. There’s not much incremental cost to put it on another station,” he said. “Adding additional playout to an automation server is a no-brainer. Playback from servers with multiple outputs is a minimal cost. The other

thing is encoding. If it is an SD encoder, you are looking at \$20,000 or less (and, for HD, \$50,000 or less) to put another on the air.”

While the costs of adding a channel may not be prohibitive, broadcasters who are serious about

## Datacasting proves a success at KLCS-DT

Say “datacasting” to most broadcasters and you’re likely to notice a shoulder shrug, hear a little mumbling about not knowing what to do with it and get a quick change of subject.

But that’s not the response you’ll get from Alan Popkin, KLCS-DT’s director of television engineering and technical operations. Popkin is a pioneer in the use of datacasting from a public television station to augment the class material offered by area teachers.

“This is an attempt to use DTV spectrum in a new and different way,” he said. “Instead of just pretty pictures, we can do pretty pictures and serve other needs.”

This year, KLCS, which is licensed to the Los Angeles Unified School District, began datacasting after a \$5.8 million upgrade to the station’s facilities to support the effort.

KLCS has at least 10,000 titles in its video library that eventually will be digitized and stored on a file server so that district teachers can access pertinent material to augment their classroom presentations. “Initially, the station is working to make a couple hundred hours of middle school math and science programming available from its server,” said Popkin.

The datacasting system relies on changing how the station’s DTV channels are used throughout the day. From 8 a.m. to 4 p.m., KLCS replicates its analog channel on a DTV channel and transmits four to 10 channels that stream educational programming requested by district teachers. From 4 p.m. to 11 p.m., the station ceases streaming and multicasts four DTV channels. From 11 p.m. to 8 a.m., KLCS transmits one DTV channel, and on the remaining bandwidth does “a massive push for near video on demand,” said Popkin.

“This is the equivalent of using seven or eight T1 lines with no additional burden on the station and little cost to the district except for receivers,” he explained.

From the point of view of a district teacher, the system is as easy to use as browsing the Internet. “Teachers just log onto the (district’s) Internet Web site and browse all the material, including low-res video proxies,” said Popkin. “All of the material is indexed and is searchable thanks to the metadata.

“When the teacher finds something to show the class, it’s a simple matter of adding it to the shopping cart and overnight the content is datacast to the edge cache. Once it’s received, an e-mail is sent to the teacher informing them that the order has arrived.”

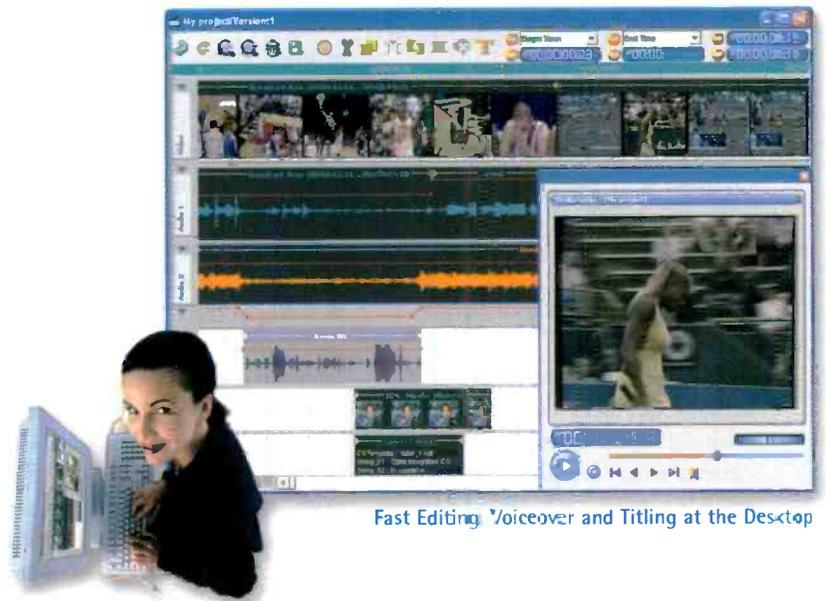
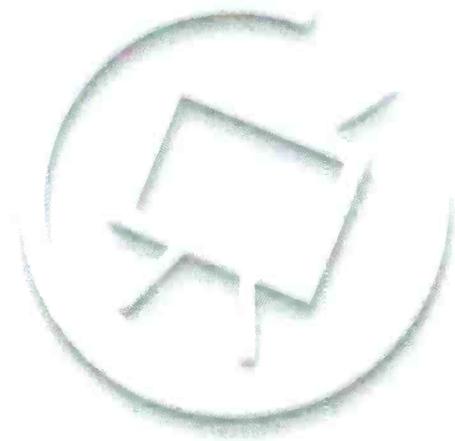
KLCS was able to build this system in less than a year for several reasons. First the district already had a “sensational IT infrastructure” with four computers in nearly every classroom. Second, the station received superb cooperation from vendors in making off-the-shelf solutions serve the station’s requirements for tapeless storage, archiving and retrieval. Third, Popkin could rely on orders of scale to ensure system coverage. One datacasting receiver covers 700 to 3000 students, which is important considering there are nearly one million students in the district.

Recognizing the potential use of datacasting to help teachers required Popkin to see the changing paradigm of DTV. “It is no longer about video, it is now all about data,” he explained. “If you think of it as datacasting and some of it as video — if you don’t care whether it is MPEG-2 or PowerPoint — you can change how you think about the pipe and how you build the infrastructure.”

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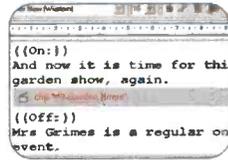


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adding multicast services to their offerings are likely to encounter a few bumps in the road. Access to cable for multiple SD-digital channels is a thorny issue, with competing interests submitting filings to the FCC in anticipation of action this year on the question of must-carry rules for digital television service.

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**“These conversations are happening because people want information, and now there’s a practical way to broadcast it.” — Glen Sakata, Harmonic**

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Programming may be another serious obstacle for broadcasters wishing to multicast. Many broadcasters who initially contemplate multicasting ask themselves: “Where am I going to get the programming? I have a tough enough time filling my channel now.” Repurposing newscasts and magazine shows is a start. Station origination of such programming means broadcasters won’t face the same rights issues as they would with syndicated programming.

But multicasting can offer a local station more than a distribution channel for rehashed news. Local information that currently goes unreported or underreported on television can make a station invaluable to viewers, and multicasting is a logical way to distribute such programming.

“There are airports that want deals with local stations for multicasting to transmit flight arrival and departure information,” said Sakata of Harmonic. “It’s of value to someone wishing to check the status of his or her flight before leaving for the airport, and it’s an advertising value to operators of companies such as taxi services or airport shuttle businesses

— or even a company like Starbucks. These conversations (between stations and airport authorities) are happening because people want information, and now there’s a practical way to broadcast it.”

Another area with a proven value to viewers is traffic reporting. About 14 years ago, Los Angeles began sharing information from on-ramp cameras and metering to a cable carrier to show traffic-flow density in a high-level way. Roadmaps with arteries displayed in red indicated traffic was stopped; green meant it was flowing. Similar local traffic coverage could provide local viewers of a multicast station with important, timely information.

Whatever the programming content, as long as it’s local, it’s pertinent to living in the community. If a station is first in the market to offer it, financial rewards are likely to follow. “A station in Louisville took off Saturday-morning cartoons in the early ‘90s and put on three hours of local news,” said Sakata. “Newspaper readership was dropping and local hardware stores and car dealerships still wanted eyeballs to view their advertising on Saturday mornings.

“They repeated the model elsewhere and wherever they were the first to do it, they took market share. Localization can provide extra revenue, but it will be an early-mover type of issue.”

### **Show me the money**

For multicasting to make sense financially, it must not cannibalize revenue the station already earns from selling commercial time on its primary station. One way to avoid that is specialization. “When you go to multicasting, you start to specialize,” said Omneon’s Turner. “As you do that, you can deliver more targeted advertising. So, if someone is doing a home do-it-yourself (DIY) channel, they can guarantee potential advertisers that viewers are interested in DIY.”

“The popular argument is that multicasting will dilute the market

for any one channel, but by delivering more targeted programming to viewers with a specific interest, you might be able to convince a Lowe’s (hardware superstore) to pay an advertising premium on a channel reaching an audience they are trying to hit.”

Perhaps commercial availability will be a powerful tool in helping to convince cable operators to carry the multicast channels of television stations. “One driver causing people to look at what could work for multi-channel is the idea of providing availabilities for cable on a secondary channel,” explained Sakata. “There is the potential to allow cable companies to sell some of that commercial inventory on a secondary channel.”

But the biggest impetus in motivating cable operators to work with broadcasters in order to accommodate their desire to have multicast channels carried via cable is direct broadcast satellite (DBS), according to Sakata.

“The number-one issue with cable MSOs is HD,” he said. “They are in a hot battle with DBS. DBS will have problems having a lot of HD. Cable is realizing their take rate for HD set-top boxes is growing exponentially, and local HD programming could be something that gives them an edge in the market over DBS.”

That’s all well and good for stations that use their DTV channel allotment to deliver full-blown HD, but what about multicast SD? “They didn’t want to give you, as a station, a full 6MHz of bandwidth when you were going to multicast SD,” said Sakata. “In the beginning, it was a philosophical objection, but now it’s a management issue. If you are going to deliver it in HD for a portion of the day and then switch to multicast SD, how are they going to know what is coming when?”

“The thing that really drives the cable guys nuts is they don’t want to manage all these channels coming and going. They have to deal with PSIP and put their own in

there, which will be different from the over-the-air PSIP.

"If a broadcaster sometimes has two channels, sometimes five and sometimes one channel, that's hard for the cable system to manage. On the cable EPG [electronic program guide], they'll indicate a channel is there but just off the air."

But given the importance of HD to cable in doing battle with DBS providers, Sakata said he believes

MSOs will be willing to work with broadcasters to accommodate multicasting SD as long as part of their offering during the day is HD.

"Cable would just rather take the HD," he said. "They will give you the bandwidth and let you play around with it. They'll commit the 6MHz to broadcasters. Then the cable operator won't mess around with the broadcaster's signals.

"If you are occasionally doing five

channels, they will show major and minor channels. If you pull it out from the multiplexing pool, it disappears from them."

Rather than working out a formal must-carry doctrine between DTV broadcasters and the cable industry, Sakata suggested that cable operators be flexible with television broadcasters on a one-on-one basis. "These cable MSOs would really rather deal at the individual level," he said. ●

## WRAL-DT turns to datacasting, multicasting to extend market presence

The lessons from the trenches of datacasting and multicasting are threefold, if the experience of WRAL-DT in Raleigh-Durham, NC, is any indication.

First, it isn't about the revenue — at least not yet. It's about enhancing the station's presence in the market by becoming an indispensable resource. Second, it's about positioning the station to compete with cable and satellite broadcasting in the future and being able to thrive in that environment. Third, it's about delivering a better product.

In other words, said WRAL programming and special projects manager Jimmy Goodmon Jr., multicasting and datacasting are about being more competitive. "Essentially, we have been on the cutting edge because the president of this company is adamant about the future of broadcast television, and digital gives us the opportunity to compete," he said.

The station, which pioneered digital broadcasting seven

and a half years ago, splits its digital bandwidth allotment into an HD channel, an SD channel and a 1Mb/s to 1.5Mb/s channel for datacasting. Bandwidth is dynamically assigned to the channels as needed through statistical multiplexing. This, along with efficient encoding, maintains optimum picture quality on the SD and HD channels.

"The picture WRAL delivers using statistical multiplexing and efficiency of encoding is superb," said Goodmon. "We can deliver HD and SD with no degradation, and we expect to see a 10 percent to 15 percent improvement in the encoding process every year. We are happy now and know where we are going."

### WRAL NewsChannel

In August 2001, the station launched the WRAL NewsChannel, a 24-hour operation, which focuses mainly on local news, as its

SD channel. Besides re-broadcasting WRAL-TV's evening 6 p.m. newscast at 7 p.m., the NewsChannel carries news specials, such as gavel-to-gavel coverage of the Michael Peterson murder



WRAL, which launched NewsChannel in August 2001, on its SD multicast channel, sees the 24-hour locally originated news channel as a way to promote the station's brand to viewers.

trial, and network news programming like CBS MarketWatch. It also is "flanked" by graphics and content from the WRAL.com Web site.

Repurposing material from the Web site and the news operation of WRAL-TV allowed management to put the WRAL NewsChannel on

the air for a fraction of the price of starting a station from scratch. "With very low personnel and equipment costs, we have started a new channel," said Goodmon.

"We need to be clear that it is a balancing act," he explained. "We don't want to take anything away from the capacity of WRAL news. We want to use it to add to the NewsChannel when we have extra capacity. We run a tight ship on the NewsChannel."

The station hired a producer and assigns its digital media manager to integrate material for the station's Web site onto the NewsChannel. Otherwise, it draws on existing resources from what Goodmon called "the big news operation" to shoot, gather, produce and air news.

Complementing the "big news operation" extends beyond newsgathering to encompass news coverage. "Earlier this year, we had a car chase," said Goodmon. "We broke into coverage on WRAL news but couldn't stay with it the whole time as it unfolded. But on WRAL NewsChannel, we could punch right in and stay with the chase. All that required was a producer/director and font coordinator, and we were live."

### **Datacasting**

WRAL uses the 1Mb/s to 1.5Mb/s devoted to datacasting for a variety of offerings, including distribution of game software, short movies, a 380Kb/s edition of WRAL's 6 p.m. news, live streamed news from the NewsChannel, an abridged

version of WRAL.com and a locally originated game show called "Brain Game."

"This is program content that we couldn't deliver before," said Goodmon.

While the current offerings are good, Goodmon said the future will be even better. He explained, "We have been experimenting with ideas that will be great for the future - approaches that are not interactive per se but send information out that can be stored in the memory of the users' computers that they can access as desired."

"If you are watching WRAL News and our sportscaster comes in with news about Duke basketball, with datacasting you will be able to get instant stats from the game. That's the future.

"Or, imagine being able to watch a basketball game and hit a pushbutton to see a graphic that was sent of the shot percentages of the various players from different parts of the floor."

Over the past two years, the number of people for WRAL's datacasting has grown beyond the initial test

audience of 100, but Goodmon does not know by how much. However, he expects the role of datacasting to grow as interactivity becomes feasible. "Interactive is growing — one step at a time," he said. "That is an important move for broadcasters to make."

### **More than money**

Ultimately, multicasting and datacasting may lead to new revenue for the station, but it hasn't yet. "We have not specifically sold a NewsChannel spot, although we have sold HD commercials for our HD channel," said Goodmon.

"But as far as the ad-buying community, you have to understand the kind of company we are. We are not driven by shareholders trying to gain a buck tomorrow.

"We are guided by a person who believes in long-term branding. These things (datacasting and the NewsChannel) will enhance our image in the community.

"We have to be everywhere that viewers or seekers want to find us. It's not a revenue play at this point but a branding play."

## **WRAL NewsChannel expands news coverage**

The WRAL NewsChannel multicast has allowed the Raleigh-Durham, NC, broadcaster to expand news coverage beyond what's covered on the flagship station. Here are a few highlights:

Kinston Plant Explosion Memorial Ceremony ( <i>Delayed</i> )	1/29/04
Governor Easley Winter Storm Press Conference ( <i>Live</i> )	1/27/04
MLK Triangle Interfaith Prayer Breakfast ( <i>Live</i> )	1/19/04
Senator Richard Lugar Speaks at Duke University ( <i>Live</i> )	1/14/04
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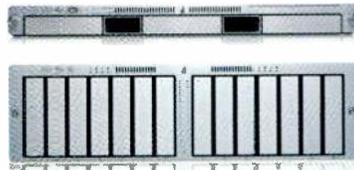


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(equalization) based on the half-clock-frequency energy remaining as the signal arrives. Incorrect amplitude at the sending end could cause an incorrect equalization at the receiving end, resulting in signal distortions.

### Rise and fall

The rise and fall times are defined between the 20 percent and 80 percent amplitude points, as Table 1 shows. Incorrect rise time could cause

## The effect of jitter on the system also depends on the frequency of the jitter.

signal distortions such as ringing and overshoot. If the rise time is too slow, it could reduce the time available for sampling within the eye. Overshoot of the rising and falling edge must not exceed 10 percent of the waveform. Overshoot could be the result of incorrect rise time but, more likely, is caused by impedance discontinuities or poor return loss at the receiving or sending terminations.

### The jitters

Jitter is seen in the eye diagram as a horizontal thickening of the trace. As jitter increases, the opening of the eye shrinks until the receiver can no longer decode the data. Jitter is measured in unit intervals (UI) where 1UI is equivalent to the reciprocal of the clock

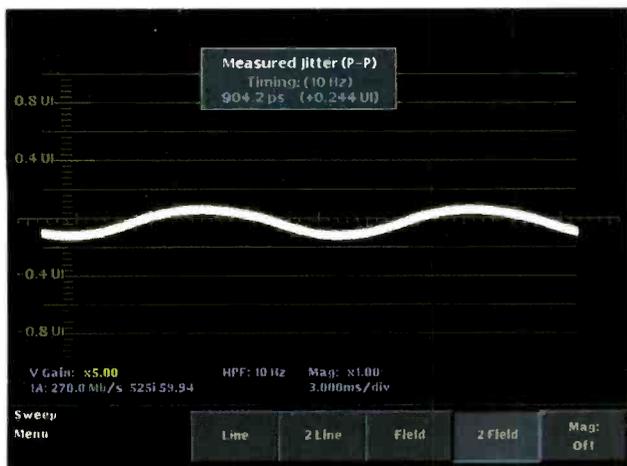
period — 3.7ns for SD and 673.4ps for HD. The effect of jitter on the system also depends on the frequency of the jitter. SMPTE defines different frequency bandwidths for measuring jitter. Timing jitter provides an overall measure of the jitter present within the transmitted signal, while alignment jitter isolates jitter components that adversely affect the receiver's ability to recover the data.

The jitter display in Figure 4 plots peak-to-peak jitter vs. time related to

video line and field rates. This display allows you to characterize jitter related to the video-signal timing. Many jitter-related problems are the result of transferring genlock reference jitter into the serial system. This type of jitter is typically between 20Hz and several hundred Hz. The phase-detection process used by genlock systems can also add noise that contributes to jitter in the 10Hz to 1kHz range. By using the appropriate bandwidth-limiting filter, you can include or reject specific jitter components from the jitter measurement.

### The right stuff

The eye and jitter displays of the waveform monitor are the tools of choice for measuring the performance of a digitally transmitted signal. EDH, if implemented correctly in a system, can help monitor critical signal paths and warn of potential problems in the system. The key to a properly maintained system is a well-designed facility that uses and maintains the correct cable type, cable length and equipment termination. **BE**



**Figure 4.** This jitter display plots peak-to-peak jitter vs. time related to video line and field rates. It allows you to characterize jitter related to the video-signal timing.

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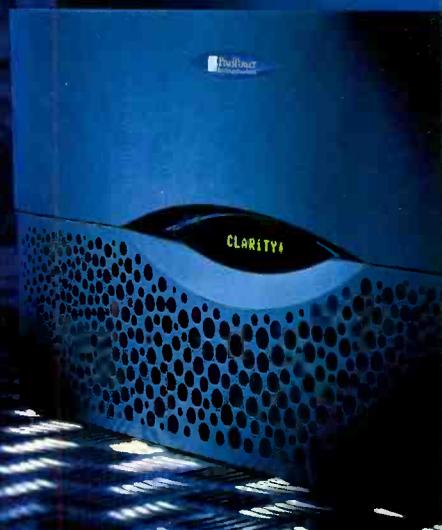
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*Michael Waidson is an application engineer at Tektronix.*

## Video servers

BY JOHN LUFF

The meaning of “serving” has some interesting connotations. I think of doing the bidding of others, of taking care to provide what others require and of impartially doing what is right. So it is with modern video servers. However, I think it is valuable to think of just how recent and shallow the roots really are, and how deeply they have modified the effective workflow in important parts of our industry.

My recollection is that Tektronix showed the first “video server” in public at NAB. It used JPEG compression, which at that point was used only for still-image compression. Concatenating successive still frames makes motion video and thus “motion JPEG.” The Profile video server was not so much aimed at a specific market, but it was shown as a development project with clearly some inkling of what potential they were releasing. But it stored too little material to be an effective spot server, had no real interface to the automation systems of the time and had lower perceived quality than the VTRs of the era. Concatenating multiple passes through the box was problematic unless the bit rate was set high. But the seed was planted. Within a year or so, it was being used as a cache on the output of robotic VTRs, enabling back-to-back playback all day long of 10-second segments. At sufficient bit rate it was arguably high enough in quality, and as a cache, large amounts of storage were not needed. Over the next few years, the most sincere form of flat-

tery and imitation, brought many servers to market and radically changed the industry.

Today we find ourselves in a rather different time. Servers are a mature product. Most, such as the Profile, Leitch VR and Pinnacle Mediastream, have gone through at least a couple

of generations of hardware and many revisions of operating software. Huge servers and small have been deployed. In some segments, the widespread usage of servers has displaced older technology virtually completely. One is clearly spot playback for television. Increasingly, servers are playing video in museums and even in point of presence displays in retail shopping environments.



**Most servers, such as the Pinnacle MediaStream shown here, have gone through at least a couple of generations of hardware and many revisions of operating software.**

Capacity has driven much of the change, as has the advent of low-cost servers without some high-end video application features. Without the current crop of low-cost devices, retail

and other public space implementations would not have become as commonplace as they are. Behind all of this are some technical advances that have little to do with video and everything to do with computing.

Storage space of two or three hours was sufficient in early servers for only

**In some segments, the widespread usage of servers has displaced older technology virtually completely.**

limited applications. Chassis were costly and adding large amounts of storage was cost-prohibitive. As disk-drive size crept up past 2GB and 4GB to today's 141GB and 181GB drives, and the cost for a drive fell from thousands of dollars to hundreds, the size of common configurations has dramatically increased. It is not unusual to see base configurations storing 60 to 70 hours, a 30-fold increase in a decade, at a real cost of approximately half. The drop in cost and increase in capacity together have removed barriers to storing long-form content on servers. Indeed, in the last four years, many large plants for DIRECTV, Turner Entertainment and others have been built around sophisticated architectures with all-server record and playout of programming. Together with archive management and media asset management (all from the IT domain), the rosy reality has made highly efficient plants with drastically different workflow possible.

The architecture of the storage was at one time a major issue to be considered. We are, however, reaching the point where the technology and



topology of storage is less an issue than the total cost of ownership. For instance, in the Turner Entertainment plant, a complex environment stores copies on multiple servers, on redundant (RAID) storage arrays, and on DVD and data tape archives. The probability of loss of content is virtually non-existent. The content is moved from one medium to another under software control. It is no longer terribly important to know where the physical copy is, as it once was with videotape. It suffices to know that the media exists in one or more pools of storage (hopefully more than one). The method of storing can be debated by any two technologists available for the fight. NAS, fiber channel storage, and other options are available.

What matters is the performance of the total system (bandwidth demands and throughput available), MTBF and the standards supported. If you want

to do H.264 or fractals, you will have a limited set of manufacturers to choose from. If you need garden variety MPEG-2, you have loads of options. If you need HD (SMPTE 292) I/O, there are few options, but if ASI I/O (or I or O) are satisfactory, the options open up.

Choosing a server comes down to verifying that the device meets the current and medium-term needs you can project, analyzing performance required (I/O, video-performance targets, concatenation effects, ability to transfer files directly via MXF), specifying the input and output connections (digital and/or analog, embedded audio, AES, number of channels), identifying the vendors you prefer to do business with, negotiating a price that is supportable for your application and verifying all of the above. All serious manufacturers will allow you to try out a box on your turf and gen-

erally are helpful in providing the data needed to analyze bandwidth capabilities of various configurations.

Lastly, you need to go back and look at special-purpose "TV needs," such as automation interfaces supported, remote-control capabilities, stunt-mode features such as slow motion, availability of time delay or sports-replay software if it is applicable, and other unique needs of a television plant. Servers are not commodities when all factors are considered, but you will find a unique configuration that best suits your needs if you analyze the options carefully and thoroughly. Price is certainly not the only factor. **BE**

*John Luff is senior vice president of business development for AZCAR.*



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# Active Power's CleanSource flywheel technology

BY BRYAN PLATER

Incoming electric power disturbances can easily disable a transmitter, resulting in dead air and, potentially, a corresponding loss in commercial revenue. A momentary power outage can cause some transmitters to experience a hard shutdown, which can lead to transient voltages, sudden loss of cooling or other control malfunctions that can damage costly transmitter components. Unfor-

momentary short-circuit applied directly to the output of the UPS. As long as the UPS can supply the high current that is demanded, the crowbar protects the IOT and no harm occurs to the transmitter. After a few seconds, the high-voltage supply restarts and the transmitter returns to normal operation. If the crowbar action does not work properly, the IOT can be damaged. Further, several IOTs may be con-

tions, starts the engine generator and switches to generator power as soon as normal voltage and frequency are present. The UPS system continuously conditions and regulates power coming from either source and, most importantly, provides bridging power during the few seconds needed to start the engine generator and transfer the load to it.

While UPS systems can provide power conditioning and voltage regulation to ensure constant quality power to transmitters, and the necessary ride-through power until a standby generator takes over, not every UPS is equipped to handle crowbar events. Caterpillar's Cat UPS uses Active Power's CleanSource flywheel technology to offer a solution that features battery-free operation and high efficiency. The architecture of the UPS handles overloads and step loads better than traditional, battery-based UPS systems, in part because it is designed to efficiently manage crowbar events. The flywheel-based UPS can handle overloads as great as 1000 per-

## The special needs of transmitters place extraordinary demands on uninterruptible power supply (UPS) systems.

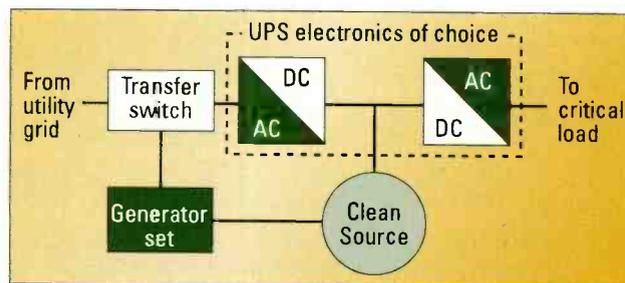
tunately, the special needs of transmitters place extraordinary demands on UPS systems. In particular, a feature called a crowbar circuit protects TV transmitters with sensitive inductive output tubes (IOTs). One of the most common problems in these transmitters is damage that may result from an improperly handled crowbar event.

The function of the crowbar is to remove the high voltage from the tube, typically within a few microseconds of the detected problem, by placing a short-circuit directly across the high-voltage power supply of the transmitter. This function is usually performed by a thyatron. It serves as a fast, high-voltage switch, comparable to a silicon-controlled rectifier (SCR) but with much higher voltage ratings and speed. When a problem is detected in the amplifier, the crowbar acts quickly; otherwise the IOT could be destroyed.

One problem with a crowbar action is that it draws several thousand amps from the AC mains. This peak current can equal 20 times the rated transmitter input current. It is equivalent to a

nected to a single UPS. To avoid dead air, the UPS must maintain good voltage to the others when one crowbars.

At a typical transmitter site, the UPS is installed in conjunction with a backup engine-generator set and an automatic-transfer switch to provide backup power for extended outages caused by storms, floods, earthquakes, fires or other natural disasters, or by utility infrastructure failures. Frequently the engine generator is located in an outdoor enclosure. The transfer switch and UPS can also be located in an outdoor enclosure if space inside the broadcast facility is unavailable or inconveniently configured. As illustrated in Figure 1, the input of the UPS is switched between utility and the generator set using an automatic-transfer switch. This switch senses out-of-tolerance utility condi-



**Figure 1. A power supply like the CleanSource flywheel UPS bridges the gap in the event of a power outage, carrying critical equipment until an automatic-transfer switch transfers the load to an engine generator.**

cent for 10ms. Even when the crowbar event causes a large overload on the UPS, the fast-switching power electronics enable a smooth transition to bypass,

supplying the desired current from the lowest impedance source. And it does so without disturbing the operation of any other amplifiers connected to the same UPS.

Combining a solid-steel flywheel with power electronics, the system stores kinetic energy in the constantly spinning, low-friction, 600-pound disk and uses this energy to provide protection from momentary power outages, while the power electronics eliminate voltage irregularity and harmonic distortion. Flywheel UPS systems are available that can support loads up to 3600kVA in a fraction of the space of battery-based systems. Battery-free operation eliminates facility design and operational problems arising from the less-desirable characteristics of the large valve-regulated battery systems commonly used in UPS systems. Also, the footprint required by flywheel systems is typically

one-quarter to one-third of battery-based UPS systems. This allows the UPS to be more easily integrated into cramped broadcast facilities.

Flywheels are insensitive to temperature variations. Battery systems require temperature to be maintained between 72° F and 83° F, while flywheels operate within a range of 32° F to 104° F. Therefore, flywheels have no stringent HVAC requirements and, in many locations, can be cooled without air conditioning. In UPS applications, valve-regulated batteries are a consumable rather than a permanent piece of equipment. They are typically replaced every three to five years, and battery life can be further shortened by frequent use. Flywheels are designed to last for more than 20 years, and the number of power outages does not affect product life. Flywheels also require less maintenance than batteries. Finally, UPS battery

systems are configured as long strings of battery cells, which reduce the overall mean time between failure (MTBF) of a valve-regulated lead acid battery system to less than a year, on average, during its life. The MTBF of flywheels is orders of magnitude greater, which greatly improves the overall reliability of the UPS system, particularly when the UPS is subject to frequent utility disruptions.

Flywheel technology offers an alternative to batteries for power protection in critical broadcasting environments and a proven solution for handling crowbar events. It is particularly beneficial in situations where high reliability is required, space is at a premium, and/or environmental conditions make the installation of battery systems inconvenient or expensive. **BE**

*Bryan Plater is director of North American sales for Active Power.*

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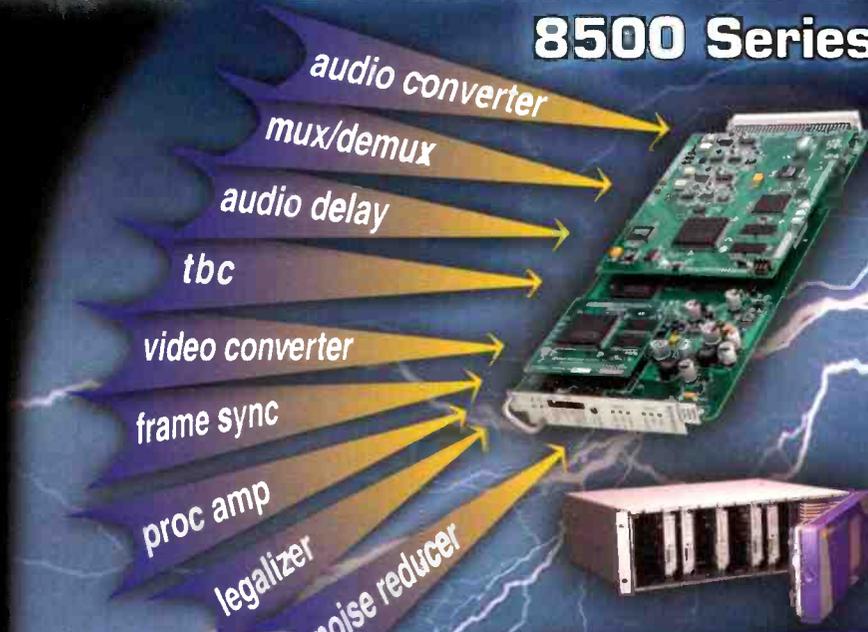
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# TVLD uses ARRI's Studio Cool

BY DAN MCKENRICK

In the past, television production studios had their own in-house lights and lighting designers. The changing economics of TV production have forced studios to outsource lighting to external consultants. In 1996, a group of lighting designers formed Television Lighting and Design (TVLD) to help serve this market.

## Incandescent vs. fluorescent

TVLD uses a wide array of lighting equipment, including incandescent and fluorescent lights. In the early years of television, studio lighting was exclusively incandescent. These lights are easily concentrated into a beam and emit a smooth, natural spectrum. But they are notoriously inefficient, consuming large amounts of power. Fluorescent lights were introduced for TV-studio use about 15 years ago. They were much more efficient than incandescents, but were difficult to concentrate into a beam and emitted an uneven spectrum with an overabundance of green that gave the subjects they lit an unnatural appearance. Lighting engineers express the "naturalness" of light with a measurement called color-rendering index (CRI). The sun is the most natural light source, and is given a CRI of 100. Incandescent studio lights typically have a CRI of 95 to 100. By contrast, the early fluorescent studio lights had a CRI of about 65 to 70.

## Fluorescents ascend

Over the past 15 years, fluorescent studio lights have improved dramatically, both in their CRI and their ability to concentrate light into a beam. About eight years ago, OSRAM, a fluorescent-tube manufacturer, introduced a new tube with a CRI of 82.

Current tubes offer CRI ratings from 82 to 96. These tubes were also more efficient than the earlier fluorescents, producing twice the light output of their predecessors, and far less power than incandescents. They became popular, and many vendors offered them in their fixtures. Since then, other tube and fixture manufacturers have jumped into the market, and a wide variety of tubes and fixtures is now available.

## Studio Cool

ARRI has introduced a new fluorescent fixture called the Studio Cool. It is available in two models: 2-tube and 4-tube. The Studio Cool 2+2 with four tubes is oriented with two pairs of tubes side by side, which is ideal for washing large areas or using with Chroma Key backgrounds. Earlier this year, TVLD received a call from ARRI, requesting our assessment of its pre-production 4-tube model. Several days later, a huge box arrived at our office. In a few minutes, we had the 4-tube

twin-tube, 21-inch compact OSRAM fluorescent lamps with a CRI of 85, and it offers some welcome features. Instead of it being necessary to carefully align the four small pins of the lamp to their matching socket holes, and then secure the long lamp to a clip or mechanical fastener, the slide-in lamp supports and sockets make lamping quick, easy and secure.

## Power up

Powering up the fixture required the use of a separate power cord. We were surprised to see that ARRI chose the Neutrik PowerCon, a connector we had not seen used in the lighting industry. The idea of having to deal with another specialty cable was initially unappealing. But, after several weeks in the field, the connector's positive locking feature proved its worth — whenever we connected it, it stayed connected.

We turned on the unit and let the new fluorescent tubes warm up for 10 minutes. During that time, we looked over the fixture's five different control

**Over the past 15 years, fluorescent studio lights have improved dramatically, both in their CRI and their ability to concentrate light into a beam.**

unit on a stand ready for lamping. The aluminum extrusion housing of the compact unit seemed ruggedly built. A large single latch secured the accessory frame, which swung out of the way, providing easy access to the reflector and lamp sockets. The reflector was held in place by four quick-turn screws, allowing for a quick changeover from the 120-degree "soft" reflector to the higher-output, 90-degree "hard" reflector.

The fixture uses four single-ended,

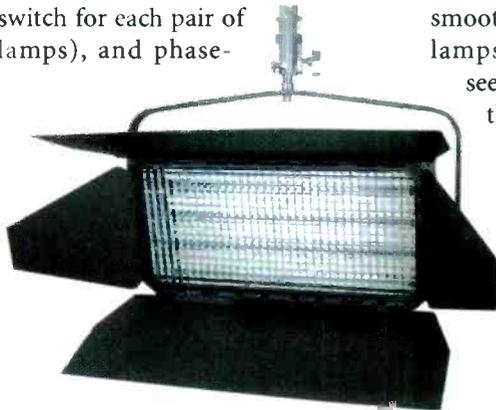
screens/egg crates and the large set of barndoors. This basic fixture has a beam spread of 90 degrees. The screens allow you to narrow down the beam, in several steps. We had some frustration deciding which was the correct orientation for some of the screens. Since we addressed this to ARRI the Eggcrates received orientation marks to indicate the correct placement in the fixture.

The optional barndoors provided two distinct advantages. The 10½-inch doors provide excellent horizontal

beam cutoff and, when closed, they create a hard protective "cover."

### Dimming

This unit has several light-output options, an easily detachable power module, switched on/off (rocker switch for each pair of lamps), and phase-



ARRI's Studio Cool fluorescent fixture is available in three models: two-tube, four-tube and eight-tube.

control dimming (powered from your dimmer outlet) or analog dimming (0 to 10 volt)/DMX 512. Once the lamps had warmed up, we tested the dimming capabilities and compared the light output to the provided specifications. The dimming was smooth down to 5 percent, when the lamps extinguished. Light levels seemed to be slightly better than the rating. One problem: the fixture dimmed to zero would flash every 15 to 20 minutes. ARRI has fixed this problem.

### Road test

Compact fluorescent fixtures work well in the studio but have had their challenges in the field. Typically, the biggest headache is protecting the lamps from breakage. We often have to

ship the bulbs in their own containers. We wanted to see how the improved lamp supports and the big barndoors would work together on the road. Adding only a Velcro wire tie to secure the power cord, we tossed the 15-pound fixture into the backseat or into the trunk. After weeks of bouncing around, the fixture and lamps were ready to go. With a set of daylight and 3200K lamps, we could deal with different color-temperature environments.

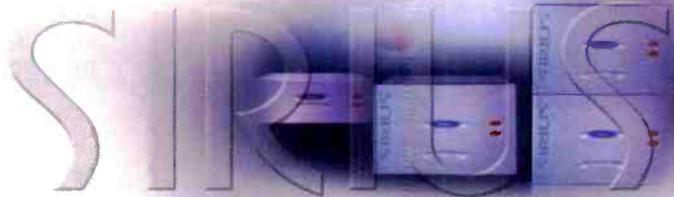
Mounting options allow for flexibility in placing the fixtures. You can hang these units horizontally or vertically and link several together to create a continuous row of light.

The Studio Cool presents our industry with an effective compact fluorescent fixture that works very well in the studio and on the road. **BE**

*Dan McKenrick is president of TVLD.*

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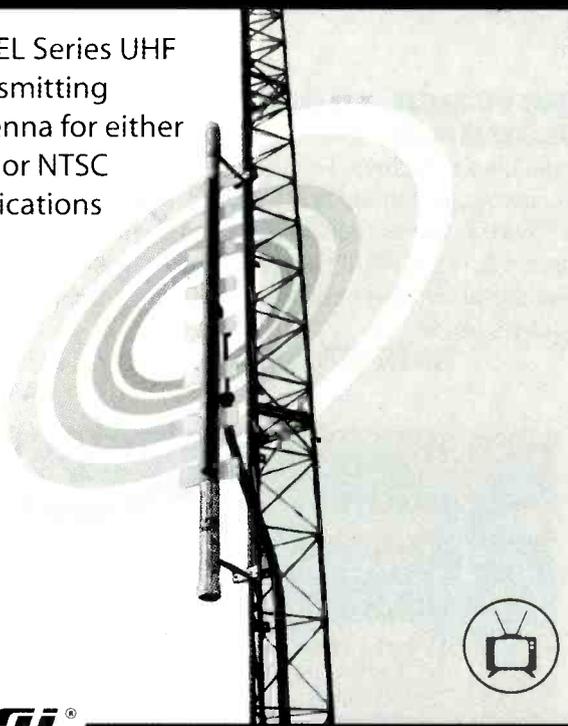
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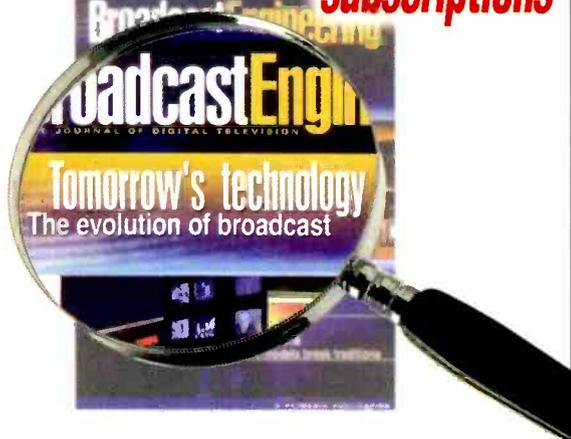


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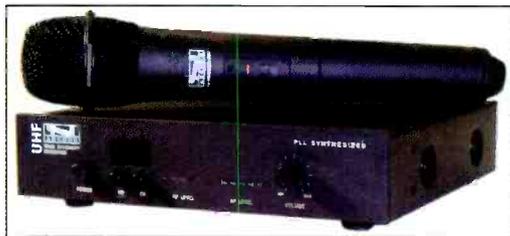
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631-249-4399; [www.videodesignsoftware.com](http://www.videodesignsoftware.com)



### WIRELESS RECEIVER

**Anchor Audio UHF-6400:** Has 64 user-selectable channels; is PLL synthesized and rackmountable; features tone key noise suppression, displays and receiver inputs/outputs; has a digital display for easy reading; output connection included — balanced and unbalanced, aux-level output from a ¼-inch and XLR jack to the sound system, mixer or amplifier aux-level input; features factory-set, squelch control, which allows a maximum operating range while reducing noise.

800-262-4671; [www.anchoraudio.com](http://www.anchoraudio.com)

### HDTV COMPRESSION CODEC

**Evertz 7770CS-HD:** Encodes one SMPTE 292M (1.485Gb/s) serial digital video signal with up to four AES channels of embedded or separate audio into one 270Mb/s SDTI (SMPTE 305M) compliant output stream; preserves VANC data in the incoming HD-SDI stream and transports this across the 270Mb/s SDTI interface; automatic detection and support of 1080i/59.94, 1080i/50, 1080p/29.97sF, 1080p/25sF, 1080p/23.98sF, 1035i/59.94 field rates is provided; occupies two card slots and is housed in either a 1RU frame that holds up to three modules, a 3RU frame that will hold up to seven modules or a stand-alone enclosure that will hold up to one module.

905-335-3700; [www.evertz.com](http://www.evertz.com)

## QUANTEL/P2 INTEROPERABILITY

Quantel generationQ and Panasonic P2 solid-state technology: Quantel will offer interoperability between its generationQ editing and server systems and Panasonic's professional plug-in P2 solid-state memory-based acquisition system; material acquired on Panasonic P2-equipped camcorders can be directly transferred into Quantel editing and server systems; material will be played back from the P2 cards and edited directly with the Quantel user interface.

800-331-8327; [www.quantel.com](http://www.quantel.com)  
800-528-8601;  
[www.panasonic.com/broadcast](http://www.panasonic.com/broadcast)

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**JVC DM-JV600:** Create an MPEG-2 bitstream from a high-definition source; features HD-SDI video input; reference either HD-SDI input or house sync; DVB-ASI MPEG-2 transport stream output; MPEG-2 compression; front panel 9 Mb/s to 40 Mb/s bit rate; is 1RU high.

800-582-5825; [www.jvc.com/pro](http://www.jvc.com/pro)

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**Miller SOLO DV:** Features selectable counterbalance, 75-mm ball leveling and quick release; is designed for single-operator crews: set up to 160-cm height in seconds and pack down to a compact 60-cm for transport; selectable leg-angle locks ensure rapid stabilization, while the 75-mm diecast alloy bowl offers quick leveling, optimum torsional rigidity and long-term durability; is available in three models: SOLO 5 handles zero to five pound MiniDV palmcamcorders; SOLO 10 handles five pound to 10 pound Mini and mid-sized DV camcorders; and SOLO 20 with the Miller DS20 fluid head handles 10 pound to 20 pound payloads.

973-857-8300; [www.miller.com.au](http://www.miller.com.au)



## PREAMPLIFIER

**Daking Mic-Pre IV:** Offers four channels of Class A preamplifiers in a 1RU with outboard power supply; use as a stand-alone or in conjunction with a console; each input offers continuously variable gain control using Daking's aluminum knobs, a 20-segment LED level meter with +24db peak indicator, switchable mic/line or hi-z instrument, switchable +48V phantom power, switchable input phase and switchable 20dB pad.

302-658-7003; [www.daking.com](http://www.daking.com);  
[www.transaudioelite.com](http://www.transaudioelite.com)

## AUDIO/VIDEO MULTIPLEXER

**Multidyne HYDRA-8000 Series:** Transports up to 32 video and 128 audio channels in 1RU with a maximum of more than 768 channels using one tactical cable; available with WDM and CWDM technology with each wavelength supporting up to eight video and 32 audio channels; tactical fiber cables are available with four, eight or 12 fibers with Hermaphroditic or TFOCA II connectors; the system is 100 percent digital; high density and modular in design; supports 24 bit stereo audio flat from 20 to 20kHz Hz with S/N greater than 90 dB and THD less than 0.05 percent.

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**BROADCAST ENGINEER (STUDIO)** - KNME-TV (PBS) at the University of New Mexico, seeks an experienced studio engineer to work in a dynamic environment. KNME, New Mexico's oldest public television station, was first in NM to begin broadcasting digital in 2001. The studio digital conversion project is well under-way and fully funded. KNME serves 1.6 million+ viewers in central and northern New Mexico. It operates a complete digital production facility with SD and HD capability, and a full-service teleport with Vyvx network connectivity. We are seeking a career-oriented professional who wishes to grow with us. The position offers an excellent benefits package, including university tuition for the entire family, and 4 weeks vacation. The Albuquerque/Santa Fe area offers great quality of life with many cultural and recreational opportunities. Salary range: \$30,146-\$52,165. For complete vacancy announcement and application, please check [www.unm.edu](http://www.unm.edu) under "jobs". Position open until filled. Refer to requisition #M38137. Resumes must be accompanied with a "Supplement to Resume" form, in web page. Contact Jim Gale (505) 277-2049 for more details about this opportunity. ALL APPLICATIONS FOR THIS POSITION MUST BE SUBMITTED VIA eJOBS, UNM's ONLINE APPLICATION/RESUME SYSTEM. Go to the eJOBS website, <http://ejobs.unm.edu>, to apply. This posting opens on Jan 23, 2004 and will remain open until filled.

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**BROADCAST MAINTENANCE ENGINEER** - KLAS-TV just completed remodeling its facility to a state of the art, digital broadcast house. Applicant must possess and exhibit a thorough working knowledge of basic electronics, digital technology, satellite, and RF skills. Troubleshooting at component level is a necessity. Candidate should have at least 4-5 years experience in broadcast television. Familiarity with Beta, DVC-Pro, server formats a must. SBE Certification is a plus. Check our website, [www.klastv.com](http://www.klastv.com). EOE. Mail cover letter and resume to HR Director/Eng, KLAS TV 3228 Channel 8 Dr. Las Vegas, NV, 89109. Or, e-mail [jobs@klastv.com](mailto:jobs@klastv.com)

**BROADCAST MAINTENANCE ENGINEER** - Fox Toledo is seeking a Maintenance Engineer. Requirements: 2 years recent experience repairing, maintaining, and installing television broadcast equipment, familiarity with computers and the Windows network environment. SBE certification preferred. Resumé to Human Resources, Fox Toledo, Four Seagate, Toledo, OH 43604. EOE.

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# Cutting corners, cutting profits

BY PAUL MCGOLDRICK



**W**e seem to have become a nation of corner cutters. From the people who think the best way to drive around a corner is to drive across it, to the students who happily, and stupidly, lift the materials for their reports — or their college entry essays — directly from other people's efforts. For some reason, cutting corners has also replaced the very different task of cutting expenses in many areas of business, including broadcasting.

There have been some really dangerous examples of that over the years. If a roofing contractor quotes a job using one type of material, then cheats you by actually doing the work with something inferior, the worst scenario is probably that the life of the roof will be shortened. If a tower manufacturer does the same thing the results can be catastrophic, as I have seen happen in places like Nigeria, Iran, Libya and Burundi.

The consequences of improperly bypassing interlocks can also be fatal. There are some things that you have to do when building and installing transmitter equipment that the operator should not have to do during regular maintenance. But thinking you know what you are doing should lead you to be extra careful, so that you think through all the possibilities. For instance, I remember a capable engineer being tossed across a transmitter hall after assuming that an output tuning capacitor had been discharged — because it should have been. It hadn't — that was the problem. Or an occasion in Saudi Arabia where a

high-power vapor-cooled SW transmitter had a leak somewhere above the final and, with all the interlocks disabled and the doors opened, a technician turned his back on the transmitter, forgot where he was and stepped back. An arc was drawn from the plate supply through him to the holding tank. Both people were burned,

specification ranges, the use of a component that exhibits an unspecified characteristic (very popular) or the use of inferior components when the supply chain is challenged by high demand. And the quality of equipment can differ from one piece to another. It used to be said that you should

**While we are all still in resolution-making mode, let's resolve to solve fewer of our perceived problems by cutting corners.**

but lived. Another man didn't when he was phasing up two 250kW generators together and closed an oil circuit breaker at the wrong moment.

Another example is the audience bleachers in a studio in Chicago, where a section had not been bolted up properly. A pile of children ended up in a collapsed pile of materials. Putting yourself in danger by cutting corners is one thing, but putting a lot of kids in such danger would personally keep me awake at night.

And despite training and retraining, how many times has a mobile news unit raised its antenna pole into power lines because they were cutting corners by not going through a checklist? Would you remain a passenger on an airplane if you knew the pilots hadn't gone through their checklist?

We also see corners cut in equipment: obvious features left off that should have been offered, the use of components outside the data sheet

not buy a vehicle that came off the production line on a Monday morning or a Friday afternoon. I've never seen a broadcast equipment manufacturer with that problem, but in the very nature of business in the United States, there can be definite quality issues with equipment that is pushed through assembly to meet the numbers at the close of a month, a quarter, or a fiscal year. When that happens and the product becomes a warranty (and reputation) issue, cutting corners becomes a profit-eating problem.

While we are all still in resolution-making mode, let's resolve to solve fewer of our perceived problems by cutting corners, and to keep a sharp eye out for suppliers or colleagues that do.

**BE**

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



Send questions and comments to:  
paul\_mcgoldrick@primediabusiness.com



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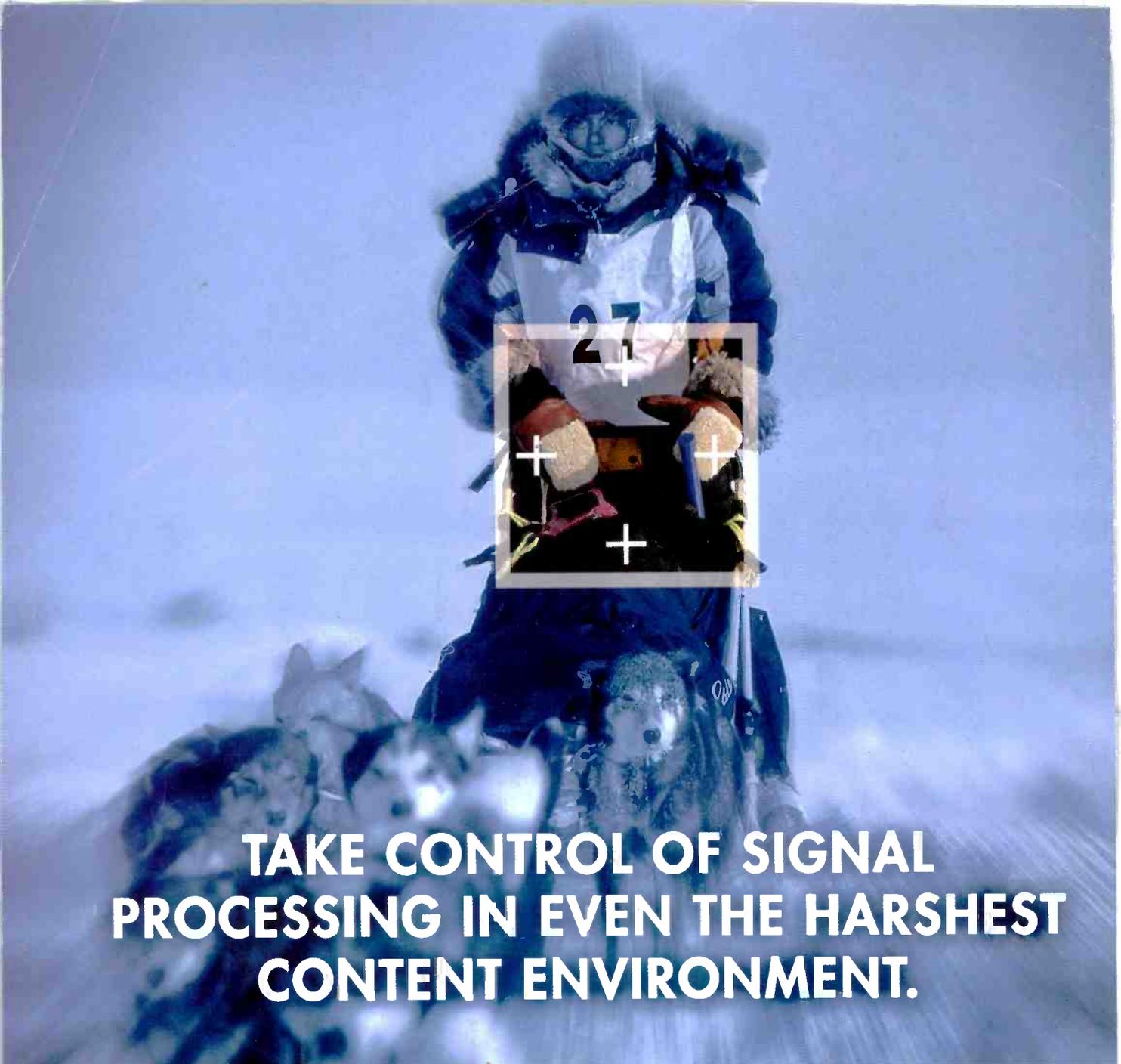
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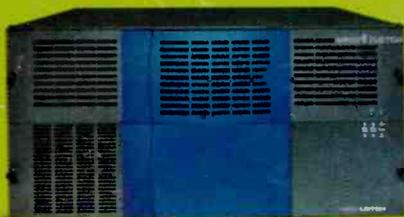
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