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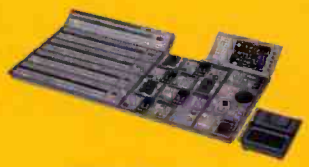

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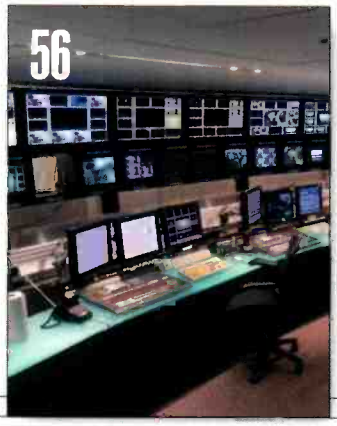
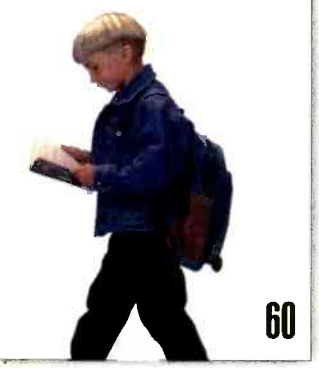
CONTENTS

FEATURES





BEYOND THE HEADLINES

DIGITAL HANDBOOK

ON THE COVER: Taking care of details such as the proper placement of an exhaust outtake can keep emergency power systems running smoothly, and broadcast facilities' downtime to a minimum. Generator photo courtesy Syska Hennessy Group.

(continued on page 8)

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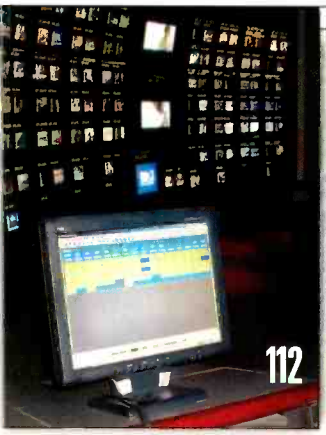
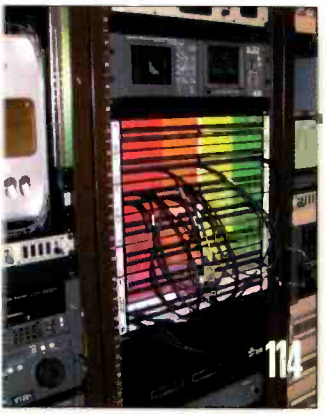
CONTENTS

Systems Design & Integration





New Products & Reviews

Departments

Define the term

Broadcast Engineering columnist Michael Robin has carefully defined many terms in his column, "Transition to Digital." Can you answer this question from one of his recent columns? What is the vertical resolution of a 1920x1080/60i format signal expressed in LPH? Correct entries will be eligible for a drawing of *Broadcast Engineering* T-shirts. Enter by e-mail. Title your entry "Freezeframe-October" and send it to: bdick@primediabusiness.com. Correct answers received by Dec. 17, 2003, are eligible to win.

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The long march toward HD

Because I write these editorials two months in advance of publication, I'm enjoying the hot days of summer. However, I still find time to sit in the cool of my home theater and enjoy the latest in HD entertainment. I was recently demonstrating HD for my son's father-in-law when he remarked that I sounded like a salesman on the topic. After some thought, I realized he's right. I have promoted HD for what seems like a long time.

However, not all my tirades on the benefits of HD have been well received. Some readers have vehemently disagreed (and still do) that HD is important to broadcasters. Some have called HD just a technology looking for an application.

One guy said, "Sure, HDTV may look good, but so does Cindy Crawford, and neither will appear in my living room any time soon." Then there was Jerry, who claimed I'd "sold my soul to the digital equipment manufacturers." He refused to believe that once the public could see HD they'd love it. He predicted there would be only two circumstances where viewers would "adopt" HD: when tuners are mandated or when there is "high-profile programming" available.

Well, Jerry, the FCC has now mandated DTV tuners in sets beginning in 2007. And I could spend the rest of this column reviewing the increasing amount of HD that's coming online.

Not all readers were negative about HD. Bob said, "Everyone who spent thousands on HD equipment this past year (myself included) is going to be furious when they turn on their local FOX DTV affiliate and see that once again, FOX has taken the cheap route to making their programming. Thanks to FOX for putting another roadblock up for HDTV. I hope all the HD viewers complain. Maybe that will prevent them from being cheap and trying to pass it off as an improvement."

Well Bob, it seems that viewers like you and, perhaps even my open letter to the great Wizard Seetooths, did have an effect on FOX's position on HD. Recently, FOX announced they would now broadcast half of their prime time programs in HD beginning next fall, which is a complete reversal from their previous position. Oh well, better late than never.

Finally, one reader wrote; "I was re-arranging the deck chairs here at the SS KEPR and ran across the August 1982 edition of *Broadcast Engineering*. Of course HDTV was mentioned on the cover, and in an appropriate article inside. It was good reading now, as it was then. I then carefully re-stacked the magazine pile on the Quad machine and went on with my day."

Okay, he's got me. Maybe I have been promoting HD too long.

Brad Dick
editorial director

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Advice on video over IP

Brad:

I enjoyed your article on video over IP in the June issue. I am considering this technology for video delivery. Have you had any experience with VPNs streaming real-time video or telco LSS services over relatively closed IP networks? It appears latency and rerouting of packets would not be so much of an issue on a network within a LATA or limited geographic area. A 45Mb/s pipe should do wonders. Any thoughts?

ROBERT J. WYATT
KHQ

Brad Gilmer responds:

I have had experience using video over IP through closed IP networks, and it works quite well. If you can control network traffic and configure the routing so that you do not have disruptions due to dynamic rerouting of network traffic, video over IP can be a reliable and cost-effective way to transport broadcast-quality video. I am not specifically familiar with LSS. Also, the addition of VPN should add a valuable layer of security, and may simplify routing and network address translation issues across firewalls. Sounds like you may have a wining combination.

Why receive OTA?

To the editor:

The article "NAB commends House bill to accelerate consumer adoption of DTV" in the Sept. 3 issue of the "RF Update" newsletter, says that it is desirable for a cable-ready receiver to be able to receive over-the-air signals. Why would that be the case?

If I can buy a cable-ready receiver without the capability to receive OTA signals for a substantially lower price, why shouldn't I have that option? I'm just going to hook my DTV set up to cable anyway. When would a consumer with cable tune to an OTA channel? That would require two RF inputs and an automatic switch that switches to the over-the-air input. I would guess very few consumers have that type of setup.

It will not take long for consumers to realize that they can use a cable STB and a DTV (or even analog) TV monitor, since the STB has all the needed outputs for a 4:3 or 16:9 screen, and digital or analog signals. Will NAB then ask Congress or the FCC to mandate that every monitor have OTA tuners?

I hope the FCC has better sense and better judgment. Let the CE industry make the products the consumer wants. Consumers don't need to pay more for a cable-ready receiver that receives over-the-air signals. After all, about 70 percent of the country is on cable anyway.

Must-carry rights

Dear Mr. Martin,

I appreciated your July column. I find myself making a similar argument. Our analog signal is not as good as our digital. Can you please tell me what case this was and how I may read it? I feel certain this would help us.

DANIEL HUBER
WBPH

Harry Martin responds:

The link to the FCC case granting must-carry rights to a broadcaster based on the reach of its DTV signal is *hraunfoss.fcc.gov/edocs_public/attachmatch/DA-03-1286A1.pdf.*

Keep in mind that the station was responsible for converting the signal back to analog and delivering it to the headend in that mode.

Watching ad dollars

There's an elephant in the room that nobody wants to talk about. When the radio consolidation took place, one of the results was that the big owners made it attractive to buy a package of spots on their multiple stations in the market. To pick specific stations where you wanted the spots to go, you had to pay top dollar. In radio that was no big deal. In TV, having some of your ad budget go where you don't want it to becomes quite expensive. I don't want to say these big owners have lunch together, but I'd hate to buy time in a market with fewer owners. I think the politicians are worried that their already expensive TV campaigns will become even more so.

ROY TRUMBULL BE

May Freezeframe:

Q. In the mid '80s JVC developed a series of cameras under the PROCAM name. What was the key marketed feature of this series of cameras and what technology was used to enable it? (Answers had to include both to be considered correct.)

A. Plumbicon tubes provided the low-light sensitivity the line was known for. No one was able to correctly give the feature and the enabling technology.

Test your knowledge!

See the Freezeframe question of the month on page 8 and enter to win a *Broadcast Engineering* T-shirt.

Send answers to *bdick@primediabusiness.com*

grass valley

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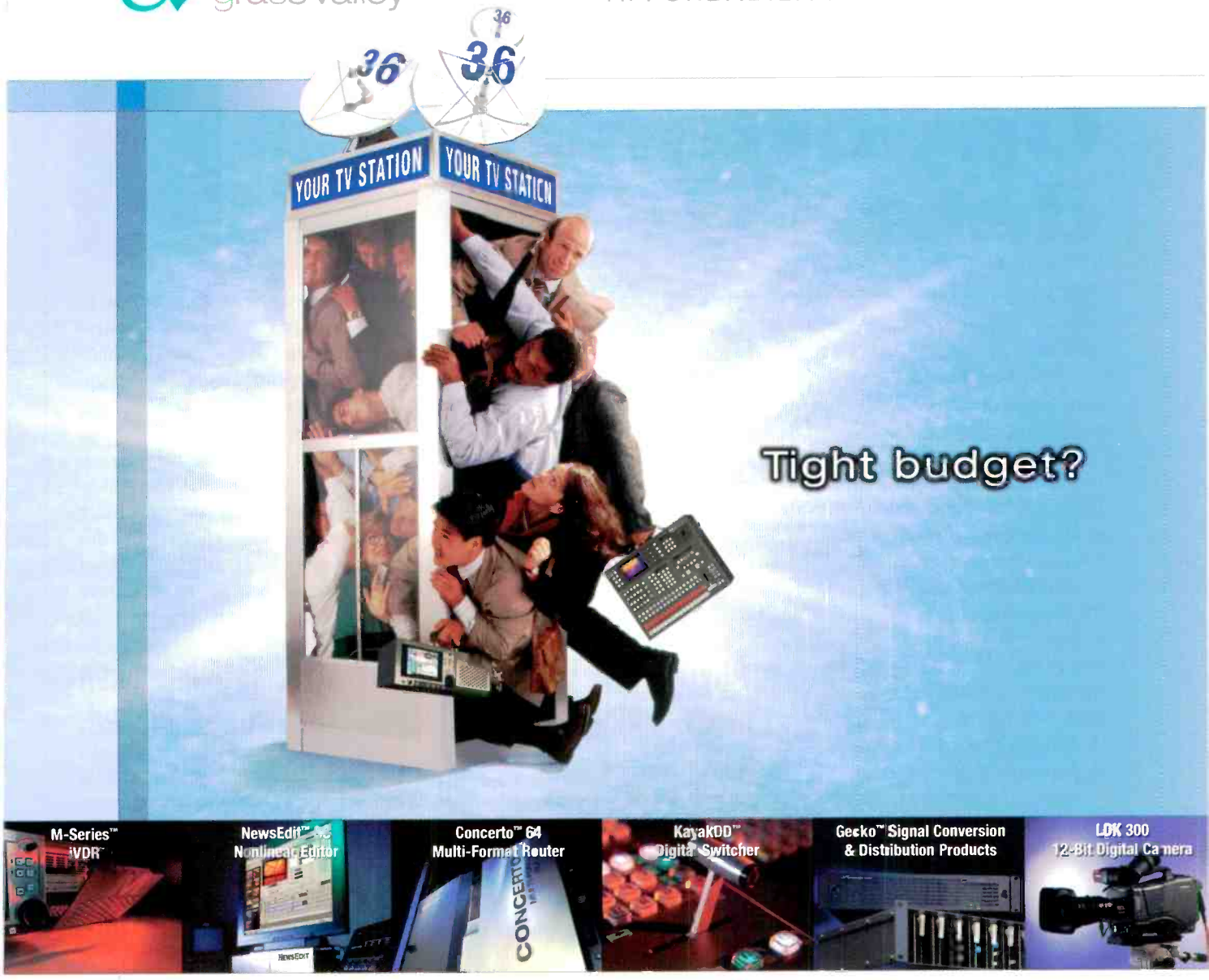

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Opportunistic data

BY CRAIG BIRKMAIER

In recent years, a variety of opportunities to develop new revenue streams from DTV broadcasts have been run up the tower and hung out to die. Some of these opportunities include:

• *HDTV.* HD is turning into a premium niche market for cable and DBS, not to mention a profitable product niche for consumer electronics manufacturers.

• *Multichannel STDV broadcasting.* It's beginning to gain momentum in Europe, but U.S. broadcasters have largely ignored it, conceding the opportunity to multichannel cable and DBS, and the media conglomerates that supply more than 85 percent of all popular TV programming.

• *Datacasting.* Anything that involves broadcasting data has been ignored, misunderstood and/or mishandled.

One can forgive broadcasters for taking a wait-and-see attitude about creating interactive content or delivering data services to PCs. The whole idea of broadcasting bits to devices that have more in common with a PC than a TV flies in the face of a generation of broadcasters who expect their programs to be consumed synchronously by passive couch potatoes. It is nearly impossible to cobble together a rational business model for data broadcasting, especially when it is nearly impossible to receive DTV broadcasts reliably in many areas.

At least that's been the excuse. Back in June, *Broadcast Engineering* stirred the waters a bit with a data broadcast. Ok, it was a highly targeted multicast, but who's quibbling? Like our readers, we are in the broadcast business. Every month tens of thousands of industry professionals receive one of our broadcasts in their mailbox. Similar to TV broadcasts, we have no control over the audience that chooses to subscribe to the print version of the magazine. They can surf the table of contents and browse a few stories; advertisers are not guaranteed that their ads will be seen or read.

Anything that involves broadcasting data has been ignored, misunderstood and/or mishandled.

The data broadcast that took place in June was somewhat different. In this case, *Beyond The Headlines,* an e-mail newsletter, was broadcast as IP data to the e-mail addresses of the newsletter's subscribers. This is possible because of the Internet, and the emerging reality that a very high percentage of the people who receive our printed broadcasts via the mail also have computers, e-mail addresses and the ability to surf the Web. It works because the data delivery infrastructure is reliable and we are leveraging broadly adopted standards that turn the bits into a consumable digital media product.

There is a point to this attempt to create a relevant analogy. The June 30 issue of the e-newsletter, *Beyond the Headlines,* included the story: "Thomson to FCC: Make broadcasters transmit full DTV power and endorse plug-and-play."

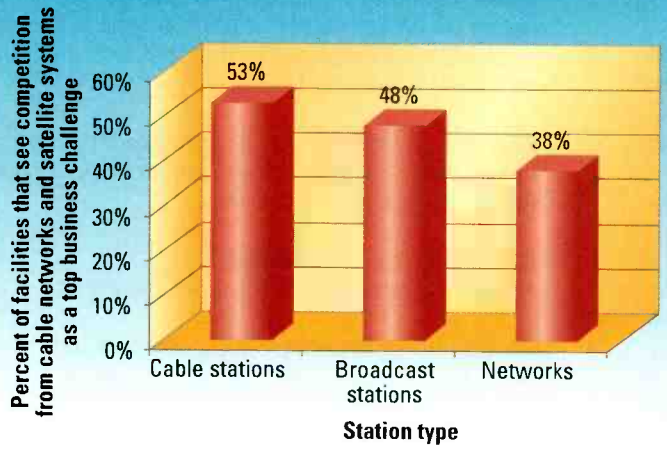
The story explained that Thomson Consumer Electronics has called upon the FCC to expedite its approval of plug-and-play connectivity standards for cable-ready digital TV sets. A Thomson spokesman also placed blame for poor over-the-air DTV reception with broadcasters, who he said have a "lack of commitment" to full power broadcasting.

"We anticipate that the majority of

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

Squaring off with cable/satellite networks

Many broadcasters see competition as a top business challenge



SOURCE: TrendWatch www.trendwatch.com

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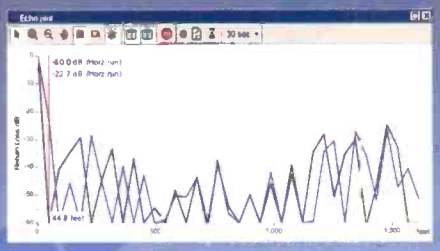

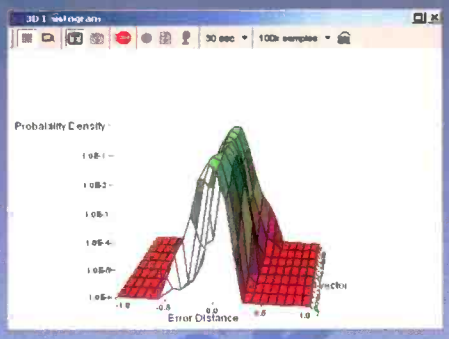

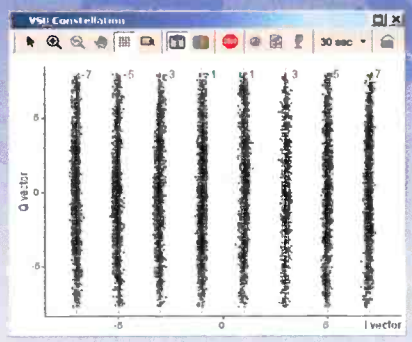

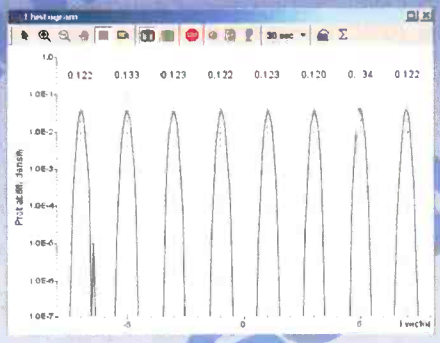

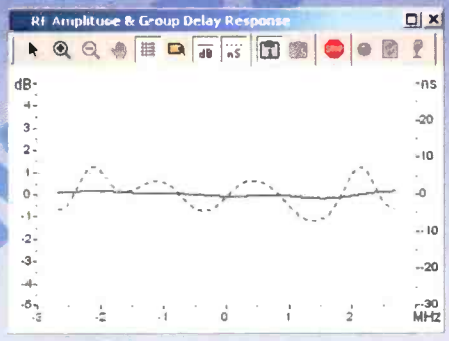

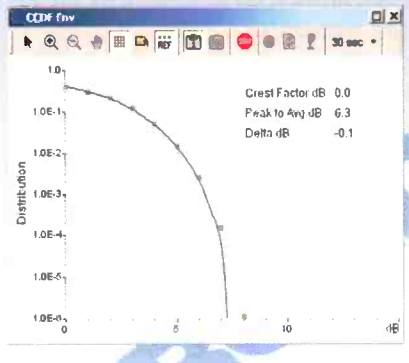

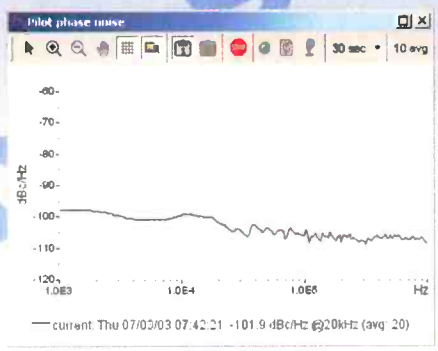

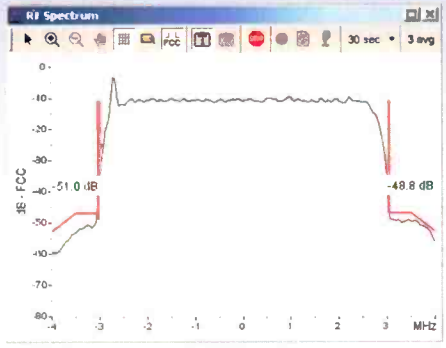

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consumers who will be shopping for HDTV sets will be expecting cable-ready products that work seamlessly with existing cable networks," Thomson's David Arland wrote to W. Kenneth Ferree, the chief of the FCC's media bureau, adding that, to meet this expectation, the commission needed to adopt the pending HDTV plug-and-play agreement.

On Sept. 10, the FCC adopted the plug-and-play cable rules that Thomson was lobbying for. As for the power level issue, one might conclude that it really doesn't matter; broadcasters continue to expect cable and DBS to deliver their content to the masses.

The aspect of this story that is relevant to this column, however, is the response to the newsletter story about Thomson that was printed in the August issue of *Broadcast Engineering*: "The DTV Reception Debate." The response from Pete Putman called into question the validity of Thomson's claim that low power levels are a major impediment to successful reception of DTV broadcasts, suggesting that problems with reception often stem from the way PSIP is sent out, rather than from RF. He advised Thomson to take a stance on the PSIP broadcasters are sending out. As he said, "Many broadcasters don't do this, and PSIP is what makes DTV more user-friendly."

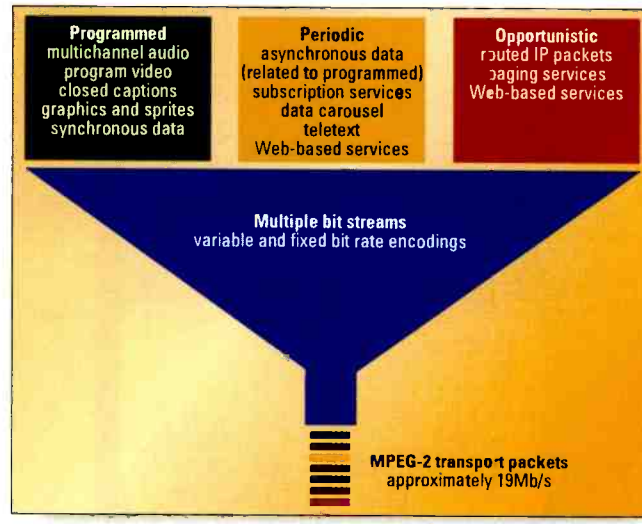

Figure 1. The three categories of data that would be carried in the ATSC transport multiplex are programmed, periodic and opportunistic.

The PSIP problem

Earlier I noted that broadcasters could be forgiven for their apparent lack of interest in the *data* opportunity. However, broadcasters cannot ignore the reality that PSIP is the only form of data broadcasting universally supported by ATSC receivers (even if it is a very small universe). PSIP is a fundamental requirement to make DTV broadcasting work. Unfortunately, many broadcasters, not to mention receiver manufacturers, have made little effort to get it right.

At the heart of PSIP one will find a bunch of tables that tell the receiver how to deal with various components of a station's ATSC transport stream. One such table carries the program guide information central to the digital multichannel services offered by cable and DBS. Broadcasters can depend on ATSC receivers to receive the PSIP broadcasts that guide viewers to their programs, but only if they implement the standard properly, and only when the receiver handles the data properly.

Bottom line, if broadcasters cannot get this right, all of the opportunities to exploit data broadcasting are irrelevant. To assist broadcasters with PSIP implementations, the ATSC has published a recommended practice (A-69) for implementation of the PSIP standard (A-65); a link is provided in the Web links associated with this article.

Unfortunately, just getting PSIP right is not enough to help broadcasters exploit the data broadcasting opportunity. The ATSC has created a suite of standards for data broadcasting built around A-90, the core standard. There is no guarantee, however, that these standards will be supported in a "DTV-ready" receiver. The FCC mandate to include ATSC tuners in new receivers only requires them to deal with 8-VSB modulation and the decoders necessary for MPEG-2 video and AC3 audio. The FCC does not require support for PSIP, much less any of the data broadcast standards.

Adding to the dilemma, it is more likely that new digital receivers will implement the standards being used by cable or DBS. These multichannel systems may not be required to deliver any data from broadcasters, except perhaps for data specifically associated with a carried program.

Opportunistic datacasting

We have known for more than a decade that digital broadcasting offers the opportunity to deliver more than the video and audio program streams associated with the analog television service. Early in the standards setting process there were discussions about the ability to deliver data services alongside traditional TV programming.

Web links

"Beyond The Headlines" story on Thomson:
editorial1.industryclick.com/microsites/index.asp?srid=11266&pageid=7414&siteid=15&magazineid=158&srtype=1#thomson
August *Broadcast Engineering* story: "The DTV Reception Debate."
broadcastengineering.primediabusiness.com/ar/broadcasting_dtv_reception_debate/index.htm
"Program and System Information Protocol Implementation Guidelines for Broadcasters" www.atsc.org/standards/a_69.pdf

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The term opportunistic data became part of the vernacular by the late '90s — perhaps because of efforts by this author to evangelize the data broadcasting opportunity. In a paper delivered at a 1997 SMPTE Conference, I defined three categories of data that would be carried in the ATSC transport multiplex: programmed, periodic and opportunistic (see Figure 1 on page 16).

While the concepts outlined in that 1997 paper have been standardized, implemented and deployed, the opportunity has been ignored ... perhaps lost.

Cable and DBS services are rapidly deploying set-top boxes with the core technologies to exploit the data broadcast opportunity: local data and program caching to a hard disk drive (a.k.a. a PVR or DVR) and the ability to transform bits delivered to cache into services that can be displayed on the attached TV.

Dish networks recently upped the ante by offering a PVR-enabled STB as part of their standard "free" hardware packages. They understand that the ability to broadcast data to local cache is the most important tool in the arsenal of weapons needed to compete with localized cable services. For example, localized weather on demand is now a reality for many DBS subscribers.

This is becoming a tired refrain, but broadcasters have the ability to compete with the multichannel services, if they choose to do so. There are three steps to exploiting the opportunity:

1. Ask Congress for the opportunity to create a competitive multichannel service in the broadcast spectrum.
2. Develop a reliable infrastructure for delivery of bits in every market.
3. Create a platform that is competitive with those offered by the other multichannel services — a platform that will allow content to be broadcast to cache for asynchronous consumption.

Broadcasters need to think of DTV as an opportunistic way to rebuild their business. BE

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

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BEYOND THE HEADLINES

Political Broadcasting 101

BY HARRY C. MARTIN

Whether you are in California or Maine, it's election season again. Here is a brief review of applicable law and regulation governing access to time by political candidates.

• *Right to access.* The political broadcast rules require stations to provide *federal* candidates reasonable access to their facilities. State and local candidates do *not* have the same right of access. Indeed, no station licensee is required to permit the use of its facilities by any legally qualified candidate for state or local public office. However, if a licensee permits any such candidate to use its facilities, it must afford equal opportunities to all other candidates for that office. And that candidate may say or show whatever he or she wants. The licensee cannot censor any of a candidate's broadcast material.

• *Qualifying uses.* Certain appearances by a candidate do not count as a "use" of broadcast facilities and do not trigger the equal opportunity requirement. For example, appearances in a bona fide newscast, news interview, news documentary (if the appearance of the candidate is incidental to the presentation of the subject of the documentary), and on-the-spot coverage of bona fide news events do not give rise to equal opportunity obligations.

However, if a candidate's appearance, either by voice or picture, does *not* fall under any of these exceptions, then the appearance may be what the FCC calls a "use," in which case the door would be opened to all other legally qualified candidates who may want equal time. Once the first use has occurred, a broadcaster must accommodate other legally qualified candidates who request time within a week after the first use.

The political broadcast rules require stations to provide *federal* candidates reasonable access to their facilities, but state and local candidates do *not* have the same right.

• *Recordkeeping.* Every licensee must keep and permit public inspection of a complete record of all requests for broadcast time made by or on behalf of a candidate for public office, together with an appropriate notation showing the disposition made by the licensee of such requests, and the charges made, if any, if the request is granted. Unlike other parts of the public inspection file, a licensee whose main studio is outside its community of license does not have to honor telephone requests for photocopies of the political file.

• *Lowest unit charge.* During the 45 days preceding the date of a primary or primary runoff election and during the 60 days preceding the date of a general or special election in which such person is a candidate, a broadcaster cannot charge a legally qualified candidate more than the lowest unit charge of the station for the same class and amount of time for the same period for any advertisement related to the candidate's campaign. Bonus spots provided to advertisers must be factored into calculation of lowest unit rate.

• *Special California issues.* In even a two- or three-candidate race, these rules can be troublesome. Consider California this year, where at last count there were more than 130 announced candidates for governor. By taking one candidate's spots, stations will open the door to 129 potential equal time requests.

In California there is another perplexing twist: As a technical matter, the current governor, who is the subject of the recall election, is technically *not* himself a candidate as far as California is concerned. Does the governor then qualify as a candidate for FCC purposes? The commission has taken the position in the past that a person who is subject to recall *is* a candidate under the FCC's rules if the candidates to replace him appear on the same ballot as the recall. BE

Dateline

December 1 is the deadline for filing with the FCC the biennial ownership reports, and for the placement of annual EEO reports in the public file, for TV stations in the following states: Alabama, Colorado, Connecticut, Georgia, Maine, Massachusetts, Minnesota, Montana, New Hampshire, North Dakota, Rhode Island, South Dakota and Vermont.

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

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Encoding
closed captions for digital television

BY DANNA BETHLEHEM

The broadcasting industry is in a state of transition from analog to digital television, and further down the road, to high-definition TV. As part of this transition, closed captions must also be converted for service with digital. Closed captions, which are encoded in line 21 of the NTSC TV signal, display the dialogue, narration and sound effects of a TV program. Viewers can choose whether or not to display closed captions by using a decoder built into or attached to a television set, which "opens" the captions and shows them on the TV screen.

The move to digital TV and the implementation of closed captions has been part of an effort by the Federal Communications Commission. The group has mandated both requirements and forced broadcasters to adjust.

Broadcasters and producers are increasingly recognizing the real market need for closed captions.

Reaching out with closed captions

Although legislation has been the major impetus for the adoption of closed captions, broadcasters and producers, supported by consumer research, are recognizing that there is a market need for them. Increasingly available on videos and DVDs, closed captioning serves a need in noisy environments, such as airports, where TV monitors provide ongoing public service information. Closed captioning has also benefited the nearly 32 million people in the United States who speak English as a second language (ESL). Studies show that captions can dramatically improve English vocabulary and comprehension among the ESL population. And, of course, closed captioning is a crucial aid for the hard-of-hearing population, the group for which the FCC regulation was originally intended.

The transition to digital TV

The closed caption standard used today is EIA-608, which specifies the use of closed captions in analog TV signals. As TV stations begin the transition to full digital environments, all programming will have to support the digital closed caption format, EIA-708. In the interim period, encoding and broadcasting equipment will have to support closed captions in both formats. The move from EIA-608 (analog) to EIA-708B (digital) brings with it many improvements. For example, viewers at home will be able to control the size of the caption text. EIA-708 also offers many more letters and symbols, as well as support for multiple fonts and colors for text and backgrounds. The traditional black box background can be replaced by a colored box, or done away with entirely in favor of edged or drop-shadowed text.

In addition, DTV captions contain more information. Currently, if we caption a show in two languages (CC1 and CC2) at 250 words per minute, we have hit the limit of what can be transmitted. There's no room for text or Internet data. EIA-708 increases the data rate by 16 times.

EIA-608 captioning

Closed caption data is included in the vertical blanking interval (VBI) section of the NTSC analog TV signal, a part of the signal not displayed on TV screens. The VBI can also contain other signal information, such as teletext, time codes, and program delivery controls.

Production houses and TV studios take the closed caption data, encode it with the TV signal, and send the integrated TV signal to broadcasters for transmission.

This composite analog TV signal is fed into an MPEG encoding board, which extracts the closed caption stream and compresses the TV signal. It then multiplexes the closed caption signal and the encoded MPEG stream and outputs an MPEG-1 or MPEG-2 stream that includes the closed caption signal.

EIA-708B captioning

As mentioned before, analog closed caption data is located in the VBI of the analog stream. Digital TV signals do not have a vertical blanking interval. The digital EIA-708B standard offers an alternate way of including existing analog closed captions in the digital signal by transcoding or converting EIA-608 data to the EIA 708 standard via a closed caption conversion box that can receive either format. This saves production houses and studios from having to reproduce existing closed caption data in 708

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format from scratch. In Figure 1, an analog signal containing CC 608 data is simultaneously fed into an MPEG encoding board and a closed caption extractor box. The closed caption extractor separates the CC data from the composite signal and feeds it into a closed caption receiver for conversion to the 708 format. Meanwhile, the MPEG encoder compresses the composite TV signal into MPEG. The MPEG signal and the 708 data are then multiplexed and output as an MPEG-1 or MPEG-2 stream.

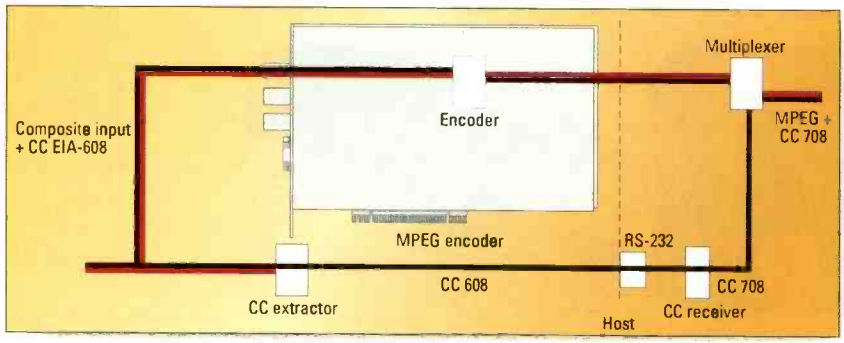

Figure 1. An analog TV signal that contains CC 608 data is fed into an MPEG encoder and a closed caption extractor box, then to a CC receiver that converts the 608 data to 708 format.

Today, most DTV content still relies on EIA-608 captions that have been converted to 708 format, mainly because of the small consumer base of DTV receivers. When a larger number of consumers have receivers that are able to receive DTV signals, there will be more pressure on producers and broadcasters to include native EIA-708 closed captions.

No time to waste

Given the regulatory pressure to produce new programming with digital closed captions based on the EIA-708B standard, producers and broadcasters should be seriously thinking how to make this move. Although investing in new equipment may involve a learning curve and a capital investment, there is no doubt that the end product, in terms of quality and benefits for consumers, will be superior to that available today. BE

Danna Bethlehem is the publications and online marketing manager for Optibase.

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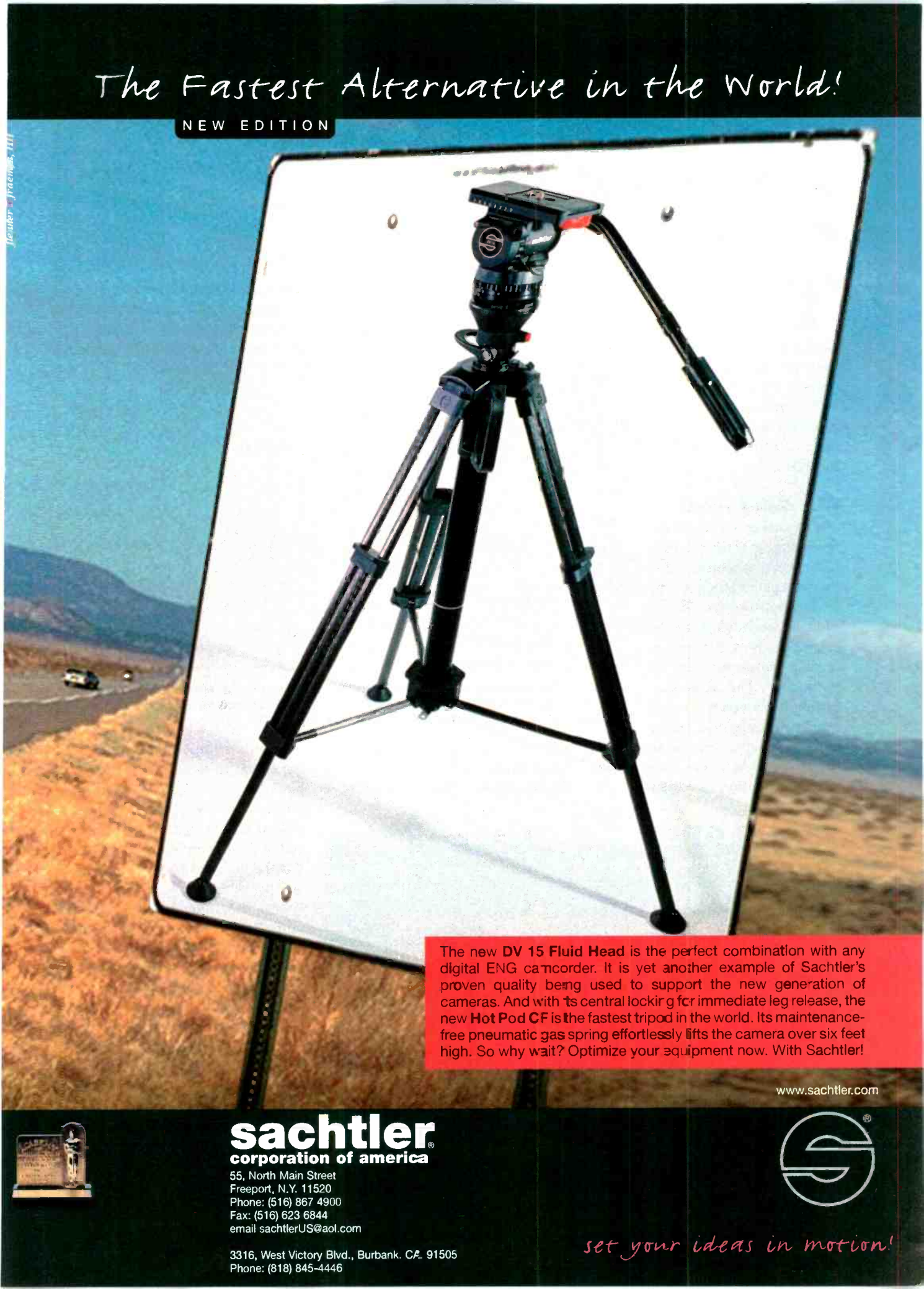

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Digitizing audio

BY MICHAEL ROBIN

The world around us is analog. Our perception mechanism is also analog. Standard audio transducers such as the microphone and the loudspeaker are analog devices. Sound perception of humans occupies about 20 octaves extending from 20Hz to 20kHz.

Why digital audio?

In an analog system, the infinite number of discrete electrical signal amplitudes that the microphone produces (the information) are amplified to a suitable level for further processing such as mixing, recording, transmission and reproduction. The signal processing is essentially a transmission medium that carries the original signal from the source (the sound captured by the microphone) to the destination (the listener). The medium inherently introduces undesirable electrical signal impairments (linear distortions, nonlinear distortions and noise), which have a direct effect on the reproduced audio quality. These impairments are additive, and the overall performance of a complete analog chain depends on the individual performance and number of discrete components assembled in a typical operational configuration (the medium).

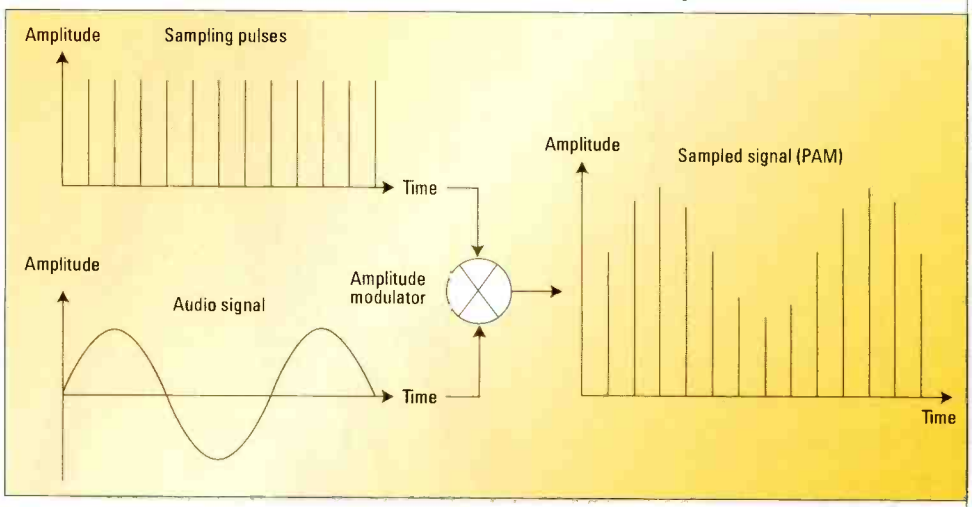

Figure 1. The sampling process consists of multiplying the analog audio signal with a stream of repetitive pulses. This is equivalent to a pulse amplitude modulation (PAM) process, which is represented here in the time domain.

This puts a limit to the number of stages that an analog audio signal can pass through before it becomes too impaired to be acceptable.

Many analog signal-handling difficulties can be eliminated if the analog signal is digitized prior to modulation and transmission. In a digital audio system, the original analog information is converted to a digital representation. This information is in binary form. Essentially, the signal has two well-defined states: zero and one. Undesirable medium-generated impairments affect the digital electrical signal in a manner similar to the one affecting the analog signal. They have, however, no effect on the information as long as the receiver can distinctly recognize the two levels. The result is that the message distortion is restricted only to the analog-to-digital (A/D) and digital-to-analog (D/A) tandem process, thereby improving

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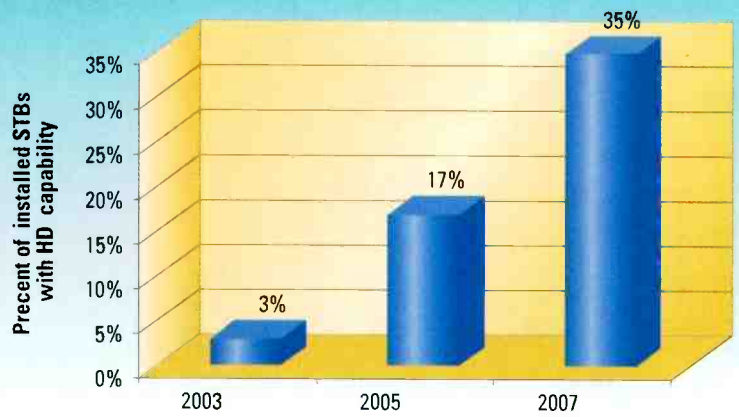

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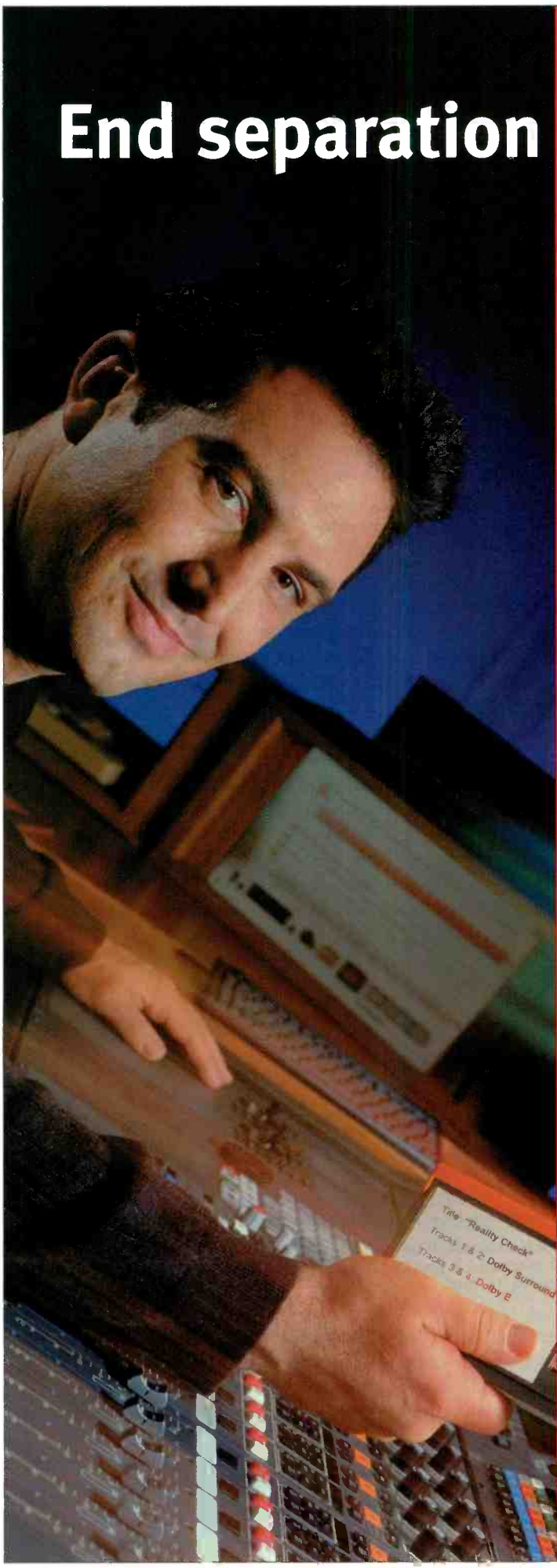

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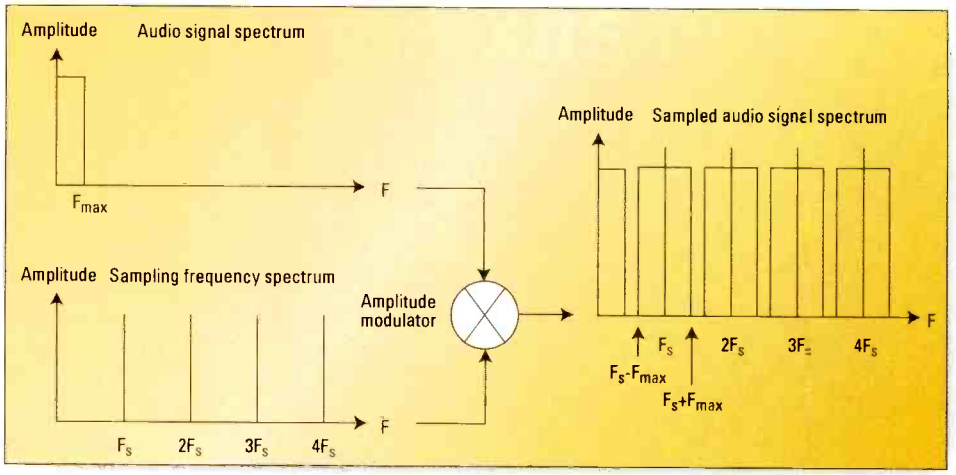


Figure 2. The pulse amplitude modulation (PAM) process is represented here in the frequency domain. In this idealized case, the sampling frequency (F_s=1/T) is considerably higher than the sampled frequency, and the sampling pulse duration is close to zero.

the transparency. The transparency is maintained as long as the SNR is within some medium-related values beyond which the "cliff effect" occurs and the transmission shuts off.

Sampling considerations

Sampling is the first step towards digitizing audio signals. It consists of measuring the analog audio waveform amplitude at periodic intervals, T. The main concern is to represent the original analog values with adequate precision. The measurement accuracy depends on the sampling frequency. The sampling frequency has to be at least twice the maximum audio frequency, preferably higher.

The sampling process consists of multiplying the analog audio signal with a stream of repetitive pulses. This is equivalent to a pulse amplitude modulation (PAM) process. Figure 1 on page 26 represents this process in the time domain, and Figure 2 represents it in the frequency domain. In this idealized case, the sampling frequency (F_s=1/T) is considerably higher than the sampled frequency, and the sampling pulse duration is close to zero.

For historical reasons, CD recordings use a sampling frequency of 44.1kHz. Sampling 20kHz bandwidth analog audio signals at 44.1kHz requires a 20kHz low-pass filter between the analog input and the A/D converter. Well-designed filters avoid interference between the baseband audio and the sampled PAM spectrum, which would result in aliasing. Even so, many purists claim that a 20kHz low-pass filter gives rise to overshoot, ringing and related audio distortions, which to some are unacceptable. For this and other reasons, studio operations are carried out at a 48kHz sampling rate. Using both sampling frequencies in a studio environment requires sample-rate converters. In addition, in a digital television studio, the audio sampling frequencies have to be coherent (derived from the same master clock) with the video sampling frequencies.

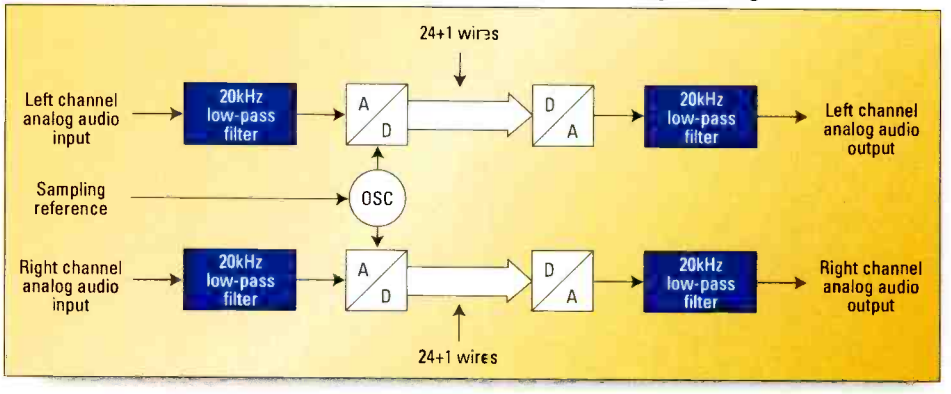


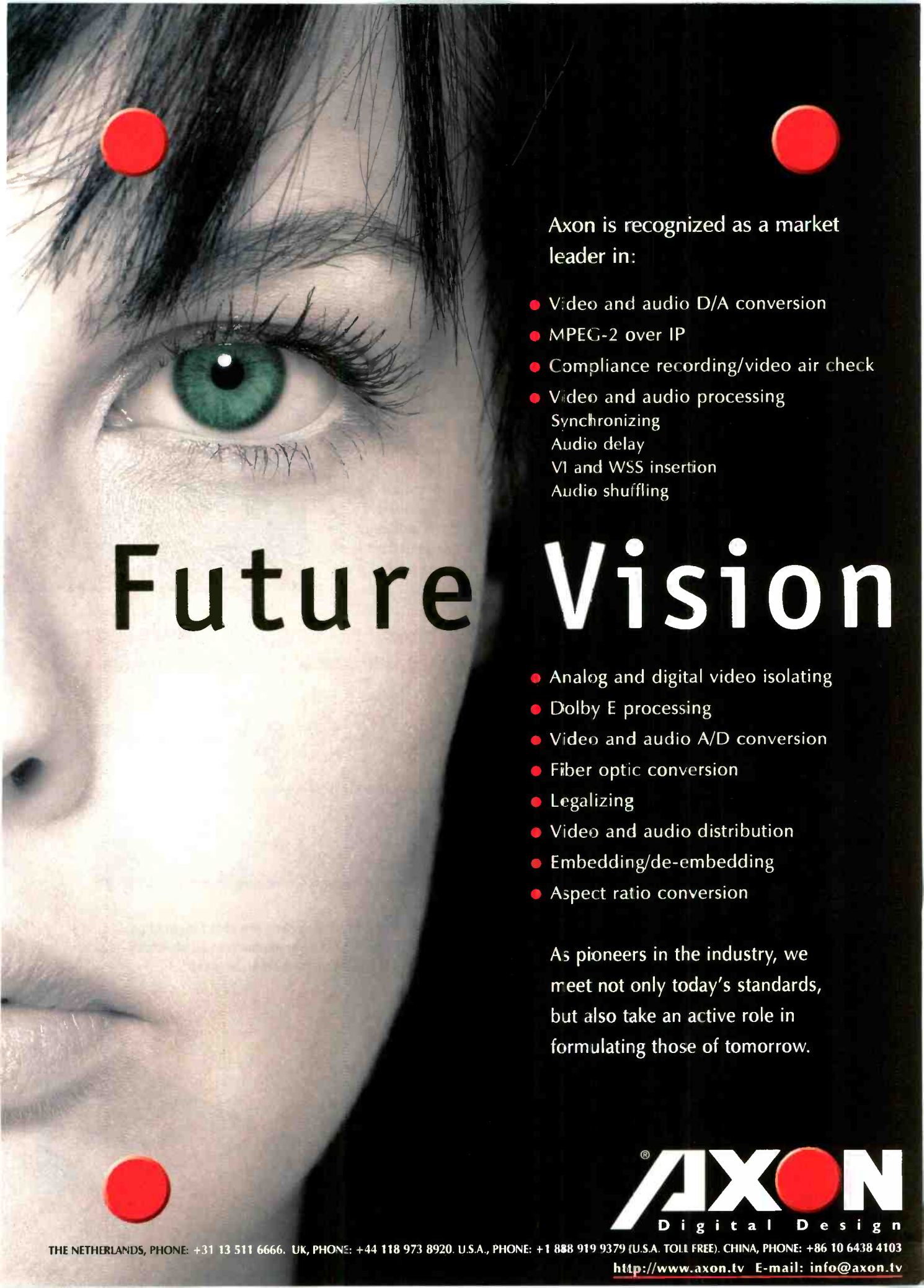
Figure 3. This simplified block diagram illustrates a stereophonic digital audio system consisting of an ADC, a DAC and a transport medium. In this diagram, the digital audio is in its bit-parallel native format.

Quantizing considerations

The samples are further processed by assigning them a binary number approximating their sampled value. This process is called quantizing. Quantizing divides up the sampled voltage range into 2^n-1 quantizing intervals, where n is the number of bits per sample (sampling resolution). For example, an 8-bit system can identify 2^8 = 256 discrete sampled signal values (255 quantizing intervals). This is the case of a signal with an amplitude occupying the whole quantizing range.

Low-amplitude audio signals would be quantized with considerably fewer discrete levels, resulting in significant quantizing errors. These quantizing errors are correlated with the signal and perceived as distortion. With higher level signals, the quantizing errors are uncorrelated with the signal and perceived as random noise. The quantizing errors can be reduced by increasing the number of bits per sample as well as the sampling frequency (oversampling).

Early digital audio equipment (e.g. CD technology) uses 16 bits (65,535 quantizing intervals). Current high-quality studio equipment uses 20 bits



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(1,048,575 quantizing intervals) or 24 bits (16,777,215 quantizing intervals) per sample.

Overall performance considerations

The formula expressing the SNR of a digital audio system is:

SNR (dB) = 6.02n + 1.76 + 10 $\log_{10}$ ($F_s/2F_{max}$)

where n is the number of bits per sample, F_s the sampling frequency in Hz and F_{max} the maximum (low-pass filtered) baseband frequency in Hz. It is evident that higher values of n and F_s ensure a better SNR. At n=24, F_s=48kHz and F_{max}=20kHz, the SNR is 151.24dB. A 6dB SNR improvement is obtained for every additional bit at a given F_s. Over-sampling improves the A/D and D/A performance by reducing the quantizing errors and aliasing component amplitudes. At a given n, 4x oversampling increases the SNR by 6dB.

Transporting digital audio signals

Figure 3 on page 28 shows a simplified block diagram of a stereophonic digital audio system consisting of an ADC, a DAC and a transport medium. In this basic diagram, the digital audio is in its bit-parallel native format. Assuming a 24-bit accuracy, each of the two signals would be transported by 24 pairs of wires (one pair per bit) plus an additional pair for the clock signal. This calls for a heavy cable and connector. Early equipment worked in this manner.

This works well in simple operational environments but not in a large installation. For large installations, the digital signals are distributed using the AES/EBU bit-serial digital audio signal distribution format. This is a self-clocking single-cable format, now universally used. We will describe this format in a future article. 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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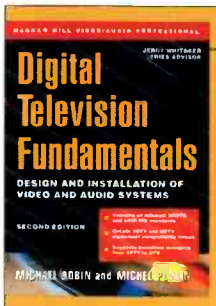

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High-speed networks

BY BRAD GILMER

Just what constitutes a high-speed network depends upon your point of view. If you are running a 10Base-T network using a simple hub, then a 100Base-T network using switches will be a major step up. If you currently have a 100Base-T network but feel the need for speed, a fiber-based Gigabit Ethernet network may be in your future.

The networking industry has been trying hard to make these upgrades as painless as possible. Let's say you currently have a 10Base-T network in your facility that's been around for a while, and you would like to upgrade it without breaking the bank.

The current network consists of three interconnected hubs with two servers and 12 workstations. One of the servers is used to store graphics that have been generated by the art department until they can be moved to the on-air systems in news. Your users have been complaining that transfer times have been getting very long lately, and that overall network performance is suffering. Upon further investigation, you find that people are now really using the network in everyday production. When you put the network in five years ago, no one used it. Even a couple of years ago, people were still exchanging files using CD-ROM. But now, the network has slowed down enough that they're using CD-ROM because they have to. What to do?

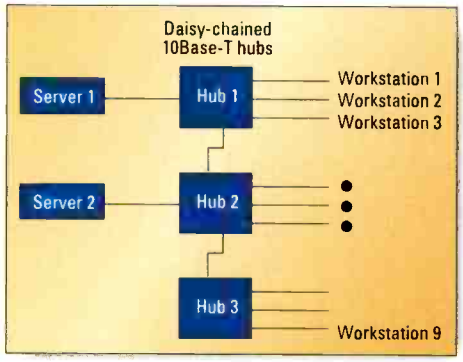

Figure 1. A typical older 10Base-T installation. All workstations "hear" all other workstations on the network.

The first thing I would do is replace the hubs with switches. For a small amount of money, you can replace all three hubs with a single Ethernet switch. Switches are fundamentally different from hubs. Hubs connect all computers together. When one computer talks, all the computers on the network "hear" that computer, whether it is talking to them or not. (See Figure 1.) If two workstations want to exchange some files while another workstation is moving a big file onto the server, the workstations will have to compete for available network bandwidth.

On the other hand, switches provide a dedicated 10Base-T connection from each computer back to the switch. Traffic is switched from one port to another on a packet-by-packet basis. This means that in the example above, the two computers involved in a peer-to-peer transfer can do so at full bandwidth without "hearing" the traffic generated by the workstation engaged in a file transfer to the server. The switch does this by reading the Ethernet packet headers to determine the destination for the packet, and then switching the packet to its destination port *without* having to read through the entire packet.

When you start shopping for Ethernet switches, you will find that you cannot purchase a 10Mb switch anymore. You have to buy a 10/100Mb switch. 10/100 means that the switch will automatically sense the speed capabilities of the network interface card (NIC) connected to each port. Users may connect a mixture of 10Base-T and 100Base-T NICs to the switch.

Just what constitutes a high-speed network depends upon your point of view.

(See Figure 2 on page 34.)

To upgrade your network, all you have to do is install the 10/100 switch in place of the three older hubs. But, of course, nothing in life is easy. You will need to check to see if any of the cards in your workstations or servers are 10/100 compatible. Second, you should check your cables. If they are not CAT-5, then you may not be able to get reliable performance at 100Mb/s, even though the card in the workstation, and the switch, are both 10/100. You may have to upgrade your cabling to get the higher network speeds. Remember that using telephone cable or other non-network cabling can cause you headaches. The switch will not detect that you are using the wrong cable. If you have a 10/100 NIC, the switch will try to operate in 100Base-T mode, but will have a very high error rate resulting in slow network connections and many time-out messages (if it works at all).

One of the nice things about having 10/100-compatible equipment is that you can upgrade your network a piece at a time. If you determine that your servers are a choke point, then you can buy 10/100 cards for them too, but you

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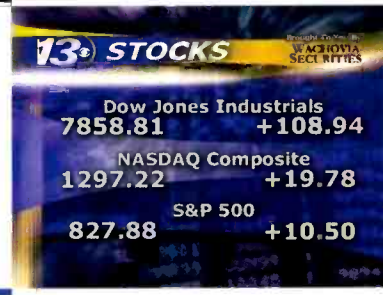

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have the flexibility to leave the workstations with their old 10Base-T cards if you like.

If you move everything from 10Base-T to 100Base-T, it is likely that the new configuration will be more than 10 times faster than the old one. Why would that be? The old network operated at 10Mb/s; the upgraded network operates at 100Mb/s, 10 times faster. The answer lies in the difference between a hub and a switch. Because the switch gives each computer a dedicated full-bandwidth connection, and workstations and servers never "hear" traffic from another port, they will never encounter a collision.

If your 10Base-T network is really overloaded, then throughput across the network will be severely limited.

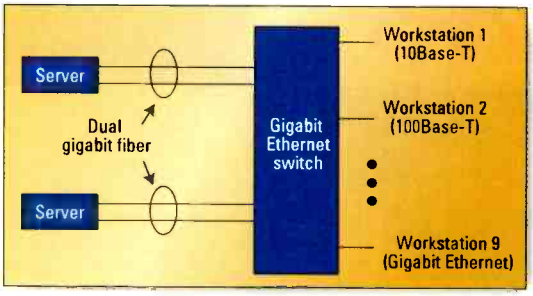

Figure 2. A multimode Gigabit Ethernet switch allows the user to mix 10Base-T and 100Base-T with Gigabit Ethernet on the same switch.

Talk time is seldom available and NICs must frequently wait for an opportunity to transmit their packets. Also, in a hub-based network, when an Ethernet collision occurs, the NIC card is forced to wait a random amount of time before attempting to resend. This algorithm works very well on lightly loaded networks, but things slow to a crawl when network utilization becomes more than about 75 percent. So, if your old network was running at 80 percent utilization, your effective throughput might have been somewhere around 4Mb/s — a long way from 10Mb/s. Moving to a 100Base-T switched network likely will get you throughput in the range of 70- to 80Mb/s. But remember, you will only see this performance improvement if your original network was heavily saturated, and if the new cards on your network are 10/100 capable. Also, it is still possible to hit major bandwidth limitations either because of limits in switch bandwidth or because of limits on connectivity to a high-demand destination on your network, such as a server or Internet firewall.

So what is the difference between a switch that costs $10 per port and one that costs $150 per port? Why do large organizations continue to purchase more expensive switches? There are two main answers. First, more expensive switches come with network management, usually operating over the network using Simple Network Management Protocol (SNMP). SNMP allows a network engineer to use tools to look at the performance of network components from his desktop. You may or may not need these tools, depending on the size of your network. Many network products now come with a management interface you can access with a Web browser, making management unnecessary for most small- to medium-sized networks. The second reason a switch may be much more expensive is because of the device's backbone bandwidth. If a 10-port 10/100 switch has a backbone bandwidth of 100Mb/s, guess what — assuming equal loading on all ports, each port will get a real throughput of 10Mb/s, in spite of the fact that the connection will support a throughput of 100Mb/s. For a 10-port 100Mb/s switch to provide 100Mb/s to each port (less actually, due to Ethernet overhead), the switch must have a backplane bandwidth of 1Gb/s. Switch designers take a number of approaches to keep bandwidth requirements from spiraling out of sight in large commercial switches, but you can see that there can be some major performance differences between different switches with the same 10/100 label on the box.

There are still a couple of other things we can do to increase network performance. If you are charged with increasing the speed of a post-production network, you may already have a 100Base-T network in place. The good news is that much of what is written above applies just as well to moving up from 100Base-T to Gigabit Ethernet or Gig-E. Gig-E still uses RJ-45 connectors, but may require you to upgrade to CAT-6 cable. If you need longer distance, or electrical isolation, Gig-E supports fiber as well as unshielded twisted pair (UTP) cable. If you are moving from 100Base-T to Gig-E switches, you may not experience as big a jump in speed, relatively speaking, as you would in moving from a 10Base-T hub to a 100Base-T switch because you are already in a switched environment and do not have problems with collisions on your existing 100Base-T network.

Let's assume you replace your 100Base-T switch with a new Gig-E switch and CAT-6 cable. Everyone is happy for a few minutes until they notice that even with a Gig-E NIC card in the server, things are still too slow. After a little checking you discover the problem. Your workstations with new Gig-E cards are running the Gig-E card in your server out of bandwidth. (Yes, this is possible, even though it might seem that 1Gb/s is a lot of bandwidth.) As soon as people start moving high-res moving video in and out of the server, new bottlenecks will appear. We have one last trick available in this month's column. If your server NIC is the culprit, check to see if your server operating system supports aggregating bandwidth across multiple NIC cards. Most do. Drop another Gig-E NIC card in your server, and the bottleneck will go away. Of course, now you probably have bandwidth limitations caused somewhere else in the network (like the server backbone), but that is an article for another month. BE

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

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Animating the rabbit and the duck

BY L. T. MARTIN

After a disappointing shortage of summer comedies, next month moviegoers will be treated to a mixture of live action and animation as Warner Bros. Studio releases "Looney Tunes: Back in Action." Director Joe Dante ("Gremlins" and "The Howling") has recaptured the spirit of the classic Termite Terrace animation by combining hand-drawn characters, including Bugs Bunny and Daffy Duck (both voiced by Joe Alaskey), with sophisticated computer- generated effects to inflict their gags upon a full cast of human actors headlined by Brendan Fraser, Jenna Elfman, Timothy Dalton and Heather Locklear.

As usual, the plot — which careens from the studio's back lot to Las Vegas, Paris and even the jungles of Africa in a search for the mythical Blue Monkey Diamond — is subordinated to the rapid-fire salvo of sight gags. In an even more ambitious interweaving of 2-D animation with 3-D live action than the studio's own 1996 "Space Jam," the techniques employed at its animation facilities in Sherman Oaks, CA, for the film's 1450 visual effects shots included many new processes made possible by revolutionary digital production technologies.

Combining live action with elaborate character animation and multilevel backgrounds inherently involves intensely complex compositing. Knowing that practically every moment in the film would involve special visual effects, visual effects supervisor Chris Watts ("Pleasantville" and "Gattaca") decided he wanted to be able to keep track of every single frame, from camera negative through high-definition dailies to final release print. By assigning a unique number to each frame and camera roll, he was able to let the editors cut the film the way they normally would, while at the same time ensuring that each frame of every element could be accessed at any time during the effects creation process in preparation for the inevitable last-minute changes. This dedicated frame identification was locked with each take so that even the final assemble list generated by the Avid DS NLE could be referenced to a master shot database in case they needed to find any take's original source.

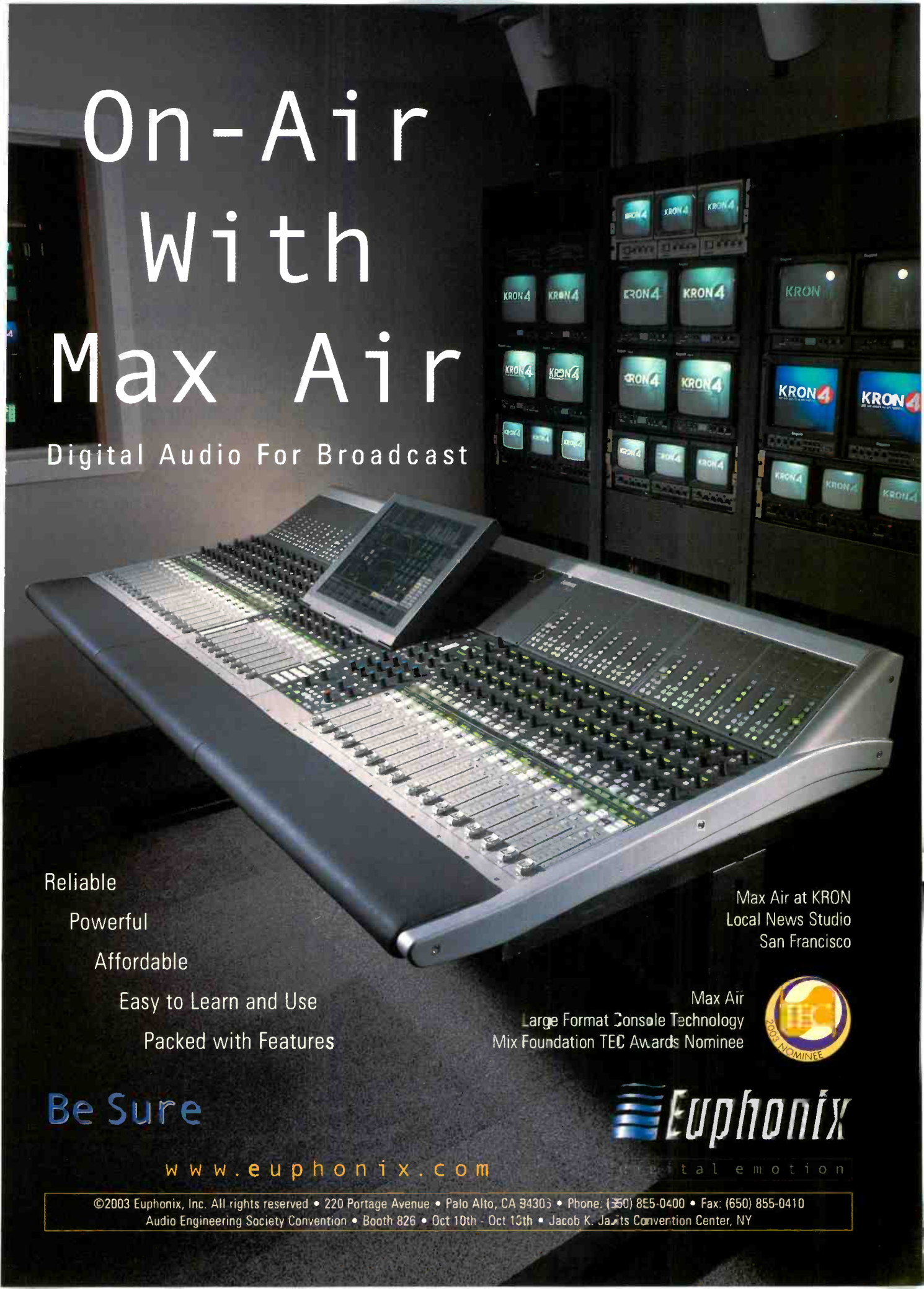
To combine live action with 2-D animation in "Looney Tunes: Back in Action," animators used a HotGears motion control rig made by Salamati Productions, a Nikon CoolPix digital camera with a wide fisheye lens, a Wacom Cintiq tablet, the Avid DS NLE, Apple's Shake, Alias's Maya, and ink and paint tools from U.S. Animation.

During principle photography, almost every scene was shot up to five times, with the camera being guided by a HotGears motion control rig made by Salamati Productions. Based on a mechanized 3-axis pan/tilt head controlled by a laptop computer, the motion control rig let director of photography Dean Cundey, A. S. C. (Oscar-nominated for 1988's "Who Framed Roger Rabbit?") precisely repeat every camera move while adding or subtracting animated or live action elements.

For example, in the first "action pass," Fraser could act out a scene playing against a puppeteer manipulating a foam rubber Bugs Bunny mock-up, something called a "stuffy." This gave the animators a reference to establish the proper line of eye contact between the star and that "wascally wabbit." In fact, for tight close-ups that couldn't accommodate a whole stuffy in the frame, two eyeballs stuck on the end of sticks would suffice to let Fraser know how to look at his cotton-tailed co-star.

Then Dante would call for a "clean pass," repeating the setup of angles that included both Fraser and the animated character, but this time without the stand-in stuffy. With the motion control rig precisely repeating the camera's movements, this take helped the animators minimize the amount of subsequent rotoscope work needed to remove the bunny costume before they could insert the hand-drawn rabbit.

But one of the biggest challenges when combining live action with 2-D animation is maintaining a consistency between the light shining on the real actors and the artificial highlights later drawn onto the painted characters. The studio's animation technicians came up with an intricate technique to provide their animators with a reference to recreate this proper perspective and depth. After the live action takes were completed for each scene, the crew repeated the camera action once again while holding a white ball in the animated character's position. The reflections off these balls served as cues for the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animation lighters to determine the angles from which the proper light sources should come. If the toon had to interact with computer-generated 3-D items in a scene, the motion control rig would re-choreograph the camera move focusing on a mirrored ball in the character's position to accurately reflect the ambient light of the surrounding environment.

Then, using a Nikon CoolPix digital camera with a wide fisheye lens, Watts' team shot at least five high dynamic range (HDR) photos of the set at opposing 180-degree angles, bracketing the exposure to cover all their bases. That way, all the illumination information for each lighting setup was stored for reference during the animation process, and a proprietary approach called LUMO enabled the character lighting department to apply computer-generated lighting effects to the animated characters for each scene.

This provided a crucial benefit if the director decided to repurpose a certain background plate in a situation for which it was not initially intended. One scene takes place in the studio commissary, where Jenna Elfman has decided to give Bugs a makeover to boost his star status. In the original script, the scene ended with Bugs mimicking his girl-bunny alter ego, saying, "Usually I play the female love interest," and then dabbing his mouth with a napkin. The laughs it garnered were disappointing. So during post, they repurposed a different shot over the original background that had the bunny wiping lipstick from his mouth, which made the gag funnier.

A foam rubber "stuffy" was used in the first "action pass" to provide live actors a reference to maintain proper eye contact with their animated co-stars.

During the actual animation process, however, the classical disciplines of cell animation rule the workflow because each character is still drawn a frame at a time. Animation director Eric Goldberg ("Pocahontas" and "Fantasia 2000"), who considers himself Bugs and Daffy's "keeper," supervised the other animators and cleanup artists while intentionally deciding to adopt the spirit of the Chuck Jones classic shorts of the 1940s and '50s.

Goldberg used a Wacom Cintiq tablet to create key character pose drawings for animation editors Jason Tucker and Rick Finney to follow, but all of the actual cells created for the film were crafted with traditional pencil and paper. Using frame grabs from the edit system, Goldberg determined key moments in the animation action and sketched them in using PhotoShop on the Wacom board. This efficiently created a rough animatic they could use to assess a sequence's timing and to subsequently screen producers for their preliminary approval.

But perhaps the most visually scintillating sequence involving hand-drawn animation comes when Elmer Fudd is chasing Bugs and Daffy through the Louvre museum in Paris. As they jump into masterpieces from different eras, the look of the animation takes on the appearance of each great master's signature style. Scott Johnston, the film's artistic coordinator, and his animation team gave Bugs and Daffy a melting look when they dove into Salvador Dali's surrealistic "Persistence of Memory," or the appearance of a lithographic print as they scrambled through Toulouse-Lautrec's Moulin Rouge posters. Johnston's crew used a combination of custom-written software along with Apple's Shake, Alias's Maya, and ink and paint tools from U. S. Animation to emulate each artist's distinctive visual style.

One of the biggest challenges is maintaining a consistency between the light shining on the real actors and the artificial highlights later drawn onto the painted characters.

Finally, when the duck and rabbit pop out of George Seurat's "A Sunday on La Grande Jatte," the famed Pointillism technique spews a shower of colored dots after them into the gallery.

That's just one example of the devices that the animators added to the gags in the original script during production. As with most of the Warner Bros. Animation legacy, it's a joke inserted just for its own humor's sake. Hopefully, this will be just one more in a long line of classics from the originators of character-driven animation featuring everyone's favorite rabbit and duck.

BaDeep-BaDeep-BaDeep, That's All Folks! BE

L.T. Martin is a post-production consultant living in the Los Angeles area.

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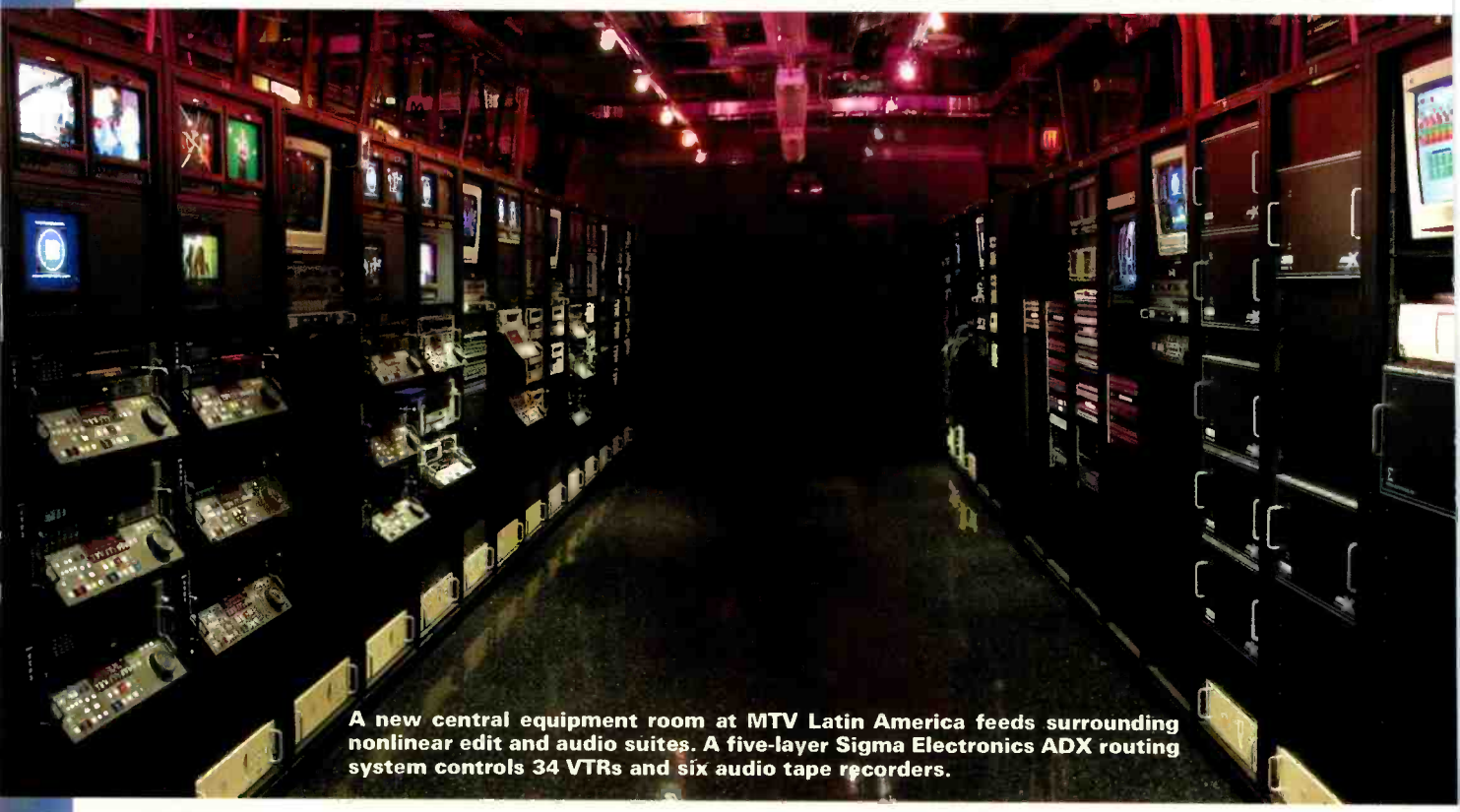
BY RAUL GUTIERREZ AND JOE FEDELE

MTV Networks Latin America



A new central equipment room at MTV Latin America feeds surrounding nonlinear edit and audio suites. A five-layer Sigma Electronics ADX routing system controls 34 VTRs and six audio tape recorders.

Often, the benefits of a facility redesign are difficult to quantify. But that isn't the case with MTV Networks Latin America, which recently completed an overhaul of its broadcast editing and reproduction facilities. The benefits are clear: time and money saved.

To illustrate, prior to the project's completion, 58 percent of the facility's work was sent out of house. The overhaul allowed the facility reduce that dramatically; now they go out of house for only 2 percent of the work. That's a tremendous savings over the course of a year.

In addition to gaining efficiencies, the network also wanted to position itself for future growth, as well as standardize its formats and centralize operations, which cover a significant amount of programming. The station broadcasts six localized cable feeds to North, Central and South America: three for each of the network's channels, MTV and Nickelodeon. MTV in Latin America reaches approximately 30 million households (including Brazil's separate operation MTV Brasil), while Nickelodeon reaches more than 14 million households, including a Portuguese language service exclusive to viewers in Brazil.

Room to grow

The original edit and production rooms were spread out over three floors of an office building, with other offices and administrative spaces in between. The network had continually added editing systems over the years, but new technologies had always been installed based on individual department needs, rather than on the technological requirements of the entire facility. This was counterproductive for

New technologies had always been installed based on individual department needs rather than on the technological requirements of the entire facility.

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several reasons.

Primarily, these were stand-alone edit rooms – each supporting all of the formats we handle. If a machine went down, then that room was down until the machine was replaced or repaired. Also, since usually only one tape format was used at a time, and editing can be a long process, it was not uncommon for machines to be sitting idle for a week. Yet, at the same time, we still had to go out of house for duplication services. The facility didn't have a dedicated audio suite, yet outside audio sessions accounted for 30 percent of post-production costs.

As part of an overhaul of station editing facilities, the project team installed six Avid Media Composer 1000XL nonlinear editing systems. The systems interface with an Avid Unity Media Network to allow staff members across the facility to collaborate in real time using high-bandwidth media.

For years, we had been toying with the idea of a centralized in-house edit and duplication facility. Finally in 2001, we sold the idea to our finance and creative departments, and started the process of analyzing and planning the build-out. Not only would this streamline workflow and drastically reduce outsourcing, it would also add a measure of security and access control to busy technical areas. In the past, anybody could walk into the edit rooms with no restrictions. There was no real distinction between office space and technical space.

Now, all edit, duplication and production spaces are located on one floor. All six suites mirror each other in software, hardware and furnishings. Every room also has access to any VTR on the floor, as well as all the hard drive space.

The overhaul has also resulted in fewer passes on each machine. With the old system, if five copies of one tape were needed in a Digital Betacam-to-Digital Betacam transfer, and only two machines were available, it had to be recorded from one to the other five times. Now we can roll it on one machine and record it on five machines simultaneously, if five are available. That not only saves time, but also wear and tear on the hardware, because the playback machine is only spinning its heads once to do the project, and not five times.

The new facility also includes a variety of other new features, including a ProTools suite, with the optional ProControl mixing surface. The team incorporated a Whisper Room isolated sound booth in the suite to create a self-contained audio environment.

The facility currently has six Avid Media Composer 1000XL units and one Avid DS system for digital compositing. All the suites interface with an Avid Unity Media Network, which provides 5TB of shared media storage. This system allows the entire facility to collaborate in real time using high-bandwidth, high-resolution, uncompressed and compressed media. This has optimized workflow by enabling editing, finishing, audio and graphics work to take place at the same time, using the same media files and projects in a shared workspace.

The project included building a central equipment room with equipment racks feeding surrounding nonlinear edit and audio suites. Because we handle a high volume of duplication requests, the equipment room provides simultaneous editing and duplication support.

The racks presently hold 34 VTRs and six audio tape recorders. Our standard format is Digital Betacam, and the majority of our machines are that format. However, since the facility handles both editing and duplication, every possible tape format is represented in the installation. While the primary format is serial digital 601, we also have the capability in each room to support an array of formats including Digital Betacam, SP, DV, D2, VHS PAL and VHS NTSC.

Everything is running through a Sigma Electronics ADX routing system, a five-layer system consisting of analog and digital video and audio, and time code. The configuration allows for a single 6RU frame system that can accommodate up to 64x64 operation, and is expandable to allow for a 128x128 matrix using a four-frame system. Several Sigma analog 8x8 routers served the old facility.

The facility employs an Avid DS system for digital compositing. This system works with the installed Media Composer editing systems and the Unity Media Network to enable staff to perform editing, finishing, audio and graphics work on the same media files at the same time.

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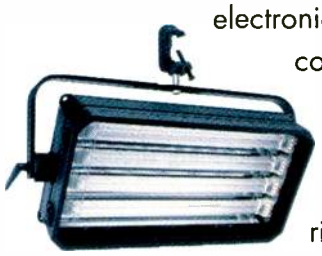

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SYSTEMS DESIGN SHOWCASE

The router's capabilities and expandability enable the staff to route any source to any destination, and use all five layers, depending on what a particular editor needs at a specific time. We needed to route machine control to allow editors to remotely control VTRs, and we worked with Sigma to accomplish this by using a DNF SW32PS external RS-422 switcher, which provides 32 RS-422 ports and switches them simultaneously with the ADX router.

A five-layer design was decided upon for the routing system because analog formats still comprise much of the facility's workload. The team thought it was best to keep analog and digital separate in their own levels of routing. With most newer, all-digital systems, everything would need to be converted to digital and then routed, adding more steps to the process.

Technology at work

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  - ANX alphanumeric control panel
- ADC audio/video patchbays
- TBC Crossfire editing consoles
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  - Media Composer 1000XL
  - Unity Media Network storage system
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  - DSR 80 and 2000 DVCAMs
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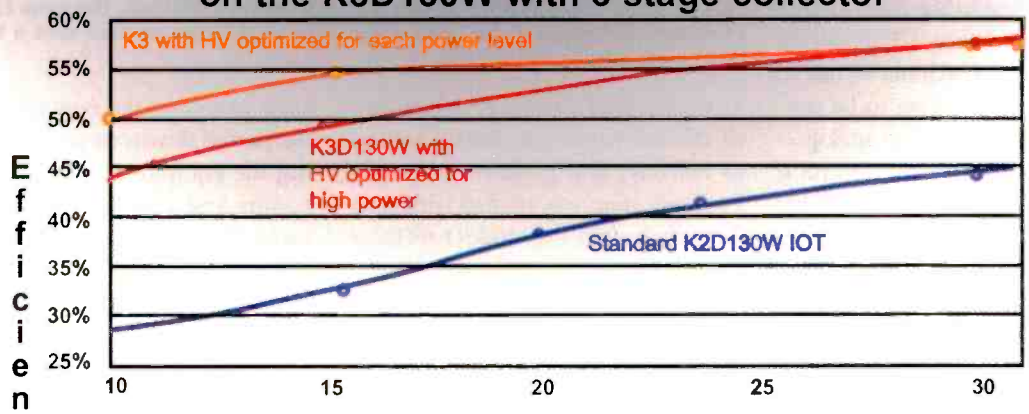

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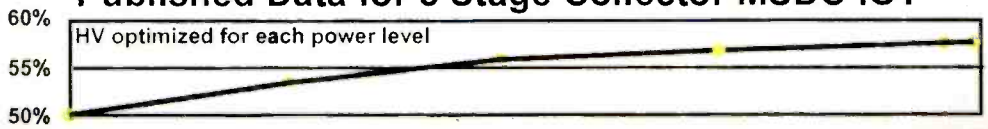

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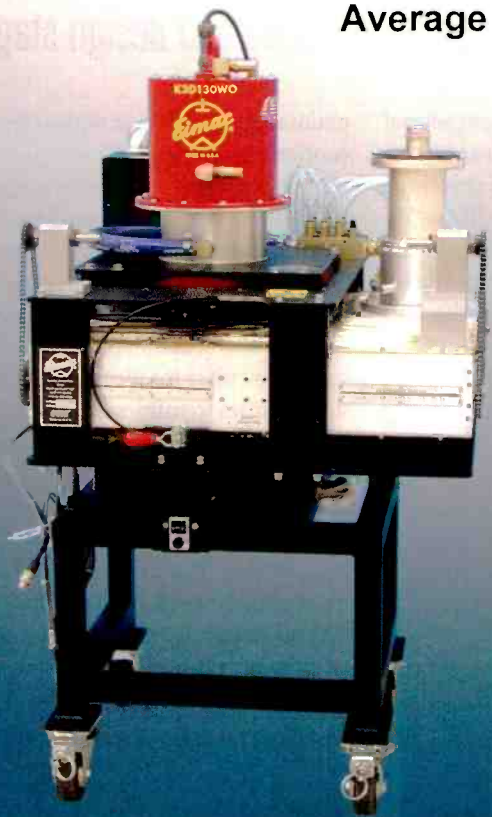

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It would also require many more A-to-D and D-to-A converters, which could end up being cost prohibitive. This routing system utilizes all the inputs to the VTRs. For example, going from an analog beta machine to a digital beta, we would use the analog inputs on the digital machine, and then use the digital converter inside the Digital Betacam, rather than having to buy another analog-to-digital converter. This design also allows analog machines to talk to each other without having to be converted to digital and back to analog.

In the new facility, quality control is achieved through Videotek VTM-200 multiformat monitors. There is a QC station in every third rack, for a total of six stations. ANX alphanumeric control panels from Sigma are installed in each station, as well as in every audio and video suite. These control panels, which can include as many as 64 remote control panels per communications port on up to 2000 feet of coaxial cable, allow an operator to route from any location within a room. The entire system is controlled using the Sigma ADX SigMatrix software. Backup for the ADX system includes dual power supplies as well as ADC patchbays for each routing layer.

The routing system also allows for future expansion. At the appropriate time, we can double the station's present capacity by expanding the ADX to a 128x128 matrix on a four-frame system.

Acoustic treatment throughout the facility was achieved by using Snap Tex acoustical wall panels on the surfaces of the individual edit rooms, as well as hallways and exposed walls. The ProTools suite was treated with Snap Tex panels and RPG Modex bass traps.

To eliminate the need for costly outside audio sessions, the new facilities include a ProTools suite with a ProControl mixing surface and a Whisper Room isolated sound booth.

Construction and build-out

The actual construction process was as intricate and detailed as the planning and design stages. To convert office space into technical space, an entire midsection of the existing location was gutted and cleared out. We took part of one of the floors where there had been several offices and hollowed the area out to build a VTR room. Then we retrofitted the surrounding offices for edit rooms.

We literally started from the ground up, putting in a new floor, new electrical and all new racks, and then installing the new router. Then we started slowly, room by room, taking the equipment out of those edit rooms and re-populating the new racks, hooking them up to the new router.

To further distinguish the technical spaces, we created an independent, supplemental HVAC system for the central machine room and a second supplemental unit that feeds the edit rooms.

While all this work was in progress, it also was critical to have the workflow maintain its usual pace, with as few disruptions as possible.

The actual construction process was as intricate and detailed as the planning and design stages.

Since each edit room was originally a stand-alone room, we worked on relocating them one at a time. That way, we really didn't lose any work time when we took one room out of service. We also scheduled the heavy construction either for weekends or other slower times to minimize disruptions.

In addition to the technological innovations, we worked closely with the architects and entire design team to create a facility that conveyed both a laid-back, almost "basement-type" environment with exposed overhead mechanical and electrical systems, and a totally modern and up-to-date image. BE

Design team

MTV Networks Latin America:
- Ernesto Navarro, director of technical operations/administration
- Raul Gutierrez, PM and sr. mgr., technical operations/administration
- Elizabeth Kahan-Ledee, post production supervisor
- Renato Schneider, Richard Maher, Daniel Ritts, Mike Lorey, Santiago Rodriguez and David Innocenti, installation technicians

Fedele & Associates:
- Joe Fedele, integration manager
- James Killinger and Paul Scallioni, PE
- Nick Barge, lead technician
- Robert Hobler and George Stevanoff, audio technicians

Raul Gutierrez is senior manager, technical operations, for MTV Networks Latin America, and Joe Fedele is president of Fedele & Associates.

SONY

it's a digital world:

MPEG Times

Over 900 TV stations broadcasting in digital

The DTV transition reached another milestone as the NAB count of digital stations exceeded 900 this week. Some 98% of U.S. TV households are in markets served by at least one DTV broadcaster. 78% are served by fi

OVER 1,000 MPEG IMX DECKS DELIVERED TO U.S. TV STATIONS AND PRODUCTION HOUSES

Sony's MPEG IMX production system achieved another plateau this month as cumulative sales in the United States surpassed 1,000 units. Over 8,000 units have been shipped worldwide. Users praise the format's phenomenal picture quality. l operating costs and backward compatibility with decades of assets reco and Betacam SP®. format

Over 380,000 DVCAM units sold

Fastest growing professional recording format ever introduced by Sony

worldwide sales exceed 380,000 VTRs and corders, the DVCAM format has scored l achievements as Sony's fastest-growing the world's number one pro digital video format. DVCAM products have proven popular for television news, corporate and event videos, documentaries and digital cinematography.

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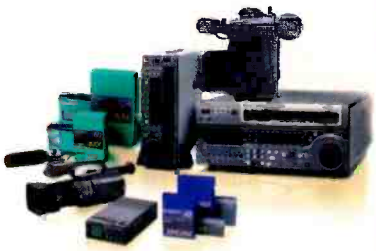

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Antenna measurements revisited

BY DON MARKLEY

While the subject of antenna measurements was discussed in a past column, questions still remain concerning what should be done, what it means and how they should be performed.

First, there is nothing magic about the new equipment being used for antenna measurements. The instrument of choice is currently the vector network analyzer from any of several different manufacturers, the most popular being Agilent. In the past, antenna measurements were performed with slotted lines, the well-known admittance meter from General Radio, or the impedance bridge from Hewlett Packard. Various schemes of test equipment were used to design home brew Smith Chart plotters and to incorporate older network analyzers into complex systems that would show plots across the entire channel at once. Those usually included a computer, various analog-to-digital converters and their inverse with a frequency synthesizer. The problem with such composite test systems was that the overall noise floor had a tendency to be greater than the reflected signals one was measuring.

However, the measurements taken with the slotted lines or admittance meter were normally quite accurate. The main problem was not in accuracy, but in speed. To understand what is happening in a wideband antenna, such as those used in broadcast systems, one needs to be able to see the results of many measurements across the band of interest. Just checking one or two points doesn't give an accurate representation of the system response. That meant taking a ton of individual measurements, measuring each frequency with a counter, and plotting them on graph paper. A sweep over 6MHz with the subsequent analysis took a few hours. There was a need for an instrument, such as the network analyzer, in one box that would perform all of those functions.

The main problem was not in accuracy, but in speed.

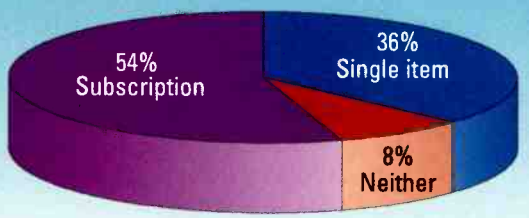
Before any measurements are even attempted, the network analyzer should be calibrated on the frequencies of interest. It measures on a number of discrete frequencies in the assigned band. For most HP instruments, the default is 201 points. However, that usually can be changed to 1601 points, which gives a smoother and more detailed result. The calibration process must include any impedance bridges, couplers and cables that are included in the final test setup. The calibration is performed using a calibrated load, open and short. Just leaving the end of the test cable open isn't enough to do this properly. The point where the open and short occur should be at the exact same location as the point where the 50Ω termination appears. It really doesn't make an enormous difference if one is measuring VSWR values around 1.5:1. But, if you are measuring values like that in a modern antenna, you have bigger problems than errors in calibration.

The calibration process measures the magnitude and phase of the reflected signal from the three test transitions. Then, knowing what the load, open and short should look like, a matrix of correction coefficients is generated. The instrument is now ready to perform the desired measurements. It should be remembered that the accuracy of all the measurements depends on the accuracy of that 50Ω load. The calibration process has taken away the errors in cables, directional couplers, etc. assuming that the load is really 50 plus j 0. If the engineer/technician performing the measurements at your station does not do this calibration prior to connecting to the antenna system, escort him gently to the edge of the site and wish him a fond adieu. Without field calibration, the measurements are

FRAME GRAB A look at the consumer side of DTV

Paying for online content

Consumers more likely to buy ongoing services



Type of service bought by North American online consumers who have paid for online content in the past year (percentages do not total 100 because of rounding)

SOURCE: Forrester Research *www.forrester.com*

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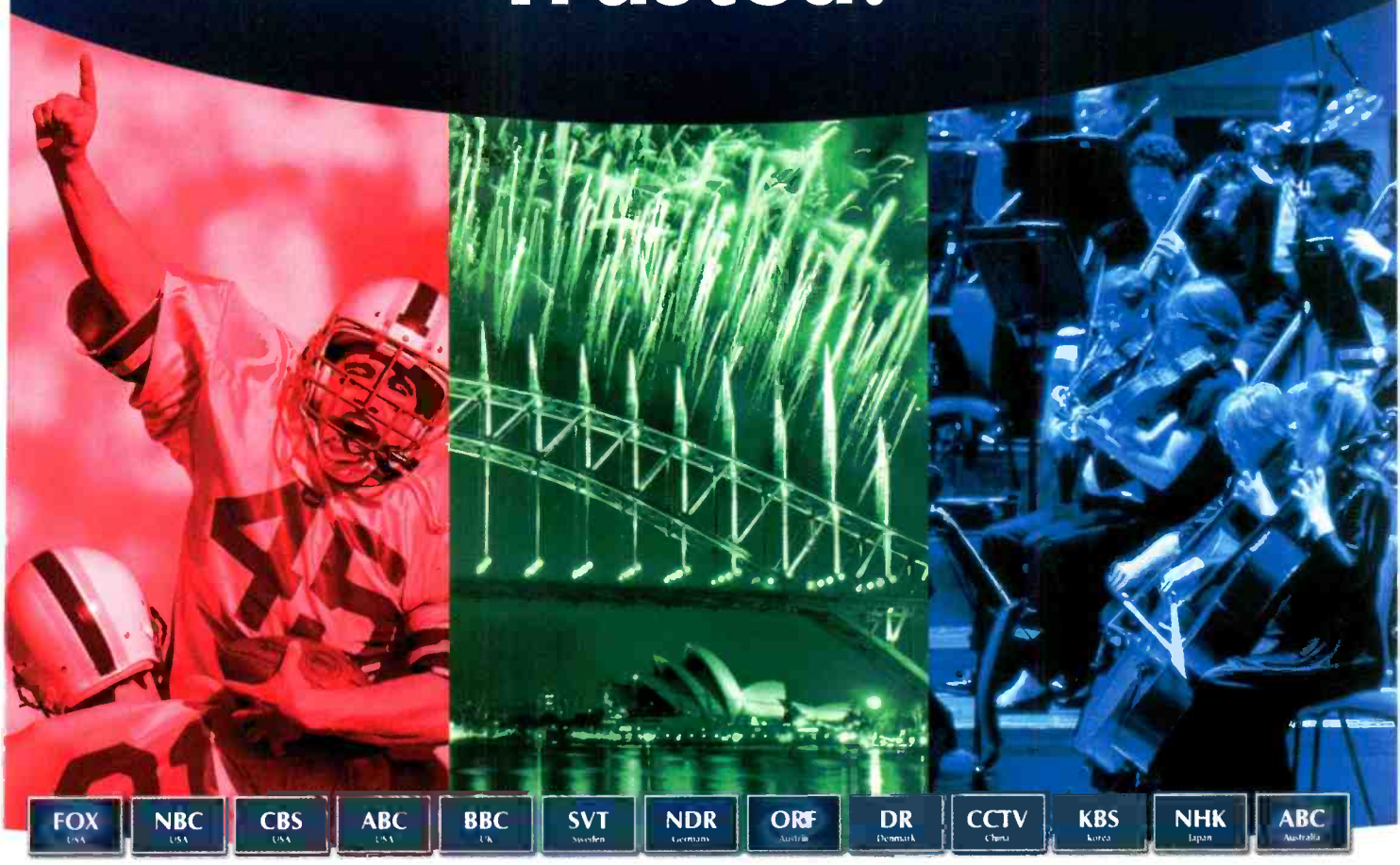

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junk. The 50Ω load is critical. It cannot be just any 50Ω termination. Off-the-shelf terminations such as one would normally use on circulators or directional couplers aren't accurate enough. The load should be calibrated by the manufacturer to have a return loss of more than 40dB. Further, the load should never be used for anything but the calibration of the test equipment. Most engineers maintain a new load at the office, which is periodically used to check the load taken into the field. When they differ, the field load buys the farm and a new load is purchased, usually for the price of 50Ω.

Remember the network analyzer only measures the magnitude and phase of the reflected signal on each of the 1601 or less frequencies in the assigned frequency band. Those are the only measurements — everything else is manipulation of those measurements by the test equipment itself. First, the measured signals are compared to the forward-going signals to determine the actual measured return loss in both magnitude and phase. That data then is corrected by use of the calibration matrix of coefficients. The corrected data then is displayed in one of several formats as chosen by the operator. These normally include the return loss, the log of the magnitude of the return loss, Smith Chart, polar plot and VSWR.

Equally important, the network analyzer should be equipped with the necessary option to give a time domain presentation. This is done by using a version of Fourier Transform to convert the measurements at individual frequencies to a presentation of what is happening as time passes — the time domain; in other words, to act like a TDR over a limited range of frequencies. This allows a quick analysis of how well the match is between the transmission line and the antenna. Further, the performance of elbows and connectors between sections of transmission line can be checked, waveguide can be tuned along its length, and the transmission line itself can be checked even down to individual insulators along a section of line. Until the system has been checked in this fashion, you don't know what is going on.

The problem is that the presence or absence of VSWR at the input of the line is not sufficient to determine how the system will operate. It is critical to know where that VSWR is coming from. If the problem is occurring at the gas barrier right at the output of the transmitting equipment, it probably will pose far less of a problem than if it is at the input to the antenna. Certainly, it won't cause ghosts or be as significant a problem concerning the bit error rate of the digital signal. The more significant problems result from the signals traveling up the line, being reflected, coming back down, going back up, etc.

Measuring the UHF TV panel array's performance upon installation is usually done by choosing a remote site and measuring the signal level received from the transmitter. Periodic measurements at that same location will reveal the amount of any degradation so corrective action may be taken. Photo courtesy Radio Frequency Systems.

Another enormous point in performing antenna system measurements is the necessity of a tuned adapter between the test equipment and the transmission line. The test equipment is normally 50Ω with a type "N" connector at the end of the test cable. The adapter must permit the connections to the transmission line, possibly including an impedance change to 75Ω, without introducing VSWR into the system. A review of the literature concerning network analyzers shows that the problem of the input connection is critical to the accuracy of the test results. Calibration requires having a calibrated load with its own adapter separated from the adapter being tuned by a reasonable length of known transmission line. Putting the adapters back to back is not satisfactory as they are then being tuned to an unknown impedance — the one where they come together — as opposed to 50Ω. If there is a section of transmission line in the middle, the adapters must both reach 50Ω. A lot of stations have started buying a factory tuned set of adapters — two is a good idea — and keeping them on hand for future measurements.

The problem goes back to the original point that the only thing the instrument measures is the magnitude and phase of the reflected signal. Everything else is manipulation of that data. If the instrument sees a large mismatch at the input, low-level reflections returning from smaller mismatches are lost, especially those occurring near the input where they are overwhelmed by the larger reflection. Some network analyzers permit bad reflections to be eliminated by "gating" functions that mathematically eliminate the "bad" reflections. This is fine if small mismatches are being ruled out, but not satisfactory for large errors. Remember what the equipment is doing — and remember that every time the data is manipulated, fondled, processed or changed, the opportunity exists for error to come creeping in — even in the digital world where the ubiquitous rounding error rears its ugly head.

The point now has been reached where the equipment is ready for the measurement and the initial measurements have been taken. The VSWR is not bad but not as good as we would like — what do we do now? Tune in next month for that —and you thought "To Be Continued" only occurred on TV. BE

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

Send questions and comments to: don_markley@primediabusiness.com

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Emergency power systems

Keeping the juice and the revenue flowing

BY BRYAN GAUGER, PE

Just about every news or entertainment broadcast facility requires a backup generator system. Today, such a system must be highly reliable to meet demanding uptime needs. It must also work seamlessly with the facility's mechanical and electrical infrastructure, especially its UPS system. Selecting a generator with the appropriate characteristics and interfacing it with other facility systems poses a number of key challenges.

To meet these challenges, first consider generator voltage and power capacity. The generator's voltage depends on the facility's power-system configuration. Its capacity depends on the type of loads it must handle and how it handles them. Generator manufacturers offer products in a range of voltages and capacities, with a variety of options and features.

Voltage and configuration

The first step in choosing a generator is understanding the facility's operating voltage and the voltage of the equipment the generator will support. For example, to use a 480V generator in a building with 208V, three-phase service, you'd have to add infrastructure to match the two. Fortunately, generators are available in a variety of voltages in both single and three phase, so there should be no problem finding a generator that matches the facility's operating requirements. Most UPS systems and mechanical equipment are 480V, three-phase systems, and the generator should follow suit. Some facilities are configured as a campus, with one main building distributing power to several other buildings. In such cases, the main building often supplies power at a medium voltage (4160V, for example) to reduce feeder sizes. With the generators also located in the main building, the emergency distribution

Proper integration of backup generators in broadcast operations can keep stations on the air, even under adverse conditions.

would follow suit and supply power at 4160V. Such a distribution system would require 4160V generators.

Generators are most commonly used for safety applications, such as emergency lights, fire pumps and fire-alarm systems. But if a building's generator is serving broadcast equipment as well as safety equipment, it could present a problem. Modern safety codes require that a separate automatic-transfer switch (ATS) serve safety and emergency equipment. In facilities where the generator serves both broadcast and safety equipment, the ATS system is set up per code, so life safety has priority. Should the generator have trouble supporting the load, it can shed non-life safety load, including broadcast equipment. Generator testing can prevent such an incident and, in extreme reliability cases, a separate generator is employed.

The UPS' battery-recharge load and magnetization can make it "look" 60 percent larger to the generator.

Load capacity

To determine the generator capacity your facility requires, begin by tallying the known loads within each category of equipment. These categories include HVAC, UPS (the actual loading on the UPS, not just its capacity), general technical equipment that is not on UPS (i.e., general receptacles and equipment with built-in battery or UPS backup) and non-code-required lighting.

Sometimes, a device's normal operating load rating can be deceiving. For example, a generator serving a UPS cannot be sized to the UPS' full-load kVA rating because the UPS' battery-recharge load and magnetization can make it "look" 60 percent larger to the generator. Similarly, you might have to inflate mechanical loads by up to 50 percent to handle start-up in-rush currents, depending upon how the equipment is started and controlled. In smaller installations, it is not unheard of to have a generator loaded to its maximum capability but rated at twice the kW rating of the UPS and HVAC loads. By contrast, lighting and general-receptacle systems don't present large start-up in-rush currents, so you don't need to inflate these loads.

Based on the load, and considering inflation factors, you can determine an approximate generator load. Be sure to include all individual loads within each category, all of which must run off the generator to ensure continued operation during a power failure. For the mechanical system, look at all the components – not just those within, say, master control. For example, for HVAC

systems, include the pumps, air-handling equipment, compressors, cooling towers, etc. Don't forget to include the control system because, without control power, the entire mechanical system will not operate.

In a base building environment, where a larger building cooling system feeds the technical rooms, it is important to look at where the heat rejection is taking place and make sure those systems are backed up. For example, if a studio is located in a large high-rise, it is impractical to use the massive building chiller and/or cooling tower system to handle the relatively smaller studio loads. Instead, it would be necessary to set up separate smaller HVAC systems that can run off a generator. Broadcast engineers often make mistakes when planning generator-powered emergency cooling systems. They sometimes assume that all the heat can be rejected into a nontechnical space during a power outage, or that a fan coil running off a larger base-building chiller system (that will be offline in a power outage) will have adequate chilled-water capacity to run continuously during a prolonged power outage. Many times these systems will not work. They typically offer perhaps an hour or two of cooling capacity, but cannot handle a prolonged outage. A qualified HVAC engineer can verify such scenarios.

During the schematic-design stages, if you don't know the loads of the systems, you can use certain rules of thumb to estimate sizes. You can estimate 2kVA per ton of refrigeration, 100W per square foot for data-center space, 75W per square foot for studio space, including studio lighting, and 25W per square foot for control rooms, including lighting. But, since these are only estimates, it is essential to use actual loads, when available, in the design of the system. Every facility is unique. Besides, all cities will require actual load calculations for their approval before they issue building permits.

The final step is to refine the generator capacity. When attempting to pedal uphill on a bicycle from a dead standstill, it is much easier to start on a gradual slope than a steep one. The same goes for a generator attempting to power several systems. Depending on the generator, it may be possible to step the loads (i.e., have the loads start up in a specifically timed sequence instead of all at once) to reduce the required generator size. Allowing 15 seconds between the addition of UPS, HVAC and other building loads gives the generator a chance to "breathe" and catch up with each successive load. This process can reduce the overall capacity requirements of the generator.

Next, identify the facility's most critical path and work with the generator manufacturer to identify and select the appropriate alternator. At a certain engine size and kVA range, there is usually a specific range of alternators you can consider. For example, one alternator may be able to handle more loads on a steady-state basis, while another may better handle high in-rush currents.

Redundancy, reliability and testing

Reliability and redundancy go hand in hand. In a perfect world, every system would have a backup. In reality, broadcast systems are often redundant, but many times the power feeding them has several single points of failure. For any mission-critical facility, such as a live-news broadcast facility, relying on a single piece of equipment for backup is asking for trouble. Just as a facility would not rely on a single piece of critical broadcast equipment, the generator system must be designed with backups and alternate routes. For example, if the system will rely on a single ATS, it should have a bypass isolation option. This option allows the power to be routed around the ATS during periods of maintenance or in case of a failure.

To combat critical failure points, other strategies employ parallel generators, each of which is capable of handling the critical entertainment-equipment loads. Or, a mission-critical facility might have feeds from two separate grids with a medium-voltage transfer switch, reducing the risk of downtime.

Increasingly, facilities are using dual-cord technology to provide two power inputs into each piece of equipment, with an internal power supply that controls the source from which it draws power. With such a system, power supplied to the equipment can potentially be completely redundant from the generators down to the plug.

To combat critical failure points, some facilities employ parallel generators. This photo shows generator-paralleling gear and ATS equipment used in a Los Angeles-based live-news studio.

This is the ultimate in the elimination of single points of failure on the electrical system. But if you power each system from the same point, you've gained nothing. It sounds obvious, but it's a common mistake.

The last step in any generator design and construction is to coordinate and schedule testing. Failure to perform commissioning and regular testing of the generator system is a hidden danger in the operation of generator systems. It is surprising how few systems really work the first or second time they are tested. The process of commissioning (in-depth testing) will identify and solve possible power failures in different load scenarios before project completion and prior to operations relying on the system. Even a simple case of miswiring, in which a piece of equipment is accidentally wired to utility power, can bring the whole facility down. Once you've successfully commissioned the system, run it weekly and perform regular (at least annual) tests simulating a power failure to verify reliable operation.

Location, location, location

In almost any facility, space is at a premium. This makes identifying appropriate generator locations particularly challenging. Consider the following issues related to fuel, noise and exhaust emissions:

- Fuel: You must consider tank size and refueling strategy. Larger generators consume more than 80 gallons of diesel an hour, and rooftop storage of a large volume of fuel for a prolonged outage may be too costly or structurally impossible. You'll also need a pump to get the fuel to the roof. Storing fuel inside may require special wall ratings, venting and controls. Many broadcast facilities have street-accessible refueling points and agreements with suppliers to bring fuel as needed.
- Noise: When designing a generator system, engineers often forget the need for a proper acoustical environment. You may require complete acoustical enclosures and critically rated mufflers to provide the proper environment. Proper placement is key to avoiding noise and vibration transmission in critical areas, at the property line, or through a shared floor. Don't fall into the trap of thinking that the generator will only be on in an emergency; you'll still need to test it weekly.
- Exhaust emissions: Early in the planning phase, consider local jurisdictional permits, limits on the diesel generator runtime and runtime verification requirements. Proper placement of the exhaust outtake is essential. Avoid locating the outtake too close to any building fresh-air intakes, or where it will leave dark stains on an expensive façade or intrude into the building.

Bridging the gap

It takes 10 seconds for a generator to achieve sufficient RPM to carry its load, but it only takes a fraction of a second of power loss for a computer system to go down. To bridge this critical gap, UPS systems provide battery storage or flywheel momentum. Battery UPS systems are more reliable, offer more flexibility, and provide a longer backup time than newer flywheel systems. Flywheel systems are only good for 15 to 30 seconds. Moreover, if a second power failure occurs two or three minutes later, the flywheel will be worthless because it may require a couple of hours to regain momentum. In contrast, UPS batteries can handle multiple outages of 10 minutes or longer, depending on the quantity of batteries provided.

Larger generators like this outdoor stand-alone unit consume more than 80 gallons of diesel fuel an hour. This generator has a Nema 3R enclosure and base fuel tank.

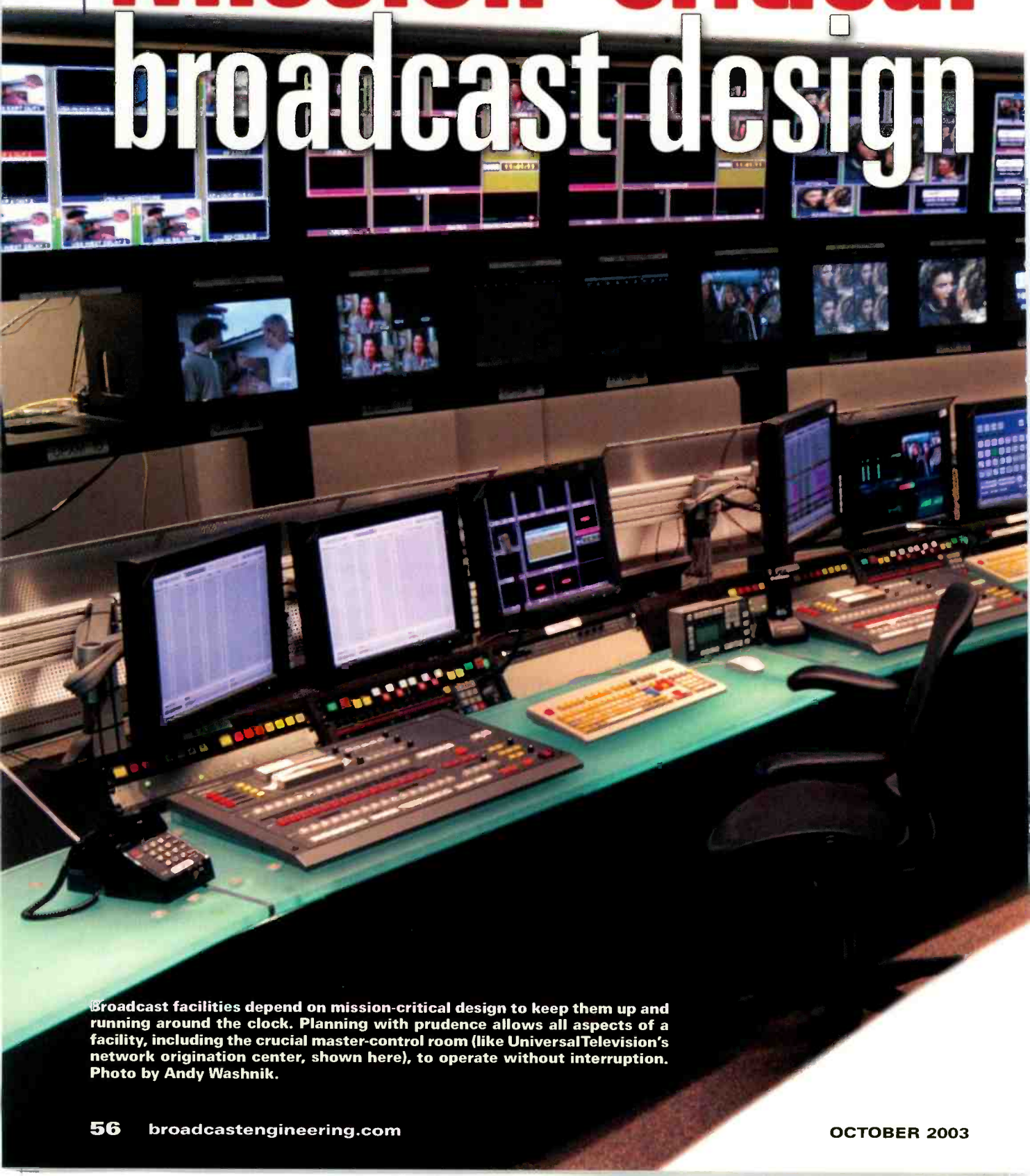
Unfortunately, battery-based UPS systems are inherently undesirable loads on a generator. This may be counterintuitive, but the UPS creates third and fifth harmonics and adds them to the fundamental power waveform. The generator's governor, which monitors the governor's output frequency and voltage, can interpret this as a problem. If not properly set up, the governor will see the distorted waveforms, assume the generator is causing the problem, and either "hunt" for the proper level or shut down. This is more prevalent in older generator and UPS systems. Make sure the generator is equipped with the latest generator regulator software and devices. Filtering on the UPS system can also help prevent this problem in older generators.

The bottom line

Downtime is money lost. Generator systems are a critically important component in maintaining reliable operations at news and entertainment broadcast facilities. Sizing, designing and integrating these systems present many challenges. But a well-conceived system design, coupled with proper maintenance and regular testing, will provide years of reliable operation. BE

Bryan Gauger, PE, is a senior associate in the Los Angeles office of Syska Hennessy Group, a consulting engineering technology and construction firm specializing in broadcast, entertainment and arena facilities.

Mission-critical broadcast design



Broadcast facilities depend on mission-critical design to keep them up and running around the clock. Planning with prudence allows all aspects of a facility, including the crucial master-control room (like UniversalTelevision's network origination center, shown here), to operate without interruption. Photo by Andy Washnik.

Planning ahead saves money

BY LEO P. SOUCY, JR.

The broadcast industry is undergoing a monumental change to digital broadcasting that affects not only signal transmission, but content, production and processing as well. Digital production, for example, requires a different medium (hard drive vs. videotape), and different processing equipment (digital servers and workstations instead of tape-based editing equipment) than analog production. Servers and workstations are much more susceptible to problems with power and cooling than their analog counterparts, and they don't recover as quickly when stressed.

With analog, a loss of power causes equipment to stop and restart where it left off, making the length of the broadcast outage directly related to the length of the power outage. But, in the digital world, a loss of power in excess of 50 milliseconds requires a reboot and a return to the proper point in the program before continuing. The actual broadcast outage can be much longer than the power outage. Digital equipment is also much more susceptible to power surges and sags than analog equipment, and must be operated in more precise cooling environments.

Large data-processing centers have a history of experience with these specialized electrical and mechanical service problems, and they address them on a daily basis. Data-center design has seen substantial progress in the past 15 years toward true round-the-clock reliability, where there is no tolerance for any system outages. The broadcast industry can take advantage of this body of knowledge without the attendant risk and learning curve.

The application of well-established design concepts from these data centers can provide mission-critical broadcast operations with a level of service

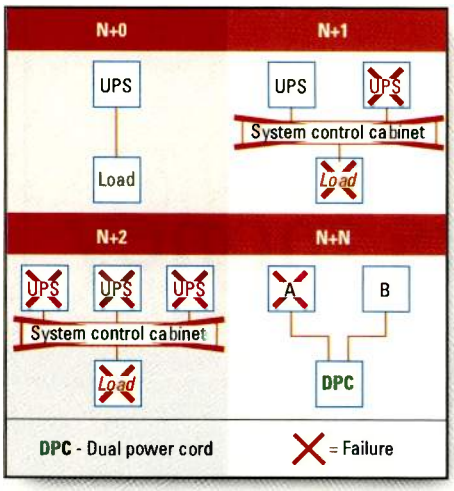


Figure 1. Redundancy has progressed from the simplest system design of N+0 to hardened approaches with "system plus system" (N+N) capabilities.

far in excess of present systems. While it is more costly to implement a mission-critical design, the added investment is but a fraction of the total costs of the broadcast equipment and facilities. If broadcast-equipment manufacturers design all their products for ultimate reliability, the weak link then becomes the systems that power and cool this equipment.

Mission-critical design

Before designing any system, you must determine the level of mission-critical design the application requires. The ultimate system will reduce the risks to an absolute minimum, but it may not be appropriate or cost effective. It would be more prudent to begin by developing a "project business objective" that outlines the project requirements from a business perspective. This forms the basis for analyzing three design criteria — redundancy, maintainability and fault tolerance — so that they meet specific project needs.

Redundancy

In a power-delivery system, where N equals the load, the number of elements (N) and their configuration defines the system's redundancy. As Figure 1 shows, there are many variations of redundancy. Redundancy has progressed from the simplest system design of N+0 to hardened approaches with "system plus system" (N+N) capabilities. The N+0 design provides merely sufficient system capacity to meet the load requirement, whereas an N+1 system has one additional unit. Systems with N+1 and N+2 redundancy require a system controller, which becomes a single point of failure. If one or two uninterruptible power supplies (UPS) fail (N+1 and N+2, respectively), there may be sufficient capacity to meet the load. But if the system cabinet should fail, the redundancy is lost.

This deficiency can be remedied by employing an N+N configuration. In this design, there are two, distinct, independent systems serving the load. And either system can serve the entire load, even if its sister fails or is offline for maintenance or upgrade. Also, there is no tie between the systems, so there is no common device that can fail. This is the preferred system design for mission-critical applications.

Computer manufacturers have responded to this preferred system design by providing dual-power-cord equipment so that System "A" can power one cord and System "B" can power the other. As you begin to implement digital technology in the broadcast environment, you will see dual-power-cord equipment. If you don't plan for this design capability, you will end up powering both power cords from the same source, thereby compromising a basic reliability feature of this type of equipment.

Maintainability

The overall design and configuration of a system directly affects the ability of its owner/operator to maintain and upgrade it. Typically, broadcasters configure their systems to minimize outages caused by equipment failures. But, if they don't design the electrical power and cooling systems properly, they can't perform maintenance without shutting down operations for perhaps six to 10 hours. This often delays or even eliminates regular maintenance, increasing the likelihood of catastrophic failure. Most broadcast environments are dynamic, and they require continuous upgrades to change or expand operations. These changes also may require disruptive utility-system alterations that take days to complete.

For example, Figure 2 depicts a condenser water system with a normal non-redundant design. In this design, there is only one condenser water path. If any item should fail or need to be taken offline for maintenance, the broadcaster must shut down the air-conditioning system. By contrast, a configuration-redundant equipment design provides alternate paths that allow broadcasters to perform maintenance without affecting the system's overall operation. Figure 3 on page 59 shows a system that has alternate flow paths for the condenser water, providing 7x24x365 maintainability.

Maintainability also requires developing a system configured so that if a normal item should fail, a backup can perform the same task. Referring to the re-designed chilled-water system, the red Xs and green Os show how the system design can compensate if an equipment-isolating valve fails to close properly (X). In such an event, there are still alternate valves (Os) that can isolate the equipment.

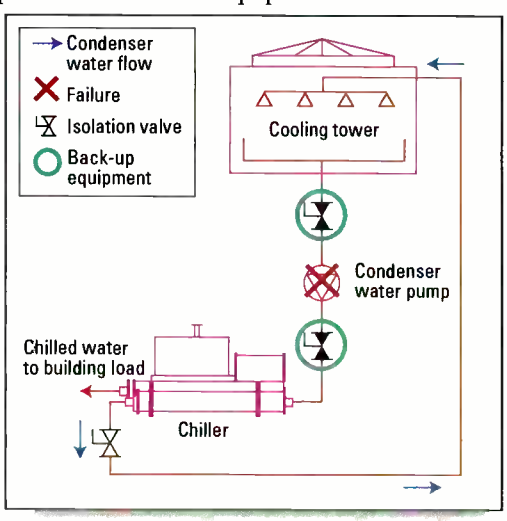


Figure 2. In this non-redundant air conditioning configuration, there is only one condenser water path. If any item should fail or need to be taken offline for maintenance, the broadcaster must shut down the entire air-conditioning system.

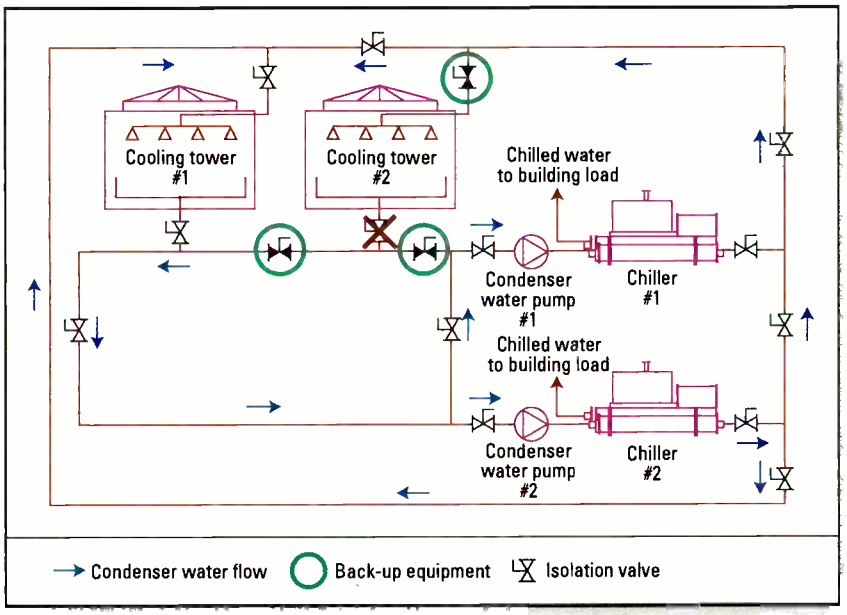


Figure 3. In this redundant looped air conditioning configuration, alternate paths are provided to allow complete maintenance of the system and to provide alternate paths should a piece of equipment fail.

Fault tolerance

Human error causes over 60 percent of outages, so broadcasters must design systems to ensure that a staff member's inadvertent erroneous operation of equipment doesn't adversely affect the mission-critical broadcast operation. Broadcasters must configure redundant equipment so that, if it is unintentionally shut down, the shutdown will not affect other equipment in the redundant system. This design concept requires broadcasters to evaluate as many different scenarios as possible with the intent of eliminating single-action items detrimental to the ongoing operation. For example, don't power all of the air-conditioning equipment serving an equipment room from a single piece of electrical switchgear. If that switchgear were accidentally shut down, it would affect all air-conditioning equipment. Figure 4 shows a concept called "checkerboarding." It can help eliminate the previously described problem by ensuring that the air-conditioning equipment is redundant and fed from several different sources.

Different designs for different systems

Once you've set the mission-critical design criteria, you can design the individual systems. You may need to develop different sets of the three mission-critical design criteria (redundancy, maintainability and fault tolerance) for different spaces, and apply the designs appropriately. Equipment rooms, control rooms, studios, transmitter and uplink equipment, and other critical areas may not all need the same level of mission-critical design sophistication, because they all have different impacts on the final broadcast content – and, therefore, the business finances.

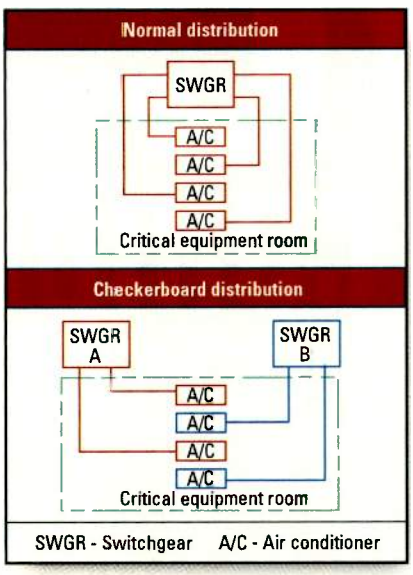


Figure 4. Normal vs. checkerboard distribution. Checkerboarding can help ensure that the air-conditioning equipment is redundant and fed from several different sources.

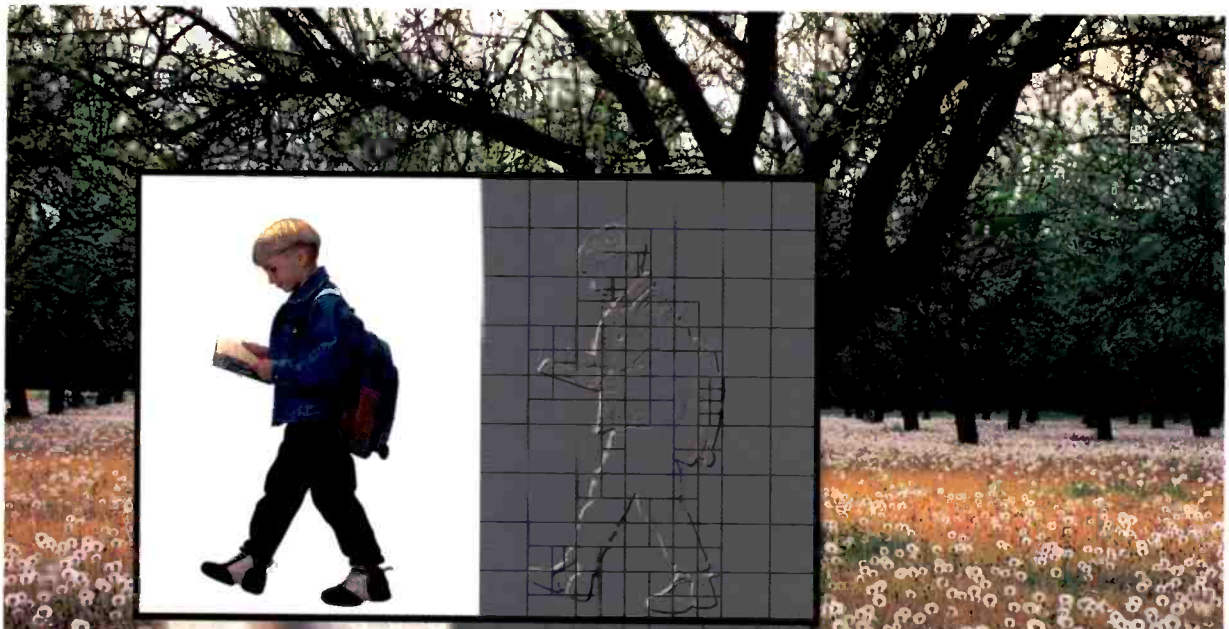
Many times, the "mission-critical design" only focuses on the electrical power system because broadcasters perceive it as the most critical system. Yet, loss of air conditioning is just as detrimental to the on-air performance of the broadcast operation. In a mission-critical facility, it is important to apply appropriate design criteria to the following systems:

- Incoming electrical power
- Standby emergency power
- Uninterruptible power
- Chilled water and air-conditioning systems
- Normal power distribution
- Emergency power distribution
- Uninterruptible power distribution
- Broadcast and electrical grounding systems
- Fire protection
- Fire suppression
- Building monitoring and control systems
- Security

From the beginning

Conversion to digital technology requires that broadcasters install this new technology while the analog equipment is still operating. Some broadcast companies are designing completely new digital facilities to minimize any risk to the ongoing analog operations. Such companies can implement mission-critical design criteria easily as they design and construct these new facilities. When compared with trying to implement mission-critical design later, after the facility goes online, this approach can significantly reduce costs. It is important to note that, in many instances, it is impossible to upgrade a faulty design to incorporate mission-critical design criteria without a major outage in the existing broadcast operations. BE

Leo P. Soucy, Jr. is president of Facilities Engineering Associates and a specialist in mission-critical design.



MPEG-4 AVC compression

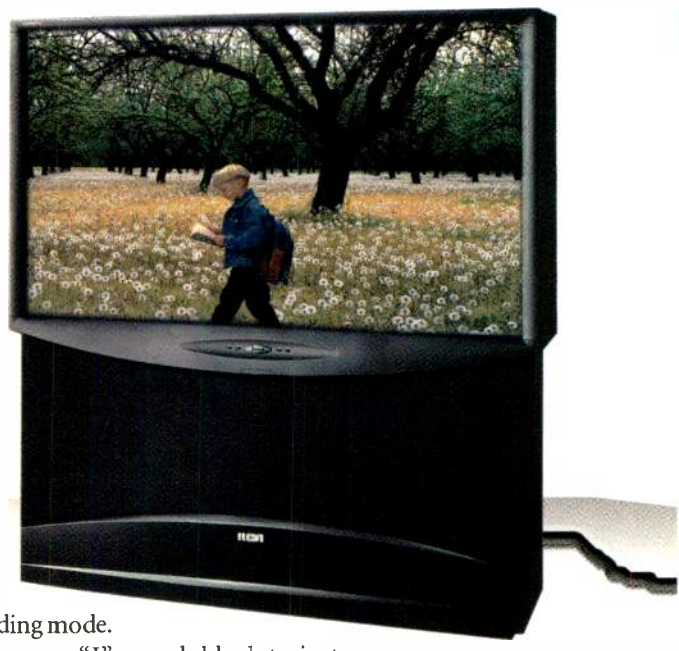
The emerging standard

BY MARIO RAINVILLE AND AMIR SEGEV

Since its introduction in the early 1990s, the MPEG-2 video-compression standard has enjoyed exclusive dominance in the broadcasting world. And during this decade, its performance has improved in several ways. The standard now has a lower bit rate, and its implementation has been enhanced by techniques such as advanced motion estimation, pre-processing, dual processing and adaptive allocation of bit rate through statistical multiplexing.

But MPEG-2's performance cannot be enhanced indefinitely. Today's consensus is that the MPEG-2 standard is reaching its practical limits. At the same time, the demand for compression is growing. Broadcasters and other communications providers are offering an increasing amount of content while introducing on-demand and personalized services over cable, satellite and telco infrastructures.

Because of this, codec users need a new compression standard to pick up where MPEG-2 leaves off. One of the leading candidates is MPEG-4 AVC, also known as H.264, MPEG-4 part 10, H.26L or JVT.



Reducing redundancy

Like other codecs, MPEG-4 AVC compresses video by reducing the temporal and spatial redundancies found in video images. Temporal redundancies are picture similarities that repeat from frame to frame, such as the nonmoving background in a talk show. Spatial redundancies are similarities that appear within a frame, such as a large number of similar pixels that portray a uniformly blue sky. Figure 1 is a simplified representation of the steps that MPEG encoders take to perform temporal and spatial compression.

Select mode, divide and conquer

The encoder begins by deciding what type of frame it wants to compress at a particular time and selecting the appropriate encoding mode. The "intra" mode produces an "I" frame; the "inter" mode produces a "P" or "B" frame. Then, the encoder divides the hundreds of rows and columns of pixels that make up the incoming frame of uncompressed digital video into smaller blocks, each containing several rows and columns of pixels.

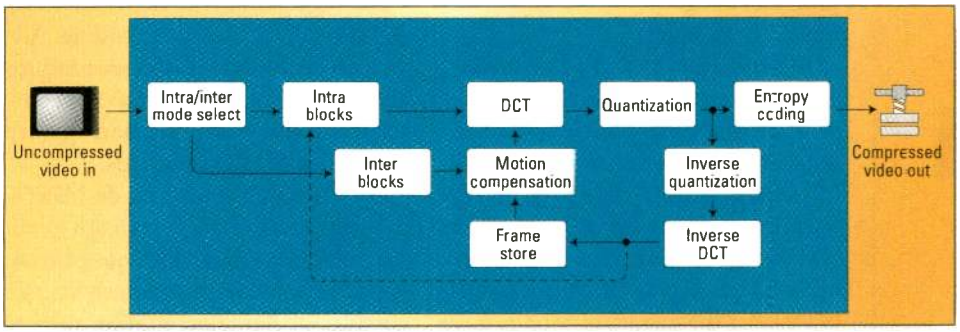


Figure 1. This block diagram is a simplified representation of the steps that MPEG encoders use to perform temporal and spatial compression. The dotted line represents an additional data path used in MPEG-4 AVC spatial compression.

Temporal compression

When the encoder is operating in the "inter" mode, the block undergoes motion compensation. This process detects any motion that has occurred between the current block and its counterpart in one or more previously stored reference frames, and creates a "difference" or "error" block. This effectively reduces the data in each block to just a representation of its motion. From there, it goes to the discrete cosine transform (DCT) to begin spatial compression. When the encoder is in the "intra" mode, the block skips the motion-compensation step and goes straight to the DCT.

Spatial compression

Blocks usually contain pixels that are similar or even identical to their neighbors. In many blocks, the pixels frequently don't change much — if at all — from one to the next. This means that in many blocks, the frequency of changing pixel values within the block is low. Such blocks are said to have low spatial frequency. The encoder takes advantage of this characteristic by first converting the block's pixel values into frequency information in the discrete cosine transform process.

Discrete cosine transform. The DCT process transforms the block's pixel values into a grid of horizontal and vertical frequency coefficients located in frequency space. When the original block has low spatial frequency, the DCT clusters most of the frequency energy at the low-frequency cor-

ner of the grid. The few low-frequency coefficients located in this corner of the grid therefore have high values. The numerous coefficients on the remaining portion of the grid are high-frequency, low-energy coefficients and have low values. At this point, most of the information describing the original block is now contained in the DC coefficient and a few low-frequency coefficients. This means that the encoder can eliminate most of the remaining high-frequency coefficients without degrading the image quality of the block. The encoder prepares the coefficients for this process by scanning the grid, starting at the DC coefficient and working its way diagonally in a zig-zag fashion through the grid's increasing horizontal and vertical frequency coefficient locations. Thus, it generates a sequence of coefficients arranged by frequency.

Quantization and entropy coding. This is where the actual spatial compression takes place. Based on a scaling factor (which the encoder can adjust), the quantizer "rounds off" all the coefficient values. Since most of the coefficients coming from the DCT are high-frequency coefficients having low values, the quantizer rounds most of these values to zero. The result is a sequence of quantized coefficient values that begins with a few high values at the beginning of the sequence, followed by long runs of coefficients that are quantized to zero. The entropy coder keeps track of the number of consecutive zero values in a sequence without having to encode them, thereby reducing the amount of data it must send for each sequence.

MPEG-4 AVC spatial-compression advantages

MPEG-4 AVC offers two improvements in spatial compression. First, this type of encoder can perform spatial compression on 16x16-pixel macroblocks instead of the 8x8 blocks in earlier MPEGs. This significantly improves its ability to perform spatial compression on images with large areas of similar pixels. Second, this compression occurs in the spatial domain before the DCT process. MPEG-4 AVC compares the current macroblock with its neighbors within the frame, calculates the difference, and sends only the difference to the DCT. Alternatively, it can subdivide the 16x16-pixel macroblock into 4x4-pixel chunks and compare each of these with its neighbors within the macroblock. This significantly improves its ability to compress detailed images.

MPEG-4 AVC enhances motion compensation by allowing the encoder to vary the size of luminance component of each macroblock.

MPEG-4 AVC temporal-compression advantages

The biggest improvement offered by MPEG-4 AVC is in inter coding. Advanced methods in this mode produce a much higher level of temporal compression and better motion quality than prior MPEG standards.

Block sizes. In the inter mode, MPEG-2 supports only 16x16-pixel macroblocks, which does not provide enough resolution to accurately encode complex or nonlinear motion such as zooming. By contrast, MPEG-4 AVC enhances motion compensation by allowing the encoder to vary the size of the luminance component of each macroblock. (The encoder uses the luminance component in this way because the human eye is much more sensitive to luminance movement than it is to color movement.) As Figure 2 shows, MPEG-4 AVC can split up the luminance component of each macroblock in four ways: 16x16, 16x8, 8x16, or 8x8. When using the 8x8 blocks, it can further split each of the four 8x8 blocks in four ways: 8x8, 8x4, 4x8, or 4x4.

Splitting macroblocks allows the encoder to handle several types of mo-

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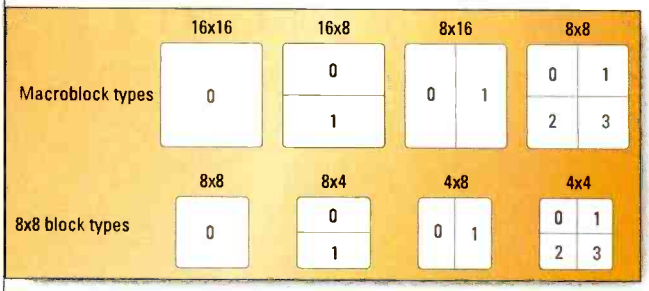

Figure 2. MPEG-4 AVC can subdivide the luminance macroblocks in several ways to enhance motion compensation.

tion according to the motion complexity and the bit-rate resources. In general, large partition size is appropriate for handling motion in the bland (homogenous) areas of the frame, whereas small partition size is useful for handling motion in more detailed portions of the frame. The result is better viewing quality, with less blockiness and fewer artifacts. Tests indicate that good tiling of the frames can yield compression saving of more than 15 percent. An example of macroblock division on the luminance portion of the image is shown on page 60. MPEG-4 AVC takes the luminance portion of the original image and uses subdivided macroblocks in high-detail areas to enhance motion compensation.

Motion-compensation accuracy. In most cases, motion at the borders of each macroblock, block or sub-block occurs in resolutions smaller than one pixel. Therefore, MPEG-4 AVC supports motion-compensation accuracy down to one-quarter or one-eighth of a pixel, in contrast with prior MPEG standards based primarily on half-pixel accuracy. MPEG-4 AVC is adopting eighth-pixel accuracy as an additional feature for increased coding efficiency at high bit rates and high video resolutions. Tests show that quarter-pixel accuracy can reduce the bit rate more than 15 percent compared to single-pixel accuracy.

Multiple reference-picture selection. MPEG-2 relies on only two reference frames to predict periodic motions, such as that of a carousel. But, when cameras change angles or switch back and forth between scenes, using just two reference frames is inadequate for good motion prediction. Likewise, more than two reference frames are necessary to predict complex motion such as waves and explosions. For these reasons, the MPEG-4 AVC standard allows up to five reference frames for coding inter frames. The result is a better subjective video quality and higher compression efficiency.

Integrated de-blocking. Compressed digital video typically produces a "blockiness" effect, which is evident at the meeting points between blocks, especially at low bit rates. This effect is due to processing with different quantizers and motion types. In MPEG-2, the only way to prevent blockiness is by using proprietary post-processing mechanisms that are not compatible with all receivers. MPEG-4 AVC defines a de-blocking filter that operates in two levels: 16x16 macroblocks and 4x4 block boundaries. De-blocking typically gives a lower peak signal-to-noise ratio (PSNR), but, in terms of subjective viewing, it offers a higher-quality viewing experience.

Transform and quantization advantages

The floating-point 8x8 DCT with rounding-error tolerances forms the core of the earlier MPEG standards. MPEG-4 AVC is unique in that it employs a purely integer spatial transform (an approximation of the DCT) for 4x4-pixel chunks. The smaller shape reduces blocking artifacts, while the precise integer specification eliminates mismatch issues between the encoder and decoder in the inverse transform. In addition, a wider range of quantization scaling factors, based on a compounding rate of approximately 12.5 percent rather than a constant increment increase, gives flexibility to the encoder's data-rate-control mechanism.

Entropy coding advantage

After performing motion compen-

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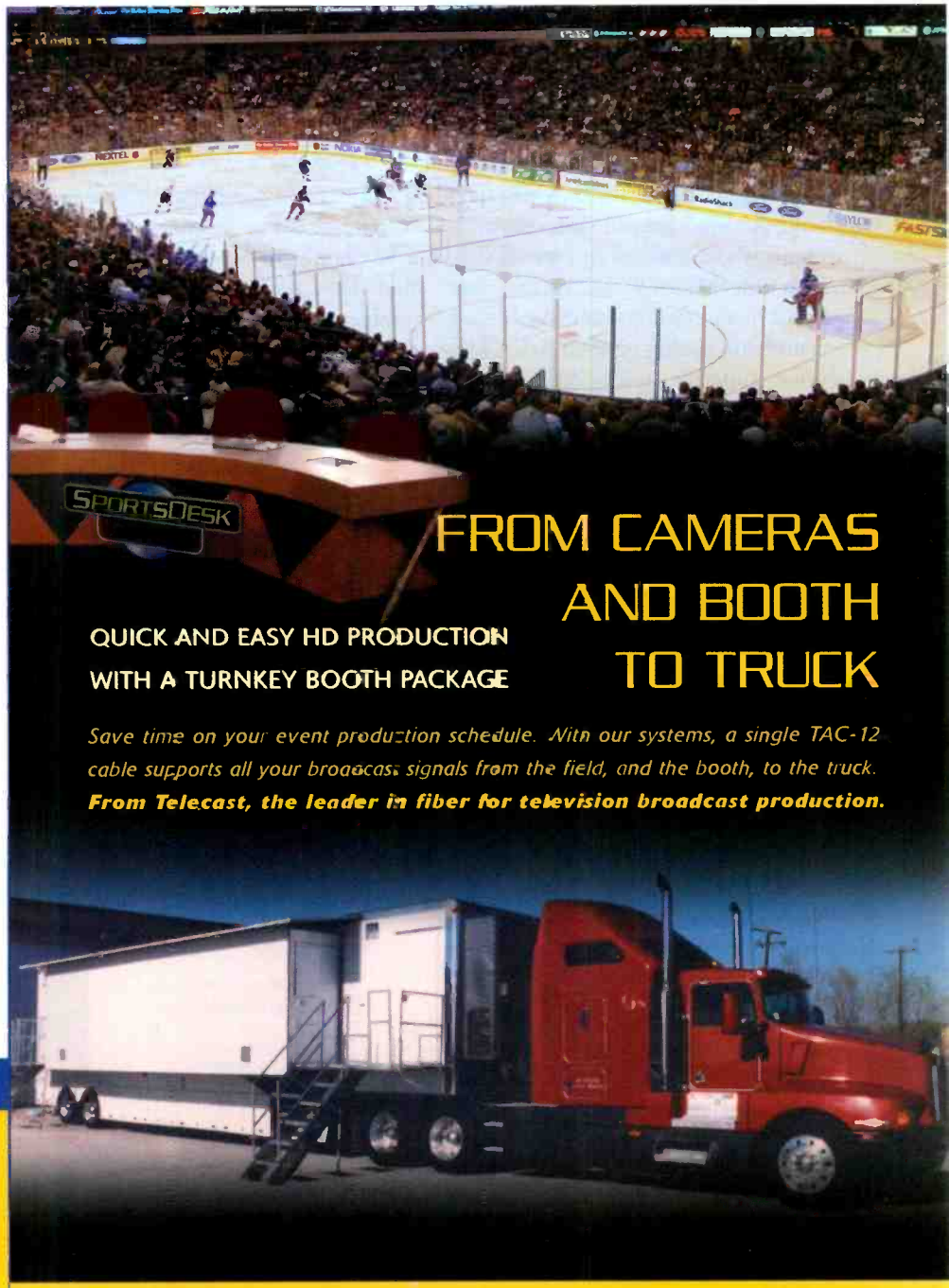

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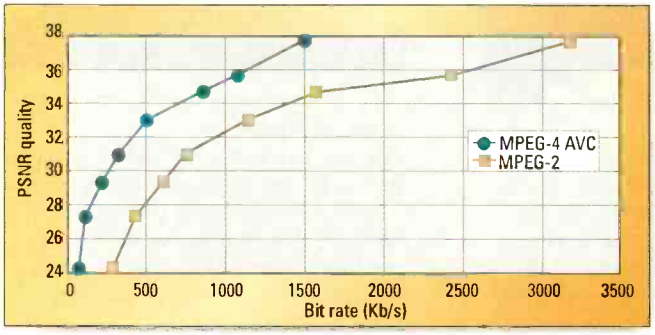


Figure 3. Comparison of MPEG-4 AVC to MPEG-2 quality and bit rate

sation, transform and quantization, earlier MPEG encoders map the symbols that represent motion vectors and quantized coefficients into actual bits. For example, MPEG-2 uses static variable-length coding (VLC), which is not optimized for real video environments where content and scenes vary with time. MPEG-4 AVC, on the other hand, uses context-adaptive binary arithmetic coding (CABAC). CABAC offers superior coding efficiency by adapting to the changing probability distribution of symbols. For example, it can exploit correlation between symbols and adaptively use the bit correlations and arithmetic coding. This mechanism yields additional bit savings of more than five percent.

Overall comparisons

Figure 3 gives a graphical comparison of MPEG-4 AVC and MPEG-2 quality. It compares the performance of state-of-the-art encoders encoding a 30-frame-per-second, CIF-resolution video of a tennis match.

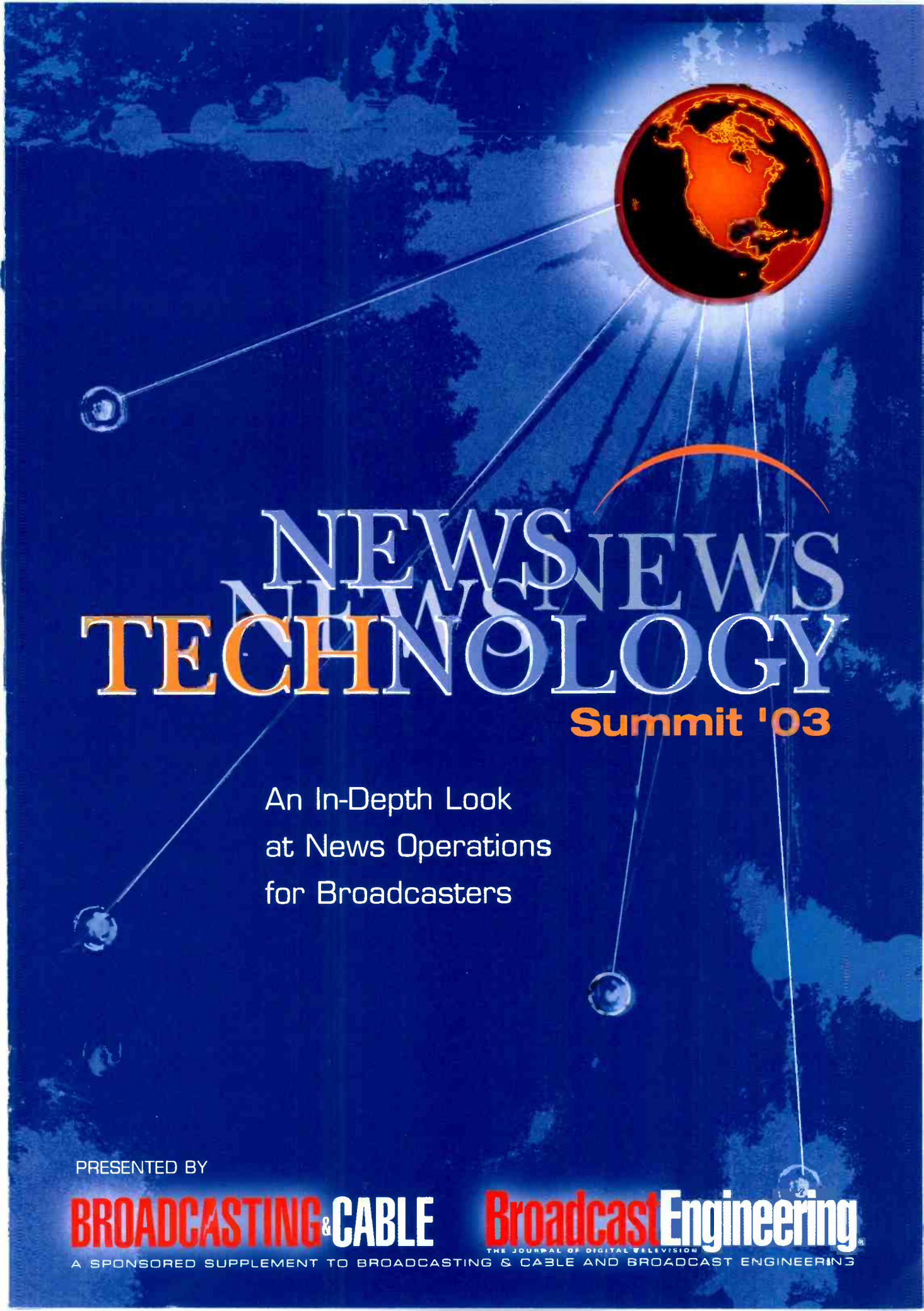
Table 1 shows the bit rate savings of MPEG-4 AVC compared to several existing standards.

MPEG-4 AVC represents a watershed in compression, implementing enhanced techniques for better bandwidth use and increased quality. Using these techniques, MPEG-4 AVC can reduce the bit rate by more than 50 percent compared to the MPEG-2 standard. But MPEG-4 AVC requires a much higher level of complexity in both encoding and decoding. Nonetheless, continual improvements in hardware and software processing power make this challenge surmountable, which means that MPEG-4 AVC is a viable candidate for replacing MPEG-2 in the coming years. BE

Codec	MPEG-4 part 2 (ASP)	H.263	MPEG-2
MPEG-4 AVC	39%	49%	64%

Table 1. Average bit rate savings using MPEG-4 AVC compared to other standards.

Mario Rainville is associate vice president of product marketing, and Amir Segev is a system architect, at Scopus.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LETTER TO OUR READERS

Dear Reader

This News Technology Sponsored Supplement is a special project focused on educating television station and network owners, management, news directors and engineering talent on the opportunities and challenges presented by the latest technological developments.

Operating efficiencies can improve news coverage, enrich program content, gain viewership through more effective news programming, and bring a greater return to the bottom line. New technology brings competitive advantages and operating efficiencies.

One of the primary editorial missions of both Broadcasting & Cable and Broadcast Engineering magazines is to provide television executives the information they need to incorporate these developments into their operations. It is clear that today, choosing the right technology is crucial to the success of a station or network news operation.

This supplement reflects the 2nd Annual News Technology Summit held October 15th and 16th in Dallas, hosted by our magazines. More than 80 television executives joined twelve leading equipment providers to discuss, explore and find solutions that will improve their news products.

We hope this special effort provides insight that is helpful to the readers of both magazines, as they strive for more compelling coverage coupled with operating efficiencies.

Regards

Dennis Triola
Publisher
Broadcast Engineering

Chuck Bolkcum
Group Publisher
Broadcasting & Cable

CONTENTS

New I.T.-based Technology for the Newsroom Changes the Financial Equation of News.

Cashing In On the News:

Consider what happens everyday in and around newsrooms across the world.

Video is shot in the field and carried or transmitted via microwave or satellite to the newsroom. Scripts are written around stories. Then the scripts and video are edited for length. Graphics and titles are generated. Voice-overs are recorded and edited in. Stories are prepared for air.

While this happens, a story breaks. Raw material arrives via satellite. If it doesn't go straight to air, it's recorded, logged and the packaging process begins all over again.

When air time arrives, a news producer tracks down the story list and cues the technical director, tape operators, character generator operator, audio engineer and others in an elaborate dance designed to pull disparate elements together into something called a story. At the last second, a story is pulled and a live feed inserted, forcing the producer to burn up the IFB and intercom to make the changes smoothly on the fly.

This traditional method of news production is complex, stressful, unwieldy and worker-intensive. It's certainly not efficient, nor is it pretty. But it's gotten the job done remarkably well for decades.

However, this old paradigm is slowly changing as local stations, station groups and networks begin to turn to I.T. technology as the logical successor to a traditional tape-based, linear workflow. Based on components like ingest systems, centralized news servers, graphics centers and proxy editors, I.T.-based solutions let many journalists, producers, graphics artists and others work on a story in parallel and share common resources while working on different, but related stories.

Many benefits of this streamlined approach are self-evident. The elimination of linear tape-based solutions translates into direct savings in tape stock, VTR maintenance, potential worker reduction –all yielding a newsroom significant cost savings. Less evident but equally valid is the fact that when used creatively, today's I.T. news production systems can also increase station revenue.

Do more, do it better, do it for new audiences. That sums up how cutting-edge newsrooms are employing I.T. technology to increase revenue

Information technology in news production gives stations the chance to grow revenue through improved efficiencies which allow them to add news programming without increasing staff.

Show Me The Money

Do more, do it better, do it for new audiences. That sums up how cutting-edge newsrooms are employing I.T. technology to increase revenue. "(I.T. allows) producing more news, be it a morning show or cut-in as a means of additional local revenue," said Parkervision's Tom McGowan. "The key to this is to not increase staff to accomplish this."

"Sharing content is also a real benefit. There's no multiple ingest points or juggling tape, which makes you faster to air," said Leitch's Andrew Warman. Being faster to air can set a station apart from its competitors and build audience. If viewers know a station is consistently on top with breaking stories, viewer numbers climb as does commercial revenue.

"From there you can repurpose what you have for the Web, for another newscast or another station in your station group without another edit staff," said Warman.

Paul Turner of Omneon agreed. "What tends to happen," he explained, "is they use I.T.-based technology to improve productivity. They can get what they need to get done

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Easy Access to Video.

It's one thing to say a digital news production system can make you work faster and quite another to see it in action. How fast is ours? Put it this way: with a PC, a network connection, and a browser, you have unlimited access to the materials you want, whenever you need them. You can quickly re-use existing media assets to extract the greatest value from them. You can share them with colleagues as easily as sending e-mail. And because of this improved workflow, and the rock-solid system reliability of our tools, you have the additional time to create richer, deeper stories that always get to air on time, every time.

At the center of these video-access capabilities is our NewsBrowse™ Web-based browser/editor. Using it, you can log on to any terminal anywhere in your facility and access the material you need, whether it's for a nightly newscast or an upcoming feature report. You can perform complex searches, select shots, develop storyboards, and create edit decision lists (EDLs) in a matter of minutes, not hours. And using our shared- storage systems, your station and sister stations can easily access each other's material.

Fastest Nonlinear Editing. Period.

Proving their worth every day, Grass Valley NewsEdit™ nonlinear editors are in use in major markets and small cities to cover everything from national college football games to local fire stories. That's because they offer two key advantages: collaborative story development and unmatched speed.

CNBC editors leverage Grass Valley NewsBrowse EDLs to assemble finished stories from a variety of sources—satellite feeds, digital files on a shared storage system, or directly from tape.

With a NewsEdit system, multiple editors can access the same feed simultaneously; there's no need to wait until someone is finished or duplicate tapes. In other words, you can produce completely separate and distinct 5 p.m. and 6 p.m. newscast versions at the same time.

Because it's networked, a NewsEdit system can automatically grab media ingested from subscription news distribution systems, such as those of Pathfire and other news services, and insert it into a current story. The insertion is transparent to the news-service operator and completely seamless to station operations. The NewsEdit system also eliminates the chance of a typing error because the name on a sequence always matches the slug name in the rundown.

"Good news is of no value if it can't be delivered reliably to our viewers"

The NewsEdit media bin quickly locates clips on any storage system—from local hard drives and third-party systems to Grass Valley Network Attached Storage and remote Open SAN systems.

Leveraging the latest in IT and networking technologies, the Grass Valley NewsEdit system provides robust, highly available newsroom connectivity to shared-storage and video infrastructures.

Tightly Integrated Play to Air.

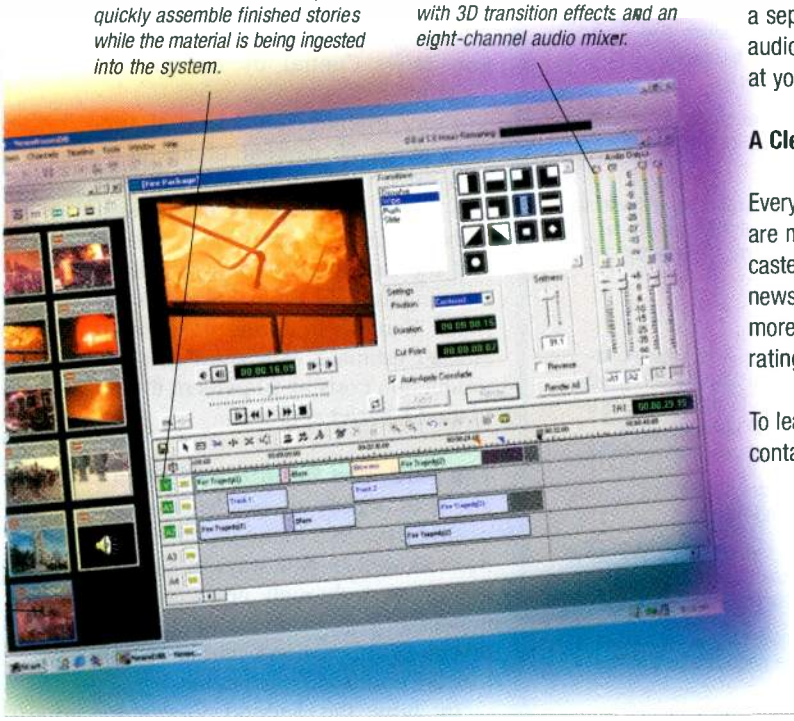
Once a story is finished and approved, it's now ready for inclusion into a scheduled playlist for air. Tightly integrated with our Profile® XP Media Platform video server—as well as our shared-storage solutions—our NewsQ™ Pro system can handle everything flawlessly.

The NewsQ Pro system is directly connected to the rundown list in your station's newsroom computer system (NRCS), providing a variety of distribution options, real-time updating of playlists, and direct playout control of a story.

The NewsQ Pro system is so easy to operate, you can play out clips in any order just by hitting the space bar. You get a thumbnail image for each story, the duration and the status for each channel, and even ID information and second-by-second playback status. And with the NewsQ Pro system, because it supports media object server (MOS) protocol integration with NRCS systems such as those from AP ENPS and iNEWS, you can get frame-accurate machine control during playback, making your job easier and letting you focus your attention where it should be: on the news.

With the NewsEdit timeline, editors don't have to wait for video to render. Instead, they can quickly assemble finished stories while the material is being ingested into the system.

The popular Grass Valley NewsEdit interface helps editors build polished, professional sequences with 3D transition effects and an eight-channel audio mixer.



Days, Not Weeks.

Every time we roll our products into a newsroom, people ask how long the training will take. And every time we leave, they can't believe how little time it took.

If you're a proficient editor in a tape-to-tape environment, for example, you can begin cutting new, air-quality stories on a NewsEdit system within two to three days of training. That's two to three days—not the year-long learning curve required by traditional nonlinear editors. And the rest of our products are similarly easy to learn.

WJAR, Providence, Rhode Island, quickly became proficient with the Grass Valley NewsEdit nonlinear editor for hard news, thanks to an easy-to-use, intuitive interface.

One way we shorten these learning cycles is by offering a thoughtfully designed user interface. Our NewsEdit nonlinear editors, for example, use the same, context-driven interface. Instead of an eye-polluting windows-over-windows design, this interface provides a separate, tabbed window for everything from video and audio editing to effects generation. All the tools you need are at your fingertips.

A Clear Choice.

Every day, Grass Valley Digital News Production Solution products are meeting and exceeding the challenges of demanding newscasters and passing the test of on-air reliability. They help make newsrooms more efficient, letting them produce more content, more quickly, and with the same resources—and help increase ratings and revenue in the process.

To learn more about bringing these benefits to your newsroom, contact your Grass Valley products representative today.

grass valley
A THOMSON BRAND

www.thomsongrassvalley.com

quicker, so they tend to find further outlets for the same or similar stories that they can market to other news stations that can't afford to do news. Or, they apply the same efficiencies to a group of stations, like Sinclair has done."

If there's a poster child for the benefits of I.T.-based news production on the station group level, it has to be the Sinclair Broadcast Group. Since October 2002 when Sinclair launched its ambitious News Central, the group has put in place the technology needed to centralize news editing, graphics output and even creation of weathercasts for local markets from its headquarters in Hunt Valley, Md.

"They can get what they need to get done quicker, so they tend to find further outlets for the same or similar stories...."

– Paul Turner, Omneon

Sinclair stations gather news video and send it via a Wide Area Network to News Central where it is edited and packaged and sent back to the stations as finished pieces for their local newscasts. Weather segments for each local station are produced at News Central, recorded and sent via the WAN to the appropriate station prior to air time. Throughout the day, promos, commercials and other video clips are distributed from Sinclair to stations over the WAN. Six more Sinclair stations plan to join News Central by the end of September.

Every evening, News Central supplies about 60 percent of the news material to its local partner stations. The rest is produced locally using a common graphic template to ensure that the locally generated stories are indistinguishable from those done at News Central. In terms of savings, Sinclair estimates it has cut its news production costs by 50 percent thanks to the I.T.-based approach.

The FCC, the Senate and Thou

The full benefit of efficiencies that could be realized in the production of news as well as new ways of generating revenue through news may be impaired by the saga unfolding in the offices of the nation's media regulators, the courts and the Senate.

In June, the Federal Communications Commission voted along party

THE ROI OF I.T. WORKFLOW

Revolutionary changes in news production spurred by the shift from video-based to I.T.-based workflow have revealed challenges and opportunities that can translate into substantial savings and new revenue streams.

Here's a list of the some of the more obvious areas and a recap of I.T.'s potential.

SAVINGS

- **Tape stock** - Typically newsrooms are awash in tape. Expect to reduce the recurring expense for videotape after making the I.T. transition.
- **VTR and ancillary equipment maintenance** - Outlay for maintenance of VTRs will drop as does their use. Once video is data residing on a news server, replacing video heads, cleaning tape paths and the rest are history.
- **Labor** - Doing the same amount of news with fewer people or far more news with the same number is a benefit of I.T.-centric news systems.

NEW REVENUE STREAMS

- **Better news, better ratings** - The ability of I.T.-based news production to improve efficiency allows stations to create more and better news stories. Better stories lead to better ratings and greater commercial revenue.
- **More newscasts** - Workflow efficiency can be so dramatic that producing new news programming, such as morning shows, news inserts and even entire newscasts for other stations without a news staff becomes a reality.
- **New media outlets** - Once news is data –not video- it becomes far easier to distribute through other outlets like the Web or even via emerging technologies, such as G3 cellular phones.
- **Duopoly double dip** - If FCC media ownership rule liberalization is allowed to proceed, companies owning two stations in the same market can easily produce two separately branded newscasts with the same I.T.-based news production system.

OTHER ROI ISSUES

- **Less hardware than analog** - I.T.-based news production is far less hardware-intensive than the traditional tape-based approach. Gone are multiple VTRs, TBCs, dedicated news editors and graphics gear. In their place is a browser-based system that allows multiple people to pull up video clips, graphics templates, scripts, and other elements to build solid news stories.
- **Repurpose material easily** - Once footage resides on the server, it's easy to access and easy to repurpose with new voice-overs and graphics.
- **Less technically skilled people needed** - Higher-paid, more technically skilled employees can be replaced or reassigned. Less technically sophisticated workers can perform analogous functions in an I.T.-based world.
- **Fewer skilled editors need** - With I.T.-based news production, journalists can do more editing themselves. Fewer skilled editors are required to get the same news done.

lines to relax existing media ownership restrictions that included rules against owning newspapers and television stations in the same market.

That area in particular –cross-ownership of newspaper and television stations and the duopoly provisions- raise some interesting possibilities for I.T.-based news production. Sharing news gathering resources with daily newspapers could potentially double, triple or even quadruple the number of reporters in the field available to a television station depending on the market. Duopolies offer obvious cost savings and revenue generation if one of two local sister stations had no newscast to start with.

But opportunities like these were put on hold when the U.S. Court of Appeals for the Third District in Philadelphia stayed the FCC's new relaxed ownership rules in early September. A week later, the Senate took up the matter and voted to reinstate the commission's previous ownership rules with legislation. President George Bush has threatened a veto if a House version of the resolution is approved.

At this point, with events unfolding daily it's impossible to predict the final outcome. However, it's not difficult to predict how stations could benefit from I.T. news production in a relaxed media ownership environment.

"We (Parkervision) can also speak to the dual newscasts being performed on both Fox (WAWS) and CBS (WTEV) at the Clear Channel station in Jacksonville," explained Parkervision's McGowan.

"They utilize our Dual PVTV NEWS systems to perform both newscasts from within the same studio – with two completely different looks and set designs.

"They spin our robotic CameraMan cameras around to perform this task. Both newscasts are performed from the same control room, though not simultaneously–they would have to have another room for that, but not more PVTV equipment.

"If they wanted to, they could simply multi-cast with PVTV NEWS, as they have the equipment to do so. (This is) an excellent example of branding two stations from the same control room with two looks."

Leitch's Warman agreed."I think this will be a growing trend with duopolies, where a 10 a.m. airs on UPN and 11 a.m. on Fox," he said. "The news server will house all content, and it will be rebranded for each station. This makes it very simple to run two different stations and newscasts."

I.T. efficiencies begin in the field. New tapeless recording technologies will allow field editing and better workflow. In the newsroom, journalists access video clips, wire copy, graphics and editing tools from their workstation.

Fade To Black

The benefits of making the transition to an I.T.-based news solution are easy to understand in terms of workflow, savings and revenue. Jim Frantzreb, Avid Technology senior product marketing manager broadcast and workgroup division, summed them up this way.

"These solutions make media simultaneously available in the newsroom," he said. "Journalists and editors work together in a way that's never been done before. Plugging everyone into a non-linear system means linear processing is eliminated and working in parallel and the efficiencies that come from it are available. Then it's possible to convert media for use in new and emerging ways to serve one's existing market better or build a new audience. For example, broadcast news can be converted for the Web or delivery via a G3 phone application."

Improved efficiency is the obvious outcome of this transition to I.T. solutions for news, but other unexpected consequences –like new revenue streams– shouldn't be totally surprising.

"We all bought word processing 20 years ago to produce quicker letters," said Pathfire's Mike Carey. "But we still take the same time to write a letter as we did 20 years ago; we just do it better.

"The same is true of the newscast. Just as we went into word processing with one set of goals and came out with another, all of the possibilities for I.T. in news are yet to be fully grasped."

NEXIO NEWSNET™

Digital News Room Solutions

The newsroom computer system is the focal point of any newsroom. It stores all your assignments, scripts, rundowns, wires and archived text data in one place and is accessible to all users. Video material needs to be handled in the same way — everything in one place, available to everyone that needs it. The mechanisms by which it is handled should be as flexible as possible to adapt to your workflow. Therefore, having the right tools and architecture are key. The NewsNet™ system is the video production equivalent of a newsroom computer system: It integrates production tools.

WHAT IS NewsNet?

NewsNet is an integrated video production system designed around the NEXIO™ video server platform and today's newsroom computer systems. It gives you the power and flexibility to deliver a superior product to air quicker and more reliably than ever before. NewsNet includes products from ingest to archive, covering such diverse applications as feed recording, editing of high- and low-resolution content, third-party NLE ingest, clip playout and MOS (Media Object Server) protocol support. Its a la carte design enables you to pick and choose only those components you need and lets you add to the system as your needs dictate.

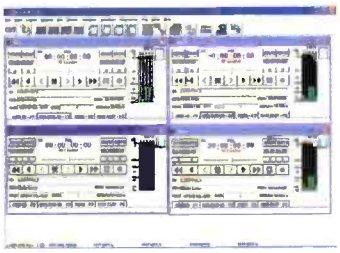
At the heart of the NewsNet system is the NEXIO video server. It is designed around a central shared storage system with nodes that offer video input and output, editing, file transfer, conforming, archiving and a variety of other functions. All connected devices have simultaneous access to all content all the time.

The core is true shared storage. It provides a solid, modular, flexible platform for pure speed. It is a stable foundation on which to build a powerful video production system for news operations. Its modular design allows you to plug in all the components you'll need to create, manage and transmit your video material.

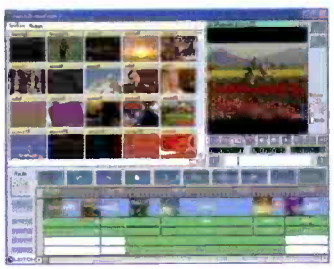
Speed is what you need

NewsNet provides all the tools to optimize the operation of your newsroom. Starting from the planning of each story to its transmission, NewsNet has all the components to bring news to air in the fastest time possible.

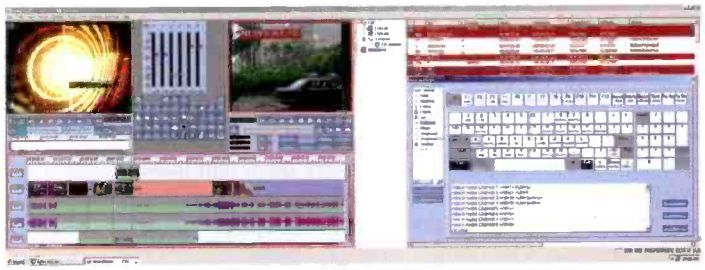
Dramatic improvements to workflow are available through the use of NewsNet's tools. Newsroom productivity is enhanced by automated scheduling of line feeds, batch digitizing of tapes, instant access to content for all editors, direct-to-timeline editing and instant availability for transmission.



Before content even reaches the newsroom, NewsNet starts working for you. By creating placeholders of clips in your stories, all newsroom computer system users can see where the final content will be placed and can follow its progress through the production process.



Instant access to any and all material all of the time allows for the fastest turnaround of breaking news.



Workflow Enhanced

A move from tape-based production to NewsNet will give you plenty of scope to change or enhance your video production workflow. In either case, you'll be able to identify a wide array of areas that can benefit from using Leitch video server technology. Here is just a selection:

- Access to all clips all the time for all devices — from ingest to editing and transmission
- All clips for your production system stored in one place — no transfers between discrete server boxes
- Automated feed ingest with one off and reoccurring feeds, router control and proc amp control
- Remote control of video server channels from standard desktop PCs
- Fully integrated non-linear editing — immediate availability of material for play to air with no file transfers
- Third-party editor integration via Ethernet
- Low-resolution browsing and editing running inside your newsroom computer system
- Playlists for clip transmission managed by the newsroom computer system rundowns
- Sharing of projects between both high- and low-resolution editing systems
- Transfer methods for sharing clips with other remote production systems

Graphics Central

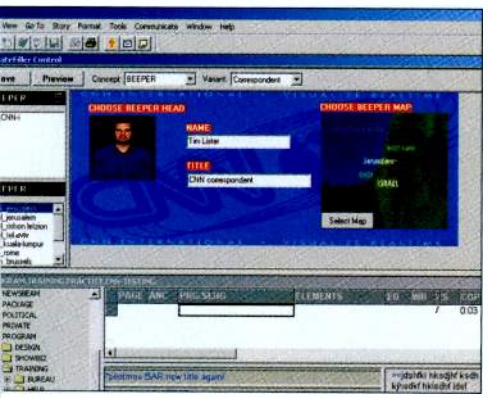
How a Hub and Spokes Can Set Your Station's Graphics in Motion

Graphics have played a central role in television news since the phrase "Film at 11" was first coined.

Their importance is undeniable. News graphics convey information, create a recognizable style for recurring stories, establish a branding look for a newscast, and to the degree that a station identifies itself with its news operations, present a visual identity for the entire station.

Lately, their central role is becoming centralized at station groups as the workflow involved in creating news evolves beyond linear videotape-based methods of news production to I.T.-centric approaches favoring collaboration, freedom and economies of scale. Instead of individual paint system and character generator operators at each individual station chained to dedicated graphics workstations, station groups have begun centralizing graphics creation around a central hub from which reporters at individual group stations can access templates for over-the-shoulder, lower-third and even news ticker graphics.

Improved accuracy is a consequence of centralized graphics. Journalists, not CG operators, insert names into lower-third templates.



Centralizing graphics in this hub-spoke approach offers a number of benefits to news operations, including consistent branding, economies of scale, labor savings, improved quality and lower hardware costs.

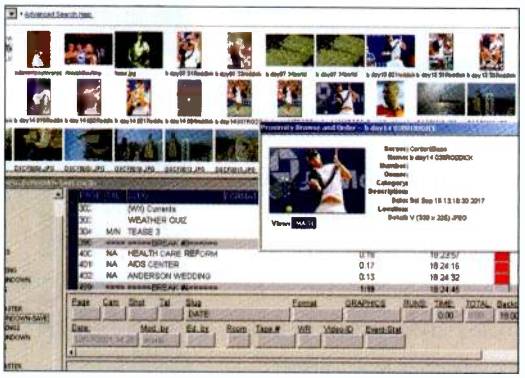
"Our experience," said Proximity president Luke Tristam, "is that for a typical station network, direct operating costs can be cut by 50 percent." These savings come from a number of areas. "There's 5 to 10 percent time saved due to streamlined content transfer based on typical TV station implementations," he said, "getting graphics directly from creation systems to on-air pay out systems in one step."

"Forty percent of graphics can be shared and re-used based on customers' analysis. Significant reuse is possible for every story with the same content running on the same day, the graphic content can be reused.

"There's a 50 percent reduction in process steps based on customers' analysis. The number of steps required to order, track and fulfill graphics orders can be significantly reduced.

"Equipment investment and support costs can be reduced over time by reducing the number of graphics creation stations required. The savings achieved in this regard can be significant."

"Maintaining the core graphics and templates at a central hub ensures that the local spokes maintain a consistent brand 'look and feel' across all programs," added Jim Altemose, director of special projects for Chyron. Additionally, the hub-spoke approach allows station groups to benefit from economies of scale. "The more spokes that are added, the more cost-effective the system becomes," he said.



Centralizing graphics concentrate skilled graphic artists in one area to produce templates others in the newsroom can use.

According to Tristam, these savings and efficiencies typically translate into a station group paying for a centralized graphics system in 18 months or less.

Workflow Enhancements

Consider how news graphics are currently created at many stations. A producer or writer develops a list of graphics needed for a story and e-mails it to the graphics department. The graphic artist dutifully fulfills the request, but upon seeing the work the journalist involved requests a re-do to better communicate the story.

According to Isaac Hersly of vizrt, that approach can benefit enormously from centralized graphics creation. "The savings come in workflow," he said. "A non-technical-creative person can put a graphic together using an ordinary PC (tied into the centralized graphics system) and feed it into the show. This can result in a reduction in the number of people, shortening of shifts and actually the use of more graphics in a show because the inefficiencies have been eliminated."

Centralization of graphics production in the hub-spoke approach con-

centrates the efforts of highly skilled graphic artists in a central location. "High-skill artists are only required at the hub," said Chyron's Altemose. "This enables spokes to free artists for other tasks or reduces the need for such (personnel)."

The centralized approach also improves the accuracy of graphics that are produced. "(There's) more efficient, accurate data entry," explained Chyron's Altemose, "allowing reporters and other non-artists to update graphics such as lower-thirds directly from the NCS (newsroom computer system). Using template pages eliminates conveying the information to a graphics operator and helps eliminate errors incurred in this process."

THE PROS AND CONS OF MOS

The Media Object Server (MOS) allows simple interchange of data between a media server with video, audio, still images or other media and a newsroom computer system. When it comes to centralized graphics systems, MOS offers several advantages and a few disadvantages as well.

According to Jim Altemose, director of special projects for Chyron, "(MOS provides a) common, open protocol enables operational consistency among various vendors (and) enables a variety of otherwise incompatible vendors to work with each other." With MOS, stations can pick equipment from a variety of vendors and be assured that they will be able to integrate it with other MOS equipment seamlessly.

MOS is not without its potential downside, especially for companies using it in their products. As with any standard, the flip side of compatibility is a potential impediment to manufacturers incorporating their hottest features into products out of a real or perceived fear that they'll lose a competitive advantage.

Templates ensure a consistent graphical look and feel viewers can easily identify.

Integration of Building Blocks

At the heart of these efficiencies is the graphic template. Created by skilled artists, these templates convey visual appeal, enhance the consistency of the newsroom's on-air look and accommodate changing story elements.

"Template pages are pre-composed page layouts with defined areas for dynamic text and graphics to be placed," explained Chyron's Altemose. "These page layouts, along with all associated static elements, such as backgrounds and banners, can typically be previewed, selected, and updated with new data from within the NCS interface. The final pages are automatically rendered by the appropriate graphic system with the new data and prepared for play-out, all without the NCS operator needing any knowledge or familiarity with that particular graphic system."

While templates may be the most visible building block, there are may others.

"A central content management system with Active X plugins in the newsroom environment allows graphics/ media assets to be searched, browsed and dragged into rundowns from within the newsroom system," said Proximity's Tristam. This makes for a seamless 'one process' workflow in the newsroom."

"By employing a content management system that scans existing creation and on–air devices, a catalog of existing media assets can be developed, without creating a new repository for content. This way, a new centralized production system can be rapidly deployed over existing content.

"Close format and protocol integration with existing still stores, video servers and other specialized equipment means a solution can be deployed without requiring significant investment in new equipment. In this way, the benefits of centralization can be realized even in smaller broadcast operations, where capital constraints are more significant."

The Transition

Regardless of station or group size, the initial goal of any change from a traditional graphics workflow to a centralized graphics approach is getting news graphics on the air with minimal disruption during the transition.

As Chyron's Altemose sees it, there doesn't need to be much disruption because legacy equipment can be controlled in a centralized system. "Typical graphics systems already in place can be used with centralized graphics solutions, and new graphics equipment is not required," he explained. "Therefore, current operation can typically continue without disruption until the centralization process is phased in."

Hersly of vizrt sees it differently. "The best way to make the transition is to create the graphics for the templates that will be needed. Make sure everyone in the whole process from the vice president to the news director to the artists like them. Do a couple of rehearsal shows and then go with it.

"I've found that it's hard for stations to keep both (the traditional and centralized approaches) going.

"When you have the keys to the new car, it's time to retire the old one."

In this business, reputations are built on relial

Acquisition

Production

Newsroom

Strength in unity.

Designed for simultaneous sharing of high-bandwidth, full-resolution media, an Avid Unity™ for News media network is the central nervous system of a collaborative, nonlinear workflow. The proven Avid Unity for News file sharing architecture can be scaled quickly and easily to meet changing needs of large and medium-sized facilities, while smaller facilities and satellite stations can "scale down" using cost-effective LANshare for News systems to store and share media.

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"Avid Unity for News solutions have helped us implement dramatic cost savings and efficiencies across our entire broadcasting operation."

Ignacio Suarez, Vice President of News
TV Azteca, Mexico

Management Transmission Shared Media Network

Succeeding in the digital age depends on leveraging every asset – systems, staff, and media – through an end-to-end workflow that provides absolute access and complete control.

That's why Avid is the overwhelming choice for digital broadcast news production

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Integration is the key – products that seamlessly integrate with each other, open integration with existing systems, and collaboration with third parties to more closely address each broadcaster's specific needs. With Avid solutions, the ability to quickly and affordably respond to industry changes, as well as protect and leverage assets and information, is well within the reach of every broadcaster.

Not only do Avid broadcast solutions take television news production to a new level, they also allow broadcasters to create and deliver rich, late-breaking content via the Internet. Now, news production can be combined with a powerful content management and delivery system that streamlines the entire process, automating many steps along the way. The joint functionality of Avid broadcast solutions finally allows businesses to manage the entire process seamlessly, from ingest to distribution.

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Avid®

The Human Factor

Where I.T. News Production Can Save Labor or Free up Staff

News production is labor–intensive. From the videographers, journalists, producers, editors, graphic artists and CG operators who have a hand in creating, capturing and piecing together the elements of a news story to the tape machine operators, maintenance techs, control room personnel and engineers who keep the technology of news humming along, the manpower needed to create a newscast can be staggering.

But change is afoot across the country as station groups, networks and individual stations have begun turning to I.T.-centric news workflows to expedite story creation and better use the human resources available to the newsroom.

I.T. in the newsroom has streamlined the process of news, according to Joe Fabiano, chief technology officer of Pathfire. "There is a real benefit to having video ingested so that it's accessible from the desktop tool environment," he explained. "People in the newsroom are able to work in the same environment and have rapid access to video without journalists and other news users having to go dub tapes."

"Currently, video, audio (and) graphic assets are transported around the facility on tape or disk," added Omneon's vice president of product marketing Paul Turner. "Many copies of an item may exist at different desks. Having a centralized server vastly reduces the complexity of managing these resources."

Labor Savings vs. Revenue Generation

"With browser-based systems," said SGI's Chris Golson, "the cost of creating news plummets because you can reach many more people in the newsroom with pictures and news information than was possible with the tape-based approach."

Savings can be achieved throughout the news chain. "In editing, in quality checking, in ingestion, in graphics insertion, in switching," he added, "all of this is automated. In maintenance, as well; there just are many fewer tape machines. And soon in the field, we will be pushing all this I.T. out to the truck."

The simplification and the ability to share video clips and graphics that I.T.-based news production delivers forces stations, groups and networks to decide between two paths. Should they lower overhead by cutting personnel and pocket the savings? Or, should they look at I.T. news efficiencies as an opportunity to better serve their communities with more news or to market their news product to stations in their area that currently don't deliver news?

"Do they do more with less in terms of head count?" asked Avid senior product marketing manager for the broadcast and workgroup division Jim Frantzreb. "If you find that you put in an ingest server and a playout server, and you remove tape decks, those people will be redeployed, or you do without them.

"That aside, stations are generally looking to keep the people they have, and do more with those people." (For a discussion of revenue opportunities see "Cashing In On The News" in this supplement.)

The transition from the tape to I.T. forces management to decide between doing the same amount or work with fewer people or more news with the same number of workers.

Making I.T. Work

Those looking for where labor savings can be realized or better ways to use underutilized personnel, need look no further than the news production chain as it exists today.

"In the old world," said Pathfire news product manager Rick Young, "ABC News 1 would gather news of regional or national interest from affiliates. They would bring it in house to New York or one of the five or so ABC news bureaus, and then along with network-produced news material send regularly scheduled feeds out to about 200 ABC affiliates." Everyday, local affiliates would wait for the right network feed and record it.

Pathfire proposed a way to escape the constraints of the linear analog world through the use of a digital store and forward approach. "We implemented a solution that involved installing and integrating a server in every ABC newsroom throughout the country as well as ABC news partners and all 200 affiliates," explained Young.

"Now as ABC gathers video, they distribute it on demand. As an item is edited or produced in New York, it is immediately distributed. So if it's done at 2:30, it's distributed at 2:30. There's no need for affiliates to wait around for feeds." Additionally, a local affiliate can request file footage electronically, and ABC sends it over the network to that specific affiliate's server.

At the network, the people formerly needed to manage the playout and stack the tapes as well as those responsible for tracking down stories stations wanted but missed the first time around can be reassigned or terminated. On the affiliate side, the need for people to record incoming feeds is eliminated as well.

"When you multiply that by 200 affiliates, those are significant savings," said Young.

A little different spin on the I.T. approach to news workflow efficiency is being used with Silicon Graphic's I.T. installation in Sweden, according to SGI's Golson. "Sweden SBT laid fiber between cities and took advantage of that by centralizing news into Oslo."

"News cutters locally do local stories. They bring stories into their local system," he explained, "and from there completed stories are shipped via fiber as data to Oslo. There they are compiled and sent back out the same day to all 20 cities."

Unlike the ABC example, Sweden SBT builds its compiled newscast from the bottom-up. Still, I.T. offers efficiencies and labor savings that would not be possible in a linear world. Sending local stories to the network "mothership" as data frees workers in Oslo from waiting to roll tape to record feeds. It also frees each local station from having to have its own crew collect stories and send them back to the headquarters in Oslo.

> **"With browser-based systems, the cost of creating news plummets because you can reach many more people in the newsroom with pictures and news..."**
>
> **—Chris Golson, SGI**

Transition to New Workflow

Whether a network, an affiliate or a station group intends to reduce its head count in the news department or to reassign employees to maximize the output of news, certain rules should be followed.

"In real estate, the key to success is location, location, location," said Pathfire's Fabiano. "When it comes to a transition to I.T. in the newsroom, the key is training, training, training."

While training might seem like an unaffordable luxury to those living the 24/7 grind of news, it solves problems before they even arise. "Newsrooms are high-stress, deadline-oriented work environments," said Fabiano. "There is a reluctance level there. But once they understand they can write and produce better news more efficiently, it's possible to get over the hurdle."

Building the desire to train is only the first step. Next, it's important to stage the training in phases to avoid disrupting daily news chores, identify I.T. champions in the newsroom who can lead the charge and adopt a single approach to the new newsroom workflow and stick with it.

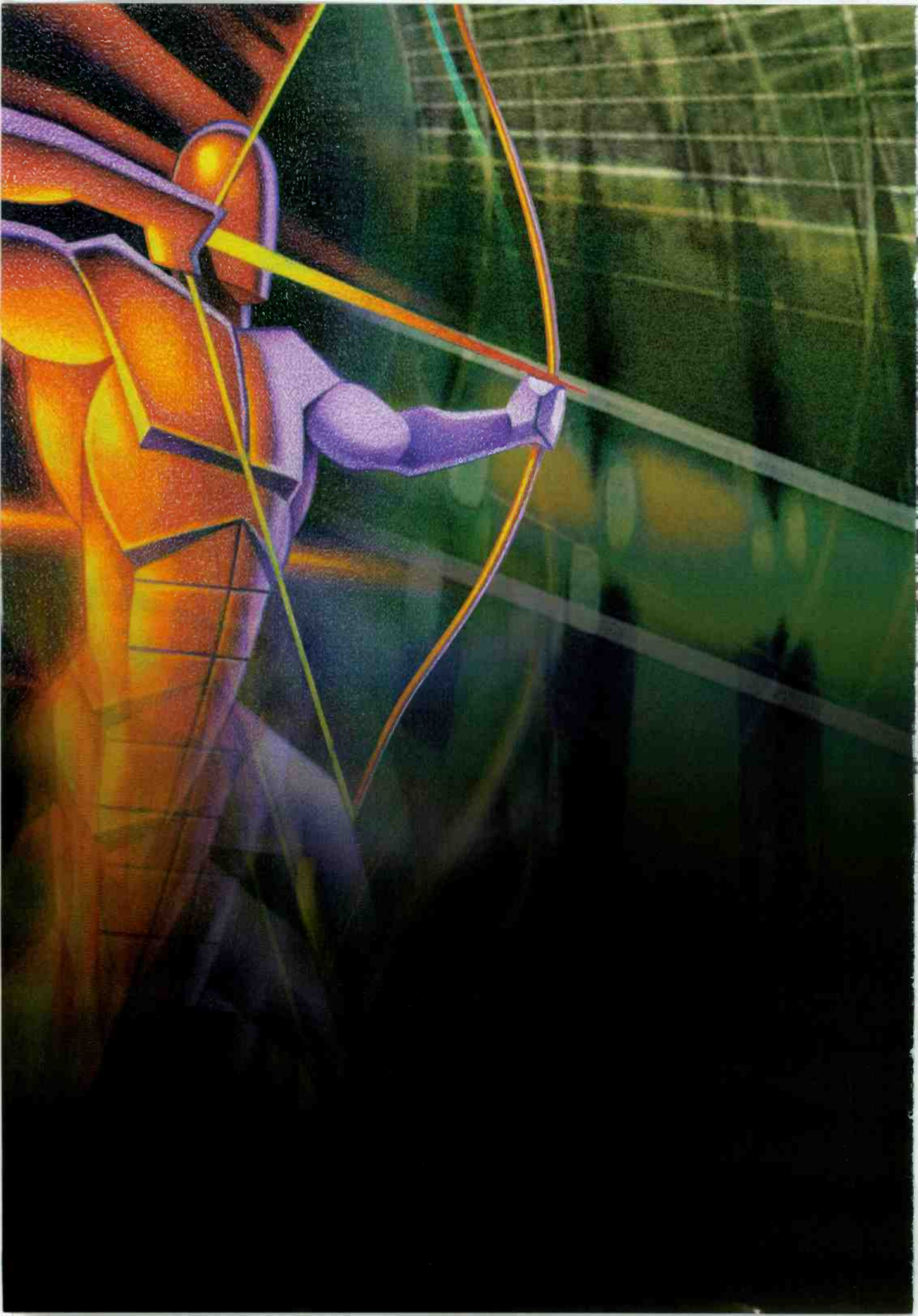
"I would offer for news operations this advice," said Avid's Frantzreb, "Identify and use internal champions, people who will lead the technology change. Train those people first."

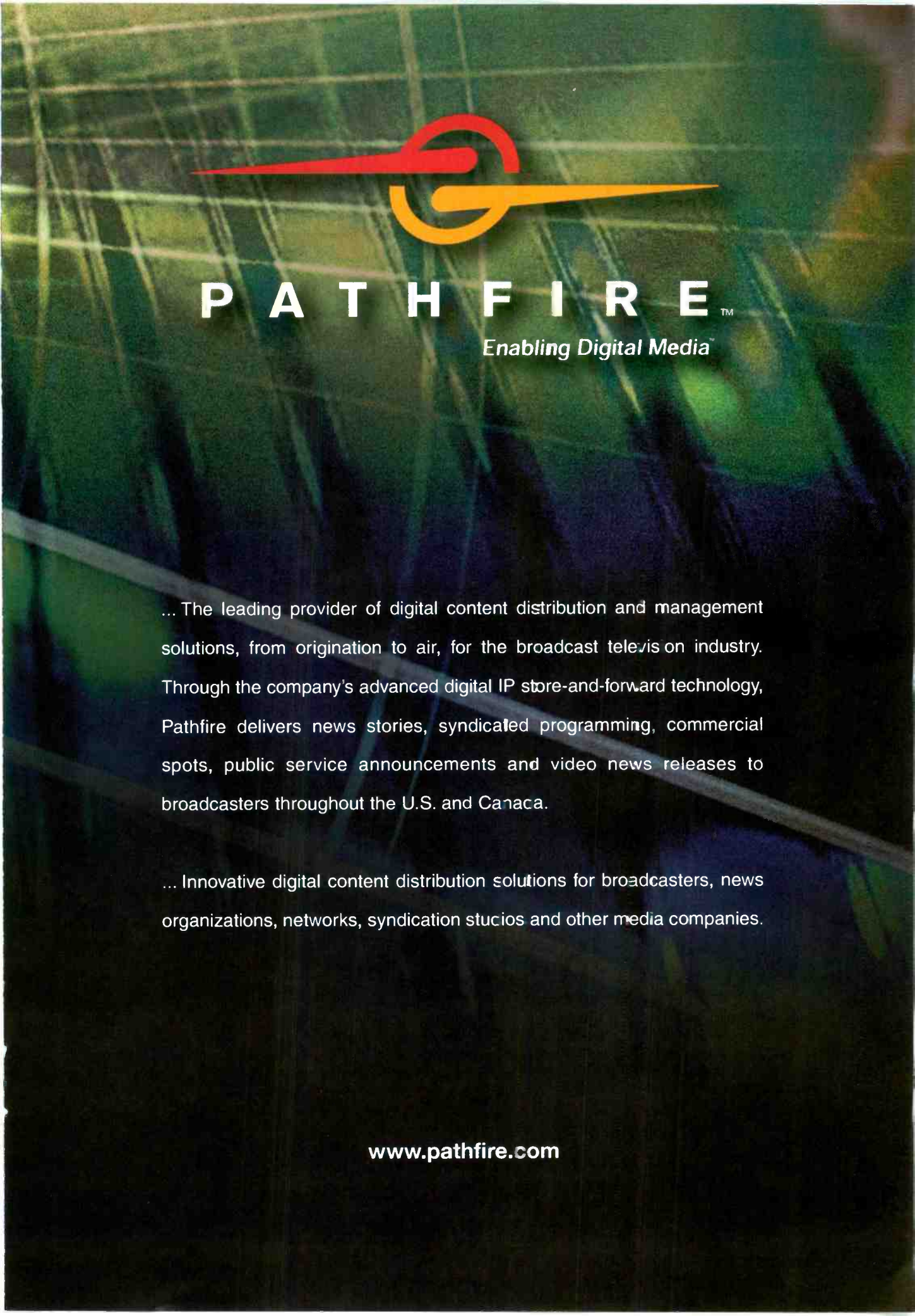
"Train in stages," he added. "Don't try to do it all at once. Concentrate on different groups at different times. Choose engineering first and then move onto news personnel later."

"Stick to a single workflow until it becomes routine. I.T.-based news production offers tremendous flexibility, so there are lots of different ways to accomplish the same task. Don't confuse yourself and other people. Don't stray from the approach you've settled on. There are too many potential problems working. Finally, talk to others who have done it."

However, Leitch product marketing manager for news strategy Andrew Warman sees things a little differently. "You can give them as much training as you want, but it doesn't take hold till they actually use it," he said. "Where things may seem confusing during training, when the crunch time comes it becomes obvious."

"We have various training programs here and on site, but on-air experience is where you find the advantages you gained."

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The New Editing Staple

How Desktop Editors and News Servers Will Conspire to Reshape News Editing

Cuts-only editing, it's the staple of the television news. From the first time a U-Matic cassette found its way back to a newsroom from the field, assembling video piece by piece with this no-nonsense method of telling a story has dominated television news.

The reasons why it rules news editing to this very day are simple to understand. Cuts-only editing is fast, easy and cheap.

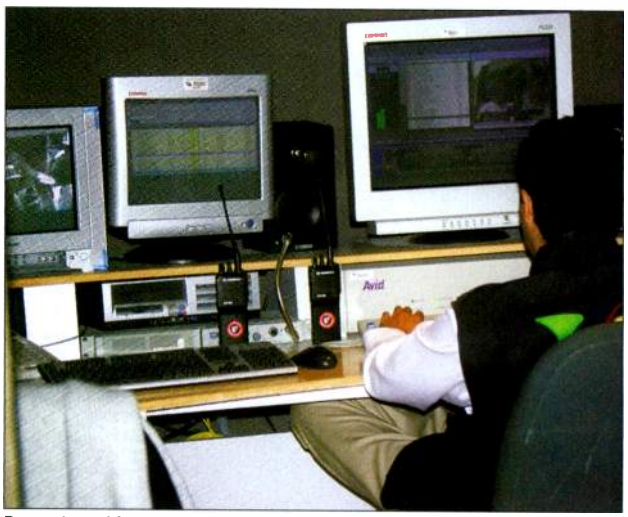
Another news editing technology has appeared on the stage, and it promises to dominate news editing for the same reasons. While it doesn't have such a catchy name, it promises to leave its mark on how stories are told in TV news for a long time.

Desktop video editing coupled with powerful video file servers in newsrooms are transforming workflow, fostering collaboration and empowering journalists with control over the content and appearance of their stories in ways that would have been unimaginable a few years ago. Oh, yeah. They're also a lot cheaper to use than their tape-based cousins.

The Scenario

Typically, this type of desktop video editing is a piece of a much bigger I.T.-centric approach to news production and management. In this I.T. scenario, footage arrives from various sources, like network satellite feeds and ENG shots, tape or tapeless media shot in the field, video news releases and other sources, and is ingested and stored as data on the station news server. The server already has files with graphic templates for typical news applications, like lower-thirds, crawls, titles and over-the-shoulder graphics.

From their individual desktop editing stations, reporters, producers and anyone else needing access to clips or graphics can browse through available material to begin assembling their story. Where proxy editing is employed in large station groups or networks, reporters work on low-resolution versions of clips and build their story. When it's completed, approved and ready to go, a high-resolution version is assembled from the material on the server. Think of it as building a visual edit decision list that gets conformed in post –only without the videotape or film.



Browsing video clips from a central news server on a desktop editor will become as ubiquitous as cuts-only editing in news. This approach lets journalists edit most stories, freeing skilled video editors from mundane news editing to work on more demanding projects

Sounds simple enough, but how does a reporter find the desired clip? After all, there must be an endless supply of video from the city council chambers. How does she find the clip where the mayor submitted his resignation? Enter metadata.

Metadata is information accompanying video and audio clips to help identify key facts, like who shot the clip, when and where it was shot, who is being interviewed, what was shot, and other information vital to tracking down exactly what appears on a given clip. While all the details of who enters the metadata are still being refined, it will prove to be a critical component to the ultimate success of this I.T. approach to desktop editing.

Once the piece is completed, it's entered into the story queue and goes to air from the playback server. Finally, the graphics are stripped from the story and the clips used to create it are archived for future use.

From a quality point of view, news stories should improve using this sort of desktop video editing, because it's simple for journalists and producers to collaborate when they don't have to chase down dubs of the raw footage. In terms of workflow, this approach significantly hastens the editing process. There's no need to find an editor, organize a production room for some fancy graphic overlay or visit with the CG operator to explain that the lower-third title should read "Jon Smithe" not "John Smith."

From a station management point of view there are a number of savings. "Less editing staff is needed and a full production crew is no longer need to do simple tasks such as CG creation for packages and mosaics to mask people's identity," explained Leitch product market manager for news editors Kyle Cowan.

"I think the networks have run into some hurdles," explained Cowan. "They may have had trouble moving down this non-linear digital road because of work rules and union considerations. But ultimately there is no stopping the train. It might have been slowed a little, but I don't think it'll stop."

This approach won't entirely eliminate the need for someone to push buttons on a few tape machines, according to Pathfire product manager for news Rick Young. "For the foreseeable future, live material will require bodies."

Editing by Proxy

Living in a television world obsessed with improving its appearance might make it seem like proxy editing is a step backwards. After all, won't Moore's Law ultimately catch up with proxy editing and deliver the processing power to handle full-resolution video –even HD video?

"Proxy editing will be around for quite sometime because of the need to see material across great distances (station groups on different coasts) that are part of several different domains," said Leitch's Cowan. "Network bandwidth is the key consideration not processor power."

"Low resolution will continue on because it is lightweight and sufficient for material search and even editing for the next 10 years or so," said Thomson director of applications engineering Bruce Lane. "More likely are high-resolution-low-resolutions hybrid systems where you use the tools transparently together. Even if technology makes it very low cost, there is still a place and balance for various codec speeds and qualities. This same paradigm will trend toward HD, SD (and) lower resolution.

Metadata is the transparent thread binding together desktop editors and news servers. It lets news editors and journalists find the right video clip for the edited sequence

... two people with a string with two cans is not valuable, but a telephone network's value is incalculable. The same is true for video editing.

—Jim Frantzreb, Avid

"The storage system is not the only driving factor when considering the resolution of the desktop solution. Available bandwidth to the desktop (Infrastructure) and the number of concurrent users help to determine the total solution. In some cases high resolution is the appropriate resolution at the desktop; however in most cases to minimize the bandwidth required, low resolution is necessary."

"The main rationale for proxy based editing is to allow a large number of editors to work from material stored on a central server," explained Omneon vice president of product marketing Paul Turner. Avid's Jim Frantzreb disagreed: "Generally speaking, for smaller applications we suggest customers do everything high resolution. Once there are more than 75 to 100 users, proxy editing is the answer."

According to Quantel business manager for news and sports Trevor Francis, the key involves how many users will be accessing high resolution material at once. "There's not a hard break point, but we are talking about the number of simultaneously operating workstations, not the total number of stations. Proxy editing will become necessary when there are more than 20 workstations."

When it comes to editing, more important than Moore's Law –named for Intel co-founder Gordon Moore who observed in 1965 that the number of transistors on integrated circuits would double every year– is Metcalfe's Law, which states that the usefulness of a network equals the square of the number of users, according to Frantzreb.

"What proxy editing gets to is Metcalfe's Law. Robert Metcalfe said that the value of a network increases exponentially as the number of nodes increases linearly," said Frantzreb. "In other words, two people with a string with two cans is not valuable but a telephone network's value is incalculable. The same is true for video editing. What we are talking about is collaborative editing and the value of investing in a network for news production."

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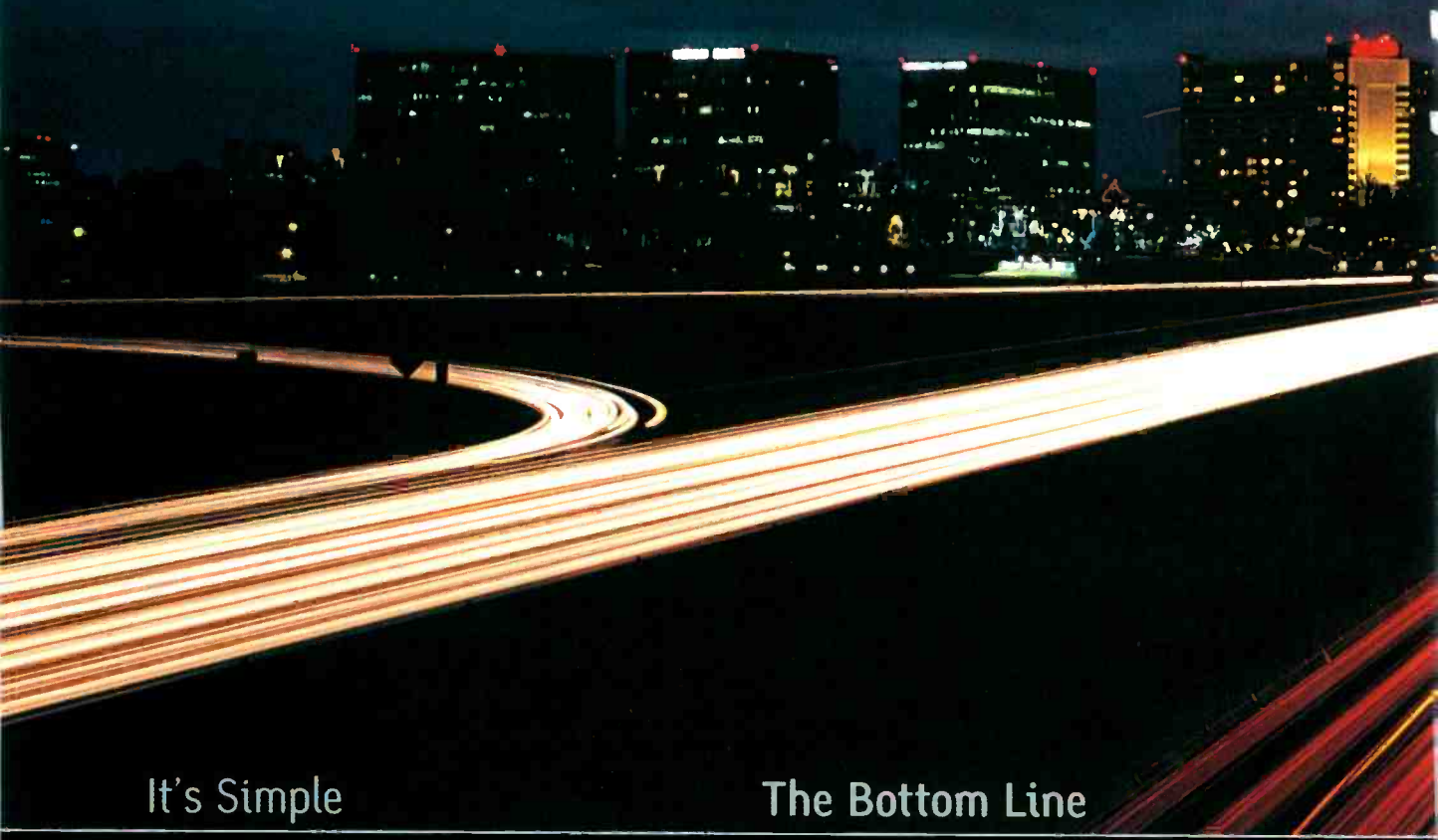

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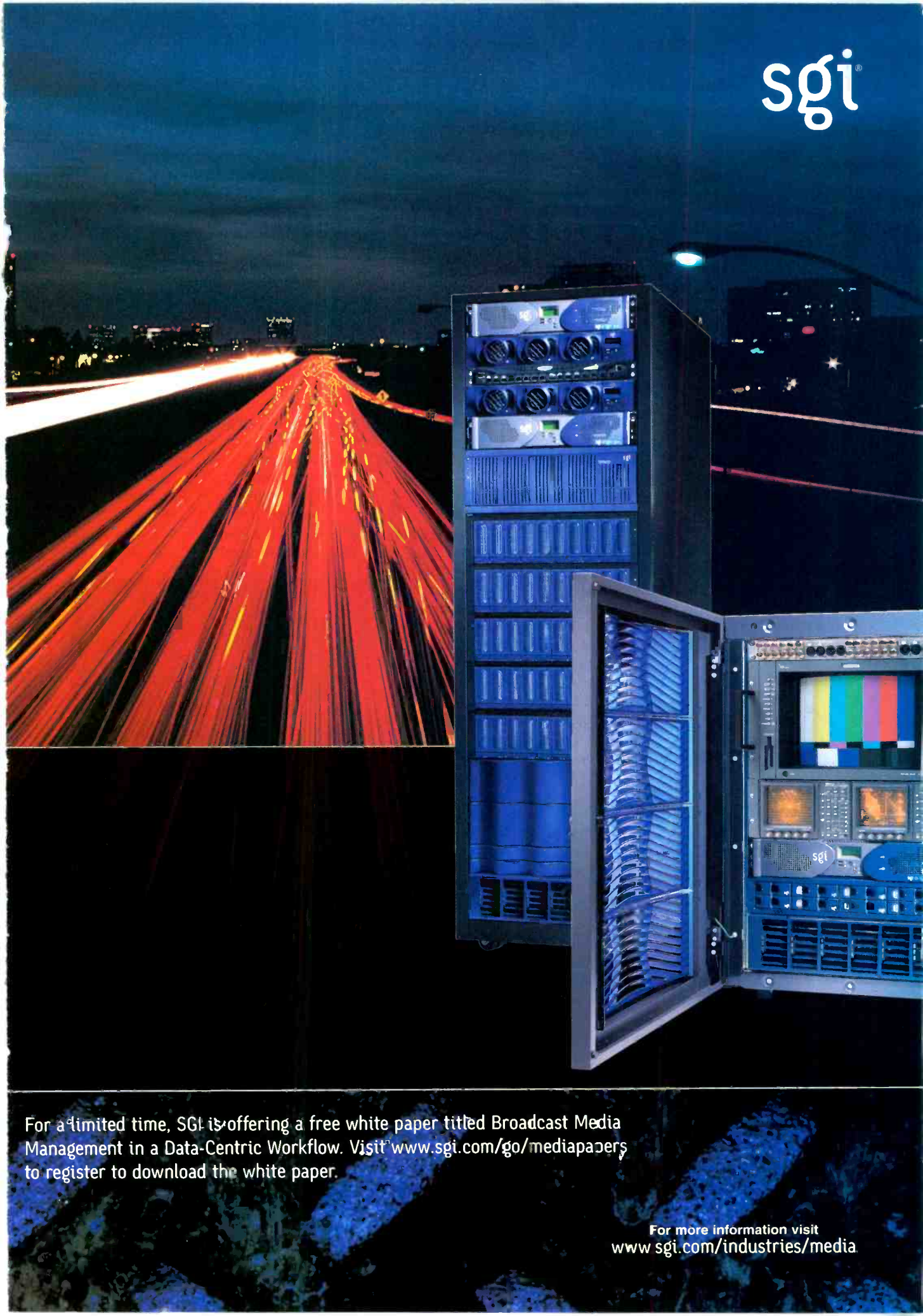
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Managing Media

From Greater Efficiencies to Expanding Outlets, Asset Management Systems Deliver the Goods

At first glance, asset management for TV news departments might conjure up fleeting mental pictures of pin-stripped financial advisors, pitching portfolios and auto-debit plans to grow the newsroom's petty cash account.

But asset management systems for news have nothing to do with stocks, bonds or greenbacks. The assets of television news take the form of interviews, video clips and audio bytes –the stuff of news stories and material that never even makes it to air. They grow quickly. Not only does the 365-day grind of news generation churn out copious assets, but on the scale of a station group or network the amount of media assets generated in a year can be staggering.

"They don't want asset management, they want access to media."
– Jim Frantzreb, Avid.

But beyond the bigger picture of archiving for the long-term, how do stations, station groups and networks manage the media assets they've generated within the last week or month?

What good are these assets, if they can't be found? How valuable would a library be without the Dewey Decimal System, card catalog or on-line stack search? To what lengths would a reporter have to go to find file footage of the police chief announcing his resignation on a Monday when preparing a story about the mayor's successful campaign to keep him on board two weeks later?

System Architecture

Ask most station managers or news directors what they want from an asset management system, and you're likely to get a quizzical look. Rephrase the question and ask them how important it is to get their hands on a desired clip, and you hit pay dirt. "They don't want asset management," said Avid senior product marketing manager broadcast and work group division Jim Frantzreb, "they want access to media."

Stations, groups and networks contemplating an asset management system must decide its fundamental architecture. "Is the system a typical 'hub and spoke' scenario, where material is maintained at a central site, and only sent out to the spoke station for play to air, after which it is purged from the server at the spoke?" asked Omneon vice president of product marketing Paul Turner.

"Does the system allow the assets to exist at the spoke for a pre-determined amount of time? Should there be a lower level asset manager at the spoke in order to deal with material? If the system is peer-to-peer, not only must the asset management systems at each station be of equal capability, but they must be able to communicate with each other in order to ensure synchronization."

In a hub-spoke architecture, a central server holds all digital assets and sends copies of the material to local cache servers. For example, imagine a centralized station group "mother ship" serving out files to cache servers residing at local stations in the group. From the cache server, journalists, news producers, skill editors and others with permission, browse the asset library for the content they desire and download video clips to their computers to create news. When work is done, an edit decision list or a completed story is sent the playout system.

Effective asset management provides a means to retain, catalog and find digitized file footage, but installing such a system requires forethought and consistency.

In a peer-to-peer network, there is no mother ship. Individual stations in the group each have their own servers.

viz|trio 2D/3D CG

viz center americas
vizrt inc.
555 8th Avenue 10th Floor
New York, NY 10018
phone (646)746-0010
fax (212)560-0709
email info-USA@vizrt.com

The **viz|trio** graphics control system from vizrt includes, but is not limited to, all the features of typical character generator (CG) systems. It is based on the **viz|media sequencer** automation/control engine, that features *transition logic*, allowing for automated transitions between all graphics without any operator or technical director intervention... all with one video output!

viz|trio supports traditional call-up code message recall in addition to content entry in a WYSIWYG user interface. Beyond the basic CG features, it contains advancements that deliver new graphical possibilities, along with a streamlined workflow that results in quantifiable economic efficiencies.

Just some of the many operational and workflow efficiencies:

- Seamless integration in **receiving elements from a newsroom system:**

  viz|trio's internal **viz|media sequencer engine** may be connected to an electronic newsroom system using intelligent interface protocol. When receiving new pages through the serial link, the media sequencer will populate/update the correct folder with the received content. The generated call-ups (or changed call-ups) will pop up in one or, when there is more than one, all trio clients.

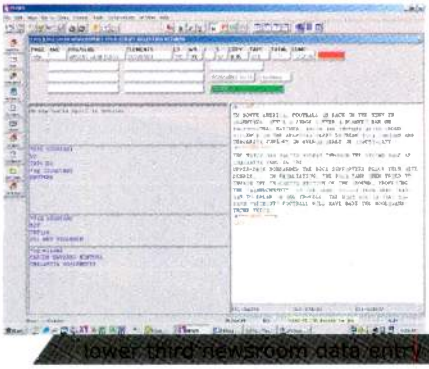
  Call-ups received from a newsroom system may be edited, and saved. If an element is saved onto the same call up number, it may be overwritten by an update coming from the newsroom system. To avoid this, the element may be saved to an unused call-up range instead.

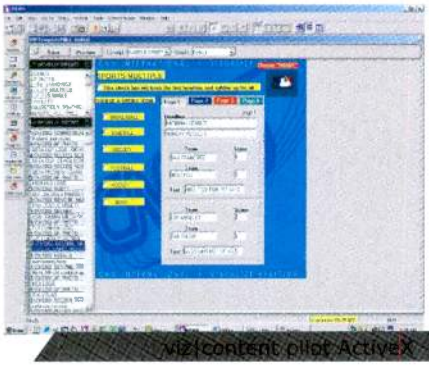
  Independent call-up ranges that don't receive elements from the newsroom system may be used to operate the system independent of the newsroom system. This is useful in a breaking news situation, where bringing content to air fast has priority.

- Writers, reporters and producers can create OTS and full screen graphics **via newsroom system integration of MOS elements through ActiveX templates:**

  vizrt's template based graphics system, **viz|content pilot**, communicates and delivers graphical elements directly into **viz|trio**. In this manner the operator controls all graphical elements with **viz|trio's** play list and WYSIWYG UI. Writers, producers and others may fill templates through the ActiveX MOS compliant version of **viz|content pilot** integrated into the electronic newsroom desktop!


viz|trio user interface


lower third newsroom data entry


viz|content pilot ActiveX

viz|trio delivers 2D/3D realtime graphics and combines the ease of intelligent interface with the power of desktop created graphics, all in a simple, logical, easy to change, graphical user interface.

viz|trio, a streamlined workflow that results in quantifiable economic efficiencies.

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These serve up files to those in the newsroom, but have the added task of being networked to similar servers at each station in the group. Instead of the centralized server handling chores like ensuring the most up-to-date version of a file is served to each cache server, peer-to-peer servers must provide for system synchronization from server to server.

Regardless of the architecture, both approaches require some fundamental housekeeping decisions to be made before going online. What will files be named? How will they be named? How will different versions be managed and systems updated with the latest content?

"It's amazing how important little things are," said Leitch director of product marketing for video servers Eddy Jenkins. "Even without asset management, it is easy for people to ignore this.

"People don't think about a clip naming scheme. Many times we will suggest an approach to people so they can at least have a place to start.

"Beyond clip naming schemes, there's standardizing work practices, which includes naming metadata, and video formats."

"All of this is particularly important when you are going to share among a network of stations. You must have common practices."

"Just as important are the deletion rights," Omneon's Turner added. "If it is deleted, where did it get deleted from? The central server? The cache server? What does it mean to be permanently deleted or archived?

"People employ a kill date in a newsroom because there is a time value to news. It gets aired and then it is yesterday's news. When it reaches a kill date, is it automatically deleted from the server?

"The issue comes down to security. Who can record, delete and edit material? You probably don't want someone who is recording feeds to have edit rights."

Scalability, or the ability to easily expand the size of the system to serve the needs of a greater number of users, is another important network architecture consideration. "Asset management systems can scale," Turner continued. "The complexity of some tasks does not scale linearly, however. This is particularly true in the area of deletion rights. The rules regarding deletion of materials can become significantly more complex as the system gets larger."

"It's amazing how important little things are. Even without asset management, it is easy for people to ignore this. People don't think about a clip naming scheme."
- Eddy Jenkins, Leitch.

Return on Investment

Quantifying the return on investment is not particularly easy according the Quantel business manager for news and sports Trevor Francis. "The chief consideration in establishing return on investment is answering 'If I spend $1 million on this software, can I save or generate $2 million? "As an industry we haven't seen that yet, but it is developing," he said.

One place a recognizable return on investment is beginning to emerge is in sharing media assets within an organization across media outlets. "The ability to distribute assets to other media –not just other stations in a group or network – to the Web and to other outlets like newspapers is bringing substance to the return-on-investment equation," said Chris Golson, SGI's senior director of the media group.

Danish Broadcasting's decision a few years ago to transform its workflow into digital media generation is a shining example of how asset management can bring efficiencies in the newsgathering and production process across media type, said Golson.

"Danish Broadcasting wanted to centralize broadcast television, radio and the Web. They decided to digitize television, radio and obviously the Web. They skipped SDI entirely and went directly to I.T.

"They decided to digitize all their assets so the assets could be used by Web, radio and TV journalists. MPEG-1 is available to radio, Web and TV journalists at the same time, but then their stories are done in their own way to appeal to their own constituent audiences."

The efficiencies Danish Broadcasting realized in news production for all media resulting from the system could have allowed the broadcaster to reduce staff, Golson pointed out. However, Danish Broadcasting used the increased news production capacity to add a three-hour morning news program without increasing the network's costs.

Besides increased efficiencies, asset management systems can improve the quality of the news product, according to Avid's Frantzreb. "The more time journalists have to look at content and to assess that content, the more time they have to work on it and produce better journalism," he said.

Ultimately, better quality journalism is the goal of what happens in a newsroom. Ready to assist reporters and producers, asset management systems give journalists a logical means of storing news clips and retrieving them when needed. With help like that, the value of news assets is sure to compound for years to come

News Tools.

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Changing Times

From Tapeless Acquisition to Remote Transmission, the Future of ENG Promises Dramatic Transformation

The television news business is poised to leap into new, uncharted territory as electronic news gathering enters the brave new world of tapeless acquisition and unconventional remote transmission.

Thanks to advancements from the aligned technological fields of general purpose computing and telephony, news crews in the field will soon be acquiring footage on a tapeless media and sending completed stories and B-roll back to their stations via emerging cellular and Internet technologies.

At the recently concluded IBC 2003 convention in Amsterdam, Panasonic Broadcast along with partners, such as Thomson, unveiled a new concept for ENG, called ING, I.T.-based electronic news gathering. At the heart of the ING rollout are solid-state memory cards –often called Flash memory cards- packaged in such a way as to give adequate storage time for field acquisition applications and convenient interchange with existing computer equipment through common interfaces such as PCMCIA and USB ports.

Tapeless dreams

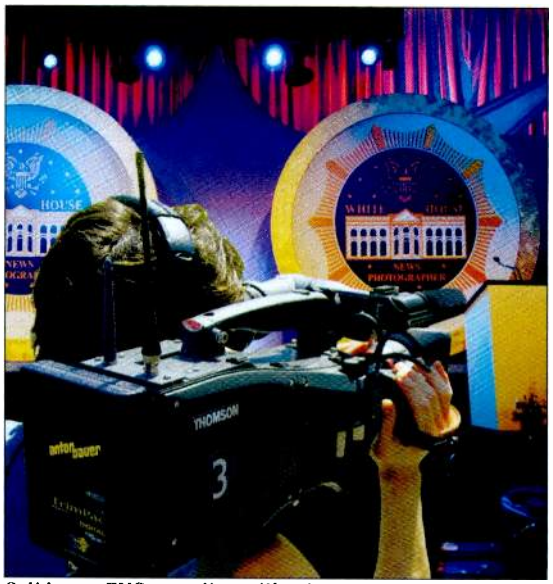
The concept of tapeless field acquisition at Panasonic developed as engineers contemplated the ideal way to relegate tape to the history books.

"A year ago," said Panasonic vice president technical liaison Phil Livingston, "we knew there would be 1 GB SD cards (solid state digital memory cards that Panasonic and others manufacturer for the computer industry).

"If you look inside the SD card, you see a memory chip, a control chip and a bunch of contacts. We said, 'You could take four memory chips and put them in a new package in one PCMCIA memory card.'"

The result was Panasonic's P2 memory card for ING, a 4GB solid-state memory device with a read-write speed 20 times greater than real time for the DVCPro format. Five P2 cards can slide into a new version DVCPro camcorder that's replaced the video recorder with P2 card support. "The only thing in the camera with a motor is the zoom lens," he laughingly said.

Using the SD memory chip also will allow users of the new ING equipment to take advantage of the economies of scale of the computer industry. "We have hitched our wagon to the media driven by MP3 players and PDAs," explained Livingston. "The broadcast industry is a drop in the bucket (when compared to the computer industry). We can ride on the coattails of Moore's Law. Prices will fall, capacity will grow by no great brilliance on Panasonic's part but through the natural evolution of the technology and the market." Panasonic has not yet announced pricing for the P2 memory cards.



Solid-state ENG recording will reduce what stations spend on videotape, cut camera maintenance, and improve journalists' workflow.

Tapeless Possibilities

The elimination of tape from news acquisition presents a number of advantages. On the financial side, doing away with tape dramatically reduces the annual budget line item for the biggest consumable of any news operation. (Tape budgets won't drop to zero anytime soon as legacy equipment continues to be supported.) Additionally, because tapeless acquisition by definition does away with the video recorder portion of a camcorder, there are far fewer moving camera parts to maintain, which translates into lower maintenance budgets.

From the point of view of workflow, tapeless acquisition offers a practical way to edit footage in the field, reducing the demand on editing resources in the newsroom. "One of the single most important features of the new tapeless solutions is their non-linear functionality," said Thomson senior product marketing manager for acquisition and production Mark Chiolis. Thomson announced at the IBC convention that it would support P2 SD-based solid-state recording with future products.

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- Dennis Csillag, Director, KGTV San Diego

"I can't say enough about ParkerVision's technical support, which was excellent."
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than real-time transfer into desktop field editors or the possibility to directly access material without ingesting by simply plugging in a solid-state memory card taken from the camera, and in-the-field editing will become the norm rather than the exception to how news editing is done," he said.

Panasonic's Livingston added: "(Our research showed) the average editing time per news story was four and a half minutes. So you could sit down in the van and cut the story."

On the financial side, doing away with tape dramatically reduces the annual budget line item for the biggest consumable of any news operation.

ENG on a Cell Phone

Point-to-point microwave and SNG transmissions have served the news business well for many years and are likely to continue meeting its needs for the foreseeable future. However, developments in and outside the television industry are making unconventional approaches to sending video from a remote site to the newsroom realistic.

"For SD formats," explained Thomson's Chiolis, "the increasing use of cell or satellite phone connections provides for 'live' or near-live shots from very remote locations, which would otherwise be left uncovered from a visual perspective.

"As compression schemes continue to improve and the possible ganging together of multiple parallel phone lines (becomes a reality), the quality of this could become respectable for use in everyday situations, in the near future."

Another possible avenue for news to reach the newsroom is via WiFi (IEEE 802.11b) wireless Internet connections. WiFi research shows that the number of wireless LAN units grew 120 percent last year, totaling 19.5 million, and that the number of Web hot spots has grown to 70,000, up from 1,200 in 2001. "I could go to Starbucks, if I were a journalist, edit my story and send proxies back to the station via WiFi," said Panasonic's Livingston, who noted that the companies ING equipment supports full-resolution, proxies and everything in between.

Prepared news stories that are wrapped with live lead-ins and out-tros should benefit dramatically from these remote transmission options. After all, what is stored in solid-state memory in an ING camera, for example, are digital files. As such, they can be sent back to the station faster than real-time when broadband microwave links are available and slower than real-time when narrower bandwidth options like cell phones are used. Video degradation will not be a factor as long as there is adequate time to accommodate transmissions that could be as slow as 56k per second over a land telephone line. All that needs to happen is that incoming video data are assembled into a completed file and stored on the station's playout server for insertion between live intros and wraps.

Regardless of exactly how these possibilities playout, the general impact is the same: The dynamics of news gathering are changing.

"Instead of having ENG or SNG trucks or vans," said Thomson's Chiolis, "they probably will (eventually) be re placed by reporters carrying all their equipment in the back of a car or motorbike. The need for large dedicated vehicles will probably be limited."

METADATA MANIA

It's often said that the most common metadata capture format in news is the sticker, pen and ink used to label cassettes shot in the field.

To maximize the benefits from central news servers, asset management systems and non-linear editing stations, more extensive metadata is needed. Gathering it in the field is the ideal solution, and new tapeless acquisition alternatives give reporters a chance to do just that.

"Having metadata connected to material before it hits the newsroom can help news editors and journalists to identify and log the right material easier," said Leitch product marketing manager for newsroom strategy Andrew Warman.

According to Panasonic vice president technical liaison Phil Livingston, including the name of those interviewed, time code information, in and out points for editing and other important metadata is easy with the company's new ING approach to field acquisition. Because the camera's P2 media slides into a laptop computer PCMCIA slot, adding metadata to the footage is simple, he said.

"Additional metadata (more so than just time code) will be available for use," said Thomson Grass Valley senior product marketing manager for acquisition and production Mark Chiolis, "provided that good solid standards are set and agreed upon so that the metadata recorded in the field actually passes and flows through all the equipment seamlessly and without changes or deletions within the downstream equipment.

"Current proposals today include more metadata than most applications would use on a regular basis, as well as leaving openings for future adcitions as new options are introduced and incorporated into daily use," he added.

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I.T. Milestones

Some Road Markers to Look for on the Path to an I.T. Transition

From the point of ingest through playout from the control room, I.T. is transforming how stories are put together and a newscast assembled.

The path from video-based news gathering and production to a system based on I.T. is as predictable as the personalities of all of the news directors, station managers and group vice presidents at the 1,100 commercial television stations in this country.

The number and severity of twists and turns along the path depends on factors like a willingness to change, the strength and negotiability of union work rules and the leadership ability of station and newsroom management.

However, certain milestones are predictable and provide a means of assessing where one stands along the path of transition. Stations still acquiring footage in an analog tape format have a longer road ahead than those shooting digital. Newsrooms relying on a gaggle of tape machine maintenance techs and operators, editors, CG operators, graphic artists, TDs and still-store personnel can safely say they haven't progressed as far as stations that have reshuffled the personnel deck thanks to I.T. and trimmed or reassigned staff to more productive endeavors.

The biggest hurdle on the path to I.T. may be changing attitudes and recognizing video as data not signals.

I.T. Milestones

One of the first milestones to look for is storage. "Robust, scalable storage that is integrated with media workflow and robust and scalable storage that's integrated with the production process are essential," said Avid senior product marketing manager broadcast and work group division Jim Frantzreb.

"Once you have those and they're integrated with the newsroom system and you have the utilities to pass information back and forth and handle various file formats, you are on your way."

Next, the islands of technology begin to give way to total integration. "In the past, editing or graphics happened as standalone processes," said Omneon vice president of marketing Geoff Stedman. "One of the benefits of today's technology is that this concept of an island of technology doesn't have to exist. By changing over to the use of networking and storage, these islands can be eliminated. MOS has enabled discrete processes to talk intelligently to one another and turned discrete elements into a working whole."

The degree to which separate islands can be integrated into a unified I.T. system is limited largely by the ability to share data. Standards are intended to knock down these barriers and make a seamless I.T. workflow possible. The availability and implementation of such standards in a newsroom I.T. system are other important milestones along the path of transition.

"The video industry has had interchange for many years –first NTSC, then component, now SDI," said Omneon vice president of product marketing Paul Turner "Server-based storage solutions added another layer to that: the idea of file formats.

"While raw DV and MPEG files are defined in standards documents, different manufacturers enclose them in

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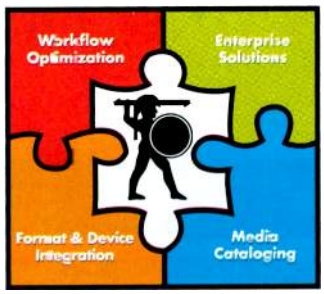

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their own 'wrapper' formats which may render one manufacturer's MPEG clip unplayable on another vendor's equipment. This, of course, is a major irritation to customers, who may have to buy external software/hardware to 'flip' the MPEG file from one flavor to another."

"The customers keep asking for it (seamless interoperability standards)," said Pathfire chief technology officer Joe Fabiano. "The industry isn't where it needs to be.

"Pathfire is committed to finding ways to play nicely with others and make sure the content we bring into a station is available to any number of upstream or downstream devices."

Even more important than video file formats may be standards related to metadata, the embedded information that describes key characteristics about video clips, such as when it was shot, by whom, where and other vital data.

"In the days of tape, metadata was transferred around as a piece of paper attached to the tape box," explained Omneon's Turner. "In the modern file-based environment, this data should be included with the essence –that way it can't get lost. Significant work has gone on in the MXF committee to standardize on the location and format of this metadata. Most manufacturers are now announcing support for MXF, which should be ratified soon."

"All major manufacturers are committed to it (MFX)," said Leitch product marketing manager for newsroom strategy Andrew Warman. "One of the challenges is that the definition is quite broad. A lot of people are looking at confining it to something that is practical."

Changes in Attitude

There's much more to the transition than technology, however. The road to an I.T. future in news begins with attitudes. "If for the last 20 years, you thought in a linear way where everything is recording and routing and you are trying to remove that and think of the process as a place where there are just electrons moving around, it is a difficult thing," explained Leitch director of product marketing for video servers Eddy Jenkins. "Going with I.T. requires you to think in a totally different way."

Pathfire product manager of news Rick Young agreed. "It's a giant epiphany for people to stop thinking about this as video and start thinking about it as files," he said. "It is amazing when you make that transition how many things open to you.

"We are linear creatures in a linear world and when you can get away from that, all sorts of things open up to you. It is a whole new way of thinking about what you can do and how you can do it."

"Engineers are used to looking at baseband video," added Omneon's Turner. "Now it's information."

"The biggest hurdle," he continued, "is getting engineers trained in I.T. practices and getting them as comfortable there as they are with video. Today, stations must undergo a fundamental integration of network technology with the ability to support real-time processes –like baseband video –and non-real-time within the same infrastructure.

"Now every engineer has to have at least a journeyman's knowledge of networking and maintaining networks. Sooner or later, the installation team leaves and the someone has to keep the station working."

Perhaps stations will know they've reached the final milestone on their I.T. quest when they've successfully replaced a linear orientation of thinking about video with the I.T. world view where all data is always available and they have in place the engineers and network specialists to maintain the I.T. infrastructure needed to pull that off.

THE GREAT LEAP FORWARD

The jump to I.T. news production at Danish Broadcasting caused a generational split in the workforce.

Danish Broadcasting is about to complete the second phase of a multi-year project to update its facilities with state-of-the-art I.T. infrastructure to assist in the production and distribution of entertainment, news and other programming.

What makes the installation interesting, is Danish Broadcasting's decision to skip SDI. "The person in charge is an I.T. man, not a broadcaster," said senior director of the SGI Media Group Chris Golson. "He decided to skip SDI and jump immediately to I.T." SGI has supplied the broadcaster with consulting services and servers for the project.

"In this way, they can share assets, and the first rule is anything that comes in before anything happens has to be digitized," said Golson.

Danish Broadcasting's modernizing of workflow through I.T. has caused a generational rift. "Skipping SDI has impact in terms of generations –age groups," he said. "They have split their organization in two. The younger generation works with I.T. and the older works online. They have transformed news and sports to be done with the new I.T. approach and moved older workers to areas where production is still done with tape."

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Ai's e2v ESCIOT five-stage depressed-collector IOT installed in a high-power amplifier cabinet. This dual-use tube is designed to maximize efficiency and minimize costs in both analog and digital operating modes.

Dual-mode MSDC IOTs

Saving money in both analog and digital

BY ANDY WHITESIDE AND RAY KIESEL

The future of broadcast TV is digital, but the future isn't yet here. There are a considerable number of digital TV stations operating in the United States, but the broadcasters who operate them rely almost exclusively on their analog signal for revenue. It's no surprise that many broadcasters are taking another look at their analog transmission plant to ensure that the engine for their major revenue stream will remain viable for what now appears to be an indeterminate number of years. In many cases, that analog transmission plant uses aging technology that is expensive to operate and maintain. In addition, spare parts and replacement tubes are becoming increasingly difficult and expensive to obtain. Older transmitters also lack modern safety features, perhaps exposing station personnel to unsafe conditions, and exposing the station itself to considerable liability. Replacing an aging analog plant with a modern inductive output tube (IOT) transmitter using the latest multi-stage depressed-collector (MSDC) technology could prove to be a wise investment for many broadcasters, particularly if the new transmitter can be converted easily to digital service in the future.

Recent developments

In the last 10 years, developers have made significant advances in transmitter technology in the areas of predistortion, control and monitoring, solid-state amplification and high-power linear amplification, to name a few. There is no fundamental reason why broadcasters cannot apply these advances to analog transmission. This would offer immediate benefits in terms of reduced power and maintenance costs, improved reliability, increased available building space and enhanced safety. In some cases, the resulting power savings alone in a new plant can pay back the investment in less than five years. For the several hundred stations that still need to build out full-power digital facilities, new analog transmitters offer the added benefit of being readily convertible to digital service at the appropriate time.

There is no fundamental reason why broadcasters cannot apply advances in transmitter technology to analog transmission.

The advent of IOT technology in the early 1990s truly enabled the adoption of common amplification as the dominant amplification mode in broadcast transmitters. This technology allowed transmitter designers to eliminate

Parameter	Digital at 30kW	Analog at 60/6kW	
Signal level	Constant	White APL	Black APL
Stage 1 current	180 mA	100 mA	178 mA
Stage 2 current	0.5 A	0.25 A	0.83 A
Stage 3 current	0.5 A	0.35 A	0.8 A
Stage 4 current	1.1 A	1.05 A	0.94 A
Stage 5 current	1 mA	0.4 mA	0.2 mA
Total current	2.28 A	1.75 A	2.75 A

Table 1. Electrode currents in a five-stage depressed-collector IOT during digital and analog operation. Transmitter designers must consider these differences when designing dual-use transmitters.

major differences between equipment optimized for analog service and that optimized for digital service, giving the broadcaster maximum flexibility to accommodate future requirements.

The design of a high-power UHF TV transmitter is so strongly influenced by the choice of the final amplifier device that selecting that device can become the determining factor in achieving the goal of dual use. For the past 10 years or so, the IOT has been the dominant choice as the final amplifier in high-power UHF transmitters. It is ideally suited to amplify signals of any TV format. The newest range of high-power IOT transmitters adds the field-proven energy-saving feature of collector depression to the already efficient IOT. Major tube suppliers offer several multi-stage depressed-collector (MSDC) IOTs, with differing numbers of depressed stages and cooling methods. It appears that the best compromise between efficiency enhancement and practical collector manufacture results from collectors with five individual stages, as was the case with the MSDC klystron.

Most developers of MSDC IOT transmitters have focused their efforts on DTV performance. But it has become clear that analog TV still has a primary role to play in maintaining station profits, so developers have refocused their efforts to enhancing the performance of these new devices in analog service.

Dual-use concerns

The typical high-power IOT amplifier can provide a power level of 25- to 30kW average in DTV service and 60- to 70kW peak sync in analog service. Conventional IOT devices with these power levels have been available for several years. In fact, the physical structure of the IOT and elements such as the electron gun were primarily designed for the demands of analog service, before they proved to be more than adequate for digital applications. But reversing this approach and optimizing the IOT elements for digital service can compromise the tube's analog power-handling capability.

The defining difference between conventional and depressed-collector IOTs is the collector structure. The principle function of any collector, depressed or otherwise, is to dissipate the "spent" energy of the electron beam efficiently and safely under all signal conditions. Since the spent electron beam has a distribution of energies, the MSDC's multiple collector stages, which are set at discrete and different voltages with respect to ground, can "sort" the electrons by energy and recover a significant percentage of the electron beam's energy, thus reducing power consumption. A DTV signal distributes the electrons in a fairly well-defined and effectively static manner over the internal surfaces of the collector. This predictable electron distribution allows designers to select the collector stage voltages to distribute the spent beam relatively evenly, in terms of electron current, thus reducing the average power density and making cooling the tube easier. But a collector designed for these static DTV currents is not suited for full-power analog service. The NTSC signal is amplitude-modulated, and the energy spread in the spent beam is significantly different at different picture levels. Amplifier designers must account for this effect when designing the collector, the cooling system and the high-voltage power supply for dual-use tubes.

Table 1 shows the currents at each electrode in a five-stage depressed-collector IOT under digital and analog signal conditions. (The stage-1 electrode is at ground potential and the other electrodes are increasingly more negative with respect to ground.) APL is average picture level.

Consider the consequences of a transmitter designed with maximum ratings based on the collector electrode current in the "Digital – 30kW" column in Table 1. To ensure that the tube's ratings are not exceeded in analog service, the maximum analog power rating of the IOT and transmitter would need to be reduced to well below that of an equivalent non-depressed-collector IOT.

	DTV	NTSC
Transmitter output	60kW avg.	120+12 kW
IOT output (includes RF losses)	66kW avg.	130/13kW
Quantity of IOTs	2	2
Standard IOT efficiency[2]/FOM[3]	38 percent	100 percent
ESCIOT efficiency/FOM	58 percent	149 percent
Percentage improvement	53 percent	49 percent
Standard IOT power consumption	173.1kW	144.7kW[1]
ESCIOT power consumption	113.4kW	97.1kW
Reduction in IOT power consumption	59.7kW	47.6kW
IOT percertage reduction	34.5 percent	33 percent
Reduction in TX power consumption[4]	57.2 kW	44.0 kW
TX percentage reduction	28.7 percent	26.7 percent
Annual savings at 8 cents/kW-hr[5]	$40,086	$30,835

Note 1. *The signal level for the NTSC data was 50 percent average picture level with 10 percent aural.* ***Note 2.*** *The term "efficiency" is used for digital operation. It is equal to average RF output power divided by average DC input power.* ***Note 3.*** *The term "figure of merit" or "FOM" is used for analog operation. It is equal to (peak visual + average aural) divided by average DC input at a defined signal level: 50 percent average picture level.* ***Note 4.*** *The transmitter (TX) power consumption is slightly reduced due to increased losses in the multi-stage high-voltage power supply and the additional consumption of a small pump in the de-ionized water loop for the ESCIOT.* ***Note 5.*** *Annual savings calculation is based upon 8 cents/kW-hr and 24x365 hours per year.*

Table 2. In a typical dual-use transmitter configuration (i.e., two IOT high-power amplifiers in parallel), an ESCIOT uses less power than a standard IOT, in both digital and analog operation.

Therefore, amplifier designers should follow the proven principle of designing for the worst case — in this case analog — when designing a transmitter for true dual-use applications.

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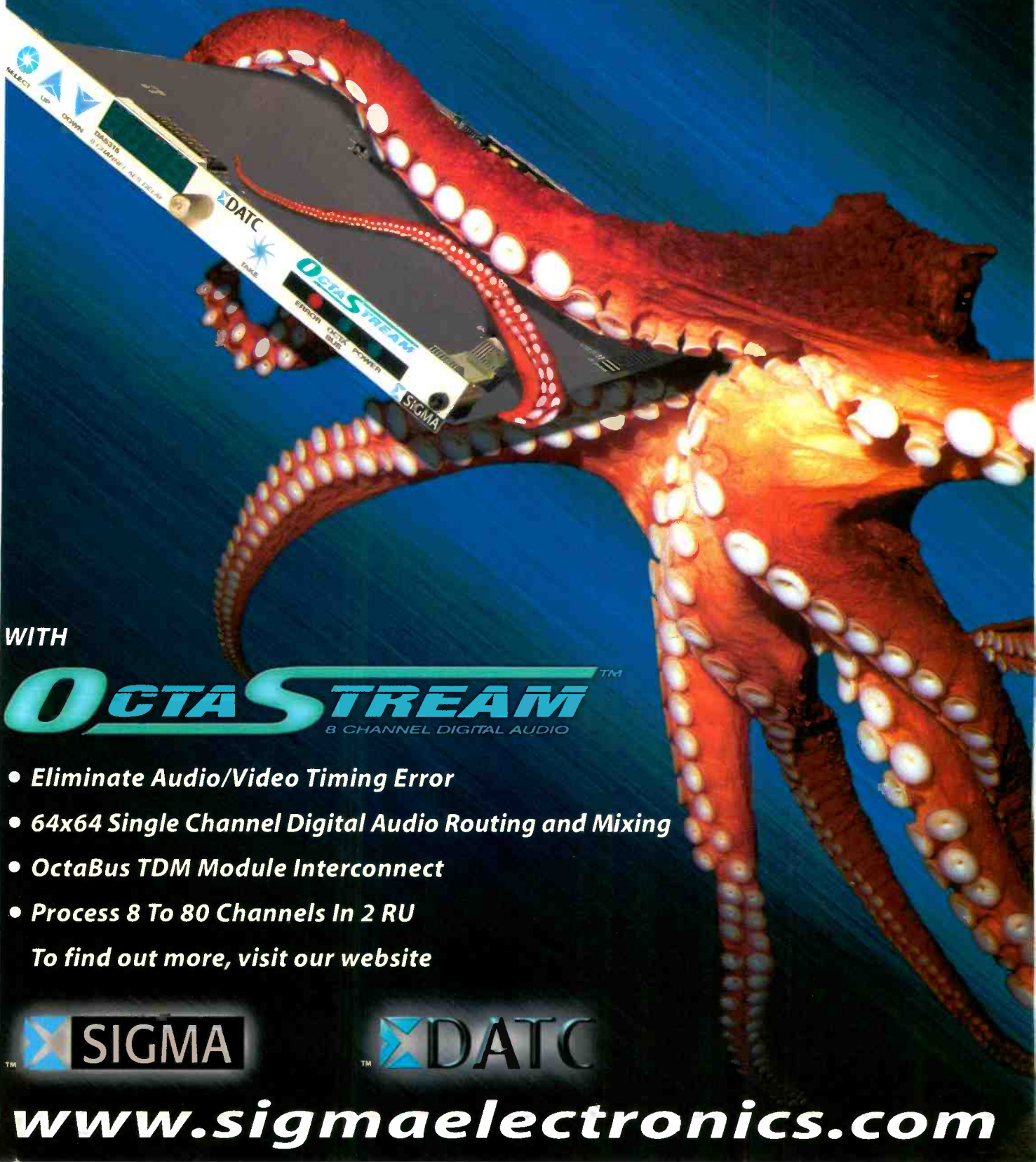

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MSDC IOT economics

The ultimate purpose of the depressed collector is to reduce the broadcaster's power costs and thus enhance profits. Table 2 on page 104 compares the performance of a standard IOT with that of a particular type of five-stage depressed-collector IOT called an energy-saving-collector IOT, or ESCIOT, in a typical transmitter configuration (i.e., two IOT high-power amplifiers in parallel).

Two things are worth noting from Table 2. First, the ESCIOT tube is capable of full-power operation in both digital and analog modes. Second, contrary to some manufacturers' recent claims, this depressed collector reduces power consumption by the same percentage whether operating in digital or analog mode. In other words, this tube can help broadcasters minimize product differences for analog and digital operation. Of added interest to the transmitter designer and the end user, these improvements are obtained by using only two additional high-voltage outputs from the high-voltage power supply, since two of the five ESCIOT collector stages are actually connected to other stages. Figure 1 shows a simplified schematic of the tube's high-voltage connections.

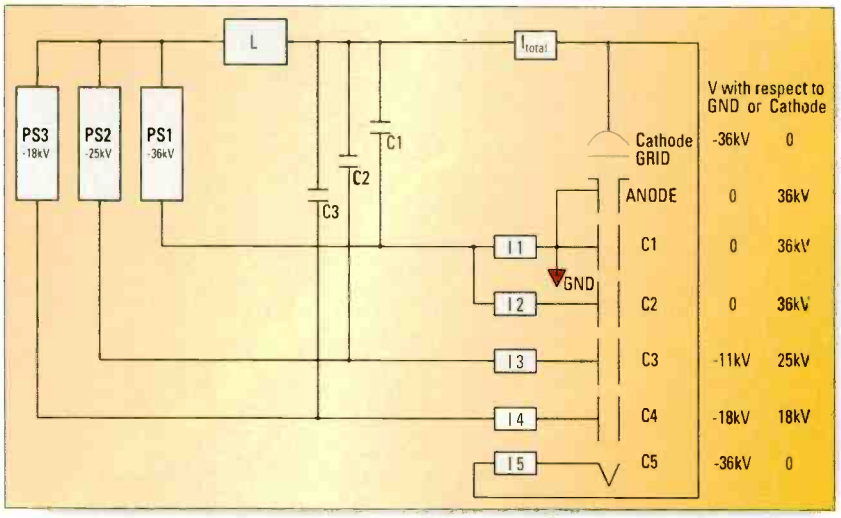

Figure 1. A simplified schematic of the high-voltage connections for the five-stage ESCIOT shows that it uses only two additional outputs from the power supply.

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Broadcasters can achieve efficiencies equal or close to those in Table 2 at lower output powers by matching the tube's beam voltage to the required power, in accordance with the tube manufacturer's recommendations.

Analog performance

Although an ESCIOT-equipped analog transmitter offers 30 percent lower power consumption than the standard IOT transmitter, it is unlikely that this would be considered sufficient savings to justify the replacement of relatively new NTSC IOT equipment, since most IOT transmitters are less than 10 years old. But there are a significant number of aging klystron transmitters still in use, and replacing these transmitters with a new ESCIOT-equipped product is a viable option. Table 3 compares the costs incurred when using a standard klystron with those incurred when using a five-stage ESCIOT in an analog transmitter.

Table 3 assumes that the klystron transmitter operates in a non-pulsed mode. If the transmitter operates in a pulsed mode, the savings would be less than $198,747, but would still exceed $125,000 per year.

	NTSC at 120/12kW output, 50 percent APL	
Type	Standard klystron	Five-stage ESCIOT
Quantity of tubes	3	2
HVDC power	366.0kW	102.6kW
Cabinets	13.0kW	13.0kW
Cooling system	30.0kW	9.8kW
Total transmitter plant	409.0kW	125.4kW
Annual power cost at 8cents/kW-hr	$286,627	$87,880
Annual savings	0	$198,747

Table 3. Using a five-stage ESCIOT in an analog transmitter, as opposed to a standard klystron can provide significant savings.

Other dual-use transmitter components

So far, we have discussed the IOT — perhaps the most costly component of the high-power transmitter — in some detail, particularly in relation to minimizing the difference between analog and digital service. But what of the other critical components? Exciters that require only the exchange of one module to convert from analog to digital service are now available. Furthermore, at least one exciter has a front-panel interface that allows the user to set it to any UHF channel without having to change any components or tune RF circuits. The IOT driver amplifiers for this exciter are fully broadband, allowing operation on any UHF channel.

Conclusion

The NTSC signal will probably remain a TV station's main source of revenue for several years to come, so replacing aging high-power UHF transmitters now might be a prudent move for some broadcasters. Recent changes in the tax law pertaining to accelerated depreciation may provide further financial incentive to make this move, increasing power savings and enhancing bottom-line benefits for the station.

Modern, water-cooled MSDC IOT-equipped transmitters offer many broadcasters immediate benefits in either digital or analog service and provide maximum flexibility for future conversion to DTV service. BE

Andy Whiteside and Ray Kiesel are engineering vice presidents at Ai.

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ADAM Systems' ADAM-1000

BY MIRIAM BUZI

Broadcasters increasingly find themselves between a rock and a hard place. Facing stiff competition, they have a growing need to differentiate and improve their offerings. At the same time, they are confronting mounting fiscal pressures and government edicts to adopt HDTV. To cope with this predicament, broadcasters need faster, cheaper and more effective ways of creating, repurposing and handling valuable digital rich media content, also called digital assets.

A new-generation digital asset management solution, based on a scalable desktop platform, has been created to address this challenge. Called the ADAM-1000, it can be inserted economically into broadcast operations to accelerate, automate and control the receipt, cataloging, management, tracking, creation, processing, duplication and distribution of digital content.

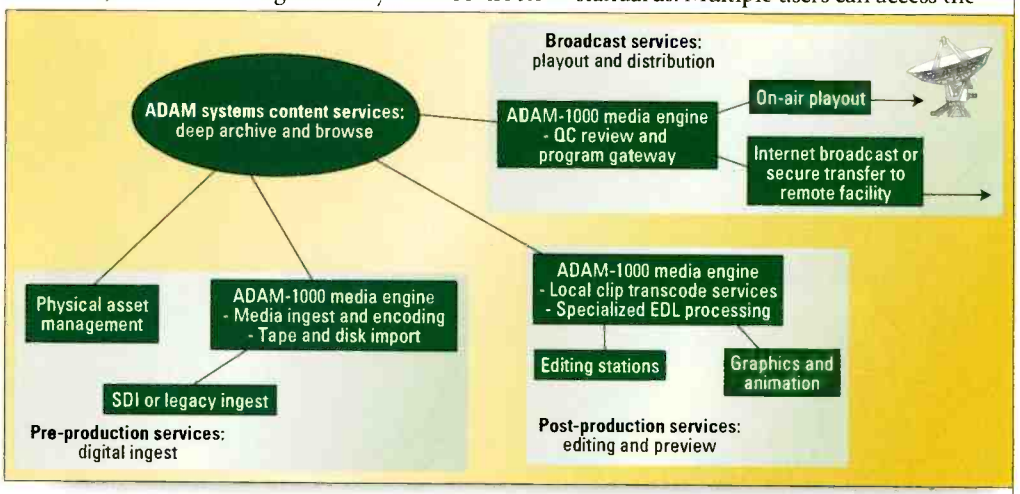

Figure 1. The ADAM-1000 is able to generate and distribute final image, audio and video products quickly and cost effectively.

Advances made in the computing, storage and digital asset transformation realm have been leveraged into an affordable, desktop-sized media processing and management engine that is built upon the core software functionality found in high-end digital asset management solutions. This system offers broadcast operations personnel the ability to generate and distribute final image, audio and video products quickly and cost effectively. Streamlined file cataloging, central control of access rights and collaborative processing across multiple departments improve workflow and minimize costs by reducing the number of promotional shorts, print ads, digital masters and supporting collateral that have to be duplicated and distributed.

The management system co-hosts Unix and Windows operating systems, and can manage more than 10,000TB of digital assets in any combination of online, near-line and offline storage. It can support legacy video technology found in many broadcast facilities using interfaces such as SDI, Gigabit Ethernet, Fibre Channel, SCSI, USB and ATM. Its application Web client interface is certified to work with Internet Explorer and Netscape on Windows and Mac. Further qualified storage components include equipment from Ampex, StorageTek, IBM and Sony, among others.

The system can ingest and distribute MPEG-1, MPEG-2, QuickTime, RealMedia, Windows Media, JPEG, TIFF and more. Composite NTSC and PAL also are supported. The ADAM-1000 also can be tailored to suit specific workflow and user interface needs and is adaptable to changes in formats and standards. Multiple users can access the system via a Web-based browser, in real time and regardless of location. Editors, producers and other creative personnel have the ability to access a central database of application software and pre-approved digital assets. This gives instant access to all authorized personnel looking for that perfect image or clip, eliminates re-shoots and duplicates, and dramatically shortens the feedback cycle from the creative and legal side — resulting in a quick ROI.

The ADAM-1000 can be tailored to suit specific workflow and user interface needs.

The system also is designed with customizable browser-based graphical user interfaces and a modular architecture. This allows each facility, network or affiliate to have a custom-designed interface that is instantly recognizable to its staff — shortening the learning

curve. The extensive design uses a mix of data formats, with the option to add new formats at any time. Database fields are Unicode-based, allowing users to choose character sets from several different languages. The ADAM team can tailor each solution to the precise client needs for ingest rate, storage capacity, retrieval speed and simultaneous networked users, as well as to accommodate software tools that need to be integrated at the client end.

Another concern of the broadcast industry is providing secure partitioned storage of its virtual repositories. The asset management system incorporates comprehensive multi-level security schemes, which include control and monitoring of user privileges, workstation access, system administration, and product distribution. In addition, the administrative controls include security logs that track and permanently record each and every transaction, file retrieval or distribution. Distribution can be controlled by rules limiting export of files according to predetermined classification categories.

Broadcasters are focusing on preserving their brand-related assets — whether they be promotional spots, collateral, vintage clips or old films. The system allows the user to indefinitely preserve digitized assets, even if they are seldom or no longer used. In the digital domain, the assets may be retrieved for on-air playout, replicated or repurposed to help generate additional revenue streams. This not only creates a centralized repository of content that can be repurposed and re-used indefinitely, but also assures a quicker time to market — a needed edge in today's competitive world.

As the broadcast industry moves toward automated, shared processing and storage solutions for digitized media, there will be a need for cheaper, faster and better digital asset management architectures that provide multi-level security, advanced processing, and efficient access to file types by remote and local users. Digital asset processing and management technology will become a crucial element in posting content for initial release or distribution, repurposing that content to exploit its intrinsic value, and finally, preserving it for future generations. The goal of any digital asset management solution is to intelligently retrieve and distribute the right digital media file in the right format to the right place at the right time — paving the way to cost savings associated with streamlined workflows and opening up new avenues of revenue generation. The ADAM-1000 is a step in the right direction. **BE**

Miriam Buzi is a senior vice president of ADAM Systems Group of Advanced Software Resources.

Evertz monitors for DIRECTV

BY NEWTON BUCHNER, JR. AND ARIEL PANGINDIAN

The Los Angeles Broadcast Center (LABC) transmits nearly 700 channels to DIRECTV customers across the nation. The broadcast operations center (BOC) at the LABC serves as the final quality control point before these signals leave the building. The BOC monitors video, audio and program-associated data feeds as they are processed through various systems in the facility. These include raw incoming signals, uplink signals, and downlink signals as seen by home viewers.

With so many signals, monitoring is obviously crucial to the company's operations. Early this year, DIRECTV installed Evertz 7761AVM2-DC video and audio monitoring systems to enhance its signal monitoring capabilities. These frames send SNMP data to a central monitoring system known as VistaLINK, which presents signal status in an easy-to-read format, and provides monitoring and configuration control via a simple client application for flexibility in administration.

The system resides in technical services and broadcast operations. The broadcast control rooms use a client and monitoring application with a 15-inch LCD monitor showing a graphical representation of all broadcast control room monitor walls. Each operator can effectively monitor any room from a single station.

The discrete channel monitoring system offers a marked improvement over the tedious, manual labor of the facility's previous monitoring environment. Operators now can recognize errors in audio or video signals much faster. Previously, they had to scan through more than 150 channels to ensure that audio and video were present and the associated signals were correct. They had to visually "catch" common technical impairments before restoration work could begin. The Evertz system simplifies the process and reduces outage time by quickly detecting such errors and presenting them to the operator in an easy to digest format. When a channel is in a normal state, the graphical representation on the CPU display is green. When the system detects a service issue such as loss of video, audio or synchronization, the button depicting the service flashes red, accompanied by an audible alarm. This alerts the operator to call up that channel on the "critical stack" portion of the monitor wall for a closer look. Double-clicking on the channel GUI opens a separate text display that lists the description of the issue, time the event occurred and an area where the operator can "acknowledge" the alarm.

The operator then can troubleshoot and call technical services if needed. Once the issue has been rectified on the channel, the system will automatically check a "corrected" box, and the system will show green again.

The system keeps outage time low and customer satisfaction high, so the potential for lost revenue is reduced.

The monitoring system also monitors its own health. When the system cannot communicate between its main server and a card within one of the server's frames, an alarm is sent to the broadcast operations and technical services departments to let them know that networking communication has been lost with one of the units, requiring immediate attention.

Both technical services and broadcast operations can alter configurations within the system. Technical services can reconfigure the system to match graphical grids with new corresponding signals during occasional transponder swaps.

The LABC's control rooms utilize Evertz's VistaLINK to provide operators with a graphical representation of all rooms' monitor walls, enabling a single operator to monitor any room from a single station.

The broadcast operations department can add or delete services and change threshold parameters. For instance, if a threshold is set for loss of video at 30 frames, those parameters can be changed if a program is scheduled with still images of longer than 30 frames.

The system should not be viewed as a tool that replaces the operator, but as a flexible and reliable way to assist the operator and streamline the error correction process. The system keeps outage time low and customer satisfaction high, so the potential for lost revenue is reduced. **BE**

Newton Buchner, Jr. is broadcast operations manager, and Ariel Pangindian is a supervisor in technical services, for DIRECTV's Los Angeles Broadcast Center.

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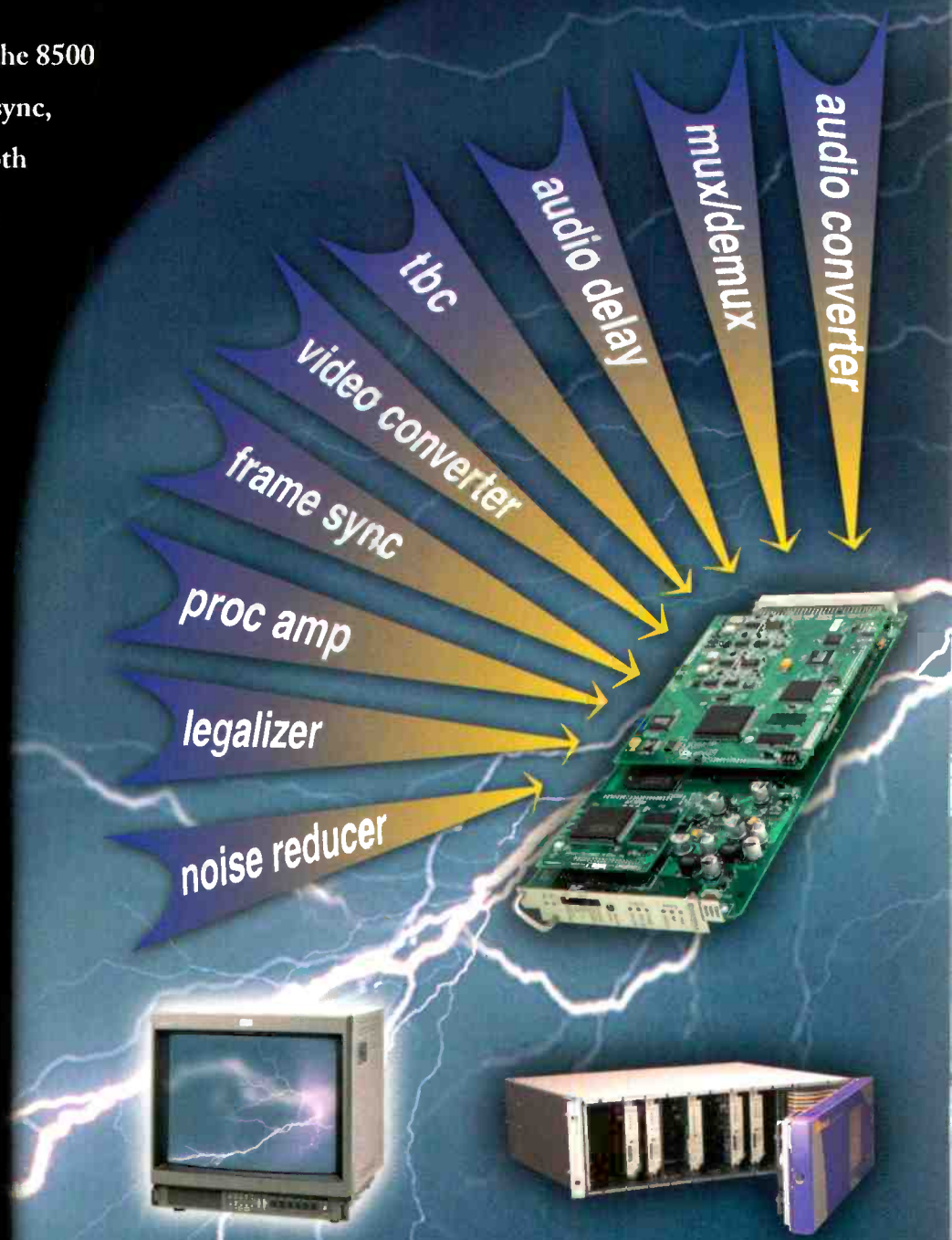

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Turner Studios
patches audio with Switchcraft

BY PETER YOUNG

Turner Studios, the in-house production studio for Turner Broadcasting, was established in the late 1990s to phase out external post-production work and cut costs. Since that time, the facility has grown tremendously, including the addition of seven new audio rooms, four of them in the past year. Among the equipment serving these audio rooms are several patchbays. In an audio production room, patchbays allow the operators to connect, disconnect and reconnect equipment to meet the ever-changing requirements of production dynamics.

What is normal?

The face of an audio patchbay has connectors arranged in pairs of rows. Each connector in the top row can be paired with the one immediately below it. Such a pair can be considered a crosspoint. The way one crosspoint connector relates to its counterpart is called normaling. A pair of connectors with no normaling is not connected; the signal coming into the back of the top connector ends there until someone plugs a patchcord into the connector to carry it elsewhere. For a pair with half normaling, the signal going to the top connector is pre-wired to the bottom one. Plugging a patchcord into the bottom connector in a half-normaled crosspoint will break the connection between the top and bottom connectors. In full normaling, the top connector is pre-wired to the bottom one, and the act of plugging a cord into either connector will disconnect it from the other.

Punchdown problems

Most audio patchbays are made so that production-room operators can pre-wire the normaling of each pair of connectors by attaching jumper wires on the back of the connectors with a special "punchdown" tool. Most of the Turner Studios facility is equipped with such punchdown patchbays. And, for a while, the facility found these patchbays to be adequate. But setting and re-setting the normaling jumpers is a tedious process, and access to the rear of a patchbay can be difficult when it is mounted in large racks with other equipment. There are other patchbays that use insertable cards to set the normaling for each crosspoint. They are less cumbersome than the punchdown patchbays, but they still can be difficult to use in a fully wired patchbay. For these reasons, and in light of Turner Studios' continuing expansion, the facility decided to explore new options.

Turner Studios chose Switchcraft EZ Norm patchbays for the equipment room serving sound design rooms 22, 23, 24 and 25. Each room's section on the patchbays is color-coded.

Why not routers?

We considered using audio routers, but realized they wouldn't fit the bill for several reasons. The first is cost. Routers are expensive. For an audio room with only about a hundred crosspoints, a router is overkill. Also, the four newest audio production rooms, designated sound-design rooms (SDRs) 22, 23, 24 and 25, were to be isolated from the rest of the facility and were built specifically to serve the needs of two particular networks within Turner Broadcasting. Two of the four rooms were built to serve TNT Latin America, while the other two were built to serve Cartoon Network Latin America. These clients did not want to bear the expense of buying routers and tying them in with

This patchbay would allow the operators to set the normal for each crosspoint simply by rotating switches on the front panel.

the rest of the facility. The second reason for not using routers is that they occupy quite a bit of rack space. The third reason is complexity. Routers require a fair amount of time and effort to program. By contrast, patchbays are relatively inexpensive, small and simple.

Making a switch

With routers eliminated as an option, we turned our attention to patchbays. During this time, a demonstration of the Switchcraft EZ Norm patchbay at the Turner facility in Atlanta revealed an unusual new feature. Each pair of crosspoint connectors on this patchbay has a small, rotary, front-panel switch that allows the operator to select or change the normal setting for that particular crosspoint with the twist of a small, slotted screwdriver. This feature eliminates the problems that we encountered when normaling the punchdown patchbays. Instead of facing the difficulties of gaining access to the electrical connections at the back of the patchbay and using awkward punchdown jumper connections and tools to set normals, this patchbay would allow the operators to set the normal for each crosspoint simply by rotating switches on the front panel. Seeing this made it an easy decision to go with the patchbay.

Current and future use

Turner Studios purchased seven EZ Norm patchbays to serve SDRs 22, 23, 24 and 25, and the engineers installed them in a central machine room that serves these four audio rooms. The installation proceeded without a hitch, and the patchbays are making the operators' lives a little easier. The facility is still expanding, and it plans to purchase more of the patchbays for two additional audio production rooms, which are soon to be built. BE

Peter Young is a broadcast engineer at Turner Studios Engineering.

MGE's UPS
protects KTVT against dead air

BY BILL WISE

As a CBS-owned television station, KTVT (CBS11) in Ft. Worth, TX, is held to the highest operational standards. When the transmitter stops broadcasting for more than three seconds, a call to CBS headquarters in New York to explain why the station is off the air is required. Unfortunately, the Dallas-Ft. Worth area is well-known for its wild weather, and the transmitting towers (and the power lines that keep them going) seem to be magnets for weather-related problems. While nothing can be done about the weather, part of my job is finding ways to take care of the effects. Installing a heavy-duty uninterruptible power supply (UPS) in October 2002 has helped immensely. In spite of several bouts of severe weather, the systems have stayed on the air. Before installing the UPS, the system went down as often as three or four times a month.

Installing a UPS was an obvious solution, but finding the appropriate UPS for the station's analog and digital equipment was not as clear-cut.

This UPS employs fault-tolerant circuitry to handle high current inrush without risk of damage to the inverter.

Although the station has redundant input from two utility substations feeding Russell Electric switchgear and a 750kW Caterpillar generator for emergency power, the sensitivity of broadcast equipment made selecting the right UPS critical. With guidance from MGE UPS Systems and Critical Site Solutions, we installed an 800KVA EPS 6000 Series UPS from MGE. The unit provides backup power for the entire analog and digital plant as well as the blowers for the HVAC system.

Having a UPS available to protect against momentary outages and bridge the gap until the generator starts up is important, but the real benefit for transmitting equipment is protection from the crowbar effect. Any time we lose power for more than a couple of seconds, the transmitter's crowbar protection circuit essentially puts a dead short across the IOT's power supply, taking 35,000 volts of DC to ground instantly and demanding an enormous inrush current. It's designed to protect the IOT from things such as internal tube arcs, but it results in premature wear. By using a UPS to avoid these glitches altogether, we eliminate a lot of maintenance and replacement costs. Since the tubes cost $35,000 each, it takes only a few failures to justify the added protection. We found that MGE's UPS systems were the only units that could handle the current without immediately going to bypass.

IOT transmitters place special demands on a UPS. To handle the short on the output, the UPS must provide current for the duration without sagging the voltage on the critical bus. Alternatively, if the static switch is beefy enough, it can effectively transfer the output to the utility line, allowing the extra force of the utility to clear the fault current. If the UPS inverter output sags during the crowbar, it may drop other electronic loads sharing the UPS output. Also, if the UPS inverter is not able to tightly regulate the voltage during these "step loads," the voltage may stray out of tolerance when the crowbar clears, which can be devastating for sensitive devices like transmitter tubes.

The 800KVA MGE system we installed provides power to keep KTVT's transmitters and other equipment going for about 10 minutes – plenty of time to keep critical systems running while the generator goes through at least three start-up cycles. In midsummer the total load on the UPS adds up to about 585KW. When power is restored, the generator shuts down automatically and the system synchronizes back to the utility. When we installed the UPS we noticed that our normal utility input is higher than the standard 480V. All of the transformers in the building were adjusted to this higher voltage. To maintain synchronization, we had to adjust the UPS to produce the slightly higher voltage. MGE's factory service techs were accommodating for this and other parts of the installation.

The unit provides backup power for the entire analog and digital plant as well as the blowers for the HVAC system.

KTVT's investment established its worth many times over. The UPS has all but eliminated dead air resulting from weather and power-related disturbances. We had a big series of lightening hits at the beginning of the year. Every station with transmitters in our area went down during the thunderstorms, except us. BE

Bill Wise is the transmitter supervisor for KTVT in Ft. Worth, TX.

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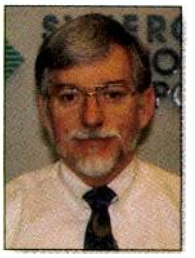

BY JOHN LUFF

Most of us know what we mean by "conversion." In the transmission world, one may speak of "turning around" a signal from a C-band transponder to a Ku transponder. It might well be useful to think of digital conversion in the analog to digital conversion instance in the same context.

The science of analog to digital to analog conversion is one of taking a representation of reality (i.e. an image projected onto a sensor, which outputs a synchronous stream of electrons we think of as a continuous image). It is no less sampled than a digital video signal but, given infinite bandwidth, it is a good representation.

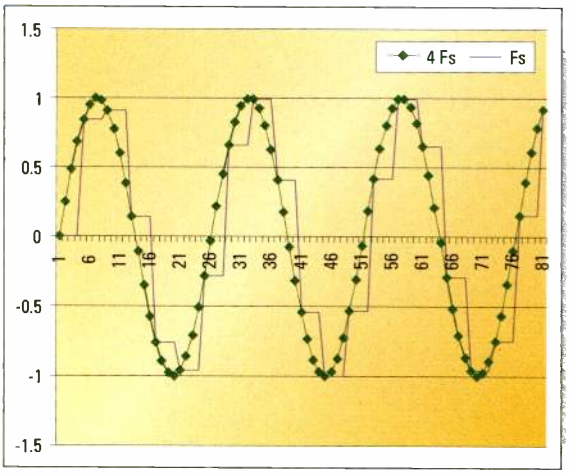

Figure 1. When the same data is sub-sampled at one-fourth of the sampling frequency, the reconstructed waveform is much harder to recognize as a sine wave.

Digital representations can offer the same, for the difference is only a matter of how many bits it takes to represent reality. Theory shows that perhaps it takes 208 million bits uncompressed to represent a 525/625 image adequately. It would no doubt also show that there is no real advantage to doubling the number of bits, for the frequency being represented is less than half of the sampling frequency. In Figure 1, the same data is sub-sampled at one-fourth of the sampling frequency, with the predictable result that the reconstructed waveform is much harder to recognize as a sine wave.

The number of bits is dependent upon just how much reality you want to represent. In Figure 1, doubling the sampling frequency might improve the result, but the difference would be slight. Clearly, perception becomes reality in digital.

Other conversions include encoding to compressed formats, color space conversions, scan format conversion, upconversion to HDTV formats or the reverse. It is representing data taken in one "universe" in a parallel universe. If we focus on the narrow definition, we miss the impact of the fact that we do conversions everyday and now cannot live without them.

In the context of more traditional usage, conversion is often used to denote simply the garden variety conversions between analog 525 or 625 video and their digital video equivalents. These conversions were once relatively expensive and now can be done for about the cost of an analog video DA — at monitoring-quality that is. High-quality conversion remains much more expensive, often topping $2000 for composite analog to component digital conversion. Some of the most critical tricks are in the filtering done in either the digital or analog domain.

Another important part of the conversion equation is removing the imprint of the composite color coding from the luminance signal without trashing the signal too badly. Component digital video looks fantastic, and it is the best way to input video to compression systems, which are inherently component as well. One special case of conversion is high-quality decoding and digital coding for exactly this purpose. Such a conversion might cost well above $2000, to the best part of $10,000 in the case of a conversion that includes noise reduction and other features.

On the other end of the scale is another conversion done quite often. Picture monitors tend to have expensive digital input converters. A great money-saving strategy is to use a converter intended for this purpose, which might cost well under $500 at retail. The output is typically Y,P_r,P_b components and is usually not intended for grade-one monitoring applications.

The form factor for converters has undergone considerable evolution, in part spurred by the silicon solutions available. Early converters occupied cards that took as much as 5RU per slot. They used discrete components and had extensive analog filtering. Now the components can easily fit in the volume of a small flashlight for monitoring converters, or even inside a patch panel! A converter with good quality 10-bit conversion now can fit on a card the size of a Palm Pilot.

HD conversions, while still not cheap, do not have to deal with composite signals. Thus, they are generally less complex in some strange twist of technical fate. But at the same time, analog HD is not of much use in the real world today, except as an input to a monitor. **BE**

John Luff is senior vice president of business development for AZCAR. To reach him, visit www.azcar.com.

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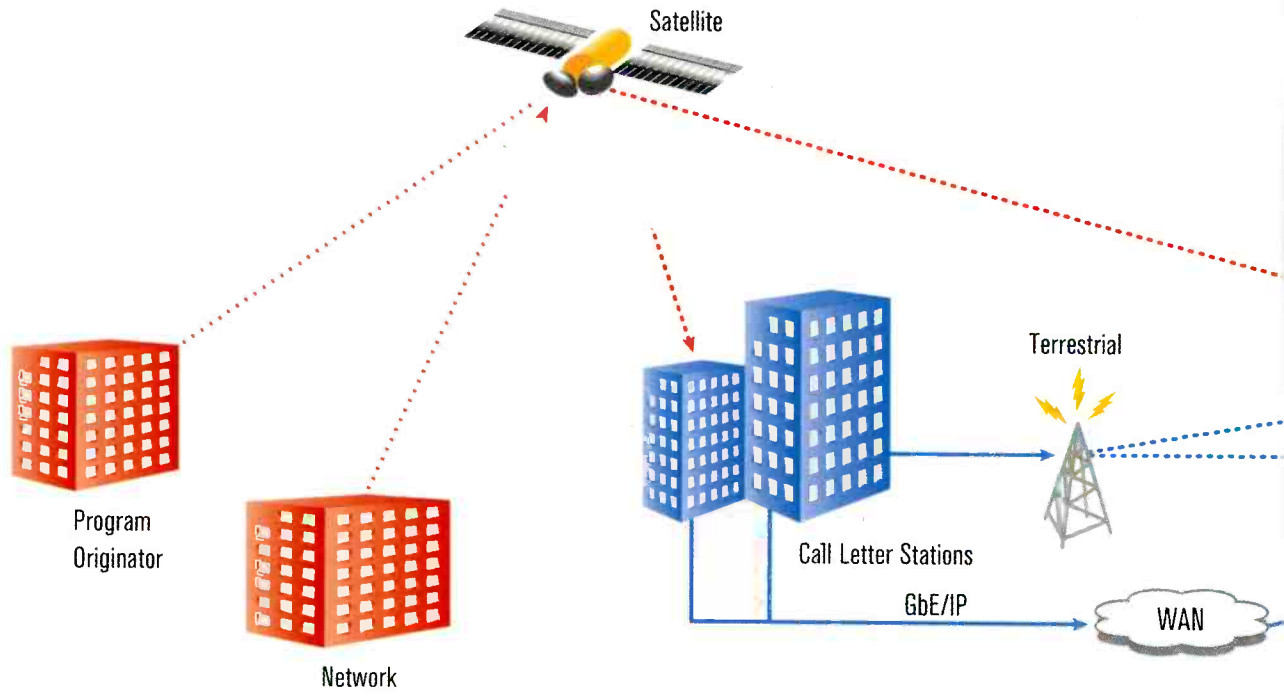

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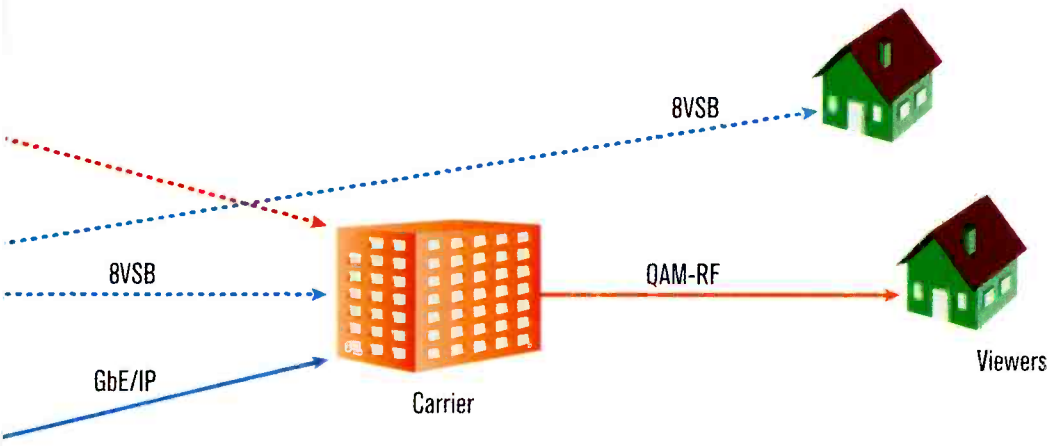

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514-333-1772; *www.miranda.com*

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Stratos SD MUX/DE-MUX engine: 8-channel broadcast video aggregation and transport product; compatible with SMPTE 259M/297M, and DVB/ASI standards; multiplexes eight asynchronous SDI video input channels on to an electrical cable or a single optical fiber; have dual optical ports that provide automatic 1+1 protection.

800-323-6858; *www.stratoslightwave.com*

HD/SD SDI WAVEFORM & VECTOR GENERATION, DISPLAY AND ANALYSIS TOOL

Pixelmetrix DVScope: has an error log/profile capability for automatic verification; supports all SDTV and HDTV serial digital video formats; provides all the functions of an SDI test and monitoring system; 1U rack mount PC with a SDI interface.

866-749-3587 ; *www.pixelmetrix.com*

ENCODING PLATFORM

Harmonic DiviCom MV 100: delivers compression efficiencies and video quality for ultra-low bit rate encoding for MPEG-2 and next generation video compression; allows capabilities to be added over time via software upgrades; can be reconfigured in the field to migrate from MPEG-2 to a next generation codec; operates in standalone mode without requiring external management.

408-542-2500; *www.harmonicinc.com*

GAMMA CORRECTOR

Panasonic AJ-GBX27: Expands the CineGamma display capabilities of the company's AJ-HDC27 VariCam HD cinema camera; designed to adjust the VariCam's HD-SDI output to coincide with the tone graduations of a high-definition CRT display; includes a "Field Mode" for checking the latitude of on-set monitors, a "Video Mode" to convert CineGamma to normal video, and a "Telecine Mode" to prepare for conversion to a film print master; RS-232 control with 12 presets.

800-528-8601; *www.Panasonic.com/broadcast*

AUDIO SHUFFLER

Eyeheight Shuftie: Compact and versatile digital audio channel shuffler and level controller; allows any incoming AES and SDI-embedded digital audio channel to be switched to any outgoing channel; a total of four stereo channels can be manipulated to any output stream; independent level control is provided on each input channel and output stream.

+44 1923 256 000; *www.eyeheight.com*

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New Products

HD/POV MODULE

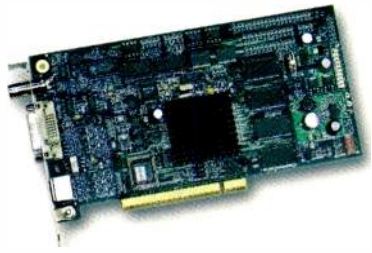
Telecast Fiber Systems Viper II: Module for fiber optic video system supports bi-directional transmission of HD/SDI and data signals from remote robotic cameras; available in either a rack-mountable or "throw-down" configuration; HD/POV links extend range and reduce labor costs by carrying all digitally and optically multiplexed signals on a single lightweight fiber optic cable to streamline the acquisition of HD images; ideal for various types of remote monitoring in live HD events.

508-754-4858; *www.telecast-fiber.com*

PORTABLE COLOR ANALYZER

Sencore CP5001: Calibrates all video display technologies including DLP, LCD, plasma, CRT and more; calibrates front and rear projectors as well as direct view displays; decreases calibration time with measurement screens and a graphical interface; CIE and RGB screens illustrate which colors need adjusting for simple calibrations; custom software lets users download calibration data to a PC for documentation, data storage and report generation.

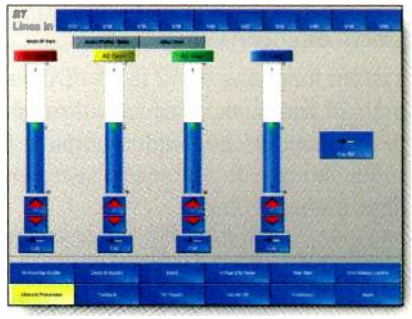
605-339-0100; *www.sencore.com*



MPEG-2 PCI DECODER

Vela CineView Quad: Half-size PCI decoder supporting four independent channels of high quality MPEG-1, MPEG-2 or MPEG-4 decoded audio and video; ideal for use in streaming video, hospitality and security applications, point-of-sale displays and anywhere requiring multi-channel playback of MPEG encoded content; supports playback data rates up to 15 Mbps.

801-464-1600; *www.vela.com*



BROADCAST SYSTEM CONTROLLER

Pharos Pilot MCR: Allows complete desktop control of broadcast equipment; enables non-engineering staff to operate and monitor an entire broadcast network; switching and control can be performed immediately via touchscreen or standard computer mouse and keyboard; all major third-party broadcast systems can be interfaced to Pilot MCR.

+44 118 950 2323
www.pharos-comms.com

AUDIO LEVEL METERS

Wohler LM series: Available for either high-resolution or distance viewing; versions are available for analog, AES/EBU digital, SDI and Dolby Digital (AC3 sources), providing from two to 32 channels of monitoring in one unit; unique tri-color LED design.

650-589-5676; *www.wohler.com*

CHANGEOVER UNIT

Leader LT 444: Safeguards broadcast signal channels by automatically switching to backup feed when it detects amplitude errors in a primary source; can handle up to 11 channels simultaneously; 11 red LEDs on the front panel provide local error warning and identify the channel affected; equipped with 75Ω BNC primary and backup inputs plus an output; rear-panel 9-pin Dsub connector allows remote reset.

+31 402 645 345; *www.elquip.com*

MPEG ARTIFACT REDUCER

Teranex imageEnhancer: Removes artifacts while leaving the detail of the image intact; allows content distributors to increase their channel capacity and maintain the overall quality of their product; built on Teranex's PixelMotion de-interlacing, cadence detection and handling and scene change detection technology.

407-858-6000; *www.teranex.com*

POWER AMPLIFIER SOUND CARDS

Altinex MT113-102 and MT113-103: Power amplifier audio cards for the modular ALTINEX MultiTasker product line; accept three stereo line level or microphone level signals with switched phantom power; microphone inputs provide AGC control and limiting to avoid audio distortions and popping; fixed balanced stereo output is provided for routing to additional power amplifiers; the MT113-102 has a 70Ω 10 watt mono speaker output, and the MT113-103 has two 8Ω 5 watt (stereo) speaker outputs.

800-258-4649; *www.altinex.com*

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Artel VSGm: A1 RU passive DWDM platform that allows the VSG solution to adapt to any network topology; uses passive optical components that enable the deployment of flexible, dense and robust VoD networks; a comprehensive selection of plug-in modules allows network engineers to create any VoD network configuration, including star, ring, point-to-point and cascade topologies; four and 20 channel DWDM muxes/demux modules; add/drop/pass filters – ITU channels 19-59; combiners/splitters (50/50 and 80/20); four channel band splitters enables low loss filtering of local traffic band splitters (red/blue) filters — split forward and return path traffic.

800-225-0228; *www.artel.com*

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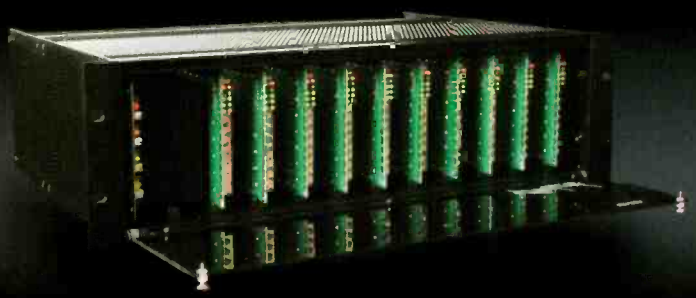

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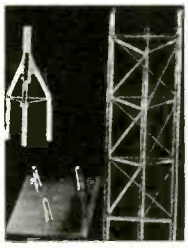

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Help Wanted

ACCOUNT EXECUTIVE, BROADCASTING *Come join our team of dynamic individuals* GlobeCast, a France Telecom Company, and the world's leading provider of transmission and production services for television broadcasters, businesses and internet media programmers, has immediate openings in our Los Angeles and New York offices for Account Executives. Candidates must demonstrate success in building and growing customer base plus strong negotiation skills. Qualified candidates should have 2 to 4 years of broadcast sales experience. GlobeCast offers competitive salaries and an excellent benefits package. Please submit your resume with salary requirements to hrculver@globecastna.com or fax (310) 845-3901. EOE

Help Wanted

MAINTENANCE ENGINEER. KTNV-TV Las Vegas Nevada is searching for an energetic person with a strong background in engineering. This successful applicant must have a thorough knowledge in the repair of broadcast equipment and a general understanding of all aspects in the operations of a television station. Experience with DVC-Pro, Beta SP., digital switchers, and video servers desired. This person must have excellent verbal and written communication skills. He or she must have an associate's degree or a minimum of 4 years experience as a maintenance engineer in a broadcast or production facility. Applicants should E-Mail resumes with salary history to Adair@KTNV.com or mail resume to Director of Engineering 3355 S. Valley View Blvd. Las Vegas NV 89102. KTNV is an Equal Opportunity Employer

Help Wanted

CHIEF ENGINEER...KVHP FOX 29 Lake Charles LA is seeking a "hands-on" Chief Engineer. Leading candidates must possess superior technical skills in studio and transmitter operations & maintenance including routing switcher, production equipment and high power UHF (Klystron) Transmitter, Sony Betacam and Panasonic DVC Pro. Strong computer skills are a plus. You need to be a good communicator. At least three years as a Chief or Assistant Chief is required. Must be familiar with current FCC rules and regulations. SBE Certified a plus. Please forward resume via email to: llangley@xspedius.net.

BROADCAST OPERATIONS- BROADCAST ENGINEER Bloomberg TV has a challenging opportunity within the Broadcast Engineering Group. Will be responsible for coordinating and performing maintenance of equipment as needed to support live broadcast operations. We will look for this engineer to be proactive and troubleshoot production and on-air issues. Will also be responsible for updating transmitter/shift logs, conducting tests, diagnostics evaluations and executing checklists to discover equipment and/or system anomalies. The engineer will also have the opportunity to coordinate and install new components and systems, as well as create and update engineering documents and diagrams. Requirements: Qualified candidates will have strong knowledge of technical TV and radio broadcasting equipment (including cameras, robotics, VTRs, routing equipment and production switchers). Knowledge of broadcast automation systems and thorough understanding of PC hardware and software operations. Ideal candidate should posses strong troubleshooting skills and have the ability to work independently and quickly in high-pressure situations. Please apply online at http://careers.bloomberg.com

CHIEF ENGINEER Weigel Broadcasting Co. is seeking a Chief Engineer for its CBS affiliate & responsible for its technical facilities WDJT-TV & DT, WMLW & W63CU in Milwaukee. Strong UHF transmitter exp., studio maintenance background, FCC compliance as well as exceptional component level & troubleshooting skills. Digital TV knowledge & computer/LAN exp. SBE certification preferred. Benefits: competitive wages, health & dental ins. , paid vacation & sick days as well as profit sharing/401K plan. Resume: CBS58/HR-CE, 809 S. 60th St., Milwaukee, WI 53214. Fax: (414) 607-8105. No calls. EOE.

SYSTEMS ENGINEER (Rochester, NY) sought for mfg. of electronic & communications eqpmt. Resp. for leading & managing systms dvlpmt & engg for advanced radio systms; Dsgn HF, VHF, & UHF radio systms; Dvlp new multi-frequency band networking solutions for systms, using Encryption, & radio E-Mail; Integrating TCP/IP & X.400 techniques into systms; Act as liaison w/customers; Manage cost estimating, prepn of budgets, & prepn for bids & proposals for int'l special operations community & other int'l prgms; Interact w/in co w/all functional areas regarding product & systm issues; Maintain regular contacts w/senior level mgmt on issues & concerns; Interact w/customer mgmt teams to ensure understanding of product & system specs; Interface w/ other appropriate depts w/in co to ensure reqd actions are occuring; & Report to Senior Systms Engg Mgr resp for systms dvlpmt & engg for advanced radio systms. Must have bach or equiv in electronics & communication engg + 6 yrs exp in job offd or in telecommunications engg. Respond to: Sr. H.R. Mgr., Attn: V2865, Harris Corp, 1680 University Ave, Rochester, NY 14610.

BROADCAST MAINTENANCE ENGINEER KARE-TV, the NBC affiliate and dominant news station in Minneapolis-St. Paul (#14 ADI), has an immediate full-time opening for an experienced maintenance engineer. Applicant should be a self-motivated team player who enjoys technical challenges. Must be comfortable with tight deadlines, multi-tasking, and maintaining a wide variety of cutting-edge broadcast equipment. Potential candidates must be able to troubleshoot to the component level and have significant experience in the routing and functioning of a broadcast facility. Strong computer skills, including networking, is a must; experience with AutoCAD and computer programming is a plus. Candidate should be able to lift and move 50 pounds. Send resume and salary requirement to Jeff Phillips, Director of Engineering, KARE-TV, 8811 Olson Memorial Highway, Minneapolis, MN 55427. No phone calls. iphillips@kare11.com *We are a drug free, equal opportunity employer committed to a diverse workforce*

MAINTENANCE MANAGER Broadcast maintenance for studio facility. Must have electronic knowledge including VTR's, video servers, automation & production systems. Two yrs. exp. Resume: HR-ME, 26 N. Halsted, Chicago, 60661. Fax: (312) 705-2656. No calls. EOE.

BROADCAST OPERATIONS- RADIO ENGINEER Bloomberg has an exciting opportunity for a motivated radio broadcast engineer. You will be directly responsible for the hands-on support and implementation of broadcast equipment and systems for WBBR 1130AM and its global radio networks. You will also design, install and troubleshoot audio components, wiring and applications for our reporter workstations, studios and transmitter site; perform preventive maintenance and diagnostics of hardware and software systems; create diagrams and document procedures, oversee FCC compliance of Public files, EAS, Annual/ Quarterly ownership programming documentation and update transmitter site logs and EEOC reports. Requirements: The ideal candidate should possess strong problem solving skills and have a hands-on working knowledge of radio broadcast FCC regulations, procedures, components, applications and operating systems. Candidate must also be capable of performing physical labor, multi-tasking and be available to work a flexible schedule...Please apply online at http://careers.bloomberg.com

VP ENGINEERING Direct and manage the technical stability of the station, and manage and maintain operations of all technical equipment, including News, Production, Transmission facilities, and master control. Supervise and motivate engineering staff and establish departmental objectives and priorities. Develop and implement current and long-range technical operation plans, and prepare departmental expense and capital budgets. Ensure station's technical compliance with all government regulations and industry standards. Minimum five to seven years broadcast engineering management experience required. Extensive working knowledge of all broadcast systems a must. Thorough understanding of digital technology, and significant technical expertise in the planning, implementation and maintenance of television station facilities, including RF facilities. Position requires a strong leader with the ability to motivate and cultivate technical staff. Excellent communication and organization skills required. Degree in Engineering preferred. Qualified candidates, send résumé and cover letter to: Human Resources–BE, WFXT Fox 25, 25 Fox Drive, P.O. Box 9125, Dedham, MA 02027. For immediate consideration, fax your resume to 781-467-7212, or e-mail in MS-Word format only to www.fox25hr@hotmail.com. No Phone Calls Please. EOE/M/F/D/V

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The decent engineer, bullied

BY PAUL MCGOLDRICK

One of the plain, unvarnished truths about engineers in the broadcast industry is that they are decent folks. They don't go around killing people, stealing from their employers or talking about others behind their backs — they just don't. They are generally very calm and collected: trying to keep everyone safe in environments that are really quite hazardous, hoping not to have an emergency to deal with today, but tackling it head on when it does arise. But why is it that we, as a profession, allow ourselves to be bullied?

The recent report on the disaster of the orbiter Columbia throws the art of bullying by management into sharp focus. Management got what it wanted, made their deadlines and cashed the check for the shuttle's commercial ventures. The engineers knew all along that further studies were absolutely needed but couldn't get that message across the bullying barrier. The price was tragic.

When I was in the BBC there was a fairly traumatic period at a large transmitting station when we were visited by a time-and-motion inspector. He spent two weeks following us around through the daily routine of recording meter readings, monitoring, essential (scheduled) maintenance, and the adrenaline-punching moments when something went down and the complete shift was focused on getting it back up. (If something was off air for more than one minute we had to go through the routine of passing a "service" message back through the network to report it.) This guy was amazed that with only six different types of VHF/UHF TV and FM radio transmitters on site, we still needed to consult circuit diagrams! His his expert opinion was that our non-office-hour shift size could be reduced by about half without any ill effects.

Engineering management was bullied into going along with this, not at the station I was at but at a similar, slightly smaller installation a few hundred miles away. About two weeks later, there was a fire at that station that caused considerable damage to a combining unit, a really vulnerable spot, with the result that a program service was off-air for nearly a week. Management thought that maybe the fire was deliberate, a way for the staff to get back at the shift reduction. But it was clear after the logs were examined that something had been degrading in the unit over several months, and that due to the decrease in meter eyeballing, they had missed the moment when a component moved from decay into complete breakdown.

Shifts were quickly restored.

Another example: An accountant bullied engineering management into centralizing spares for a studio complex. During a live transmission of an opera a camera went down — one of five on the floor — and it was clearly the Image Orthicon tube. We were practiced enough to be able to change a 4½-inch IO in about three minutes, including the removal and replacement of the lens turret (plus about two minutes for power-up and rough calibration), but with the centralization of spares it took another 10 minutes to fetch a replacement. I didn't see how the director coped with the 15 minutes of downtime of 20 percent of his cameras. I was told he did pretty well, but I'm sure every extra minute was sheer torture. Engineering again was bullied away from doing things the way they should have been done.

Another example: A few years ago I was visiting a station that cable companies describe as one of the "superstations." As always, the chief engineer, similar to many who are very proud of what they have built up, was happy to show me around his empire: from studios to recording/editing suites, central control, his remote vehicles and his workshop space. But when we got to the news area he was decidedly less happy with what he was showing. The equipment being used for editing was several generations out of date. He showed me how he and his two technicians (yes, just two) were keeping the stuff working with mechanical fixes that would remind you of the belief by a toddler that Scotch tape can hold anything in the universe together.

Why is it that we, as a profession, allow ourselves to be bullied?

He clearly wanted to share his feelings with me and said that management just wouldn't replace the equipment in an area they didn't think of as a profit center until it could no longer be fixed. While he and his technicians kept things going, the decision makers were happy to sit back and watch. "I know what I need to do," whispered the chief engineer to me. "I need to sabotage the equipment so they're forced to buy new stuff. But I just cannot do it!" No, like the majority of engineers in our business, he is decent. BE

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

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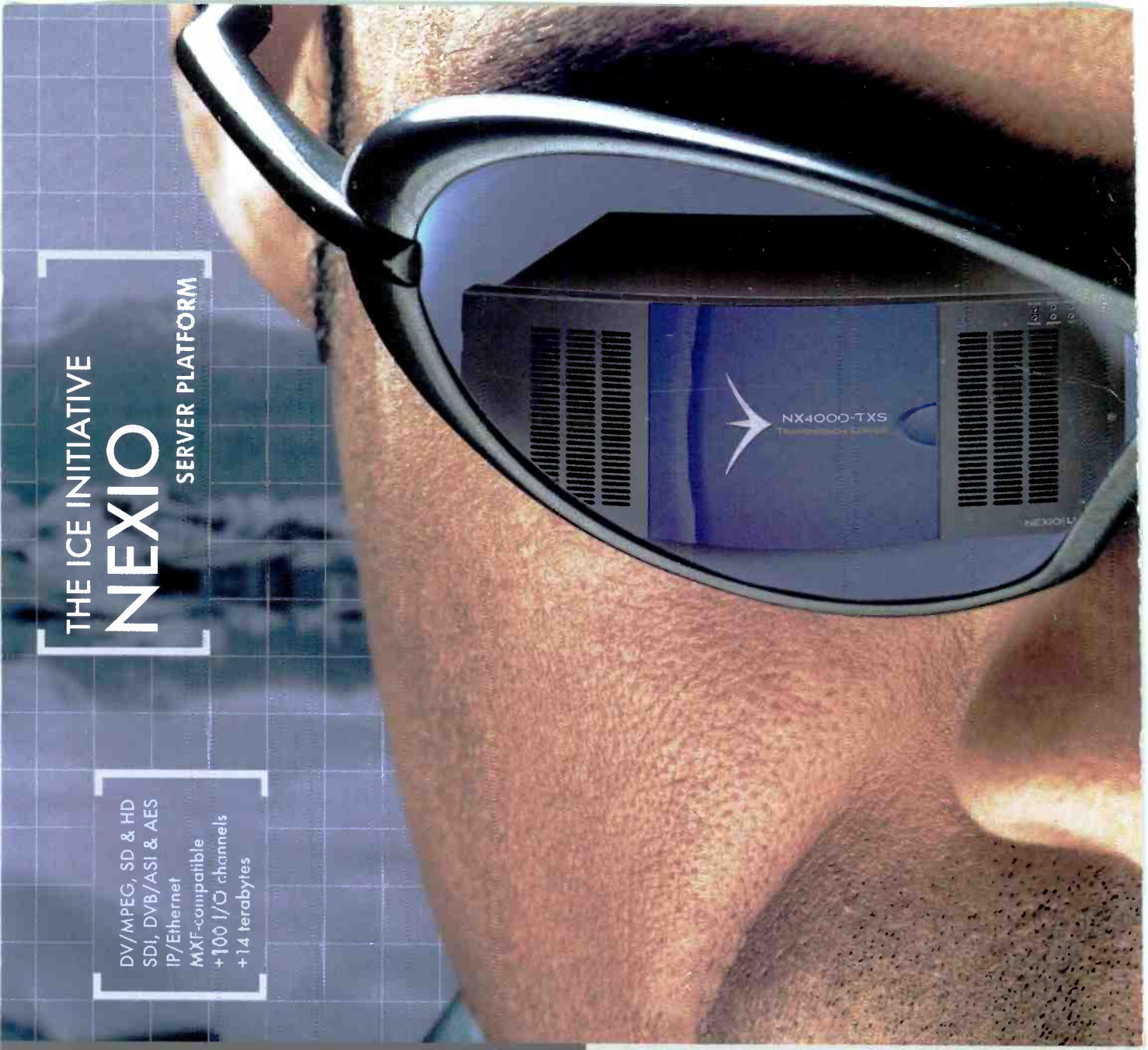

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