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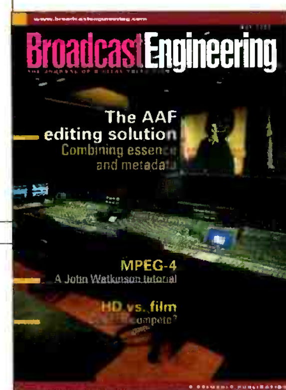
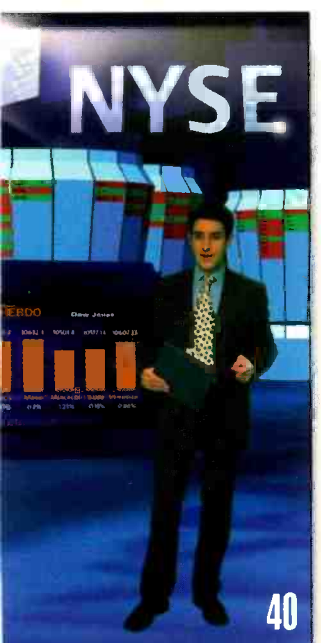


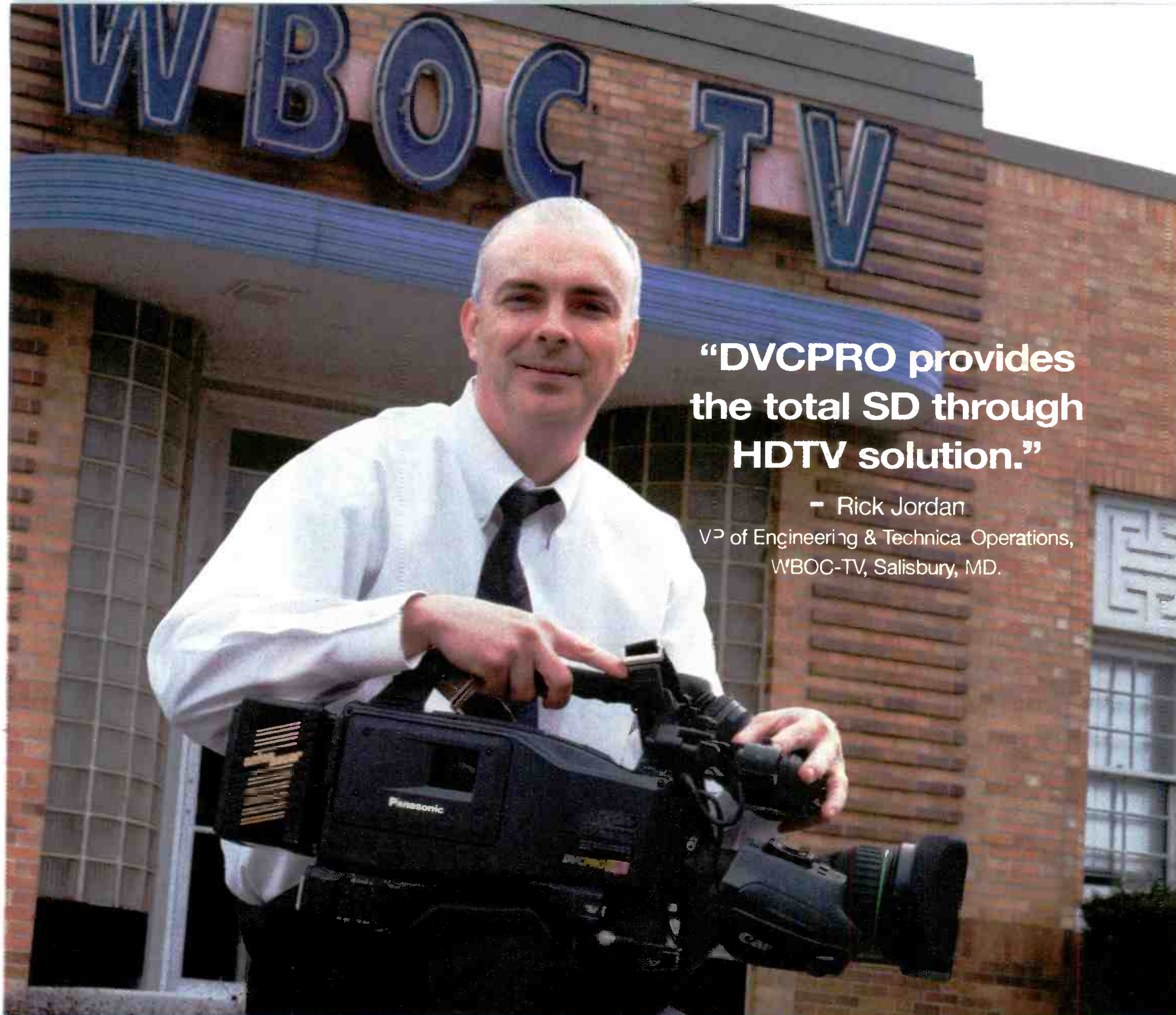


BEYOND THE HEADLINES

DIGITAL HANDBOOK

ON THE COVER: Complete Sound, a premier Hollywood post facility and home to some of TV's highest-rated dramas including *Judging Amy*, *Roswell* and *Any Day Now*, recently upgraded its two Solid State Logic Avant digital consoles to Avant Plus digital post consoles. Pictured is Stage 2, one of the two stages to receive the upgrade. Photo by Edward Colver.

(continued on page 6)



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Name this transmission site

Name this famous broadcast transmission site. The photo was taken in 1967. Correct entries will be eligible for a drawing of the new *Broadcast Engineering* T-shirts. Enter by e-mail. Title your entry "Freezeframe-May" in the subject field and send it to: bdick@primediabusiness.com. Correct answers received by June 17, 2002, are eligible to win.

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No FUD found

Given the dire premonitions from many circles, one would have thought that the mood at this year's NAB convention would resemble a funeral rather than a trade show. With vendors and attendees alike predicting a disastrous show and low attendance, those I talked with prior to the event weren't expecting much positive news. Exhibitors (and the NAB) were really worried that attendees wouldn't make the yearly trek to Sin City.

If feared low attendance wasn't enough to give exhibitors heartburn, many were concerned that those who did show up would be so full of fear, uncertainty and doubt (FUD) that buying anything would be the last thing on their mind.

So what happened?

Well, the sky didn't fall and the world didn't end. Attendees came, they saw, they bought. Now that's the recipe for a successful trade show.

First, there were people at the show. Sure, maybe the numbers weren't as high as in previous years and, as of this date, NAB refuses to release any official attendance figures. They told me, "It takes four to six weeks to get a final figure." Guess their Ouija board is broken.

NAB's "unofficial" figure was 95,000. You can expect the final number to be around that, probably slightly lower. The "real" number, according to exhibitors, was probably nearer to 85,000, but that's hard to predict with the two new halls and the Sands Exhibition Center still being used. Sure there were lots of "Quantity is down, but quality is up" statements. But the bottom line is that people did show up and everyone, literally everyone, I talked with was pleased. I'd even say there were more smiles per booth than at a clown's convention.

Second, according to *Broadcast Engineering* advertisers, attendees actually came to buy. Many of those vendors were writing orders on the show floor, and I know for a fact that products were shipped directly from Las Vegas to readers' facilities.

Finally, there were plenty of new things to see, even some genuinely new technology, which we haven't had much of in several years. As an example, take a look at this year's Pick Hit awards. The winners include a wide assortment of technology and solutions; not a single transmitter, but plenty of production equipment. *Broadcast Engineering* readers are buying into tomorrow's technology.

Most of you know I slammed NAB pretty hard in my March editorial, and they deserved it. However, I give kudos to the show organizers. More exhibitors than in all my years of attending NAB combined complimented this year's show staff for being more helpful than in previous years. While it may have had something to do with the NAB's own FUD factor, it appears the convention staff was more customer-oriented than ever. Good job! Keep it up!

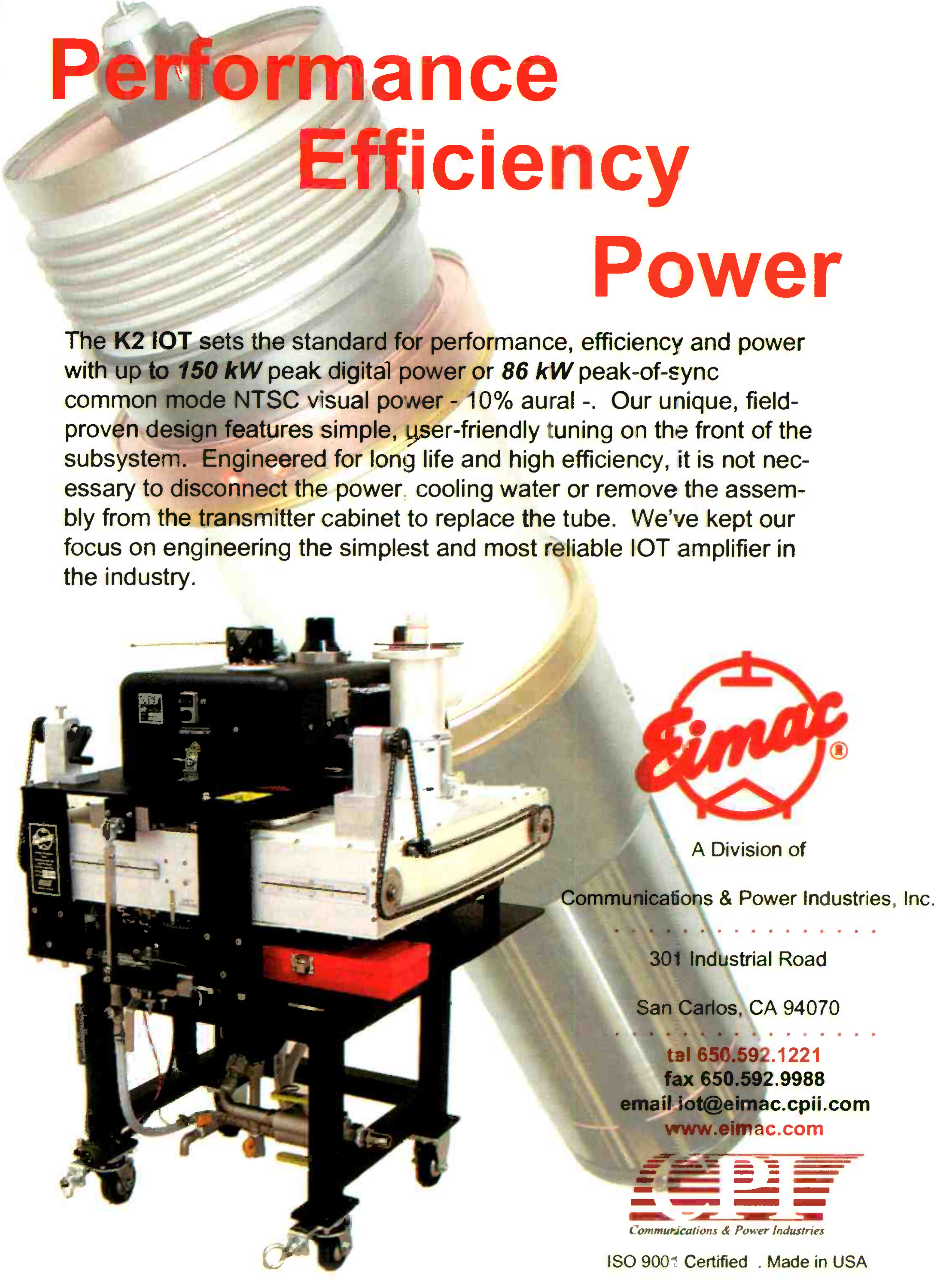
So, after a successful trade show, what more could we ask for? Well, how about more good news? There is further evidence confirming that production and broadcast companies are finally ready to buy and invest in new technology.

Data from the research firm SCRI (www.scri.com) shows a 34 percent increase in planned equipment spending for this year. Combined with a positive trade show, things in the production and broadcast industry appear brighter than only a few weeks ago.

So, could our industry's FUD finally be fading? Frankly, that'd be fantastic.

Brad Dick
editorial director

Send comments to: • direct: editor@primediabusiness.com • web site: www.broadcastengineering.com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No DTV for me

Editor:

I've been in broadcasting for more than 54 years and continue to be occupied in the industry through the ownership of one television station. DTV for broadcasters is a "solution in search of a problem"! It is impossible for the eye to see any difference between analog and digital in sets below 32" screen size. Digital has been designed for the "big" theater screen but, quite frankly, I don't have a place in my home to accommodate a 60" screen.

If I understand the Consumer Electronics Association correctly, from inception through Dec. 31, 2001, there have been fewer than 300,000 HDTV sets delivered to dealers capable of receiving off-air DTV, with a total of 29 million analog sets sold. I will not live long enough to see the last analog broadcast! That's quite a difference in numbers and one the politicians are not likely to ignore when the FCC starts turning off analog stations. Can you imagine the stink raised?

Further, over 60 percent of the people in the United States have indicated that they are not interested in a quality signal. Otherwise, they wouldn't be hooked up to cable!

People will adopt HDTV under two possible circumstances and two circumstances only: Mandate DTV tuners in every set sold and/or make high profile programming available only on DTV.

I think you've sold your soul to the digital equipment manufacturers!

Jerry Proctor

Media propaganda

Dear Mr. McGoldrick:

In response to your December article in *Broadcast Engineering*, I believe it is not the real purpose of al-Jazeera TV, but about the real purpose of all mass media (TV, radio, newspapers).

As you know, some countries run the mass media under the control of the Ministries of Information. A similar body in the USA is the information agency running the Voice Of America. Such ministries and agencies treat the mass media as a sovereignty and operate it for propaganda purposes to support their captive regimes and to push their alleged policies.

al-Jazeera TV can broadcast virtues but should not carry out dialogues, debates or sins about the government of Qatar. The United States' National Security Advisor, Condoleezza Rice, has won an agreement from American broadcasters to edit the inflammatory language from Al Qaeda videotapes, noting that it might contain secret messages to bin Laden sleepers to launch an attack against America (*Newsweek*). Those instructions to the American broadcasters has led to less talking and reduced media exposure of bin Laden and also degraded al-Jazeera TV's creditability. All this matched with the USA administration's desire to lower the profile of bin Laden as part of the tactics of the war on terrorism.

Similarly, after Sept. 11, the mass media did a remarkable job in providing news and information. The most important task involved broadcasts by other networks. Large and dominating organizations like Voice of America, BBC, Air France, Deutsche Welle and others have redirected their services towards the battlefield, and some went even further by purchasing airtime on other nation's transmitters near the action.

So, my perspective on the topic is that the main purpose of mass media is for propaganda, although it is used for other purposes as well.

Ibrahim Adlan

Dear Ibrahim:

I hope you are wrong. Certainly commercial TV broadcasting in the United States and the rest of the "Western" world is there to make money — and the lowest common denominator in programming seems to attract the most advertising revenues.

News broadcasting in the United States is also very parochial, and a live car chase in Los Angeles is more likely to be aired than a shooting on the West Bank. We still have to turn to a CNN or FOX News-type of program to get real world news, and we can continue to benefit from the still-untarnished reputation of the BBC. The willingness of U.S. broadcasters to limit the amount of time bin Laden's tapes were aired was a bow, I believe, to common sense. The government could have issued "D" notices, as it has done during war, preventing the airing completely – but it did not.

Yes, there are a lot of countries where there are borderline political/entertainment issues – but at least they usually start playing martial music when they are about to wave the political cane.

Thanks for reading.

Paul McGoldrick

I will not live long enough to see the last analog broadcast!

Are we there yet?

BY CRAIG BIRKMAIER

The May 1, 2002, deadline for *all* U.S. commercial broadcasters to begin operation of their DTV channels is now history. History will note that the majority – 894 of the nation's 1300 commercial stations – recently filed for extensions to this deadline. Many of those who have met the deadline have done so with less than full enthusiasm, not to mention less than the full licensed power levels for which their DTV channels have been authorized.

The continuing delays with the DTV transition once again dominated discussions about the future of broadcasting at the recent National Association of Broadcasters convention in Las Vegas. Like restless children, imprisoned in the back seat of minivans headed for a distant destination, the question on the lips of many panel moderators and members of the media was: "Are we there yet?"

Industry luminaries noted the growing interest in digital television by consumers, but the success stories have little to do with consumer demand for DTV receivers. Sales of digital television monitors continue to be driven by DVD and the digital programming offered by cable and DBS. Broadcasters continue to blame a multitude of factors for their plight. At the top of the list is the lack of carriage of DTV signals by cable.

Just days before the industry gathered in Las Vegas for NAB, FCC Chairman Michael Powell announced a voluntary plan to help accelerate the DTV transition (see sidebar: "Powell: 'Time to step up to the plate'"). The plan addresses a number of issues that have become barriers to the transition, as the consumer electronics, cable, DBS and broadcast industries wrestle for control of digital television. The plan seeks to encourage each of the major networks to offer at least 50 percent of their prime-time programming either as HDTV or with enhancements that differentiate the programming from that carried on the analog channels. Stations in the top 100 markets are encouraged to pass this content through (no downconversions). It asks cable to carry up to five channels of HD and enhanced programming, but does not stipulate that this content originate with DTV broadcasters. It asks the cable and consumer electronics industries to make HD-capable set-top boxes available to consumers. And it establishes a phased timetable for TV set manufacturers to include DTV receivers in new sets.

> **Powell insists that there will be no swinging of the bureaucratic club.**

Powell insists that there will be no swinging of the bureaucratic club. During an NAB question-and-answer session with ABC News anchor Sam Donaldson, Powell said the plan was completely voluntary. But it is clear that the chairman hopes that the use of his FCC bully pulpit will encourage the long-cantankerous industry segments to work together to accelerate the DTV transition.

"This transition is not just important to broadcasting. It's important to America, and it's been languishing for far too long," Powell said. "Every one of those segments has to step up to the

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

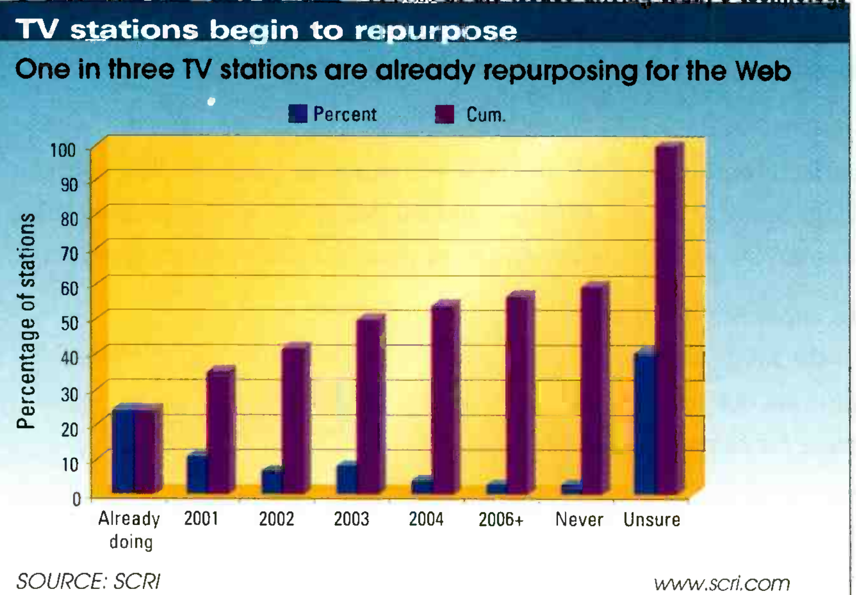

plate and do things they don't like and do some things they will like. All of them have something to gain."

Leaders of the affected industries promised to take a close look at Powell's proposals, signaling cautious approval for the plan.

NAB President and CEO Edward O. Fritts called Chairman Powell's plan "a major step forward in breaking the DTV logjam." Congratulating Powell on the proposal Fritts said, "While we have concerns over elements of the proposal, we stand ready to work with the FCC and Congress to bring consumers the next generation of television."

"Our industry remains committed to working with the FCC, Congress and all other relevant parties to continue to drive the transition forward," said Gary Shapiro, head of the Consumer Electronics Association. But Shapiro cautioned, "The devil is in the details."

And Robert Sachs, president of the National Cable & Telecommunications Association, said Powell's initiative contained some thought-provoking proposals that the group would discuss with the agency.

During the NAB session with Donaldson, Powell made it clear that broadcasters need to adapt to a changing marketplace, and that DTV is part of fundamental changes taking place in the communications industries. Powell said, "You have to get on the train, or it will run over you."

Donaldson pointedly asked the chairman if he would be upset if DTV broadcasting failed to gain the support of consumers and simply faded from the scene. Powell responded, "We don't love anyone," making it clear that broadcasters cannot depend on the government to prop up their franchise in the face of competition and a changing technological landscape.

FCC Chairman Michael Powell at an NAB Q&A session with ABC's Sam Donaldson: "We don't love anyone." The chairman made it clear that the FCC will not prop up over-the-air broadcasting if broadcasters are not able to gain support from consumers.

Taking the low road

Meanwhile, on the show floor, broadcasters were exploring their options, enabled by the relaxed rules related to financial hardship, power levels and hours of operation that the FCC put into place last fall. Those rules state that initially stations need only reach their city of license with digital TV, rather than replicating their entire analog coverage areas.

A high percentage of the applications for extensions of the May 1 deadline were related to financial hardship, and another sizable category were related to interference issues with existing NTSC channels. The ability to operate at low power levels initially addresses both of these issues.

At NAB manufacturers were offering digital-TV transmission systems priced as low as $50,000 for as few as 1000 W.

David Glidden, director of TV transmission products for Harris, says the low power approach can save broadcasters $50,000 to $75,000 per year in electricity compared to operating a 60 kW IOT transmitter. Those savings may be sufficient to justify the capital investment in a temporary solution while the DTV market develops.

Looking forward to NAB2003, there may be fewer excuses for why we are not there yet.

Keeping the pressure on

While the FCC has relaxed the initial requirements for DTV broadcasting, it does not appear that they are relaxing the pressure on broadcasters to get a DTV signal on the air. The FCC sent 309 requests for additional information to stations that had requested extensions to the May 1 deadline.

While it may take some time to untangle the remaining issues that have caused so many broadcasters to miss the deadline, it appears that most commercial stations are moving forward with plans that will allow them to meet at least the minimal requirements for DTV broadcasting by the end of the year.

Looking forward to NAB2003, there may be fewer excuses for why we are not there yet. But it appears that progress will continue to be slow. There was one area in which there seemed to be nearly unanimous agreement during NAB panels and discussions in the hallways. Nobody believes that the transition will be over in 2006. BE

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

Web Links

The Powell Proposal
www.fcc.gov/commissioners/powell/mkp_proposal_to_speed_dtv_transition.pdf

FCC Letters of Inquiry regarding extensions to DTV deadline
www.fcc.gov/mb/video/files/dtvextletters.pdf BE

Powell: "Time to step up to the plate"

Asking all of the parties involved in the transition to digital television to step up to the plate, FCC Chairman Michael Powell delivered a five-point plan to help accelerate the DTV transition on the eve of NAB. Here are the basic elements of that plan. A link to the full proposal is included in the Web Links with this article.

1. The top four broadcast networks (i.e., ABC, CBS, Fox and NBC), and several cable networks including HBO and Showtime, should provide high-definition or other "value-added DTV programming" during at least 50 percent of their prime-time schedule, beginning with the 2002-03 season.

2. By Jan. 1, 2003, or as soon thereafter as they commence broadcasting, DTV affiliates of the top four networks in markets 1-100 will obtain and install the equipment necessary to pass through network DTV without degradation of signal quality (e.g., pass through HD programming, if that is what the network provides).

3. By Jan. 1, 2003, cable systems with 750 MHz or higher channel capacity are asked to offer to carry, at no cost, the signals of up to five broadcast or other digital programming services that are providing value-added digital programming during at least 50 percent of their prime-time schedule.

In addition, they are asked to provide cable subscribers the option of leasing or purchasing a single set-top box that allows for the display of high-definition programming.

4. By Jan. 1, 2003, DBS services are asked to carry the signals of up to five digital programming services that are providing value-added digital programming during at least 50 percent of their prime-time schedule.

5. Consumer electronic manufacturers are being asked to commit to meeting the demand for cable set-top boxes that allow for the display of high-definition programming, and to market broadcast, cable and satellite DTV options at point-of-sale. BE

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Video description rules in place

BY HARRY C. MARTIN

On April 1, 2002, the Commission's video description rules for video programming became effective. Video description is the audio description of key visual elements in programming, inserted into natural pauses in the audio, to make television programming more accessible to the visually impaired.

Under rules adopted by the Commission in July 2000, television stations in top-25 markets that are affiliated with ABC, CBS, NBC or Fox must provide 50 hours of video description per calendar quarter, either during prime time or on children's programming. Television broadcast stations that are affiliated or associated with any television network must pass through video descriptions when the network provides them, provided the station has the technical capability to pass the descriptions through (subject to some technical exceptions).

Dateline

No biennial ownership reports are due in 2002. However, broadcasters who purchase a new station, or obtain an initial construction permit or license for a new facility, must still file a Form 323. These forms now may be filed electronically.

On July 10, all commercial and noncommercial stations must place in their public files their quarterly issues/programs lists and quarterly children's programming reports (Forms 398) for the period April 1 – June 30. The issues/programs lists must contain a brief narrative describing the issues covered and the programs that provided the coverage, with information concerning the time, date, duration and title of each program.

Multichannel video programming distributors (MVPDs) that served 50,000 or more subscribers as of Sept. 30, 2000, must provide 50 hours of video-described programming per calendar quarter during prime time or on children's programming, on each channel on which they carry one of the top five national non-broadcast networks. MVPDs of any size must pass through video description on each broadcast station and non-broadcast network they carry when the station or network provides video description (subject to some technical exceptions).

Once a broadcaster or MVPD has aired a particular program with video description, it is required to include video description with all subsequent airings of that program on that same station.

Petitions requesting exemptions from the video description rules can be submitted based on a claim that compliance would impose an undue burden. Factors in determining whether compliance would be an undue burden include the nature of the video description and the cost of providing it, the impact on the operation of the video programming distributor, the financial resources of the video programming distributor, and the type of operations of the video programming distributor.

These rules are currently being challenged in the D.C. Circuit Court of Appeals. The Motion Picture Association of America, National Association of Broadcasters, National Cable & Telecommunications Association and National Federation of the Blind (petitioners) are attacking the rules on statutory and First Amendment grounds. The National Television Video Access Coalition, Metropolitan Washington Ear, WGBH Educational Foundation, American Council of the Blind, Blinded Veterans Association and the American Foundation for the Blind have intervened on the side of the FCC, which is defending the rules as necessary and properly promulgated.

In February, the petitioners asked both the Commission and the U.S. Court of Appeals in D.C. for a stay of the implementation of the rules pending the outcome of the appeal, but these requests were denied. Oral argument in the appeal before the D.C. Circuit is scheduled for Sept. 6, 2002.

FCC restructured

The changes to the Commission's organizational infrastructure, which have been in the works for several months, have at long last been formally announced. The FCC has renamed three bureaus and merged two into one, supposedly to make the Commission more effective, efficient and responsive. The new organization formally went into effect on March 25.

Perhaps the most noteworthy change is the merger of the Mass Media and Cable Services Bureaus into a new "Media Bureau." The new Media Bureau will be organized as follows:

Media Bureau
Office of Broadcast Licensing Policy
- Audio Services Division
- Video Services Division
- FM and TV Allocations

Policy Division
Industry Analysis Division
Engineering Division
Office of Communications and Industry Information

BE

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

Send questions and comments to:
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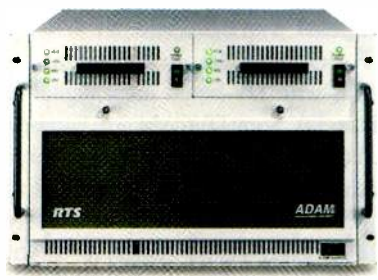

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The cost
of digital – Part 1

BY GLENN ESTERSOHN

Why shoot digital? Producers and directors are discovering persuasive reasons, including new creative options, better suitability for digital effects, greater fluidity in shooting and instant "dailies." But time and again, it can all come down to cost.

In a perfect world, shooting digital can save money through lower costs for shooting stock, processing and dailies. But in the real world, the savings are often "spent" in other ways.

Of course, trading off cost against other considerations is nothing new. Film has always offered the producer a hierarchy of quality vs. cost, with the ultimate choice made largely based on aesthetic aspirations vs. budget limitations.

Digital and film formats are so fundamentally different that head-to-head comparisons can be misleading. But producers are coming to consider specific digital formats as potential alternatives to specific film formats. In that vein, we can look at the hierarchy of film formats, and compare them up with corresponding digital formats.

Digital corollaries of film

For example, 16mm film clearly contends with DV-based 4:1:1 digital formats. DV, Sony DVCAM and Panasonic DVCPRO25 all share a few common technical attributes. To squeeze all that digital information onto quarter-inch tape, all these formats use digital subsampling and 5:1 compression. Together, these techniques reduce the number of bits to be recorded by 85 percent. To minimize the real estate for each recorded bit, these formats use metal tape technology. The result is 40 or more minutes of digital acquisition on a tape you can slip into a shirt pocket.

Cost comparisons (see Table 1) make at least two digital advantages clear. Based on street prices in New York, DVCAM tape with IC Memory is 97 percent less expensive than 16mm stock, developing and dailies. Tape without IC memory is less expensive still. Digital practically eliminates stock and developing costs.

According to *Bamboozled* director of photography, Ellen Kuras, ASC, the choice of DV was dictated by director Spike Lee's desire to shoot affordably and quickly, covering each take from multiple angles. "We used up to fifteen simultaneous cameras for the performance scenes," says Ellen Kuras. Of these, 11 were DV and four were 16mm film. An innovative but expensive shooting technique was made affordable by using digital media.

In the real world, the savings are often "spent" in other ways.

The next step up in quality, Super 16mm, is roughly paralleled by such

Stock	16mm Eastman 7293 EXR 200T	DVCAM Sony PDVM-40MEM with IC memory	Super 16mm Eastman 7293 EXR 200T	Digital Betacam Sony BCT-D40	35mm Eastman 5293 EXR 200T	HDCAM 24p Sony BCT-40HD
Feet	400	233	400	791	400	791
Minutes	11.11	40	11.11	40	4.45	50
Cost	$126.56	$24.95	$126.56	$27.99	$220.20	$79.95
Stock cost/minute	**$11.39**	**$0.62**	**$11.39**	**$.070**	**$49.48**	**$1.60**
Developing/foot	$0.14	$0.00	$0.14	$0.00	$0.14	$0.00
Developing/minute	**$5.04**	**$0.00**	**$5.04**	**$0.00**	**$12.58**	**$0.00**
Video dailies/foot	$0.15	$0.00	$0.18	$0.00	$0.09	$0.00
Video dailies/minute	**$5.40**	**$0.00**	**$6.48**	**$0.00**	**$8.09**	**$0.00**
Total cost/minute	**$21.83**	**$0.62**	**$22.91**	**$0.70**	**$70.16**	**$1.60**
Digital savings		**97%**		**97%**		**98%**

Table 1. Considering the cost of stock, processing and dailies, DVCAM tape and Digital Betacam media are about 97 percent less expensive and HDCAM 24p is about 98 percent less expensive than the corresponding film formats. Sources: Kodak, B&H Photo, and DuArt Film and Video.


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8
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higher-quality standard-definition 4:2:2 digital formats as Sony's Digital Betacam, JVC's D-9 and Panasonic's DVCPRO50. Also in contention is Panasonic's DVCPRO 720p. Compared to the earlier set of DV variants, the 4:2:2 standard-definition formats feature higher recorder bit rates and increased color resolution with little or no digital pre-filtering and milder compression.

While the quality of these digital formats is technically higher, their stock cost advantage is comparable. As just one example, Digital Betacam cassettes are about 97 percent less expensive than Super 16mm stock, developing and dailies.

Digital and film formats are so fundamentally different that head-to-head comparisons can be misleading.

Digital point of comparison for 35 mm film

With its full 1920x1080 CCD sampling combined with progressive scanning at the film rate of 24 fps, Sony HDCAM 24p is the digital point of comparison for 35 mm film.

While the captured image quality for HDCAM 24p is significantly ahead of our previous contenders, the economics for media are essentially the same. The cost for stock, developing and dailies is cut this time by about 98 percent.

In addition to effects-driven science fiction productions, the HDCAM 24p system is beginning to find its way into the indie scene and some mainstream theatrical features. Director of photography Steven Douglas Smith has shot three features with the Sony/Panavision 24p camera and estimates that in one production he saved $1 million on potential film processing and scanning fees by shooting in 24p.

After 100 years of film, creativity and cost remain in contention on almost every production. Digital cinematography is already proving a powerful tool in managing this trade-off. **BE**

Glenn Estersohn is a writer who follows digital cinema, digital television and digital audio from his home in Scarsdale, NY.

Editors note: We will continue our discussion of the cost of digital in next month's Production Clips column by comparing camera rental costs and examining other cost benefits of digital acquisition.

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Measuring the performance of audio devices and systems

BY MICHAEL ROBIN

When sound is represented by an electrical signal, it can be changed in many ways. Audio devices (such as mixing consoles and tape recorders) and entire audio systems can make useful changes to the signal, but they can also introduce undesirable changes such as distortion and noise. Audio engineers judge the performance of audio devices and systems by measuring three major groups of parameters: linear distortions, nonlinear distortions and noise. This article discusses these three groups of parameters and the methods for measuring them. A future article will discuss dynamic range with reference to analog and digital systems.

Linear distortions

Changes to electrical-signal waveforms that are independent of signal amplitudes are called linear distortions. (It is assumed here that the amplitude of the electrical signal does not exceed the clipping level of the device under test.) There are two major types of linear distortion encountered in practice: non-uniform frequency response and non-uniform phase response. Non-uniform frequency response is measured via the amplitude vs. frequency response test. Non-uniform phase response is measured via the phase vs. frequency response test. These tests are described below. Figure 1 shows the typical equipment setup for such frequency-response measurements.

• Amplitude vs. frequency response test: Amplitude vs. frequency response is defined as the peak-to-peak variation, over a specified frequency range, of the measured amplitude of an audio signal, expressed in dB with reference to the signal level at a specified frequency. The reference frequency is usually 1 kHz. The input port of the device under test (DUT) is fed a signal of 1 kHz at the standard operating level (SOL). This would be +8 dBu or +4 dBu for high-level inputs and, typically, -60 dBu or -70 dBu for microphone inputs. The gain(s) of the DUT are adjusted to obtain SOL (+8 dBu or +4dBu) at the output. The audio analyzer is calibrated to read 0 dB at the reference frequency. The input signal frequency is varied in discrete steps, or continuously, and readings in dB, with reference to 0 dB, are taken at specific frequencies. The measured frequency range is usually 20 Hz to 20 kHz.

• Phase vs. frequency response test: Phase vs. frequency response is defined as the variable phase shift occurring in a system at several frequencies within a given band. The input of the DUT is fed a signal of variable frequency. A calibrated phase meter is connected at the DUT's output. A plot of phase vs. frequency is carried out over the frequency band of interest.

Noise is best described as an unwanted disturbance superimposed on a useful signal.

Nonlinear distortions

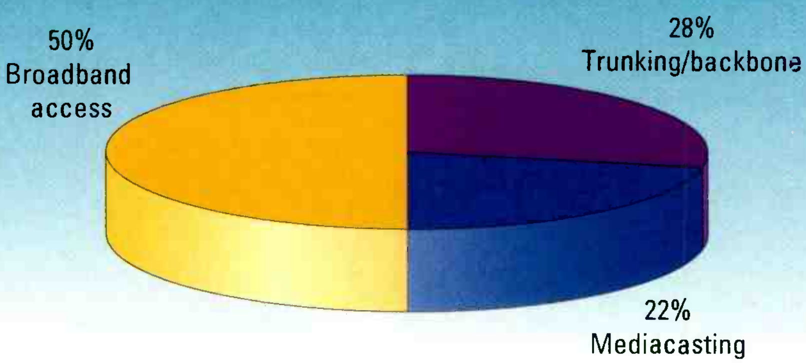
Nonlinear distortions of an electrical signal are caused by deviations in the linear relationship between the input and the output of a given audio component or system. There are two types of nonlinear distortions encountered in practice: harmonic distortion and intermodulation distortion.

• Harmonic distortion: Harmonic distortion occurs when a system, whose input is fed with a pure sine-wave signal of frequency *f*, produces at its output a signal of frequency *f* as well as a set of signals whose frequencies

FRAME GRAB A look at tomorrow's technology

Signals from the sky

By 2008, broadband could dominate satellite carriage



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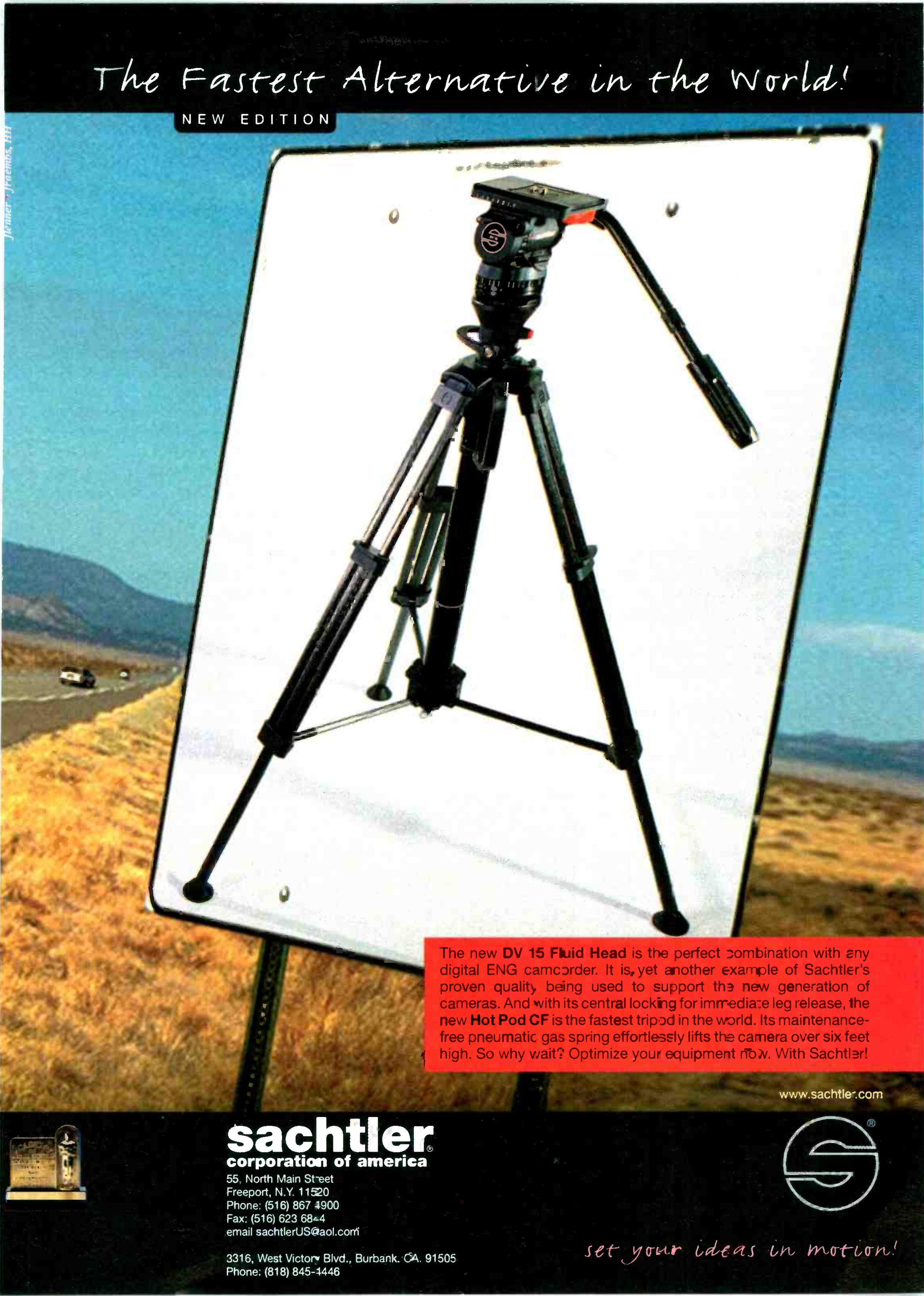

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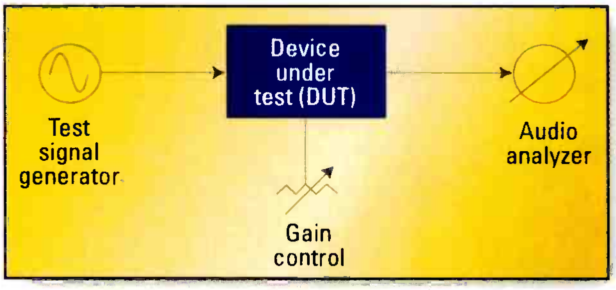


Figure 1. Equipment setup for measuring frequency response

($2f$, $3f$, ...nf) are harmonically related to the input frequency. The distortion factor of a signal is the ratio of the total RMS voltage of all harmonics to the total RMS voltage. The performance of audio amplifying devices is expressed as a percentage of total harmonic distortion (THD) at a specified output level. For professional studio-quality equipment, the output level at which THD is measured is 10 dB above SOL (+18 dBu or +14 dBu). The percentage of THD is the distortion factor multiplied by 100. The mathematical expression for THD is:

$$THD = \frac{\sqrt{(E_{2f}^2 + E_{3f}^2 + ... + E_{nf}^2)}}{\sqrt{(E_f^2 + E_{2f}^2 + E_{3f}^2 ... + E_{nf}^2)}} \times 100$$

where

THD = percentage of total harmonic distortion

E_f = amplitude of fundamental voltage

E_{2f} = amplitude of second harmonic

E_{nf} = amplitude of nth harmonic voltage

The measurement bandwidth is usually limited to the upper limit of human hearing: 20kHz. Figure 2 shows the typical setup for THD measurements. To measure the THD, the audio analyzer removes the fundamental (first harmonic) component of the distorted signal present at the output of the DUT and measures all the remaining energy, including noise and harmonics. Since noise contributes to the measured results, a more accurate name for this measurement is total harmonic distortion and noise (THD+N). The tests are carried out at several frequencies, such as 50 Hz, 100 Hz, 1 kHz, 5 kHz, 7.5 kHz and 10 kHz. Any tests carried out at frequencies above 10 kHz would generate harmonics above 20 kHz – above the limit of human hearing – and would be irrelevant.

• Intermodulation distortion: Figure 3 shows the typical setup for intermodulation distortion (IMD) measurements. IMD occurs when a system whose input is fed with two signals of frequencies f_1 and f_2 generates at its output, in addition to the signals at the input frequencies, signals having frequencies equal to sums and differences of integer multiples of the input frequencies. The SMPTE IMD test specifies the use of a test signal consisting of two separate frequencies (f_1 = 60 Hz and f_2 = 7 kHz) with a respective amplitude ratio of 4:1. The IMD causes the 60 Hz signal to modulate 7 kHz "carrier." This results in the generation of sidebands above and below the 7 kHz carrier with components at 60 Hz and its harmonics. IMD is computed as:

$$IMD = \frac{\text{demodulated signal}}{E_{f2}} \times 100$$

where

IMD = intermodulation distortion

E_{f2} = amplitude of the 7 kHz component

Noise

Audio signals are affected by noise. Noise is best described as an unwanted disturbance superimposed on a useful signal. Noise level is usually expressed in dB relative to a reference value, and is commonly referred to as signal-to-noise ratio (SNR). In professional studio equipment, the reference level for SNR measurements is MOL, or 10 dB above SOL.

• Random noise: The main source of random noise is the thermal agitation of electrons. Given R, the resistive component of an impedance Z, the mean square value of the thermal noise voltage is given by:

$$E_n^2 = 4kTBR$$

where

E_n = RMS noise voltage

k = Boltzmann's constant (1.27 x 10^{-23} joules/Kelvin)

T = absolute temperature in degrees Kelvin

B = bandwidth in Hz

T is usually assigned a value such that 1.38T = 400, corresponding to about 17°C. The SNR at the output of a system depends on the noise generated by

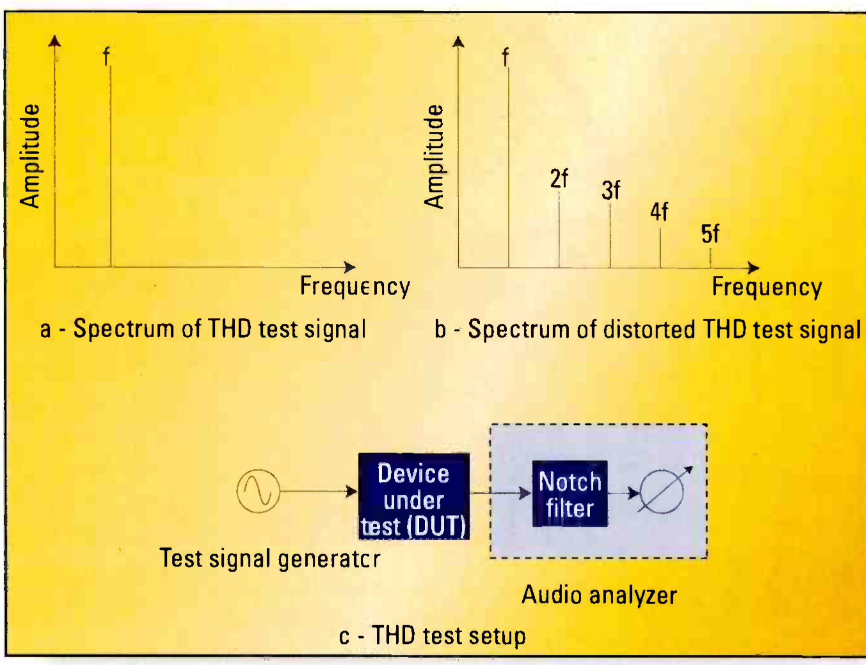


Figure 2. Total harmonic distortion test spectra and equipment setup

Maintaining television IT networks

BY BRAD GILMER

So your network has not exactly been itself lately. Transfer times are high, collisions are through the roof, users have difficulty logging in at times, or maybe there is one computer that just refuses to talk on the network. In situations like these, you need to get your network back on track. Where do you start? And what tools are available to help you?

The usual culprits

The most common network problem is a faulty cable termination. Another common cause of network problems is the use of improper network components such as non-CAT-5 cable, telco punch blocks or telephone jumper wires. In fiber systems, the usual culprit is dirt in connectors. These items may not cause problems initially, but can contribute to network failures as the network grows in size.

NIC indicators

One of the most commonly available troubleshooting tools is a desktop computer. And one of the most useful network-troubleshooting tools is the set of diagnostic LED indicator lights on the computer's network-interface card (NIC). Most desktop computers have a NIC with one or two diagnostic LED indicators.

```
C:\Ping 10.10.10.2
Pinging 10.10.10.2 with 32 Bytes of data:
Reply from 10.10.10.2: Bytes =32 time<10ms
TTL=128
Reply from 10.10.10.2: Bytes =32 time<10ms
TTL=128
Reply from 10.10.10.2: Bytes =32 time<10ms
TTL=128
  C:\>
```

Figure 1. You can use any desktop computer to ping another computer to see if it is alive. Be aware that some servers, especially those on the Internet, are configured to drop ping requests as a defense against denial of service attacks.

One of these lights is a link-integrity indicator. If it is lit, it indicates that there is a physical connection between the network card and something at the other end of the wire – usually a hub. It does not mean that the cable type is correct, or that the frequency response of the installation is sufficient to provide reliable communications. But the light does just fine for a quick "Is it plugged in at the other end?" check.

One of the most commonly available troubleshooting tools is a desktop computer.

There may be a second light on the NIC, or perhaps there is only one light on the card but it is dual purpose. In any case, almost all NICs also provide a visual indication of "link activity." This means that the light blinks on and off as messages are sent across the network. If the link-integrity light is steadily lit, and the link-activity light is blinking on and off at a random rate, then you are probably looking at normal indications.

However, if the link-activity light is off, but you know that other computers are able to communicate, then there is no activity on the wire connected to your NIC, even though it is physically connected to a hub or another computer. If, on the other hand, the light is on almost continuously, then the problem could be that your network is saturated with traffic. Symptoms of this include network-timeout messages, inability to log on to a server, or a slowing of server-based applications. Networks need some "breathing room" between network communications. Without this quiet time, the network's performance can drop substantially.

If the LED on your NIC is operating correctly, but you are still unable to establish a connection, you should break out the diagnostic diskette provided with your NIC. This diskette contains a number of tests to verify that your computer is communicating with the NIC, and that the NIC is performing correctly. Most diagnostic utilities also allow you to set up communications between two computers to verify that two-way communication is functioning properly.

Handy utilities

What should you do if your system passes the diagnostics tests but things still do not work correctly? Check to see that your computer is recognizing your NIC. If you are running UNIX, you can scan the startup messages to see if your NIC is properly detected. Check to see if you receive any warning messages at boot time when the system is configuring the cards. If you are running Windows 95, 98 or 2000, there is a great utility called device manager built into the system. To use this tool, select Start/Settings/Control Panel/System and then select the Device Manager tab. (In Windows 2000, you have to select the Hardware tab before you see the Device Manager button.) The Device Manager tells you, in real time, how various devices on your system are doing. Look for a yellow or red circle with an exclamation mark next to the "Network Adapters" entry. If you see a problem here, you can be pretty sure that the computer will not function properly until it is corrected.

You can expand the "Network Adapters" section to view the specific driver for your card. Select it and then view Properties. Under the General tab, there should be a message in the Device Status window saying that the device is working properly. Next, choose the Resources tab. You should see the message "No conflicts" in the Conflicting Device List window.

If you do see a yellow or red warning flag, be aware that there are many things that could cause problems with your network card or drivers. If you are having a problem in this area you should check with your NIC manufacturer to be sure you have the latest drivers. You can usually download these from the Internet. If you continue to have problems, you probably should contact technical support for your specific hardware.

If your LED indications are normal, your NIC diagnostics pass and your device drivers all check out, the next stop is to check your software configuration.

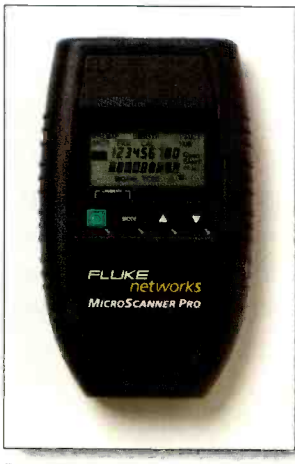
Take command

If your high-speed network supports TCP/IP — and many of them do — there are a few commands that may help you isolate the problem. The exact format of the commands will differ, depending on your computer's operating system. This discussion assumes that you are using an Intel machine running a DOS window in Windows 2000. While the commands are specific to these systems, all network-capable operating systems have similar commands and functions.

First, find the IP address of another computer on the network that is working normally. Next, go to the computer that is having difficulty and open a DOS window by selecting Start/Run and then typing COMMAND. At the DOS prompt, type "Ping [IP address]," where [IP address] is the address of another computer that is working normally and is connected to your network. If you see a message that looks something like the one above, your system is communicating with the other computer. (See Figure 1.) If you see the message "Request timed out," this means that there is a problem either with the wiring or the driver.

If you are unable to "see" the other computer, try pinging yourself at the local loopback address, 127.0.0.1. This is a special address that allows programs requiring networking to talk to themselves even if a network cable is not connected.

If you are able to ping yourself using the loopback address, but are unable to see other computers on the network, check your network settings. Check your NETMASK to be sure it is set correctly. Usually, this is set to 255.255.255.0. If you are communicating with another computer on a local network, you do not need to set your GATEWAY address. If you are trying to ping a computer that is remote from your location, or you are trying to ping a computer on the Internet, then your GATEWAY address will have to be correct. A gateway is a computer that is configured to act as an Internet connection for a number of computers on a local network. You may or may not have a gateway, so check with your network administrator for this information. In addition, it is important to note that many servers on the Internet are configured to reject PING requests for security reasons.



The Microscanner from Fluke is a device that quickly tests for faulty connectors and wiring errors.

The Device Manager tells you, in real time, how various devices on your system are doing.

Higher-level problems

If PING works normally, but you still cannot communicate, the problem is most likely associated with networking software. Be sure you have the proper clients loaded for the type of network you are running. You might also check to be sure that the services you are trying to access are TCP/IP-based.

If PC-based tools do not help, it may be time to look at some dedicated test equipment to help you resolve the problem. LEDs may not detect all potential cable problems. For example, the LEDs will not tell you if the cable has very poor frequency response or is improperly terminated.

One last hint: Check to see if the computer is running a personal firewall. Personal firewalls are becoming very popular. They are used to keep someone from connecting to your computer over the Internet. Unfortunately, sometimes these firewalls can also keep your computer from properly communicating over a network. Be sure to turn off any firewall software to see if that fixes your problem. (Don't forget to turn it back on when you're finished.)

If you have tried all of the above and you are still having problems, or if your problems are not confined to a single computer, your network or server may be at fault. Likely culprits are: 1) heavy network traffic caused by an overloaded network topology, 2) an overloaded server, or 3) bad or improperly installed cabling.

Server problems

If you are having problems with a server, whether you are running Windows, UNIX or some other operating system, manufacturers usually include monitoring software to help you isolate problems and correct them. One of the most useful tools is the server system monitor. Specific implementations of this tool vary, but in general,

this software runs on the server and keeps track of resources devoted to various tasks. Read the manual to find out what tools you have at your disposal. Areas to check are overall system use, disk space available, memory space available, and the number of simultaneous connections. Bear in mind that a network or server designed by a non-video person may fail to take into account the special demands that video can place on a network.

Server-based problems are usually easily fixed with the liberal application of money. Purchasing larger disk drives, more memory or additional network interface cards may put life back into an overburdened server. If the problem turns out to be insufficient network capacity, you may have to add some hardware to reduce your traffic load.

Test equipment

Testing products are available for both wire and fiber applications, from low-end "continuity testers" to elaborate test sets with graphical capability, traceable standards measurement and a host of other advanced features. In many cases, the low-end test equipment works just fine and can identify the majority of cable problems.

The MICROSCANNER from Fluke is an example of such a piece of test equipment. It checks wire continuity and wire configuration; pinpoints opens, shorts, and crossed and split pairs; and generates multiple tones for locating cables.

If your cable checks out okay but you still have a problem, then it may be time to bring in the pros. There are a number of networking companies that specialize in troubleshooting broken networks. When they arrive, one of the tools they are likely to employ is a protocol analyzer or sniffer. Sniffers are software packages that usually run on common PC platforms. The sniffer allows a trained technician to look at the messages traveling on the network. From these messages they can tell a lot about what is going on and they can determine why and where network messages are getting scrambled.

Finally, if you troubleshoot fiber optic cables on a regular basis, you might want to check out the Siecor SmallTALK fiber communicator. This simple battery-operated unit provides two-way radio-like communications across a fiber-optic circuit, which is useful if you find yourself in a wiring closet trying to yell to a co-worker down the hall while troubleshooting a network problem. BE

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

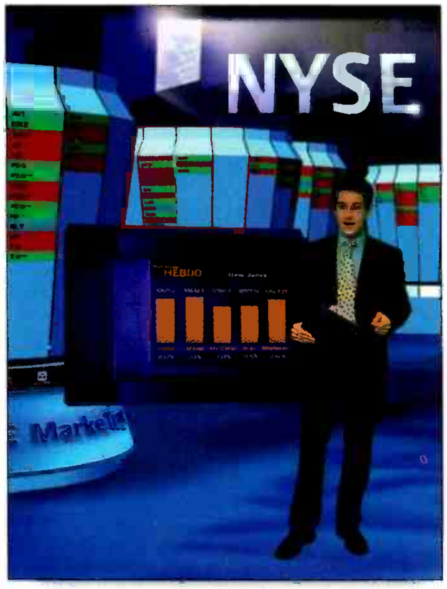
SEND Send questions and comments to:
brad_gilmer@primediabusiness.com

Trends in broadcast graphics

BY SHAWN UNDERWOOD

Three trends are changing the look of broadcast graphics for weather, sports and news coverage. More data is available to use, use of live data has greatly escalated and there's been a miniboom in virtual sets. Graphical compute power has increased dramatically, allowing for the creation of extremely realistic graphic representations of data and the on-air delivery of a virtually unlimited number of real-time data streams.

More data – and more precise and cheaper data – is available than ever before. Two or three years ago weather maps were accurate to within a kilometer; today, commercially available terrain data can be acquired for about the same price that provides accuracy to within three meters. In sports, the fly-throughs used for the 2002 Winter Olympic Games were so realistic that most viewers probably assumed they were live. They were, in fact, data reconstructed from satellite and other photos by Harris' RealSite software running on an SGI Onyx 3200 system.



Thomas Misrachi anchors "Wall Street Hebdo" for Bloomberg TV France from the New York Stock Exchange (NYSE) Virtual Studio — powered by vizrt viz virtual studio software and a Silicon Graphics Onyx2 visualization system.

The growing use of weather and terrain data is based on the increased ability to do complex texture mapping. First, all the polygons that compose the 3-D mountain range or ocean or building are created. This number can vary from several hundred thousand polygons to several million per scene. Then, the geospatial texture data, which can be as much as several gigabytes, is mapped onto it. This process has become more affordable because of the rapid increase of texture memory in high-performance computing.

As well, software techniques like clip-mapping and image-based rendering can create "virtual" texture space in addition to the hardware memory. Three years ago a PC graphics card had a couple of megabytes of texture memory, the Silicon Graphics Octane workstation had 16 MBytes of texture memory and the Silicon Graphics Onyx graphics server had 64 MBytes of texture memory. Today, texture memory on the typical PC card is 32 MBytes, compared with 128 MBytes on an Octane2 system and 1 GByte on an Onyx system.

Geospatial imaging revolves around the computational size of the data, but news data sources – the tickers you see everywhere – are streams of data served from a variety of sources. For instance, the news services and stock exchanges provide live data feeds, and content aggregators can provide continuously updating sports scores.

If police are chasing a bank robber, the station could broadcast a fly-through of the buildings and streets to make the news more compelling.

Increased use of live data

Where is all that extra data being used? Virtually any station or cable channel that's involved in information programming – sports, news or weather – has at least one ticker, and maybe several.

Years ago, a ticker was used primarily for severe weather alerts, and information had to be typed in manually by the Chyron operator. Today, that process is completely automated, and the large amount of available forecasting data is beginning to be used for microforecasts, to direct television viewers to the station's Web site, which uses the same processing and serving hardware.

The day can't be far off when micronews, similar to local traffic reports, will be delivered the same way. Once the weather department has paid for the 3-m- or 1-m-resolution data, why not turn around and use it in a news story? If police are chasing a bank robber, the station could broadcast a fly-through of the buildings and streets to make the news more compelling.

Sports coverage is another example of increased use of live data. In the old days, if sports producers wanted to show the television audience a clock, they would focus a camera on the clock on the scoreboard. Today, the digital output of the timer that drives the clock becomes a graphic.

What Could Possibly Go Wrong With Your Digital Conversion?

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The Olympic biathlon is another example. In addition to the clock that counts down the athletes' skiing time, a graphic now represents the number of shooting targets the athletes have hit, as they hit them. Lock-down cameras and radar guns transmit the data to workstations and servers that instantly deliver the information as a graphical representation on the home television screen.

Sportvision is the current leader in live sports data; Orad and Princeton Video Images (PVI) are also major providers. Sportvision's RACEf/x software, branded as FoxTrax for the NASCAR on FOX 2001 telecasts, is but one example of technology driving increased use of live data in sports.

What's left for local stations to differentiate themselves with is local news.

Virtual sets

More and more broadcasters are looking for ways to broadcast to niche audiences because the competition is so fierce. We know that CNN delivers national and international news much better than a local television station. What's left for local stations to differentiate themselves with is local news. Even with the trend toward centralcasting (where there would be one operations center for, say, 37 affiliate stations), all this realistic, accurate, available data, combined with a virtual set, allows the local station to affordably present local news in dynamic ways.

Virtual sets from leading software companies vizrt, Orad, Brainstorm and Discreet are enjoying a miniboom across the United States at local broadcast stations and cable channels, and around the world. For production and live coverage of the 2002 Winter Olympic Games, Wige Data, one of the world's leading providers of sports data processing and result services, delivered vizrt's viz [virtual studio] software package powered by Silicon Graphics Onyx2 systems to German public television broadcasters ARD and ZDF. Covering all of Germany, the stations used the virtual sets to air interviews and on-site commentary.

Because, again, much more texture memory is available on high-performance computers, virtual sets can now be much more realistic. All the extra memory can be used to create the carpeting or the desk or, in the case of the New York Stock Exchange, a banister on a balcony that doesn't exist.

With the increased use of ever more realistic virtual sets, the vocabulary of "on location" could go away. Correspondents will still be reporting "live," but the location of the "live" reporter will be in a studio, using a texture-mapped, photo-realistic representation created for the occasion or served from the growing archives of terrain data and local 3-D fly-throughs.

A few years ago the vice president of news at Fox made an insightful comment. He pointed out that viewers have been trained by their remote controls to surf. In the five seconds that viewers switch to your channel, you can get them to stop surfing only by having something compelling to see. That "something" is a graphical element – the more realistic, the better.

The increased quantity and quality of data and the increased streams of data are all converging. The technology, certainly, is here. The trend, and the challenge, is to use that data to present a much more immersive experience to the television viewer to prevent him or her from pressing those up and down buttons. **BE**

Shawn Underwood is the director of product management, Visual Computing, at SGI.

CONFORM

FORGET THE JONESES

WE'VE GOT WORLDWIDE TELEVISION STANDARDS TO KEEP UP WITH

For years there have been two primary analog TV standards worldwide. Now, with DTV, there are over 18 digital delivery standards. Only film is compatible with every single one of them. And if history is a teacher, you can bet that these too will be superseded by tomorrow's new standards. The one sure way to protect your investment is to originate on film. No other medium has kept pace with broadcast changes quite like it. So your program can live happily ever after in syndication, well into the future. Which should please everyone—including the Joneses.

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Pinellas 18 and Public Access Channel 96

BY LESLIE FOX

Pinellas County's new broadcast facility offers the capacity to air live programming and enables the shows to combine studio shots with remote video, as well as create longer and more varied programs. Photos provided by Professional Communications Systems.

In March 2001, Pinellas County, FL, came of age - the digital age. The county was introduced to new state-of-the-art facilities for its public access and government television channels. These two channels now share a new home, with advanced equipment and a world of possibilities. However, a closer look finds their history just as intriguing as their future.

Until the launch of the new facilities, Pinellas 18, the county's channel offices and studios were run in modest quarters on property located adjacent to the Pinellas County courthouse in Clearwater, FL, with the county's production studio just 192 feet away. The county commission chamber's television production control, master control, post-production, dub/multiformat equipment and nonlinear suites were being run out of a half dozen small rooms on the sixth floor of the courthouse building.

Weekly, Channel 18 broadcasts live closed-captioned coverage of county commissioner board meetings and work sessions, and at least a dozen programs that provide information on current affairs, veteran services and local emergency information.

While Pinellas 18 programs are a valuable asset to more than one million residents, it was seriously lacking in studio space and equipment needed to produce the programs at broadcast quality. In fact, the modest accommo-

dations had minimal room for producers to maneuver cameras, and broadcast time was limited due to inadequate programming equipment.

In January 1999, notification was received to move the entire Pinellas 18 operation from the sixth floor to the fifth in the courthouse, just down the hall from the county commissioner's chambers. While it made sense to move the control room next to the chambers, this area didn't have adequate square footage for the studio facilities.

Several miles from the courthouse, Time Warner Cable's Public Access Channel 96 was itself in dire straits. Required legally to designate a channel for government access and public access shows, Time Warner decided it no longer wanted to provide a studio for the public access producers. For years, Channel 96 used their tiny Time Warner studio to tape shows about local politics and religion.

Although Time Warner and Pinellas County held various negotiations over time regarding this dilemma, no plan had been solidified – and, even worse, Pinellas had no place to relocate the Channel 96 operation.

The County Commission and Department of Public Affairs decided on a new facility to house a studio and office complex for both channels. In September 1999, the county commissioners approved funding for a new 25,000-square-foot central production facility on the property that formerly housed the Pinellas 18 studios and offices.

Although both channels reside in the same facility and use identical equipment, they have separate control rooms, studios and offices. In addition, a tight budget forced the county to choose cost-effective equipment.

Strict schedule, tight budget

By April 2000, the county had assembled the construction team for the consolidation and update of these two channels. Rees Associates, AIA (American Institute of Architects) would complete building programming, while architect Harvard Jolly Clees Toppe would design the new building. Professional Communications Systems (PCS) was deployed to design the cablecast facilities.

The team's task was to complete the project and be on air by Feb. 1, 2001. The entire facility would have to be designed, built and online in less than 10 months.

PCS immediately went to work developing a written scope of work for the project and interviewing key personnel. During this interview process, every possible aspect of the facility design was covered and documented. With this done, design goals were set.

It was determined that the facility would be broadcast quality and have an SD video/stereo analog audio infrastructure – while being fiscally responsible with taxpayer money. Both channels would have totally separate control rooms, studios and offices, yet their equipment would be identical with a few exceptions.

Additionally, satellite program acquisition (two 4.5m C/Ku dishes) as well as an automation system would be installed to run program acquisition, with master control for both channels on a 24-hour basis. Most importantly, there would be space for future growth.

Throughout the discovery period, it was also determined that the overall budget would be tight. For that reason, the equipment list would have to be extremely cost-effective without sacrificing quality, giving the county the best value for their money.

The county commission and Department of Public Affairs decided on a new facility to house a studio and office complex for both channels.

Low-cost, high-quality solutions

Installation began at PCS's 13,000-square-foot Tampa buildout facility with the mounting of the equipment in the racks and cable manufacturing. By December 2000, the county revised the completion and on-air dates to March 1 and March 15, respectively. Even with this added time, it was essential to pre-manufacture cables and check equipment offsite to minimize onsite installation time.

The result: Both studios were equipped with three Ikegami HL-45WBT/2 triax cameras with a studio option package and QTV's FDP-15 WinQuePro 15" LCD teleprompters. Vinten's Multi-controller II studio robotic pan/tilt/zoom system was used for

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Pinellas 18, while Vinten's HD-1/Petrel heavy-duty tripods were used in the Channel 96 studio. ESC and Brightline fluorescent and quartz lighting fixtures were selected for studio use.

Both production controls were equipped with Echolab 5800 switchers, three Sony DSR-2000 recorders, Clear-Com intercom and IFB, Ikegami monitoring, and custom consoles provided by Harvey Scenic.

Audio control for both channels was equipped with a Mackie 24.8 mixing console with monitoring bridge, JBL Control 1 speakers, Tascam audiocassette and DAT machines, and a Panasonic CD/DVD player. The PESA Tiger was selected as the router system and was framed to 144x144 and populated to 96x64. The video was SD and the audio was stereo analog. Grass Valley Group was used for distribution/format conversion and the sync system was Tektronix.

Each MCR output air channel consisted of a 16x2 stand-alone PESA Bobcat manual switcher and was fed by router under pre-select busses under full automation control and other MCR sources. Should either router buss fail, the operator could manually take the other router buss on the 16x2. If the Bobcat manual switcher failed, the second switcher could be patched in its place and still be under full automation control without reconfiguring the automation system.

For automation failure, both channels could be switched manually on the 16x2. Downstream of the MCR switcher is an Evertz 9525DSK with logo, also under automation control. A Pluto AirSpace server with 44.3 hours of storage at 25 Mbits/s and Sundance automation software was used to control the PESA router, Sony VTRs, Pluto servers and Evertz DSK.

Pinellas County created a new broadcast facility from concept to air in less than one year, and under budget.

A total of three Sony ES-3 nonlinear edit systems with 18 GBytes of storage each were purchased to complement the existing Sony ES-7. Ancillary monitoring, speakers and DVDs were added to complete the design.

Once the equipment was selected and installed at the buildout facilities, new challenges awaited the PCS team. Technical areas of the building were still under construction and reliable power was a problem. PCS utilized temporary lights during the early stages of on-site installation. As planned, the final installation was finished on March 1, 2001, with training completed on March 15. Pinellas County then decided to delay the on-air date another week to allow for more training.

Meeting the deadline

Through the dedicated effort of the entire design team, Pinellas County had created a new broadcast facility from concept to air in less than one year, and under budget. Through diligent work by the Department of Public Affairs staff and the PCS design and installation team, the equipment and integration portion of the project was completed well under the original budget.

The Pinellas 18 studio alone is more than 2300 square feet with 17-foot ceilings, soundproof walls and doors, and interview sets for talk show guests. The new equipment will allow the capacity to air live programming. It will also enable the shows to combine studio shots with remote video, and create longer and more varied programs.

It can now be more of a news show, with digital technology that not only improves the picture quality of the programs, but is more compatible with what other local television stations use – making it easier to share taped programs with other channels. More importantly, the facility is set up so that during emergencies such as hurricanes, local television stations can broadcast easily from the facility, just a short walk from the emergency operations center.

The taxpayers can now watch their government at work at a quality level, comparable to the commercial channels on the cable system. The days of makeshift studios are over for Pinellas 18 and Public Access Channel 96. BE

Leslie Fox is a freelance writer.

Project team

Mike Ramsey, director of engineering
Chuck Sumner, chief engineer
Tom Borawski, project manager
Beers Construction, contractor
Glenn Thomason, director of engineering
Rich Merriam, chief engineer
Bill Blush, project manager
Don Peterson, engineer

Equipment List

Ikegami HI-45WBT/2 triax cameras
QTV FDP-15/WinQue Pro 15" LCD teleprompters
Vinten Multi-controller II studio robotic pan/tilt/zoom system
Sony DSR-2000 recorders
Panasonic CD/DVD player
PESA Tiger router system
Tektronix sync system
Grass Valley Group distribution/format conversion
Sundance automation software
Sony ES-3 nonlinear edit systems

I'm from the government and I'm here to help you

BY DON MARKLEY

Those words have often struck terror into the hearts of station management. This also applies to visits by representatives of the Occupational Safety and Health Administration (OSHA). It has been said that the acronym for that organization comes from the first comment made by the chief engineer when he hears that they are on site – "Oh Sha!" or something like that – which may be just a rumor. In any case, the worry accompanying their arrival may be unfounded as they really can be a valuable asset to the staff in improving conditions in the workspaces.

Everyone should be aware by now of the existence of OSHA and their role in investigating accidents. That awareness also should extend to knowing of the requirement for a climbing safety device on all new towers. Many are still unaware of the assistance offered by OSHA to help stations avoid violations and improve overall working safety conditions.

A quick visit to the Web site www.osha.gov can be of great help. There you will find compliance guides and directives as well as the agency library. You can also find the complete OSHA regulations, although they are a bit bulky to attempt to browse. A better solution is to find the address of the area office of that agency. Then plan a visit to that office the next time you are in its vicinity. At the same time you can schedule a meeting with a representative to discuss your operation and how the OSHA regulations may apply.

It is also possible to schedule a visit from an OSHA representative to your station to review your operations and safety practices. They will gladly (or at least cordially) make such a visit and give you guidance in meeting their requirements. This is a no-cost trip that can save you very big bucks if someone is injured in an accident while at work. It is highly recommended.

At the least, the regulations require that stations perform a hazard assessment of their facility to determine those factors or conditions that may be dangerous for your staff. That assessment should be posted at the station and signed by all your staff after they have read it and discussed it with the chief engineer. In addition, safety meetings for the staff are necessary periodically to discuss hazards and work that is being performed. Those meetings are essential when construction is being performed on the site. In addition, there are actions that must be taken during construction such as the mandatory wearing of hard hats, warning sign placement, notifications of measures to be taken if accidents occur, etc.

If an accident does occur at the station where someone is injured, OSHA should be advised immediately in case they want to investigate the occurrence. It is much better for the station to advise them of the accident than for them to find out from the news media or through a complaint from a staff member. The first rule in such an incident is to bare the corporate soul in total. In other words, be honest with them as to what happened, why it happened and what may have been done incorrectly. They will find out anyway and having it

Everyone should be aware by now of the existence of OSHA and their role in investigating accidents.

FRAME GRAB

A look at the consumer side of DTV

VOD revenues predicted to soar

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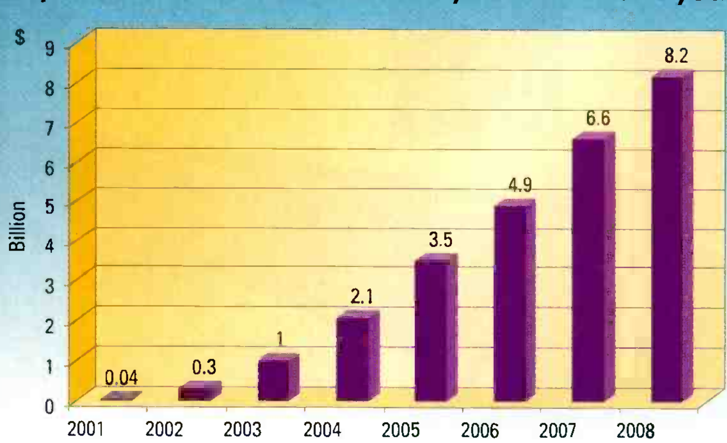

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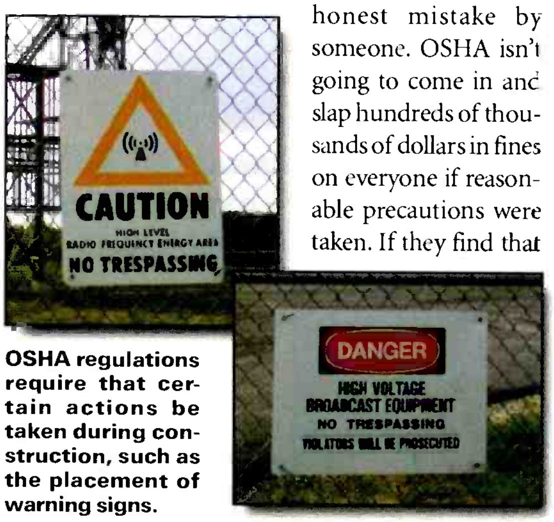
freely and completely disclosed will indicate your willingness to cooperate with their investigation. In addition to notifying OSHA when an accident occurs, immediately start a log of times and actions taken concerning the incident. It should show dates and times for all actions, who was advised and who took action, what conditions existed at the time of the accident, and as much detail as possible to clarify the situation. Document everything clearly and honestly. If it is determined that someone lied to the investigator, every stone will be turned and examined in detail based on the fact that some type of cover-up may be taking place.



OSHA regulations require that certain actions be taken during construction, such as the placement of warning signs.

Let it be assumed that the accident was just that – an accident that involved something that could not or wasn't anticipated and that involved, at worst, an honest mistake by someone. OSHA isn't going to come in and slap hundreds of thousands of dollars in fines on everyone if reasonable precautions were taken. If they find that the station did something wrong or not in accordance with their regulations, a fine may result, but it probably won't be major. This is especially true if the required safety meetings and precautions were taken. The really big fines occur if a hazardous condition existed that was known to the management but concealed from the actual workers who were directed to perform the work anyway. Those events may result in major penalties, as they should.

A big service that OSHA will provide if an accident occurs is to help the station determine changes that can be made to avoid the recurrence of the incident. They will help the station better determine existing or possible hazards, notify the staff of such conditions, and make changes to improve overall safety.

If OSHA makes suggestions concerning changes to be made, take action promptly on such suggestions. If their recommendations are ignored or if promised changes by the station are not completed and another accident results, woe unto all involved. Not only will the resulting fines be considerably larger, the station has just opened the door for all sorts of civil damage actions by the workers involved.

Much like FCC regulations, OSHA regulations may be something that the station would rather not deal with. However, all are simply a condition of doing business. Your staff should be fully aware of those occasions that require systems to be disabled during work by "lock-out, tag-out" procedures, how such actions are to be taken and just who bears the responsibility for taking such actions. The procedures for dealing with accidents should be known by all staff members and acknowledged by signing the appropriate documents that, in turn, should be properly posted.

Document everything clearly and honestly.

Use the OSHA requirements to prepare a training manual for all new hires at the station. Again, the use of a training manual along with a signing sheet to show that appropriate training has occurred is not only an attempt to meet the applicable regulations, it is simply good business practice. Working to comply with OSHA regulations before someone is hurt on the job is good operating practice, good business and a great action to cover your stern sections from resultant serious damage. BE

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

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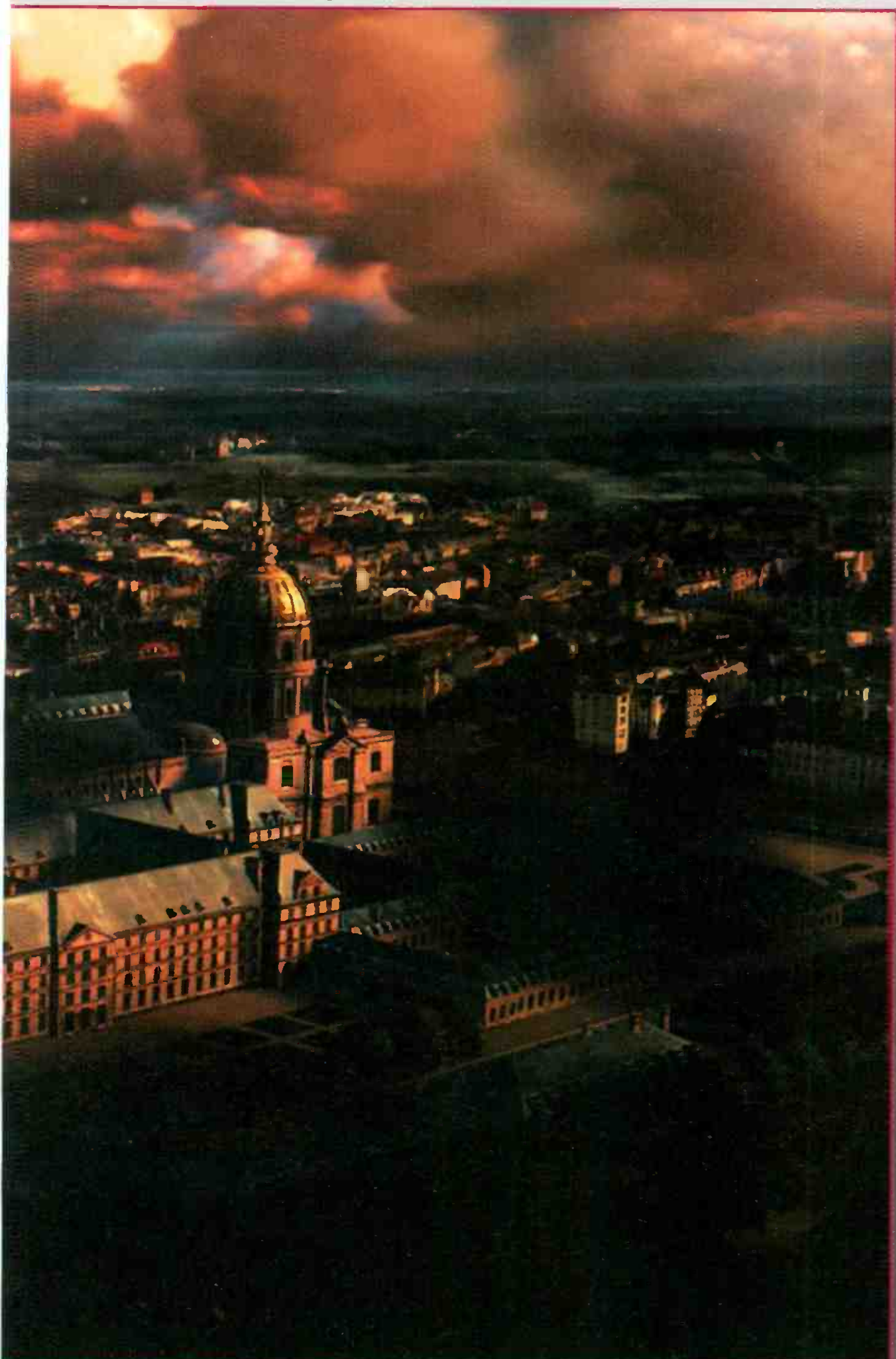
AAF - The "Super-EDL"

EY BOB TURNER

This mostly digital re-creation of 1830s Paris was made for the French movie *Vidocq*, whose creators relied on AAF metadata.

If you heard a story about someone who was still using 30-year-old television technology in post-production today, you'd probably smirk in disbelief. But, if you use post-production software from multiple manufacturers, or more than one computer platform for post production, or a second platform for compositing, you may be using such outdated technology yourself.

CMX invented the edit-decision list (EDL) more than 30 years ago. The company closed up shop almost five years ago, yet many of us still use this ancient technology to share editing decisions. In our digital, nonlinear era, this is a disgrace. There is a solution, but manufacturers need to know that customers would like them to implement it.



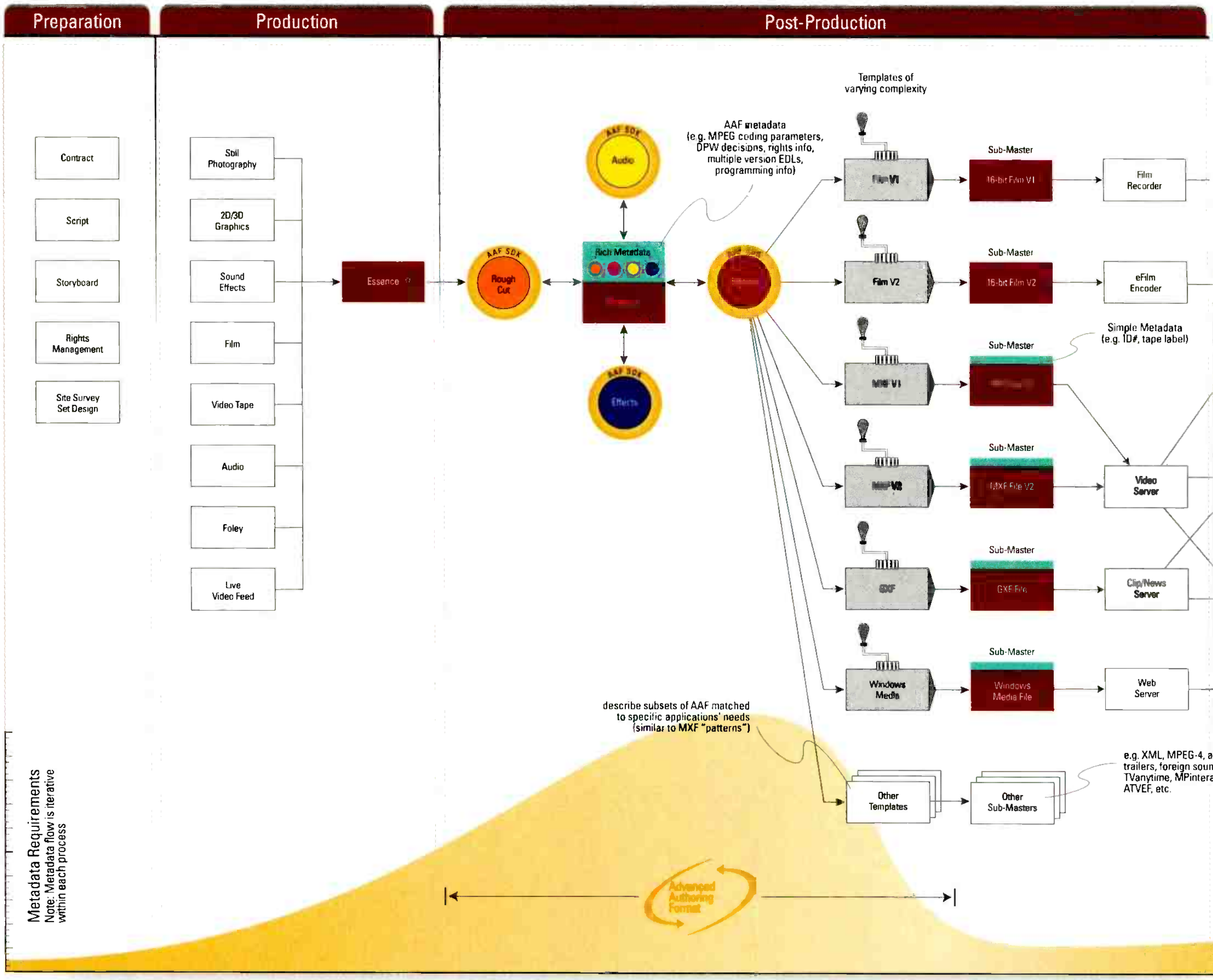
The solution is the Advanced Authoring Format, or AAF. It is a technology designed specifically for digital nonlinear post production and authoring. It is a "Super-EDL," but it is also much more. Its purpose is to solve the problems of cross-platform interoperability — operating post-production and authoring software from different manufacturers.

Today, we have a hodgepodge of video and audio formats that go into and out of the post production process. Furthermore, the media can make more "roundtrips" than the developers of EDL had anticipated. These media processes can include versioning, repurposing original content, outputting multiple formats to multiple delivery media, and workgroup processes (audio sweetening, graphics/effects compositing, offline, finishing).

There is a growing need for a solution that allows work to cross over multiple platforms, operating systems and software without the loss of creative decisions made on any one software package or platform. Users want to eliminate the redundancies of recreating those creative decisions (audio levels, custom effects, titling). We want to avoid the lose-lose choice between re-inputting original media or performing a time-consuming transcoding process because the media is incompatible with the process.

More importantly, we want more than an EDL limited to one video track and four audio tracks. We want an exchange interface that deals with different compression schemes, multilayer composites, multiple versions and multiple format outputs with multiple aspect ratios. We want EDLs to include:

- library information
- better audiovisual clip identification
- media asset management information
- scheduling data
- effects information
- information to facilitate interactive authoring
- ease of working in various frame rates across platforms



AAF metadata can start with scripts, time code logs, notes, etc, and this data can be attached to a multitrack EDL rough cut. The combined metadata can travel with the project to the finishing facility where the metadata is used in a workgroup environment. Then the finished project is archived with all the compositional metadata and sent as an MXF file where it can be delivered in a wide range of formats via a wide range of methods. Diagram courtesy of the AAF Association.

File interchange

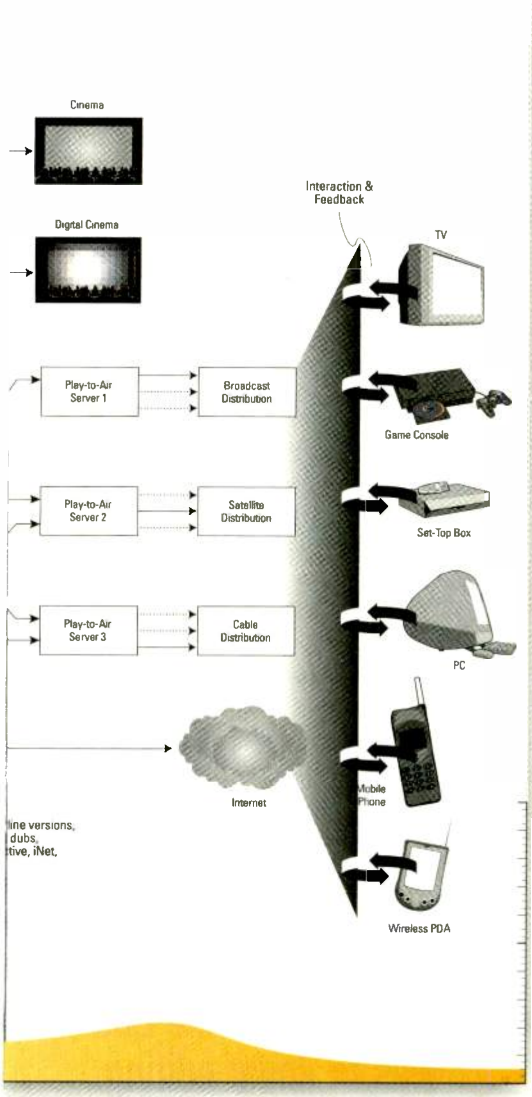
AAF is to digital editing/compositing what the EDL was to linear editing. The AAF solution has several components:

- It supports the complex combination of a piece of essence and its associated metadata. This allows the content to be described as a media object.
- It facilitates the cross-platform interchange of metadata or program content. (It is designed to replace OMFI.)
- It allows operators to track the history of pieces of program content from source elements through final production.
- It allows access to networked content files on remote platforms or storage.
- It allows the combined essence in a selected format to be rendered later in the post process.
- It catalogs an extensive list of audio and video effects with a rich set of built-in standard effects.
- It provides a way to "wrap" elements of a project together for archiving.
- It encapsulates HTML and XML content, includes translators, and supports HTML/XML output.
- It provides for application program interfaces (APIs).

While designed to eliminate incompatibility and redundant tasks to expedite project management, AAF also allows a manufacturer to include proprietary metadata, while maintaining exclusive access to it.

An example might be a feature like Avid's script-notation alternative to bins-based media management. Avid holds a semi-exclusive license for this technology, and it can be included in the

There is a growing need for a solution that allows work to cross over multiple platforms, operating systems and software.



AAF proprietary metadata that Discreet, Quantel, Media 100, Adobe or FAST products cannot access. By the same token, the other manufacturers can add proprietary metadata that Avid's product cannot access. Thus, the AAF format allows for a compilation of standardized metadata and proprietary metadata.

At NAB2002, one of the biggest announcements in the Avid booth was the company's AAF-based MetaSync tracks on the Avid timeline. Avid demonstrated how the MetaSync tracks could be used for creating iTV programming, as well as everything from Web publishing and DVD authoring to creating amusement-park virtual-reality rides. Research firm Emarketer predicts that iTV will grow from 12.7 million U.S. households in 2001 to 22.1 million by the end of 2002.

The MetaSync AAF metadata required to accommodate this growth is an excellent example of why a CMX EDL is no longer sufficient data.

Even Quantel, formerly known for high-quality (albeit expensive) closed-system/proprietary OS products, has recently announced a Generation Q series of products with an AAF-compatible family of post-production, graphics and broadcast-news solutions.

Open-source standard

AAF development is the responsibility of the AAF Association, incorporated in February 2000 as a nonprofit group. It is made up of hardware and software manufacturers and end-users who want to advance media and metadata interchange. (The association's Web site is www.aafassociation.org.)

At NAB2001, the AAF Association announced that its board of directors voted to make the technology open-source and available on Source Forge for a download. (LINUX is another example of an open-source solution.) This means that the software development kit (SDK) is free and downloadable from the Web site. Four hundred downloads have occurred in the past year since that announcement.

Version 1.01, incorporating AAF member contributions over the last year, is now available for download. The AAF Association has recently put those contributions through a process of testing and porting to all of AAF's supported platforms. The association also announced Version 1.5 implementation guidelines for edit interchange. This is an AAF Association guide to using AAF to model edit decisions (and you can use the v1.01 toolkit to implement these design implementations).

One new component of Version 1.01 is the availability of an AAF Explorer, which works in Windows to open and play AAF files. Also included are an EDL-to-AAF converter and an MPEG plug-in.

Shaping the technology

You may wonder why anyone would want to be a member of the association if the software is free. The answers include opportunities to shape the future evolution of the software and prioritize new features, as well as benefit from the association's publications and developer

AAF membership

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- Avid
- British Broadcasting Corp.
- Cable News Network
- Discreet
- Fox News Corp.
- Liberty Livewire
- Microsoft
- National Imagery and Mapping Agency
- Panasonic
- Pinnacle
- Quantel
- Sony
- Turner Entertainment Networks

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- EMC
- Encoda Systems
- Grass Valley Group
- Leitch
- Matrox
- NL Technology, LLC
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- Pandora
- Philips
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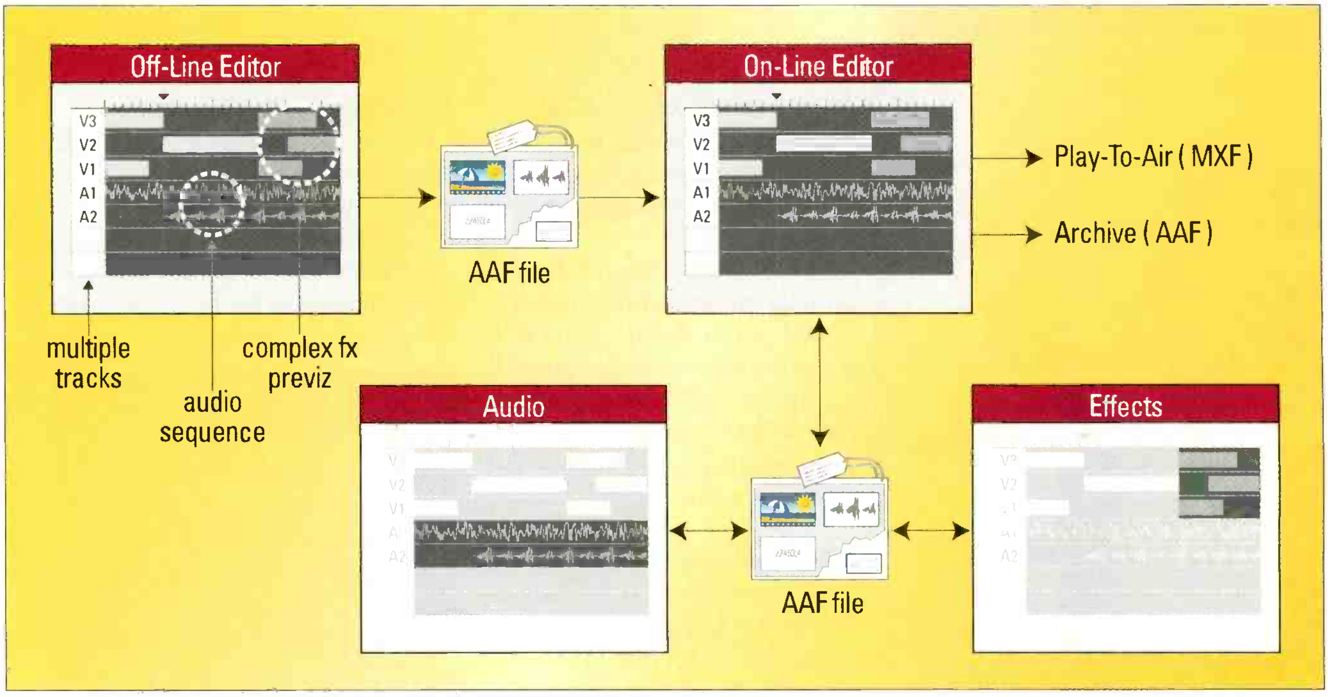


AAF enhances workflow by allowing specific parts of a composition to be sent to an appropriate application for treatment and then gathered back into the whole. Diagram courtesy of the AAF Association.

technical support.

In addition to its planned compliance with umbrella metadata standards under the SMPTE and EBU, the AAF Association is working with the International Standards Organization (ISO) and has a close development relationship with the Pro-MPEG Forum.

At NAB2002, there was an Industry Interoperability Center in the Las Vegas Convention Center where six manufacturers' systems displayed the benefits of such interchange technologies. In that center, one company, Oliver Morgan's MetaGlue (www.metaglue.com), offered test, measurement and validation software for MXF and AAF interoperability as well as consultancy services for users, designers and implementers of metadata-intensive television-production systems. In addition, there were at least eight AAF-compatibility presentations on the convention floor at various manufacturers' booths.

Essence data

While AAF was designed to deal with metadata either married to essence media or linked to essence media but located elsewhere, AAF can be a native essence media file format. Such a file format, with essence wrapped in metadata, is mainly designed for post production needs. Remember that the ancestry of AAF includes the OMF interchange format.

One new development trend is using MXF media files with AAF metadata. Because of the depth of metadata associated with AAF media, there are advantages to associate the metadata with a separate but compatible media file format. (See sidebar "MXF and AAF" for additional information.)

The BBC announced its implementation of "Project Mercury" to create an AAF-based open-system architecture designed for the 21st century. This design incorporates both common media files and AAF metadata. Along with this announcement came a joint announcement that the BBC purchased 600 seats of AIST's new AAF-compliant Cinegy NLE software.

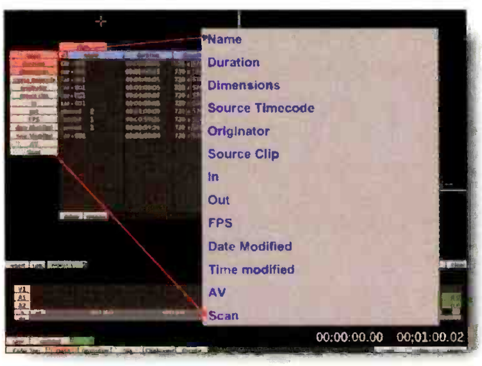
QuickTime is focused on information needed to play or stream the file. The AAF technology has a different focus. It is married to metadata that carries a history of processes from the original creation or storyboard through the final editing. Such information can make it easier to repurpose content, or provide distribution capabilities through media with differing aspect ratios, resolutions, etc.

At the show, the AAF organization indicated plans to wrap an AAF metadata container around any media file, so QuickTime or any other media could become part of an AAF metadata system.

A call to action

AAF technology can improve the

AAF is to digital editing/compositing what the EDL was to linear editing.



AAF metadata contains far richer information than the traditional EDL. Each clip listed on this Quantel iQ screen can be embedded with the above metadata, and a non-Quantel AAF-compliant edit system will be able to access the data. Image courtesy Quantel.

post-production process. It can eliminate many tedious steps, saving time and simplifying project management. And it can preserve information normally lost when going from process to process. AAF makes it possible to select the best software for each process without data loss.

AAF products are available now. There were a large number of popular editors and compositors demonstrating AAF compatibility. If you want the benefits of AAF technology, contact your systems' manufacturer and ask when it will be available.

But many manufacturers have not yet begun AAF implementation. They say, in effect, "We are interested, but we just have not seen the demand yet. And it won't be that hard for us to incorporate AAF technology when the time is right."

The AAF Association has had a hard time communicating the benefits of this technology to the average user. But as soon as users understand how it will save them time and money, provide better quality and maybe even offer more creative choices, the demand will grow strong and loud.

Find out what AAF could mean for you. The benefits described here are only a part of what AAF will offer in the future. We can have a true cross-platform, cross-OS, cross-manufacturer transfer of content solution, and we will be able to select the software solutions we want without compromise. BE

Bob Turner is a 30-year veteran film and video editor and nonlinear editing system consultant.

Editor's note: The editor would like to acknowledge Brad Gilmer, executive director of the AAF Association and writer of Broadcast Engineering's *"Computers and Networks" column, for his assistance with this article.*

MXF and AAF

Most broadcasters are probably familiar with Material eXchange Format (MXF), created by the ProMPEG Forum. It is essentially an essence media and metadata subsystem of AAF. MXF shares the AAF object model but not the binary file format. By making the MXF design a subset of the essence-oriented parts of AAF (but with a different binary format), the AAF organization has the option to use MXF or AAF as the essence container. You can expect to see a future version of the AAF toolkit supporting direct access to MXF's binary format.

MXF was designed for video servers and streaming. The smaller mediafile metadata containers make the format a good choice for less demanding news editing operations. Because of its less complex file structure, it is faster for archiving and online/near-line mediafile solutions.

The limited MXF metadata can be accepted in an AAF metadata post-production environment, and the AAF metadata can be filtered to fit an MXF metadata file. In other words, they are relatively compatible. This means that a broadcaster can have a facility where the post-production department can share media and metadata with the news editors and the media and metadata can reside on the same servers. Because of the search and access speed for MXF essence media source material, there is a trend by manufacturers to use AAF metadata associated with the MXF source media and not use the more complex AAF media with the complex metadata container. At this year's NAB, Mike Rockwell, CTO of Avid Technology, indicated that Avid's media files would be heading in exactly this "MXF with AAF associated metadata" direction. He pointed out that, with an MXF header to point to – any media file, from QuickTime to .wav – could have AAF associated with it.

Data dictionary

Essence data or essence media: All program content consists of two parts: essence data and metadata. Essence data is the actual audio/visual media, such as:

- Video data – uncompressed video, RGB, HDTV, proprietary video file architectures, or common compressed video formats such as MPEG-2, QuickTime, .avi and DV
- Audio data – any digital audio source (audio clip from a single track on an NLE, .aiff, .wav, or DAT)
- Graphics/CG/animation – graphics, animation or text formats (.tif, .tga, .jpg, .pix)

Metadata: All the data that cannot be seen or heard, such as EDLs, timecode and sync/blanking information. Metadata comes in two categories: descriptive metadata and structural metadata.

Descriptive metadata can include:

- *Identification and location metadata* – anything that can identify essence media (e.g., file source type or location of a videotape)
- *Process metadata* – How essence media is assembled (how the media is composited or edited). This data may be used to automatically assemble a new essence media.
- *Administration metadata* – digital rights, encryption, user access, air date scheduling and other business administration
- *Interpretive metadata* – language descriptions, scene/take, character, artists
- *Parameters metadata* – signal coding, storage type, streaming parameters

Structural metadata can include:

- *Relational metadata* – links, synchronization or relationships of essence media
- *Spatial and temporal metadata* – creation dates, durations, event times, delays, layer of object

MPEG-4 secrets

BY JOHN WATKINSON

Coming so soon after MPEG-1 and MPEG-2, MPEG-4 raises a number of questions. Will it replace MPEG-2? Does it make existing equipment obsolete? How does it affect the broadcast industry? To answer those questions, this article explores MPEG-4's predecessors and puts MPEG-4 into perspective.

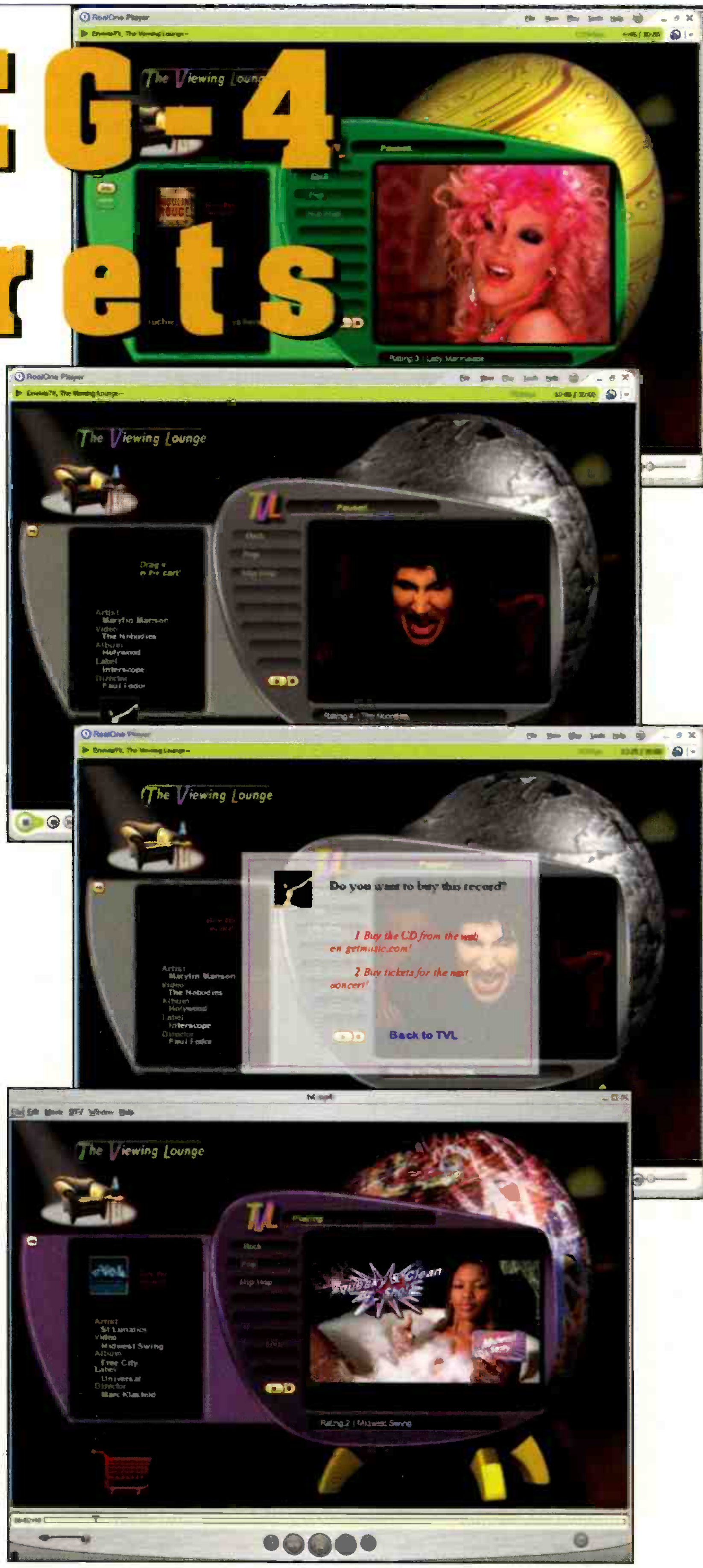
All compression-decompression schemes (codecs), including the MPEG variety, are concerned with using fewer data or less bandwidth to store or transmit pictures and sound. Compression certainly isn't new to broadcasting.

For example, interlacing scan lines is a way of halving the video bandwidth and is a crude compression technique. Systems like NTSC fit color into the same bandwidth as monochrome and are also classified as compression techniques.

Effective compression relies on two devices: an encoder at the signal source that packs the information more efficiently, and a corresponding decoder at the destination that unpacks it. Unless these two devices are compatible, the system won't work. Without standards to provide this compatibility, there would be chaos.

Flexible and upgradeable

The problems facing the MPEG designers were many, but the most important ones were how to make



Envivio's Video Lounge allows users to select and watch their favorite music videos and buy CDs and concert tickets. The Video Lounge screens consist of multiple MPEG-4 objects that are composed using the MPEG-4 binary information for scenes (BIFS) composition tools.

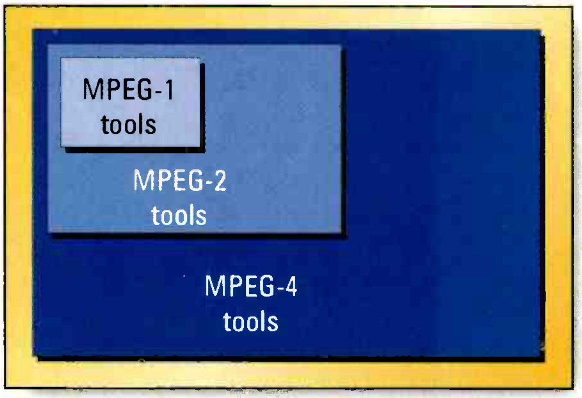


Figure 1. MPEG-2 did not obsolete MPEG-1, but rather augmented it. MPEG-2 can be thought of as a larger toolbox that includes all of the MPEG-1 tools. Likewise, the MPEG-4 toolbox is massive, but it still contains all of the MPEG-1 and MPEG-2 tools.

compression available to a wide range of applications and how to allow future enhancements to prevent obsolescence.

The designers wanted to make MPEG available to applications from large-screen, high-quality video systems to small, black-and-white security systems. Obviously, an electronic-cinema compression system designed to work on a giant screen must have more powerful hardware and more memory than a system designed for a security camera.

The designers addressed this problem by defining "Levels" and "Profiles" in the system. Levels set limits to the amounts of processing power and memory needed to decode the signal. Profiles set limits to the complexity of the encoding and decoding.

MPEG designers addressed the problem of avoiding obsolescence by adopting two steps. The first was to define the signal between the encoder and decoder devices, instead of defining the devices themselves. The second was to make improvements that were backward compatible.

MPEG defines the syntax and protocol of the signal between the encoder and the decoder. This is, effectively, a kind of language. A compliant encoder is one that can speak the language, even if it only has a limited vocabulary. A compliant decoder must be able to understand the whole vocabulary at a particular profile, just in case an encoder chooses to use some of the obscure terms.

MPEG works by making available a set of tools that may result in compression under different circumstances. One of these is the discrete cosine transform (DCT), which turns an eight-row-by-eight-column block of pixels into a set of coefficients. When typical images are subjected to DCT, many of the resulting coefficients are small, or zero, and thus can be eliminated from the data stream. Another MPEG tool is the ability to send picture differences that convert another picture into the present picture, and so on. An intelligent encoder will choose the most appropriate tools for the type of incoming material.

Developing compression tools is rather like an arms race.

Developing compression tools is rather like an arms race. Engineers build a simple encoder that works well, but occasionally it encounters a particular type of picture that it can't compress. So the engineers develop a new tool to fix that. The result is that the encoder encounters uncompressible pictures less often, but it still happens. So the engineers keep developing new tools to keep up with compression difficulties. They can't develop these tools overnight, and they have to start somewhere. MPEG-1 was the starting point for compressing moving pictures. It contained a useful set of compression tools (some of which were developed for JPEG), but it was by no means the definitive system.

Figure 1 shows that MPEG-2 did not obsolete MPEG-1, but rather augmented it. In a sense, MPEG-2 is a larger toolbox that includes all of the MPEG-1 tools. An MPEG-2 decoder, by definition, contains an MPEG-1 decoder and is compatible with MPEG-1 bit streams. A compliant MPEG-2 decoder includes all of the MPEG-1 tools, and would interpret an MPEG-1 bit stream as a valid MPEG-2 bit stream that did not explore all of the

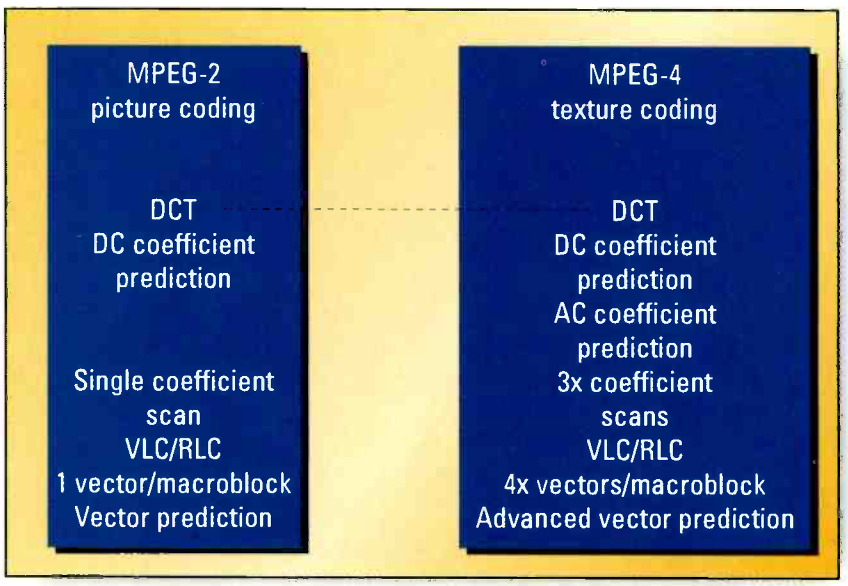


Figure 2. A comparison between MPEG-2 and MPEG-4. MPEG-4 brings extra tools to image coding.

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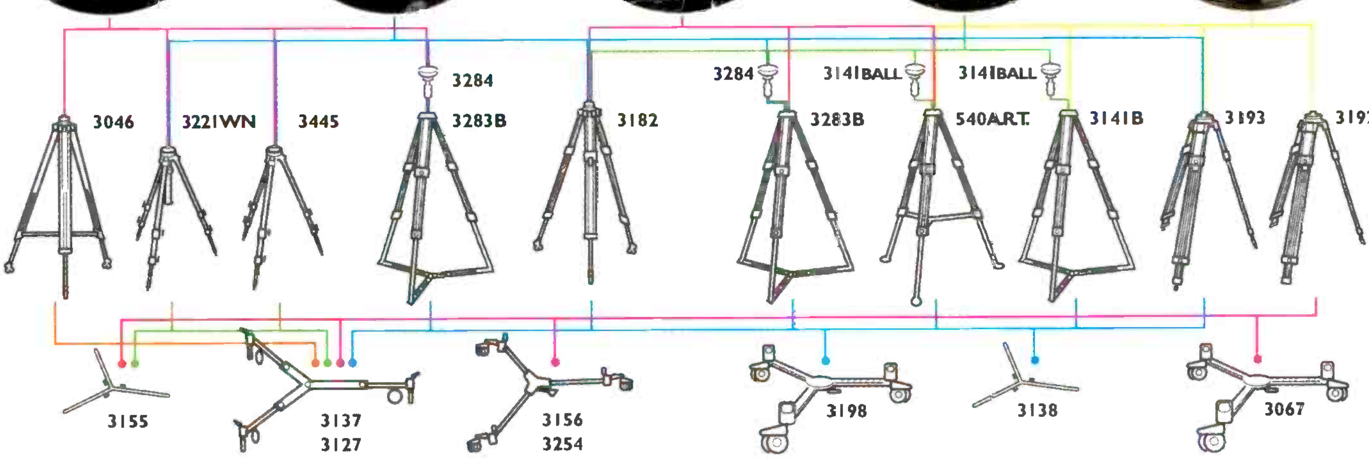

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coding possibilities. However, an MPEG-1 decoder would not understand the coding tools introduced by MPEG-2 bit streams. This relationship of backward compatibility within the MPEG family holds for MPEG-4 as well. The MPEG-4 toolbox is massive, but still contains all of the MPEG-1 and MPEG-2 tools.

Extra tools

Let's consider the extra tools MPEG-4 brings to image coding. Figure 2 shows a comparison between MPEG-2 and MPEG-4 in this respect. In all of the MPEGs, the DCT creates coefficients. It does this on a block-by-block basis, which gives a certain degree of compression. However, in some picture areas, the coefficients in one block may be similar to those in the next. In these cases, the codec can obtain better performance by predicting coefficients from an earlier block rather than just sending new ones whole. MPEG-2 does this using the so-called DC coefficient. The author cannot see how an array of pixels can result in a direct current, and it might be more accurate to refer to this parameter as the zero-spatial-frequency coefficient, which effectively conveys the average brightness of the pixel block.

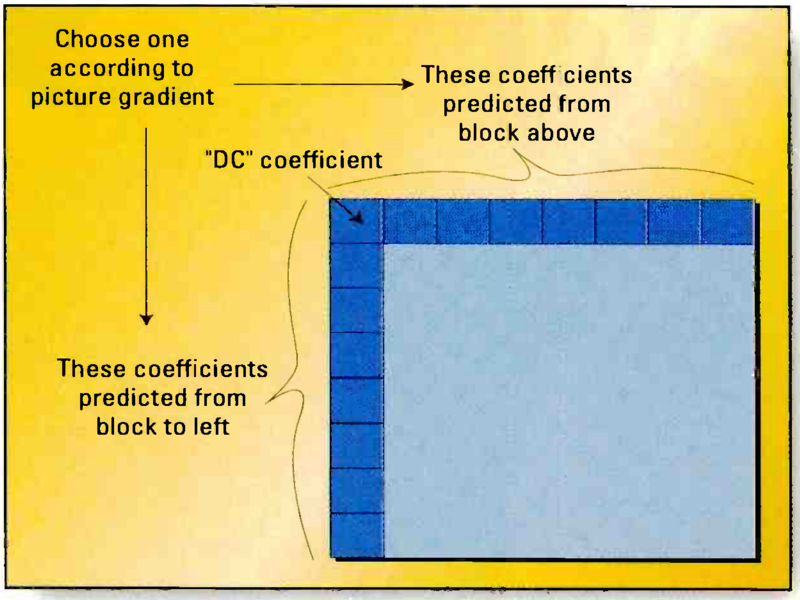


Figure 3. With MPEG-4, one can predict the entire top row of coefficients or the entire left column of coefficients from an earlier block.

Clearly, in an image containing a large plain area, the average brightness of several blocks might be the same. MPEG-2 takes advantage of this by arranging blocks in a horizontal picture strip called a slice.

Within a slice, the first block will have an absolute value for the DC coefficient, whereas the subsequent blocks will have difference values that must be added to the previous block's value to create the value of the current block.

MPEG-4 goes further than this. Figure 3 shows that, in MPEG-4, one can predict the entire top row of coefficients, or the entire left column of coefficients, from an earlier block. Choosing between predicting the row coefficients or column coefficients would be based on the picture content. For example, consider an image containing a dominant vertical object such as a utility pole. Scanning horizontally across this image would result in large changes as the pole is encountered, whereas scanning vertically down the image would result in a column of blocks all containing the pole and all having similar coefficients whose

The MPEG-4 toolbox is massive, but still contains all of the MPEG-1 and MPEG-2 tools.

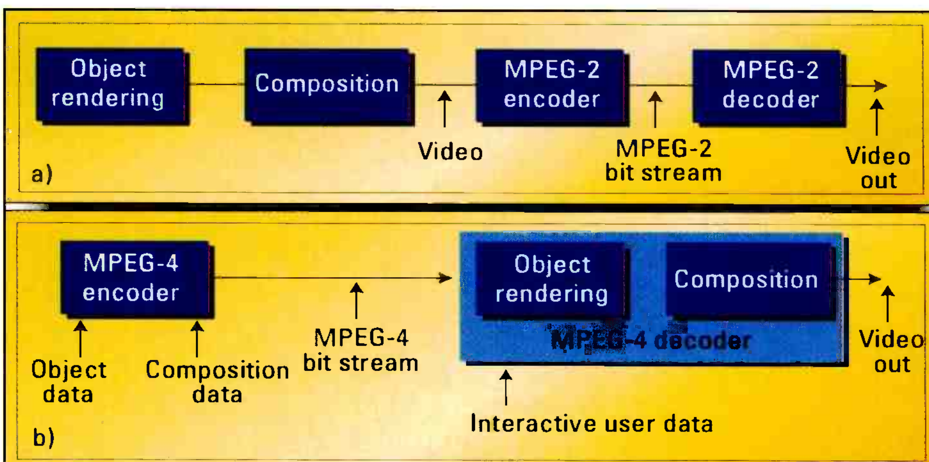
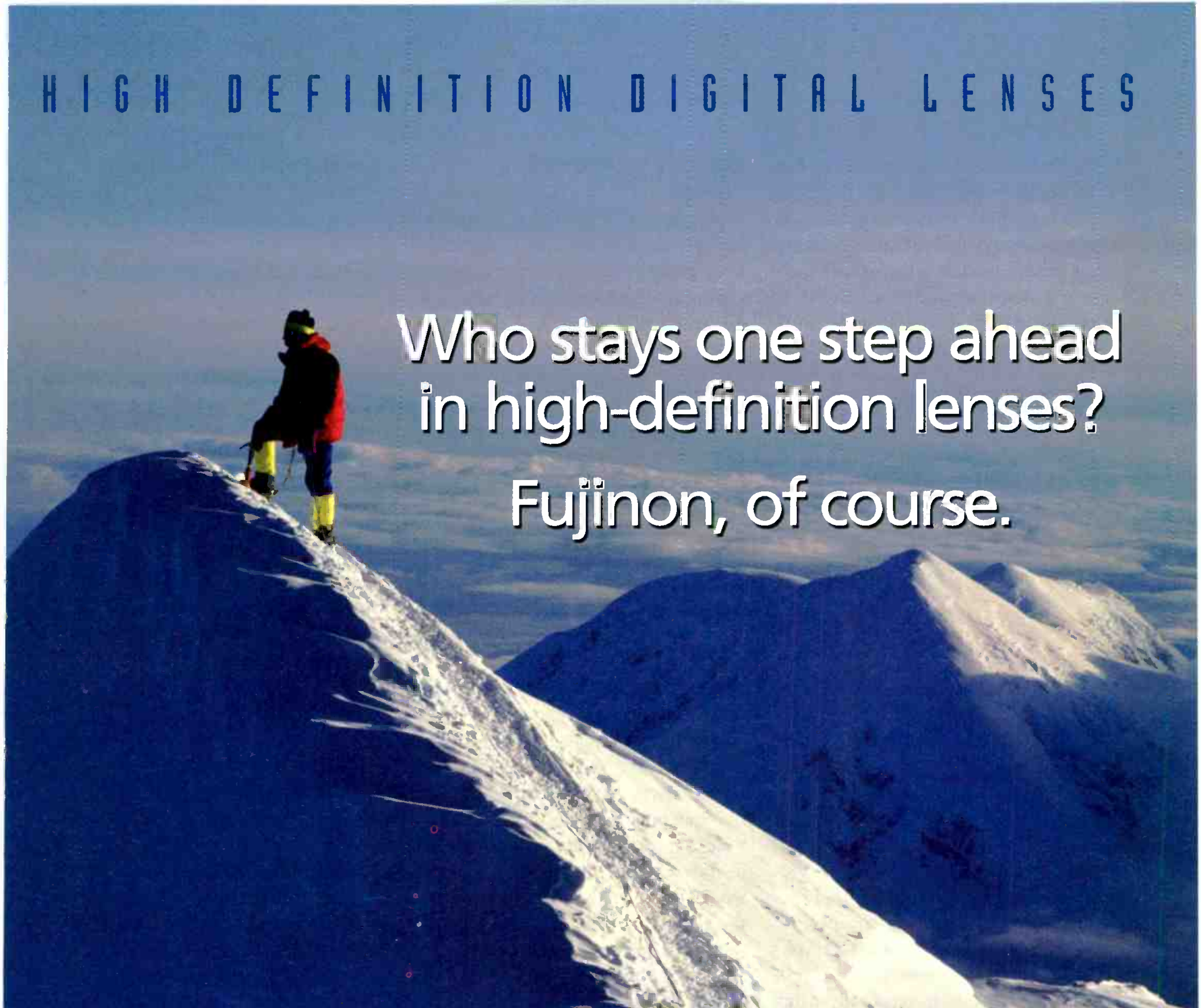


Figure 4. MPEG-4 approaches graphics better than MPEG-2. As Figure 4a shows, an MPEG-2 encoder expects as an input a complete picture repeating at the frame rate. However, an MPEG-4 encoder can handle the graphic instructions directly so that the rendering engine is actually in the MPEG-4 decoder, as Figure 4b shows.



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similarity could be exploited to get better compression.

To use MPEG-4 terminology, the utility pole would result in strong horizontal picture gradients that would indicate the use of vertical prediction. If the picture contained a dominant horizontal object such as a horizon, vertical prediction would create strong vertical picture gradients, indicating that horizontal prediction would be the better mode. Since the choice of which mode to use is based upon the picture gradients, the decoder can determine which mode the encoder must have used simply by looking at the picture, so no extra data needs to be transmitted to specify the mode.

MPEG-2 uses motion compensation, sending one vector per macroblock (a macroblock is a set of four blocks). MPEG-2 uses this vector to bring pixels from another picture to the location in the present picture giving the greatest similarity to the actual values. MPEG-2 predicts the vectors horizontally using slices (a slice is a series of macroblocks). MPEG-4 enhances this approach by allowing extended vector prediction. MPEG-4 can predict the vector for a given macroblock from those above or to the left, so it only sends the prediction error. As this reduces the amount of vector data, it then becomes possible to have one vector per DCT block. With four times as many vectors, the motion prediction will be better, resulting in smaller prediction errors.

Considering just picture compression, MPEG-4 does slightly better than MPEG-2, but not sufficiently better to warrant obsoleting the latter. MPEG-2 is well established in broadcast production and transmission as well as in DVDs, and is not under serious threat from MPEG-4.

MPEG-4's potential

However, whereas MPEG-1 and -2 work with pictures in their entirety, MPEG-4 goes far beyond. It can work with picture information generated, captured or manipulated by computers, and it is in these areas where the potential of MPEG-4 resides.

Figure 4 shows a comparison between MPEG-2 and MPEG-4. In Figure 4a, an MPEG-2 encoder expects as an input a complete picture repeating at the frame rate. Imagine that such a picture was the output of a graphics engine that was rendering images in real time. The graphics engine would compute the appearance of any virtual objects, from the selected viewpoint, using ray tracing. If the viewpoint or one of the objects were to move, each video frame would be different and the MPEG-2 encoder would use its coding tools to encode the image differences. However, the motion of a virtual object could be described by one vector.

Given the massive power of MPEG-4, there isn't much it can't compress.

Figure 4b shows that an MPEG-4 encoder can handle the graphic instructions directly so that the rendering engine is actually in the MPEG-4 decoder. Once the appearance of objects is established in the decoder, animating them requires little more than transmitting a few vectors.

Figure 5 shows that MPEG-4 works with four types of objects. Objects may be encoded as two- or three-dimensional data. Two-dimensional objects are divided into video and still. A video object is a textured area of arbitrary shape that changes with time, whereas a still texture object does not change with time. Typically, a still texture object may be a background. Although it does not change with time, it may give the illusion of doing so. For example, if the background pixel array is much larger than the display, the display can pan across the background to give the impression of motion.

Figure 5 also shows that MPEG-4 standardizes ways of transmitting the three-dimensional shape of a virtual object, known as a mesh object, along with the means to map its surface appearance, or texture, onto that object. Generally, it can handle any shape object. The decoder re-creates each object and renders it from the selected viewpoint. In parts of the picture where there is no object, the decoder keys in the background. It should be clear that if the decoder is aware of the shape and texture of all relevant objects, the encoder does not need to choose the viewpoint. In an interactive system, the viewer might choose the viewpoint.

For applications such as videophones and video conferencing, MPEG-4 supports a specific type of mesh object (described above), which may be a human face alone or a human face and body.

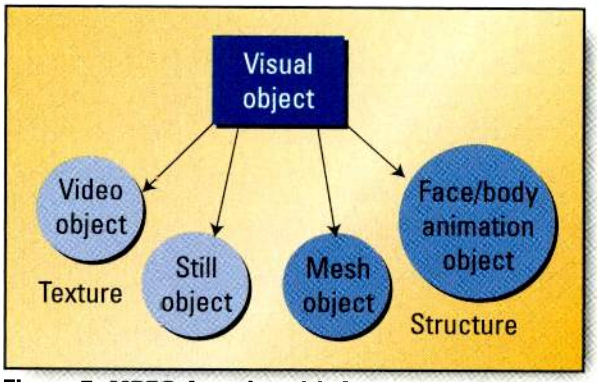


Figure 5. MPEG-4 works with four types of objects: video and still objects, which are two-dimensional, and mesh and face/body animation objects, which are three-dimensional.

At this point, we have left television and video far behind. Forget rasters and pixel arrays. Instead, consider the appearance of an object chang-

ing with time. A flexible object may actually change shape, whereas a rigid object would appear to change shape as the result of a change of perspective. MPEG-2 can only handle perspective shape changes very crudely, using motion-compensation vectors on individual macroblocks. MPEG-4 handles such changes using a technique called warping. It samples the surface of the object by a series of points. As the object changes, the points may move relative to one another. If a flexible object shrinks, all of the points get closer together, whereas if it turns in perspective, some points may get closer together and others may get further apart. The points form a structure called a mesh. MPEG-4 can distort the mesh by sending vectors to move the points. As the points move, the texture is interpolated in the decoder so that it continues to fit the new shape. In this way, object movements that would result in considerable picture differences in the video domain can be coded by MPEG-4 with just a handful of vectors.

In two-dimensional coding, the equivalent of a video frame is the video object plane (VOP). VOPs occur at the frame rate and intersect one or more video objects. MPEG-4 uses prediction between VOPs just as MPEG-2 uses prediction between pictures. There are groups of video object planes (GOVs) that contain I-VOPs, P-VOPs and B-VOPs. Figure 6 shows how a B-VOP can be bi-directionally coded from two other VOPs.

In three-dimensional coding, the meshes are not planar. Instead, each point or vertex has x, y and z coordinates. The encoder describes the mesh to the decoder using differential coding, where each vertex is coded as a spatial difference from the previous one. Each set of three points forms a triangle that can be filled with texture. By definition, a triangle has a flat surface. Based on this, it is possible to have a scalable three-dimensional mesh. The base-level mesh describes a body having reference planar triangles, but a subsequent layer could make the shape of the body more accurate by defining new points that are displaced with reference to the triangle surface. In this way, the decoder can produce an image that is the best possible for the allowable bit rate.

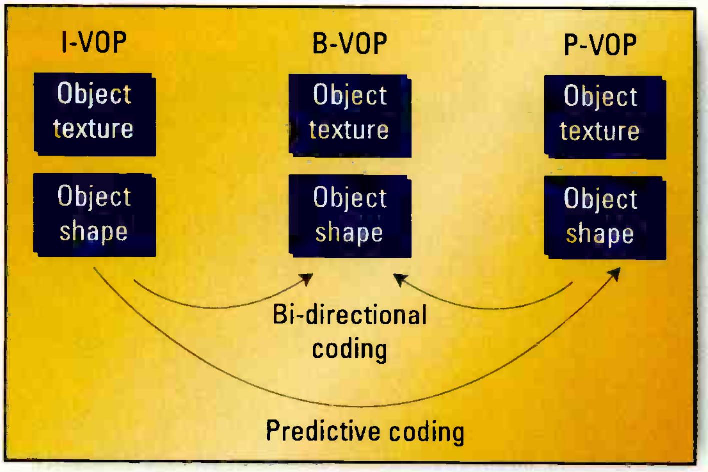


Figure 6. VOPs in MPEG-4 work like pictures in MPEG-2 and can be intra-, forward- or bi-directionally coded.

In face animation, MPEG-4 defines a neutral face. This is a mesh having a set of vertices corresponding to an average expressionless human face. All decoders know this neutral face, and so to create a real face it is only necessary to transmit the differences between the vertices of the neutral face and those of the real individual. Texture then covers the surface to obtain a realistic reproduction of the speaker in three dimensions. The decoder can then render the face for a certain viewpoint.

To animate the speaker, the encoder sends vectors that move the vertices of the facial mesh. However, these are not generic vectors, but are specifically designed vectors relating to the kind of expressions that humans use. As the decoder receives the vectors, it modifies the mesh to create the latest version of the shape of the face. It then maps existing texture onto the face. This is a very efficient process because facial texture only needs to be sent once. From then on, the facial expressions are obtained by warping the texture to fit the new mesh. In practice, the bit rate needed to send the mesh update is less than the bit rate needed for compressed speech.

Given the massive power of MPEG-4, there isn't much it can't compress. One of the fundamentals of coding theory is that the complexity of the encoder and decoder must rise with the compression factor. MPEG-4 probably represents the practical limit in coding complexity. Although it can reduce a moving image to a few vectors, it does require the decoder to be a powerful graphics-rendering engine. And although the object-based tools of MPEG-4 are very efficient, they are easily applicable only to computer-generated images. In principle, an encoder could be built that would take in real video from a natural image and dissect it into objects, but this would be a very complex process.

So there we have it. Is MPEG-4 clever? Yes. Does it make MPEG-2 obsolete? No. MPEG-4 will find applications in videophones, video conferencing, Internet image transfer, interactive video games and virtual reality, but it won't replace MPEG-2 in DVB, DVD or television production. **BE**

John Watkinson is a high technology consultant and author of The MPEG Handbook *(Focal Press).*

Turner
Broadcasting system automation

BY CLYDE SMITH AND DUNCAN LOFTING

Turner Broadcasting System, (TBS), an AOL/Time Warner company, is currently in the process of moving into a new facility with approximately 193,000 square feet. All technical facilities will be moved and upgraded, and the automation capability will be expanded.

Overview

The Network Operations (Net Ops) unit provides wide-ranging 24-hour functional support for the 130 network operations staff members who manage playout of 18 network feeds originating from the Turner facility. These networks include TBS Superstation, WTBS-17, TNT, Cartoon Network, Turner Classic Movies, Boomerang and Turner South, as well as nine networks in Latin America. Net Ops departments include broadcast operations, library services, log management, sales operations, engineering and broadcast transmission.

All networks and channels transmit 24 hours a day at different levels of operation. These levels range from the highly complex major network channels – which include captioning, fully automated DSKs and live programming – to the smaller channels that operate a simple schedule on an eight-hour wheel.

> TBS has a number of requirements for their automation system, including scalability and redundancy.

Automation requirements

In deciding to fully automate the Net Ops facility, a strong factor was the desire to have the ability to add more channels and networks while maintaining a "tight" playout look, without a major staff addition for each channel.

The Pro-Bel automation system is divided into two parts: Sextant and MAPP. Photo courtesy Chyron.

TBS has a number of requirements for their automation system, including scalability and redundancy. The scalability is important due to the diversity of channels TBS supports.

When new networks are introduced, they generally start off as a simple channel. As these networks grow and become more complex, the automation system must be able to grow with them. Redundant operation is required throughout the facility to ensure consistent operation, and that program and commercial playout occurs as scheduled.

Automation architecture

The Pro-Bel system is divided into two parts: Sextant and MAPP. Sextant is the overall automation control architecture, which controls all devices including VTRs, CGs, still stores, audio carts and DSKs. It generates the overall playlist and is the system manager. MAPP is the media management system controlled by Sextant. It can also be equated to a server operating system. Its functions include ingest, storage, playout and background Fibre channel transfer. MAPP also has the ability to work with nearline storage solutions.

With the diversity of channels originating from the facility, it is important to provide the operators with a similar interface so that training can cover all the channels. This enables the operators to move between channels without a massive "channel re-orientation." It is also important for the automation system to operate on a well-known operating system (NT 4.0 Windows 2000). This allows the hardware and operating systems for the control system to be easily understood by a wide range of technical personnel and reduces the need for specialized training in these areas.

Media management

TBS' requirement for dual server redundancy requires the media

management system to have accurate records of material on both the main and backup servers. It also has to be able to manipulate material on both servers to be able to output both the main and backup playlists. The MAPP system maintains a database of all programming on both servers to make it 'instance' aware of all available media. This awareness allows it to maintain and update both playlists while they operate simultaneously.

It is important for operational security and redundancy that individual networks or groups of networks not interfere with each other, however, they do need to be able to interoperate when needed. To address this requirement, the automation system is designed so that each network is able to run its own MAPP database without reliance or connection to any other network. The database also allows for mass data import and export if desired.

It is important to provide the operators with a similar interface so that training can cover all the channels.

The automation system has to be able to fit into the TBS workflow model, which includes log management. The Sextant and MAPP combination allows TBS to convert to and from various log management systems. The conversion process allows Turner complete control. Any changes that may be required as individual networks grow can be accommodated under TBS Net Ops control.

Benefits of automation

The MAPP system provides a simple output representing the current on-air schedule. This output is scalable and can be enhanced to include interactive TV operation, which is one of the features TBS is looking to use in the future. Since this enhancement is designed to be a part of the existing system, TBS will be able to continue to utilize the same interface on everything from a simple broadband channel to multiple interactive platforms.

In general, Pro-Bel automation has made operation more efficient by enabling TBS to add channels, programs and commercial content without greatly increasing staff, and has given all networks a consistent look based on the demographics of the specific network. BE

Clyde Smith is the senior vice president of broadcast entertainment technology for Turner Entertainment Networks, and Duncan Lofting is the contracts manager for Pro-Bel Americas.

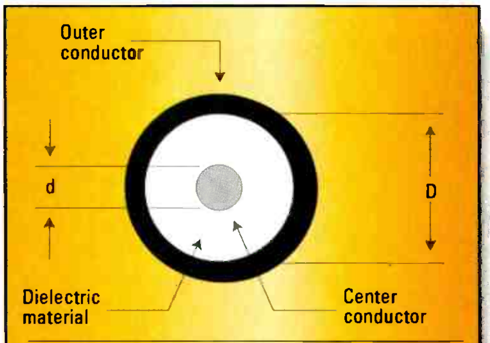
Gepco's
HD cable

BY GARY R. GEPPERT

The frequency requirements for high-definition broadcasting far exceed those of any other video format. The good news is that as facilities begin to migrate to HD, they won't have to worry about the transmission of less demanding formats such as analog or serial digital. In the past couple of years, connector and jackfield manufacturers have been busy making subtle changes and tweaking impedance in order to improve structural return loss, especially at frequencies from 1 to 3 GHz. For the most part, broadcast cable manufacturers have been ready for quite some time with products that meet HD requirements.

The mission for anyone making a video cable for HD is simple: manufacture a product that has no impedance variations over a broad frequency range.

How is this done?



$$Zo = \frac{138}{\sqrt{\varepsilon}} \times \text{Log}_{10} \frac{D}{d}$$

Zo = impedance in Ω
D = inner diameter of outer conductor
d = outer diameter of the inner conductor
ε = the dielectric constant of the insulation of the cable

Figure 1. The equation above details the development of Gepco's HD cable.

That's where the simplicity ends. First, you need a center conductor that has no variations. Remember, impedance is determined by the diameter of the insulation over the diameter of the conductor. Conductor uniformity for solid wire is achieved by paying close attention during the drawing process to eliminate die chatter or scratching. This spurious phenomenon will cause multiple high-frequency structural return loss spikes.

Die chatter can create so many small spikes that, when viewed electrically on a spectrum analyzer, it looks as if it is some type of hash or noise instead of independent spikes. By looking closely under a microscope, one may observe what looks like randomly dispersed small divots in the wire. Upon even closer inspection with a measuring gradient in the microscope, a specific distance from one divot to the next can be observed. There are usually many groups of these periodically spaced grooves, and this is why they create so many structural return loss spikes.

Another method to ensure center conductor uniformity of the copper is to stop a couple mils short of the final required diameter at the intermediate drawing process, then draw the remaining two mils at the dielectric extrusion process. By using a clean precise diamond die to perform this single drawing operation, you can clean up many imperfections that were generated by previous drawing operations. This holds true as long as the imperfections do not exceed the depth of your final drawing operation. At worst, you will still reduce many anomalies and lower the structural return loss number at the higher frequencies.

Tension control is extremely important when manufacturing coaxial cable. A head is used to apply polyethylene. The consistency at which the plastic is applied is important. The control of periodicity at application of plastic is extremely important to reducing impedance variation of the final product.

The frequency requirements for high-definition broadcasting far exceed those of any other video format.

Tension control systems usually consist of a motorized let-out system followed by an accumulation method integrated into a regenerative metering and take-up capstan, monitored through strain gages with a dampened method to adjust and hold a constant tension. Ensuring that the wire does not elongate over a long distance takes some very exacting equipment with the correct control algorithms to properly dampen the system so as not to overcorrect. Correct tension control not only can ensure the uniform application of the plastic, it also can maintain the exacting size of the wire, two extremely important requirements in manufacturing high-quality coaxial cable for HD.

In the manufacturing process, cable must pass over a series of guides in order to keep it properly aligned through its various paths from payoff to take-up. The wire, whether uninsulated or insulated, takes a route over guide wheels called sheaves, which have bearings at their center. In order to predict a potential problem with regard to periodicity it is best to, wherever possible, use sheaves and bearings that are the same size. This will ensure that when structural

return spikes are discovered they may be easily traced back to a specific size sheave or bearing diameter.

To determine the diameter of a spurious sheave or bearing, simply convert the speed of the cable in feet per second, divide by the frequency of the spike in megahertz, multiply by 12 to convert to inches, and then divide by pi (3.1416) to get the diameter.

Coaxial cable anomalies can also be further reduced by the use of precision laboratory bearings. They are usually more costly and harder to find, but the results are worth the effort.

Creating foams is achieved by blending specific types of polyethylene. The recipe must be repeatable over a long time span for a broad product range, and the consistency of the compound must be maintained over a long duration.

Development process

Gepco's development of a precision video cable for HD began back in 1986 with the introduction of VPM2000. This cable revolutionized wiring for the broadcast market due to its small size, low attenuation and ease of termination. Until its introduction, all precision cables for broadcast were constructed with solid polyethylene dielectrics. Velocity of propagation was restricted to 66 percent, shields were constructed of double braids and outer jackets were also solid polyethylene. All of which made for a product that was difficult to use, heavy, stiff and that did not meet any of the new UL requirements. Previous video broadcast cables had been modeled after the Western Electric 724 construction, the standard since the 1940s.

Up to this point, foam dielectrics were prohibitive for use as a precision coaxial product because of inconsistency in the blending of chemical foams, which caused variations in diameters, shrinkage and cracking with variations in temperatures.

With the development of nitrogen gas injection systems, creating foam for use as a dielectric with electrical consistency became practical. It made it possible to manufacture a product that could be regarded as precision. Blends of materials and delivery of the gas in the extrusion process now made foams harder and more consistent, with broader temperature operating range. Velocity of propagation rose to 82 percent, four percent better than chemical foam products. Attenuations were much lower than any of the other precision cable available at the time.

As broadcasters continue their migration into high definition and market demands continue to change, Gepco will also evolve its products to stay ahead of the market. BE

Gary R. Geppert is president, CEO and owner of Gepco International.

Dialight tower lighting

BY DOUGLAS WOEHLER

The Federal Aviation Administration requires all obstacles that present hazards to aircraft navigation, notably television and radio antenna towers, to be clearly marked at all times. Flashing red beacons are generally recommended at 150 feet and are mandatory at 200 feet and above, depending upon the structure's proximity to an airport. In addition, towers situated along highways often must be marked, regardless of height.

Tower owners typically fulfill these marking requirements by using red lights at night – both flashing beacons and steady-state obstruction lights – and white strobe lights during the day. Although the FAA permits tower operators to use white strobe lights 24 hours a day, studies show they can strain community relations and adversely affect migratory birds.

An alternative approach is to paint towers FAA-specified orange or white, but this requires costly repainting every five to six years.

To date many tower owners have used incandescent lamps to meet the FAA red lighting requirements. Rated at 2000 to 8000 hours, these lamps can last anywhere from six to 18 months. If they fail, they must in some cases be replaced immediately. As a result, many tower operators replace the lights annually as part of routine maintenance. Although incandescent lamps cost only $20, the cost to have someone climb a 2000-foot tower to replace one could exceed $4000.

Dialight's LED-based flashing red beacon features a less abrupt on-off transition than strobe lights and minimizes potentially disturbing ground-lighting effect.

LED technology

Another option is light-emitting diodes (LEDs), which last at least five years. They have only recently become available for high-intensity, outdoor applications such as tower lighting.

LEDs were developed in the late 1960s, primarily for use in electronic systems as status indicators. They demonstrated advantages over incandescent lights, notably longer service life and reduced power consumption. These factors captured the imagination of design engineers seeking more efficient lighting solutions for a wide range of outdoor applications, including tower lighting.

Conventional incandescent light bulbs and LEDs operate on entirely different technologies.

Conventional incandescent light bulbs and LEDs operate on entirely different technologies. Because incandescence involves heating something to produce light, it is by definition a self-destructive process. Luminescence, by contrast, is a process that emits light by deriving energy from an essentially non-thermal semiconductor reaction, giving LEDs virtually infinite life.

Incandescent bulbs are composed of a thin resistive filament suspended between two electrodes encased in a glass sphere. This filament burns away as electric current passes through it to generate light. Most of the energy is dissipated as heat, which is why incandescent lamps are so energy-inefficient. As the filament continues to burn, it becomes even thinner and more brittle, depositing a layer of tungsten inside the bulb, which further decreases light output. Moreover, the low resistance of the filament when it is cold permits an in-rush current that can be 10 times the rated operating current. Because of these factors, the service life of incandescent bulbs rarely exceeds several thousand hours.

By contrast, LEDs are solid-state devices encapsulated in an optical-grade epoxy. They consist of a semiconductor die mounted on a conducting lead with a bond wire connecting the top of the die to another conducting lead. Current flows through them in a forward direction, emitting light as the electrons move between the two semiconductor materials. This process converts more of the energy supplied to the device into light with less dissipated as heat. Due to their semiconductor construction, LEDs are also less likely to fail prematurely from shock and vibration.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The past 25 years have seen dramatic improvements in LED technology. Today's LEDs are over 10 times more efficient than earlier generations. In 1985, the first bright red and infrared LEDs became available. These sunlight-viewable devices were composed of gallium-arsenide with an aluminum outer layer. They were used in applications with relatively short service lives, i.e., less than 10,000 hours.

When used in applications where the expected service life was much longer, it was found the external aluminum layer would oxidize, resulting in significant light loss after 10,000 to 20,000 hours of operation. In 1993, a new type of LED chip was introduced that protects the aluminum layer from oxidation with a layer of indium. This material became the standard for traffic signals, until the development in 1998 of super high-flux LEDs by Lumileds, a joint venture of Agilent Technologies and Philips Lighting.

These LEDs provide more than 10 times the flux of conventional high-intensity LEDs, permitting the development of LED-based flashing red beacons and steady-state red side tower lights.

Today's LEDs are over 10 times more efficient than earlier generations.

Designed to meet the requirements of the FAA, Transport Canada and the International Civil Aviation Organization (ICAO), the new LED-based flashing red beacon can replace conventional 300 mm incandescent units using existing wiring, controllers and monitors. In addition, it lasts at least 10 times as long as an incandescent light and, at 115 W compared with 1240 W, consumes 90 percent less energy. On-off transition is less abrupt than strobe lights, and potentially disturbing ground-lighting effect is minimized.

Like the red flashing beacon, LED-based L-810 tower side lights in both single and dual versions easily replace incandescent lights and last up to 10 times as long, extending replacement intervals and reducing maintenance costs. And at 12.5 W, they use only a fraction of the energy of a standard 116-watt incandescent bulb.

LED-based tower lighting offers significant maintenance and energy savings, while eliminating the need for costly conversions to alternative high-intensity lighting solutions. Although warranted for five years, LED-based lighting has a projected service life of seven to 10 years, so maintenance costs become fixed rather than variable. As a result, the initial investment can usually be recovered in less than three years and, in some cases, in less than one year. BE

Douglas Woehler is business development manager, Aviation Lighting, for Dialight.

NEW PRODUCTS & REVIEWS

Corplex uses
Solid State Logic's MTP

BY BILL COFFEL

Corplex was founded in June 1985 as an engineering and sales company. Two facility expansions and 17 years later, the company now provides equipment for system design and integration, maintains a rental department, and carries new and used equipment with more than 50 new product lines.

Corplex has also been in the mobile market since 1997, and has built three state-of-the-art digital trucks in 2001 and 2002. The main focus in the design of the fleet's centerpiece truck, a 53-foot Expando called Sterling, was on quality, and providing customers with the ability to meet the demands of modern broadcast production, both now and in the future. The trucks can handle a range of sports or entertainment venues.

Corplex installed Solid State Logic's MTP mobile digital console in its new production truck to help customers broadcast in a range of venues.

Corplex equipped the truck with a Grass Valley Group Kalypso switcher, Sony BVP-900 and BVP-950 cameras, a PESA router and a Dveous DVE from Accom. Corplex chose a Solid State Logic 192-input MT Production (MTP) mobile digital console for the audio component of the truck.

The true test of any truck is how it performs in the field.

Corplex chose the MTP because its physical design and layout fit the concept and design of Sterling. In addition, the console offered capability for surround sound, as well as snapshot, 5.1 mixing and the new HS control processor. Two other features that sparked Corplex's interest were the recall and reset functions.

Corplex consistently uses the same freelance engineers, so it is imperative that they have the ability to save and recall their mixes. They plan on broadcasting several college and professional football games, often for the same teams. The ability to recall the settings used for one game saves hours of preparation time and decreases the cost of operation.

The true test of any truck is how it performs in the field. One of the first events covered using Sterling was country artist Martina McBride's first live pay-per-view concert on Oct. 13, 2001, at the Orpheum Theatre in Minneapolis.

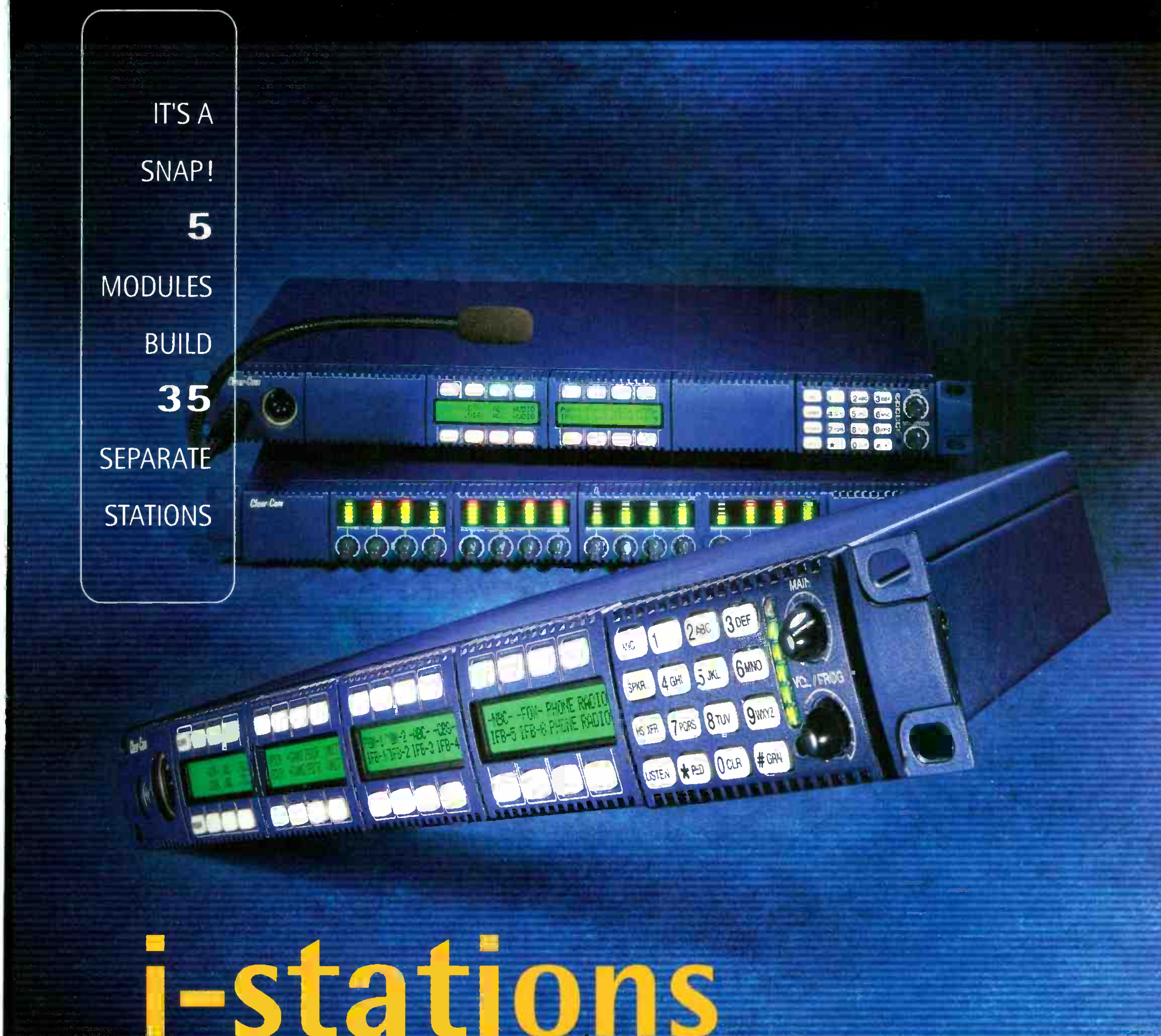
Production involved using a 48-track digital audio hard-disk recorder to record a multitrack master for future use, while also mixing the live stereo feed for uplink to five pay-per-view networks. Traditionally, events such as this would have required a dedicated production truck just for the audio. The MTP handled the 70-plus sources with ease.

In February, Corplex used Sterling for Supercross events in Indianapolis, Minneapolis and Atlanta. The total automation of the MTP allowed Sterling to shoot other shows between these events and recall the "Supercross" setup for each Supercross show.

In Indianapolis, separate shows were created for ABC and ESPN using nine cameras, including a super "slo-mo" unit. For the event, the SSL MTP supported 20 trackside mics, 16 tape/EVS playback channels, six music channels and eight announcer/interview mics. Having a compressor/noise gate on each channel helped to keep the mix clean.

On the video side, the Grass Valley Kalypso switcher with four M/Es accommodated the simultaneous production of two shows with different graphics packages. BE

Bill Coffel is an engineer at Corplex.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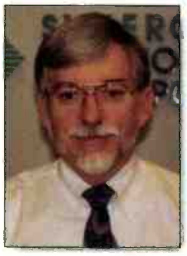


Media asset management systems

BY JOHN LUFF

This issue we complete a four-part series on station automation. We have looked at station automation, newsroom automation, data archive systems and, in this issue, media asset management systems.

In the simplest view, broadcasters have always had media asset management of some form. Any form of cataloging assets and keeping track of where they can be found could qualify as a media asset management system (MAM). A card file at a library is an asset management system, and so on. Media assets are no different in reality except that they are often stored now in ways that are not easily obtainable.

Media assets have some characteristics in common with any class of assets. They may be tagged with a name or title, the date they were created, and a host of other information. The asset management system keeps track of all of those pieces of information and makes them accessible for the various purposes one might require.

In the case of media assets, one might need to move them to a location where they can be stored for a long time without damage and then later moved to a location where they can be played into a station's air signal.

The difference between media assets and other classes of physical assets is that it is important to think of the number of instances of the asset. As an example, you might have a car spot recorded on videotape, in the air server, on a backup or mirrored server, or in a long-term archive like I discussed in the last issue. In addition, that same spot might be stored in other instances with a local tag. This gives rise to a parent-to-child relationship, which is very important even though the new instance is stored under a different name.

Production footage has the longest heritage of such relationships, beginning with camera originals, protection copies (often cloned), perhaps a copy downconverted from an HD master, the production intermediates, edited masters, protection and air copies, and so on. Each instance of an individual shot might well be tracked all the way to the camera original, which might be a can of film negative. Keeping track of the information about the content has become the job of metadata.

When an asset management system stores the content, or essence, it also stores the metadata related to the content so you can find the specific asset you are looking for at any point in the future. The MAM system is a database that keeps all of the information in a logical form and allows you to manage the movement and keep track of the use of the content as well.

Any form of cataloging assets and keeping track of where they can be found could qualify as a media asset management system.

Media assets may be tagged with a serial number, a name or title, the date they were created, and a host of other information. Image courtesy of blue order.

A news operation might, for instance, have the right to use content only once and thus would need to track the parent-child relationship as the pictures purchased are used in finished stories. This specific type of data is often handled by a rights management system, which might be accessed for other purposes, but has to be linked to the MAM system to ensure the essence still exists and how it has been used.

The MAM system is sometimes part of an interrelated system for browsing the content using a proxy copy made when the media is first entered into the MAM database. Though this function can be entirely separate, the browse system is usually closely linked to the MAM database (usually providing key bits of metadata, like scene descriptions and automatically detected scene changes). Browse systems can sometimes act as simple MAM systems, allowing content to be added to or deleted from the MAM database, though not usually controlling the location and use of the media.

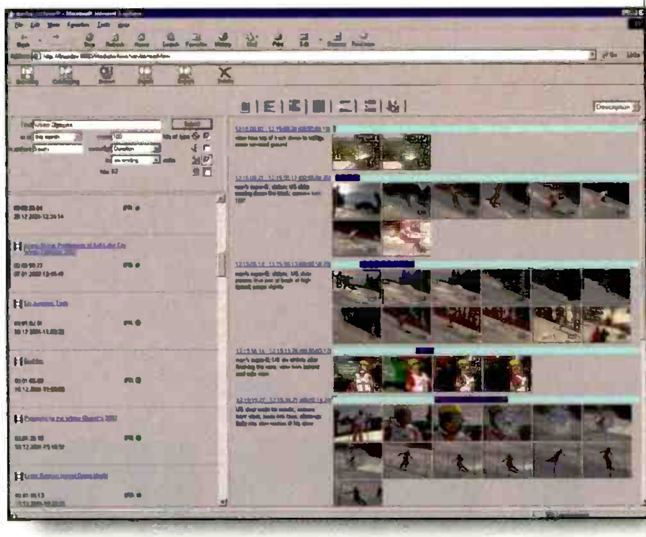
The MAM system is usually not the physical keeper of the essence. It does, however, normally manage where the content is kept. Take the case of a server system with a backup and a near-line archive, like a data robot.

The automation system is told by traffic that a spot is needed for air. If it doesn't find it on the server, it queries the MAM system if any instances of the spot exist and if so asks that it be moved to the air server.

The MAM system is usually not the physical keeper of the essence.

It might be found on the backup server, or on the archive, in which case the content is moved to the air server, perhaps without the operations staff ever knowing the process has happened in the background.

It might, however, find that it is on the shelf on a data tape. In that case the MAM system must report back that physical action is required to load the tape before the process can be completed. If it is not found in the MAM database in a form ready for use it might request that the copy on videotape be loaded (mounted) so a copy can be made (dubbed) on the server. All of those actions take multiple steps.



When an asset management system stores the content, or essence, it also stores the metadata related to the content to enable users to find the specific asset they need. Image courtesy of blue order.

The system is queried to see if the asset exists, if it is the right version and so forth. It has to find the instances of the spot and decide which one is the most appropriate to report back on.

MAM systems are usually under control of the archive robot, often acting as the gatekeeper deciding what assets are moved from the active library to the near-line or offline storage.

Some MAM systems are purchased once and no annual fees are required, though annual maintenance contracts are strongly suggested. Others are licensed and not owned by the user, and the fee is calculated on the basis of the amount of content currently under management.

One system introduced in the last 12 months actually has physical access to the essence itself, making a copy on its own disk drives to allow the media to be cached and written to more than one archive at a time. At the same time the system converts the MPEG-2 file to MPEG-4 for browsing.

Implementing a MAM system is a complex process requiring thoughtful setup and rigorous management. It can, however, be the link between simple use and the ability to repurpose content for many other uses, allowing a user to develop a rich library of content without losing track of what begat what. **BE**

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

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

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800-528-8601; www.panasonic.com

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Sony HDWF900: capable of record/playback of 1080 line 24/25/30 frame progressive or 50/60 interlace images; employs 2.2 million "square" pixel CCD imager, 12-bit AD and a two million gate VLSI for more than 30-bit calculation.

866-SONY BPC; www.sony.com/broadcast

MULTIPLE WEB STREAM VIDEO/AUDIO ENCODER

Leitch dpsNetStreamer version 1.1: upgrade includes an automated scheduler, ability to pre-record footage for later insertion into a live Web stream; encodes live video and audio in real time; provides multiple simultaneous streams.

757-548-2300; www.leitch.com

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978-640-6789; www.avid.com

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732-302-3090; www.modsci.com

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Frezzi Energy Systems BP-14MH: handles high power equipment demands; features 14.4 V and 130 watt hours of capacity; has thick shock-absorbing internal padding and a rubberized aluminum casing.

973-427-1160; www.frezzi.com

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DEMO ROOM

732-846-0544; www.radamecbroadcast.com

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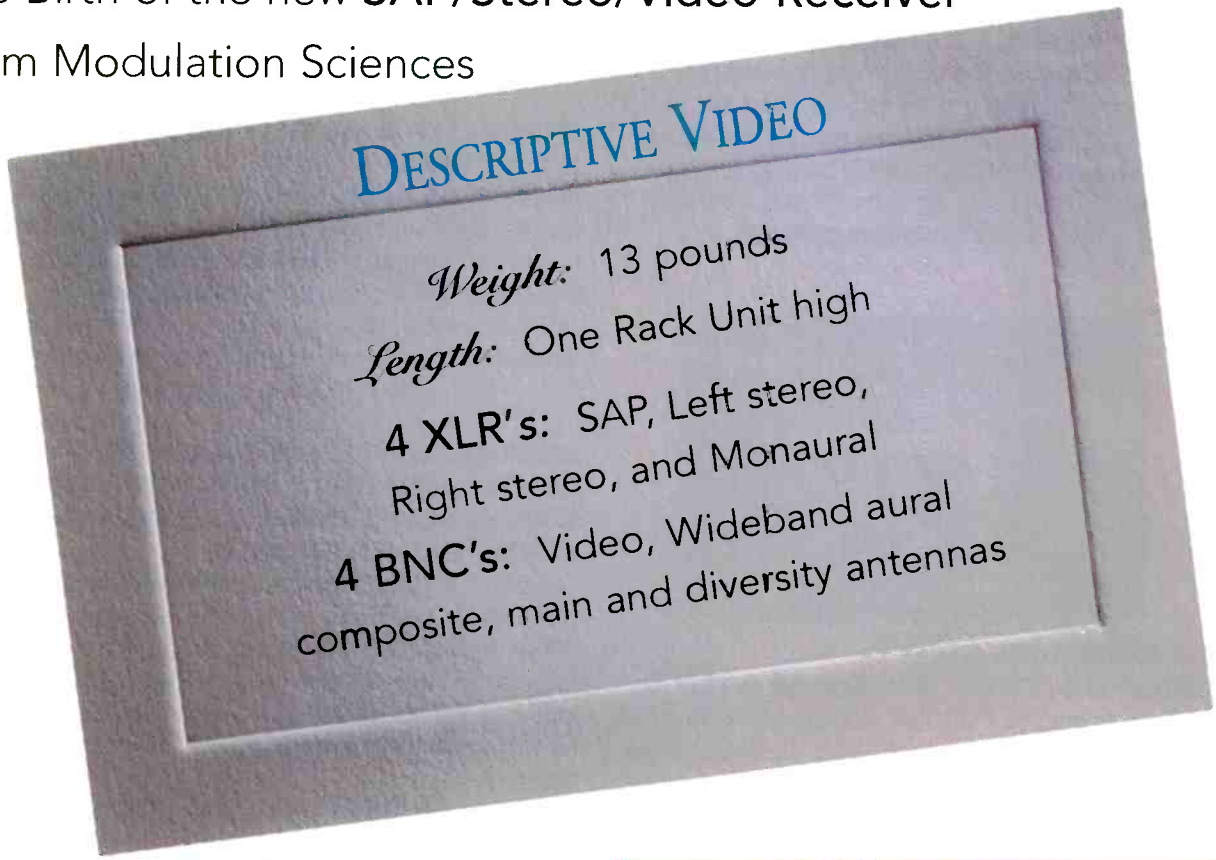

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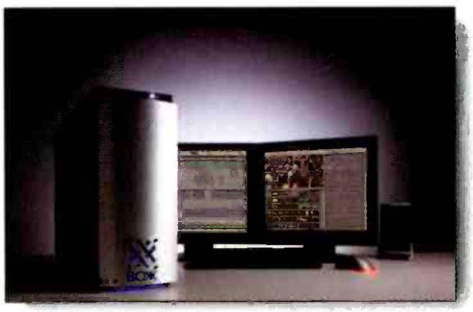
650-726-3482; www.canopuscorp.com



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905-884-8028; www.digital-rapids.com

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650-526-1600; www.pinnaclesys.com

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INTERNATIONAL

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COO: Jack Condon, jcondon@primediabusiness.com
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Primedia Business to Business Group - 745 Fifth Ave., NY, NY 10151
President & CEO: David Ferm, dferm@primedia.com
Chief Creative Officer: Craig Reiss, creiss@primedia.com
Creative Director: Alan Alpanian, aalpanian@primediabusiness.com

Primedia Inc.
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President: Charles McCurdy, cmccurdy@primedia.com

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BROADCAST ENGINEERING, ISSN 0007-1994, is published monthly (except semi-monthly in May and December) by PRIMEDIA Business Magazines & Media Inc., 9800 Metcalf Ave., Overland Park, KS 66212 (primediabusiness.com). Current and back issues and additional resources, including subscription request forms and an editorial calendar, are available on the World Wide Web at broadcastengineering.com.

SUBSCRIPTIONS: Non-qualified persons may subscribe at the following rates: United States and Canada; one year, $65.00. Qualified and non-qualified persons in all other countries; one year, $80.00 (surface mail); $145.00 (air mail). Subscription information: P.O. Box 12937, Overland Park, KS 66282-2937.

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Media, message and myth

BY PAUL MCGOLDRICK

Scanning the exhibitor list of NAB2002 was a challenging exercise in name recognition. Whatever the show has become, it is no longer an exhibition place for broadcast equipment, but rather a trade show for an amazing cornucopia of media, most of which are unrelated to broadcasting as we know it.

During his opening address, the president and CEO of NAB, Edward (Eddie) O. Fritts, rightly paid tribute to the broadcast media coverage of the tragic events of Sept. 11, 2001. He also told his audience that during that evening the American public turned to broadcast television by a four-to-one margin over cable news networks combined. That may have been so, but it hardly reflects the delivery systems that the audiences used, and it is a reasonable assumption that the majority of viewers were not terrestrial ones.

Mr. Fritts (who calls everybody "friends") then gave FCC Chairman Powell a minor pat on the back for his voluntary plan to aid the conversion to DTV (more below), and patted NAB on the back for defeating the Torricelli Amendment on Campaign Finance Reform (as in, "give us politicians free television time").

Then he dissed satellite radio (and its motives), praised iBiquity and IBOC, dissed EchoStar, touched on the Internet opportunities for radio (and the new, ridiculous copyright costs), and offered "an invitation to CBS, FOX and NBC to return to the NAB fold" (as ABC has done).

Then he told us to "go out on that exhibit floor and see our future." Yes, that was to all those exhibits that bear no relationship to our world of broadcasting – but hey, they're paying for all that floor space, to NAB, of course.

Chairman Powell's timely DTV letter and proposal to the U.S. Senate Committee on Commerce, Science and Transportation and the U.S. House of Representatives' Committee on Energy and Commerce provided a key talking point on the floor.

The Chairman's proposals are entirely voluntary, but I give him kudos for realizing that DTV and HDTV adoption are about content. (Ever heard that before on this page?) He suggests that ABC, CBS, Fox, NBC, HBO and Showtime provide at least 50 percent of their programming with added-value DTV by 2002-2003, added-value being either HD or interactive/multicasting. He then suggests that the delivery vehicles – terrestrial, cable and satellite – pass through such signals to their viewers with cable and DBS carrying at least five such channels during at least 50 percent of prime time.

These are laudable goals but are unlikely to be embraced, regretfully. The networks are the primary stumbling blocks while they remain embattled with their own distribution channels (35 percent ownership rules may be "only one issue" separating them from NAB according to Mr. Fritts, but it is, mostly, one of the only issues for the networks as they gird up for "rationalizing" terrestrial distribution). Cash that they might have is going to be used in the next few years for acquisitions, and turning out expensive add-on value – with advertising revenues diluting continually – pleasing the chairman is not that relevant to them.

On the other side of that same coin, the affiliates are living in fear (those who understand the significance of what is going on – there are also a lot of ostriches out there) and certainly are not going to spend money unless they are forced to by mandate.

With cable and satellite we have a different set of values at work, and this is the best opportunity for the consumer. Whether we continue to have two DBS suppliers or not (and I think that only having one with must-carry rules makes more sense for everybody), there will always be intense competition with cable. Anything that satellite provides cable will have to match, as it will be the other way around, so the chairman's wishes may well be met – provided these suppliers can find sources for the material needed, as it won't be coming from the networks.

Whatever [NAB] has become, it is no longer an exhibition place for broadcast equipment.

While totaling up the revenue from all the NAB non-broadcasting exhibitors, Mr. Fritts was quick to point out that "few things are free anymore with the exception of the public library and over-the-air broadcasting...and we are going to fight to keep it free."

That really wasn't the future I saw when I was invited out to the exhibit floor to look for it. It's time for the organization to get onto the same page with the reality of a content-driven world instead of concentrating on protecting the delivery system. Instead of protecting the myth. BE

Paul McGoldrick is a freelance industry consultant based on the West Coast.

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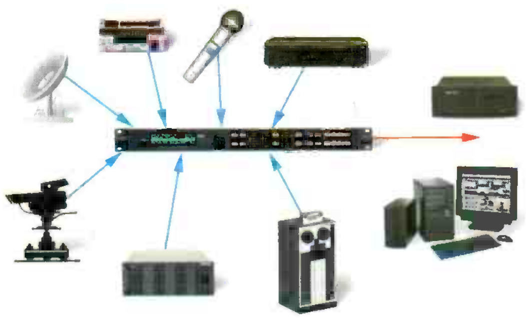

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