FEBRUARY 2007

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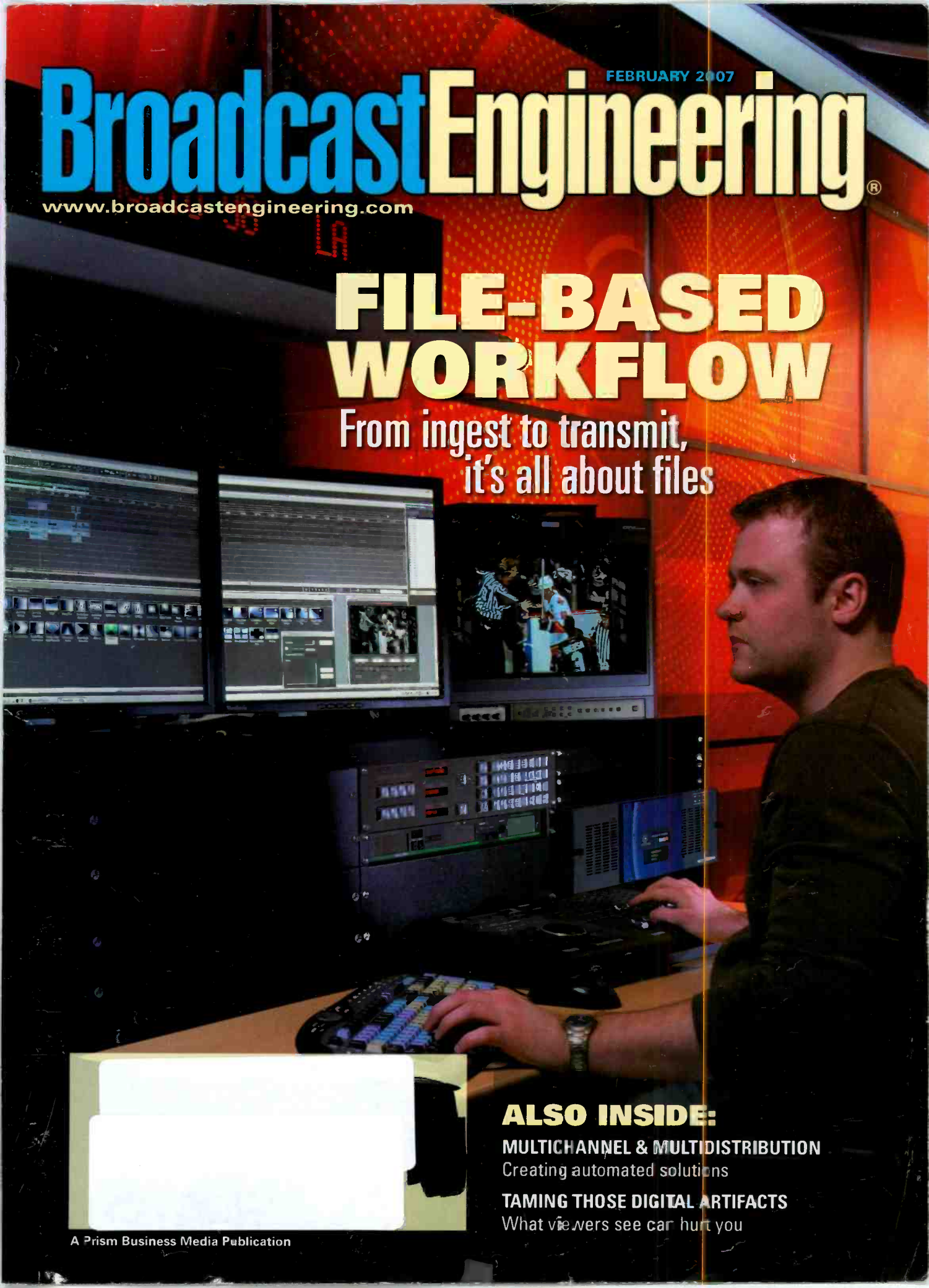

ALSO INSIDE:

MULTICHANNEL & MULTIDISTRIBUTION
Creating automated solutions

TAMING THOSE DIGITAL ARTIFACTS
What viewers see can hurt you

A Prism Business Media Publication

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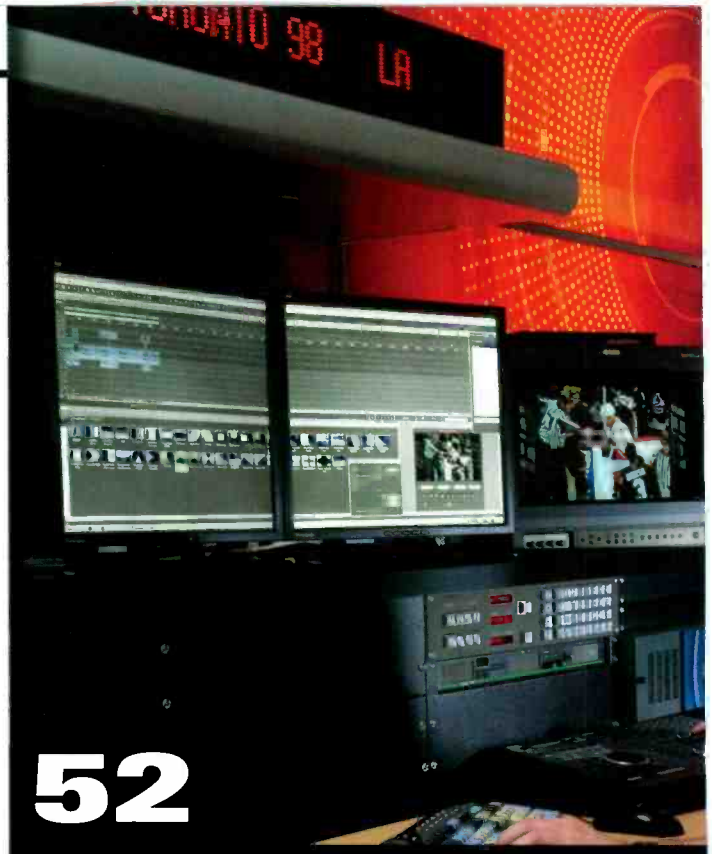
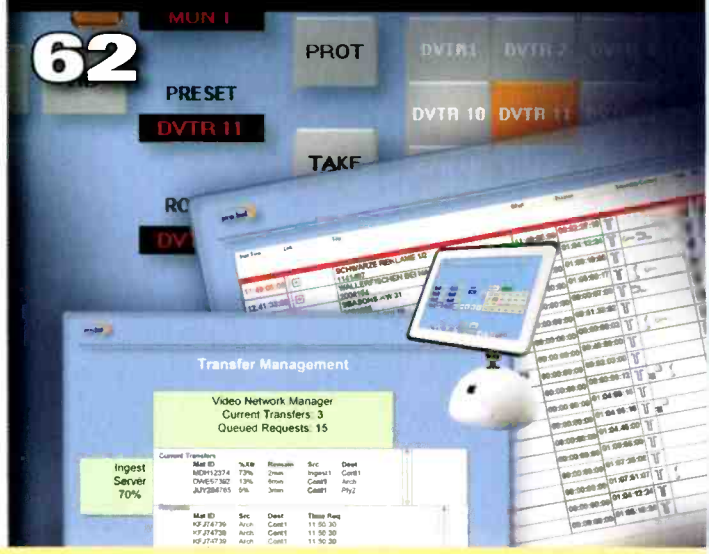


ON THE COVER:
An editor at TSN HD in Toronto uses a Harris VelocityNX craft editing system linked to a NEXIO XS HD/SD.



THIS MONTH'S FREEZEFRAME QUESTION

Match each of the following audio recording formats to the correct statement. This question is from "Broadcast Engineer's Reference Book" by E.P.J. Tozer, available from Focal Press.

Readers submitting winning entries will be entered into a drawing for *Broadcast Engineering* T-shirts. Enter by e-mail. Title your entry "Freezeframe-February" in the subject field, and send it to: editor@prismb2b.com. Correct answers received by April 1, 2007, are eligible for the drawing.

FORMAT	STATEMENT
DA88	Played both analog and digital cassettes
DCC	Used S-VHS cassettes to record multitrack audio
DASH	Became DCC with the addition of MPEG layer I compression
MiniDisc	Used 8mm video cassettes to record multitrack audio
S-DAT	Used 2in analog tape
ADAT	Uses ATRAC audio data rate reduction

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- DVCPRO 25/50/HD
- Optional AVC-I codec support

P2HD **when reliability counts.** **Panasonic ideas for life**

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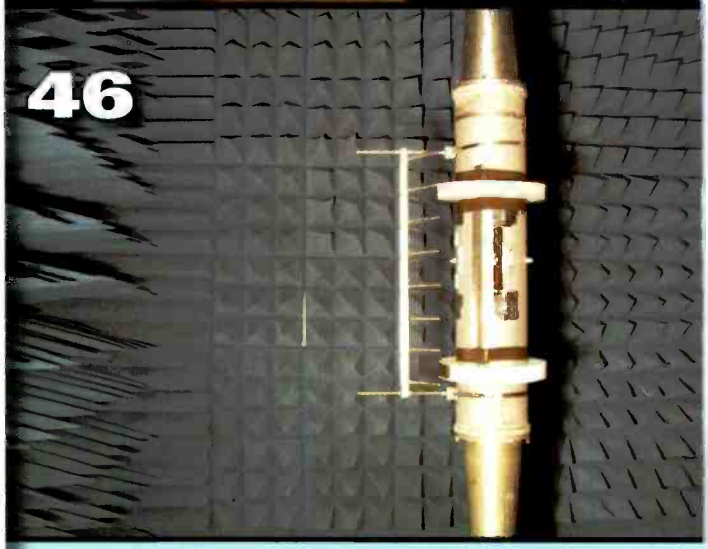
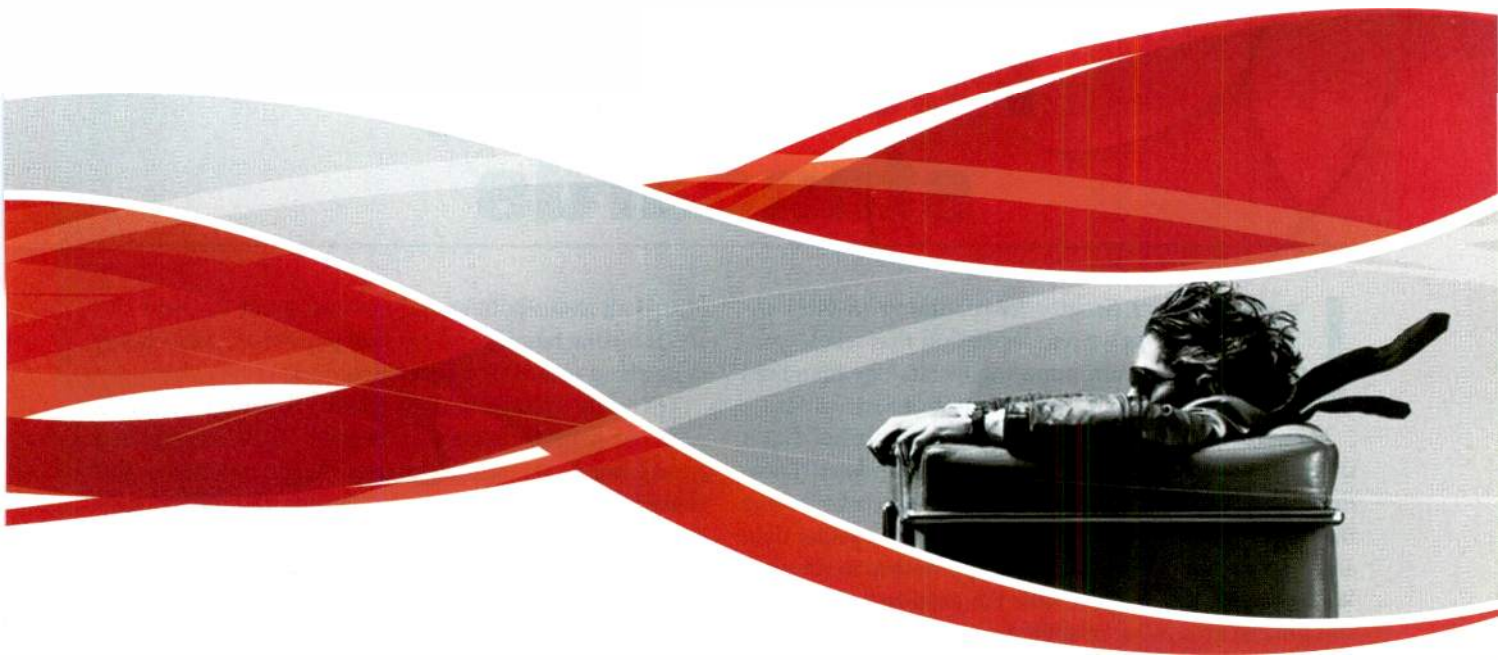
OCTOBER'S FREEZEFRAME ANSWER

Q. A 1TB disk drive will provide approximately how much actual storage capacity when installed into a computer?

A. 0.91TB

OCTOBER WINNERS:
Tim Canary, Tim DeWitt, Al Van Dinteren





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Poor driving standards

In early January, Senator John Sununu (R-NH) announced he was writing legislation that would prohibit the FCC from imposing technology mandates on the broadcast and communications industries.

He said, "The FCC seems to be under the belief that it should occasionally impose technology mandates. These misguided requirements distort the marketplace by forcing the industry to adopt agency-blessed solutions rather than allow innovative and competitive approaches to develop. We have seen this happen with the proposed video flag, and interest groups are pushing for an audio flag mandate as well. Whether well-intentioned or not, the FCC has no business interfering in private industry to satisfy select special interests or to impose its own views. My legislation will ensure that decisions about the design and development of products and services to meet FCC rules are made by technology experts, not government regulators."

Oh boy, oh boy! Decisions will finally be made by engineers, not bureaucrats! No more finger-in-the-wind decisions like those of former FCC Chairman Reed. No more "I've changed my mind" flipflops like those from former FCC Chairman Powell.

For years, many of us have pushed to require that at least one FCC commissioner have some kind of technical background. The cold truth is that being appointed to the FCC is all about politics and nothing about expertise. It's about kissing fannies and political payoffs. It's never going to be about technical competence.

This rule change sounds great. Technical decisions would be made by experts in the field. SMPTE would be a good group to set technical standards. It's impartial, right? However, is SMPTE willing to become the official standard setters for all of broadcast? Heck, for the right money, anyone will do anything. And, there would be plenty of free money to pay these standards setters.

But then there's the consumer side of standards. Who's the technical expert there? Could a SMPTE-like group set transmission standards and then the consumer guys would develop receivers to match? Or, would the 2000lb Goliath consumer industry tell broadcasters what technology they must implement and to hell with other viewpoints?

Then, there's the small matter of deadlines. Standards development and approval takes time. Consider Microsoft's Windows Media 9, which was submitted to SMPTE in September 2003. SMPTE didn't release an approved standard until April 2006. Did the three-year process negatively impact VC-1's adoption as a compression standard? You bet it did.

This is not meant as a slam on SMPTE's work. Standards setting, even with the best experts, requires time. However, the consumer electronics industry is chomping at the bit to build new products to sell. (The CEA predicts sales to exceed $155 billion this year.) Imagine the pressure under which any standards-setting body would have to operate.

So, while it would be great to get the FCC bureaucrats out of the standards-setting business, would viewers and our industry be any better serviced by a confusion of committees, battling egos and even a panel of highly-qualified experts all claiming that their standard is better than someone else's? I doubt we'd reach our desired destination with the different factions all grasping for the wheel. **BE**

Brad Dick

EDITORIAL DIRECTOR
Send comments to: editor@prismb2b.com

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FOR THE CHANGING FACE OF TELEVISION

Can you see me now?

Editor:

Your October 2006 editorial brought to mind an incident from my days as chief at Channel 3, the ABC affiliate in Corpus Christi, TX. One day the phone rang. It was a little old lady who asked, "Did you know Channel 10 is on your channel?" I stifled my sigh and gave my standard chief engineer response: "Thank you for calling. We'll look into it."

My brain got into gear. My guess was that what she thought was Channel 10 was probably Channel 3 in Lafayette, LA, located 200mi away, across the Gulf of Mexico. My station occasionally received cochannel interference from them (and caused it, too).

Sure enough, the Layfayette signal had wiped us completely out for an area of several miles around the station. I zipped over to the news director's house to take a look. It was all Lafayette and none of us, which means at least 40dB relative signal strength difference, and our transmitter was only 17mi away.

The ducting lasted about 20 minutes before we magically reappeared. The interesting thing was that the little old lady had referred to the signals as "Channel 3" and "Channel 10," not by call letters or network affiliations. Those poor folks must be *really* confused by now.

W. Louis Brown, PE
Sales Engineer
FPDI

Connection standards

Aldo Cugnini:

I read with interest your September 2006 article "Get connected" on the *Broadcast Engineering* Web site. I have several Sony DSR-80 decks that were built before FireWire was an accepted standard for professional video. At the time, I was connecting to my editors via SDI.

They are still in great shape, but this has become an expensive way to move data because most editors now use 1394 as standard, and SDI-to-DV connection boxes add cost to the system. I'd hate to retire these decks. Is there a method to convert Sony's QSDI (SDTI) to 1394?

Marc M. Myers
Suffolk County Department
of Health Services
Hauppauge, NY

Aldo Cugnini responds:

According to Sony Support, while the DSR-80 comes standard with SDTI, there is no i.LINK (IEEE-1394) option for the unit. It would be expensive to outfit every deck you own with an external SDTI-to-1394 converter.

Some other Sony decks (e.g., DSR-1600) do have both SDTI and 1394 outputs. So there may be a remote chance that some board swapping is possible, but still at a considerable expense.

And while it's conceivable that you could get a custom house to retrofit a 1394 interface into existing decks, the cost of that would be even more prohibitive. Unfortunately, you are up against one consequence of technological progress — the inevitable obsolescence of previous standards.

TV that's no good

A note from the editor:

The *Broadcast Engineering* December 2006 article "The end of television as we know it" generated some interesting comments. Paul Allen, vice president of network operations for No Good TV (NGTV), sent a flier announcing the station's launch. It carried the theme "The end of television as you know it."

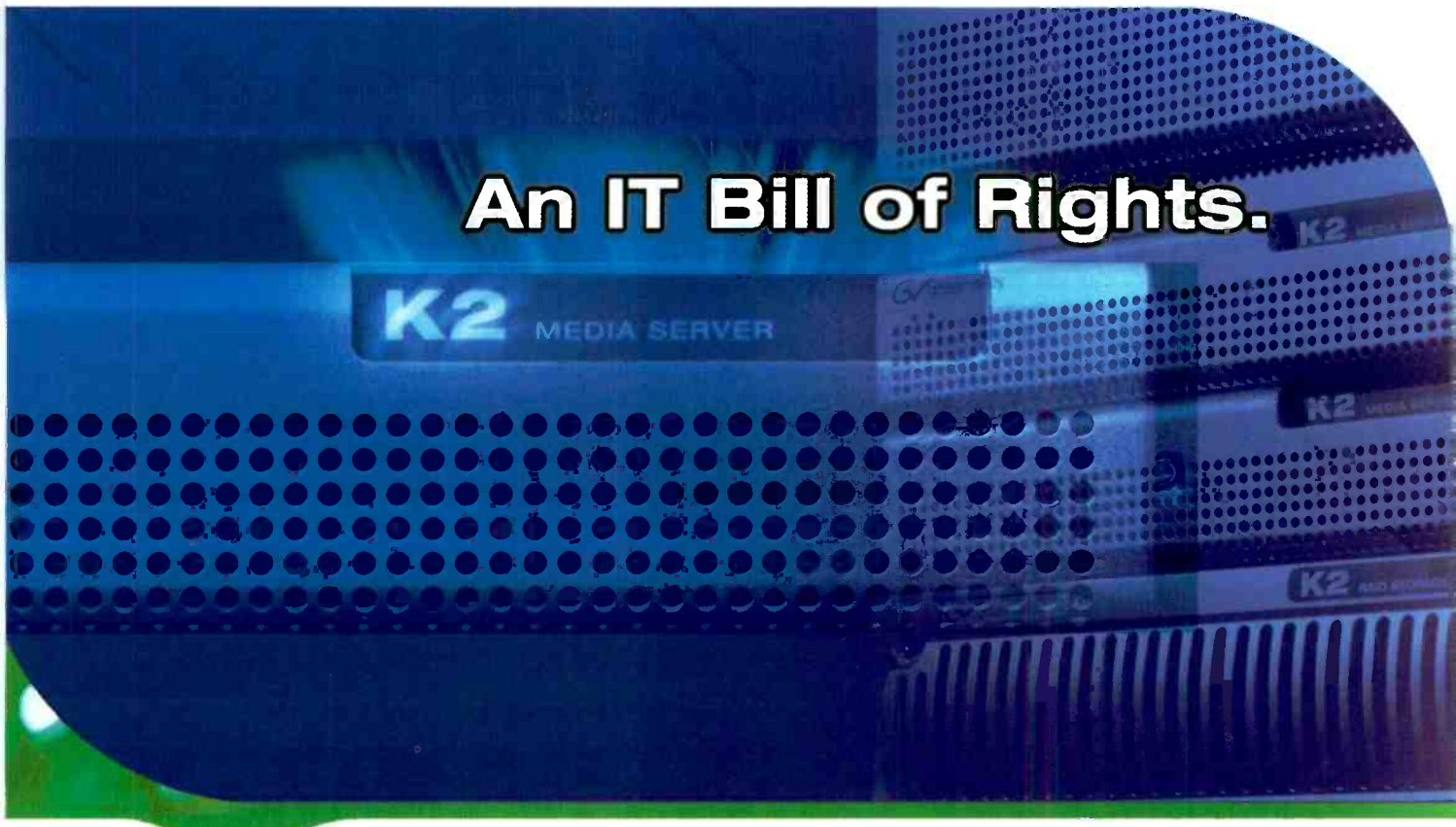
The December article and the last *Broadcast Engineering* Summit addressed meeting the needs of the new viewer. David Payne, senior vice president and general manager for CNN.com said, "Younger audiences demand a different experience. Give them what they want on the schedule they want."

This is an example of a network foregoing the traditional TV model in order to attract those younger viewers. NGTV's alternative programming begins this month. You can watch the promo at *www.ngtv.com*. BE

Test Your Knowledge!

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

Send answers to editor@prismb2b.com



A Guide for Broadcasters To No-Compromise, File-based Server/Storage Systems

As the acceptance accelerates for IT-based technologies such as video servers, nonlinear editing systems, centralized storage, and more, broadcasters and video professionals must have options that give them the confidence to commit to moving wholesale to approaches that avoid many obstacles that today block their ability to truly improve their workflows.

Certain, Inalienable Rights.
As a leading provider of premium-quality content, you have certain, inalienable RIGHTS to a server and storage approach that lets you improve quality, reduce costs, increase flexibility, enhance workflows, and deliver better technologies to improve your overall business.

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An IT Bill of Rights

1. The right to low-entry pricing and high performance—that remains low for large systems.
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Who's watching you?

Getting close to your customers is critical for broadcast TV survival.

BY CRAIG BIRKMAIER

Do you know who watches the programming delivered by your station? If you are reaching for the latest ratings book so you can cite the number of viewers in specific demographic groups for various shows and day parts, stop!

This column is not about ratings and audience demographics. It is about the relationship your station has with its viewers.

Do you know their names, where they live and what they watch? Do you have the ability to communicate with them to better serve their needs? Are you building the tools and the skills needed to compete with those who have intimate knowledge about your customers and the ability to interact with them?

Chances are good that your answers to these questions are no. Why? Because you're a broadcaster. Your transmitters push analog and digital signals to the anonymous masses, the vast majority of which no longer use antennas to receive your signals.

You don't know them. They rarely communicate with you. And now you expect them to pay to watch your content if it is delivered by the cable, DBS and telco TV systems that serve your market. Some broadcasters may think this knowledge is trivial compared with the ability to leverage customer relationships to pad the bottom line with retransmission consent payments.

Maybe it's a good thing you don't know your viewers or talk to them. They might ask you why they should pay for the advertiser-supported content.

Maybe it's a good thing you don't know your viewers or talk to them. They might ask you why they should pay for the advertiser-supported content you have been giving away for decades. Perhaps they'll be sympathetic to your plight when you tell them that you want the same deal as all of those cable channels that they are paying for each month.

Here's why you need to worry about the future: Because analog TV could disappear in 2009. Because consumers may tell you and the rest of the TV industry where to stick it. And because they can spend the $50 to $100 a month they now send to a multichannel TV service to download the content they want via a broadband Internet connection.

A fork in the road

Be honest with yourself. Do you really believe that local broadcasting can survive the digital transition without changing the basic business model that has been in place since the middle of the last century?

I'm not talking about the DTV transition. That's almost over. I'm talking about the transition to a new digital communications infrastructure — the ability for anyone to access virtually any content at any time on a wide range of devices in the home, the office and on mobiles.

I'm talking about an emerging digital world, where the best coverage of that local news story comes from a viewer's video-enabled cell phone. I'm talking about the reality that a license to broadcast may stop being a license to print money.

We are approaching a fork in the road. One path leads to the digital cliff. The other leads to an intensely competitive digital world, where broadcasters will need to reinvent themselves in order to survive. Your survival

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

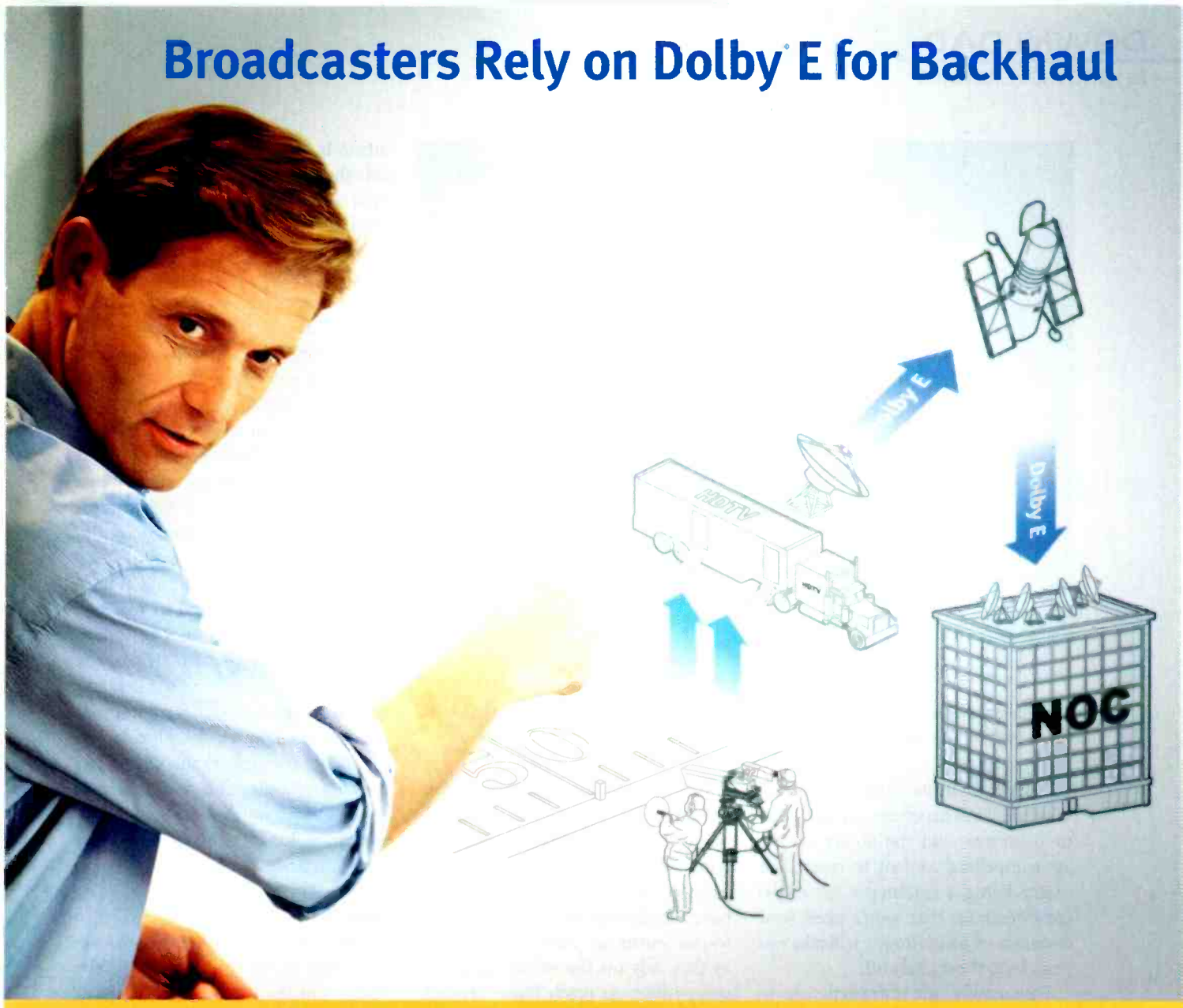
Declining flat-panel TV prices

A 32in LCD TV was $558 cheaper in 2006 compared with 2005.

Top selling flat-panel screen sizes based on unit volume	Average selling price 2005	Average selling price 2006
32in LCD TV	$1354	$796
42in Plasma TV	$2034	$1265
40-42in LCD TV	$3014	$1606
50in Plasma TV	$3574	$2052
46in LCD TV	N/A	$2601
37in LCD TV	$2096	$1113

Source: The NDP Group *www.ndpgroup.com*

Broadcasters Rely on Dolby® E for Backhaul



For sporting events, live concerts, and other presentations, **Dolby® E** is the most popular backhaul solution for carrying surround sound from the remote truck to the network operation center. It's cost-effective and, unlike other codec options, Dolby E maintains the highest-quality audio—even through multiple encode/decode generations.

- Delivers up to eight channels of superb-sounding digital audio on just two audio channels, saving you money and bandwidth on your delivery
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DP572 Dolby E Decoder

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www.dolby.com/tvaudio

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Broadcasters have reached a fork in the road. Staying the course leads to the digital cliff. Adapting to a competitive marketplace leads to the future.

will depend on the ability to leverage multiple infrastructures to get close to customers and the ability to create compelling content to meet their needs. Being a gatekeeper for media conglomerates that won't need your transmitters much longer will take you straight to the digital cliff.

Fortunately, the infrastructure to build relationships with viewers, and to create the new services that will help you survive, already exists. (Hint: It's called the Internet). A station's Web site may be the most important tool for the survival and rebirth of over-the-air TV.

Web links

- "All Web sites are alike," David Kirkpatrick, *Fortune* senior editor *http://money.cnn.com/2006/06/08/technology/fastforward_fortune/index.htm*
- The Ultimate Tail-Gator Contest – WSKY Radio *www.thesky973.com/videos.htm*
- Apple iPhoto overview *www.apple.com/iphone*

But most stations are more concerned about the return on investment from new technologies they don't understand or control. Too many broadcasters think they do not have a back-channel to support one-to-one customer relationships, even as they rely on the infrastructure of competitors to reach those customers. Worse yet, they think they are in the TV business, not the information business, and that they are in the entertainment business, rather than the business of helping local advertisers connect with local customers.

David Kirkpatrick, a senior editor for *Fortune* magazine, notes that Web sites are the equalizer. "Regardless of their owners, they can all do the same set of things. In that fact lays the profound crisis facing all aspects of the media industry," Kirkpatrick says. "It doesn't matter whether a Web site's owner once focused on publishing newspapers or magazines, broadcasting television or radio, making music or producing movies, or even selling soft drinks. Any Web site can host text, audio and video, it can facilitate connections and communication between users, and it can enable those users to create and display their own text, audio or video." (See "Web links.")

Case in point: When I need to get some information about a year-old local government story, I can't turn to a local station's Web site because the Gainesville, FL, stations do not maintain an archive of the stories they run in their newscasts. In fact, they do little more than use their sites as a shell to link to the Web sites of their network affiliates. Small wonder I go to the *Gainesville Sun's* Web site for news and *www.wunderground.com* to get the local weather forecast.

Radio is even further along. A local talk radio station turned to YouTube for a recent promotion. The station set up a contest for two tickets and an all-expenses-paid trip to Glendale, AZ, for the BCS National Championship game to watch the Florida Gators play (and defeat) the Ohio State Buckeyes. Contestants were asked to create a video stating why they should win and upload it to YouTube to share with fans. (See "Web links.")

Use it or lose it

This year we are going to see an acceleration of the convergence of television and the Internet. It will occur on two fronts:

- *Watch more TV on your computer.* This includes additional content that cannot be seen when the show is broadcast. And let's not forget about the ability to build communities of interest around a program via the program's Web site.
- *Use your TV like a computer.* More devices will connect to new big screen TVs, making them more akin to computer monitors than the old analog TV receivers.

When using a Web browser, you probably do not notice that modern Web sites pull content from multiple servers to create the page you are viewing. The ads may come from a company that specializes in selling and inserting ads in the Web sites of its customers. The search engine is probably

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Multibridge Pro includes built-in HDMI out. Perfect for connecting to the latest big screen televisions and video projectors for incredible digital cinema style edit monitoring.

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Dual Use – Converter and Capture Card

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The Internet is a network-of-networks, and there is no reason that your TV station cannot become part of the information superhighway. With your digital transmitter, you can broadcast all kinds of bits, not just TV. And with a set-top box that is connected to the Internet, you can close the loop with your customers. The same applies for PCs and notebook computers that incorporate a DTV tuner and a broadband connection.

My son got a Nintendo Wii for Christmas. It has built-in WiFi, and when connected, it has several information services, including a weather channel that you can watch on the TV. Microsoft and Sony are trying to go a step further with the Xbox 360 and PlayStation 3, adding HD-DVD playback capabilities. (See "Lean back media redefined.")

The time has come for local broadcasters to connect to modern realities. You are in the communications business and have the unique competency to create content and connect advertisers and potential customers in your market in compelling new ways.

Traveling down the fork in the road that leads to the future won't be easy, and it may not be profitable for years. But for broadcasters who are trying to eke the most out of their markets, the time is coming to an end. Wouldn't you rather know who's watching, rather than who's not? BE

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

Send questions and comments to:
craig_birkmaier@prismb2b.com

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Lean back media redefined

"We are shifting content experience from a lean-forward PC exercise to the comfort of the big screen TV in your living room."

If you think that this is a quote from Steve Jobs' Macworld announcement of Apple TV, think again. It was delivered by Randy Waynick, senior vice president of the home products division for Sony Electronics. He went on to say: "Internet video will clearly be the next step in the evolution of high-definition television, giving users more control over the content they view."

Apple TV connects the big screen in the family room to your in-home computer network to access your music and photo libraries and video downloaded via the Internet.

Welcome to the world of Internet video, Sony style. At the 2007 International CES show in Las Vegas, Sony announced the BRAVIA Internet Video Link, which will allow most of its new televisions to access free Internet video content, even in HD, from providers including AOL, Grouper and Yahoo, as well as Sony Pictures Entertainment and Sony BMG Music.

The product is a module that will attach to the rear of Sony Internet video-ready televisions. It will link the television set directly to a user's broadband Internet service provider via an Ethernet connection. Viewers will use Sony's Xross Media Bar icon-based interface to access content via their remote control.

The notion that the Internet and the big screen TV in the family room are on a collision course was echoed across the expansive halls of the CES exhibits, even as the press and analysts kept an eye on Apple's Macworld announcements. Microsoft's Bill Gates took things a step further, announcing the Windows Home Server, which is intended to store both computer data and media that can be shared by computers and a Media Center PC attached to the big screen.

Once again, Jobs stole some of the thunder from CES. The expected announcement of Apple TV, which Jobs previewed last fall, seemed almost anticlimactic, just a warm-up act for the main event — the announcement of Apple's iPhone. (See "Web links" on page 16.) The iPhone combines the functionality of a cellular phone, widescreen video iPod, e-mail and text messaging center, and a full-functioned Web browser that fits in the palm of your hand.

Powered by Apple's OS X and an innovative touch-screen interface, Jobs claimed that the iPhone is five years ahead of the competition. His optimism is well founded, and we will likely see many of the core technologies developed for the iPhone appear in a wide range of consumer electronics products. One can easily imagine the touch-screen interface being used as a remote control for TV users to surf the Web and navigate through the media stored on an Apple TV, PCs, iPods and other devices with wireless interfaces. BE

The iPhone runs Apple's OS X and uses a touch-screen interface. Could it also be a remote control for converged TV and Internet surfing?

HDCAM

"Sony was the only supplier to step up to the plate."

— Jason Taubman and Paul Bonar, Game Creek Video

HDemanding

Jason Taubman, VP of design for mobile production company Game Creek Video, faced contradictory demands. He tells us, "Some clients required the highest quality in 1080i and others demanded the same in 720p. Some venues only had fiber and some strictly triax. Sony was the only supplier to meet all these requirements in a single camera."

"We committed to the HDC-1500, Sony's 1080/60p camera before it was even a model number," says Paul Bonar, VP of engineering. "And Sony committed to us. Their engineers heard our input on the large lens 'sled,' which works like a charm. We gave them distressed cable to help design the triax adaptor, which is brilliant. And in service and support, Sony has risen to every challenge and met every need. We're now on our fifth consecutive truck with the HDC-1500, the best HD camera we've ever seen."

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Transmission boost

The FCC permits a distributed transmission system.

BY HARRY C. MARTIN

In December 2006, the FCC granted TV station WTVE-DT Channel 25 of Reading, PA, special temporary authority to begin operating a distributed transmission system on its DTV channel. The six-month STA grant is good news for proponents of this new transmission method. The FCC will take the experience of this station into account as it evaluates other STA requests and considers authorizing systems on a permanent, licensed basis.

Transmission technology

Distributed transmission operations use several synchronized transmitters spread around a station's service area — much like on-channel booster stations or cellular transmission sites. But unlike analog booster stations, which can generate a significant amount of self-interference, distributed transmissions rely on adaptive equalizer circuitry in DTV receivers to cancel or combine the multiple signals to produce a single signal.

Proponents say it improves spectrum efficiency by increasing service levels while maintaining or reducing interference. The lower power levels and lower towers allow greater placement flexibility — a particular boon in urban and suburban areas.

WTVE-DT will use eight transmitters within the station's maximized construction permit contour.

The FCC approved in principle the use of distributed transmission system technology in a 2004 report and order. In the order, the commission said that DTV stations wishing to use such systems should apply for STAs, which would be evaluated on a case-by-case basis under a set of interim guidelines. In November 2005, the interim guidelines were clarified, and the FCC began a rulemaking proceeding to establish long-term rules and standards for distributed transmission operations. This proceeding is currently pending.

WTVE-DT

WTVE-DT will use eight transmitters within the station's maximized construction permit contour. The transmitters will range in power from 0.11kW to 126kW. The proposed facilities, the station claims, will increase the DTV population served, while decreasing interference to other DTV and analog stations.

An FCC review found that the proposed operation was unlikely to generate impermissible interference. Moreover, the FCC specifically noted that information obtained from the station's STA operations would be valuable in evaluating the future use and deployment of the technology.

The FCC warned, however, that the station's operations would be subject to the rules developed in the distributed transmission system rulemaking proceeding. Thus, it is possible WTVE-DT will have to reconfigure or rebuild its distributed transmission facilities. And while the rulemaking is pending, any service beyond the station's authorized maximized service contour will be considered secondary in nature and will not be protected from interference.

In other FCC news: Ownership studies ahead

The commission will include 10 new economic studies in its ongoing review of the multiple ownership rules. Commissioners Michael Copps and Jonathan Adelstein have indicated that they were not consulted about the scope, content or authorship of the new studies. Nor does the FCC have a timetable for resolving the proceeding, which will affect all agency-regulated media.

Add to this criticism of the 2003 rules being reconsidered that the dissenters' party now controls Congress. It is expected that when the rules emerge from the Republican FCC, both the courts and Congress will weigh in before any new rules become effective. BE

Harry C. Martin is a past president of the Federal Communications Bar Association and a member of Fletcher, Heald and Hildreth PLC.

Send questions and comments to: harry_martin@prismb2b.com

Dateline

April 2 is the deadline for TV, Class A, LPTV and translator stations in Delaware and Pennsylvania to file their 2007 renewal applications. TV, Class A and LPTV stations that originate programs must also file EEO Program Reports (Form 396) along with their renewals.

TV stations in the following states must file biennial ownership reports on or before April 2: Delaware, Indiana, Kentucky, Pennsylvania and Tennessee.

Also by April 2, TV, Class A and LPTV stations originating programming must place annual EEO reports on their Web sites and/or in their public files. The public file requirement only applies to full-power television.

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Tame those artifacts

Know the compression acts that create artifacts.

BY ALDO CUGNINI

While we all know that compression causes artifacts, just how much do you know about what causes them and how to reduce them? While the occurrence of artifacts would seem random, it is directly linked to specific parts of the compression process.

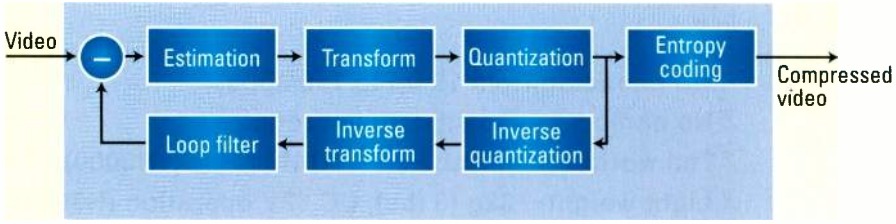


Figure 1. A typical video encoder. The lossy process of quantization is responsible for producing artifacts.

Video coding

Transform coding is comprised of several cascaded processes. The two critical elements leading to artifacts are the discrete cosine transform (DCT) and quantization. (See Figure 1.)

The DCT takes the amplitude values of the 2-D, spatially ordered pixels (usually 64 in an MPEG block) and applies a mathematical algorithm that transforms the array into one that represents the frequency components of the block. The DCT can be considered an ordered set of weighted basis functions, or elementary functions, which, when taken in combination, can replicate any image. (See Figure 2.)

These DCT coefficients are quantized, i.e., converted to a lower precision value, and then transmitted in the compressed bit stream. This process lowers the number of bits needed to reproduce the image. It is this same process that causes many compression artifacts.

Block visibility

When the coarsness of the quantization is high enough, the normally invisible edges of the blocks will become noticeable. This is due to an inherent property of the DCT. Each coefficient affects the entire block when it is converted back into spatial pixels.

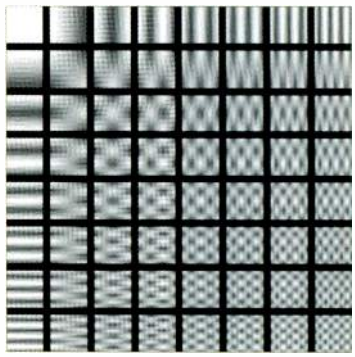


Figure 2. Every 8 x 8 image block is coded as a weighted combination of these 64 DCT basis functions.

Thus, when quantization of a certain DCT coefficient creates an error that is dispersed over the entire block and a neighboring block with similar image components has a different error, then the neighboring edges of the blocks will have a level transition that was not present in the original image. Figure 3 on page 24 shows a heavily compressed image to exaggerate the effects.

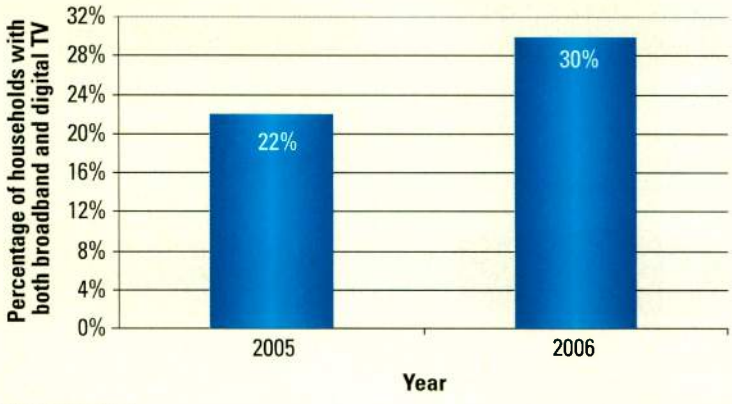
It should be noted that once an artifact is created, attempts to remove it by using a conventional filter at the decode side will blur the picture and result in a loss of sharpness. However, sophisticated deblocking filters can improve the image with less loss of detail. MPEG-4/AVC includes a signal-adaptive deblocking filter that operates within the encoding error loop and provides considerable improvement in blockiness reduction.

FRAME GRAB

A look at tomorrow's technology

Households with broadband and digital TV increasing

Thirty percent of homes in 2006 subscribed to both technologies



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Basis functions

In addition to block-edge visibility, a coarsely quantized block can actually cause the basis functions to appear. A highly detailed part of the image will tend to mask errors in coding. This is a normal part of the psychovisual process. Areas with flat contrast show errors more readily than those with more detail.

Figure 3. Various artifacts are present in this highly compressed image.

However, when the quantization is coarse enough, the array of DCT coefficients will not be reproduced faithfully. Thus, there can be instances where a particular basis function is stronger than that from the image source. In such a case, you can actually see the basis functions. (See Figure 4.)

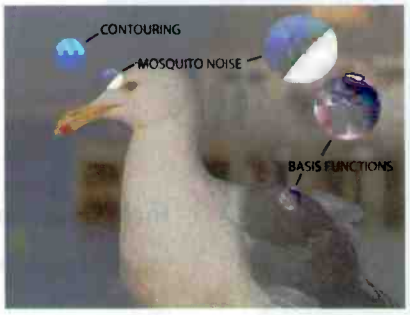

Figure 4. Highlighted here are the three main compression artifacts.

Bugs in the picture?

Another artifact that is caused by DCT is mosquito noise. Named for its appearance, this effect appears when a complex part of the block may appear normal, due to the busyness of the image, but another, less busy part of the block may have an increased visibility of the basis function. (See Figure 4.)

Because images are inherently complex, encoders cannot always choose the best quantization for every element of a picture. Thus, a block that contains different kinds of detail may include some elements that were reproduced well and some that were not, hence the mosquito effect.

Another consequence of heavy compression is contouring. This is where normally smooth graduations in luminance or chrominance levels take on a step-like appearance.

Finally, MPEG and similar codecs all use predictive coding, where some frames are predicted from less-frequent anchor frames. Any strong

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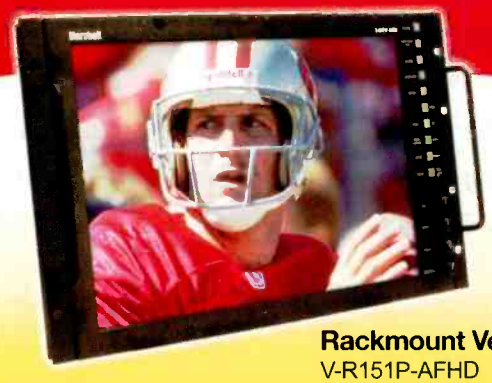

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artifacts in the I-frames are usually propagated in time and could change on a GOP-by-GOP basis, causing a noticeable pumping in the video.

Audio compression's limits

When lossy coding is employed, audio coding results in artifacts. The MPEG, Dolby and other codecs rely on psychoacoustic masking. The production of artifacts is modeled at the encoder, and the amount of quantization is chosen to minimize the likelihood that those artifacts will be heard. This model relies on certain characteristics of the human auditory system, whereby quiet sounds are masked by louder sounds, especially when those sounds are within critical bands.

In order to analyze the audio in these critical bands, audio codecs use either the modified discrete cosine transform (MDCT) or sub-band filters. Quantization of the compressed audio samples will then give rise to various artifacts.

However, because of the complementary synthesis transform (or sub-band filter) used in the decoder, artifacts tend to remain within the critical bands. Both systems also must rely on sliding time windows in which to perform the various compression functions. These windows can be responsible for a certain amount of artifact production, as transient phenomena get smeared in time.

Among the various artifacts that have been ascribed to audio compression are ringing or pre-echo, warbling, metallic or underwater sounds, transient dropouts, and smearing or sizzling. Perhaps most notable are sounds with percussive attacks and decays, such as those produced by castanets. Two examples include when onset of the sound loses its sharp attack and the atonal sounds produced by cymbals, where the harmonics take on a swishy sound. Simple sounds approximating pure tones are also useful as critical listening material.

Quality is key

So how can you minimize these artifacts? There are two fundamental rules. First, use the best encoder you can afford. Second, use the highest practical bit rate. Some characteristics of the encoder may be adjustable, too.

Always base your analysis using both typical and critical video — the latter is available quite readily on test disks. Now that you know what to look (or listen) for, comparisons should be easier to make. BE

Aldo Cugnini is a consultant in the digital television industry.

? Send questions and comments to: acugnini@prismb2b.com

The MAC factor

This address is just as important as the IP address to get packets to their destination.

BY BRAD GILMER

Last month we talked about domain name resolution — the process of resolving a host name to an IP address. This month, we will discuss core network routing protocols and Media Access Control (MAC) addresses.

The ISO model

You may recall the ISO seven-layer network model. For this tutorial, we will use a simplified version of the ISO model. (See Figure 1.)

The first layer is the physical layer. It consists of the wires, connectors and the specifications for the electrical signals sent over a network. While Layer 1 is a necessary component of the network, it is not responsible for routing packets.

The second layer is the data link layer, in which networking transport technologies are differentiated. Examples of Layer 2 protocols include Ethernet and token ring. Clearly, the dominant Layer 2 protocol today is Ethernet.

The third layer is the IP layer. We discussed Layer 3 in depth in last month's article.

The fourth layer is the transport layer. Layer 4 transports application data from one place to the other over a network. In the case of TCP, this means requesting the retransmission of lost packets and correcting for other errors on the network.

MAC addresses are Layer 2 addresses assigned by the manufacturer of the network card.

MAC addresses

MAC addresses are Layer 2 addresses assigned by the manufacturer of the network card. A MAC device might be a network interface card (NIC), or more commonly, the device is built into the motherboard of the computer.

MAC addresses take the form nn:nn:nn:nn:nn:nn. The first three numbers designate the manufacturer. The last three numbers uniquely identify the particular NIC card or network device. For example, a MAC address of 00:03:47:d6:bb:52 indicates that the card is made by Intel because 00:03:47 is Intel's registered number. Intel assigned the number d6:bb:52 to uniquely identify this card.

In last month's article, we discussed Dynamic Name System (DNS). As you probably know, you can manually assign an IP address to a machine, or you can use Dynamic Host Configuration Protocol (DHCP) to assign the address automatically. Your computer may be assigned many different IP addresses over its useful lifetime. But the manufacturer assigns Ethernet MAC

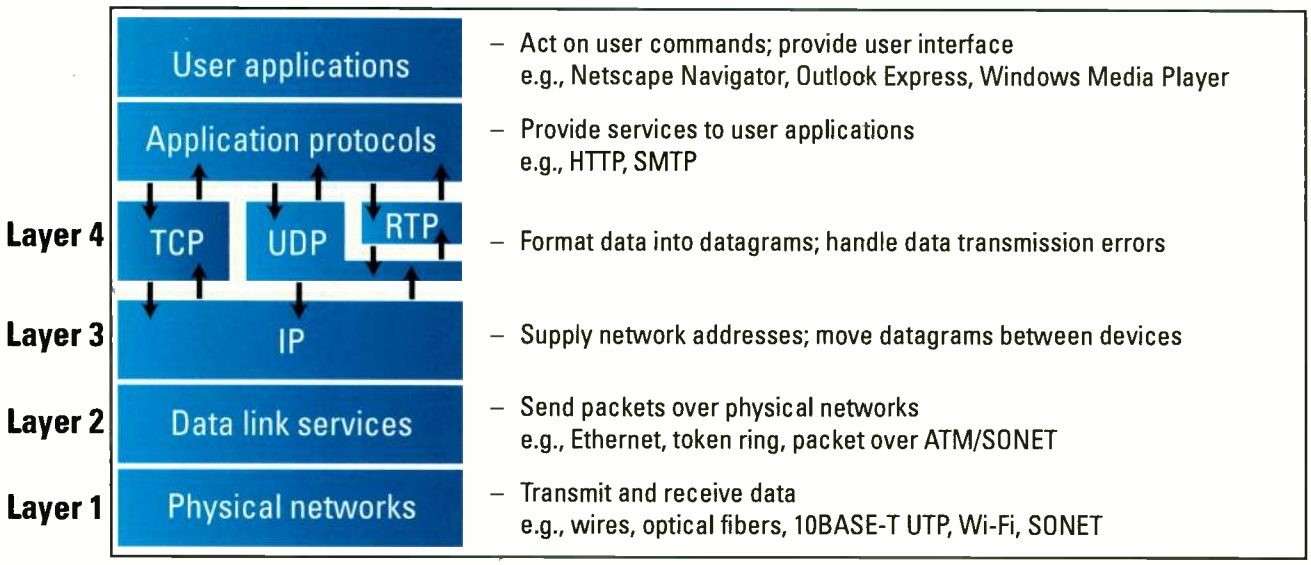

Figure 1. A simplified ISO layer model for broadcast applications with Layers 1 through 4 of the ISO model

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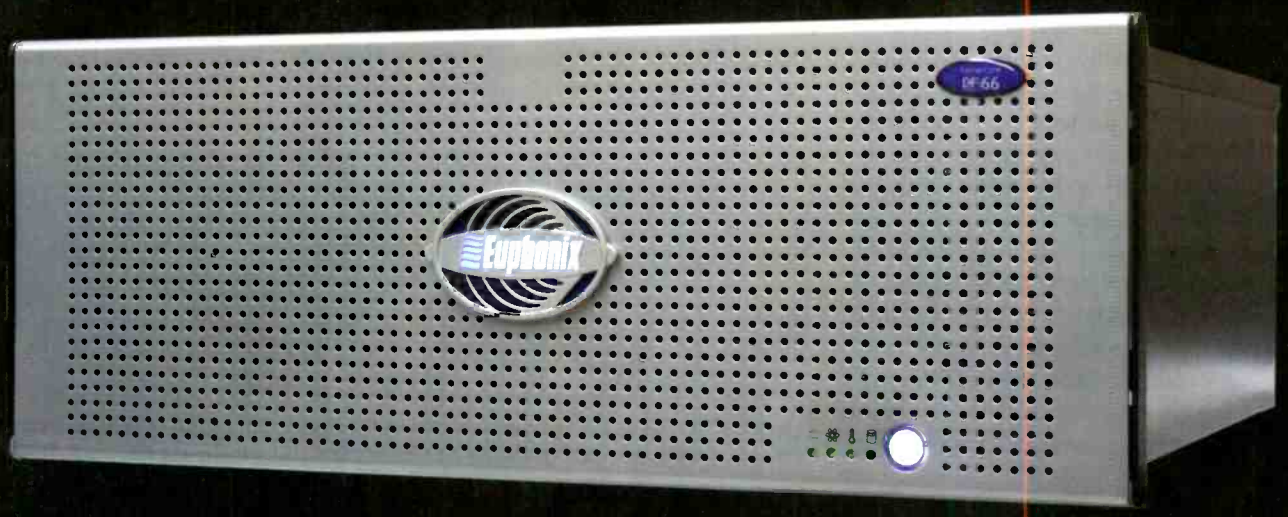

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addresses. These addresses cannot be changed. So why would a computer have two types of addresses, and why do they have different properties?

It is important to have both types of identifiers on a network. The Layer 2 MAC address ensures that there is one globally unique identifier for each computer on the system. The Layer 3 address allows computers to be organized into groups or networks. This permits the efficient routing of traffic across network boundaries, thus keeping local network traffic local and reducing the amount of traffic on the Internet at large.

Why would a system need a MAC address if it knows the IP address of a target computer? A Layer 2 switch sends packets to various outputs based on where the target resides. By associating the IP address with the hardware MAC address, the switch knows where to send the IP packets.

Also, remember that IP runs over a multitude of hardware, including Ethernet, SONET and token ring. If you know the IP address of a particular computer, you still do not know what sort of network the target is on, or what packetizing system it uses. The way a switch or router determines this is by sending out an Address Resolution Protocol (ARP) request.

ARP in action

Let us look at a simple example with two computers on a network. A person at one computer wants to use the ping command to see if a second computer is available on the network. At the outset, the first computer does not know the MAC address of the second computer, but it does know its IP address (10.0.0.15). The person types the ping command and sees the response below:

```
C:\> ping 10.0.0.15
Pinging 10.0.0.15 with
32 bytes of data:

Reply from 10.0.0.1:
bytes=32 time
<1ms TTL=127
```

To the person at the first computer, it looks as if all that has happened is that their computer sent a ping to the second computer and received a reply. But an Ethernet packet sniffer reveals a conversation. (See Figure 2.)

The first computer generates a broadcast ARP request. This request says, "Who has 10.0.0.15? Tell 10.0.0.14." The initial message contains the source IP address (in this case 10.0.0.14) and the source MAC address. It includes the target IP address, but the target destination MAC address is all zeros "Broadcast."

The ARP request is broadcast to everyone on the network. The computer known as 10.0.0.15 receives this ARP request, recognizes that it is the target of the request and responds with an ARP reply, which is directed to the source of the request. The reply is identical to the request, with the exception that the target computer fills in its own MAC address. Now the first computer knows where to send the ping request. The ping is sent, and the target generates a reply.

The first computer is not finished though. It makes a note of the MAC address of the second computer in its ARP table. The ARP table contains the IP and MAC addresses of computers on its network. By storing the information locally, it will not have to issue another ARP request when it receives more packets for the same target. Figure 3 shows what the ARP table looks like for the first computer. The ARP entries are dynamic — they expire over time. Otherwise the first computer would remember this association forever.

Let us look at two interesting cases. First, what happens if the target fails to respond? The ARP request is sent, and the request times out. The ping request fails, and the user is notified.

Second, what if the user pings an IP address that is not on the local network — 65.223.1.49, for example? When you configure the IP stack of a computer, one of the entries is for a default gateway. Any traffic destined for an address that is not on the local network is sent to this gateway. In Figure 3, you can see the default gateway is a Cisco router located at 10.0.0.1. The ping to 65.223.1.49 is sent to the default gateway and from there to the Internet. BE

Source	Destination	Type	Description
Intel_03:26:b3	Broadcast	ARP	Who has 10.0.0.15? Tell 10.0.0.14
IBM_53:dc:22	Intel_03:26:b3	ARP	10.0.0.15 is at 00:23:4c:53:dc:22
10.0.0.14	10.0.0.15	ICMP	Echo (ping) request
10.0.0.15	10.0.0.14	ICMP	Echo (ping) reply

Figure 2. After using a ping command to see if another computer is available on the network, a computer will generate an ARP request, as shown above.

```
C:\> arp -a

Internet address      Physical address      Type
10.0.0.15             IBM_53:dc:22          Dynamic
10.0.0.1              Cisco_03:26:b3        Dynamic
```

Figure 3. An example of what an ARP table looks like

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

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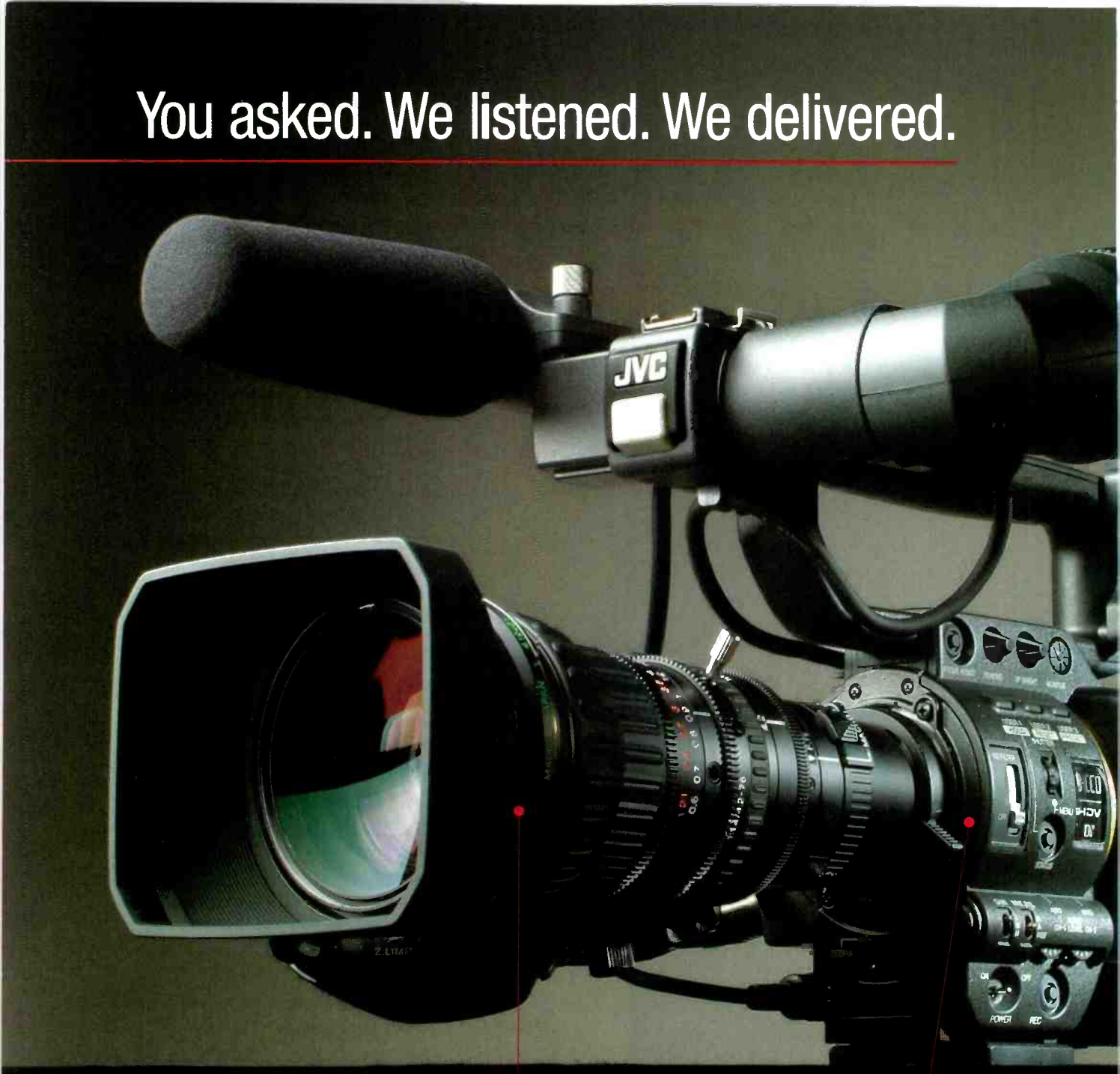

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Simulcast support

HD/SD graphics platforms use different processes to simulcast operations with varying results.

BY EUGENE PLAWUTSKY

Many stations have found that optimizing graphics for HD/SD simulcasting can be pretty challenging. For instance, a facility that downconverts HD content to create an SD channel will face many compromises with graphics presentation. Other stations with dedicated graphics devices for HD and SD channels have experienced different problems related to more complex system integration and automation during installation. Using separate HD and SD graphics processors for branding can also contribute to more complex graphics workflows on a day-to-day basis. Before we look at possible solutions, let's discuss these issues in more detail.

Figure 1. Overcoming compromises with positioning of HD branding

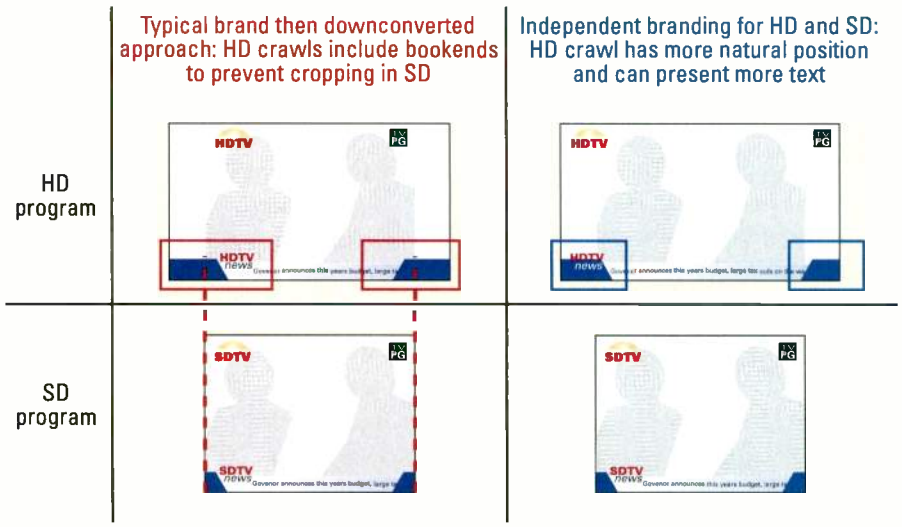

Figure 2. Improved crawl presentation with independent branding for HD and SD

Simple downconversion

A typical HD/SD simulcasting system, based on downconversion of an HD feed, will involve adding channel branding graphics ahead of the conversion process. This means that the positioning of the 16:9 HD graphics must accommodate the 4:3 SD format. This often results in an awkward appearance for the HD output.

The HD graphics are simplified to work effectively in SD, and this prevents the broadcaster from using the full breadth of graphics effects possible with HD. This is a real pity, as HD opens up new branding opportunities, both in terms of the sophistication of the graphics and the use of text on the bigger, higher resolution screen area.

Stations have found that optimizing graphics for HD/SD simulcasting can be pretty challenging.

With downconversion, it's common to find fairly simple HD graphics positioned toward the middle of the screen, rather than in the classic position toward the edges. (See Figure 1.) Also, crawls will often have rather ungainly bookends, which reduce the amount of visible text. (See Figure 2.) Another issue inherent with downconversion is a lack of differentiation of the HD and SD channels, as they are based on the same branding graphics.

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Separate graphics devices

The use of separate branding graphics devices for HD/SD simulcasting is a partial solution to this. It overcomes the need to compromise graphics positioning, and it also allows the use of more elaborate and text rich graphics on the HD channel, making the most of the format's potential. However, using separate graphics devices for HD and SD tends to create a more complex installation, typically demanding two automation interfaces and two playlists to drive the playout. This is more costly with respect to capital expenditure and more demanding for engineering to install and manage on an ongoing basis.

Importantly, separate branding devices for HD and SD also significantly increase the graphics requirements, as there is often a need for dual systems for graphics preparation, data interfacing and media management. Naturally, this adds to the complexity of the graphics workflow, and increases costs for training and maintenance.

Single processor, dual graphics engines

What is needed is a single processor with dual graphics engines for HD and SD. (See Figure 3.) This type of processor features two independent graphics engines for HD and SD outputs.

When using an HD feed, simulcasting may be performed effectively by branding the HD channel using a dedicated HD graphics engine. The SD output is derived from a downconverted clean feed, with channel branding inserted by a separate SD graphics engine.

This device can also perform simulcasting with an SD feed, with the SD channel upconverted to 1080i or 720p to create the HD output. In both cases, the HD and the SD channels will have graphics optimized for the format in terms of positioning and style.

A single HD/SD processor simplifies system integration, automation and maintenance. Just one automation interface and one playlist can drive both HD and SD simulcasting channels, and this can significantly reduce system complexity.

Perhaps even more important, the development of dual-format, template-based graphics workflow software has simplified graphics workflows in simulcasting and multichannel HD/SD environments. A multiformat graphics automation application makes it faster for designers to create graphics templates for HD and SD, and it simplifies interfacing for data-driven graphics.

With this type of environment, television-ready graphics can be created easily from a user's desktop, dropped into predefined templates, linked to live data sources and quickly inserted into playlists. Live data can be accessed once, mapped to the appropriate HD and SD templates and then sent to the delivery channels, without burdening the production process.

This advanced operation increases productivity, allowing the output of detailed and complex graphics without all the complexity of resizing and reformatting in both HD and SD. Media management is also simplified by using a single archiving and distribution system for both formats.

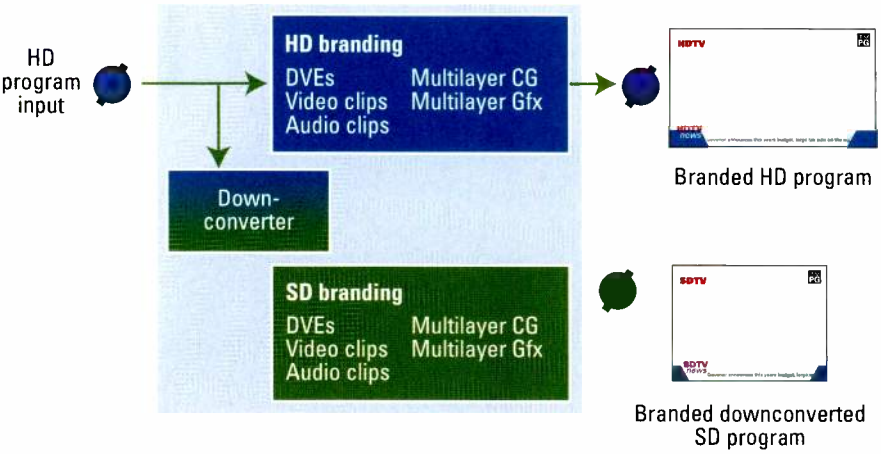

Figure 3. HD/SD simulcast graphics with independent branding engines

Independent graphics processors, such as Miranda's Vertigo XG, are optimized for HD/SD simulcasting, with integral up-, down- and crossconversion and two independent graphics engines.

A multiformat graphics automation application makes it faster for designers to create graphics templates for HD and SD, and it simplifies interfacing for data-driven graphics.

These multiformat graphics workflow tools can also radically simplify rebranding activities for mobile TV and other new media formats.

HD/SD graphics workflows can be simplified further if the graphics system can go beyond channel branding and promotional graphics to support production graphics for news, live sports and elections. There are natural efficiencies from using a common system for newsroom graphics and channel branding when it comes to asset management, graphics creation, content editing and real-time data management, as well as work-order management and playout control. Again, obvious benefits include fewer applications to learn and support, as well as less duplication of effort, which further enhances productivity.

Under control

Other important issues in creating an effective HD/SD graphics workflow in multichannel facilities are scalability and control. Effective scalability demands an open, modular architecture that can operate well with a single user or with hundreds of users across multiple locations.

For driving multiple HD and SD channels with complex graphics, there is typically a requirement for fully automated operation and highly versatile manual control. Rapid and intuitive manual control of multilevel graphics across multiple channels demands a combined hard/soft panel or a pure soft panel solution.

Soft panels are rapidly gaining popularity because they offer effective and independent control of all the various on-screen elements. They can be readily configured to suit an operator's particular style, or accommodate changes in the channel or programming lineup. They can also offer effective previewing of graphical elements, such as idents, clips, data streams and transitions.

By considering all of these factors before selecting an HD/SD graphics system, television engineers or operators can ensure that they optimize the efficiency of the hardware and software installation, while also saving time and money, and offering the highest level of on-air presentation. BE

Eugene Plawutsky is product manager – graphics products for Miranda Technologies.

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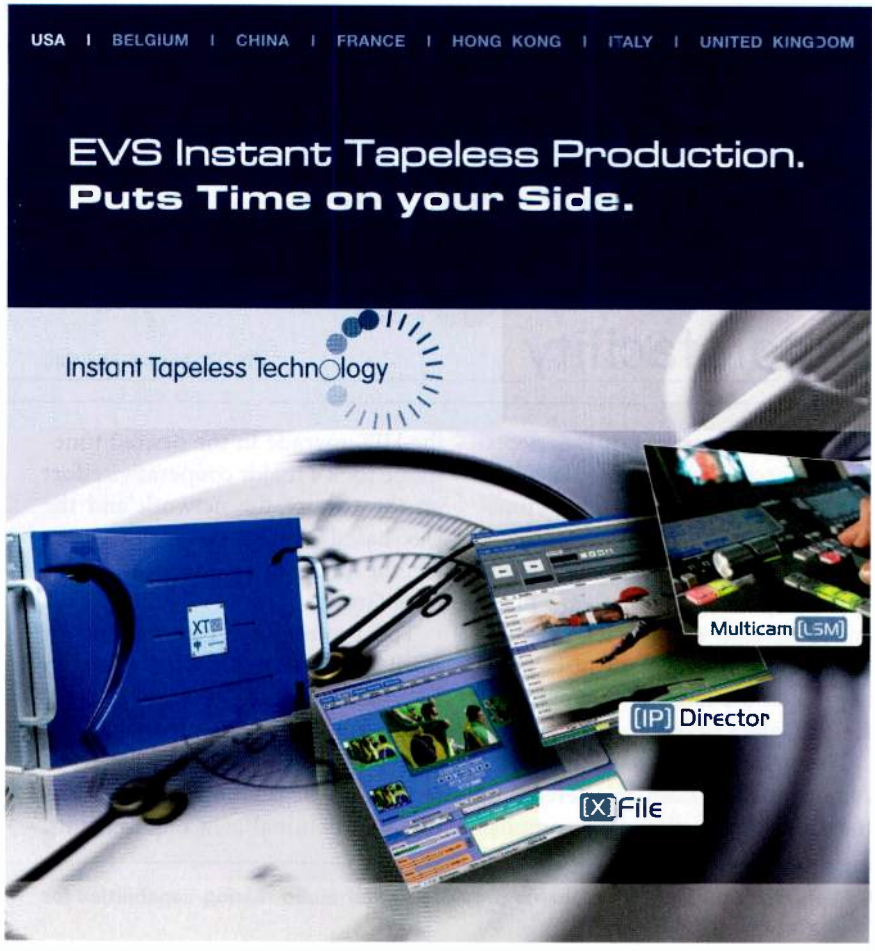

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SYSTEM DESIGN SHOWCASE

TV Azteca scores a goal with its HD production facility

BY TOM LARRISON

In Mexico, as in much of the rest of the world, football of the soccer variety attracts huge television audiences. In light of this, it is not surprising that TV Azteca, one of the largest producers of Spanish-language television programming in the world and broadcaster of Mexico's national team matches, wanted to be the first in Mexico to broadcast the upcoming 2006 FIFA World Cup competition in HD. In addition to its near-term goal, the network wanted to create a platform robust enough to support all of its HDTV requirements for the next 15 years.

A two-phase approach was necessary to accomplish both goals. The first phase was to launch a fully functioning HD production facility in time for the start of the 2006 World Cup competition. The second phase was to develop and implement multiple HDTV master control facilities to provide the long-term capabilities the TV Azteca needed.

The broadcaster was already producing in SDI. Even so, developing and executing a plan to accomplish the HD upgrade in the desired timeframe took a major cooperative effort on the part of the network and the U.S.-based design-build integrator for the project, TI Broadcast Solutions Group.

The project began at the end of April 2005 with meetings between TV Azteca and the systems integrator. During these meetings, engineers from both organizations reviewed objectives and began the process of identifying functional area requirements,

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selecting the best products to meet those requirements, assigning tasks, and establishing costs and schedules.

Initial planning

TV Azteca's comprehensive preplanning made it possible for the systems integrator's engineers, who would be designing the system, to identify and begin planning the major functional areas within the broadcast center. The network also provided conceptual information for workflow between the functional areas. The information was key to effective overall planning and design, as well as for proper placement of QC functionality within the broadcast center.

From this, TI Broadcast Solutions Group identified four functional areas for the new broadcast center: two master control areas, an HD production control area and a new central routing facility.

Master control

Among requirements for the master controls were virtual monitoring capabilities and remote operation of all heat- and noise-generating devices. It was also important that the areas make an immediate, positive statement about the network's brand image and worth. The key considerations were in selecting the display technologies, multi-image processing systems, KVM switching and extension, ergonomic consoles and seating, overall visual appeal, channel branding solutions, play-to-air interface, traffic log reconciliation, and synchronization of closed caption files.

HD production control

TV Azteca's plans called for repurposing an existing facility to create the HD production control area. This space needed to be connected to the central routing facility across the broadcaster's campus, a requirement that the systems integrator met with fiber tie lines for inputs and outputs.

The plan for this area included six cameras supported by a large switcher and sophisticated audio mixing capabilities for heavily music-oriented content. Other capabilities needed in HD production control included monitoring and tally systems, via a virtual monitor wall system. And lighting changes were made to accommodate the newly created high-definition facility.

The new HD production control area includes an NEC virtual monitor wall and a Sony MVS-8000 series switcher that supports six cameras.

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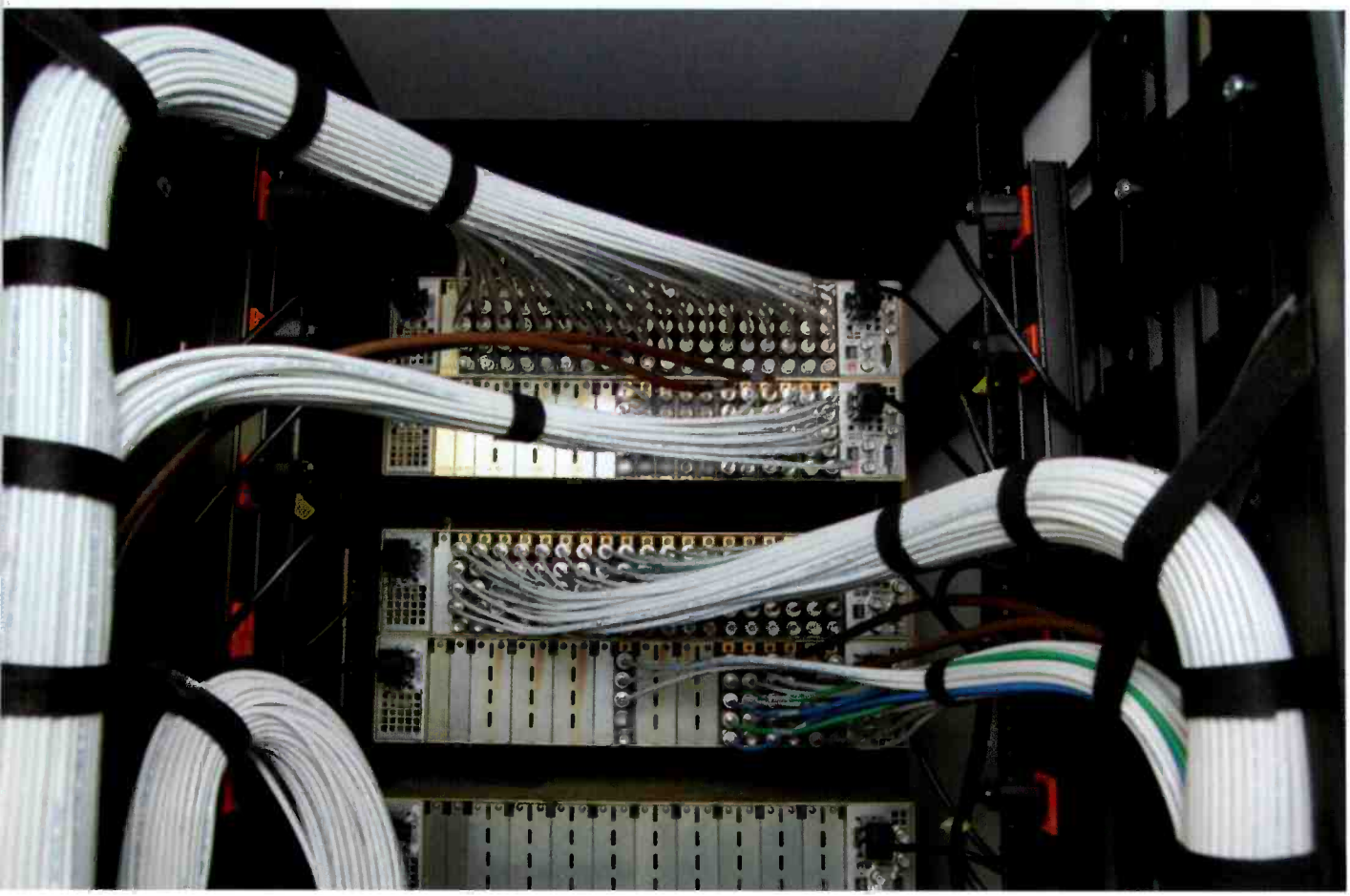
Central routing

The central nerve system of the facility is the location for routing, patching, distribution and conversion gear. For this facility in particular, it was imperative that the broadcaster and systems integrator work closely together to evaluate key components. An important consideration for this room was the selection of racks that could both meet specific seismic ratings for the geographic area and allow for easy integration of the project from off-site prefabrication through on-site installation.



To ensure optimal performance, cabling in the TV Azteca HD facility complies with the highest SMPTE 292 M standards.

The design process

TV Azteca and TI Broadcast Solutions Group agreed on a five-week design schedule. Each week of the schedule addressed a major aspect of the project and built up to the next week's activities. Staying on schedule was critical for completion before the start of the World Cup competition.

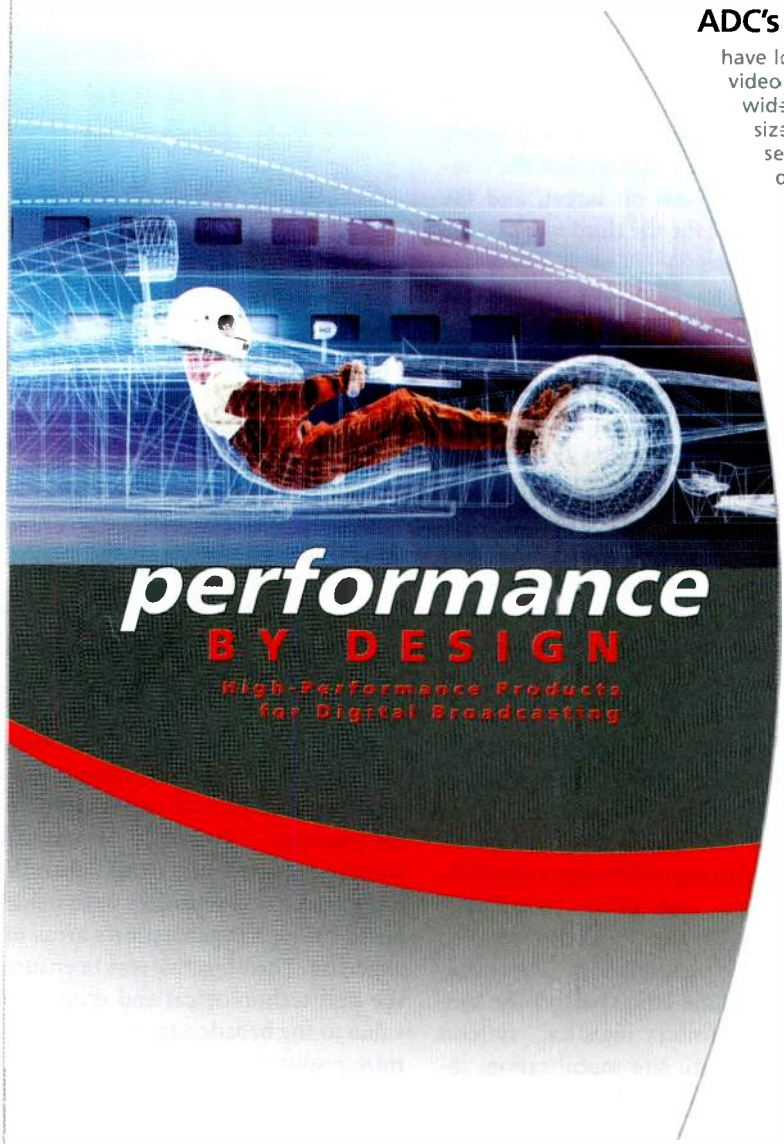
The only deviation from this original design schedule was near the end, when the broadcaster and systems integrator brought vendors to Atlanta for in-person product presentations. These presentations took place prior to final design approval, which was originally scheduled for week five in the design process. While this added a little less than two weeks to the design schedule, the team was able to complete the HD implementation on schedule and in time for the World Cup.

Week 1: Key concepts and manufacturers

During this week, TV Azteca and TI Broadcast Solutions Group laid the foundation for the entire system. This phase required that both parties be in the same city.

To facilitate the week's activities, the work was divided between two teams. The first team, made up of engineers from both the broadcaster and systems integrator, developed the major goals for the systems. This team defined the best approach to meet workflow requirements and the correct tools to achieve the desired look and feel.

The second team also was composed of representatives from both TV Azteca and the systems integrator. The team worked with key equipment manufacturers to select major system components, such as switching equipment, cameras, routers and automation, servers. As part of this critical initial planning, two representatives from TI Broadcast Solutions Group traveled to the broadcaster's campus in Mexico City and conducted a



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comprehensive site survey, during which they identified potential issues and mapped the existing facility and its equipment.

Design team

TV Azteca
- Roman Gomez, director of engineering
- Jorge Pickering, director of production services
- Omar Oilvera, technology development
- Felipe Ceballos, master control operations manager

TI Broadcast Solutions Group
- Michael Wright, president
- Jay Gonzalez, vice president of media technology services and chief technologist
- Pat Matthews, senior project manager
- Terry Long, lead technician

Technology at work

- 360 Systems DigiCart
- DNF Slo-Mo controllers
- Dolby E encode and decode
- Euphonix Max Air audio console
- Forecast Consoles technical furniture
- Image Video TSI-1000 Tally Control
- Leader LV5700 HD scopes
- Harris Leitch
  - Integrator Gold router
  - LogoMotion branding
  - NEO SuiteView for monitoring
  - NEXIO HD servers
  - OPUS HD master control switchers
  - Platinum router
- Sony
  - HDW-M2000 VTR
  - MAV-555A video disk recorder
  - MVS-8000A HD switcher
  - NDC-1500L cameras
- TC Electronics System 6000 Reverb

Week 2: Conceptual design

The design engineers used this information to develop conceptual drawings of key systems. During this week, the broadcaster's personnel returned to their regular jobs and to business as usual.

The systems integrator sent an electronic version of the conceptual plan to the broadcaster at the end of week two. This allowed TV Azteca to immediately begin reviewing the plan.

During a telephone conference, the network and TI Broadcast Solutions Group addressed and resolved issues. The broadcaster agreed that the conceptual plan was on target, and the stage was set for the third week of the design phase.

Week 3: Detailed design and integration planning

This week's focus was on two major initiatives. The first was completing the detailed design documentation for various systems, including routers, patching, conversion and I/O for demarcation points. At the end of this week, the design engineers provided completed portions of the design to the broadcaster for review and acceptance.

The second initiative was engagement of the field operations team for planning and budgeting later project phases. This resulted in delivery of the project's bill of materials with pricing and budgets for cable, connectors and other installation materials. It also yielded a detailed timeline for completion of the project and a final labor budget for subsequent project logistics, systems prefabrication, site mobilization, installation, test and checkout, training and as-built documentation.

Weeks 4 through 7: Final design and vendors

The systems integrator completed the detailed drawing set for the project, addressing issues such as patch panel layout planning, mnemonics, wire numbering, pin-outs, edit bay panels and IT network details. During weeks five and six, representatives from TV Azteca and TI Broadcast Solutions Group met with vendors to evaluate products and make final equipment selections.

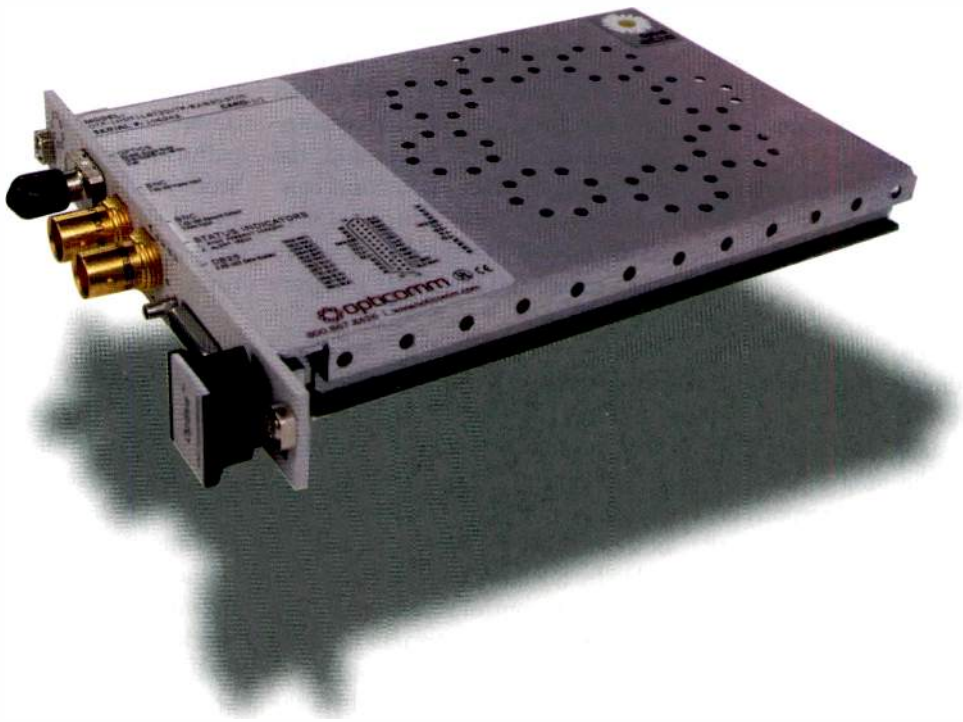
Following these meetings, both groups met for final design review. Each drawing was accepted as-is or with changes. With this step completed, the systems integrator prepared final documentation and delivered it to the broadcaster in both electronic and printed versions.

Decisions regarding which organization would handle each aspect of the project were made based on each organization's areas of expertise.

Building the future

Once the design phase was complete and system components were determined and orders placed, the systems integrator and broadcaster agreed to a division of responsibility for completion of various system components. Decisions regarding which organization would handle each aspect of the project were made based on each organization's areas of expertise. The objective was to ensure the best technological and economic value to the broadcaster and to maximize resources and efficiency.

TV Azteca assumed responsibility for the completion of:
- system power;
- HVAC/mechanical;
- lighting;
- satellite encoding;
- RF/teleport equipment;
- fire suppression monitoring;
- local ad insertion and cue tones;
- acoustics;
- nonbroadcast LAN;



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TI Broadcast Solutions Group was responsible for:

- integrated workflow solutions;
- broadcast automation;
- ingest, storage and playout servers;
- multiformat routing and master control;
- seismic racks;
- ergonomic consoles;
- quality-control solutions;
- in-plant audio, SDI and HD cabling; and
- ingest bay installation.

Throughout the project, the door was open for changes in responsibility if it appeared that shifting a task would be beneficial. This flexibility and cooperative approach resulted in fewer stumbling blocks to meeting the sometimes-rushed schedules.

Among the challenging aspects of this project were the long runs needed to connect the central router room and the new Studio 5. The only way to get HD signals from one to the other was fiber, which TV Azteca personnel ran under the street through a previously installed ladder tray.

Another challenge was the location of the area being converted for HD production control. This area was across the campus from the building where equipment was stored and staged. In addition, it was on the third floor of a building with elevators that were not large enough to accommodate the equipment. As a result, the equipment for HD production control was hand-carried piece-by-piece up the stairs to the third floor, where it was staged and then built, integrated and tested.

Innovative features

Several innovative features of TV Azteca's new systems have resulted in a more intuitive workflow and improved productivity. Notable features in the new HD facility include:

- Dolby 5.1 audio with remote control in each control room enables listening to program streams on- and off-air with the touch of a button.
- Program feeds are received via the latest Harris transmitter technology.
- Display of all predistribution, post-on-air and off-air program signals on a large-screen LCD display enables technicians to quickly identify issues such as poor signal quality and take immediate corrective action.
- Connections from both master control rooms to both the central router room and existing standard-definition systems enable seamless switching between systems.
- Forty transmit and receive fiber paths facilitate performing instant on-air tasks and live cuts. These paths are currently used to connect Studio 5 to the master control rooms. Eventually, they will be used to connect all six studios on the network's campus.

Live in HD

The culmination of the first part of this project was TV Azteca's ability to broadcast the entire 2006 FIFA World Cup live and in high definition. From the network's perspective, that meant larger audiences and an enviable position among Mexico's networks. The network broadcast the World Cup in both HD and SD and continues to support dual broadcasts at this time.

The master control rooms and router room were completed before the start of World Cup competition. Installation of the studio, which was 90 percent complete prior to the World Cup competition, was completed in July 2006. BE

Tom Larrison is vice president of the Broadcast Integration Group, part of TI Broadcast Solutions Group.

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DTV antennas

Careful planning, design and installation are the keys to an effective radiation pattern.

BY DON MARKLEY

In the November 2006 column about the use of antenna ranges to measure patterns, I stated that Jampro had the only full-size range in use. I have since found out that ERI also has a range. That range has existed for several years, and many FM antennas have been tested there. Following the acquisition of the TV transmitting antenna and rigid transmission line departments from Andrew, the company expanded the range to permit television measurements.

ERI's 70-acre antenna test range in Chandler, IN, features low RF interference.

The inner-workings of an antenna range

For engineers under the age of 50, an explanation of antenna ranges might be in order. For that purpose, I'll refer to the range shown in the photo at right. While this particular range belongs to ERI, the general functions of the various on-site facilities are similar to most ranges.

The purpose of an antenna range is to measure the antenna's pattern on the structure where it will ultimately be mounted. To that end, ERI uses several tower sections for measurements. When an actual section of the proposed mounting structure cannot be delivered to a site, it is necessary to fabricate an equivalent tower. The buildings near the top of the photo are used for that purpose. Those and other manufactured tower sections can be seen stacked near the access road.

Two test sites with towers make up the heart of the range to test the antennas. The towers are erected on large turntables so they can be rotated. The antennas are mounted on the tower sections in what will be the final configuration along with any other conduit, transmission lines, ladders

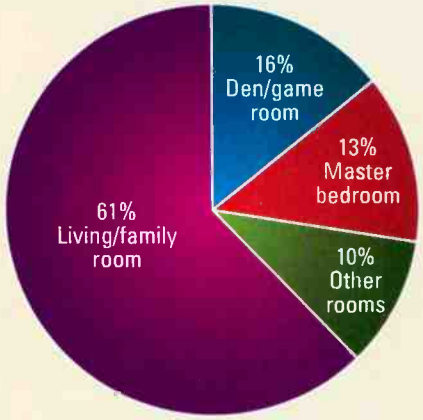
Two test sites with towers make up the heart of the range to test the antennas.

FRAME GRAB

A look at the consumer side of DTV

Distribution of HDTVs in broadband households

Sixty-one percent of broadband HDTVs are in living/family rooms



Source: The Diffusion Group *www.tdgresearch.com*

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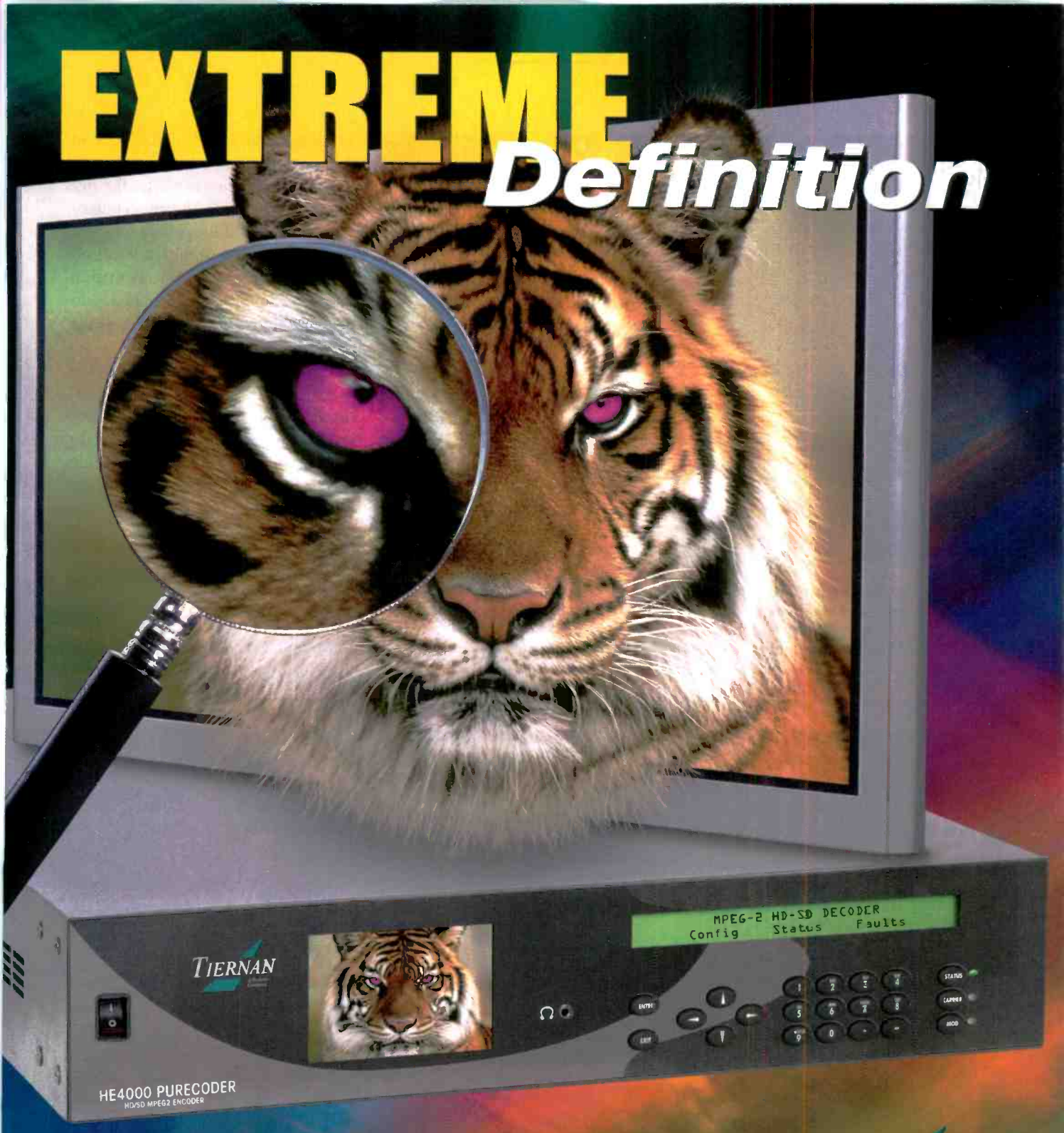

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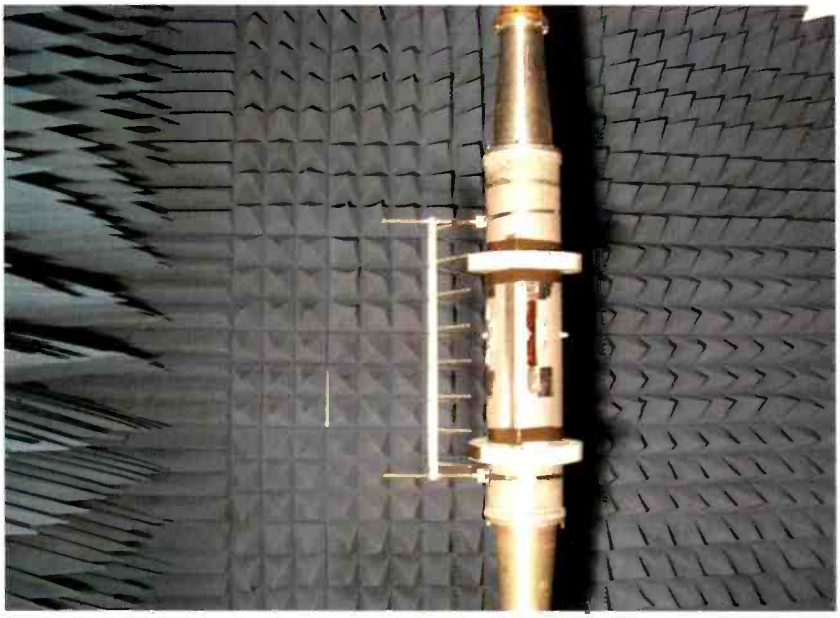

ERI's anechoic chamber includes an overhead crane arrangement, which completely retracts from the chamber interior so as not to compromise performance. The large 16,000-cubic-ft chamber allows the use of deeper absorber material, thereby lowering the usable frequency range to high-band VHF channels.

and other hardware that might be in the aperture.

Again, the antennas receive the signals from the source. The source antennas are located off the photo on the left side. The buildings at the test locations contain the necessary instrumentation to measure the received signal and to plot that signal versus azimuth as the antennas are rotated.

Some engineers prefer to see the measured patterns on a range using full-scale components. On older ranges, the antennas could also be rotated on a large stand to measure the vertical pattern. This method has mostly disappeared, with the vertical patterns either simply calculated or measured on a model.

The photo at left shows an anechoic chamber with an antenna being tested. In this system, a model of the antenna is constructed and placed

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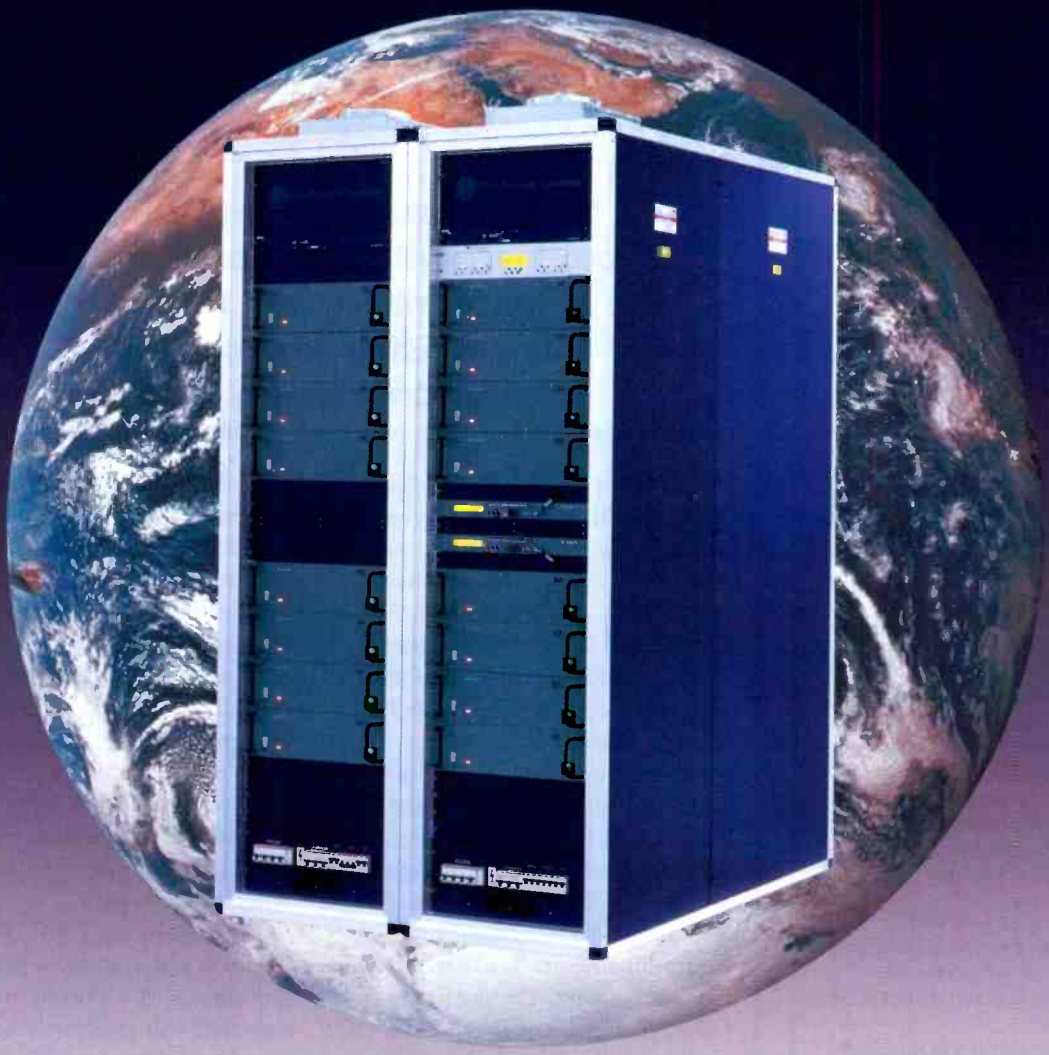

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in the chamber. The chamber has one open side where the signals from the RF source are received. The material on the chamber walls, ceiling and floor absorbs all the reflected signals as well as the unused energy from the source. The construction of that material can be seen on the left side of the photo.

The purpose of the chamber is to ensure that the signal measured by the antenna comes directly from the source rather than from any reflections. Again, the tests are performed using the antenna as a receiver because it is significantly easier to construct the system in that manner.

Several manufacturers offer DTV products with questionable claims of performance. The mechanical characteristics of such antennas vary considerably as well.

Types of DTV antennas

DTV antennas vary in size, configuration and operation. For low-power, low-band VHF use, many operators use Yagi or log-periodic antennas. Such antennas make more sense for ERP values up to a couple of kilowatts rather than erecting a five- or six-bay batwing antenna. When the power starts increasing, the most common antenna to use is a batwing with a few bays. Thanks to the commission, most low-band VHF DTV stations will not have a high ERP, and the simpler antennas will work fine.

For high-band VHF, the ERP values are somewhat higher. In this situation, analog stations commonly use the standard antenna types. There are some low-cost alternatives but the majority of DTV antennas in that band are batwings and dipole arrays. Those antennas have stood the test of time and are of moderate weight. Size will continue to be based on frequency and gain until someone finds a way to bypass the laws of physics.

At UHF frequencies, antennas range from the simplest dipoles to the familiar slot and panel configurations. Several manufacturers offer DTV products with questionable claims of performance. The mechanical characteristics of such antennas vary considerably as well.

Some antennas use flexible feed lines from one or more power dividers to connect to the elements. For many DTV stations, especially those of lower ERP, these antennas offer a workable solution. When properly mounted, they should provide successful operation for a long time. The antennas themselves work well, but users should plan on more maintenance than for a slot antenna, for example, because the line will need periodic mechanical service or replacement. These antennas are highly flexible for directional use, and electrical performance is really not a consideration. The power-handling capability and life expectancy are the real criteria to consider.

For high-power UHF DTV, a good choice is a slot antenna protected by radomes. It is a proven antenna design that will produce excellent performance with a long life expectancy. There are still slots in service that are more than 30 years old, although the newer antennas offer improved performance.

Going cheap may cost you

The big issue in buying an antenna is that it could be totally transparent for the station operation. That is, other than checking the gas pressure in the line, the transmission line and antenna systems should provide excellent performance without more than the occasional mechanical mount checkup.

When buying an antenna system, spending the least amount of money may not be wise. The antenna and line are not located where repair work is convenient or inexpensive. Therefore, stations should select a system that is built solidly enough to stand the harsh environment of its location and electrically sound enough to perform for years without trouble.

Granted, any antenna system may develop a problem. Such problems

When buying an antenna system, spending the least amount of money may not be wise.

are usually caused by exterior forces such as lightning, frustrated hunters or the failure of other components on the tower. That type of problem, while irritating, cannot be anticipated and is simply a risk of operating a system. Poorly built antennas or lines with cheap hardware and materials cause unacceptable problems.

When an antenna can't handle power and causes the station to go off the air, the managers or ownership of a station won't care how much money you saved them by choosing a cheaper antenna. Then, the only consideration is that the antenna or line failed. This isn't to say that there aren't savings that can be realized by checking with different vendors before making a purchase. Sacrificing quality to save a few bucks can be a real disaster when trying to keep the station operating. **BE**

Don Markley is president of D.L. Markley and Associates.

? Send questions and comments to: don_markley@prismb2b.com

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An editor at TSN HD in Toronto uses a Harris VelocityNX craft editing system linked to a NEXIO XS HD/SD.

The EFFICIENT WORKFLOW

Take an in-depth look at the key technologies that interlock acquisition, editing and content exchange in the newsroom.

BY FRED SCHULTZ

After half a century of refining itself as a medium-based presentation business, broadcast news now finds itself under pressure to accommodate new technologies for file-based sourcing and content management, as well as real-time, streaming and file-based delivery systems.

Despite changes in nomenclature and hardware, the front end of every broadcast news business continues to be the acquisition, editing, storage and exchange of content. File-based technologies bring substantial economies, flexibility and improved technical quality to these operations. The middle step for all news operations is creation of the actual on-air product. It is here that each news operation generates its unique value.

On-air is universally done in real time, intermixing live video and audio of the anchors and journalists with playout of file-based content and supporting graphics. The finished feeds then move to the third operational step of the business — distribution — through any combination of real-time (e.g., broadcast), file-based (e.g., archiving, redistribution) or streaming (e.g., Web, handhelds) media channels.

Startup

The primary impetus for upgrading news technology is the resounding success of proprietary video servers in transmission applications. Not long after video servers established their value as replacements for videotape recorders, substantial improvements in the power and cost advantages of digital content storage

technology introduced an IT-centric rethinking about operations for all of broadcasting. This paradigm shift, plus a tightening business climate, reframed the business question of how to better use technology as a means for operating individual newsrooms more efficiently, and of coupling multiple news operations together.

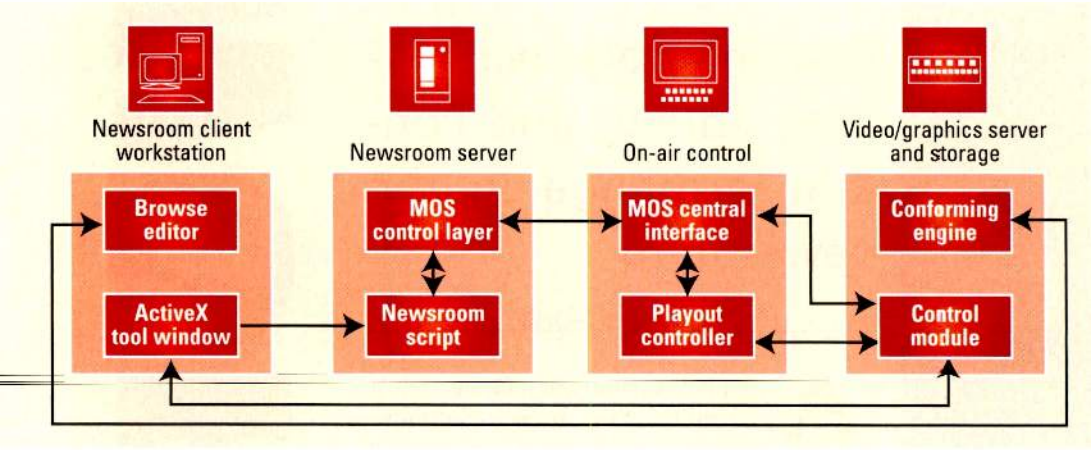

Figure 1. File-based integration of a newsroom computer system and video/graphics servers accelerates news production with tools that work directly from the client desktop.

During that period, the term file-based began to gain common use to define the transition of broadcasters away from tape-based operations. While the phrase references important distinctions that bring undisputed advantages, taking it to literally describe all broadcast news operations risks obscuring a clear understanding of two key aspects of newscasting that are not file-based.

First, files of necessity reside at a specific location, and each encloses contents that must be finite with a beginning and an end (though the end point may not necessarily be known at the time of creation). As noted above, the news program itself is an aggregated product composited in real time from live studio and remote video, along with video played from files and graphic devices. While the output feed of a live news show is usually recorded (which returns it to the file domain), its primary revenue value is as a live, nonfile feed to broadcasting and cable distribution.

Second, digital news operations diverge from file-based underpinnings when the news program (or portions of it) is supplied to secondary markets, such as the Web and handheld mobile devices. These operations use streaming rather than actual file transfers to provide the viewer with content.

While streaming technology requires the use of source files, the recipient's device does not receive a copy of the file itself, but rather a stream of time-stamped data that the client application displays on arrival. This allows the viewer to see the requested content without jeopardizing control of ownership rights.

Aside from these two aspects of real-time production and frame-streaming to applications, all other parts of the news business are immersed in a comprehensive file-based makeover. While the legacy backbone of shoot-process-cut-stack-air continues to remain recognizable, all the tools and workflow processes are in active flux.

Starting with images

From the outset, the most compelling aspect of television news has always been its unique moving images, with their power to engage the viewer. These moving images, more than anything else, give television news its competitive advantage over magazine or radio news coverage.

The images that are shot today in SD (still the dominant format) are captured with a range of field acquisition equipment, from the aging Beta SP analog, through the baseband digital tape formats of DigiBeta, SX and DVCPRO, and into file-based technologies such as Sony's XDCAM and Panasonic's P2. The impending arrival of HD newsgathering focuses additional attention on XDCAM and P2, along with the HD capabilities of Ikegami's Editcam HD, Grass Valley's Infinity/REV PRO, and a variety of standalone hard drive acquisition systems such as FireStore.

No matter which acquisition format is used, video servers are the central technology for file-based operation. The first servers with sufficient capacity, reliability and data rate for broadcast were the closed, proprietary devices introduced in 1994 for commercial insertion. Today, server technology includes the high-performance, high-reliability, highly integrated offerings of major industry vendors, such as Avid, Grass Valley, Harris and Omneon, as well as custom-built systems assembled from available IT components. The purchase decision of each customer is driven by the particular importance placed on cost, reliability, shared storage operations, expansion of channels, bandwidth, storage capacity and linked operations, such as editing and browsing, archiving and system management.

From the outset, the most compelling aspect of television news has always been its unique moving images.

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Engineering The Broadcast Future

For news, the most valuable development in servers is the ability to offer true shared storage as an alternative to copying and moving files across a network. Content had been thought of as a resident that lived within its media. Shared storage revealed it to be a forefront entity, capable of simultaneously serving in multiple locations, residing on multiple types of media and possessing potential value in lines of business not traditionally associated with television news. The unrestricted, shared, simultaneous availability to file material has resulted in a dramatic shift in the industry's expectations about interoperability and universal access to content.

Going low

Some pathways to the universalization of content have proven faster and easier to implement than others. Because the relationship between network capacities and file size was so widely understood, an obvious next step was to generate low-resolution proxies for viewing and editing. Low-resolution operations increased costs by adding complexity to a station's infrastructure and workflow, but three key benefits paid off from the beginning and are still important today:

- browse viewing on any desktop rather than on expensive baseband video monitors;
- browse viewing cheaply across large geographical distances; and
- editing on more seats than would be possible using full-resolution video.

Initially, the only means available for creating files of differing resolution was to use real-time baseband video as a source. Although low-resolution files could theoretically be stored in the same servers as the high-resolution originals, most successful offerings used less expensive standalone servers and storage devices for this procedure.

This creation of dual inventories raised the need for content management tools. The most pressing requirement was for a scavenge tool that could create low-resolution copies of the high-resolution files that arrived in the server without passing through baseband ingest, such as finished edits from attached nonlinear editors. This task required databasing the inventory of both low- and high-resolution domains, along with rules-driven software for tracking discrepancies, managing high-resolution playout and coordinating low-resolution recording.

A related need was to manage deletion of low-resolution proxy files when their high-resolution masters were removed from the server. While operators have consistently expressed the desire to have low-resolution viewing access to any content that has ever resided on the server, the high cost of an archive system that automatically returned archived high-resolution content back into the server has restricted this feature primarily to large installations.

News operations would probably not add much more archive content into their shows even if it were readily available. But the ongoing desire for easy viewing and editing access to all their content continues to drive vendors toward better solutions.

The ongoing desire for easy viewing and editing continues to drive vendors toward better solutions.

Content sharing

In addition to fueling the development of low-resolution functionality, the need to gain access to content across proprietary hardware platforms drove development in two directions. One was toward standards-based wrapping and unwrapping of files across manufacturers. The second was toward math-based transcoding of files across codec families and bit rates.

The post-production community initially began articulating a vision for the free exchange of works in progress across platforms and channeled this into the development of AAF. The broadcast community recognized a parallel need for exchanging finished media products and supported similar developments with MXF.

Today the MXF is codified as SMPTE 377M and provides a standards-based way of exchanging material across devices. MXF applications range from linking P2 and XDCAMs with today's major news editors, to a broadcast group that uses a single archive linking Grass Valley K2 servers and Harris NEXIO servers to serve as the translation engine for sharing files across their operations.

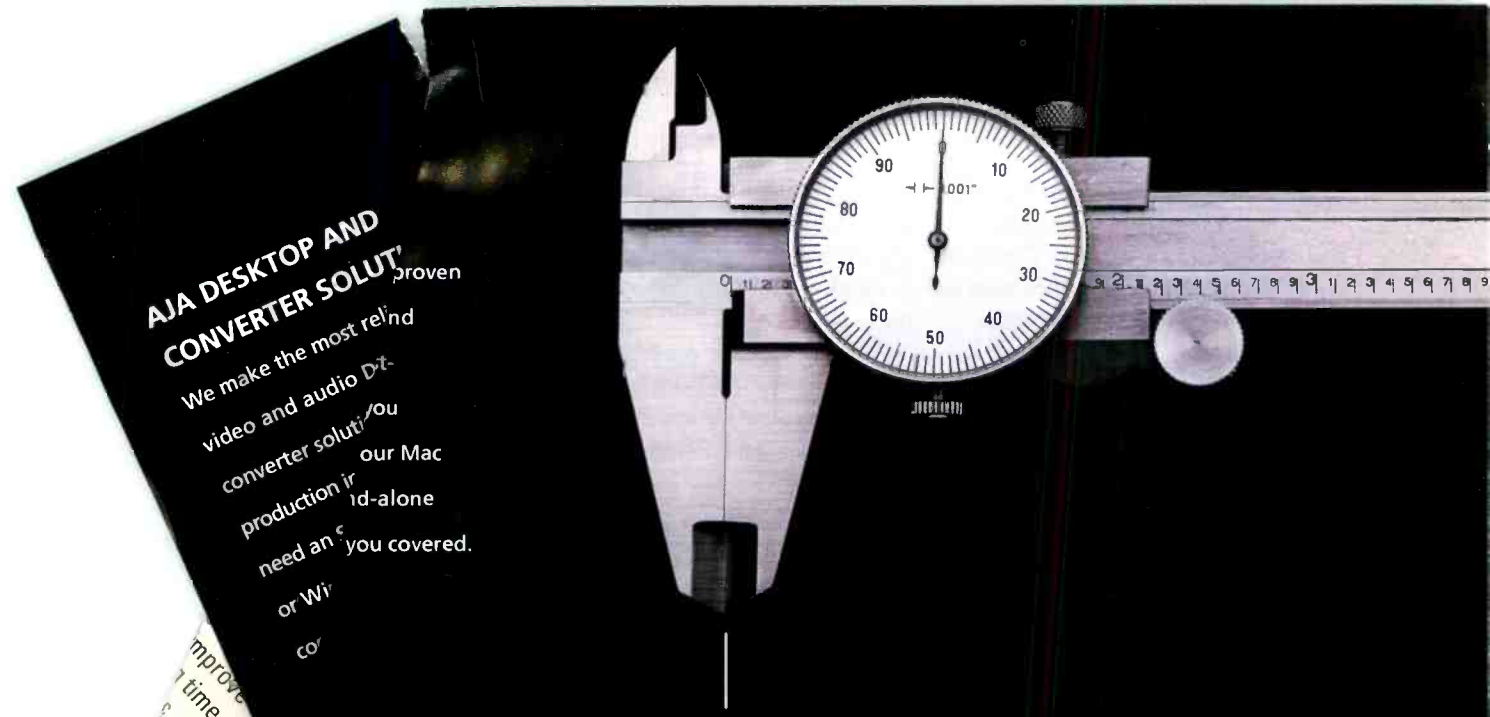
The MXF and AAF standards have

Leverage your file-based workflow

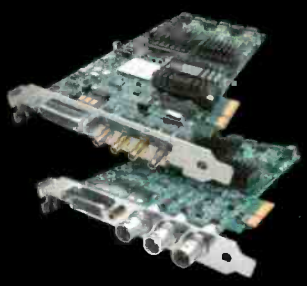
BY MARK TURNER, DIRECTOR OF IT AT MEDIA GENERAL BROADCASTING

To get the most out of your workflow, your file-based system needs to be:

- **Pervasive.** Offers multiple people simultaneous access.
- **Immediate.** Allows rapid access to any clip or point in a clip.
- **Abstract.** Virtual clips can be created by referencing other clips.
- **Independent.** Clips in a sequence can be deleted without destroying others in the sequence.
- **Self-describing.** Rich metadata can be embedded.
- **Extensible.** New types of metadata can be added.
- **Portable.** A file doesn't change regardless of the type of physical media it's stored on.
- **Agnostic.** Multiple file types can exist on the same media.
- **Secure.** IT controls can manage who sees what.



THE DIFFERENCE BETWEEN TOLERANCE AND ZERO TOLERANCE



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resulted in intellectual contributions, which have improved the way files and their content are understood. The standards identified that a file of content is in fact composed of three elements:

1. its wrapper;
2. the essence of the content (the audio and the video itself); and
3. metadata that describes the content.

This distinction brought new clarity and inspiration to the thinking of operations management, technology developers and business opportunity planners.

As needs arose to convert files from one bit rate and/or codec family to another (e.g., creating low-resolution browse files, compacting DV-based

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The new and impr workflow

By implementing a file-ba workflow, your team could the final product while savin Below are some of the specifi benefits:

Improved product

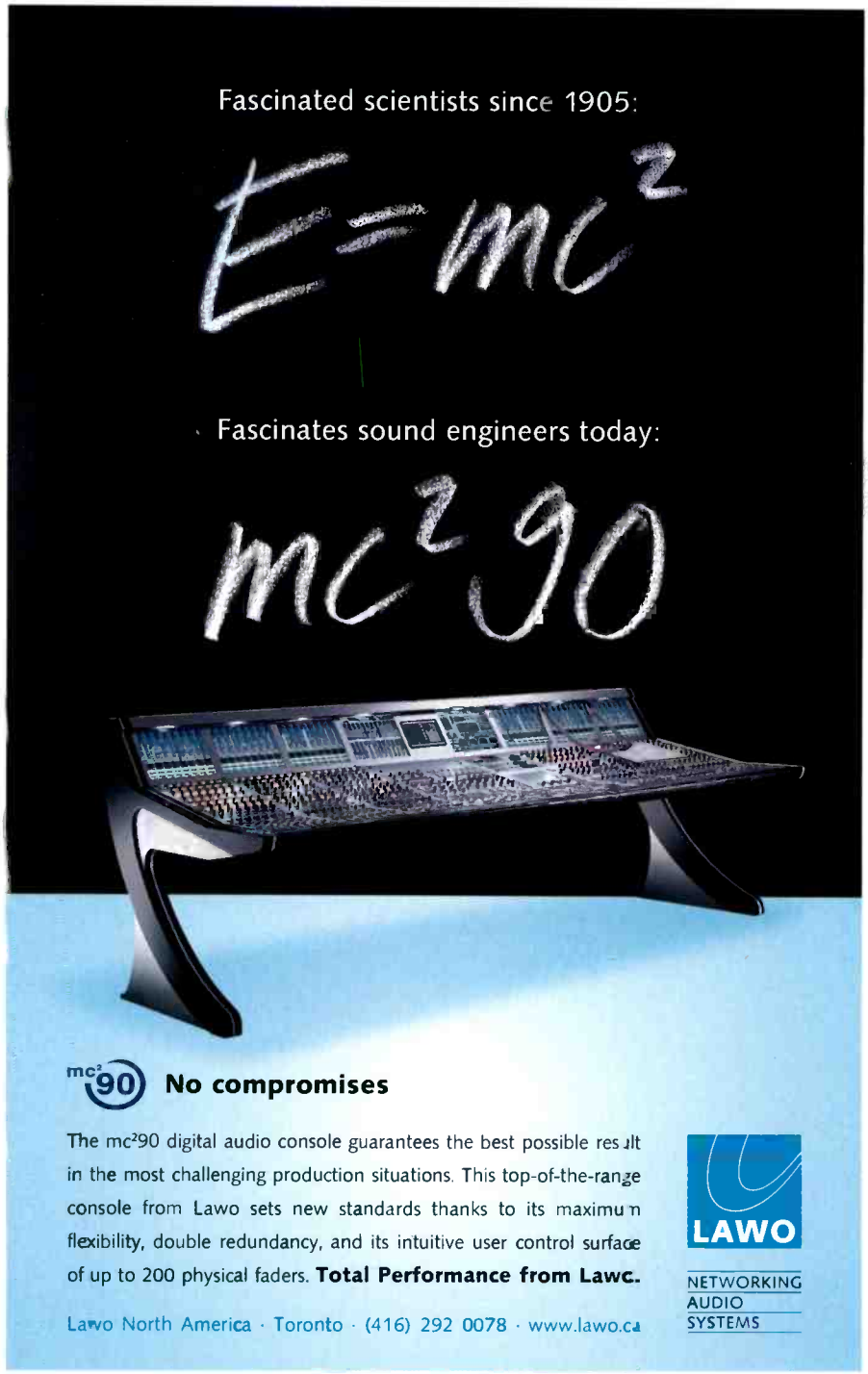
- Video content can be simultaneously used without restriction.
- Allows fast re-editing, which eases repurposing of stories.
- Pointer lists can be played to air faster than waiting for rendered files.
- Producer can automatically re-sequence media elements while on-air, without staff.
- Searching can return viewable content instead of a reference to shelf/tape/time code.

Improved economies

- Commodity IT storage replaces VTR design/manufacturing/maintenance/expendables.
- Commodity IT connectivity replaces costs and restrictions of baseband transfers.
- Editing skills are increasingly prelearned by the new-hire pool.

New benefits

- Content is accessible without geographical restrictions.
- Editors receive preselected source material in bin simply by clicking story.
- Transfers can be faster without lock to baseband clock.
- Searches can examine multiple databases simultaneously.



When computational-based transcoding arrived, it not surprisingly proved to be computationally intensive. Many particular conversions required substantial processing time, and the per-channel cost was not trivial. As a consequence, legacy baseband ingest remained a viable way of creating browse video. Competitive computational transcoding products have now somewhat broadened the marketplace, and the new generation of architectures for HD/SD servers are beginning to promise internal co-generation of different formats and resolutions.

File-based delivery systems

The ability to transfer content as files rather than as baseband has eased and sped up news operations at almost every step in the workflow. The freedom from the cost, scheduling and technological complexity of baseband linkages has improved the quality of the news product substantially.

Archiving

Archiving is an example of how thinking about file-based workflow for news was initially defined by solutions created for large transmission facilities. Those solutions have three requirements:

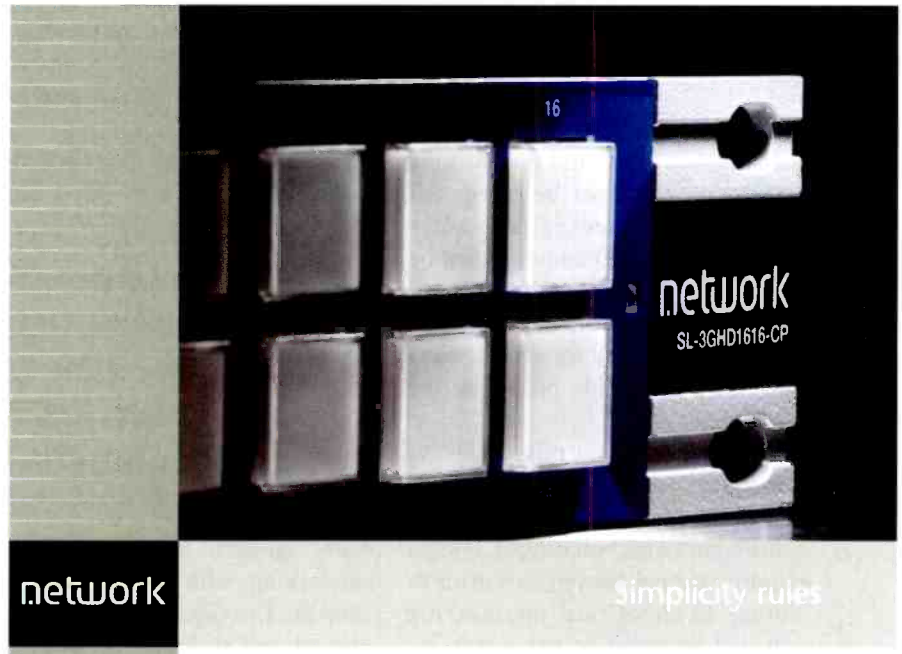
1. The archiving is nonlossy.
2. Both archiving and retrieval are automatic.
3. Retrieval is triggered by a customer's use of a reference to an archived piece (e.g. dropping its ID into a playlist) without requiring the customer to perform additional steps to implement that request.

A direct parallel for file-based news is obvious and attractive. When a browse edit includes shots that have been moved off to archive, the system would restore the necessary high-resolution content automatically and transparently.

The technology for implementing archiving with this level of automation is readily available, but its current cost cannot be justified by many (if any) call letter news operations. Creative thinking remains to be done about the assumptions and appropriate workflow to provide affordable archiving for file-based news operations.

High definition

By far, the largest set of changes for broadcasters as the result of implementing file-based workflows will surround the (usually) simultaneous arrival of 16:9 and high definition. From the moment a facility introduces its first frame of production in HD, all material — both SD and HD — needs identifying metadata to assure proper handling by the file-managing devices. These devices



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include captioning engines, storage and playout servers, editors, browse encoders and transcoders, browse editors, and browse conform engines. But for this content identification to be meaningfully used, virtually every step of the production workflow requires human decision making, because every option will have branching consequences that require informed evaluation by engineering, production and management.

An example is editing 16:9 HD and 4:3 SD source content together in the same story for simultaneous transmission in SD and HD. As long as SD content must be integrated and substantial viewing takes place in 4:3, then the HD content must be shot with 4:3 framing. The most expedient news workflow would then be to cut and produce an HD output, using black side pillars on the 4:3 content.

Some NLEs accept mixed SD and HD source content and perform up- and downconversion and aspect ratio conversion (ARC) on output. Others require external conversions prior to editing. In either case, the resulting edit will be saved to the server for HD playout. (Browse editing adds some initial complexity, largely setting the encoder/transcoders to accommodate HD, and setting autoconform engines to output in HD.) To play that same edited piece in SD, some servers will automatically downconvert and correct the aspect ratio with a 4:3 center crop. Other servers will require downconversion and ARC as an external real-time process. In either case, the SD viewer sees a full screen of 4:3 content that is unstretched and unboxed.

While this process gives traditional 4:3 viewers the best-looking product and is currently the most expeditious in terms of workflow, it locks out the creative potential from using the full width of the HD frame. Its value will therefore diminish as 16:9 penetration rises among consumers. Yet the vital importance of news in each station's profit picture and the rising importance of third- and fourth-screen markets, which are primarily 4:3, argue for favoring 4:3 as the preferred distribution aspect ratio for news.

Business impact

File-based operations have revised the economics of news production at virtually every step and in the process have affected the costs of hardware and processes. With commodity IT hardware replacing baseband hardware, new economies have improved both connectivity and storage.

Connectivity, which had relied on baseband piping, now flows across vastly greater distances through networking, which has grown from 10BASE-T to Gigabit Ethernet. Commercial and technical services have finally been worked out for interconnecting multiple locations. Now that exchange speeds are no longer locked to real time, operations and management have substantial flexibility for controlling the speed, resolution and cost of connectivity at every step.

Holders of broadcast licenses realize that news is ... the key differentiator they have against their competitors.

VTR technology, which had been hugely expensive to manufacture and support, has been replaced by piggybacking IT storage technology. Not only is IT storage far more powerful and robust, but its costs of development and scale are distributed across a vastly larger customer base. The savings from using field cameras with IT storage instead of tape allows stations to put cameras into the hands of many more shooters in their communities.

With the content of file-based assets now clearly exposed, management is engaged in finding additional ways of extracting value. The Web, mobile phones, public facilities like elevators, airports and trains, and a burgeoning variety of video-enabled handhelds, such as the Video iPod, are platforms where news can be repurposed with value for both owners and customers. The fact that rights to much news content is in the hands of large companies with other types of media to distribute (like music, movies and sports) brings both deeper pockets and a longer view to the search for opportunities. Increasingly, the success of applications in which customers pull content of interest will depend on attaching and exposing the metadata in an economical and meaningful way. And some markets, such as with handhelds, are proving to be so new and unknown that innovative offerings will necessarily be high risk.

The real product of the news business remains the news program itself. Holders of broadcast licenses realize that news is their brand identity — the key differentiator they have against their competitors. With the market in flux from changes in demographics, lifestyles and technology options, news operations certainly expect emerging technologies that will reduce costs and improve the quality of their product. Even more crucially, they will also expect their vendors to help anticipate new market opportunities available from the upcoming technology and work cooperatively to develop them. BE

Fred Schultz is senior marketing manager, news solutions, for Harris. He has written for the SMPTE Journal, *is the author of a series of white papers on server technology, has won a prime time Emmy Award, and holds a Ph.D. from Vanderbilt University.*

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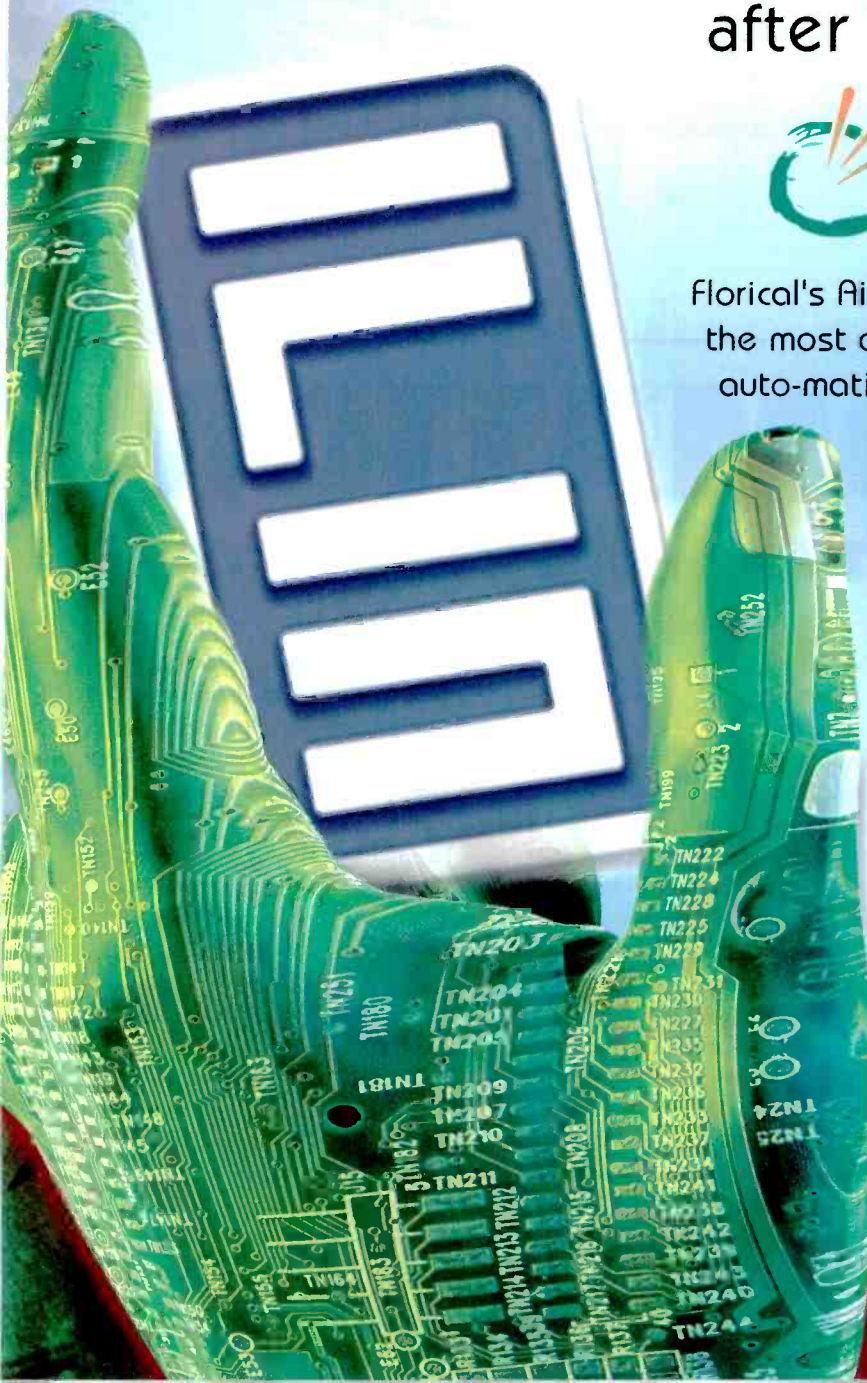

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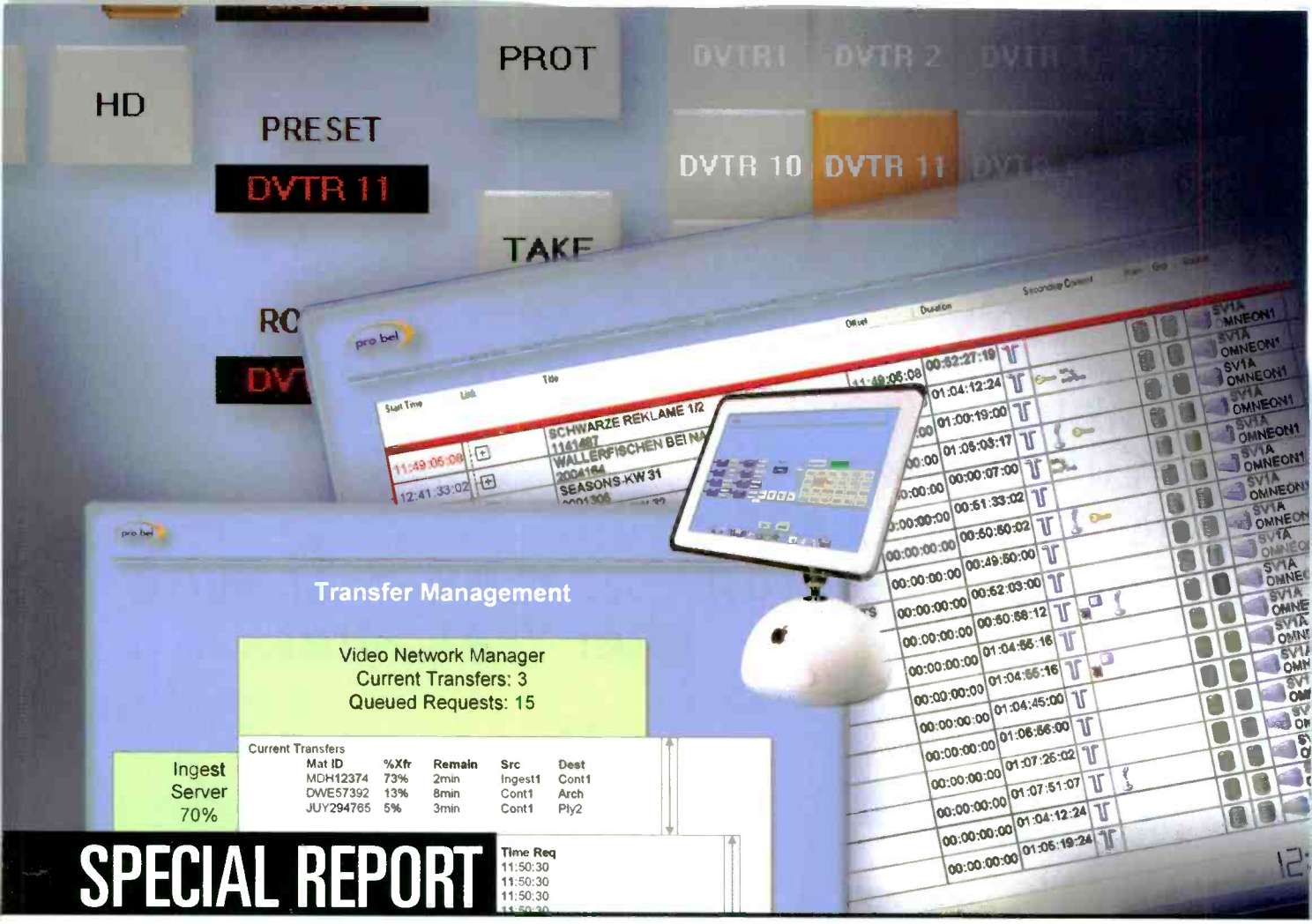

SPECIAL REPORT

AUTOMATION
for multichannel operations

BY ADRIAN SCOTT

Almost every area of broadcasting has been transformed by new technology in recent years, and none more so than automation. This progress is not only changing the way people think about automation, but also how they think about broadcasting and the delivery of electronic content.

Old vs. new

In the past, automation systems had a simple task: to implement a schedule by managing an array of supported devices, including character generators, mixers, routers, still stores and VTRs. The video elements of such a system were largely centered on containers.

A vital factor in achieving accuracy was the cassette label, and the precision with which it was created and its information transferred (usually manually) into the schedule. The automation system and its operators had little or no contact with actual content, and the operation was entirely linear in nature. Automation was the last in a line of largely separate production processes linked by hand-carried cassettes, after which the media was stored in a library or recycled.

Today's automation process features significant differences. After a period of what might be called parallel progress, during which individual elements of the production chain (ingest, editing, storage and playout) were digitized without much reference to each other, there is now an accelerating trend to connect these elements.

The archive is now a multitiered repository where everything lives. Rather than being at the end of the chain, it is at the heart of the whole process. Material is ingested into it and is subsequently produced, post produced, scheduled, played out and then stored according to a set of rules, without ever leaving the central repository for a great length of time.

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production? In all too many examples, there seems to be a largely tapeless infrastructure, but an absence of what one might call truly tapeless thinking. One reason: People are still concentrating on the linear passage of individual items through a series of processes, rather than on the management of content, infrastructure and resources as a closely integrated continuum.

In its old-school, strictly broadcast interpretation, automation occupied a limited role in a connected infrastructure. It was little more than the front end of an increasingly significant media management operation.

Today's automation systems are already well ahead of such a narrow interpretation. They are the traffic cops for the digital environment and deliver creativity, flexibility, competitive advantage and enhanced revenue opportunities to their users.

The traffic cop aspect is provided in several ways. Sophisticated internal media management capabilities, which can be integrated with external asset management systems, handle the media lifecycle from both tape and file transfer ingest all the way through to playout and archiving.

In addition, advanced control, monitoring and reporting applications are now being closely tied in to the automation function. This takes the management of devices and infrastructures to new levels.

Flexibility is also important. Automation is sometimes seen as a "rich man's game," with only the largest broadcasters being able to afford the more sophisticated systems. This is no longer true. Today, broadcasters can purchase small, single-channel systems with little or no compromise in functionality, with the best of them being upwardly scalable.

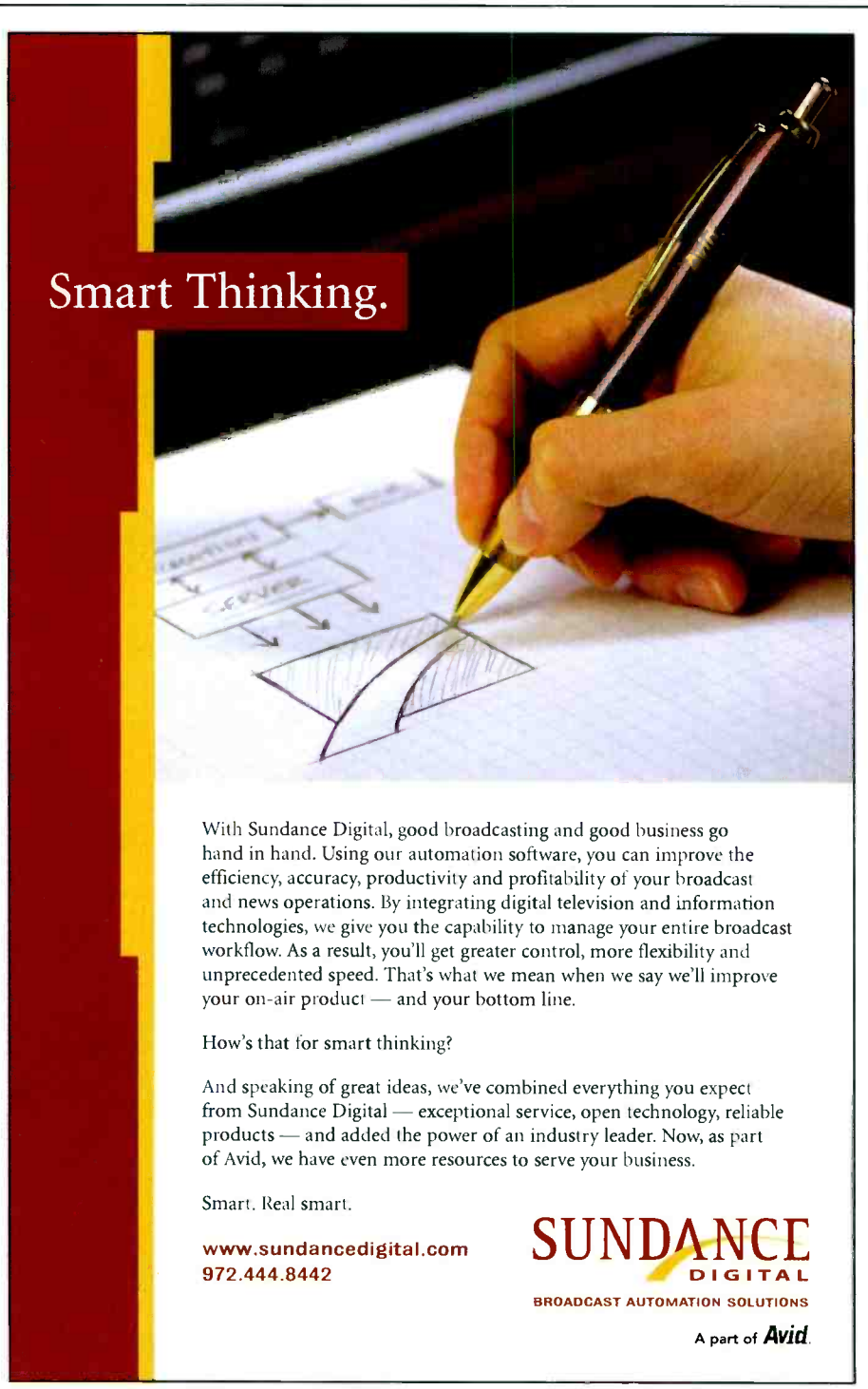
New tools

In the more advanced automation systems on the market, a range of playout workstation tools provide creativity and competitive advantage. These tools are used to visualize and, if necessary, directly amend or enhance the media objects that are being managed through the production and delivery process.

Also, sophisticated tools are now available to build complex sequences of secondary and tertiary events. For example, these tools can create special commercial breaks or interstitials, hold them in reserve and then deploy them in reaction to emerging events, such as when an on-field event causes a time-out in a live sports broadcast. This can greatly enhance a channel's brand awareness.

Future systems

Broadcast automation systems are



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already evolving into sophisticated content and infrastructure control and management systems. But what else is in store for future systems?

Tapeless thinking is, as we have already noted, about the elimination of the container and all of the preconceived ideas about the container that have dominated the process for so long. It is also about the open interface and exchange of content and its metadata through a digital infrastructure. This provides an unlimited set of processes and transformations, all of which are carried out to service a business model, or several business models, at the same time.

The parallels between broadcasting and the manufacturing and retail delivery of consumer products are becoming more noticeable. In such an environment, the overarching management system must address more than just the individual devices. To do a complete job, it must consider:

- content and the various elements that go into creating and managing a media asset or service;
- the workflows by which that content is processed, repurposed and turned into viable products;
- the mechanisms and devices that deliver the content to various audiences;
- the physical infrastructure and its individual components — how they are controlled and monitored both as one system and as many, how they relate to each other and how they perform both moment to moment and over time;
- the relationship between the media environment and the systems that drive the business, such as CRM, DRM and ERP; and
- the underlying business logic that drives the entire process.

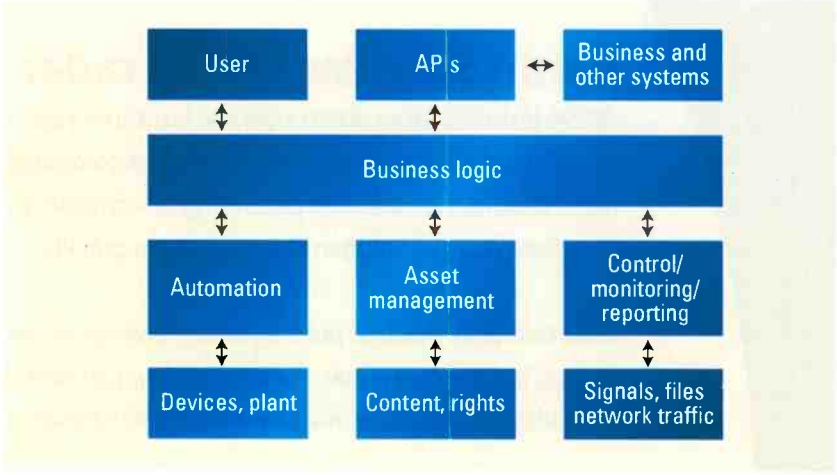

Figure 1. Future extended automation systems should include a business logic layer, which can drive the workflow.

This is not as daunting of a shopping list as it might seem. Many of the elements already exist. The biggest challenge is creating the business logic layer.

This is not just a manufacturer issue. Many broadcasters and content creators have trouble identifying what drives their businesses and translating that into a clear set of requirements for the manufacturing sector.

Fully implemented, a business logic layer will not only drive the workflow, it will also allow the broadcast infrastructure to become more self-aware. (See Figure 1.) It will do a better job of resolving issues according to a set of rules, without involving an operator unless a judgment call is required.

Another area of development is in

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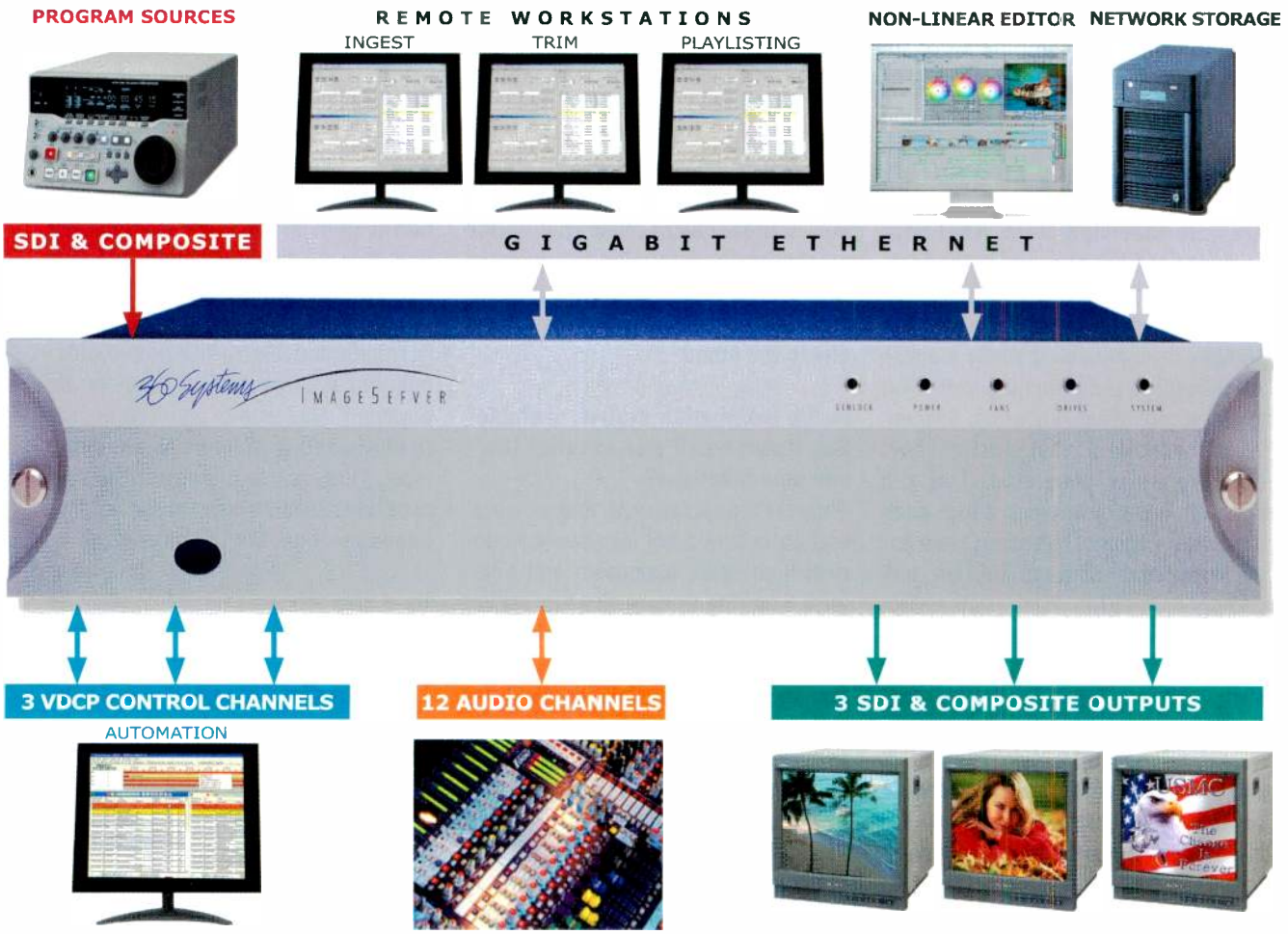

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the nature of the human-machine interface and the advent of a cockpit philosophy to combine all of the necessary status information and control surfaces in a more logical and ergonomic way than most playout facilities or master controls now offer. These developments are in the future, but don't count on that future being very far away. BE

Adrian Scott is the chief marketing officer for Pro-Bel.

Questions for broadcasters

Are you absolutely sure what your business is, both now and in the foreseeable future?
This is about far more than just the number of channels. It really matters what kind of programming you wish to deliver, to what audience, through what channels, in what style and how the revenue is generated. This will drive all kinds of choices about such things as channel branding, reactivity, interactive content delivery and content-to-mobile. Your automation vendor needs to understand your business in order to put together the right system to meet your needs, and that means you have to understand it.

Do you have processes in place to achieve not just procurement but change and business transformation?
Installing the latest automation system inevitably raises complex personnel issues as people have to adapt to new workflows and processes. With any complex technology implementation, a broadcaster must analyze the current state, determine the optimum future state and then work with suppliers to figure out how to get from one to the other.

Is the automation system scalable? Can I start small and expand? Can I add new functions?
There is a popular myth that all automation systems fall into two categories: high-level, expensive and complex, catering only to the top end of the market; or small, cheap, channel-in-a-box alternatives that offer little, if any, expansion possibilities. Look for systems that provide no-compromise security and functionality, but that can be enhanced and upgraded smoothly as requirements evolve.

Is it capable of being fully integrated with a variety of other manufacturers' products? Does it observe industry standards?
However large or small an automation system is, a modern system lives and dies by the ease with which it can be integrated with other systems and devices. We live in a world that is rapidly moving to file-based playout, but we are still, by and large, applying the same methodologies to file-based workflows as we did to tape. That has to change if the real cost and flexibility advantages of file-based systems are to be realized.

How can the automation system be monitored and controlled alongside other elements in the infrastructure?
The control and monitoring of all the devices in a network is vital to its operation. Broadcast is somewhat behind the IT and telecom worlds in this respect. Automation systems must be part of an umbrella environment in which all of the elements can be controlled and monitored, not just as individual components but together. BE

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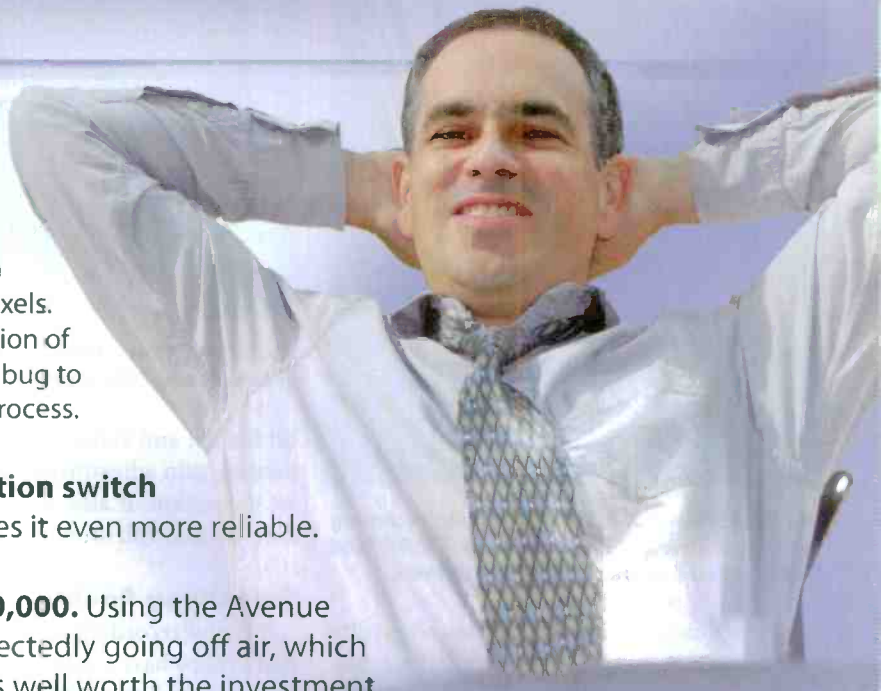

You can use the **sophisticated detection system** to your advantage by adjusting the switch's parameters for *your* facility's needs. For example, the black detection system allows you to set both the threshold and the percentage of non-black pixels. But that's not all, you can also determine the portion of the picture to be considered. This allows a corner bug to be either included or excluded in the detection process.

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Signal Processing and Infrastructure – That's All We Do

Korg's mobile recorders

The MR-1 and MR-1000 offer a portable audio solution.

BY MALCOLM DOAK

ENG, EFP and Foley work demands high-quality mobile recording. In addition, the same recording may need to be provided in different formats for various clients or applications.

Despite the digital revolution, many studio engineers still make a safety archive master with analog tape because of its superior sound quality and because it creates an archive they can reuse to create a new digital master as formats change. However, even in a controlled climate, analog tapes continue to decay over time, and each time one is played, the quality can be compromised.

The pocket-sized MR-1 offers mobile recording using such one-bit formats as DSF, WSD and DSDIFF, as well as traditional PCM formats.

Recording mobility

Korg has developed two new one-bit mobile recorders: the pocket-sized MR-1 and the studio-compatible MR-1000. Both units can record in various one-bit formats, including DSF, WSD and DSDIFF, as well as such traditional PCM formats as BWF with resolutions up to 24-bit/192kHz.

These recorders forgo removable media and record to an internal hard drive (20GB for the MR-1, 40GB for the MR-1000). A USB 2.0 connection allows recordings to be transferred to a computer and vice versa. The included AudioGate software converts files to any one-bit or PCM multibit format and allows file splitting or joining, gain adjustment and DC offset correction. It also creates smooth fade-ins and fade-outs.

The MR-1000 has a 40GB internal hard drive for mobile, studio-compatible recording in one-bit and PCM formats.

Preserving fidelity

One-bit recording is not new. Sony and Philips have used the technology as part of the Super Audio CD (SACD) format since 1999. More to the point, one-bit conversion is at the heart of most digital formats. Even in today's state-of-the-art 24-bit converters, the output of a one-bit A/D is subjected to real-time sigma-delta modulation, decimation and filtering in order to shape the data into multibit words that can be recorded and saved in the chosen PCM format. To play back the PCM recording, further interpolation filters are needed to recreate the analog audio signal. All of this processing and interpolation can affect the audio quality of the recording.

One-bit recording bypasses much of this processing. But there is a catch: The one-bit data stream must be recorded at a high sample rate in order to preserve the highest fidelity and dynamic range. Both of the portable audio systems record at the SACD standard of 2.8MHz. The MR-1000 doubles this sampling rate to 5.6MHz.

One-bit recording is not new. More to the point, conversion is at the heart of most digital formats.

At such high sampling frequencies, both recorders can capture anything from a DC voltage up to 100kHz and can maintain a dynamic range of up to 120dB. This super-high sampling rate allows the noise floor to be frequency shifted into the audio range well above

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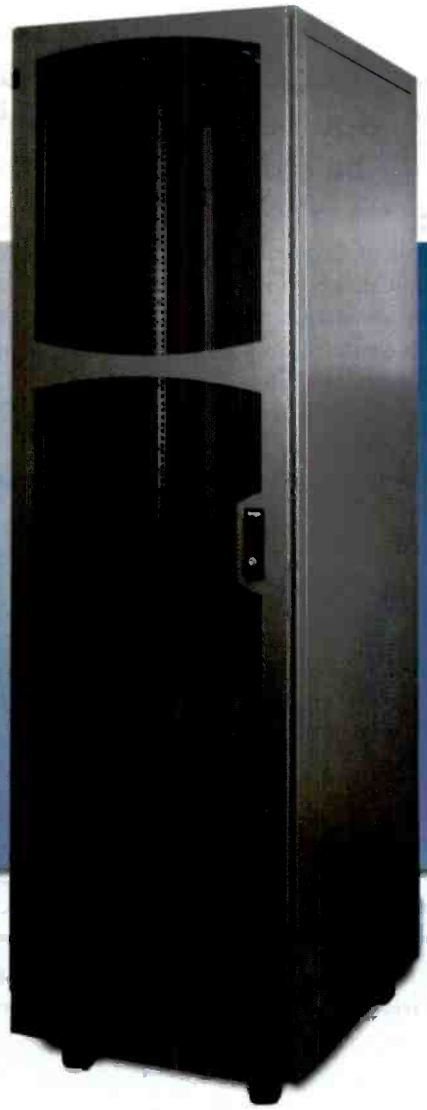

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human hearing. Another benefit is the elimination of any steep Nyquist filtering that may have affected the audio or the encoding process.

Under the same conditions, one-bit recording can compete with and even exceed current multibit formats in terms of frequency response and dynamic range. However, one of the biggest advantages of one-bit recording is in mastering and archiving. Analog tape can accurately capture frequencies up to 50kHz. One-bit can double this. And unlike analog masters, one-bit masters can be safely stored without degradation. In addition, one-bit masters can be archived in their native format and reused for various applications. For example, with Korg's AudioGate software, users can take the one-bit file and create a 16-bit/44.1kHz master for a CD, a 24-bit/48kHz DVD-Audio master, a 24-bit/192kHz track to import into a ProTools session, or a master in new formats when are developed and adopted.

Analog tape can accurately capture frequencies up to 50kHz. One-bit can double this. And ... one-bit masters can be safely stored without degradation.

One chance

When you have only one chance to capture a great performance, Foley effect or interview, the MR Series will reliably yield the high-quality audio with the versatility of both one-bit and multibit PCM formats in a single unit. The AudioGate software can also translate the one-bit recordings to match your computer's audio hardware, so you can listen in real time.

Both recorders include an AC adapter and can run on battery power. (The MR-1 uses a rechargeable lithium battery. The MR-1000 uses eight AA batteries.) Both include a soft carry case for protection in the field. BE

Malcolm Doak is a product manager at Korg USA.

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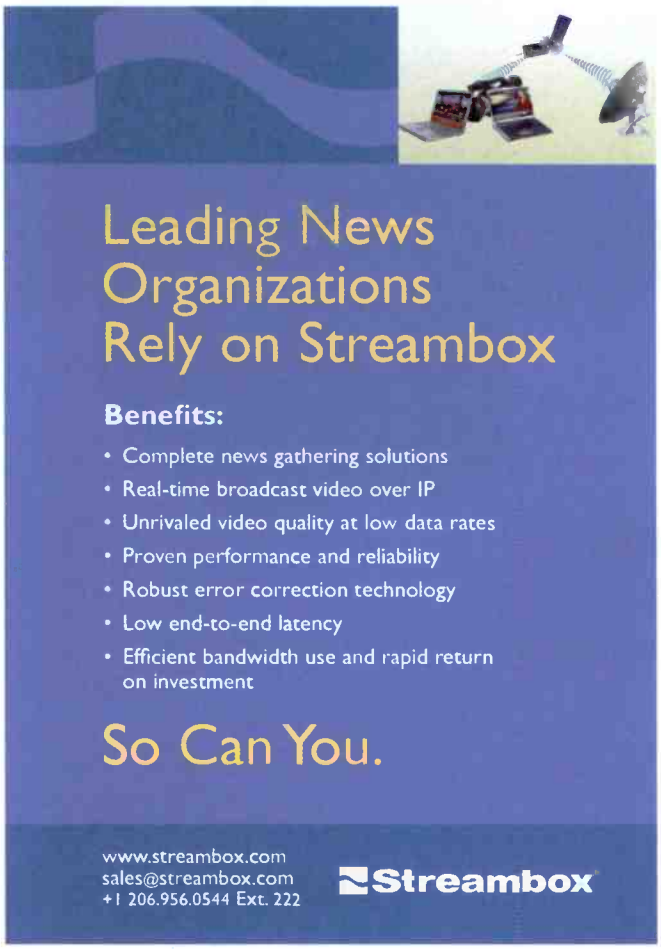

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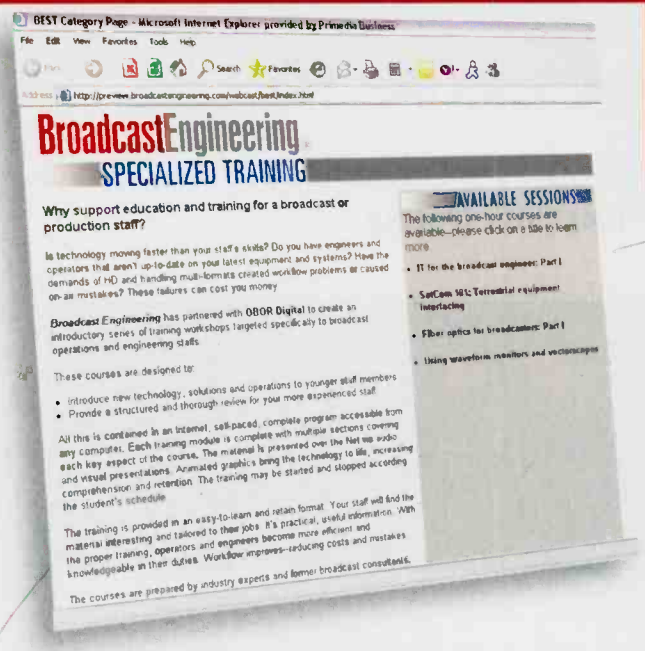

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Digital Rapids' encoding

Format-flexible tools enable online local news.

BY TJ KUDALIS

Internet Broadcasting publishes local news online for 79 TV stations of several major U.S. broadcasters, including Cox Television, Hearst-Argyle, Meredith Broadcasting, NBC, Post-Newsweek, Scripps Howard and The McGraw Hill Companies. Effectively bringing local news content to today's expanding range of new distribution platforms represents branding and commercial opportunities for TV stations. The challenge is integrating these new technologies with existing infrastructures.

We selected Digital Rapids' DRC-Stream hardware and StreamPro software to take our company and its partner TV stations to the next level of quality and reliability in both VOD and live streaming video. The hardware and software are flexible enough to work with the wide range of technology and infrastructure available at all of our partners' stations. Speed, efficiency and ease of use were also extremely important, as the systems must be usable by nontechnical editorial staff in a high-pressure, breaking news environment.

Integration and workflow

Internet Broadcasting has deployed approximately 40 systems with DRC-1500 cards. The cards' inputs include:

- SDI and IEEE-1394;
- analog composite, component and Y/C video;
- balanced and unbalanced analog audio; and
- AES/EBU digital audio.

One of the biggest challenges was dealing with the radically different technologies and resources available at all the TV stations we support. The DRC-Stream workstations allow us to integrate into virtually every environment. Some of the workstations have a single SDI feed with embedded audio; others are attached to an analog router feed (composite video and balanced audio), a DVCAM deck (via the DV input), a PVR (component video and unbalanced audio) and a VCR (S-Video and unbalanced audio) all at once. We have employed virtually every possible combination of inputs across our network to meet the requirements at each station.

On the software side, we have integrated the systems into NLE environments by dropping files directly from editing booths over the network onto the workstations, where the StreamPro software transcodes them into multiple formats for a variety of target devices. The software's automated FTP features allow us to name and transport the resulting encoded files for hands-free importation into our content management system. Installation, configuration and integration have been seamless.

Digital Rapids' DRC-Stream PCI capture and processing boards allow users to add professional high-quality, real-time, multiformat video/audio encoding and Web streaming capabilities to existing workstations.

The ability to capture several different streams simultaneously with almost no CPU overhead is incredibly useful.

Reaping the benefits

We chose the cards and software because of the quality of the video, the reliability of the card, the wide and ongoing format support, and the flexibility of both the hardware and the software. The onboard processing makes the cards stand out in terms of quality. The hardware-based preprocessing and deinterlacing are phenomenal, and the ability to capture several different streams simultaneously with almost no CPU overhead is incredibly useful.

The systems' extensible codec flexibility allows us to expand those workstations as new video format requirements (such as podcasting and Flash video) arise, letting the company leverage its existing investments as the field progresses. We can make use of a broad range of input and output formats, including AVI, Flash, MPEG-1, MPEG-2 and MPEG-4, QuickTime and Windows Media 9 (Microsoft's implementation of SMPTE VC-1). Most recently, Internet Broadcasting added the On2 VP6 (Flash 8) plugin to its format lineup.

Operationally, we have benefited both in ease of use and turnaround time. Largely nontechnical editorial staff perform video capture and transcoding, and the software makes the often-tricky transitions between inputs, capturing and transcoding easy. The simplicity and speed of the multiple-format transcoding process is essential for the workflow; the company operates in a breaking news environment where speed and ease of use are paramount.

Doug Frattallone, national video editor, configures the encoding of a news feed on the Digital Rapids DRC-Stream system.

The DRC-Stream cards and StreamPro software have enabled Internet Broadcasting to expand the reach of its partner TV stations into new distribution avenues, including the Web and podcasts. In addition, they have provided the company with the ability to create high-quality streaming media quickly and easily with existing editorial staff. The parallel transcoding saves critical time during breaking news, and the quality of the video matches the high expectations of our broadcasting partners. BE

TJ Kudalis is the senior multimedia engineer for Internet Broadcasting.

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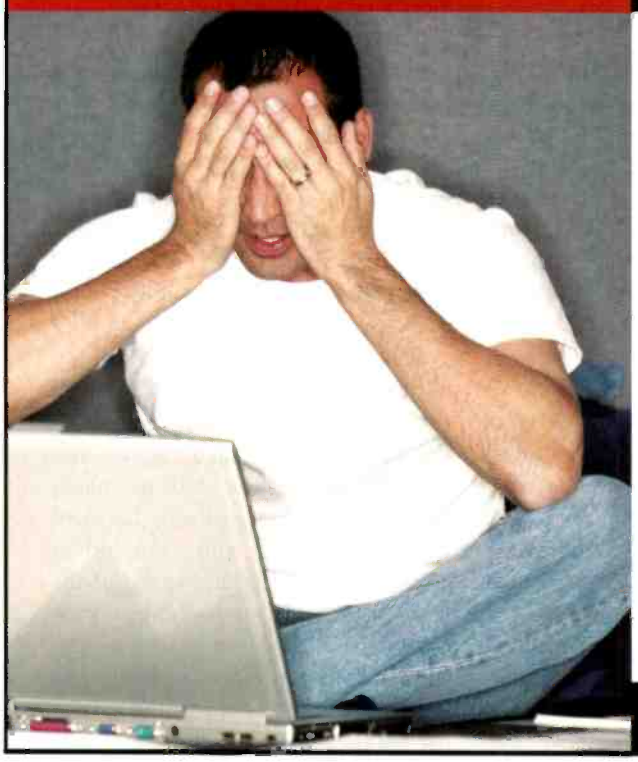

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Panasonic's plasmas

The 103in HD plasma displays and "Football Night in America" form a winning team.

BY RANDY RADDATZ

The special chemistry between the NFL and high-definition television has been cited since the origins of the video format. NBC Universal capitalized on that synergy with the integration of two 103in Panasonic TH-103PF9UK professional plasma displays into the set of the network's "Football Night in America" studio show. NBC Universal was the first commercial customer for the 103in display. As the largest plasma television available, it was the dream display option for "Football Night," which premiered last fall and served as the lead-in to "NBC Sunday Night Football."

The stakes couldn't have been higher for "Football Night." The country's weekly marquee football game was shifting from Monday night to Sunday night, the most-watched night on TV, and to a new network — ours. From the top on down, there was concern that this not be just another pre-game briefing, but rather the essential destination show for football fans, providing the first complete look at all of the NFL highlights and stories of the day.

The roster

Following the completion of our six-year NFL deal (including Super Bowls in 2009 and 2012), we assembled a broadcast team consisting of Al Michaels and John Madden in the game booth; Bob Costas and Cris Collinsworth as "Football Night" hosts; and analysts Sterling Sharpe and Jerome Bettis, along with reporter Peter King. Both "Football Night in America" and "NBC Sunday Night Football" would be broadcast in high definition, and the visuals had to be stunning.

Last April, "Football Night's" director, Bucky Gunts, and production designer, Jeremy Conway, saw the 103in plasma firsthand at NAB2006. It was clear that this was a viable commercial display product that offered a picture quality and size to handle all of "Football Night's" story lines and segments. The stumbling block, however, was availability. Panasonic was talking about fourth-quarter deliveries, which would be too late for our September kickoff.

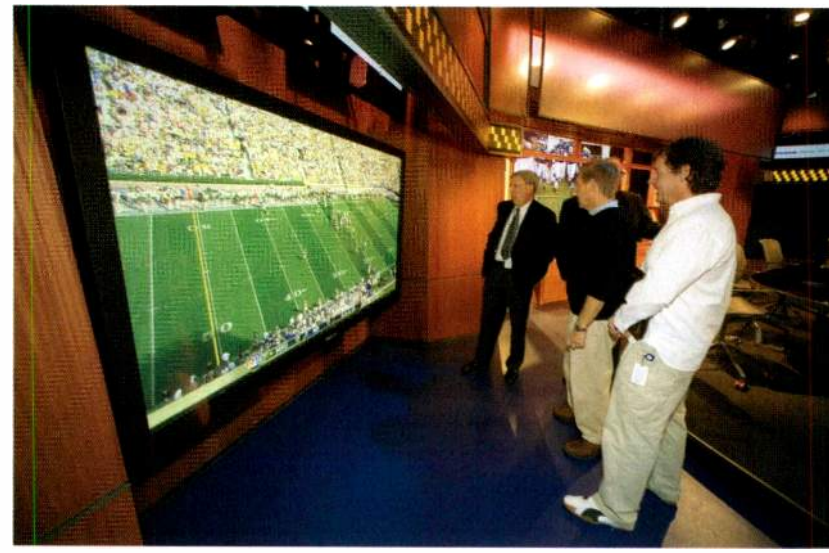
It was at this juncture that Panasonic North America's chairman, Yoshi Yamada, became intimately involved in our discussions. He secured a commitment to meet our install and production schedules. That passion for the product extended down to a great team that Panasonic assembled to support our project timeline. The result was that when "Football Night in America" debuted on Sept. 10, 2006, two 103in plasma displays were located on each side of the on-air talent desk on the newly constructed set at 30 Rockefeller Plaza.

Not incidentally, the set also features five Panasonic 50in TH-50PH9UK HD plasma displays for bumper shots, graphics and game look-ins. Two sit atop each 103in display, and one hangs high in the center from the ceiling.

Possession

Perhaps the most daunting aspect of being the proud owner of 103in 1080p displays is the actual installation process. The imposing plasmas weigh 475lbs each, so exceptional forethought and care were given to delivery. In Japan, Panasonic handled packaging and shipping. Once received in the United States, the displays were tested for signal and picture quality by company engineers in Secaucus, NJ.

Panasonic provided specs and handling suggestions to our freight company and set construction firm. Brackets were fabricated to support the weight of the plasmas. And the walls



NBC's "Football Night in America" studio show employs two Panasonic TH-103PF9UK HD plasma displays, which provide a key visual element to the game action and story line breakdowns brought to viewers each week.

where the displays are hung were specially reinforced.

We brought in the plasmas on rollers, removed packaging in our basement, and then used a special forklift to situate the 103in displays in our freight elevator. The final portions of the studio, such as the glass windows, were built around the plasmas after their installation. All this took place a full month before the show's debut, allowing ample time for final rehearsals, camera placements and adjusting the look.

Game on

During football season coverage, the plasmas added a stunning visual element to the game action and story line breakdowns that we brought to our viewers each week. Beyond the inevitable "wow" factor, the 103in plasmas, which are equivalent in size to four 50in Panasonic plasma displays, are easy to use. They also were easily integrated with NBC's video production equipment with optional TY-FB9HD HD SDI terminal boards.

The plasmas also proved to be highly flexible, as we used the displays quite diversely. For instance, Costas did live tie-ins to Michaels and Madden on the 103in plasma. In addition, Costas and Collinsworth analyzed game plays using the 103in in a telestrator application. And finally, we played out previously recorded profiles. Whether the application was graphics, telestration, live commentary or playout, the displays excelled and were an integral part of the studio show's success.

Studio 8G, where "Football Night" is produced, is prime NBC real estate. (The studio shares a control room with "Saturday Night Live" studio 8H.) Therefore, the studio will be used for future broadcasts in the football off-season. While specifics regarding upcoming sports or news coverage aren't immediately available, the studio has been used for such big events as 2006 election night coverage last November. This coverage originated from studio 8G with Brian Williams, Tim Russert and Campbell Brown commenting on breaking news and polling data displayed on the 103in plasmas.

Winning season

We partnered successfully with Panasonic this season. The 103in plasmas afforded the audience of NBC Sunday night football broadcasts a big window onto the NFL's fast-paced and dramatic game action. BE

Randy Raddatz is vice president sourcing & production logistics for NBC Olympics.

Quality-control monitors

Can anything replace the old, reliable CRT? Yes!

BY JOHN LUFF

We sometimes forget that the television medium is inherently analog. That is true for both picture and sound. Broadcasters are deeply caught up in the technology that has transitioned to digital over the last two decades, with transmission being the most recent advance.

High-power RF transmission is, however, an analog medium, with analog representations of digits modulated onto an essentially analog medium and transmitted so they can be decoded at the point of reception. Picture and sound also start and end as analog signals (light and sound pressure waves), with today's digital technology most often doing the processing and carrying the content.

Cameras must have lenses to capture the analog phenomenon of light reflected off of scenes. After television is processed in acquisition, emission and transmission, broadcasters provide consumers with a signal that they can turn back into light representing the original scene, with artistic intent included for rendering the desired images.

Factoring in color

For a long time, display technology consisted of electron beams scanning cathode ray picture tubes. During the development of the first high-quality monochrome television, then color and most recently HDTV, the picture tube remained remarkably unchanged in physics and manufacturing, other than the introduction of color picture tubes after World War II.

Color put many new constraints on display designs. In the early days of color production, professional displays seldom matched, and any comparison between consumer and professional CRTs made it clear there was much room for improvement. In time, improvements were made, and today it is practical to render a scene and have it show up at home remarkably close to the intent of the producer. This is facilitated by closely matched standards worldwide, principally promulgated by SMPTE and the EBU. Broadcasters are fortunate to have SMPTE-C Phosphors and great methods for calibrating all aspects of a display. Modern digital measurement technology allows contrast, brightness and white set point to be calibrated accurately, and all parameters are stable in modern CRT displays.

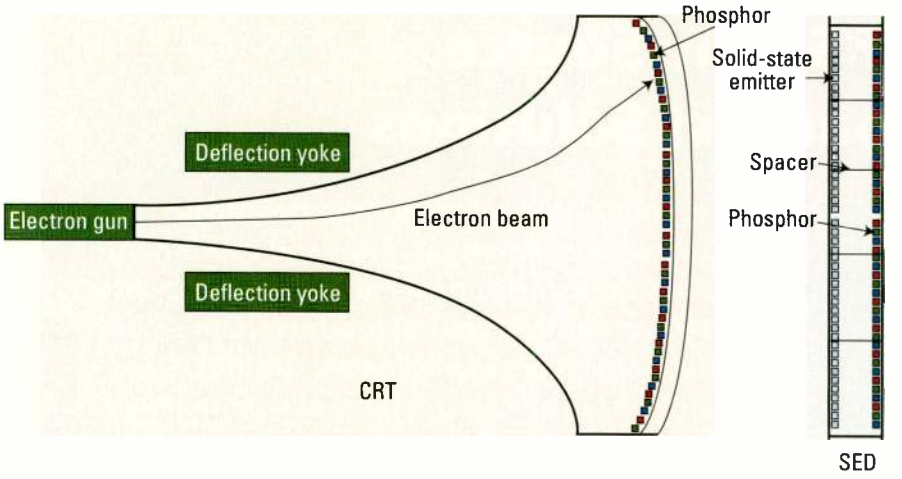


Figure 1. In SEDs, the surface conduction emitter emits electrons that excite a phosphor coating on the display panel, the same basic concept found in traditional CRTs.

The problem with CRTs

Broadcasters face a growing dilemma. CRTs are built using rare earth elements in the phosphors, which are deemed toxic. Millions of CRTs from computer displays, consumer televisions and professional displays end up in landfills every year. As a result, there is a lot of regulatory pressure to eliminate CRTs from the marketplace. In 2003, California passed a law imposing a fee on the purchase of all CRTs to pay for disposal. Predictably, much of the recovered material that is restricted in U.S. landfills ends up overseas. But simply moving the problem to a location with less stringent legal constraints doesn't eliminate pollution.

Another reason why manufacturers are keen on eliminating CRTs is because of the movement to larger displays with wide aspect ratio screens. CRTs are too heavy to be practical in large sizes useful for HDTV. This presents no insurmountable technical problem, except for the fact that most other new display technologies do not produce the high quality and consistent results needed for professional monitoring applications.

This is because of several factors affecting the physics of the display in ways that were overcome with emissive CRT technology. For example, LCDs are transmissive devices and

must contain a backlight to be useful for monitoring pictures. They would be a good solution provided the backlight provides a smooth response across a broad slice of the visual spectrum, and the color filters in the LCD closely match the color primaries standardized for television in ITU-R.BT709.

LCDs also do not have sufficiently deep blacks because they must cut off all light from the backlight source to achieve black. Lastly, LCDs take time to react to new data applied, creating significant lag in the response time to new content. This appears as smear on fast motion.

There are ways to minimize all of these effects. For example, LEDs can be used for the backlight and shut off when black is needed. Modern LCD materials can also largely eliminate the lag. However, for professional use, more engineering must be done to overcome resistance to implementation of LCD in QC applications.

Alternative display technologies

Plasma displays are a widely available type of new emissive display technology and can be extremely bright. They generate light in essentially the same physical process of stimulation as a phosphor with high-speed electrons used by CRTs. This allows them to be built with excellent color fidelity. Plasma displays larger than 50in can be more cost-effective than LCDs. This is not much of an advantage in a control room environment where more modest monitors are often preferred for camera matching and QC applications. The size of control rooms often precludes using single, large displays for each source, though monitoring processors can deliver multiple images to a single display in geometry more efficient than single monitors permit.

Plasma displays are a widely available type of new emissive display technology.

Other new emerging display technologies offer promise as well. Front projection using Texas Instruments' Digital Micromirror Device (DMD), also called Digital Light Processing (DLP), reflective technology works well when the light levels in the room are constrained. Because the light source can be full spectrum, colorimetry can be excellent, and contrast ratio is limited mostly by the power of the light source.

Another new technology called surface-conduction electron-emitter display (SED) offers the characteristics of a CRT, but in a panel only a few centimeters thick. (See Figure 1.) An electron beam produces the light, so the possibility of maintaining the colorimetry, dynamic range and temporal response capabilities of a CRT appears good. Power consumption should be low, making professional use possible.

In any event, until a display offers the characteristics of a CRT without significant drawbacks, professional applications will be challenged when trying to adopt technologies developed for consumer applications. BE

John Luff is a broadcast technology consultant.

? Send questions and comments to: john_luff@prismb2b.com

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314-481-6965; www.studionetworksolutions.com

Digital Compact Mixer — STAGETEC

Compact digital mixing console; features a modular design, offering eight to 24 faders; presents a fixed layout comprising 32 input channels, eight groups, eight sums, eight aux paths and eight mix-minus sums; can be deployed immediately without setting up a configuration; can easily route to the mix-minus buses directly from the channel strip.

+49 9545 4400; www.stagetec.com

Powerware BladeUPS — Eaton

Power system expands power protection from 12kW to 60kW in a single 19in rack; can be deployed in several configurations, from a distributed architecture (one in every rack) to end of row (up to six units in a rack) to a central system (not on the IT floor but in the electrical closet); grows with expanding IT applications using scalable architecture.

216-523-5000
www.powerware.com/bladeups

HSI6000 — HME

A headset interface for use with the DX series wireless intercom systems; allows users to connect a standard 2.5mm cordless or cell phone headset to an HME BP200 beltpac; this adapter makes it more cost-effective for users of the HME DX series systems to replace headsets or add new users.

800-848-4468; www.hme.com

XRC-S2 — Quantegy

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DVE5000 — Advent Communications

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X-Rack — Solid State Logic

An analog mix bus system; includes two new modules: the Four Channel Input, a four mono line input module, and the Master Bus, a summing, metering and control room module; the new modules allow users to build a multi-input, dual stereo bus mini SSL with Total Recall.

212-315-1111
www.solid-state-logic.com

VCC-8000 series — Avitech

The multiviewer is a multiformat data module for critical video applications; features an integrated on-screen display with Asian character support, tally functionality, alarm reporting and a variety of text label options; offers image processing and tools for flexible monitoring environments, including in TV and production studios as well as OB van applications; can be integrated with major providers of tally management systems, production switchers and routing switchers.

425-885-3863
www.avitechvideo.com

C2-2000 series — TV One

Consists of 10 units, including four downconverters, four video switcher/scalers and two universal switcher/scalers; features DVI and analog inputs and outputs; five are equipped with SDI; all units have an LCD on the front for setup; offers automatic incoming resolution detection and support of multiple TV standards; can handle a maximum input PC resolution of 2048 x 2048 and all HDTV resolutions up to 1080p.

859-282-7303; www.tvone.com

Viper — Sierra Video Systems

Ultra-wideband video routing switcher features 500MHz bandwidth and hot-swappable video boards, control processors and power supply; offers configurations up to 64 x 64 in eight input and/or output increments, housed in a 4RU frame per video channel; includes a passive back plane with no external components.

530-478-1000; www.sierravideo.com

FS-8000 — Fujitsu Components America

A Cat 5, multiuser KVM switch; part of the company's SERVIS system product line; reduces equipment costs and provides space-efficient, centralized server management by allowing multiple users independent or simultaneous shared access to any attached computer's keyboard, video and mouse, regardless of platform; consists of a KVM Main Unit, a User Console Unit and a Server Unit.

800-380-0059; http://us.fujitsu.com/components

H4 SuperMINI — Holophone

Camera-mountable 5.1-channel surround microphone features an integrated multi-channel preamplifier, monitor and encoder; offers six microphone elements with a bandwidth of 20Hz to 20KHz, a matrix-encoded stereo analog output and six line-level analog outputs; includes an audio zoom button, virtual surround headphone output with gain control, auxiliary center channel microphone input and LED monitor.

416-362-7790; www.holophone.com

TCD/V3 — LEIGHTRONIX

Station automation and video server controller allows users to manage up to 16 channels of digital video playback; interfaces with the LEIGHTRONIX TCD/NX, as well as third-party servers; controls a wide variety of resources, including DVD players, recorders and VCRs; includes WinLGX network management software for scheduling, immediate system control, user account management, system configuration and site management.

517-694-8000; www.leightronix.com

RFX-CMT-HD — RF Central

High-definition camera mount transmitter offers low delay and extremely low power consumption in a lightweight unit; features high-quality linear RF amplification technologies; accommodates various frequency bands, including 2GHZ; ideal for sporting events and live news coverage.

717-249-4900 ext 288
www.rfcentral.com

H5100 — NTT Electronics

The all-in-one HDTV encoder/decoder comes equipped with built-in audio processing functionality, including up to 16 PCM channels of audio input and Dolby E or Dolby Digital processing; a BISS-1/E scrambling function protects data on satellite links from unauthorized viewing; adopts HTTP menus for browser-based operations; SNMP functions are designed to make the unit easy to maintain.

415-318-4108; www.nel-world.com

SD|Fidelity — Bluefish444

Video card for uncompressed post-production workflow; is designed to allow video professionals to migrate from low-cost consumer analog equipment to professional SDI and digital audio devices by changing the connections on the video card; offers an internal keyer for logo insertion, embedded audio and six channels of AES/EBU XLR digital audio I/O connections with built-in sample rate converters for 5.1 surround sound monitoring.

866-314-7785
www.bluefish444.com

Axion — Analog Way

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Time Tailor — Prime Image

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408-867-6519; www.primeimageinc.com

4K Resolution Image Mastering/Playback System — Doremi Labs

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818-562-1101; www.doremilabs.com

2K Plus v4.1.2 — da Vinci

Newest version of color enhancement system includes support for digital projection standards, specifically resolutions of 2048 x 1080 10-bit RGB at 23.98sF and 24sF; supports advanced features of Grass Valley Spirit 2K/4K telecine, including six-sector secondary color correction, auto focus, automatic calibration and focus aid, which eases manual adjustment.

954-688-5600; www.davsys.com

ClearVue — Teranex

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407-858-6000; www.teranex.com

Protus Ph.C — Snell & Wilcox

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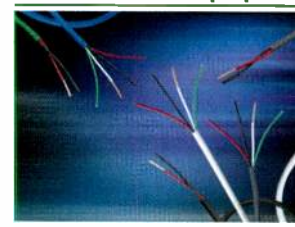

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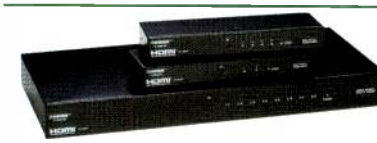

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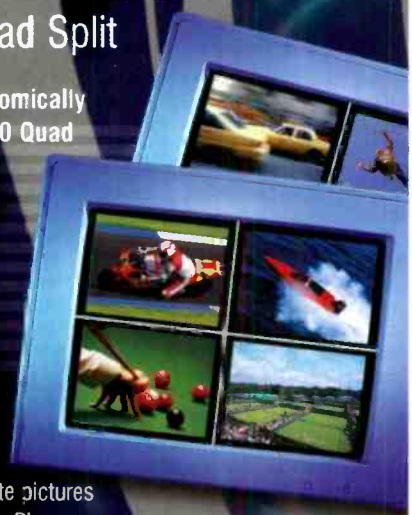

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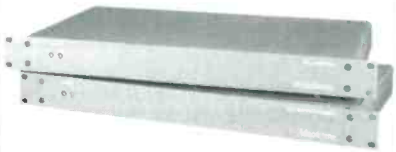

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MAINTENANCE ENGINEER

QUALIFICATIONS: Immediate opening for Maintenance Engineer at WPRI CBS & WNAC FOX affiliate stations in North East. Applicants should have a minimum of 5 years experience in broadcast television maintenance. The candidate must be well trained and experienced with computers and computer networks. Knowledgeable in Broadcast systems: ATSC and NTSC. Transmitter experience preferred. Must be able to troubleshoot to the component level and have a basic understanding of the FCC rules. Excellent communication and people skills necessary.

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Send resume to: WPRI/WNAC-TV Engineering Dept., 25 Catamore Blvd., East Providence, RI 02914 or Email to: resume@wpri.com.
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TV news vs. technology

"Film at 11:00" is long gone.

BY GEORGE MAIER

News organizations have been partners with technology since the days of the Speed Graphic camera. The Speed Graphic may not have been developed with newspaper photographers in mind, but it became the standard press camera and remained so for decades.

In this situation, the news industry found a solution by adopting existing technology. Along the way, camera manufacturers and news operations began working together to develop products with features and options that were more news-centric.

This relationship kicked into high gear in the 1970s, when lightweight ENG video cameras and VTRs were introduced as film replacements for local news and remote production. The benefits of video capture versus film were quickly realized when an ENG camera was combined with a transportable microwave system to provide live coverage of breaking local news. The advent of live news created an opportunity for a diverse group of manufacturers, who rushed to provide smaller and more sophisticated recording, switching and microwave transmission equipment, as well as specialized vehicles for ENG.

In ENG, technology was the catalyst, but the new tools were quickly mastered, and crews began pushing the equipment to its limits. Soon, compact mobile satellite systems were developed to get the story in places that were not accessible via microwave.

With a host of new ENG tools in place, the pace of news coverage sped up considerably. Adapting to the new technology was not too difficult, as the workflow involved in videotape capture and editing was in many ways similar to film, only much quicker and with a steadily increasing array of graphics and other video tools.

Today, TV news has made the leap to digital and is rapidly going tapeless, resulting in different workflow requirements because of its nonlinear nature. Storage media and transmission methods are multiplying as fast as the ways in which they can be used. At times, it's hard to tell if news is driving technology, or vice versa. The answer depends on whom you ask.

Next-generation crews

Seasoned ENG crews have already been through the digital conversion, but are somewhat suspicious of the increasing rate of change. New recruits were raised on cell phones, digital snapshots, the Internet, iPods and video games. To them, rapidly changing technology is just a way of life. But what do the new recruits bring to table, and how will they fit into the changing paradigm?

Experienced crews know their ENG vans inside out. If something breaks at a critical moment, they know how to create an emergency work-around and get the story on the air.

The new crop of operators can master digital capture, graphic interfaces, microprocessor-controlled equipment and PC editing stations quickly and with an intuitive grasp. However, they are primarily appliance operators and may not know how it all works. When the inevitable equipment malfunction or breakdown occurs, some of the newbies will have problems devising work-arounds because they grew up on dumpster technology (meaning: if it breaks, throw it away, and get a new one). Also, real-time transmission has not been a top priority for the Web-enabled generation; just hit the refresh button or wait for the buffers.

The future of ENG

The ENG operation of the future will be different. Manufacturers are already taking advantage of IP interfaces for storage media and editing systems. ENG cameras produce video as a compressed digital stream that can be transmitted in real time or recorded as a file. The file can be edited on a laptop PC, a specialized mobile editor, or, in some cases, use the camera's own storage media for a cuts-only version. The file will be transferred to the studio server in one of several ways, some of which are still under development.

When the inevitable equipment malfunction or breakdown occurs, some newbies will have problems devising work-arounds.

The key to success will be adapting current crews to new IT-based tools, as well as teaching newcomers how to deal with real-time issues and how to react to emergency situations. When future ENG crews are in trouble, it's likely someone at the studio will be able to help. ENG van equipment will include Ethernet control ports that can be accessed remotely. An engineer at the studio will be able to control the van's on-board equipment using a GUI on a PC via wireless hookup.

With so many tools and technologies to choose from, making the right choices will be difficult, but history has shown that value, speed and ease of use will be the winning combinations that move the news from the good old days of "Film at 11:00" to wherever the future takes us. BE

George Maier is president of Orion Broadcast Solutions, a consulting firm.

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