JANUARY 2007

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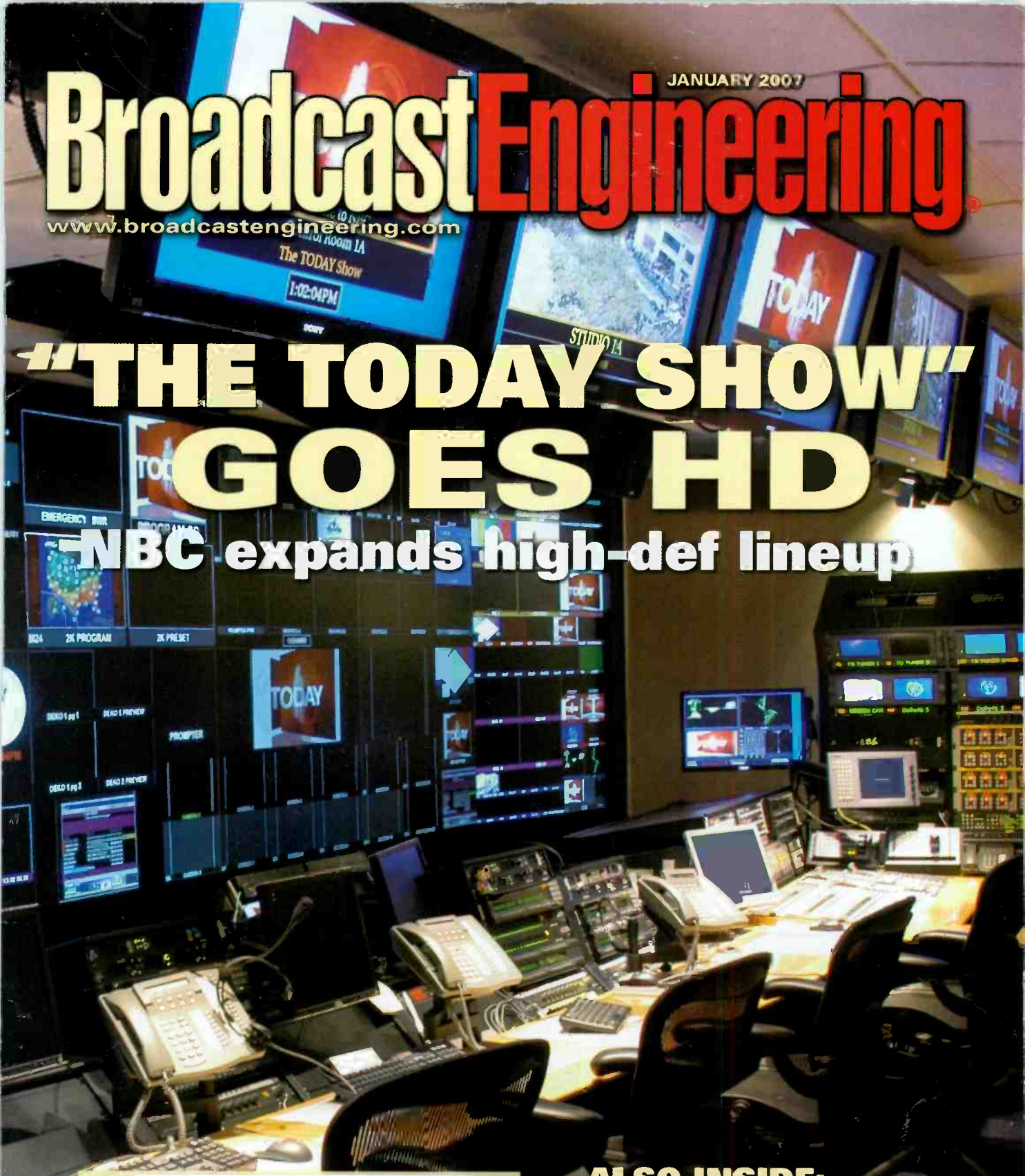
"THE TODAY SHOW" GOES HD

NBC expands high-def lineup



ALSO INSIDE:

PACKAGING WITH MXF
A key tool for creating IPTV content

THE MIAMI HEAT ADOPTS DAM
Matching workflows to tasks

MIGRATORY BIRD DEATHS
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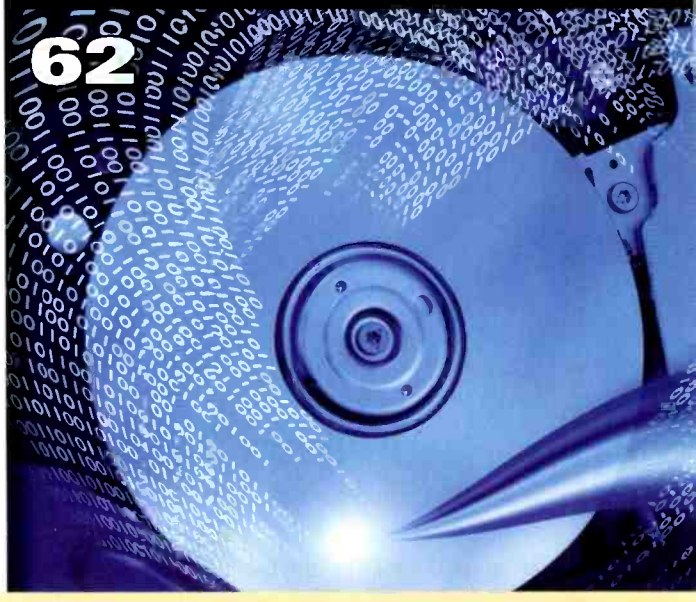
"The Today Show's" Studio 1A control room features a highly flexible, multid splay monitor wall.



AUGUST'S FREEZEFRAME ANSWER

Q. What is the official analog cut-off date?

A. Feb. 17, 2009

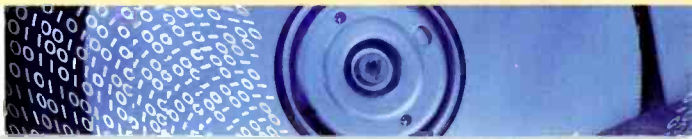
AUGUST WINNERS:
Bart Canninstra, Tim Costley, Al Van Dinteren, Mark Everett, John Harris, Terry Lindgren, Scott Michaels, Patrick O'Brien

SEPTEMBER'S FREEZEFRAME ANSWER

Q. When two DTV stations share the same channel, what is th general formula for calculating the pilot offset, which will reduc interference?

A. $F_{offset} = 1.5 \times F_{seg} = 19.4031\text{kHz}$

SEPTEMBER WINNERS:
Chuck Condie, Tim Costley, Rich Lohmueller



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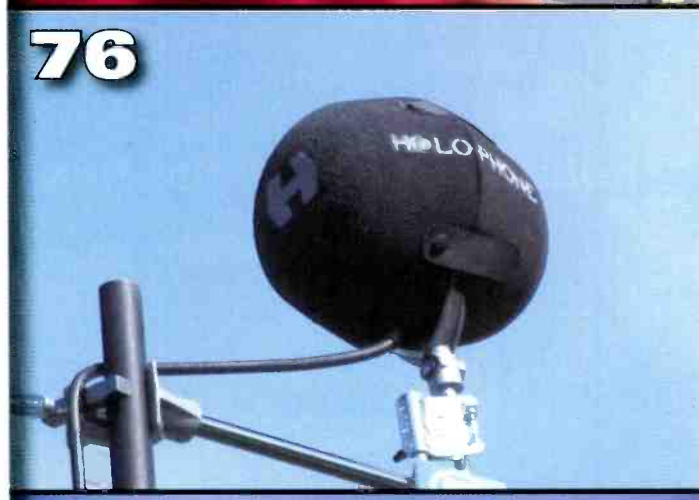

THIS MONTH'S FREEZEFRAME QUESTION

Match the RAID level with the correct definition. The question was taken from "Digital Asset Management, Second Edition," written by David Austerberry, editor of *Broadcast Engineering's* World edition, and available from Focal Press.

RAID levels	Definitions
RAID-0	P and Q redundancy
RAID-1	Block-interleaved distributed parity
RAID-2	Block-interleaved parity
RAID-3	Mirrored
RAID-4	ECC hamming code
RAID-5	Bit-interleaved parity
RAID-6	Nonredundant

Readers submitting winning entries will be entered into a drawing for *Broadcast Engineering* T-shirts. Enter by e-mail. Title your entry "Freezeframe-January" in the subject field and send it to: editor@prismb2b.com. Correct answers received by March 1, 2006, are eligible to win.

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Marketing to boomers: boon or bust?

In the movie "Fried Green Tomatoes," there's a scene where Kathy Bates' character Evelyn yells at a young woman who cut her off and stole her parking space. The girl, thinking herself the victor, says, "Face it, lady: We're younger and faster."

Evelyn then repeatedly rams her car into the back end of the girl's car, smiles and says, "Face it, girls: I'm older, and I have more insurance."

As I age, it becomes more apparent to me that maturity — or experience, as some would say — is a key factor in what you get from society. Boomers rule — or can choose to rule as Kathy Bates' character did.

New research from Harris Interactive says we baby boomers feel that Madison Avenue has forgotten we exist. The study, commissioned by the TV Land cable network, shows that two-thirds of adult TV viewers say that most television programming and advertising is targeted at people under 40.

More than 80 percent of respondents over 40 claim they can't find TV programming that reflects their lives. A miniscule 3 percent of boomers said they were extremely satisfied with television programming choices.

"The amount of people dissatisfied with television overall was a pretty big eye-opening thing for us," said Larry Jones, president of the TV Land cable network. Well, duh!

Boomers, those born between 1946 and 1964, aren't accustomed to being left out in the cold. As the largest generational group, they are used to being catered to — first by parents, then by society and especially by television. These boomers now find that once they've crossed that magic threshold of 50, TV programmers and advertisers see little value in markets that serve them.

And that's not far off from the truth. ABC and NBC focus their advertising business on the 18 to 49 demographic. The younger the eyes, the more advertisers will pay. For the 18 to 24 demographic, every thousand set of eyes is worth $335. That number drops to $119 for those 55 to 64.

Two-thirds of adult TV viewers say that most television programming and advertising is targeted at people under 40.

Ken Dychtwald, president of the San Francisco-based consulting firm Age Wave, says that ignoring boomers is a costly mistake.

"Fifty-three percent of the boomers said that when they see ads that don't relate to them because they're more focused on the youth side of equation, they tune out," he said. "Another 33 percent of the respondents said they get so annoyed by the ads that they actively refuse to buy the products and will turn away from the advertising and the medium altogether. Boomers won't put up with being snubbed."

I'd like to remind Madison Avenue that we boomers represent an extremely affluent demographic. In fact, we can boast more than $2.3 trillion in annual buying power. So, if you want our money, stop with the 20- and 30-something actors in your commercials and prime-time shows, and give us programs with themes we'll relate to.

Fortunately, we boomers invented most of today's technology and know quite well how to get what we want. We'll simply TiVo the shows we do want to watch — and bypass the commercials we don't.

So, be careful TV programmers. Ignore us at your own peril. And remember: Boomers rule!

Now, where are my reading glasses?

Brad Dick
EDITORIAL DIRECTOR
Send comments to: editor@prismb2b.com

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FOR THE CHANGING FACE OF TELEVISION

Commercial-free TV

Editor:

Imagine turning on the television to watch your favorite half-hour sitcom, and it actually lasts 30 minutes. There are no commercials, and you access it from a server provided by your local TV station. It works much like how cell phones work now — through broadcast RF.

Once this new technology is available for televisions, TV stations will be scrambling to figure out how to use it for advertising.

The technology is called Program Integrated Advertising (PIA). PIA recognizes that viewers will not sit through 30-second commercials and promos, let alone two-to-three minute breaks. So, instead of those long breaks, advertising appears within the programs.

For example, suppose a health club sponsors a TV program. The lead character may be seen working out at the gym with a visible exterior shot. Then the camera will zoom in on an attractive physical trainer.

The technology is just around the corner. It's time that the major players and local stations start introducing their viewers to PIA.

Evertt Sayler
TV commercial production

Craig Birkmaier responds:

Product placement has been increasing for several years, and there has been a lot of coverage about it. Google the phrase, and you'll find about 24 million hits. There are two main drivers of this phenomenon: the TV remote and the PVR, which has been called the Death Star for commercials.

It's interesting that many of the new streaming services providing access to network programming via the Internet are configured so that you cannot skip the commercials. The same is true for the on-demand offerings of many network shows.

More than 85 percent of U.S. homes have a multichannel TV service that costs about $50 a month. And many homes spend this much or more to buy and rent content. Considering this, I believe there will be a time when viewers will spend that money on commerical-free content.

I see a wide range of options in terms of how content will be paid for in the future. If broadcasters are to survive, they need to start thinking about individual viewers as opposed to generic audiences. The tools are coming together to provide that kind of one-on-one relationship with viewers — even in a broadcast medium.

A good example of this technology was discussed in my November 2006 column about set-top boxes. While this idea represents an opportunity to reinvent broadcast television, broadcasters have shown little interest in developing the STB into a platform for new services and revenue streams. Broadcasters are content to let cable and DBS be the pioneers as long as they can negotiate lucrative retransmission consent agreements.

LPTV digital deadline

Editor:

As manager of an LPTV station that operates four UHF channels, I, along with my board of directors, am anxiously awaiting word from the FCC as to when LPTV stations will be given a federal mandate to go digital.

We know full-power commercial stations are required to go digital in February 2009. So to keep competitive, we're planning to go that route. However, because we're a viewer-supported station, there's always the possibility that fundraising may take longer. If I could tell my board that we have more time to raise the money, it might calm some fears that the station won't make it by the 2009 deadline.

Dan Thesman
Station manager
Blue Mountain Television
College Place, WA

Harry Martin responds:

There is no DTV transition deadline for LPTV and Class A stations. They can continue to operate in the analog mode as long as they want.

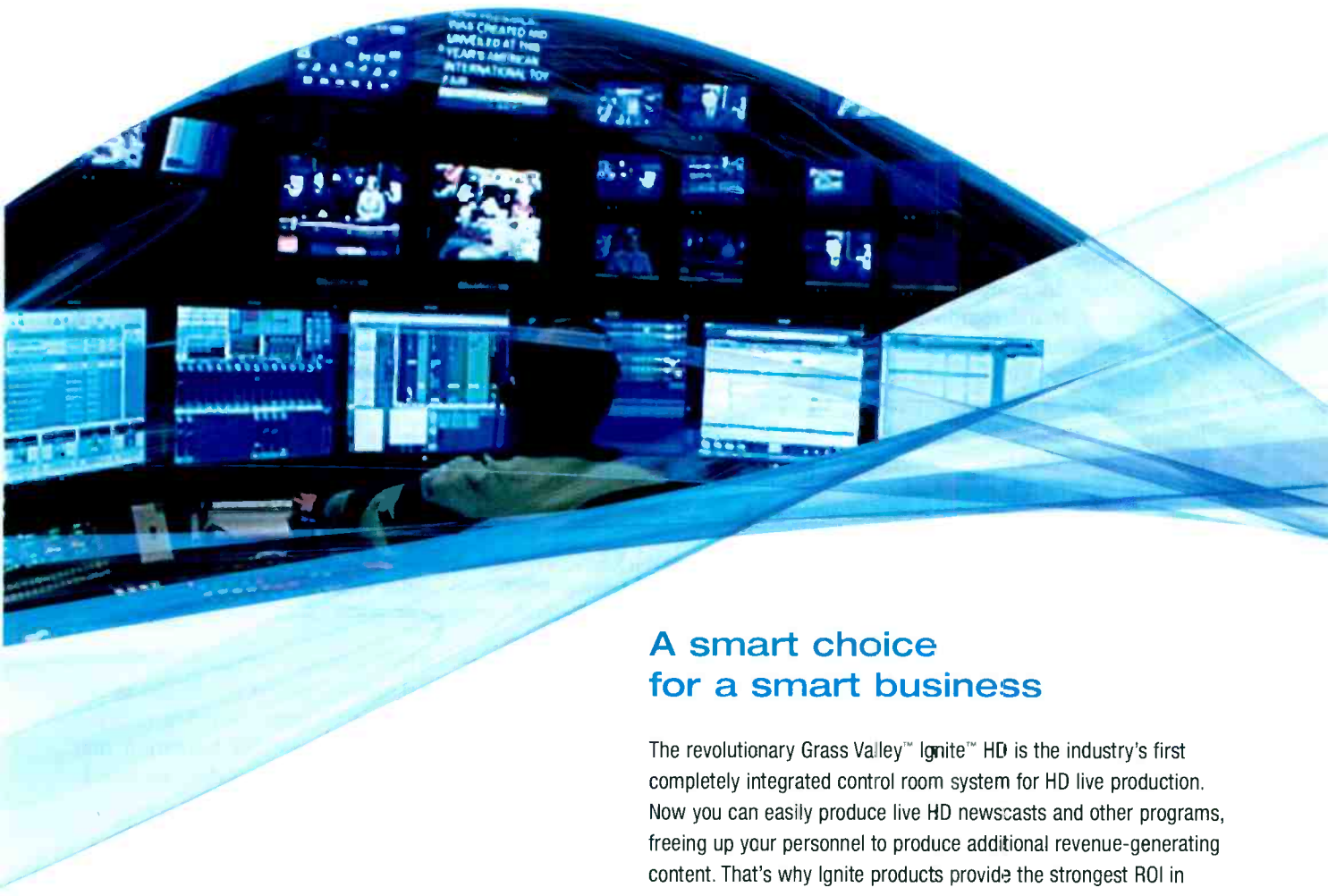
LPTV and Class A stations were afforded an opportunity to apply for companion DTV channels earlier this year, and the FCC is now processing those applications. Stations that receive companion channels will have three years to build them, but they are not required to build a second facility if they decide not to do so. They, along with LPTVs with no companion channels, can flash cut to digital at any time, but don't have a deadline to do so. 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

Ignite HD



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Transmission gridlock

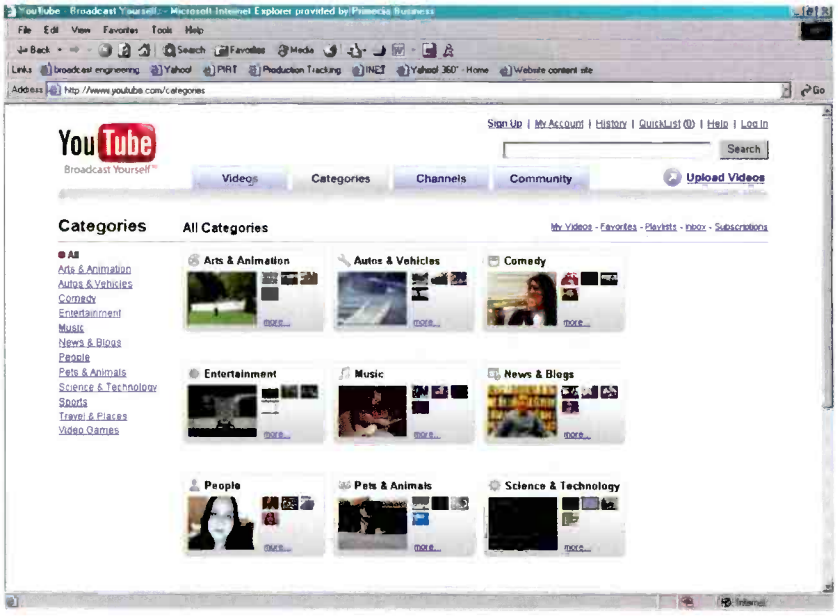
Will the information superhighway become a toll road?

BY CRAIG BIRKMAIER

There is a school of thought that suggests that it is in the best interest of the electorate to vote for a divided government. That is, to elect the president from one party and Congress from the other. And that's just what has happened in the United States as a result of the midterm elections this past November.

From time to time, this column takes a look at the techno-political landscape of the U.S. Capitol, seeking to learn and predict where the latest political winds may blow the broadcast industry. As U.S. broadcasters now rely on their competitors to reach the vast majority of their audience, these periodic glimpses at the legislative and regulatory inner workings of our business must include the gamut of related telecommunications businesses that compete with — some of which also enable the continued existence of — "free" over-the-air television.

As a starting point, it is important to observe that the NTSC transmitters are still pumping out megawatts of analog broadcasts to U.S. homes tuning in with rabbit ears. Jan. 1, 2007 — the date set by the FCC in 1997 for NTSC shutdown — has come and gone, and only a tiny percentage of U.S. homes are now watching the new ATSC broadcast service.



The popularity of YouTube represents a shift in viewer interest to online media and entertainment. Broadcasters finally took notice this year and have placed more content — including full-length show episodes — online.

Looking back at the efforts of the previous Congress, it is fair to say it passed one piece of legislation that will have a significant effect on broadcasters. That legislation set a new date of Feb. 17, 2009, for the shutdown of the NTSC service. Some people question whether the politicians will stick to the deadline this time.

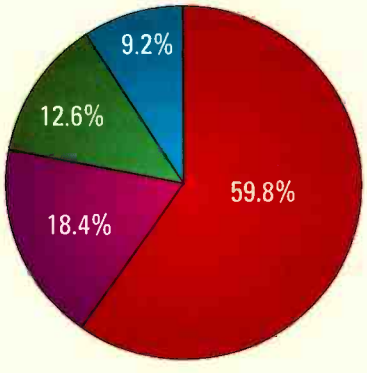
Here's my prediction of what the current Congress will do regarding broadcasters: The 2009 deadline date will not be changed. However, the Democrat-controlled Congress may

Glimpses at the ... inner workings of our business must include ... the gamut of related telco businesses.

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

On-demand program consumer spending

In 2016, consumers will spend $8.7 billion on on-demand services



	Revenue (billions)
VOD/SVOD/NVOD	$5.2
Adult erotic	1.6
PPV/Near-VOD movies	1.1
Pay-per-view events	0.8
Total	**$8.7**

Source: Kagan Research *www.kagan.com*

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*"The **Dolby LM100 Broadcast Loudness Meter** has had a huge impact on all our postproduction operations. It's a key component in our specifications for program delivery. It's also particularly valuable in analyzing our transmission and uplink chain and in troubleshooting complaints, whether from viewers or affiliates."*

— Sean Richardson, Manager
Audio Post Production
Starz Entertainment Group

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throw more money into the National Telecommunications and Information Administration (NTIA)-administered program to provide coupons that subsidize the purchase of ATSC set-top receivers for those who want to continue using their old NTSC receivers. That's it.

For the next two years, Congress will be operating in gridlock, much as it did for the past two years. Attention is likely to shift to the FCC. For broadcasters, ownership caps and spectrum sharing (i.e. the white space debate) will be the hot topics this year.

Network neutrality is likely to be the subject of considerable debate over the next two years.

To be honest, the politicians have little choice but to move on to more important issues. They need the revenues that will be produced from auctions of the spectrum that broadcasters will be returning in 2009.

Attempts to create national franchise agreements that would allow the telcos to enter the multichannel TV business without gaining local franchise approval likely died with the previous Congress. And it is unlikely that network neutrality legislation will get through the current Congress because of gridlock in the Senate.

Web links

- Vinton Cerf Senate testimony
http://commerce.senate.gov/pdf/cerf-020706.pdf
- The coming tug of war over the Internet
www.washingtonpost.com/wp-dyn/content/article/2006/01/21/AR2006012100094.html

But network neutrality is likely to be the subject of considerable debate over the next two years. At stake is the ability of one set of gatekeepers to turn the information superhighway into a toll road, not unlike what has happened to "free" television, thanks to the content conglomerates that now control television content creation and distribution.

Significant milestones

At a global level, several significant milestones were passed in 2006. The Netherlands became the first nation to turn off its analog transmitters. This is not surprising given the fact that 95 percent of homes in the Netherlands subscribe to cable, and it has one of the highest rates of broadband penetration in the world. It's worth noting that the United States has slipped to 13th in the world in the rate of broadband penetration, an area that is drawing considerable interest from Congress.

Another big change last year was new display technologies overtaking the venerable CRT display in unit sales. HDTV-capable displays were one of the top product categories for Christmas sales in the United States. This is due in part to significant price drops for LCD and plasma panels.

Many of those new displays now offer 1080-line progressive scanning. Virtually all of the new display technologies can be used to view traditional television content and new forms of square pixel digital content from the world of computing and the Internet.

In 2006, YouTube became a phenomenon, and the ability to share user-generated video content finally caught the attention of the media conglomerates. Late in the year, Internet powerhouse Google acquired YouTube.

Using the Internet to download entertainment content is likely to gain steam in 2007, with major pushes by Apple, Google, Microsoft and Yahoo. This, in turn, is fueling the network neutrality debate.

Tollbooth ahead?

"Allowing broadband carriers to control what people see and do online would fundamentally undermine the principles that have made the Internet such a success," said Vinton Cerf, credited by many as one of the fathers of the Internet, to a Senate panel in February 2006. Cerf is now vice president and chief Internet evangelist (no joke, it's his actual title) for Google.

Cerf went on to say, "Google believes that consumers should be able to use the Internet connections that they pay for the way that they want. This principle — that users pick winners and losers in the Internet marketplace, not carriers — is an architectural and policy choice critical to innovation online." A who's who of consumer advocacy groups have lined up behind Cerf in the network neutrality debate.

On the other side, AT&T and BellSouth went on the offensive last year. They say carriers should be able to receive compensation from the companies using their Internet pipes to deliver services. This compensation could include carriage fees for downloading content or the ability to give the services of a paying company preferential treatment over another that does not pay.

In 2006 ... the ability to share user-generated content finally caught the attention of media conglomerates.

On Dec. 29, 2006, the FCC approved the proposed merger of AT&T and BellSouth. Terms of the approval include a provision that will require the merged company to maintain network neutrality for two years, or until Congress enacts legislation regarding the network neutrality issue.

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And the media conglomerates are paying attention. As gatekeepers for television content, they fully understand the potential to control consumer behavior that network neutrality represents. They also understand that this could be used against them, allowing the telcos and cable companies to control the tollbooths on a digital superhighway that virtually everyone believes will be used to distribute digital media content — someday.

The more things change ...

Meanwhile, broadcasters seem content to sit back and milk their legacy business model for all it is worth until that someday comes. There is a growing awareness that the lobbying power is waning for the NAB, MSTV and other organizations that represent the interests of broadcasters in the nation's Capitol. But gridlock can be a good thing, especially when one is trying to postpone the inevitable.

Gridlock can be a good thing, especially when one is trying to postpone the inevitable.

Unfortunately, this strategy may lead directly to the digital cliff. Many analysts are suggesting that TV broadcasting will wither rapidly after analog shutoff. This is a likely scenario if broadcasters fail to update a dying business model.

On the other hand, the digital revolution could save broadcasting — even revitalize it. It is an era when consumers literally have a world of content available to choose from via broadband networks.

Television broadcasters have the ability to deliver bits to things that move, and they have the ability to leverage the Internet to develop relationships with their viewers. We will explore some of those possibilities next month as we take a look at ways to exploit broadcast Web sites. BE

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

Send questions and comments to:
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Migratory bird deaths

Rules for prevention put towers in a different light.

BY HARRY C. MARTIN

The FCC is proposing new rules to prevent migratory birds from flying into communication towers. The U.S. Fish and Wildlife Services estimates that between 4 million and 50 million birds deaths in the United States each year are tower related.

The evidence

In 2003, the commission issued an inquiry designed to develop a factual record about the cause of migratory bird deaths. The inquiry sought information on factors, such as lighting, tower height, antenna structure, weather, location and migration paths. In addition to numerous comments from environmental groups and others, the commission hired an environmental consulting firm to evaluate existing research. The facts gathered in this proceeding led to a series of tentative conclusions, which are included in the rule making.

With respect to its legal authority to issue rules in this area, the commission tentatively concluded that the National Environmental Policy Act provides a basis for the commission to take action to protect migratory birds if communication towers are found to be a hazard.

New lighting

The commission has tentatively concluded that red obstruction lights should be replaced by medium-intensity white strobe lights to the maximum extent possible without compromising safety. The evidence indicates that such lighting creates better visibility for birds, particularly in bad weather when visibility is poor and birds are flying at lower altitudes. The proposed rules would only affect new or modified towers.

The FCC is seeking information on additional remedies. This includes evaluating tower height and location and the use of guy wires. For example, the co-location of new antennas on existing towers minimizes the impact of communication towers on migratory birds. The commission wants to know whether the use of white strobe lights alone will eliminate the need for additional remedies proposed by environmental groups.

The commission has proceeded cautiously in dealing with the protection of migratory birds. The evidence of harm is largely based on guesswork. Nevertheless, environmental and bird groups have pressured the FCC to take action. The rule making, issued more than three years after the original inquiry, does not suggest aggressive action be taken to protect migratory birds. Requiring white strobe lights only on modified or new tower facilities is not a significant change. Moreover, the fact the commission has solicited another round of comments could mean that a decision on protecting migratory birds is a long way off.

The commission has tentatively concluded that red obstruction lighting should be replaced by medium-intensity white strobe lights.

In other FCC news: Fines assessed in historic review cases

The FCC has fined two communications companies (one $11,000, the other $5600) that conducted their historic impact studies after their towers had been constructed.

Under procedures that became effective in 2005, most new tower projects are subject to the National Programmatic Agreement (NPA), a compact between the FCC, the Advisory Council for Historic Preservation, and state and tribal historic preservation agencies. The purpose of NPA, which has been incorporated by reference into the FCC's rules, is to minimize the impact of tower construction on local historic sites.

When filing FCC Form 301, applicants must certify that they have conducted the extensive studies required by NPA or that the proposal is exempt (due to, for example, a co-location of facilities). As indicated recently, the FCC will fine certifiers that have not abided by the new procedures. BE

Harry C. Martin is the 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

Feb. 1 is the deadline for renewal applications for TV, Class A, LPTV and translator stations in New Jersey and New York. TV stations and nonexempt Class A and LPTV translator stations also must file EEO program reports (Form 396) with their renewals.

Feb. 1 is the date TV stations (but not Class A, LPTV or translators) in the following states must file their biennial ownership reports: Arkansas, Louisiana, Mississippi, New Jersey, New York.

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BY ALDO CUGNINI

Many video operators probably take the operation of the various processing devices in the video chain for granted, especially as they affect the video program material. In fact, many of the operating parameters of these devices can be changed, but it takes a bit more knowledge of the processes to anticipate the final effects and trade-offs. This month, we'll look at the tools available to the "compressionist" and how they affect the video.

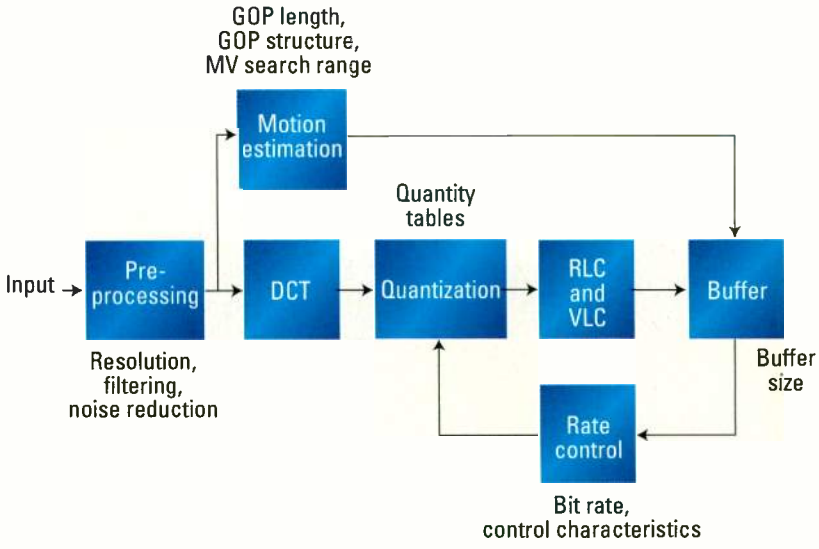

Figure 1. In this simplified block diagram of a typical video compression encoder, the tagged elements describe the variable elements that can affect video quality.

Compression fundamentals

As is well known, systems such as MPEG and VC-1 lower the bit rate of a video signal by means of compression, which involves removing certain redundant characteristics of images. And lossy compression exploits certain perceptual characteristics of the human visual system, whereby errors are allowed to form in ways that are generally less noticeable by the viewer. To understand how this affects the video, see Figure 1.

Preprocessing is the first function used in an encoder, and it happens to be a lossy one, as the information discarded by this process cannot be faithfully retrieved. After conversion to digital form, the input signal is typically scaled to a desired format, and the chrominance is subsampled, usually to the 4:2:2 or 4:2:0 sampling structure.

4:2:2 means the chrominance is horizontally subsampled by a factor of two relative to the luminance. 4:2:0 means the chrominance is both horizontally and vertically subsampled by a factor of two relative to the luminance.

In order to provide maximum quality, 4:2:2 (or even 4:4:4, which means no chrominance subsampling) is most often used for video editing and storage operations. 4:2:0 is typically reserved for final distribution and transmission.

This reduction in spatial sampling rate is the first contributor to lowering the overall output bit rate. This is a nonlinear contribution. For example, cutting the vertical sampling in half does not simply cut the number of bits

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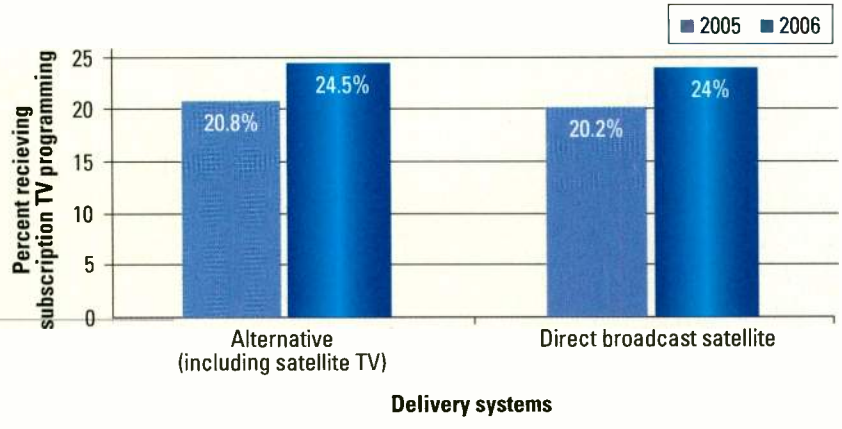

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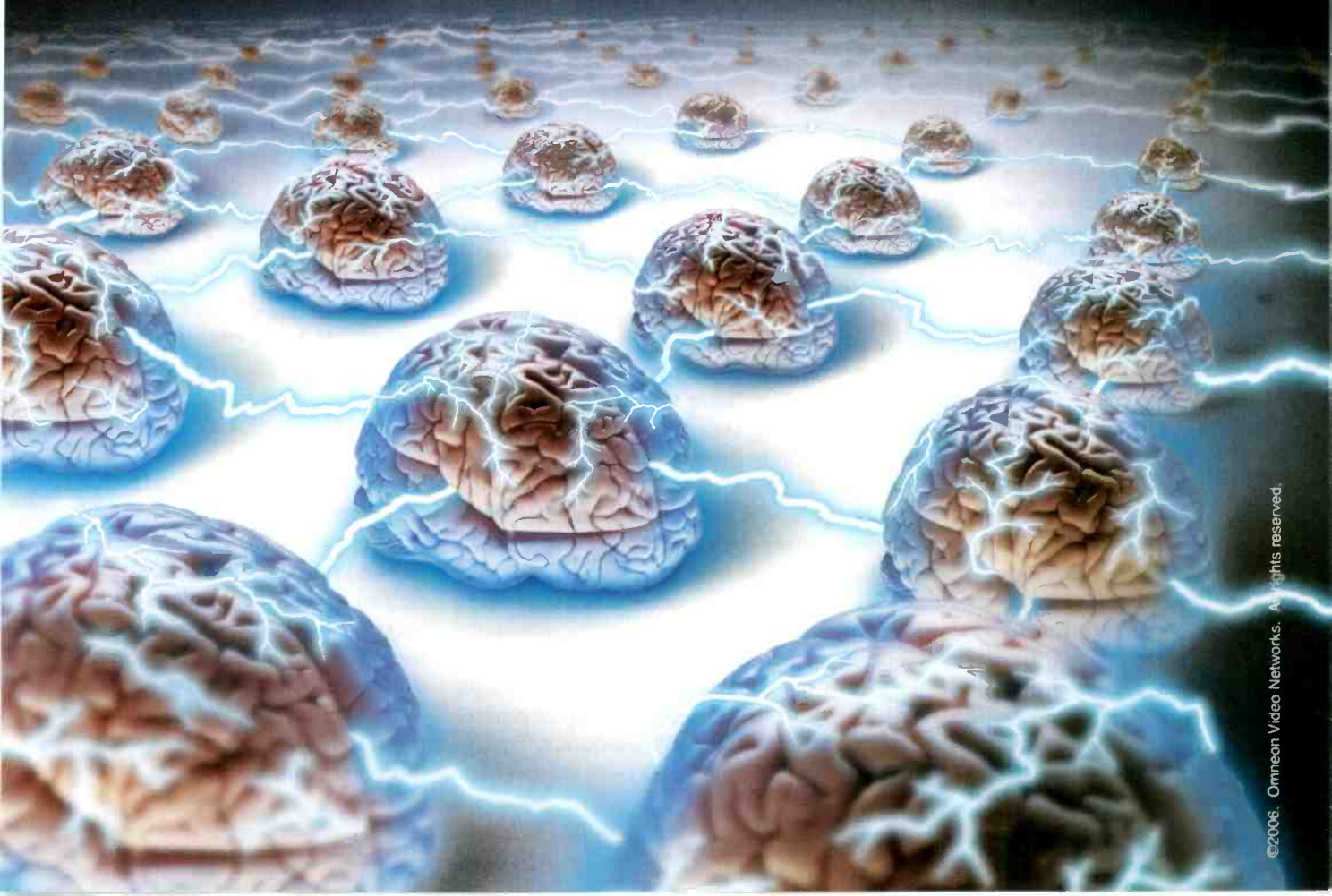

needed in half because of the variation of spatial redundancy in the video. Filtering of the input signal — possibly in both the horizontal and vertical directions — will have a contributory effect on the total bit rate, with an associated effect on the picture quality.

Noisy pictures will cause the encoder to waste bits by coding the high-frequency energy in the noise and will tax the performance of the motion estimation function of the encoder. More on that later, but for the moment, remember that it pays to provide clean video — or the use of a good noise reduction processor — when encoding.

DCT and quantization

The next encoding steps involve the discrete cosine transform (DCT), quantization, run length coding (RLC) and variable length coding (VLC). The RLC and VLC lower the bit rate by cleverly removing redundancy from the code word stream, losslessly, to within the accuracy of the arithmatic operations.

The DCT, however, does not alone result in any bit rate reduction. The output of the DCT contains just as much information as the input of the function. However, the transform is needed to convert the spatial video information into frequency information that can then be perceptually compressed by means of quantization. By acceptably lowering the quantization of DCT coefficients, this core function lowers the bit rate of the video.

The DCT, RLC and VLC functions are tightly defined in most compression systems and therefore cannot be directly modified by the operator. However, the quantization is continually adjusted by the encoder, and the tables used for weighting the different DCT coefficients can sometimes be changed indirectly by the operator, especially in software encoders.

In general, these tables tend to quantize the higher frequency components more coarsely than the lower frequency ones. The characteristic trade-off is thus bit rate for fidelity of (and lack of artifacts in) visual details.

Motion estimation, interframe coding and GOP structure

The other key video compression technique exploits the temporal redundancy in pictures — the fact that most of the time, considerable sequences of pictures are repetitive and similar. Motion estimation and interframe coding take advantage of this by transmitting only the differences between successive frames and by coding motion vectors that provide an efficient way of accounting for the small motion-related differences that do occur.

prised of I (intra), P (predicted) and B (bidirectionally predicted) pictures. A longer GOP will produce a lower average bit rate, but it will also produce a longer end-to-end delay, which therefore increases the startup time (channel-change or acquisition) in a decoder. Typically, the relative compressed sizes of these I-, P- and B-frames can be expected to be about 10:5:2 respectively; of course, this will vary depending on the encoding parameters used and the actual video material. The number and position of P- and B-frames can also be changed (or eliminated completely)

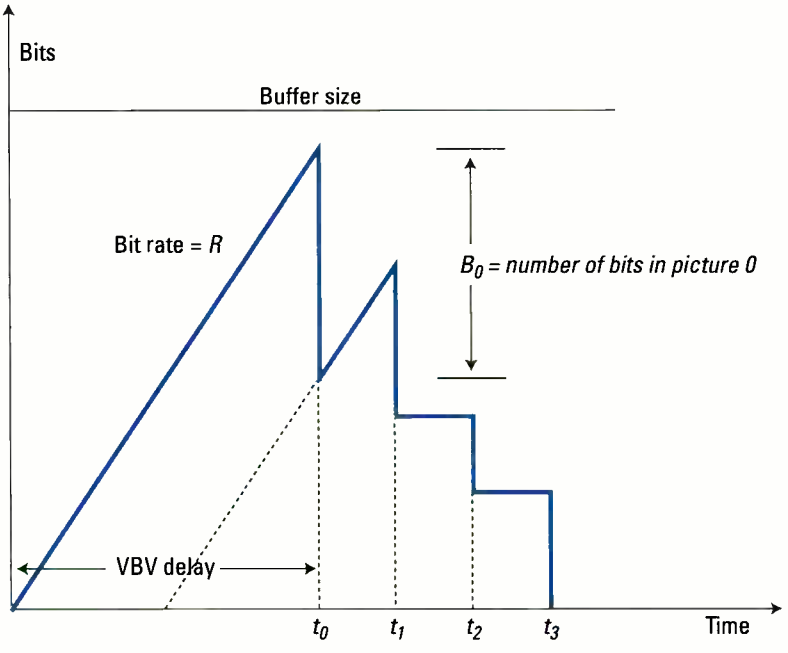

Figure 2. In this MPEG video buffer verifier (VBV) model, the slanted lines indicate the bit rate, and the vertical lines illustrate pictures being removed from the buffer.

One factor that can trade off processing time for video quality is that of the motion estimation search range, or the distance over which the encoder must search to find best-matching blocks. Larger search ranges will take longer to process, but can result in better video. This parameter is sometimes available to the operator.

Closely related to motion estimation and interframe coding is the length and structure of the group of pictures (GOP) in an MPEG sequence. Typically, 15 frames form a GOP, which is com-

with associated changes in delay, artifacts and bit rate.

Rate control and its effects

Perhaps the most readily available video compression control is the final bit rate. While the ultimate rate may be defined in some applications, certain parameters controlling this rate are nonetheless adjustable. Because the instantaneous bit rate changes from frame to frame, a buffer is required at the output of the encoder to smooth this behavior into a constant rate. This

buffer then provides information to a rate control mechanism that affects the quantization of subsequent video. This feedback mechanism, when poorly implemented (or highly challenged), can result in "pumping" or "breathing" of the video, noticeable as GOP-related cyclical quality changes in the resulting video.

The MPEG-2 standard defines a hypothetical buffer model, called the video buffer verifier (VBV). (See Figure 2.) This is a model used by the encoder to predict the filling and emptying of the output buffer, to assure that the decoder buffer never overflows or underflows (empties). Such a condition would cause pictures to be lost or to freeze. The MPEG standard defines the VBV delay as the time needed to fill the VBV buffer from its initial empty state at the target bit rate (R in Figure 2) to the correct level immediately before the first picture is removed from the buffer.

In addition to the actual (physical) buffer used in the encoder, the rate control can specify the size of the VBV, essentially a software parameter. A smaller VBV, while leading to a smaller end-to-end delay, will cause the rate control to allow fewer bits per picture, resulting in a decrease in picture quality.

The bit rate can be defined as constant, as shown in Figure 2 (and typically used in all broadcast transmissions), or variable. The latter can result in better instantaneous picture quality, but usually requires some other kind of mechanism to prevent buffer violations. One such application is the DVD, where the data playback essentially can be sped up or slowed down as needed.

Of related interest is the statistical multiplexer, or statmux, which is used to simultaneously encode multiple program sources with the goal of combining these into one program stream, such as when multicasting. The technique essentially uses a shared buffer model that is a composite of each of the separate individual buffers. If done poorly, there can be visible artifacts from the different channels affecting each other. However, when done well, and for a large number of channels, the result can be the ability to squeeze in more channels than would be possible by individual encoding alone.

If you have the opportunity to modify some of these parameters, you should experiment and see how it can improve your operation. Just make sure you put in a lot of time and critical viewing before you commit to any change to your on-air operation! BE

Aldo Cugnini is a consultant in the digital television industry

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The name game

Domain Name Systems simplify long IP addresses.

BY BRAD GILMER

Did you every wonder how IP addresses like 64.236.29.72 relate to domain names such as *eng-server*? Have you ever wished that you could type in something easy to remember, such as eng-server rather than an IP address to get to a local server? This month we will look at what a Domain Name System (DNS) does and how to use it.

```
# Host database
#
# This file should contain the addresses and
# aliases for local hosts that share this file.
# Replace 'my.domain' below with the domainname
# of your machine.
#
127.0.0.1          localhost localhost.my.domain
#
# Imaginary network.
#10.0.0.2          myname.my.domain myname
```

Figure 1. A hosts file is a local file that matches an IP address with a name. Once you have entered the name, you can use it rather than typing in the IP address.

Hosts files

DNS was created for people who can't remember long strings of numbers. It is a lot easier to remember *cartoon network.com* rather than a four octet IP address. Even if you commit the IP address to memory, Cartoon Network might need to switch to a different IP address at a later time. Or the network might want to send people to several different Web servers with identical content so that it can balance the load between multiple servers. DNS does this and more. Conceptually, DNS is a huge distributed database that contains IP addresses and the hosts domain names.

Computers do not use domain names to send messages to a remote host on the Internet. Instead, the domain name, sometimes called the host name (e.g. *cartoonnetwork.com*) is resolved to an IP address (e.g. 64.236.29.72). The IP address is what used to communicate with the host.

Early on, programmers invented HOSTS.TXT files as a way to translate between names that are easy to remember and the IP addresses actually used on the network. The HOSTS.TXT file was centrally maintained. Administrators could e-mail HOSTS.TXT changes to the central administrators. The administrators modified the master HOSTS.TXT file and then posted it on a server. Anyone who needed a copy could download it and install it on their computer. HOSTS.TXT files still exist, but the names have been modified to hosts files. Figure 1 illustrates a hosts file from a UNIX server.

If you search your Mac or Windows machine, you will find a hosts file. If you prefer to type the name *router* instead of typing the IP address of your local router, you can add a line to the hosts file as follows:

```
192.168.0.1       router
```

(Be sure to substitute the IP address of your router for 192.168.0.1 in the example above.) If your router has a Web page that allows configuration, you can now access this page by starting a Web browser on your computer and entering *router* instead of 192.168.0.1.

How DNS works

The hosts file was a great solution when networks were small, but when people began to connect computers together to create the Internet, the hosts file quickly became unmanageable. Something better was needed.

The end result has proved to be a flexible solution, which has served the Internet well as it has grown beyond what the original DNS designers ever envisioned.

DNS works by setting up servers that have the last word (known as authoritative servers) regarding the domain name/IP address relationship for a particular domain. DNS servers are authoritative for a specific zone, or area of a domain. A DNS server that is authoritative for an entire domain — all of *examplebroadcaster.com*, for example — may delegate responsibility for a subdomain such as *engineering.examplebroadcaster.com* to another DNS server.

This allows small organizations to control DNS for an entire organization in one place. It also allows larger organizations to distribute control of subdomains on a departmental or other level. Only one DNS server is allowed to be authoritative for any given domain.

By giving control of domains on the Internet to many different DNS servers, the information is distributed throughout the Internet. DNS has become an Internet mission-critical system. Backup DNS servers automatically track changes made to the primary servers.

BIND servers

The Berkeley Internet Name Domain (BIND) is a DNS server commonly used on the Internet. In BIND, DNS servers are designated

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as master servers if they are authoritative for their zone. They are designated slave servers if they are backup servers for a zone. Once a server has been configured as a slave, and once the master has been made aware of the existence of the slave, any changes made to the master DNS server will automatically be sent to the backup. If the master DNS goes down, the client trying to resolve the domain name will automatically check with the backup to get the IP address for the domain. If everything works properly, and it almost always does, you will never know the master is down.

If these servers are located all over the Internet, does this mean that every time someone types *cartoon network.com* into an Internet browser, the authoritative DNS server for this domain has to answer? Once local DNS servers have gone to the authoritative server for a domain, the results are saved locally. When another client asks the DNS server to perform a lookup, it uses its local cache rather than performing another search on the Internet. This reduces the load DNS places on the Internet.

Root servers

By now, some of you may have spotted a problem with this system. What if you do not know the authoritative DNS server for *cartoonnetwork.com*? How do you find the DNS server and get the IP address you need?

When you configure your computer to operate on a network using TCP/IP, you will need to enter the address of the local DNS server. Or if you are using Dynamic Host Configuration Protocol (DHCP), information about your local DNS server is automatically provided to your computer. This nearby DNS server knows about domains under its control, but how does it find out about domains it does not control?

If you ask your local DNS server for the IP address of *cartoonnetwork.com*, assuming the DNS server is not authoritative for that domain, it begins by sending a query to other DNS servers upstream from it. With this particular domain, the query will probably not have to go far before it finds a name server that has the information in its cache, because *cartoonnetwork.com* is quite popular. But if the domain information is not cached somewhere, the query will work its way up to the top level Internet domain name servers, sometimes known as root DNS servers.

Because the root servers are authoritative for every domain under their control, the DNS server that is authoritative for the "." (root) domain may not know about *cartoonnetwork.com*, but it will know which server is authoritative for the ".com" domain, because it has been configured to delegate the ".com" zone to that server.

Once the query reaches the root servers, it is then sent back down the tree to the appropriate server responsible for that zone. The ".com" server knows which server is authoritative for *cartoonnetwork.com* because it has delegated control of that zone to that DNS server. It asks the server for the IP address, and the authoritative server gives the answer.

The answer is then relayed to the server that originated the query. Now the local DNS server knows the answer, but so do all the servers along the way. If someone else asks the same question, it can be answered without having to go back to the authoritative server because the answer has been cached locally. We can easily experiment with this. Figure 2 is the result of a `dig` command from one of my FreeBSD servers.

From Figure 2, you can see that my DNS server passed a question to my local DNS server at 205.152.0.5 and received an answer (64.236.29.72) from *twdns-01.ns.aol.com*. Actually, you might notice that I got two answers. It appears that *cartoonnetwork.com* has two valid IP addresses.

```
$ dig cartoonnetwork.com

; <<>> DiG 9.3.2 <<>> cartoonnetwork.com
;; Got answer:
;; QUESTION SECTION:
; cartoonnetwork.com.          IN A

;; ANSWER SECTION:
cartoonnetwork.com.   300 IN A  64.236.29.72
cartoonnetwork.com.   300 IN A  64.236.22.72

;; AUTHORITY SECTION:
cartoonnetwork.com.   900 IN NS twdns-04.ns.aol.
com.
;; SERVER: 205.152.0.5#53(205.152.0.5)
$
```

Figure 2. This output of a DNS query shows that *cartoonnetwork.com* has two servers on the Internet.

Conclusion

Experiment with this on your computer. If you have a UNIX-type machine, use either `dig` or `nslookup`. If you have a Windows machine, use `nslookup`.

You may be surprised to know that after all this, many routers do not use IP addresses, but instead use MAC addresses to properly route packets to their destination. I'll discuss more about this topic next month. BE

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

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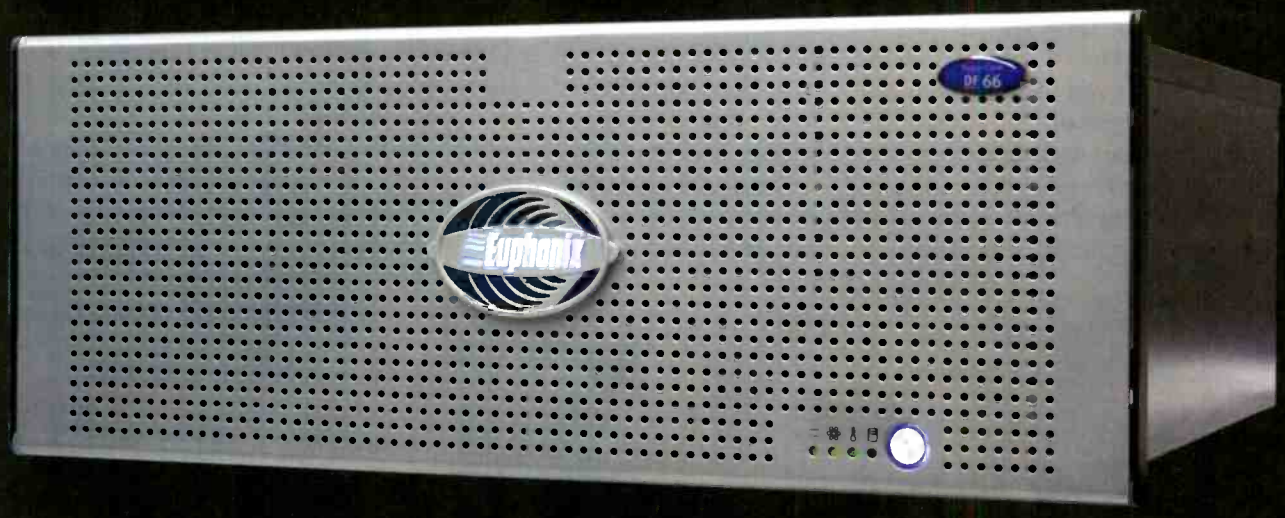

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digital emotion

Mics in a digital world

There's a lot of analog in digital mics.

BY EDDY B. BRIXEN

Digital equipment is working its way into all corners of the broadcast facility. Even the loudspeakers are digitally controlled to some extent. However, the vast majority of microphones are basically still analog. Furthermore, the marketplace is loaded with new microphone brands presenting vintage designs. Has modern technology nothing to offer when it comes to microphones? The answer: Of course it has. However, it seems like broadcasters and others in the pro-audio field are reluctant to implement these technologies.

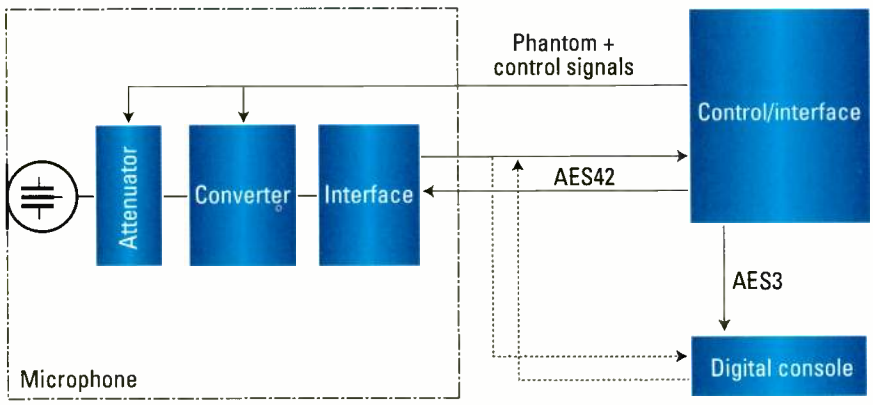

Figure 1. Schematics of a digital microphone that conforms to AES42

What makes a mic digital?

The microphone is a transducer. Analog microphones have two basic parts. The first is the membrane that vibrates in accordance with the surrounding sound field. The second is the power plant that transforms the vibrations of the membrane to electricity, basically a voltage.

If we convert the output of the microphone to digital code, we may call it a digital microphone. It is just a question of how close to the membrane we can place the analog-to-digital conversion.

It should be mentioned that digital semiconductor microphone elements that produce digital code directly do exist. However, the sonic qualities of these products are not yet sufficient for high-quality audio production.

The digital microphones made for pro audio in general have a condenser capsule followed by the least possible amount of analog circuitry. In major designs, an attenuator is introduced as an important interstage before the A/D conversion. It is there to optimize the dynamic range of the membrane system to that of the digital system.

Interface

Today, two different interfaces are used with digital output from microphones. The first is AES42, which covers digital microphones connected to digital audio input. (See Figure 1.) The second is the USB interface, which is regarded as a device connected to a computer. The USB connection is not really a microphone-related standard as there is no common agreement on interpretation of signaled values. These are defined by the individual manufacturer.

The standard

The Standards Committee of the AES has an active working group that prepared the AES42 first published in 2001. The latest version is from 2006. This standard describes an extension of the existing digital interface AES3 (formerly known as AES/EBU) to provide a digital interface for microphones. The major features — besides the audio transfer — are microphone signaling and remote control functions.

In the receiving end, it is possible to get information that identifies the microphone, the actual settings and so on. Also it is possible to remotely control the microphone. The typical options here include gain settings, directivity pattern and low cut. Synchronization is another issue of great importance also addressed within the AES3. Two modes are possible, the master being either the transmitter or the receiver.

The connection involves a combination of the standard AES3 and the phantom-powered microphone connection. A DC supply for the microphone and the electronics is needed. The DC is modulated, providing the controlling of the microphone. A standard XLR is mandatory. A special XLD connector is described for the use with digital microphones in order to prevent connection errors.

What is the advantage?

Remote control of microphones is nothing new. It has been done for more than 50 years. So what are the advantages of this technology from the broadcast perspective?

First, the degradation of the (analog) signal is not related to the cabling. Line losses will not directly influence the signal.

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The optimization of the dynamic range is an obvious advantage. Remember that the dynamic range of a high-quality microphone basically is larger than what is obtainable with most A/D converters. The use of digital signal processing can improve the microphone and enlarge the scope of application.

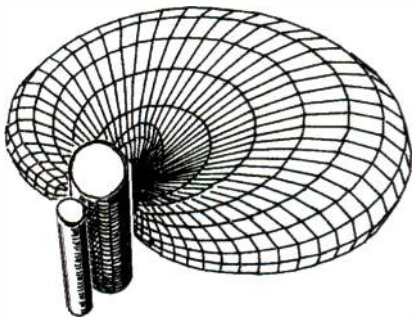

Figure 2. Directivity pattern of an array microphone with digital signal processing

The automation routines offer a major advantage in that they make it possible to add microphone settings to the scene memory of the console. Of course, there is no physical positioning involved. But still it makes large-scale live setups faster to operate when the optimization of the microphone signals is a part of the automation.

On the negative side, high-quality digital microphones are few and expensive. Besides, only a small number of mixing consoles offer input for digital microphones. These facts are the major reasons for the relatively limited distribution.

Digitally processed signals

A group of microphones regarded as digital does in principle have an analog output but involve a certain amount of DSP. These microphones are already widely in use.

For example, in array microphones, more capsules are built into one microphone housing. By processing the multiple signals, interesting features can be obtained, including direction steering and directivity control of a much higher order than known from any single or double capsule microphone. (See Figure 2.) Other possibilities are wind noise reduction and automatic sound source tracking. Much effort is put into the research of a specific area, especially for sports broadcast.

Another group of microphones involving more or less digital processing is for surround sound production. Surround sound is a major issue in digital broadcast, especially for the car industry, with its increasing number of vehicles installed with 5.1 systems.

Future of analog mics

There is a future for analog microphones. And there is a future in the manufacturing of good input stages, preamps, optimized for the different designs in order to get the preferred sound. The output of these devices might eventually be converted into digital streams.

The sound of the voice and the traditional musical instruments are still analog. The perception of sound is far from the digital domain.

However, money is also an issue here. It is a question of cost vs. benefit. We must realize that if there had been no use of business computers, digital audio would not have reached the dominating position we know today.

Concerning microphones, too much hardware is required to make the digital ones prized equal to the analog. We will pick our microphones — digital or analog — depending on the application and sound quality. Now and then we also look at the pricing. BE

Eddy B. Brixen is a consultant of EBB-consult of Denmark.

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The Miami HEAT SCORES

with a shared storage environment

BY BILL BUHRO

To improve pre- and post-production workflow and efficiency for broadcast and media production, the National Basketball Association (NBA) 2006 World Champion Miami HEAT wanted to upgrade its tape-based ingest environment to a scalable content management solution. It decided more than a year ago that it needed to expand storage and expand its nonlinear workstations from three to five.

At the same time, NBA Entertainment, which produces NBA TV, was implementing the No. 1 high-tech powerhouse in the world of sports content management in its Secaucus, NJ, headquarters. NBA Entertainment had contracted SGI Professional Services to help design an SGI InfiniteStorage production and archive solution enabling NBA broadcast engineers to catalog and store all the action from every NBA game as it occurred. After touring the massive system at NBA Entertainment, Ed Filomia, senior director of broadcast services for The HEAT Group, felt it provided all the functionality they would require.

The Miami HEAT contracted SGI to design a similar, much smaller bundled system that could fit in one

Functioning as a mini post house for the 2006 World Champion Miami HEAT, The HEAT Group ugraded to an SGI InfiniteStorage NAS 2000 system where content is digitized once and then immediately available to everyone.

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rack and provide ingest, storage, editing and archive of game footage. The team also wanted to eliminate the duplication of digitizing media, specifically the time that it took to copy media from nonlinear station to nonlinear station. The SGI InfiniteStorage NAS system now allows all five editors to share the same video content.

Housed atop the AmericanAirlines Arena in downtown Miami, where all home games are played, the media production department functions as an in-house post-production studio for the team's marketing department. The rotating staff of 15 producer-editors uses the SGI NAS system — approximately 16 hours a day, in season — to create content for HEATV, an in-arena network that broadcasts to 20,000 basketball fans every game night. The media production department also produces content for NBA TV, seen nationally, as well as SunSports, the exclusive regional TV partner of the Miami HEAT (available via cable and satellite in the south Florida market). That content is used in pre-game shows, half-time shows and within the on-air broadcast.

Design team

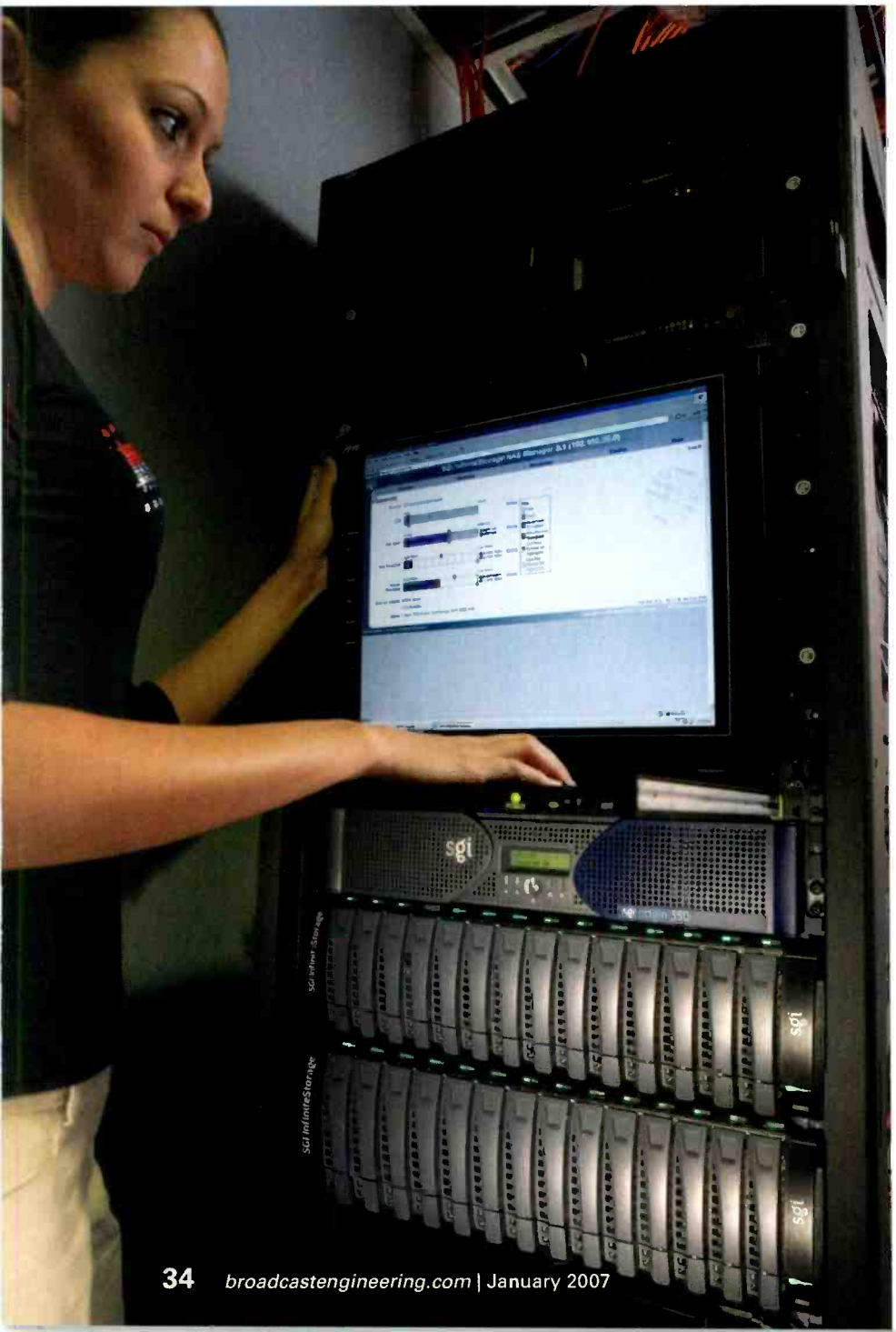
The HEAT Group
- Ed Filomia, senior director of broadcast services
- Dave Vickery, head engineer
- Alex Rojas, director of IT
- Matt Shedenhelm, director of media production

SGI
- Bill Buhro, media solutions architect, SGI Professional Services
- Chris Walker, project manager, SGI Professional Services
- Ron Short, solutions architect
- Carlos Iglesias, SSE

The team produces 70 broadcasts on SunSports. In addition, it produces a half-hour exposé-type program, "Inside the HEAT." HEATV content is also streamed to www.HEAT.com. All types of corporate presentations and sales presentations for big sponsors are produced by the mini post house, in addition to promotions to boost ticket sales for the numerous events that come to the AmericanAirlines Arena during NBA off-season, from Shakira to U2.

A NAS environment

The media production department purchased an 8TB SGI InfiniteStorage NAS 2000 system to create a turnkey NAS environment for its five Avid Liquid editing stations and two graphics workstations (one PC and



The 8TB SGI InfiniteStorage NAS 2000 system creates one centralized shared environment for encoders, asset management software, Avid nonlinear editors, read-only graphics workstations and older storage.

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one Macintosh) running Adobe Photoshop and Adobe After Effects.

By building a new GigE network, SGI Professional Services integrated the encoders, asset management software, Avid nonlinear editing workstations and read-only graphics workstations, plus older storage, to create one centralized, shared environment. Performance tuning was done on the system and NLEs as well as the server system to optimize the performance, enabling all the machines to operate at the same time without any conflicts on the system.

The HEAT's Alex Rojas, director of IT, worked with SGI to configure the system from a networking point of view so the right people had access to the right things to enhance system security. When high-speed GigE was suggested to connect the editing systems (on two different floors), the servers and the arena screens, Rojas was skeptical that video files could be moved across Ethernet quickly enough. After some tweaking to get the maximum performance, get the system on the corporate firewall and give SGI access to it for troubleshooting, Rojas was surprised to see that speedy delivery was accomplished.

Technology at work

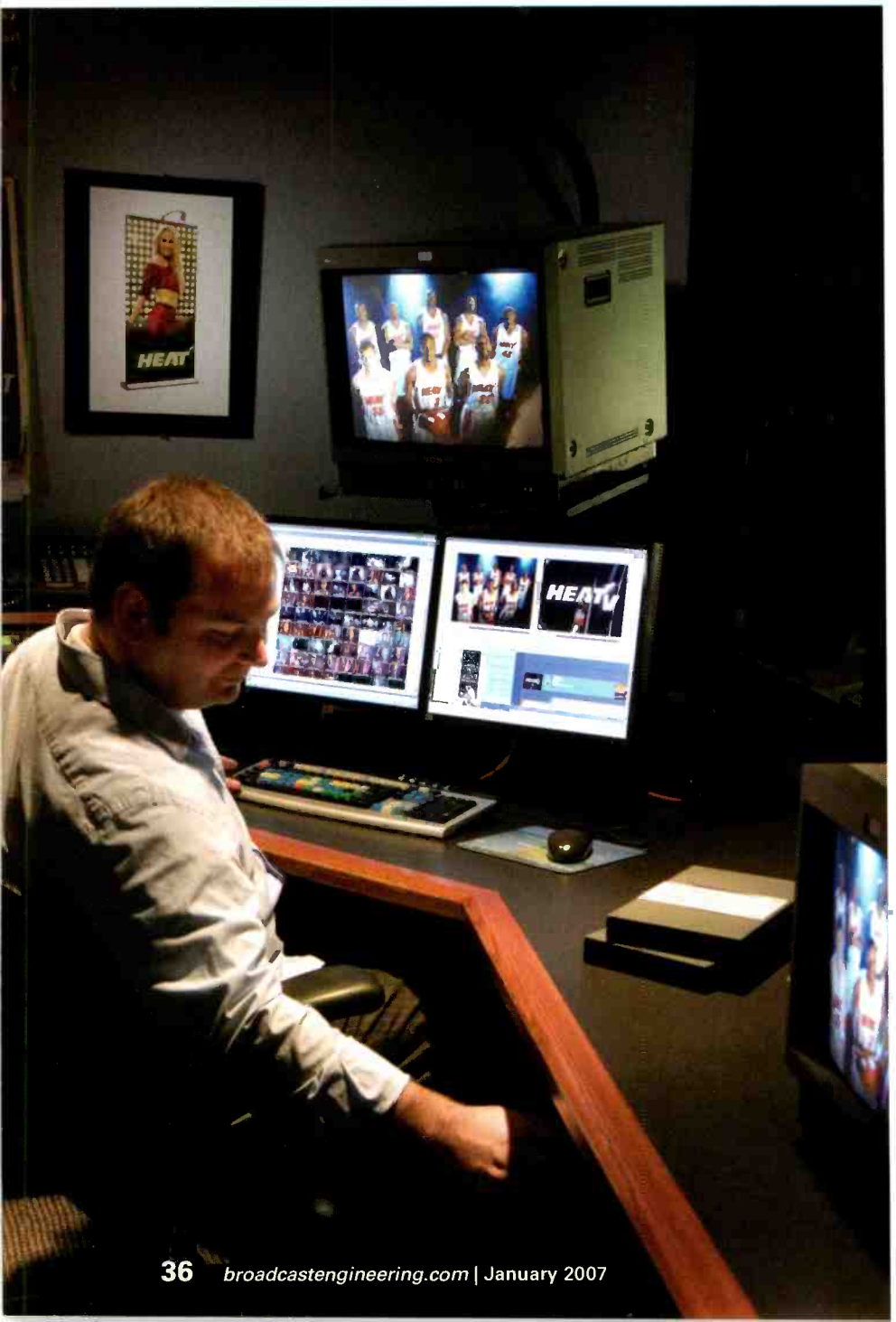
Avid Liquid nonlinear editors
SGI InfiniteStorage NAS 2000

The NAS system was up and running in the middle of last year's season. Matt Shedenhelm, director of the HEAT media production department, who also functions as the lead producer/editor/photographer, faced some serious growing pains in the department, between the recently installed latest version of software for the Avid NLEs and working closely with SGI to tweak and maximize the efficiency of the system.

As the new season gets under way, Rojas and Shedenhelm both agree that working in a shared storage environment, where content is digitized once and then immediately accessible as context-specific data to all, allows producer-editors to put more time into the actual creation of a promo, graphic, program or marketing piece. Creating a workflow where media gets digitized to a central storage provides the tools needed to produce all the different presentations for the different mediums, and has significantly improved the workflow and the efficiency of producer-editors.

The near future

While the 8TB SGI InfiniteStor-



The HEAT Group's 15 rotating producers create content on the SGI NAS system approximately 16 hours a day, in season, for many outlets, including pre-game shows, half-time shows and within the on-air broadcast.

age system suffices to take the media production department through the season — and that's mainly for the highlights, with up to eight different camera angles per highlight — the team also chose the scalable SGI NAS system because it's plug-and-play. If the team wants to upgrade, it can simply buy another chassis, populate the array and have additional storage, especially for archiving.

Currently, some of the HEAT games are being shot in HD, and Sun-Sports is broadcasting several games in HD this season. So, the media production team will begin migrating to HD soon.

Another major factor in its decision to tap SGI was to make sure that the team's architecture was compatible and would have interoperability with the NBA Entertainment system so the HEAT could share content with the NBA system and vice versa. SGI Professional Services set up the team's system so it could share content in the future, when the NBA Entertainment system was ready to deliver content to any team organization.

Working in a shared storage environment allows producer-editors to put more time into the actual creation of a promo, graphic, program or marketing piece.

NBA Entertainment intends to provide that capability from its SGI-designed digital media management system to the video production facilities of the different NBA teams, so an Internet browser can look at and select content in the NBA archive for use in a local team's video production. Essentially, an editor will go in to the Internet browser, and search and select content on the NBA archive system. This will generate an order in the system. From that order, selected video pieces that the team wants will be delivered to an FTP server that can be accessed by the teams' systems, and then the team will be able to download those video clips and drop them directly into its central work environment.

The Miami HEAT is the first NBA team to upgrade its video production to digital asset management; other teams are expected to soon follow suit. BE

Bill Buhro is a media solutions architect for SGI Professional Services.

Storage management

It may take losing it all before the industry demands more powerful backup tools.

BY STEVE ATKINSON

As videotape gradually disappears from the broadcast plant, digital storage becomes more important. In most cases, this is a combination of spinning disk and removable media, either data tape or DVD. With that comes the management of material as it moves from video server, to nearline, to archive and back again. The software products that perform this function are generally called hierarchical storage management (HSM) systems. However, this is actually a misnomer, as HSM refers to a specific type of storage management rather than a product category.

HSM is often used as a catchall term for storage management. Storage management really consists of four broad subcategories of products, each of which has advantages and disadvantages as it applies to on-air, production and news environments. Specifically, the subcategories are: shared file systems, HSM systems, disk extenders and data movers.

Shared file systems

Shared file systems were developed in response to the introduction of storage area network (SAN) systems into a heterogeneous computer environment. In the IT world, SANs allow disparate operating systems to share files seamlessly, enabling common storage to be used for multiple applications and computer types. This does not necessarily translate to a broadcast workflow, where video file formats and real-time processing require a closed environment. Shared file systems are more reasonable to implement in either a homogenous (i.e. single vendor) or a production environment with less of a real-time requirement.

Shared file systems offer several advantages over discrete storage. First, it allows file sharing between different applications. This is particularly important in a production environment where one set of applications may be used for effects and another set for finishing. Rather than cutting a tape to move material, the material is passed as a file.

Second, bandwidth is greatly enhanced for the applications sharing files. Instead of moving files across a network, the material appears as direct attached storage to the application.

Third, redundant file storage is eliminated. This practice allows files to be stored just once. This is often used in multichannel facilities that share spots, where two servers may need the same file at different times to share program material between networks.

Finally, file (i.e. media) management is greatly simplified when the material is stored in one place. If material needs to be purged, there is one place (possibly two if a backup is employed) to go to administer this function.

Shared file systems are no panacea, however. There are no common file-sharing constructs within broadcast, although MXF holds much promise. MXF is a great tool, but it is only a descriptive wrapper and does not guarantee common essence implementations between applications. Given that these hurdles can and will be overcome, a secondary issue is control. Sharing of files begs the question of who moves material from production to on-air and under what conditions.

HSM systems

HSM systems are designed to migrate material between different levels of storage based on rules defined by the user. This presents storage as a single unit to the application but is, in fact, a hierarchy of storage moving from high-performance, high-cost media to progressively more inexpensive and remote media storage. The HSM software tracks files wherever they are in the hierarchy. (See Figure 1 on page 40.)

FRAME GRAB

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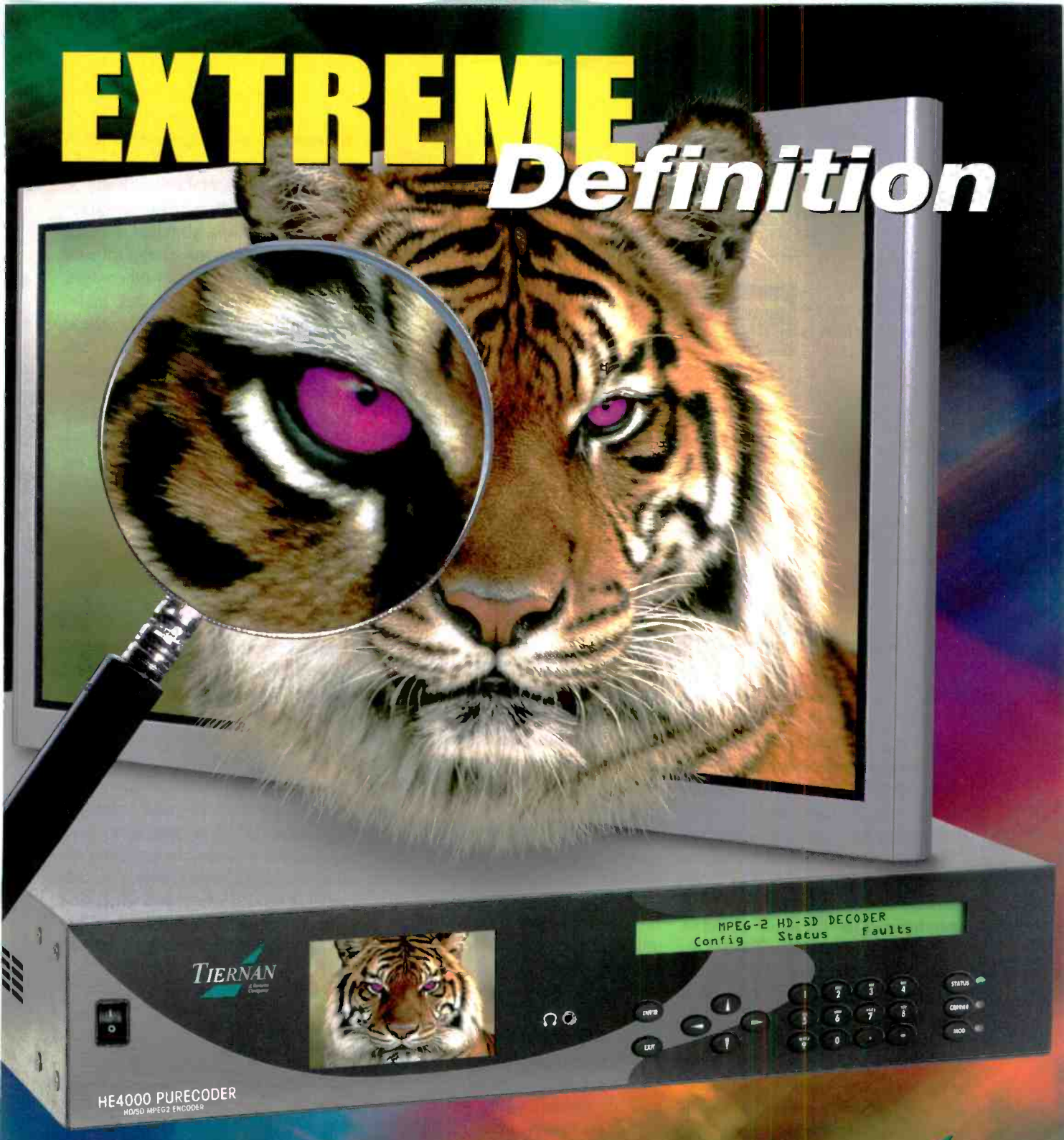
LCD and plasma TV sales increased in 2006
Forty-eight percent of TVs sold in 2006 were LCDs

Television unit share and average price

Television type	Unit share 2005	Unit share 2006	Average price 2005	Average price 2006
LCD	26.30%	48.80%	$599	$558
Projection	7.80%	7%	$1598	$1291
Plasma	5.20%	10.10%	$2139	$1451
Tube	46.40%	21%	$189	$165
TV combos	11.20%	13%	$213	$167

Source: NDP Group www.ndp.com

EXTREME Definition



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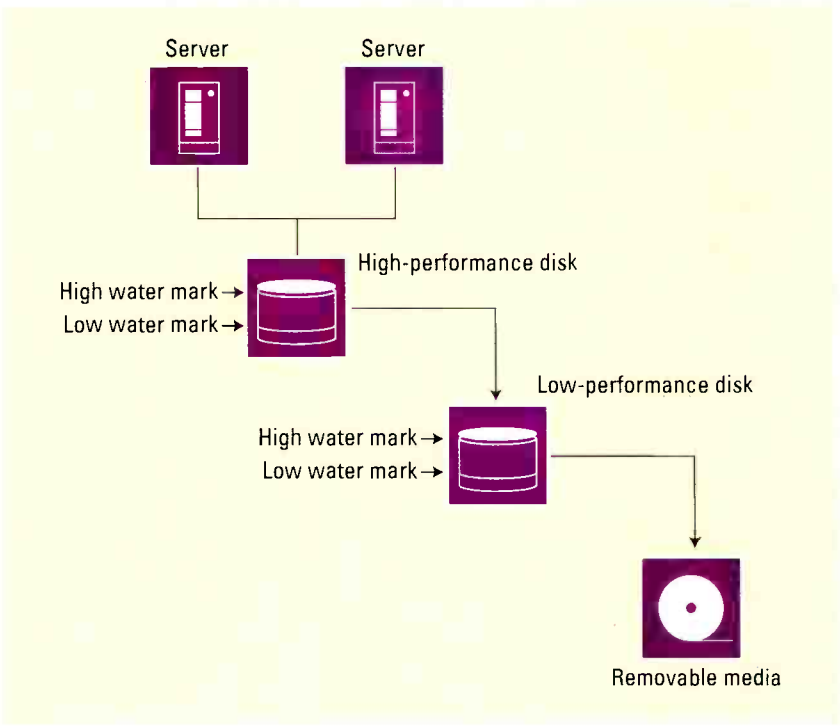

Figure 1. A typical HSM architecture. Figures courtesy of ADIC.

The most common migration rule in the IT world is called "least used." As the name implies, the files that have been used the least — or not at all — in a user-set time period are candidates for migration to a lower level of storage. Reverse migration also may be applied.

In business, information becomes less relevant over time. And to a certain extent, HSM storage mirrors news operations in the relevancy of stories over time. However, it has limited relation to on-air operations, because previous use of a program or spot may or may not have any relevancy to when that material will be needed again.

If we look at the on-air video server as the top of the hierarchy and removable media as the bottom, a broadcaster does not want the spot scheduled to play in five minutes migrated to removable media. The movement of media needs to be more explicit.

Disk extenders

Disk extenders operate under the premise of making removable media look like a part of the spinning disk system. A disk subsystem in the front end provides the first level cache. The disk extender keeps a "stub" of the file on disk and moves the majority of the file off to cheaper removable media. To applications, the robotic system appears as a letter drive with all files stored on the same disk. When an application requests a file, the data blocks on removable media are restored to the cache and then transferred to the application. Figure 2 illustrates the data flow.

The migration associated with a disk extender product is initiated by a high watermark. The concept is similar to HSM. The difference is in implementation. HSM systems are usually used in self-contained systems. Disk extenders often integrate with third-party applications.

The biggest problem with disk extenders is that they treat the removable media robot as a giant disk, which means that media cannot be removed from the library. It also means that if a video file is larger than a single piece of media, it cannot span to a second piece of media and, therefore, cannot be archived.

Another drawback is latency on restoring video clips. Migrated material with HSM or data mover applications is restored directly back to the target. With disk extenders, however, material is migrated from the disk cache to removable media, so the restore path is back to the disk cache instead of back to the target requested by the application. This means that the video file must be restored to the disk cache before being transferred back to the local storage on the application server (on-air or editing server).

Data movers

Data movers operate as explicit migration tools. In other words, data movers wait to move files from one level to another until they are told to do so by a controlling application. Controlling applications include automation, editing and asset management. (See Figure 3 on page 42.)

Explicit migration of video files is in line with common operations within a broadcast plant that tend to be synchronous. Whether the controlling application is automation or news editing, the application knows what material is needed where and when, and can control where the file needs to be.

A typical operation on the part of

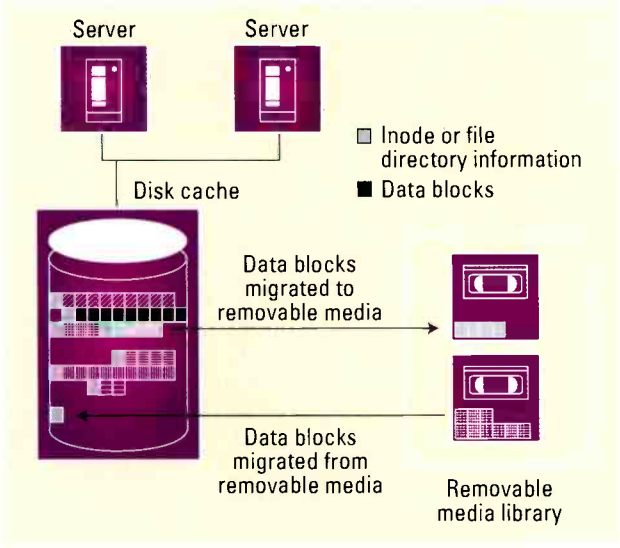

Figure 2. Data block migration as part of a disk extender

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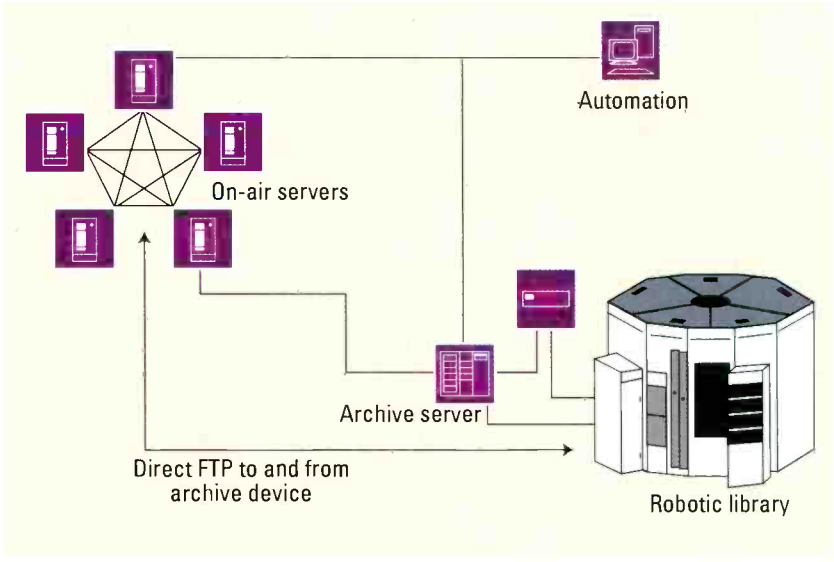

Figure 3. A typical data mover architecture

the controlling application would be to move a video clip from a video server to an archive through the data mover API. File movement can be between different levels of storage or storage locations of the same type.

The advantages to data movers are also the disadvantages. The movement of data is explicit, and data movers have no inherent intelligence in moving data around to the correct location. For that reason, data mover providers are incorporating more HSM-type functionality into their products.

A standard feature of data movers is the ability to offer multiple levels of storage as a single entity to the application, with rules based on migration. However, migration rules for broadcast go beyond the concept of least used. They can include migration based on time as well as type of file and targets to include levels of storage and other equipment, such as transcoders.

One other point to note about data movers is that they are specific to their industries — in this case, broadcast video. Data movers work well with the automation, video server and editing systems in the market, which have specific interfaces. Broadcasters need the storage software to work in their environment and also have companies that are responsive to their needs. This means that the install base is of hundreds rather than thousands. This makes the data mover application more expensive because the development and marketing costs are spread over a smaller customer base.

In the future, the standard architecture will be a data mover/HSM hybrid offering the best elements of both approaches. And data mover providers have made significant progress in providing the migration tools needed to effectively manage storage. But there is more to be done. Common file formats will help make shared storage for all departments easier to implement.

Backing up

Disturbingly, backup strategies are rarely considered from a data management standpoint within the broadcast community. Broadcasters' healthy paranoia which cause them to duplicate almost everything has not been applied to media files themselves. Inevitably, it will take someone losing everything before the industry as a whole recognizes this as an issue and demands better tools. BE

Steve Atkinson is vice president of sales for SGL.

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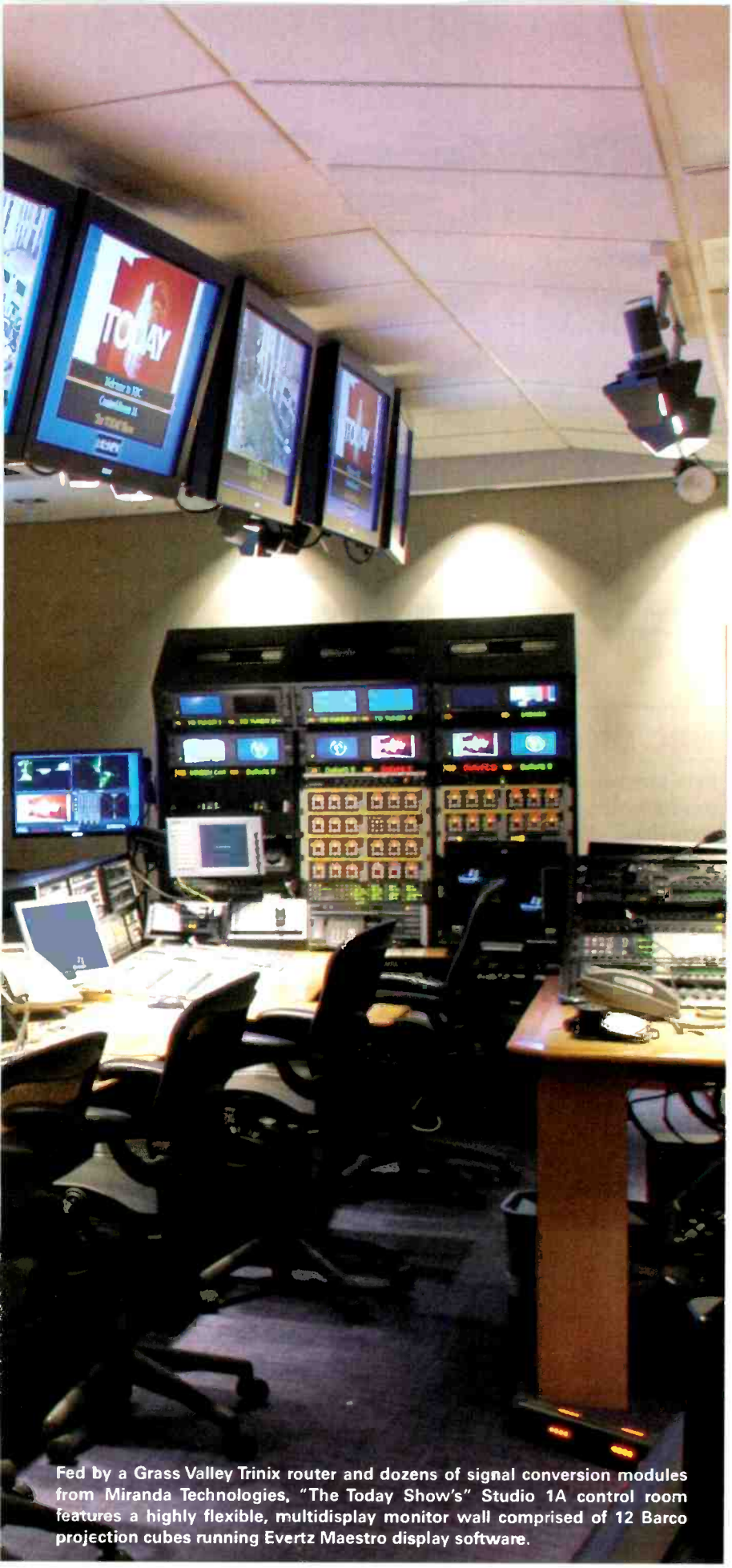

Fed by a Grass Valley Trinix router and dozens of signal conversion modules from Miranda Technologies, "The Today Show's" Studio 1A control room features a highly flexible, multidisplay monitor wall comprised of 12 Barco projection cubes running Evertz Maestro display software.

NBC builds its network HD facilities for "Today" and tomorrow

BY MICHAEL GROTTICELLI

NBC's "The Today Show" has produced many technical milestones in its 50-year history. The latest was the move to high-definition broadcasting, with its spectacular images and multichannel sound. For the network's systems engineering department, this monumental move required a sophisticated technical backbone that's equally impressive.

The news set features Sony HDC-1500 HD cameras and variable lighting to present segments in a variety of colors.

The main control room's Sony MVS-8000 HD production switcher is used for a variety of multilayered effects during the live show and also for pretaped segments.

The strategy

Two years ago, NBC began rebuilding the entire infrastructure at the network's New York City headquarters. The company took a three-step approach for its massive transition to broadcasting the 1080i HD format. In 2005, it embarked on converting the studios for "Saturday Night Live" and "Late Night with Conan O'Brien," as well as building an edit system to support the shows.

This year, the second step included installing new multiformat equipment and cabling, and a massive 1024 x 1024 I/O video router that handles all of the signals and file formats necessary to broadcast the various programs. The flexible infrastructure enabled the network's flagship local station WNBC-DT, which is produced in the same building, to broadcast all of its content in HD as well.

Part of step three — which will complete the migration of the NBC network to HD — was the conversion of "Today." The aggressive timelines were necessary to ensure a solid base for the future.

The network's strategy was to create a flexible environment that could be used for a variety of programs with studios and control rooms — and even adjacent buildings — securely

NBC UNIVERSAL STAFF

Dave Lazecko, director of studio systems
Jim Starzynski, principal engineer, advanced technology
Larry Thaler, vice president, engineering
Keith Barbaria, "The Today Show" technical manager

KEY TECHNOLOGY

Apple Macs with Final Cut Pro software
Avid Technology
- Deko graphics
- Media Composer Adrenaline NLE
- Unity storage solution

Barco mDR50-DL projection cubes
Calrec
- Alpha console
- Sigma digital audio console

Daktronics 3mm and 4mm LED panels
Digidesign ICON console with D-Control
Dolby DP564 surround decoders
Evertz Maestro virtual monitor software
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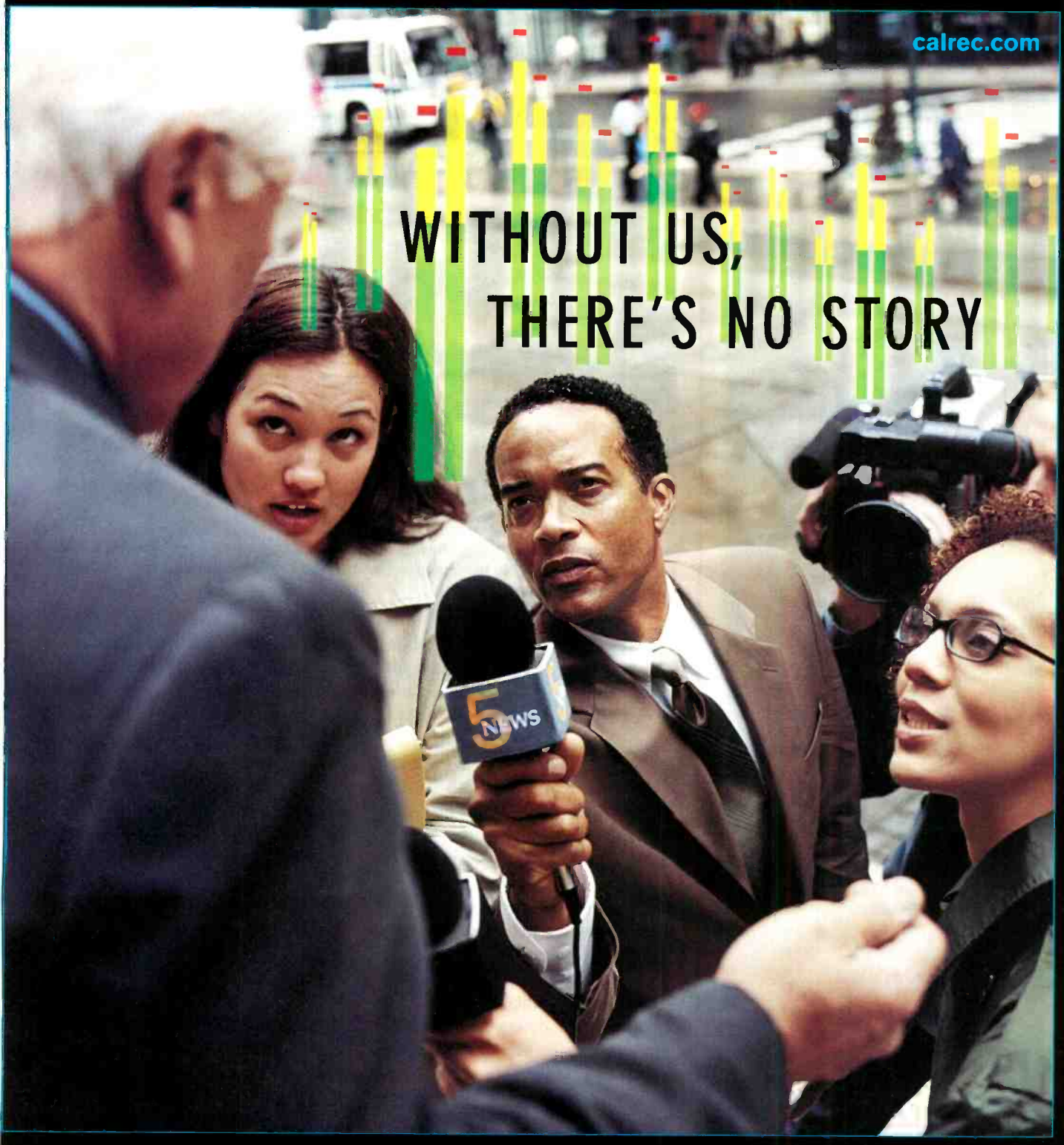
Grass Valley Trinix HD router
Linear Acoustic upMAX channel surround-field synthesizer
Miranda Technologies XVP-811i signal conversion gear
M&K 5.1 speakers
Pro Tools plug-ins
Sony
- HDC-1500 HD studio cameras
- HDLA-1500W camera sled
- FWD32LX1/B 32in and FWD40LX1/B 40in LCD monitors
- MVS-8000 HD production switcher



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Putting Sound in the Picture

A Calrec Sigma digital audio console (with Bluefin DSP technology) is used in the network's new 2K audio control room, which feeds taped segments to "The Today Show's" Studio 1A.

connected with GigE fiber cabling and network connectivity. Any production area in the building can now be set up and reconfigured quickly. For example, Studio 1A is located at 10 Rockefeller Plaza, across the street from the network's 30 Rock main broadcast facility, but the equipment for "Today" is seamlessly tied in.

The ability to broadcast live HD signals was a key component of the project, but the main goal was to allow all of the network's programs originating out of 30 Rock to be interconnected and share technology resources when required. The equipment is designed to support every show, whether it's news, entertainment or sports. For example, a reporter working on a late-breaking story can broadcast live in HD from anywhere in the building.

The design philosophies and business decisions regarding technology were based on the versatility of the systems and how they meet the needs of all of the shows NBC produces in New York City. This includes both SD and HD programs, which can coexist on the same servers and routers deployed.

The NBC engineering team developed and installed an intelligent tie line management system between the building's separate SD and HD infrastructures so producers, editors and engineers can share signals and switch between the two resolutions when necessary. SD had to be accommodated because NBC's news and other departments will gather, create and broadcast content in SD for quite some time.

HD in stages

HD signals within the building are transferred as uncompressed 1.45Gb/s baseband video files, which helps maintain a high signal quality. Some floor monitoring feeds are multiplexed together.

Live remotes coming into "Today" are brought in as SD signals and then upconverted to HD in a 4:3 aspect ratio before being switched into the live program. Likewise, signals coming into the control room (complete with a Sony MVS-8000 multiformat HD switcher and a virtual monitor wall supported by Evertz Maestro display software and 12 Barco projection cubes) are upconverted prior to being inserted into a program.

Once the live signal leaves the control room, the show is delivered in SD and HD to affiliates and O&O

stations in each time zone.

Product engineers from Miranda Technologies worked with NBC to develop and implement a set of aspect ratio format descriptors (SMPTE 2016 Trial Publication) to make the process transparent. A Grass Valley Trinix router communicates with all of the production rooms in the building, and — using a tie line system and more than 1000 Miranda processing cards — signals are automatically converted in the background. Now, as operators work with SD and HD sources, there's no need to worry about aspect ratio or image quality.

Set the stage

A new set was built for "Today" in about six months. It provides a wider look that includes Daktronics LED panels displaying native HD graphics. Variable lighting presents segments in a variety of colors.

The physical move was one of the more challenging aspects of the switch to HD. The cast and crew moved four times between different outside sets (some from the Athens and Torino Olympics telecasts) while construction was completed. The TV audience never noticed a disruption.

With the new HD infrastructure, anything is possible. A second production studio, used for special segments, is located directly above the main studio. It has been reconfigured from existing guest room space and is seamlessly tied into a single overall production system. This enables operators in one control room to access equipment installed in the other.

Using new HD protocols, camera operators working with Sony HDC-1500 HD studio cameras shoot for 4:3 audiences while framing all of the action for HD viewers. The show employs 12 Sony HD cameras in all, six in the main studio and six for ENG shooting. The number of handhelds required fluctuates, so NBC uses special Sony HDLA-1500W camera sleds that allow the cameras to be changed from studio to handheld use quickly and easily.

"Today" shares edit suites located inside the building's digital production center. Facilities are spread between the news, sports and entertainment divisions and include Avid Technology and Apple nonlinear editing systems, EVS HD servers used as playback devices, and graphics and CG systems from Avid.

Going live with HD

The network's mobile and online divisions also receive the SD and HD feeds, from which they produce custom content. The signal is uplinked live from the 30 Rock location to affiliates across the country. Terrestrial WNBC-DT and analog audiences receive their RF signal from an antenna on top of the Empire State Building. Redundant SD and HD transmission facilities are located there, along with Thales digital and Larcan analog transmitters.

The video servers employ a time delay for the different time zones, giving the network the ability to update the Central, Mountain and Pacific times after the East Coast feed has been broadcast in the event of late-breaking news.

Storage is also a concern when producing and broadcasting in HD. NBC uses Avid Unity systems with multiple terabytes of capacity for archival.

A sound plan from the start

When the decision was made to transition "Today" to HD, there was no question that the audio accompanying the 1080i pictures would be in 5.1 channel surround sound.

The challenge was moving the show's sound from its current stereo broadcast. The network carefully considered the differences between the sound of talent in the studio and the live concert series, which is broadcast from outside on the plaza or from inside Studio 1A.

All of "Today's" audio is broadcast in 5.1, including the concert series and studio segments that are mixed discretely for surround. Content originally produced in stereo is processed for 5.1 and integrates seamlessly with other show elements.

A Calrec Sigma digital audio console (with Bluefin DSP technology) has been installed in the new 2K audio control room, which feeds taped segments to Studio 1A. The console

There was no question that the audio accompanying the 1080i pictures would be in 5.1.

at 30 Rock is connected — via a Calrec Hydra system — to a multichannel input on a Calrec Alpha 100 console for Studio 1A. Stereo segments are imported via a Linear Acoustic upMAX or a Dolby DP564 box.

On any given morning, once "Today" is finished taping, technicians can go in and quickly reconfigure the main studio to produce a show that looks and operates differently, such a news show or a sports special.

The Alpha console creates the main 5.1 broadcast mix. The console also handles live studio and plaza mics for talent and the crowd, commercial playback in stereo or 5.1, and the multichannel audio from the brand new music room. A 48-channel Digidesign D-Control console produces the surround music mixes of the concert series.

A Dolby LM-100 system fed from the Alpha's center channel assures an accurate dialog level, while several M&K 5.1 speaker systems with bass management provide accurate monitoring in both the broadcast and music mix rooms. A 96-channel Pro Tools system rounds out the show's mixing and recording facility.

The six-channel program output on a Calrec Alpha audio console merges audio signals with the HD video and metadata via Miranda processing equipment, where a downconverted and downmixed feed is made for SD.

A solid foundation for "Today" and tomorrow

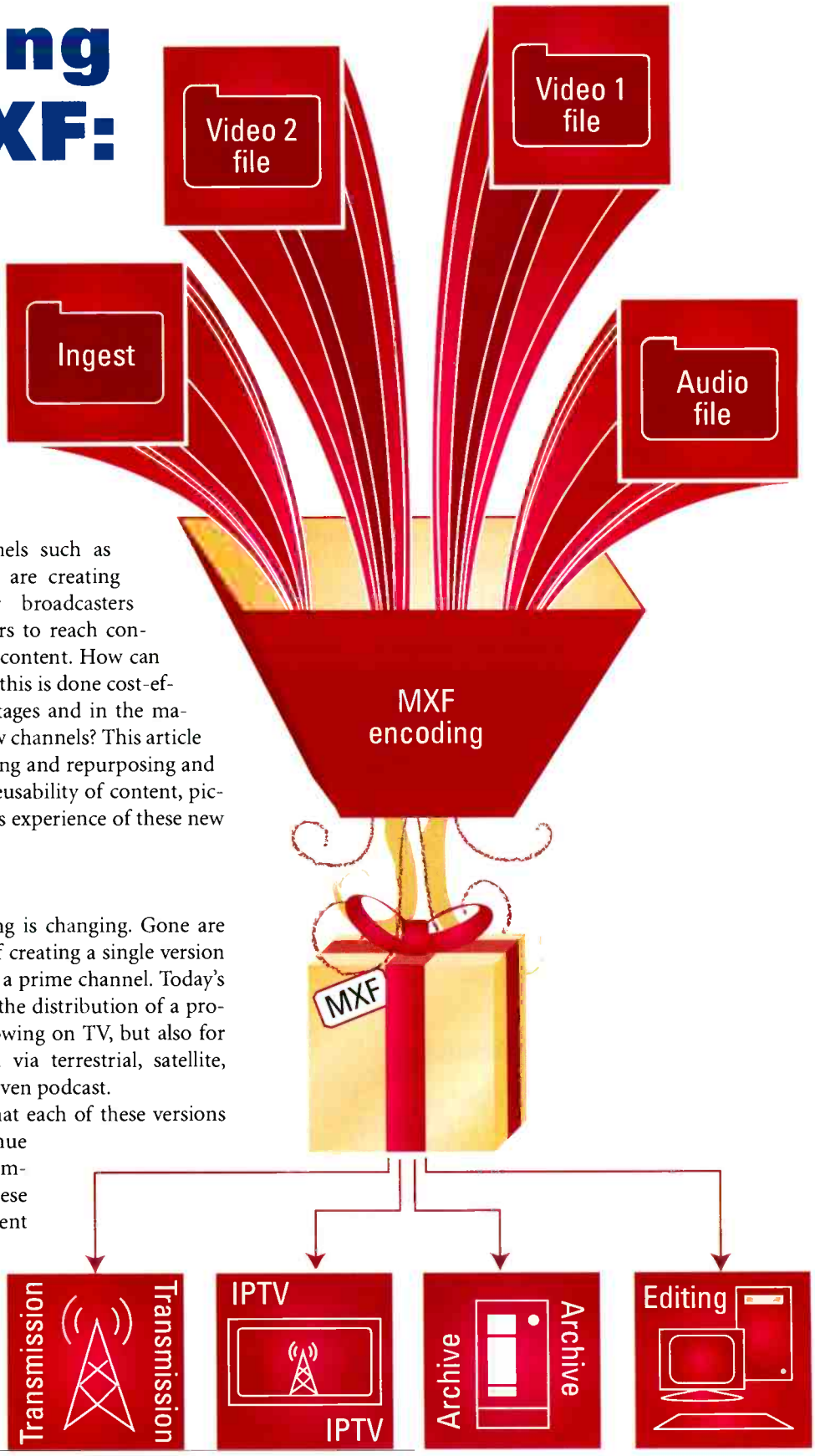
With the "Today" transition, NBC created an all-digital, totally redundant production environment that can be conformed to produce and broadcast any type of SD or HD content and is totally agnostic to the particular studio being used. On any given morning, once "Today" is finished taping, technicians can go in and quickly reconfigure the main studio to produce a show that looks and operates differently, such a news show or a sports special.

This comprehensive design strategy ensures that the network gets the most value out of the technology employed and provides it with a great foundation for the future. BE

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

Packaging with MXF: A tool for IPTV content

BY BRUCE DEVLIN



New delivery channels such as IPTV and mobile are creating opportunities for broadcasters and content owners to reach consumers with new and existing content. How can technology help to ensure that this is done cost-effectively, both in the rollout stages and in the mature market phases of these new channels? This article will cover the basics of mastering and repurposing and will look at issues that affect reusability of content, picture quality and the consumer's experience of these new channels.

So many versions ...

The business of broadcasting is changing. Gone are the traditional requirements of creating a single version of a TV program for airing on a prime channel. Today's broadcaster needs to consider the distribution of a program, not only for its first showing on TV, but also for secondary showings delivered via terrestrial, satellite, cable, IPTV, Web, mobile and even podcast.

It would be nice to think that each of these versions would generate equal revenue from a new group of consumers, but the reality is that these new channels require stringent cost-controlled delivery if they are to turn into a profitable long-term business.

One way for broadcasters to do this is to rely on IT and automation. Moving toward an

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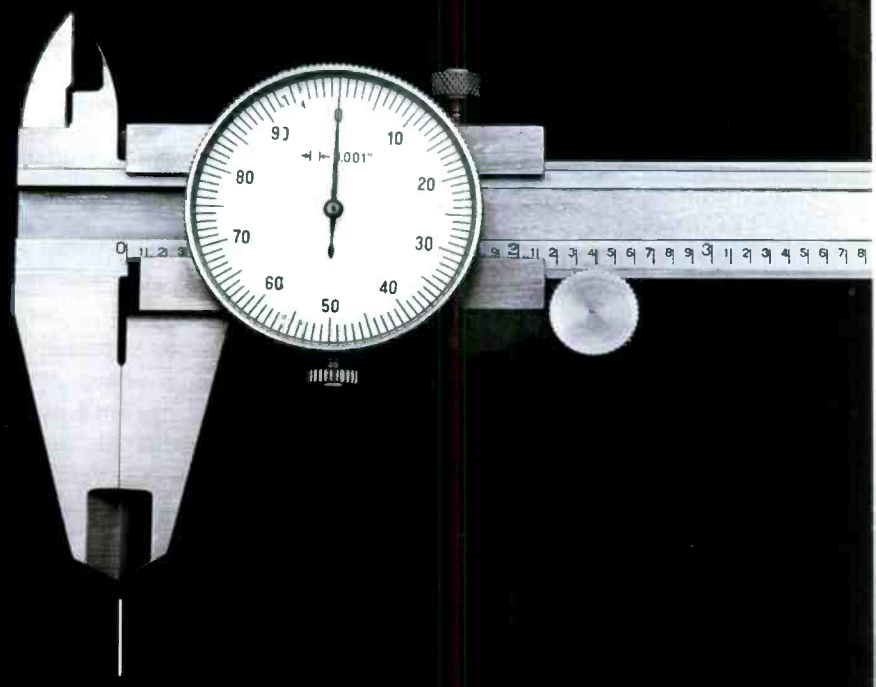
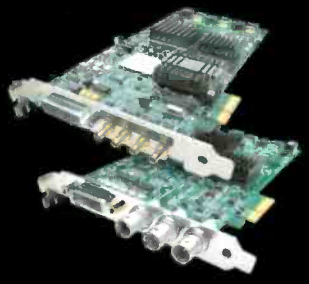
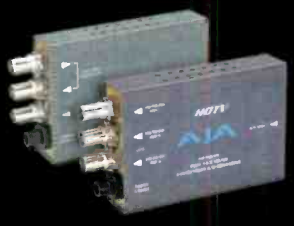


THE DIFFERENCE BETWEEN TOLERANCE AND ZERO TOLERANCE





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operational scenario where minor adjustments can be made to a "master" of the asset to produce the different revenue-generating distribution versions seems like an obvious way to go. In practice, however, incompatible file formats and compression issues make it a difficult goal to achieve.

At present, many IT-based systems use a file format/compression system optimized for their particular product or application area. Playout servers and editing engines are often battling different ends of the spectra for usability, file size and editability, turning interoperability into an art form.

End users designing a facility often choose operational file format/compression systems based on what they already have and their current needs. The end result is that facilities have different native file formats in operational use. Over time, this means vendors will have to implement all the file formats in order to interoperate properly. This requires massive engineering overhead — a cost passed on to the end user.

The MXF file format was designed to take into account this precise scenario. So, why can't we buy a solution off the shelf? Why isn't MXF the overwhelming native file format of choice for building a broadcast facility that addresses not only broadcast but IPTV, mobile and other delivery media?

The answer is that the design scope of MXF is broad. To use MXF as a master file format for cost-effective IT-based content delivery, we need to manage MXF's complexity. This involves defining rules for operational use of the files and defining metadata for indicating language variants. And it requires vendors working together to achieve good interoperability.

The MXF master file

The goal of using an MXF master file is to create a group of files structure manageable at the MXF level. This structure allows all assets to be handled in the same way regardless of whether they are MPEG-2 master videos for playout or edited versions for repurposing to mobile phones.

Essence files are referenced by an MXF master file that links them all together and synchronizes their audio, video and data components. All files must appear to be completely valid MXF files and be playable at all times, including during capture/ingest and while being updated. This is important in a shared storage environment in which there may be several read processes operating on the file simultaneously.

Figure 1 shows the basic structure, for which:

- the program version file (Example.mxf in Figure 1) references the program components;
- each program component file (i.e. the essence) contains only a single sort of essence — be it video, audio or VBI;
- each program component contains MXF metadata that describes what has actually been stored (e.g., 50Mb I-frame SD video at 59.94fps);
- all program component files are standard OP1a MXF and can be played by any player;
- each program version file references the stored program component to indicate the start and end points of the playout; and
- the program version file is standard MXF, and no new standards are needed to describe this structure.

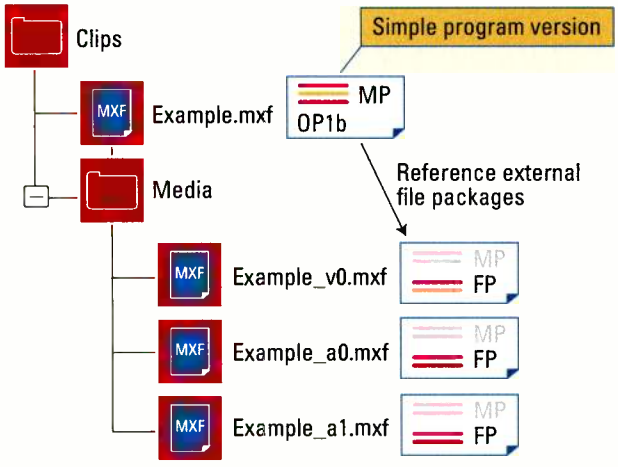

Figure 1. OP1b MXF file referencing external MXF atomic essence files

Table 1 lists the various types of files required when building a large facility with MXF, with their definitions.

The MXF master format enables the ability to master content once and then repurpose it to many output formats. The format uses only

Application	Structure	Operational Pattern
Program component	MXF essence file	OP1a mono essence with partitions
Simple program version	Synchronized essence files	OP1b with external essence
Complex program version	Synchronized essence files	OP3b with external essence
Program inventory	File containing several versions	OP3c aggregation of versions with external essence

Table 1. Definitions of MXF file types

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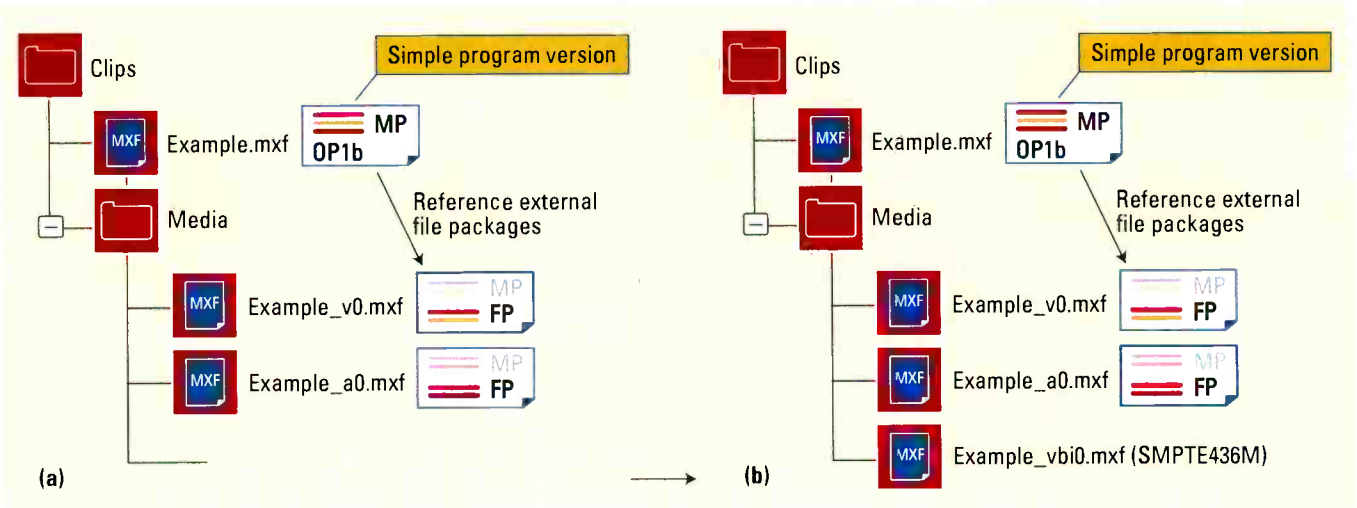


Figure 2. In the MXF master format, ANC and VBI data is stored as a program component and handled at the MXF level.

standardized elements from the SMPTE MXF specifications and recommends restrictions on MXF encoder behavior to enhance interoperability between decoders, as well as meet the requirements of managing assets in a consistent fashion irrespective of the compression formats or image resolutions being used.

Interoperability

The goal of the MXF master format is to create cost-effective, streamlined workflows based on open standards. The following is an example of the benefits offered by this approach, in which use of the MXF master format allows the content owner to answer this question: How do I capture an HD signal into an MPEG-2 file and then create a DNxHD submaster and an H.264 submaster, all with identical ANC data?

One of the issues with processing ANC data in files is that there is little common practice between vendors. Furthermore, the ANC, as well as VBI, data is often stored in a proprietary fashion on a device. Moving the ANC data from one domain to another often requires custom software creation and the associated testing of that software. In the MXF master format, ANC and VBI data is stored as another program component and handled at the MXF level.

Figure 2 shows the addition of the ANC or VBI program component. The program version file (Example.mxf) is updated to synchronize the added component. Having added the ANC or VBI program component, it is now in a standard MXF form. This means that an application that needs to convert EIA-708 captions into EIA-608 captions, for example, can read the standardized MXF program component without having to understand how the data was embedded in the video component file.

Reusability

Figure 3 shows the creation of language variants of an asset. The program inventory metadata file can be thought of as a number of individual program version files referencing the same video essence and the individual language variants of the file. Tagging the multiple language variants is achieved using standard MXF tools as explained later.

In many circumstances, not just the audio track of a file changes between language variants. Often the title

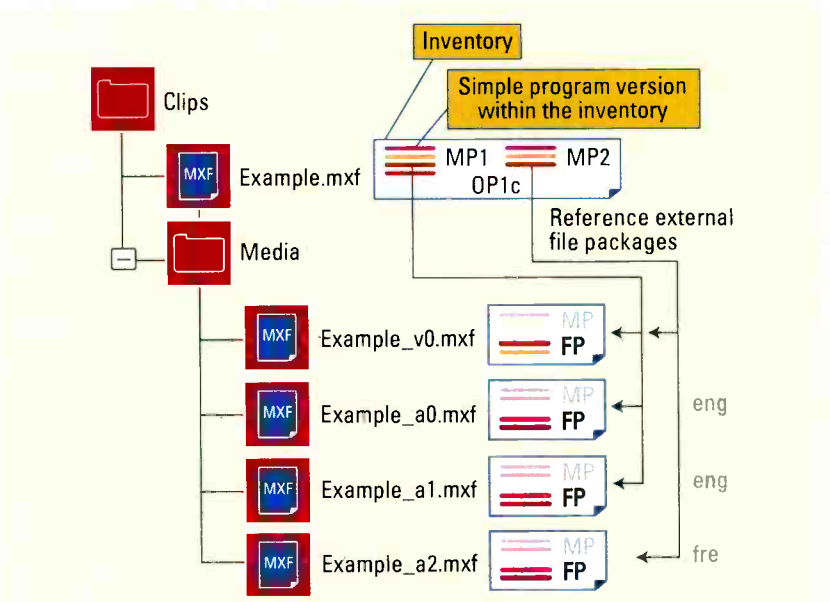
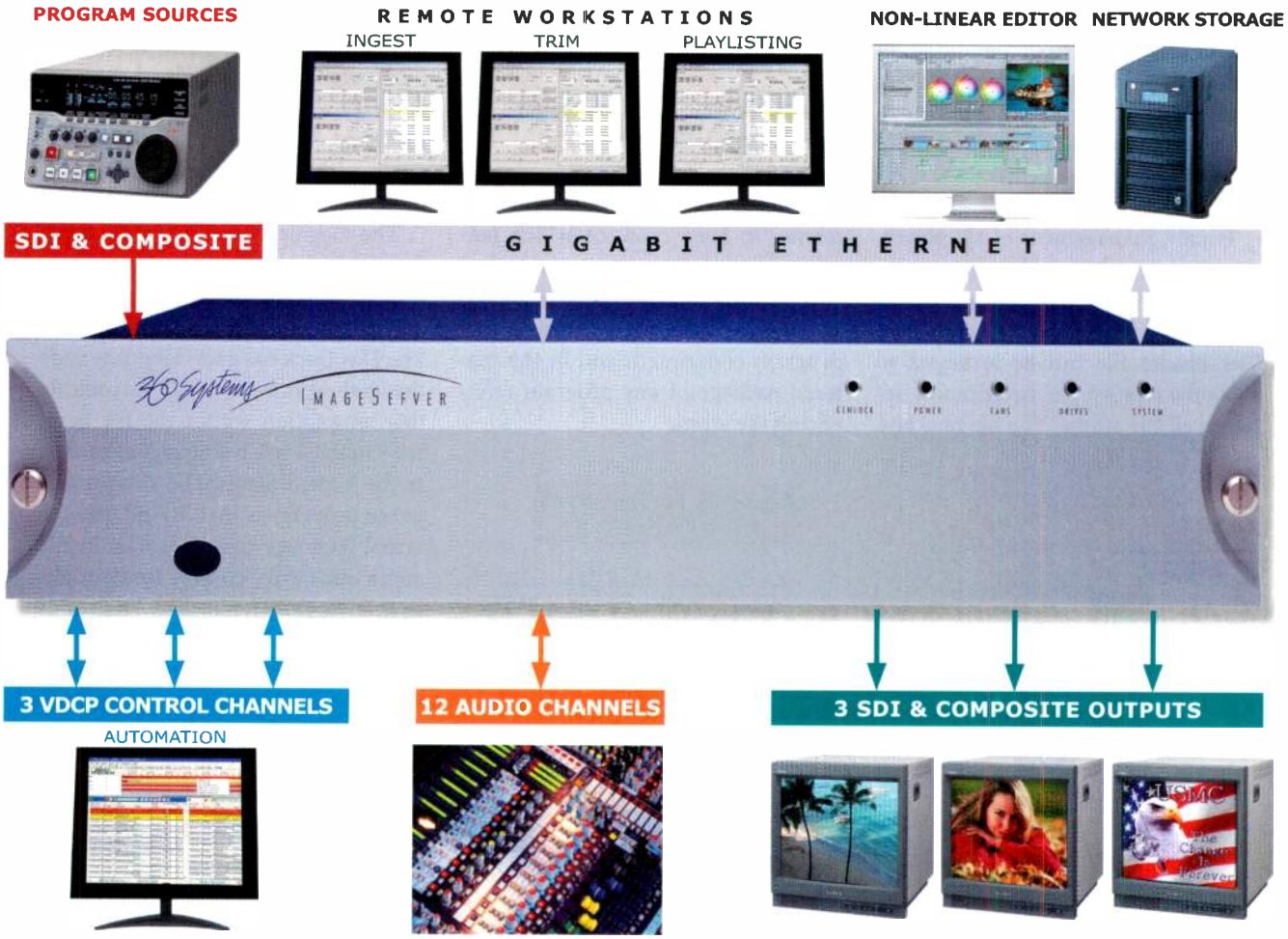


Figure 3. The creation of simple English and French versions of a file

Talk about intelligent design...



- MPEG-2 CODECS
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sequences and the credit sequence need to be altered or extended. The MXF master file provides a complex program version that is able to sequence together a number of program components to achieve the reuse desired. The header file that sequences together several AV essence files is shown in Figure 4.

Finally, management of all the versions can be enhanced by using an inventory MXF file that binds together all the different atomic essence files. The header file can be arranged to show the relative synchronization between all the atoms. The file may also be used to bind together the different MXF essence identifiers (UMIDs) as an aid to tracking the content.

Identification of foreign-language variants

Versioning is widely used to produce assets with multiple language tracks. To keep track of which language an audio program component corresponds to, the language should be tagged in the file package of the program component and in the material package of any program referencing the atom.

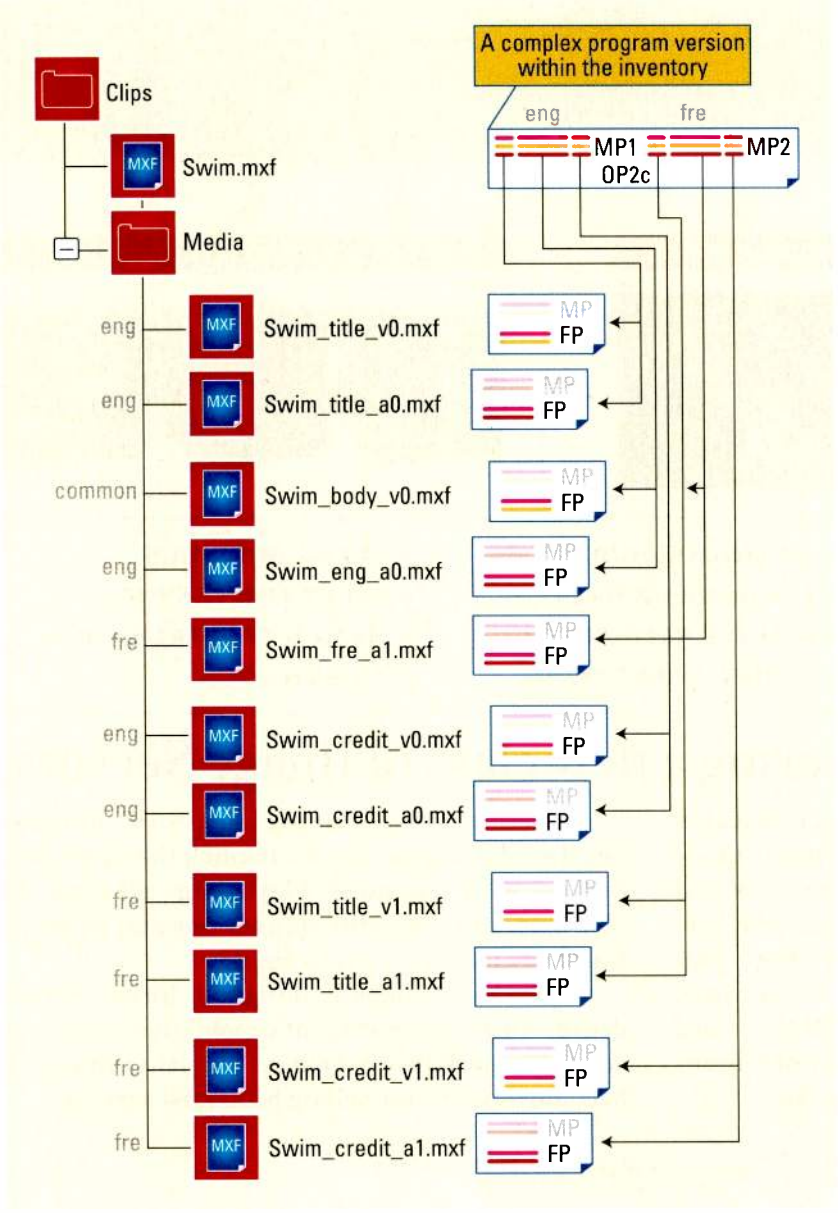


Figure 4. English and French versions of a file sharing the main video

Using standardized metadata (RFC 4646) and a standardized metadata container (SMPTE 380M, a descriptive metadata scheme also known as DMS-1), we can add language-tagging metadata that can be widely understood with little extra work required by vendors. (See Figure 5 on page 60.)

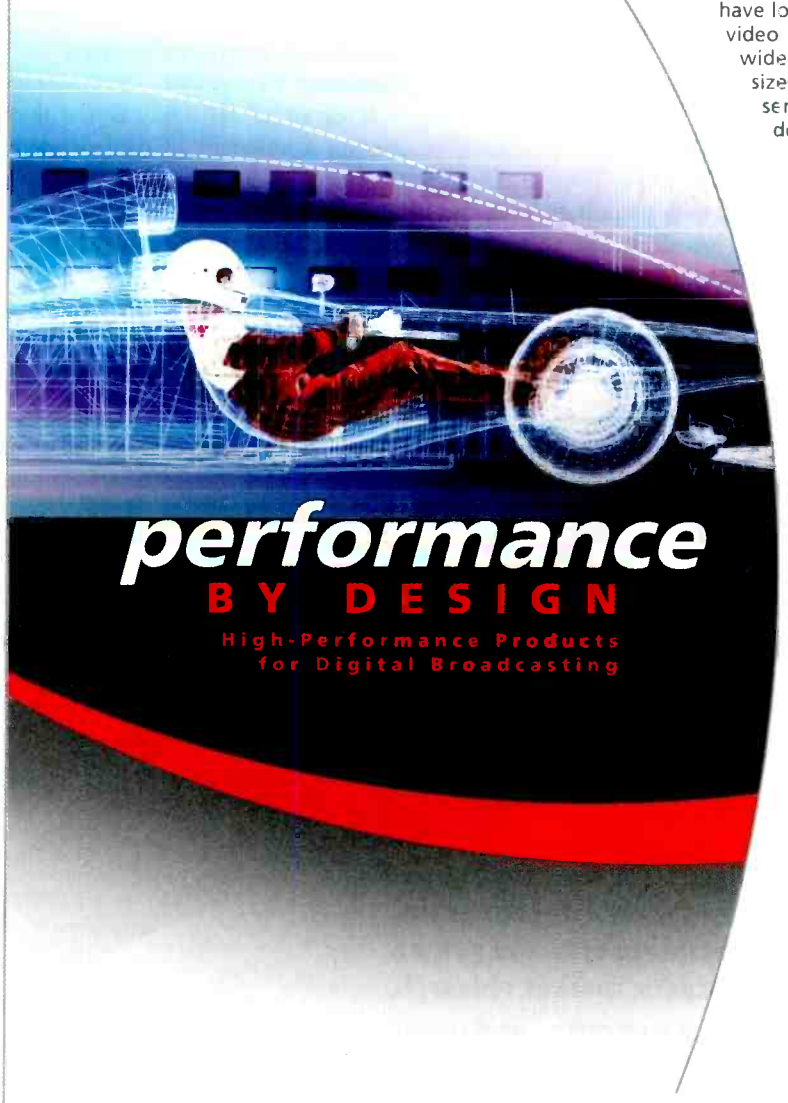
The tagging is accomplished using the DMS-1 production framework. A descriptive metadata (DM) track is added to the package in the MXF file. The DM track has a text language code that is always set to "en-US" to indicate that annotation within the file is always in the English language as spoken in the United States. The spoken language property is used to indicate the actual language that is spoken in the audio track with "en-GB," for example, indicating the language is English as spoken in Great Britain.

Language annotation is, however, highly business-sensitive. There may well be a desire to indicate within the file that it is a version of the English soundtrack that has been checked and cleared to ensure that there is no profanity so that it can be aired during the daytime. RFC 4644 provides extension mechanisms to allow the syntax of these business-specific extensions to be standardized.

Playout server compatibility

The MXF master file has been designed with input from playout server vendors such as Omneon. The integration of appropriate file conversion applications into the system makes it possible to optimize the variant of MXF at the appropriate location in a facility.

For example, complex program versions on nearline storage can easily be edited and manipulated. When the file is required on a playout server, issues such as channel count, delete tracking and program component complexity become important. File conversion engines can be used to convert a complex program version into a simple program version that is optimized for the playout function.



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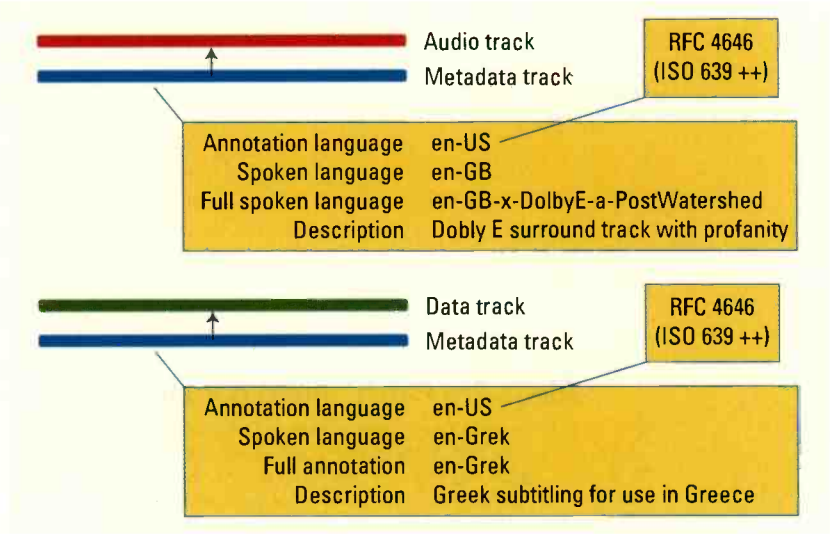


Figure 5. Language-tagging metadata added using DMS-1

Bandwidth saving

A component-based file format can be used effectively to reduce storage and bandwidth requirements in a facility. In Figure 6, we restore an interleaved file from an archive, add an audio track to it, place it on a playout server and broadcast it on some channel. If we want to archive this new audio component, then we have to copy the entire interleaved video and audio and add it to the archive.

Using the MXF master file for the same operation results in identical playout workflow. The difference is in the recovery of the new material added. (See Figure 7.) All that is required is copying the audio component file, resulting in a savings of bandwidth and storage. It is also likely to result in a shorter time to complete the operation and a higher chance of interoperability given that all files in the system follow the same open standard.

Business continuity and disaster recovery

A feature of MXF files is that they contain a hierarchy of content identifiers. MXF-compliant devices are required to maintain the integrity of the links between stored content and played content. This means that they must have a valid source reference chain.

Well-behaved MXF applications

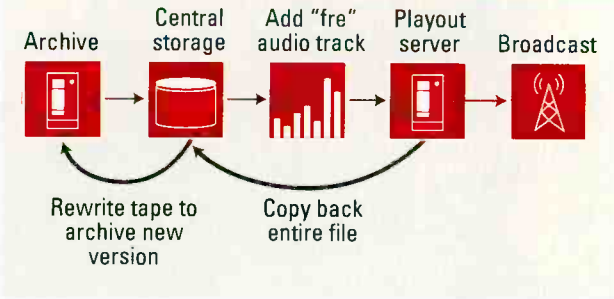


Figure 6. The addition of an audio track to an interleaved file

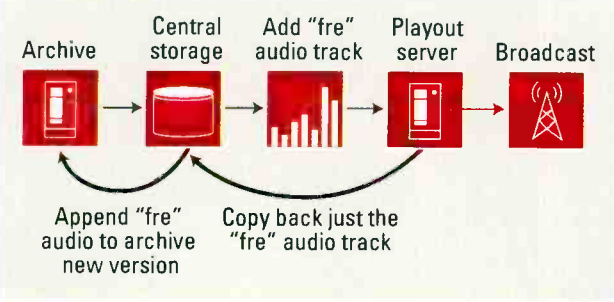


Figure 7. The addition of an audio track to a component file

also preserve the history of previous generations of the file's contents by extending the source reference chain with historical information. When a valid source reference chain is coupled with the use of the MXF master file, real benefits occur.

First, by using program component files instead of an interleaved file format when storing the master on high-capacity tape (such as LTO), new synchronized essence tracks can be appended to the tape archive instead of requiring the rewriting of large interleaved files. Appending brings a speed benefit and allows updating of the asset using standard file commands rather than requiring custom software to be written.

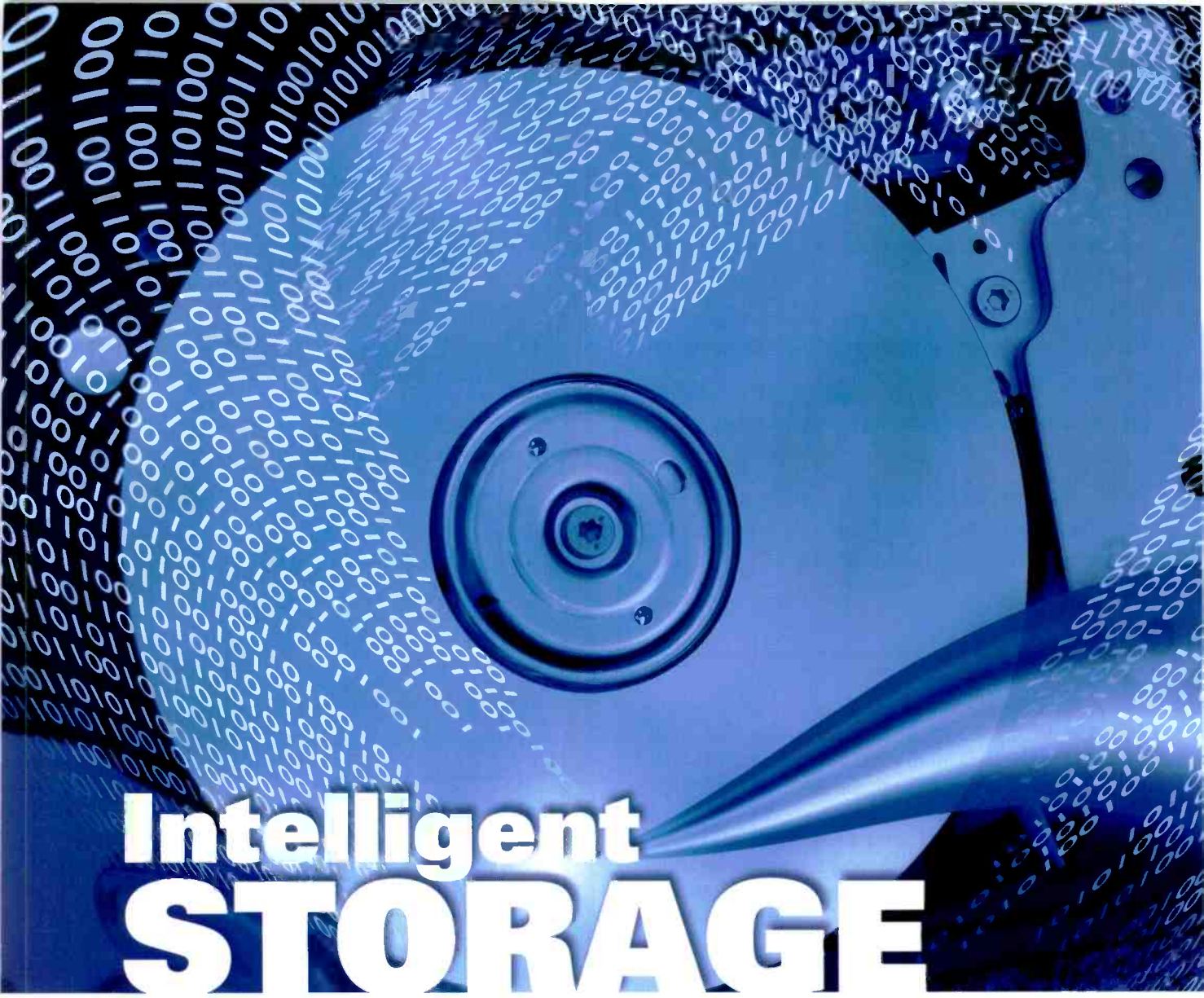
Second, by using MXF's source reference chain, the tape archive becomes a self-describing link of the genealogy of the asset. The tape archive then allows the automation of the ingest and reconciliation of the assets in a structured and standardized way.

Putting it into practice

Far from being a paper-based exercise, the MXF master file format is being documented, debugged and implemented to prove the concept. A live demonstration is planned for NAB2007. It will include interoperable equipment from several vendors, showing the business value of an interoperable open standard.

Creation of multiple versions of content for diverse distribution platforms such as IPTV and mobile devices can be performed automatically and cost-effectively using MXF. Playout servers and file conversion software exist to use MXF and create revenue-generating files for new media distribution. BE

Bruce Devlin is vice president of technology for Snell & Wilcox in the UK.



Intelligent STORAGE

IT can offer improved performance at a low cost.

BY DAVID AUSTERBERRY

The migration to HD and the adoption of file-based workflows have created new demands for high-capacity storage. Transporting HD files also requires high performance from the data networks. The desire to contain cost means that broadcasters must look to commodity IT components to meet their needs for large storage networks.

Desktop video

Broadcasters want everything available at the desktop. This speeds workflow for review and approval processes. Operations like captioning can be streamlined. Viewing proxies can be made available to all from online disk arrays. Editing quality content can be stored in data tape libraries.

Before the introduction of file-based production, the main applications of IT-based systems were in the islands of video editing and playout. Elsewhere video was transported as real-time streams and videotape. As files replace streams, from acquisition through to playout, the door is open to use IT systems.

The workhorse for video storage has been the SCSI drive, with Fibre Channel drives used where the highest performance was needed. Recently there have been several developments that promise to improve performance while lowering cost — just what is needed for HD workflows.

One is the move from parallel to serial disk interfaces; the other has been the ubiquity of Ethernet and IP, with the attendant cost reductions from volume manufacture. Coupled to these hardware developments is the move from dumb to intelligent storage systems.

Data rates

Even the latest technologies are stretched by HD data rates. The Ultra SCSI disk interface has a transfer rate of 160MB/s or 320MB/s (1.3GB/s and 2.6GB/s), with a single drive able to sustain data rates of more than 100GB/s. Fibre Channel is moving from 2Gb/s to 4Gb/s, with 8Gb/s promised soon. The serial PCI Express bus can transmit 200MB/s

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Engineering The Broadcast Future

per lane. A 16-lane slot can support a transmit rate of 3.2GB/s, more than twice the rate of the earlier PCI-X 533 standard.

Compare those to HD bit rates for 1080i video sampled at 10-bit, 4:2:2. At a 50Hz field rate, the data rate is 130MB/s, and at 60Hz, it is 156MB/s. Editing a multilayered HD sequence in real-time is still pushing technology. And waiting in the wings are the 1080p/50 and 1080p/60 standards, with a data rate of 3Gb/s.

Interconnects

The first digital video systems used parallel interconnections. They were replaced by the serial 270Mb/s interconnection that we still use today, now joined by HD-SDI at 1.5Gb/s. The old parallel interconnections suffered from several disadvantages:

- Data skew limited cable length.
- The 25-pin connectors had a low packing density that made devices such as routers very large.
- The cost of cables and cable termination was high.

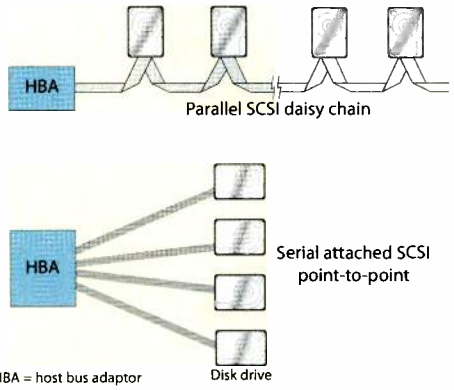

Figure 1. SAS replaces large connectors and daisy chains with point-to-point connection.

Hard drive interfaces are going through a similar evolution. For many years, parallel SCSI and IDE/ATA have been the most popular disk interfaces. SCSI is used for enterprise applications with a high duty cycle, and ATA is used for desktop computers. (Video applications use the more robust SCSI drives.) Both systems support a daisy-chained bus, where many disks share the same bus adaptor to the host processor. Parallel data is limited by factors such as cable skew and crosstalk, and the Ultra 640 interface has been supplanted by serial standards. This architecture adds a further disadvantage: The shared bus represents a data bottleneck.

SCSI

SCSI is a family of standards that describes command sets and physical interfaces for the interconnection of storage devices, tape and hard drives. What is often referred to as a SCSI interface usually refers to a SCSI parallel interface carrying SCSI commands. Ultra 160 and 320 are the current 16-bit parallel standards. Recent developments based on the serial ATA (SATA) interface have created a new standard, Serial Attached SCSI or SAS.

The standard removes the many disadvantages of the parallel SCSI interface and provides higher performance. The low cost of high-speed serial transceivers means it is now cost-effective to replace parallel SCSI with simpler serial interconnections. SAS has a roadmap to 12Gb/s with the initial product rated at 3Gb/s. Compare that with the upper limit of parallel SCSI of 2.6Gb/s (Ultra 320). The serial connectors and cables are more compact than the parallel interconnections, a great advantage for building high-density disk arrays.

Serial attached SCSI is compatible with SATA, which allows common components to be used in devices in order to lower manufacturing cost. SAS connectors carry two ports, allowing for fail-over system design.

Instead of a manually set device identifier (ID), a globally unique ID means that no user interaction is required when attaching drives, the bane of video editors when moving jobs around on SCSI drives. A discrete signal path is used for each drive rather than the daisy-chain, so the user does not have to worry about terminators (as with parallel SCSI). SAS disks can be hot plugged. Parallel drives cannot be added or removed while the bus is active. (See Figure 1.)

Ethernet

GigE or 1Gb/s Ethernet is standard for current networks, but for many storage applications, it lacks speed. The next step up is 10GigE, which has been implemented in copper and fiber versions. For short runs, the copper standard 10GBase-CX4 offers cost-savings. With a range of 15m, it is sufficient for cabling within a rack. The fiber version can use single- or multimode cable, depending on the range required.

The high capacity of 10GBase-CX4 lends it to links within storage systems. It and Infiniband find applications interlinking storage nodes. Infiniband is a serial interconnection that can provide low latency connections between storage and processing clusters.

The SAN and NAS

In enterprise computing systems, the clients are generally all running a single OS, namely Windows. In creative applications, there is more often a mix of Windows, OSX and Linux. Most storage area network (SAN) products will only support one OS per head, and a mix of OSs complicates the design.

The pressures on media businesses to reduce overheads can militate against Fibre Channel SANs. Support needs specialist knowledge beyond the average IT technician.

Network attached storage (NAS) is a popular alternative. The support requirement is similar to a basic file server. The NAS cannot be considered a replacement for a SAN. The data transfer rate of a NAS is constrained by the network interface. For large collaborative projects, several NAS appliances may be needed to serve the workflow. Unfortunately, the files must be split across the several appliances. This adds a management overhead, as jobs may have to be transferred from one NAS to another to free space or consolidate. In contrast, a SAN pools all the storage for common access.

The basic difference between a SAN and a NAS is access to the data, block or file, respectively. The special demands of the media business —

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large file sizes and high data rates for real-time transfer — have led to the search for an alternative that meets the needs of collaborative workflow with cross-platform support, yet at reasonable cost. As products evolved, hybrid solutions have been developed that feature the advantages of both file and block-based storage. As a result, the boundaries between the two architectures have become blurred.

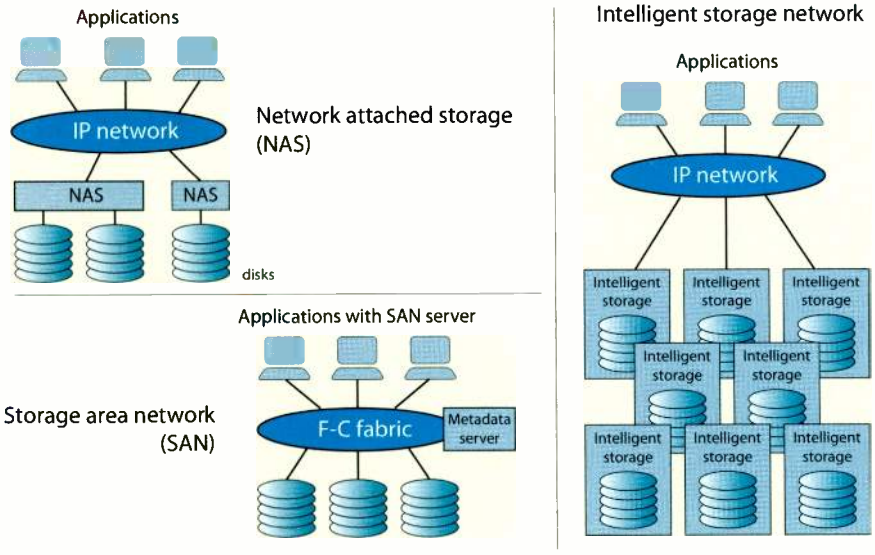

Figure 2: Intelligent storage uses switched IP to connect large clusters of smart storage.

Intelligent storage

The NAS and SAN architectures use interconnected dumb drives. With the low cost of processing power today, the limits of the SAN and NAS can be overcome by distributing intelligence through the storage system. One or more disks, a CPU and network interface can be packaged as a single storage device. Many of these units are then linked to form a large and scalable storage system. With intelligence in the storage array, more sophisticated data redundancy than RAID can be constructed. (See Figure 2.)

Some intelligent storage products use a separate metadata server to manage file requests and direct the client to the requisite storage unit to access the media file (much like a SAN). Other products distribute the file system across a cluster of storage units, with each able to handle read/write requests. In both cases, file locking for multiple write access and file replication for redundancy is handled by the management layer.

Intelligent storage can incorporate load-balancing to handle client applications and automatic file migration to distribute files across the storage as older files are deleted or migrate to archive storage.

Object-based storage devices

Object-based storage is a generic term for clustered storage with distributed intelligence. Files are split into several storage objects, which are then distributed across an array of storage object devices. Tasks such as block allocation are now managed by the storage device. This relieves the metadata server of those low-level operations, which represent a bottleneck with very large storage systems. The metadata server is left with the task of mapping files to objects and ensuring the redundancy of objects. The traditional method of redundancy is RAID.

Object-based storage devices (OSDs) can provide redundancy by replicating objects across more than one device. RAID systems have always been vulnerable to failure during a drive rebuild, often necessitating the restoration of a file from archive tapes. A smart management system knows where copies of the object are located and can rebuild a copy very quickly; RAID rebuilds can take many hours.

The intelligent storage devices can serve files directly to the initiating applications, avoiding the network interface bottlenecks of a NAS.

The T10 committee of INCITS (International Committee for Information Technology Standards) is responsible for the SCSI standards. It has defined formal standards for object-based storage devices.

Advantages

Intelligent storage can offer many advantages to broadcasters. The systems scale to the large sizes that are needed for HD production. Smart storage systems allow a 100TB system to appear as a single drive to applications and support multiple operating systems. The maintenance overheads of Fibre Channel SANs are avoided, with the move to Ethernet and IP networks. The driver is the low cost of CPU power, which means it can be distributed throughout the storage rather than concentrated in a metadata server.

Commodity disks have 500GB capacity, with 1TB around the corner. Serial interconnections promise lower costs. Plus they need less rear-panel real-estate to connect ever large disk arrays for the creation of random-access content libraries.

It is no longer a dream for a production staff to have the content library available to view from the desktop, and with instant access. This can be achieved only by the adoption of the latest IT hardware and systems. **BE**

The second edition of David Austerberry's book "Digital Asset Management" is available from several booksellers. It also can be ordered directly from the publisher at www.focalpress.com.

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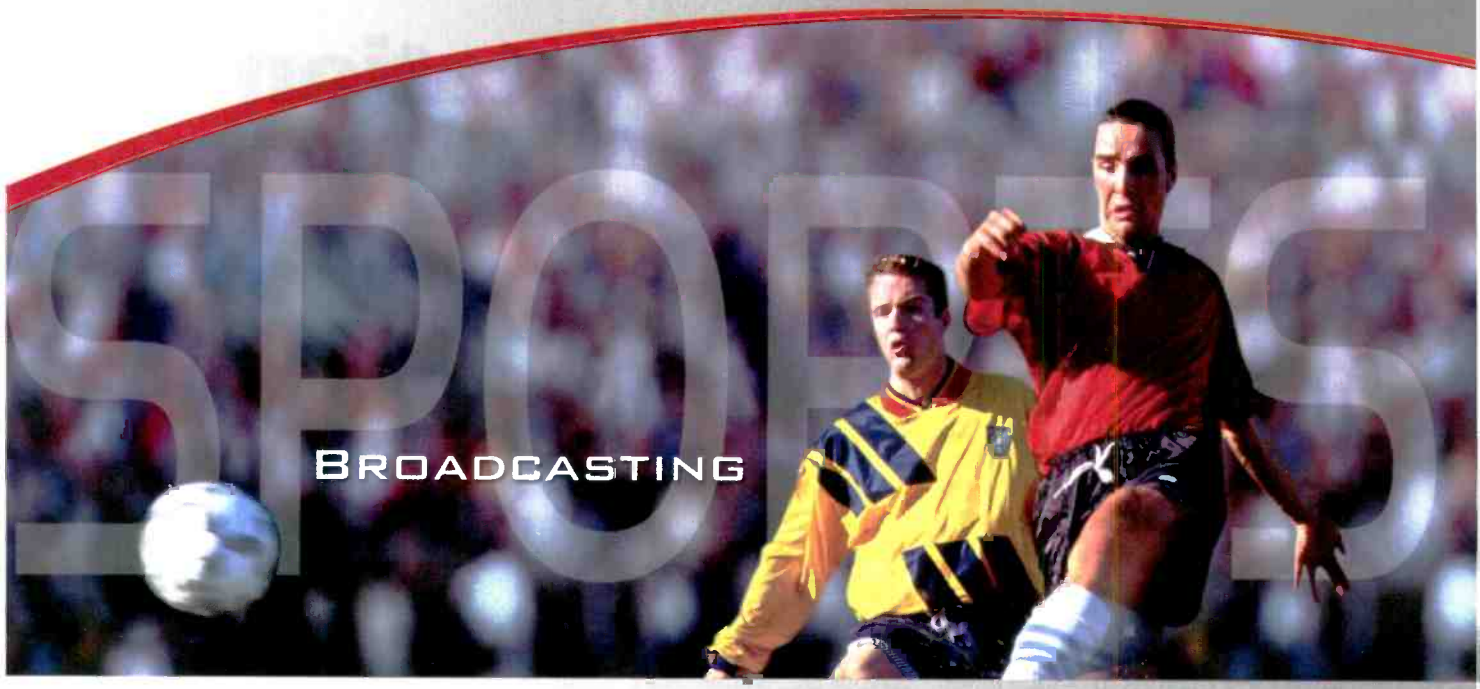

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Miranda's Xstation

The system offers lower cost specialty and subchannel playout plus network localization.

BY EUGENE PLAWUTSKY

Many DTV broadcasters are looking to expand their channel counts by creating subchannels, using repackaged content from their main channels. This offers the potential to attract new viewers and generate additional advertising revenues.

However, subchannels tend to earn lower advertising rates, and in turn cause these channels to require lower capital costs and minimal operational costs. This makes a high level of automation fundamental to their success.

This demand for cost-effectiveness and playout simplicity is equally applicable to specialty channel providers, who need to maximize their returns when expanding their channel lineups. Low-cost playout is also important for small affiliate channels and in the localization of networks.

The creation of additional channels and network regionalization, however, has traditionally involved spending significant capital. For example, adding an extra channel has typically demanded extra capacity for the station automation and the traffic systems, as well as more server outputs and additional TV graphics equipment. Often, this takes a long time to implement, and many broadcasters with older servers have found that extending the capacity of their existing infrastructure can be a major investment. The integration of the equipment from multiple manufacturers has also created technical challenges and consumed precious engineering resources. Taken together, it's not surprising that these factors can discourage and delay system expansion.

No need for multiple boxes

To address this situation, Miranda has developed the Xstation, a one-box solution for the playout of additional TV channels and network localization. This HD/SD system incorporates a graphics processor, graphics automation tools, a video playout server and playout automation. It's a single device that provides all the software and hardware needed to create, schedule and air television without compromises in presentation quality.

This integrated design reduces the cost of playout, as well as simplifies and speeds the installation and playout processes. A channel can be on-air faster, allowing a broadcaster to start realizing revenue faster.

The Xstation is well-suited to localizing a national channel, mixing some live content from a network playout center with regional news and advertising. With this edge operation, most content is played out by the automated, local Xstation, creating a high level of efficiency with respect to both capital costs and manpower.

The system uses a high-performance Vertigo XG graphics processor and a suite of graphics automation applications. The video content and asset management server at its heart features almost 2TB of storage for 400 to 500 hours playout at 6MB/s to 8MB/s. The system is available in SD, HD and dual-format SD/HD versions, and provides full-featured playout with graphics rendering. It offers dynamic control over long-form clips, commercial spots, tickers, crawls and more.

It features a keyframe animation editor and timeline for real-time animation playback, along with unlimited virtual keyers that can be controlled independently. A built-in multi-input DVE is ideal for many picture-in-picture applications, such as squeezing back full-frame video to reveal promotional graphics.

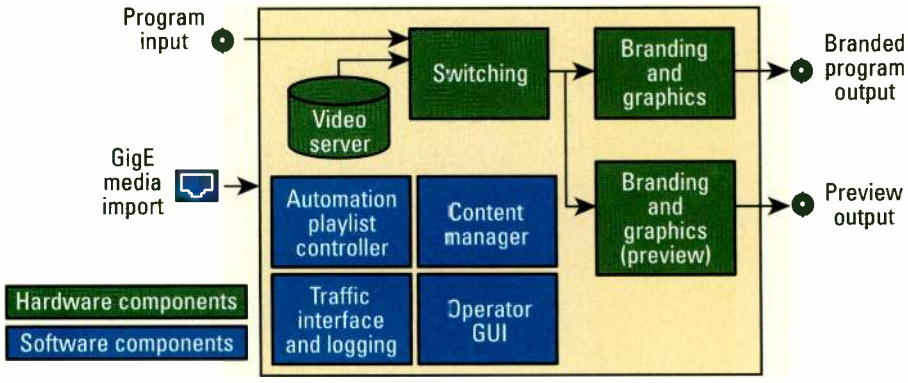

Figure 1. A schematic showing Xstation's core functions

Advanced workflow tools

The advanced suite of applications offers easy graphics creation and template building. The applications can be used to manage data-driven graphics using data interfacing to standard news feeds, such as AP NewsWire,

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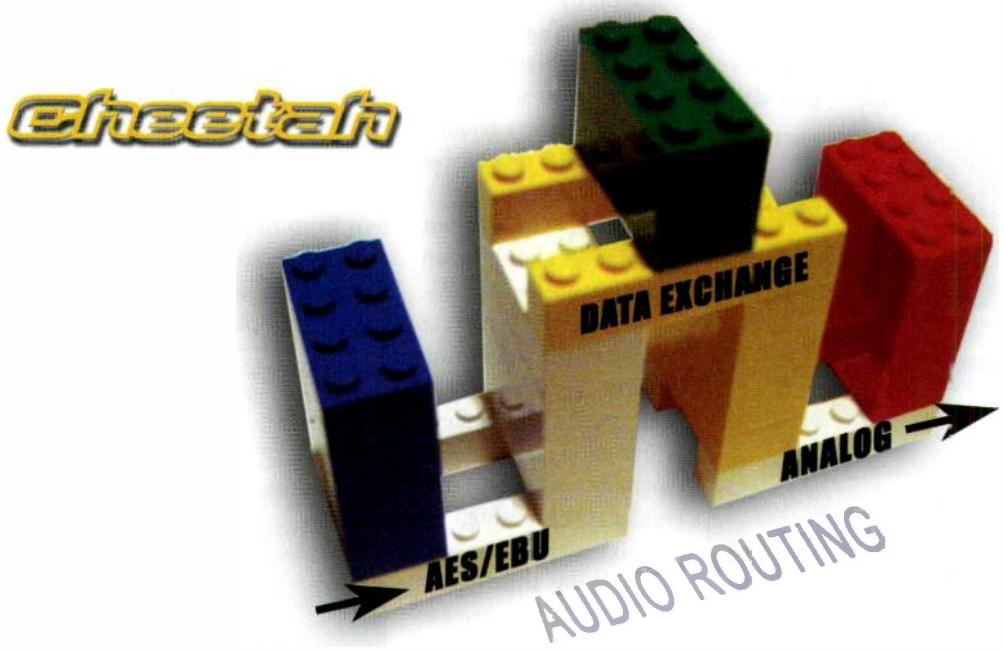

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Miranda's Xstation enables users to cost-effectively add new broadcast channels.

Xplay is the playout automation application that features a graphical interface with a preview of upcoming events, including bugs and crawls. The system runs as a standalone, turnkey system, using playlists created in Xbuilder, or it can use an existing third-party traffic system to trigger all primary and secondary events.

Scalable operation

Although Miranda's Xstation represents a fast and cost-effective solution for adding extra channels, the workflow systems behind it can be scaled effectively for much larger multichannel applications, and for widespread network regionalization. This flexibility has led to interest in the system from many types of broadcasters and TV service providers, driven by the need for newer and more effective methods of playout. BE

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

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Avid Unity ISIS

The system offers real-time access to multiple users.

BY BILL MOREN

Within a decade, the need for multiple users to have common, unrestricted access to digital media files has gone from a convenience to a business necessity. What had been referred to as the digital media shared storage system is becoming understood as the media network — the backbone of the broadcast or post-production facility. This term better conveys the concept of connectivity and bandwidth needed to deliver digital media in real time.

Each Unity ISIS 4RU chassis, called the ISIS Engine, holds 16 storage blades, two Ethernet switch blades, and redundant power and cooling.

The fact that storage is involved is a given. It's how the storage is organized to deliver reliable, digital media in real time that differentiates the media network from the more generic shared storage system or SAN.

The problem

In terms of performance and need for availability, there are few data applications more demanding than broadcast and post-production video editing. These are collaborative environments where real-time access is constantly needed. Every client requires simultaneous isochronous performance and data delivered with time constraints.

Also, broadcast environments often support 24/7 operations, further driving up the demands on the media network infrastructure that is the cornerstone of the facility. Add to this the growing need to accommodate higher bandwidth HD and an increasing number of users requiring access to media, and it becomes apparent that the system's ability to scale — without compromising access or availability — creates a difficult problem set.

A new approach

Building on the principles of the Avid Unity MediaNetwork, the Unity ISIS was developed to address these challenges. ISIS stands for infinitely scalable intelligent storage. It is a modular design, leveraging industry standard GigE throughout.

By combining a modular architecture with Ethernet, it is possible to offer a highly reliable, redundant storage infrastructure that is easy to configure, expand, service and administer, as well as provide the real-time isochronous performance required in multiclient media applications.

Fundamental to the system is a real-time distributed 64-bit file system with key attributes of distributed file system management among clients, a centralized management resource and intelligent storage elements. This type of data architecture enables efficient client storage access, increasing performance and ensuring real-time access.

A distributed approach also means that as storage and clients are added, the processing power to manage the system grows as well, eradicating potential CPU bottlenecks that would limit scalability. The storage system, in fact, has no intrinsic upper bounds in terms of client counts or storage capacity. Any limitations are functions of available Ethernet switching hardware along with the practical boundaries set to ensure thorough testing of configurations that will guarantee real-time delivery.

The storage system ... has no intrinsic upper bounds in ... storage capacity.

Two independent and fully functional Ethernet switches are integrated into each storage chassis, called the ISIS Engine, eliminating the need for external switches for many configurations. This integrated Ethernet architecture simplifies the configuration of a shared storage system, reducing administration and service costs while increasing reliability.

Next-generation media protection

The Unity ISIS media network employs a distributed data striping plus mirroring approach. Media is divided into data chunks, and every time a data

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chunk is written on a storage blade, it is also written on another drive in the system. Unlike traditional RAID-1 (mirroring), however, the system does not pair the physical drives. The second copies of the data chunks are stored randomly across all of the other storage blades in the system.

A benefit to this approach is the increased bandwidth gained in striping data across the storage blades. Intelligence in the ISIS file system enables the clients to determine which storage blade is able to optimally service each request. Since clients have direct access to each intelligent storage blade, clients do not access a central resource to balance the I/O load across the system.

Another benefit to this media protection method is a much faster reconstruction of a failed blade's data. When a blade failure is sensed, the system makes a new copy of the mirrored data, randomly distributing it across the storage blades. This process is called reconstruction.

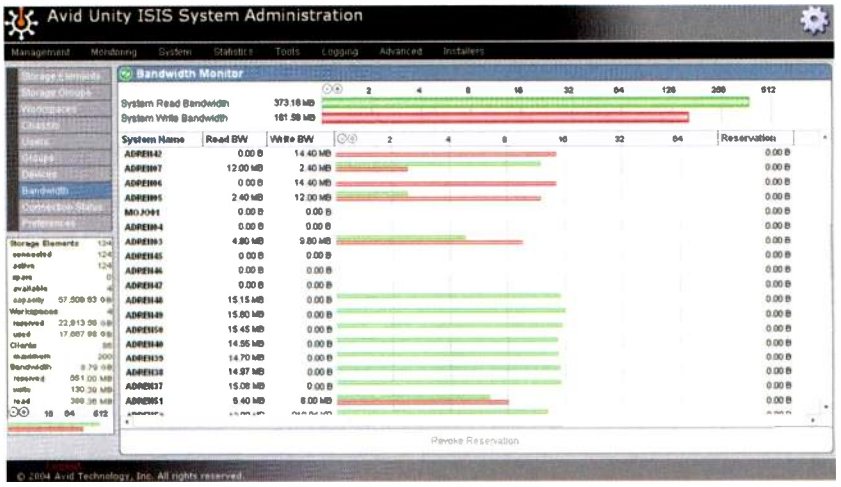
When a blade reconstruction is initiated, each storage blade determines whether it contains any data that was on the failed blade. If so, the blade itself initiates the copying of the data to a new location in the available pool of storage blades, creating a new mirror. This happens in parallel across all the storage blades in the system. Because every storage blade is involved in the reconstruction process, it takes a fraction of the time required by the parity RAID subsystems that are typically used in Fibre Channel SANs.

Clients have direct access to each intelligent storage blade.

Rethinking storage hardware

A network of intelligent, Ethernet-connected storage blades couple processing power and memory with a pair of high-performance SATA II disks. Each storage blade connects to an integrated Ethernet network that is also accessible to the clients.

Both storage blades and integrated Ethernet switches are housed in a chassis. They can be configured into the system to provide the desired bandwidth, capacity and redundancy.



In the collaborative environments of broadcast and post-production video editing, workflows benefit from the Unity ISIS' ability to provide real-time isochronous performance and accommodate higher bandwidth HD and multiple user access.

Also connected to the network is an ISIS System Director, a central resource server that facilitates access to the storage by clients. When a client or storage blade wants to access a file, it serves as an index to the file system from which all access to a particular file can be derived. With the index in hand, a client or storage blade can then algorithmically find and access any other part of the desired file without iteratively communicating with a central metadata controller.

The 4RU chassis holds 16 storage blades, two Ethernet switch blades, and redundant power and cooling. Each storage blade contains two 250GB or 500GB drives for a total chassis capacity of 8TB or 16TB. Each switch blade provides eight user ports or 16GigE client ports per chassis. The rack-mount System Director has dual connections to Ethernet ports on two integrated switch blades.

A second System Director, which can be added for redundancy, is constantly updated with the same metadata and monitors the primary unit via a regular heartbeat inquiry through dual redundant private Ethernet connections. Each switch blade includes a high-speed 12Gb port that interconnects switches from multiple ISIS Engines. Up to 12 chassis can be interconnected, providing a total storage capacity of 192TB per system.

With heat and vibration as the major causes of disk drive failure, the storage chassis uses highly efficient front-drawn laminar airflow for cooling. Redundant power and cooling are key capabilities of the system. There are load-sharing, hot-swappable power supplies in each chassis, and each power supply has its own AC input, allowing a failed unit to be pulled easily. Through the use of rigid enclosures, vibration has been reduced to low levels.

The system's architecture leverages file system, networking, storage and processing technology to meet user demands. For high-pressure, deadline-driven broadcast, post and film production, this means uninterrupted availability, reliability and the ability to scale and adapt intelligently to changing business requirements. Its layers of intelligence and redundancy reflect a media network design philosophy. The result is the foundation for an enterprise-level workflow. BE

Bill Moren is a senior product manager for storage at Avid Technology.

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Holophone's H2-PRO

The microphone provides surround audio for Mexico's professional soccer league.

BY JORGE PICKERING

TV Azteca is one of the largest producers of Spanish-language programming. We currently produce the content for two major Mexican television networks, Azteca 13 and Azteca 7. As of the third quarter of last year, both networks are transmitting in full HD.

To lead into the HD coverage of the FIFA World Cup in Germany and the commencement of complete HD transmission, we planned to transmit the Federación Mexicana de Futbol (the First Division of Mexico's professional soccer league) games in HD and surround sound. We decided that Holophone's H2-PRO surround microphone was the best choice for our needs, as it had been used for previous live broadcasts across the globe with exemplary results.

Holophone's H2-PRO microphone can capture up to 7.1 channels of discrete surround sound.

Realistic sound capture

For a typical game setup, one H2-PRO is placed at the back of the stadium parallel with the halfway line to capture the ambient sound of the field and the fans. After the mic is placed, no additional adjustments are needed; just plug its eight XLR microphone connectors into the monitor, and it is ready to use. To capture the same quality and range of sound without a surround microphone, multiple microphones would need to be positioned around the stadium, which would add additional time to the pre-game setup.

One criterion in selecting a microphone was for viewers to receive true-to-life sounds that matched whatever camera angle we selected. Hearing the different sounds of the game — whether it is fans playing trumpets to show team spirit or the crowd's reaction to on-field action — is just as important to the live experience as seeing each exciting play. From one microphone, we are able to capture realistic perception of volume and proper perspective for any camera angle. With the average game having 12 to 14 cameras, this is not a small feat. The eight mic elements enclosed in the mic capsule along with its elliptical shape mimics the way a human head receives sound, providing realistic sound reproduction.

From one microphone, we are able to capture realistic perception of volume and proper perspective for any camera angle.

No mixing necessary

Another timesaver is that no additional mixing, signal manipulation or processing of the ambient sound is needed. The discrete signal is sent directly from the mic to the monitor. For live television, where everything is happening so quickly and there's not a lot of time for adjustment, the mic is able to do its job with very little tweaking during the game. If we were using a multi-mic setup to capture surround sound, we would need to regularly adjust the mix coming in to create a similar sound to that received from one surround microphone.

In addition to the H2-PRO, we use several other types of mics for game coverage. We use headsets with microphones for the play-by-play commentary, as well as reporters on the field, on the benches and other locations throughout the stadium. All of these

signals are mixed and then added into the central channel with a little bit of a split into the left or right channel.

To supplement the sounds the H2-PRO picks up from the field, we have boom microphones behind the goals, in the corners, at the middle of the field and along each side of the field. The booms follow the cameras at field level to reinforce the sounds of players kicking the ball, especially when they are executing a corner kick or taking a penalty shot. Most of the sounds captured by these microphones are put on the left, right and front channel, but are never used for the background. The background channel is always the H2-PRO.

Technology transcends sports

Because of its ease of use and sound quality, the H2-PRO has become the standard for surround recording on both networks. All current and incoming crew members are being trained in the use of the surround microphone.

Our staff is in charge of producing most of the programming seen on the station from news coverage, to game shows and soap operas, so having a technology that's easy to use and requires minimal training is helping make the switch to HD seamless. In addition to using the mic for sports coverage, we are using it for on-location shoots of soap operas. We also have plans to use it to capture audience reactions for the game shows we produce. Further, with camera-mountable mics in the works, we will soon have surround sound in ENG situations for our news broadcasts.

Using a surround microphone gives your viewers the sound they are looking for with minimal setup time.

Audio quality matters

HD viewers demand sound that matches the high-quality images they see. Broadcasters are looking to meet this need, but multi-mic setups to capture surround sound is often time-consuming and costly. Using a surround microphone gives your viewers the sound they are looking for with minimal setup time, ensuring that you and your viewers don't miss a moment of the action. BE

Jorge Pickering is the director of technical services for TV Azteca.

Remote monitoring

Embedded intelligence makes multichannel monitoring and control possible.

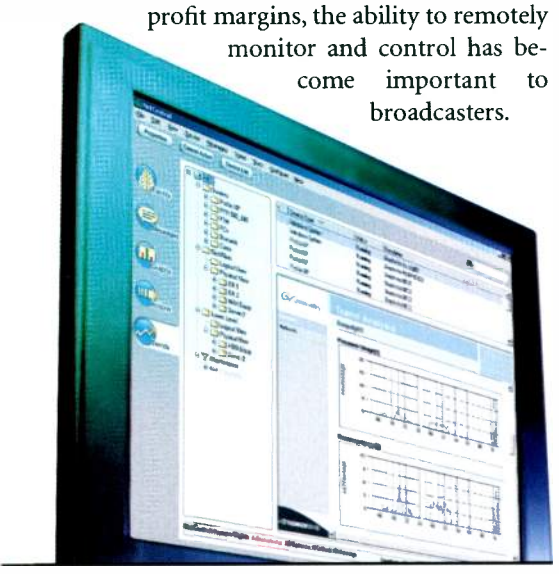
BY JOHN LUFF

There was a time in our industry when monitoring signals from a distant location was neither practical nor necessary. Broadcasters acted locally instead of over large expanses or territory.

Then two dynamics made remote monitoring both important and profitable. First, as some broadcast stations grew, it became harder to find qualified transmitter engineers. Second, labor costs became an issue to owners who began to feel the inexorable rise in costs.

For these reasons, controlling a transmitter from a remote studio location was technically possible and useful from a business standpoint. By using a modem over a leased loop from the local telephony carrier, a broadcaster could return data that allowed control and monitoring of meter readings.

Over the last two decades, the importance of remote monitoring has grown considerably. Fueled by business imperatives and erosion of profit margins, the ability to remotely monitor and control has become important to broadcasters.



Grass Valley's NetCentral 4.1 software for SNMP-based facility monitoring supports off-the-shelf computer systems and third-party products.

Borrowing from the IT world

Modern digital technology, especially IP-based networked systems, has facilitated an explosion of applications that makes good technical and business sense. Our narrow and rather small industry has been able to borrow techniques from the much larger IT world. These techniques have made facilities more reliable and more maintainable.

Fueled by business imperatives and erosion of profit margins, the ability to remotely monitor and control has become important to broadcasters.

For example, SNMP has been in use for a long time in the IT world, monitoring the infrastructure of management information systems all over the world. It can monitor the health and operational parameters of disk arrays, robotic archives, IP routers and desktop computers, making large and complex systems much easier to maintain.

When an SNMP-enabled system detects an incipient failure, it sends a message to a management system, which then displays an error message. SNMP management systems allow logging of errors and remote control when the devices support it.

The first system I worked with was an HP OpenView SNMP system, which managed DiviCom (now Harmonic) MPEG encoders. By using an existing SNMP product, DiviCom showed that broadcasters could successfully monitor and control hardware using common platforms.

Broadcast monitoring systems

In the last eight years, several companies deeply entrenched in broadcast hardware have developed systems for monitoring both their own hardware and that of companies who recognize the value of integrating product lines. Some companies have brought expertise in multi-image display technology directly into the monitoring system, allowing the display to be reconfigured when error messages are important enough to force them to the monitor wall.

This ability to highlight maintenance information only during critical events is extremely powerful for operations personnel. It reduces the number of displays required in a control room and permits complex graphics displays that show, for example, the geographic location of a failure along with the explicit information on the nature of the event.

Remote monitoring systems can also show the location of a failed component — for example, a distribution amplifier that has reported its own demise to the monitoring system — both as text information as well as the rack layout and the explicit frame and slot at risk. Systems can be programmed to bring up schematics that show how the component is used in the system, making a workaround plan easier to formulate.

I first saw such a system in the late '80s in London at ITN News. The system would flag a problem and then bring up a graphic, showing perhaps the failed frame synchronizer and

how it was routed in the system. By dragging a replacement from a pool in the corner of the display on top of the failed unit, the system commanded the house router to switch the failed synchronizer out of the path and replace it with a spare. The operator did not need to know input and output numbers, or even use a router panel. The monitoring system and the control overlay allowed simple analysis and effective repair without complicated actions.

This should be the goal of all monitoring and control systems. However, simplification of complex environments is increasingly difficult without using a system that can interact with IT systems. As we integrate more IT components into broadcast infrastructures, we need to increasingly look to systems that converge on common platforms, or at the very least allow the display of data collected from SNMP and other monitoring systems.

Evaluating signal monitoring

Today, with centralized operations and other WAN systems, it is often important to bring data and control, as well as the monitoring of the signals themselves, back to a central location for evaluation. Using a scope, a broadcaster can digitize the waveform and transmit that data over a network. But this process is bandwidth-intensive if the data is to be even close to real time.

Another approach is to probe the signal, catching a snapshot of the signal and transmitting both a thumbnail and a representation of the waveform in low bandwidth. This is often enough, especially if failure conditions, such as loss-of-signal or out-of-range parameters, trigger a remote alarm of more intensity.

The largest broadcast remote monitoring systems are the network distribution systems used by most of the large networks.

If desired, a streaming copy of the signal can be forwarded at whatever bandwidth necessary to allow adequate analysis of picture or audio errors or content verification. System latency can complicate such monitoring because streaming engines can take many frames to deliver encoded content. Monitoring of closed captions, MPEG stream analysis, PSIP data and a host of other information gathered routinely from content is possible and highly useful.

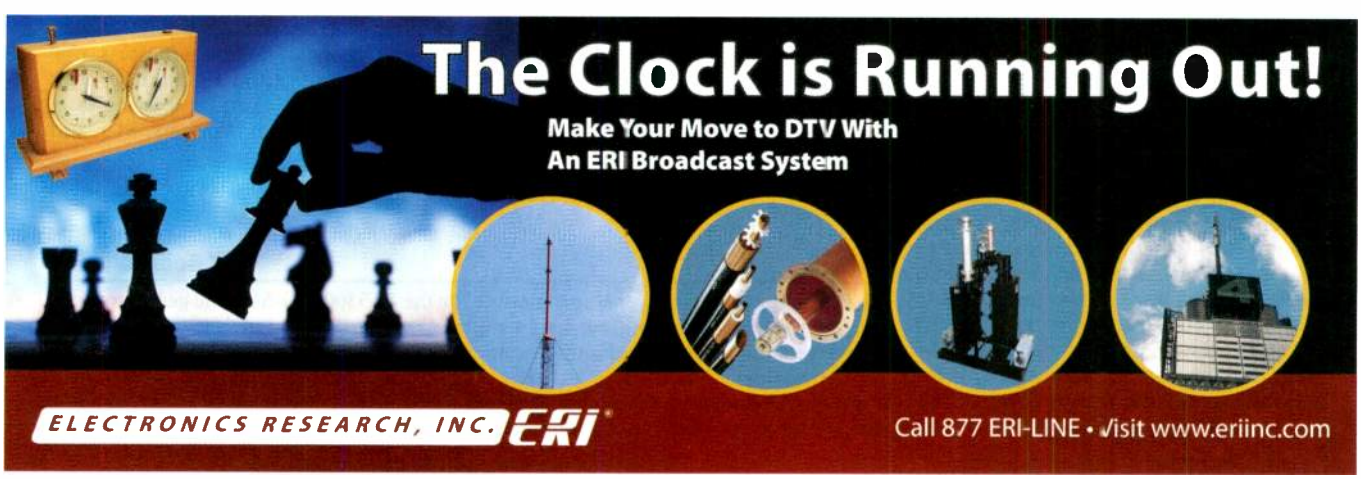
Lastly, in some cases, small and inexpensive remote monitoring devices can provide highly useful information. A solution can be deployed to cable headends that remotely monitors a station's signal, verifying that the signal integrity is good without delays while operators find phone numbers and chase down their counterparts.

Security cameras and remote monitoring systems can be combined to permit lights-out facilities to be monitored almost as if an operator has been dispatched to a location where trouble is suspected, such as to an unattended transmitter building.

With such technology, we now can determine when failures happen and often repair the affected system using remotely monitored and controlled routing systems. The largest broadcast remote monitoring systems are the network distribution systems used by most of the large networks. These not only monitor the health of the network signal, but also switch receivers and, like E.T., phone home for further instructions. BE

John Luff is a broadcast technology consultant.

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



DIGISUPER 22xs — Canon

High-definition studio lens optical system maintains size and weight commensurate to that of other portable production cameras, weighing one-third of a typical HD box lens; features 105mm input optical port that produces a high sensitivity, high contrast, optimized uniformity of brightness across the image plane.

800-321-4388; www.usa.canon.com

Apx585 — Audio Precision

Audio analyzer with eight simultaneous channels of analog I/O designed for multichannel audio products; features a user interface that allows operators to take measurements almost immediately; enables operators to automate entire test sequences, which then generate customizable graphic reports on individual test settings and results every time a sequence is run; offers a continuous sweep method that can take multiple measurements at once.

503-627-0832; www.ap.com

Headzone — beyerdynamic

Portable mixing system provides headphone-based 5.1 surround-sound reproduction for broadcast, post production, recording studios, mobile recording and video game sound design; offers ultrasonic tracking system that locates the orientation of the listener's head with respect to the source material and adjusts the audio accordingly; allows the operator complete freedom of movement; offers an advanced room simulation program that allows the operators to create an ideal auditory space in which to monitor the surround audio.

631-293-3200
www.beyerdynamic-usa.com

SMK4061 — DPA Microphones

Stereo microphone kit based around a pair of 4061 miniature series omnidirectional microphones; provides accurate sound quality for both live and recording applications; can handle the extreme sound pressure levels that occur when mounting the microphones in close proximity to, or on, the instrument; includes a variety of mounting accessories such as magnetic mounts and boundary layer mounts, which transform the mics into pressure zone mics, for a wide range of positioning options.

303-485-1025
www.dpamicrophones.com

NET 1 — Sennheiser

Wireless network system allows up to 10 receivers to be connected; works with a PC or alone; features a frequency management facility, frequency bank scanning, automatic distribution of frequencies to the receivers and wireless synchronization of the transmitters; allows real-time monitoring and remote control; integrates with existing wireless systems; includes a wide voltage range power supply for worldwide use.

860-434-9190
www.sennheiserusa.com

Duality — Solid State Logic

Large-format production console enables channel processing to be placed in the input or monitor path of the workstation by using a new split channel path; includes a Variable Harmonic Drive input stage on each channel and a SuperAnalogue mic amp, E and G series equalizers, and peak sensing RMS/over-easy compression; provides VCA-style or moving fader automation and complete control over DAW parameters from the console channel rotaries; offers multiple stereo busses or multiple 5.1 stems to optimize use of a full set of 5.1 pan/positioning controls on each channel; features a control surface that adds TFT display across all channels and Eyeconix, which enables the use of icons and images as track markers.

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

DP600 Program Optimizer — Dolby

File-based audio loudness analysis and correction system automatically normalizes the loudness of all file-based programming and commercials without affecting the original dynamic range by either adjusting metadata values or scaling the audio signal itself to a target loudness level; offers faster-than-real-time encoding and decoding of Dolby Digital, Dolby Digital Plus and Dolby E content, as well as transcoding between formats; includes compatibility with many common broadcast media file formats.

415-558-0200; www.dolby.com

FHD-4i — Quantegy Recording Solutions

External hard drive features a quad interface including two FireWire 800 ports, one FireWire 400 port, one USB 2.0 port and one eSATA port; features an internal power supply, an ultra-quiet fan, a full complement of interface cables and a carrying case; includes Oxford Semiconductor 924 chipset; is compatible with Windows, Mac and Linux workstations.

800-752-0732; www.quantegy.com

PT8613 — DK-Technologies

The dual link test signal generator module for the PT5300 HD-SD sync generator uses 1080p progressive scanning and 4:4:4 sampled component HD signals with up to 12-bit video resolution; allows 16 channels of audio test signals to be embedded into the video signal; provides a variety of test patterns, including dynamic patterns synchronized with the embedded audio for checking of AV synchronization; allows the insertion of a text label of up to 3 x 16 characters into the active video.

831-335-5543; www.dk-technologies.net

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MZ-M200 — Sony

Hi-MD recorder for broadcast and ENG applications records; plays in Hi-MD and MD formats; features larger buttons for basic record and playback operations, an overload indicator, a manual recording level control, and an ECM-DS70P stereo microphone; accepts removable 1GB MiniDiscs for up to 94 minutes of linear PCM uncompressed recording time and up to 34 hours in ATRAC3 plus format; includes USB 2.0 port for Mac and Windows.

800-686-7669
www.sony.com/professional

XA22x7BES — Fujinon

Compact, lightweight HD studio box lens has a focal length from 7mm to 154mm and F-stop ramping characteristics; features minimal focus breathing, 14-bit (16-bit optional) control with external port for robotics interface; incorporates a belt drive for zoom and focus; accepts a 127mm filter in the front barrel; offers all the features of the company's DIGI POWER controls; features LED indicators for zoom, iris and extender on the outside of the lens; comes with a support that fits on standard ENG-capable tripods, studio pedestals and robotics systems.

973-633-5600
www.fujinonbroadcast.com

DM240XR — Radyne

The open standard modulator includes DVB-S2 CM, VCM and ACM mode support; is DVB-S and DVB-S2 compliant; enables data rates up to 250Mb/s; features a Pro-MPEG GigE interface, as well as ASI, DVB Parallel, HSSI and G.703.

602-437-9620; www.radn.com

HD-RH1 — Iconix

High-definition POV 3-CCD remote camera system features a 1/3in progressive 16:9 image sensor, backed by a 1/3in 3-CCD prism system for optics, using 14-bit quantization at the A/D conversion and processing steps; prism leverages an asynchronous signal processing architecture that runs the CCD imagers at a different clock rate from the output signal; captures and outputs video in NTSC and PAL formats in all HD resolutions, while supporting frame rates of 24fps, 25fps, 30fps, 50fps and 60fps; includes outputs of HD-SDI as two single-link 4:2:2, dual-link 4:4:4 RGB/YcbCr, DBI-I and analog outputs, with genlocking capability to tri-level sync.

800-783-1080
www.iconixvideo.com

VM6000 — Tektronix

Automatic video measurement set runs on a new platform with high-speed signal acquisition hardware and optimized video measurement algorithms; detects video format automatically; allows testing of SD (480i, 480p, 576i and 576p) and HD (720p, 1080i and 1080p) video formats; enables users to freely select test patterns; uses the DPO7000 oscilloscope platform with a 12.1in XGA high-resolution, touch-panel display; supports software options for the basic oscilloscope functions of timing measurement, power measurement, serial data, and compliance testing for Ethernet and USB 2.0.

503-627-4753; www.tektronix.com

p1411A — precisionWave

RF vector signal generator includes a spectrum analyzer display and an internal IQ waveform generator, which can generate other signal types, specify data content or create worst-case signal scenarios for development and testing; produces EDGE, GSM, IS-95, NADC, PHS, WCDMA and CW signals, serving the 800MHz and 1700MHz cellular bands; features a 7in TFT display with touch-panel controls and low phase noise 10MHz internal frequency reference, which allows the source to accept an external 10MHz reference signal for synchronizations with other devices and test equipment.

866-386-6798
www.precisionwave.com

Hybrid Fiber Breakout Box — Gepco

Single-channel 4.5in SMPTE 304M hybrid fiber to ST breakout box breaks out to two ST female connectors on a recessed, protective metal top plate with optional electrical connectors; allows for an HD camera to CCU interconnection over existing fiber tie lines and can be used for Lemo-terminated hybrid fiber cables to standard ST fiber connectors; features ceramic ferrules and sleeves for high-quality optical alignment and low loss, a chassis constructed from heavy gauge anodized aluminum, and replaceable fiber jumpers and metal dust caps.

847-795-9555; www.gepco.com

FS-4HD/Pro HD — Focus Enhancements

Portable Direct-to-Edit (DTE) recorders feature higher capacities, with 60GB, 80GB and 100GB available for Pro HD version and 40GB available for HD version; both versions record in eight DV25 DTE file formats, including AVI Type 2, QuickTime, Matrox AVI and Canopus AVI, and HDV M2T; Pro HD version also records in M2T, QuickTime HDV, Avid OMF, MXF and Pinnacle AVI file formats; feature backlit display, hard drive and removable, rechargeable battery.

408-866-8300; www.focusinfo.com

MC Media Application Controller v1.1.3 — Euphonix

Includes enhancements to the way the MC controls Pro Tools and several new features for improving control of all applications; features a new Pro Tools application set with multiple banks of SmartSwitch keyboard shortcuts to make it simpler and faster to access Pro Tools commands; can handle 5.1 surround monitoring and two additional alternate speaker sets, plus two stereo SLS/headphone outputs; can be upgraded to Studio Monitor Pro with up to 7.1 monitoring, 48 inputs/outputs, recording feeds and four separate talkback feeds.

818-766-1666; www.euphonix.com

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DELL™ SONY millimeter
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Y-Split OpticalCon — Neutrik

OpticalCon system expansion offers an assembled Y-split cable comprised of four multimode fibers within two OpticalCon connectors on each end; accommodates a standard optical LC-Duplex connector in an all-metal housing; can be used with an LC connector in permanent connections or with an OpticalCon cable connector for mobile applications; features superior cable retention and a push-pull locking mechanism; protects against dirt and dust via an automatically operated sealing cover.

732-901-9488; www.neutrikusa.com

ENCORE — EGT

Video processor's expansion offers widescreen signaling and video programming system; enables TV sets of various sizes to receive and display signals; offers functions such as DVR/VCR control and multilanguage switching; encodes up to 32 distinct mono audio programs within a 1RU encoder; features increased GUI security, enhanced IPTV robustness and remote access for distributed closed-loop architecture.

404-591-4800; www.egtinc.com

Carbon Coder v2.0 — Rhozet

Provides accelerated transcoding and support for additional video formats, including H.264, MXF OPAtom, JPEG 2000, DPX and AAC; includes Carbon Drop, which streams data from Carbon Coder to Carbon Server for farm encoding, poster frame extraction at markers or time increments, YUV file import and export, improved VOB subtitling and chapter point handling, improved Line 21 and VBI handling, increased audio channel mapping flexibility, and improved watch folder management.

408-432-3333; www.rhozet.com

XA88x8.8BESM — Fujinon

HD telephoto lens features 88X magnification and focal length of 8.8mm to 777mm telephoto; uses the company's Precision Focus Assist and GO-Technology for improved image resolution and chromatic aberrations at all focal lengths; incorporates multiple aspherical lenses with three zoom groups; tightly sealed, dust-proof housing offers a built-in moisture protection system.

973-633-5600
www.fujinonbroadcast.com

PCM-D1 — Sony

Portable recorder outfitted with built-in condenser microphones and a high-performance mic preamp from analog devices features a 24-bit/96kHz recording capability and 4GB internal Flash memory; incorporates a built-in USB 2.0 port for both Mac and Windows OS; includes analog level meters with LED peak overload indicators, an LCD display with recorder status indication and menu selection, and signal processing functions including SBM, limiter and 200Hz high-pass filter.

800-686-7669
www.sony.com/professional

.75X wide converter — 16x9

Lens accessory for the Panasonic HVX200 camera employs four glass elements to reduce geometric distortion and improve off-axis performance; includes 82mm screw-in rear threads for easy attachment to the HVX200, which when combined with the accessory, shifts the 4.2mm to 55mm focal length to 3.15mm to 41.25mm; interfaces with Alfred Chrosziel HDV mattebox systems for professional shading and filtering; features optional 82mm to 72mm step-down ring, allowing compatibility with the Sony HVR-Z1U and Canon XL-H1, XH-G1 and XH-A1 camcorders.

661-295-3313; www.16x9inc.com

Opus 900 — beyerdynamic

Wireless system offers a wide variety of transmitters, including the DM 960 S, DM 960 B and the DM 969 S dynamic transmitters, the EM 981 S and the CM 930 B condenser transmitters, and the TS 900 M and TS 900 C pocket transmitters with rechargeable contacts — which are also outfitted with ACT infrared interface for frequency setting; offers three receivers, with 99 preprogrammed frequencies, including the NE 900 S single channel, NE 900 D dual channel and the NE 900 Q quad channel.

631-293-3200
www.beyerdynamic-usa.com

1080p HD plasma displays — Panasonic

Displays produce entire color range specified in the HDTV standard (ITU-R, BT709) with 1920 x 1080 pixel resolution; feature contrast ratio of 5000:1 and 16-bit processing with 4096 steps of gradation; provide three interchangeable, multifunction slots to accommodate a wide range of terminal boards for various applications; available in 50in TH-50PF9UK, 65in TH-65PF9UK and 103in TH-103PF9UK models.

201-348-7000; www.panasonic.com/broadcast

TR-1, TR-1A, TR-2A and TR-3 — Kramer Electronics

Isolation transformers eliminate noise in video and audio signals caused by ground loop problems; the TR-1 (for composite video signals), TR-1A (for balanced mono audio signals), TR-2A (for balanced stereo audio signals) and TR-3 (for composite video and balanced stereo audio signals) break the ground connections in video and audio transmission lines to eliminate any hum caused by ground loops and remove both DC potentials and common mode noise that could be the result of long cable runs; offer various grounding options.

908-735-0018; www.kramerus.com

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Help Wanted

ASSISTANT CHIEF ENGINEER

WISN-TV, Hearst-Argyle television station and ABC affiliate, is looking for Assistant Chief Engineer with drive and dedication to quality control of local news production and day-to-day engineering operations. Requirements: engineering degree or equivalent experience; minimum five years broadcast engineering experience; or equivalent combination of education, training and experience; excellent digital and IT skills; also must have thorough knowledge of LANs, WANs and computer networking; knowledge of analog and digital studio and transmitter systems. Looking for person with positive, news-oriented team attitude with some skills in business management, accounting, and human relations. Previous experience with Harris automation systems and Pinnacle servers, Avid nonlinear editing systems, electronics maintenance, project management, RF engineering and previous technical management, is preferred. Valid Wisconsin driver's license required. Fax: 414-342-2657, e-mail: tcoleman@hearst.com or mail: Tony Coleman, Director of Engineering, WISN-TV, PO Box 402, Milwaukee, WI 53201. EOE.

POSITIONS AVAILABLE

The Voice of America is a component of the Broadcasting Board of Governors. The VOA broadcasts news and information to millions throughout the world in more than 40 languages, via radio, television and the Internet. Our diverse, multicultural and dedicated professionals staff correspondent bureaus, transmisison stations and marketing offices around the world in addition to our main offices in Washington, D.C. we are currently seeking seasoned professionals in the following postions to supplement the technical staff supporting VOA's television broadcast mission to Iran. These positions are full-time and are assigned to VOA's Operations Directorate in Washington, D.C.

- Master Control Technician
- Studio Supervisor
- Maintenance Technician
- Character Generator (Chyron) Artist
- Graphic Artist for basic and 3D work
- TV Director
- Telecommunications Specialist
- Mini-Cam (ENG) Technician

Full vacancy announcements can be viewed at www.usajobs.com. Under agency search, look for Broadcasting Board of Governors. You may also contact VOA's Office of human Resources, Leslie Brown at (202) 619-3117 or by email at lybrown@ibb.gov.

MAINTENANCE ENGINEER

WMBD/WYZZ-TV Peoria, Illinois is looking for an experienced Maintenance Engineer to maintain and repair studio and ENG equipment, set up and operate live events. Responsible for IT administration with IT experience in Windows, familiar with Sony betacams and Panasonic DVCPro equipment. Associates degree in Electronics and 2 years experience preferred. Send resume to: Herman Marvel, Chief Engineer, WMBD-TV, 3131 N. University St, Peoria, IL 61604. EOE.

Help Wanted

MAINTENANCE ENGINEER

QUALIFICATIONS: Immediate opening for Maintenance Engineer at WPRI CBS & WNAC FOX affiliate stations in North East. Applicants should have a minimum of five 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 FCC rules. Excellent communication and people skills necessary.

JOB DESCRIPTION: Responsible for the repair and maintenance of all broadcast equipment for the station including automation equipment, video servers, digital switchers, network and fiber paths, cameras, audio, microwave and satellite equipment, digital and analog.

Send resume to: WPRI/WNAC-TV Engineering Dept., 25 Catamore Blvd. East Providence, RI 02914 or E Mail to: resume@wpri.com. by January 12th, 2007.

We are an Equal Opportunity Employer. No Phone Calls Please.

nep NEP Broadcasting is seeking Mobile Unit Engineers of all experience levels to manage and monitor mobile unit broadcast operations at remote sites, perform preventative maintenance, trouble-shoot, execute changes and engineering updates on the mobile unit. Degree, training, 3+ years experience in broadcast technology, equipment, facilities, and production or any combination considered. Maintenance engineering background a plus. Please send resume and salary history to NEP Broadcasting LLC, hr@nepinc.com, Fax: 412-820-6045, 2 Beta Drive, Pittsburgh, PA 15238.

BROADCAST SYSTEMS DESIGN ENGINEER
SPARROWHAWK BROADCAST SERVICES

Immediate opening in our Denver Network Operations Center. Position is responsible for design, drawing and installation coordination of broadcast equipment systems. Reqs. 5-10 yrs broadcast engineering exp, ability to perform maintenance & repair of broadcast equipment systems, exp with TV signal measurement equipment, and exp. with Autocad 2D or VisCAD SQL. To apply, forward resume to: resume@shbroadcastservices.com or fax to (303) 224-0879.

BROADCAST ENGINEER/TECHNICIAN

Experienced w/ knowledge of production and transmission. Position is immediate. Salary and Benefits commensurate to experience. Additional details available.

Flight 9
845-426-5320
Fax Resume to: 845-426-2548
E-Mail JillH@Flight9.com

Help Wanted

TURNER STUDIOS

ENGINEERING PROJECT MANAGER

TURNER STUDIOS provides broadcast and post-production facilities and services for the Turner Entertainment Networks from our all-digital television complex in Atlanta, Georgia.

We are seeking a motivated, experienced, client-oriented **Engineering Project Manager** to join our expanding team. If your passion is cutting edge technology in a creative, fast-moving environment, Turner Studios Engineering is looking for you!

Please visit **www.turnerjobs.com** and search for **Requisition #70816BR** for complete details.

Submit resumes to: Jeff Sharpe, Director of Engineering via email only - **jeff.sharpe@turner.com**

Turner Broadcasting System, Inc. and its subsidiaries are Equal Opportunity Employers.

ENGINEER

WTKR News Channel 3 is looking for a qualified engineer to fill the position of Sr. Maintenance Engineer. Send resume to WTKR-TV 720 Boush St., Norfolk Va. 23510 or email Jerry.Garvin@WTKR.com.

ENGINEER

KSBI TV 52, OKC DMA, seeking an experienced Engineer. Duties will include operation and maintenance of broadcast equipment such as Beta and DV cam video tape recorders, satellite earth-station controllers and receivers, video servers, ENG receive systems, routing systems, audio mixing consoles, and camera video control panels. Also, programming and loading spot playback systems, transferring commercial and program content from various sources, and maintaining documentation of content, in coordination with other departments. Additional duties will include review and quality control or recorded material, occasional switching of non-air programming, monitoring and logging transmitter status, video and audio set-up and operation for live remote broadcasting, and other related duties as directed by the Chief Engineer. Requirements: knowledge of broadcast video and audio systems, experience with video tape and servers, C-band and Ku-band satellite receive systems, and computer operation, including familiarity with Windows NT, 2000, and XP operating systems. Basic electronics troubleshooting knowledge and experience with post-production video editing, on-air switching, and live production audio is a plus. Qualified candidates may send resume to info@ksbitv.com or fax to 405 631-7367.

CLASSIFIEDS

Help Wanted

VIDEO NETWORK SPECIALIST

Rainbow Network Communications seeks an experienced candidate in its Broadcast Engineering group as a management level position in the Video Network Applications / IT support division for its Bethpage, NY TV facility. Candidate will manage and maintain all aspects of live SD/HD, on air broadcast automation and media archive systems, specifically network configurations and control platforms. Candidate must possess a minimum of 3-5 years in broadcast systems and associated network architectures and related support, as well as hardware/software installations and configurations and have the ability to work well in pressure situations with minimal supervision in a fast-paced environment. Candidate must have the ability to manage a team of network applications engineers/technicians by coordinating and executing the implementation of new project initiatives and technologies as well as the routine day to day troubleshooting and maintenance functions on all broadcast network systems. Computer and networking skills a must – MS Windows OS, SQL server, Harris automation, GVG Profile DDRs, SANs and related experience highly preferred.
Submit resume to: jhurney@cablevision.com

Cablevision is an equal opportunity employer, M/F/D/V, and a drug free workplace.

BROADCAST TELEVISION SYSTEMS ENGINEER

Rainbow Network Communications seeks an experienced Broadcast Television Systems Support Engineer for its Bethpage, NY facility. Individual must possess a minimum of 4-5 years experience in broadcast systems maintenance and be willing to work nights, weekends and holidays. Responsibilities include support and troubleshooting live on-air master control suites & post-production equipment. Must possess a strong working knowledge of analog/digital SD & HD systems. This includes video switchers, routers, DVE's, DDR's, automation equipment and editing systems. Experience with GVG 7000, M2100, Profile DDRs, Accom Axial and Harris automation is a plus. Must be able to work well under pressure with minimal supervision, understand schematics in diagnosing on-air problems, and have hands-on experience with computer networking, Windows OS, as well as hardware/software installations and configurations. Submit resume to: jhurney@cablevision.com .

Cablevision is an equal opportunity employer, M/F/D/V, and a drug free workplace.

BROADCAST ENGINEER

KSHB-TV, the NBC affiliate in Kansas City, is looking for a seasoned broadcast engineer to join our staff. Qualified candidate should have at least 2 years of college or technical school training majoring in electronics and 3 years exp-broadcast engineer. Must comprehend schematics, mechanical drawings and technical manuals. Valid CDL and FCC license. Resumes to: HR Manager, KSHB-TV, 4720 Oak Street, KC, MO 64112. EOE

Help Wanted

CHIEF RF ENGINEER

Rainbow Network Communications seeks a Chief RF Engineer for its Bethpage, NY TV facility. Ideal candidate will possess a minimum of 5-10 years of experience in RF Transmission with proven technical skills, hands-on experience managing a technical staff and dealing with FCC issues. Comprehensive knowledge of C/Ku band satellite transmission, fiber, and their associated sub-systems a must. Individual should possess a strong knowledge of digital/analog skills, audio/video evaluation, broadcast MPEG encryption systems such as VC II, DC II, Harmonic and Power VU, as well as a fluid understanding of MPEG SD and HD encoding, transmission and processing.
Submit resume to: jhurney@cablevision.com

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NETWORK APPLICATION TECHNICIAN

Rainbow Network Communications seeks a Network Application Technician for its Bethpage, NY TV facility. Ideal candidate possesses a minimum 3-5 years television broadcast experience, must have good troubleshooting and interpersonal skills and ability to work independently under pressure. Computer and networking skills a must. Working knowledge and experience with MS Windows OS, Harris Automation and GVG/ Thomson Profile DDRs and SANs preferred. Some lifting of heavy equipment required. Must be willing to work flexible hours including weekends as needed and be available for support after hours. Submit resume to: jhurney@cablevision.com .

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A Prism Business Media Publication
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January 2007, Vol. 49, No. 1 (ISSN 0007-1994) is published monthly and mailed free to qualified persons by Prism Business Media, 9800 Metcalf Ave., Overland Park, KS 66212-2216. Periodicals postage paid at Shawnee Mission, KS, and additional mailing offices. Canadian Post Publications Mail Agreement No. 40597023. Canada return address: DHL Global Mail, 7496 Bath Road, Unit 2, Mississauga, ON L4T 1L2. POSTMASTER: Send address changes to Broadcast Engineering, P.O. Box 2100, Skokie, IL 60076-7800 USA. CORRESPONDENCE: Editorial and Advertising: 9800 Metcalf, Overland Park, KS 66212-2216 Phone: 913-341-1300; Edit. fax: 913-967-1905. Advert. fax: 913-967-1904.

Predicting the end

It's budget-setting time, and engineers are trying to foretell — and forestall — equipment replacement.

BY STEVE BLUMENFELD

Once again we've reached an end: the end of the year and the end of an era. Recently, I have been contemplating the end.

The Internet

The Internet is a circular data-linking environment with no beginning and no end. But what if it did end? Despite its massively distributed architecture, a few choice catastrophes, could end the Internet as we know it, even if only for a short time.

It's architecture was designed to prevent a single failure from causing a disruption to the whole. During the past 20 years, the Internet has proven to be a robust and organic system with great survivability.

Survivability and uptime are two things we strive for. Systems are only as reliable as their weakest link. Have you ever done a reliability inventory? While this is not important for a massively redundant system such as the Internet, it is important to smaller broadcast systems.

Predicting a system's end

In the last few months, I have seen a main broadcast component crash and — in the eyes of engineers — come to an end. The good news is that with the end of this troublesome component came a shiny new cluster of devices that promise to live a long life and adapt to meet future needs.

The end of life can happen in many ways. In a technological sense, an item reaches its end when it becomes obsolete or is no longer supported. And when it breaks down and can't be repaired, it is certainly at its end.

So why am I dwelling on this topic? Engineers must continually make predictions based on many technical aspects. One of those predictions is the end. Around the end of the year, it's budget time, which means engineers must put on their magic wizard hats and break out their crystal balls to predict what equipment will survive the next year and what will need to be replaced.

When evaluating new systems, I spend a lot of time looking at MTBF numbers. In the early days of video servers, engineers had to constantly weigh the reliability of the devices, specifically the hard drives and how much redundancy (i.e., cost) was needed to be added to the systems to receive acceptable levels of reliability.

Engineers must put on their magic wizard hats and break out the crystal ball to predict what equipment will survive the next year and what will need to be replaced.

You may ask, "Isn't that what I pay all those maintenance contracts for?" While those contracts may give the management some peace of mind, there is a huge difference between the ability to repair a system and it not failing in the first place.

In an all-tapeless facility, broadcasters expect at least 99.999 percent uptimes of all major systems. If the system generates revenue, then even the .001 percent lost could be disastrous. However, with redundancy comes complexity, and with complexity comes more chance for failure. The conundrum is to find a system that is 100 percent reliable, simple to use and easy to maintain.

Interestingly, as systems become more complex, the MTBF can be dependent on the seemingly least important and least technologically advanced component or subsystem. Today, the latest storage technologies have mean times of 1 million hours (about 100 years), which is great, but the capacitor in the power supply may have a MTBF of two years.

If systems are designed properly, redundancy is built into the subsystems with low MTBF. Therefore, a single failure doesn't bring the whole system down. A problem arises if this is not carried through to devices with high MTBF.

Remember, MTBF is just a statistic. Any part can fail at any time for any reason. Thus the conundrum that hits at budget time: low complexity, low cost or high reliability. Balancing these leave little room for unexpected equipment breakdowns. So engineers must hope a system's end does not come before its replacement is budgeted for. BE

Steve Blumenfeld is chief technology officer for Current TV.

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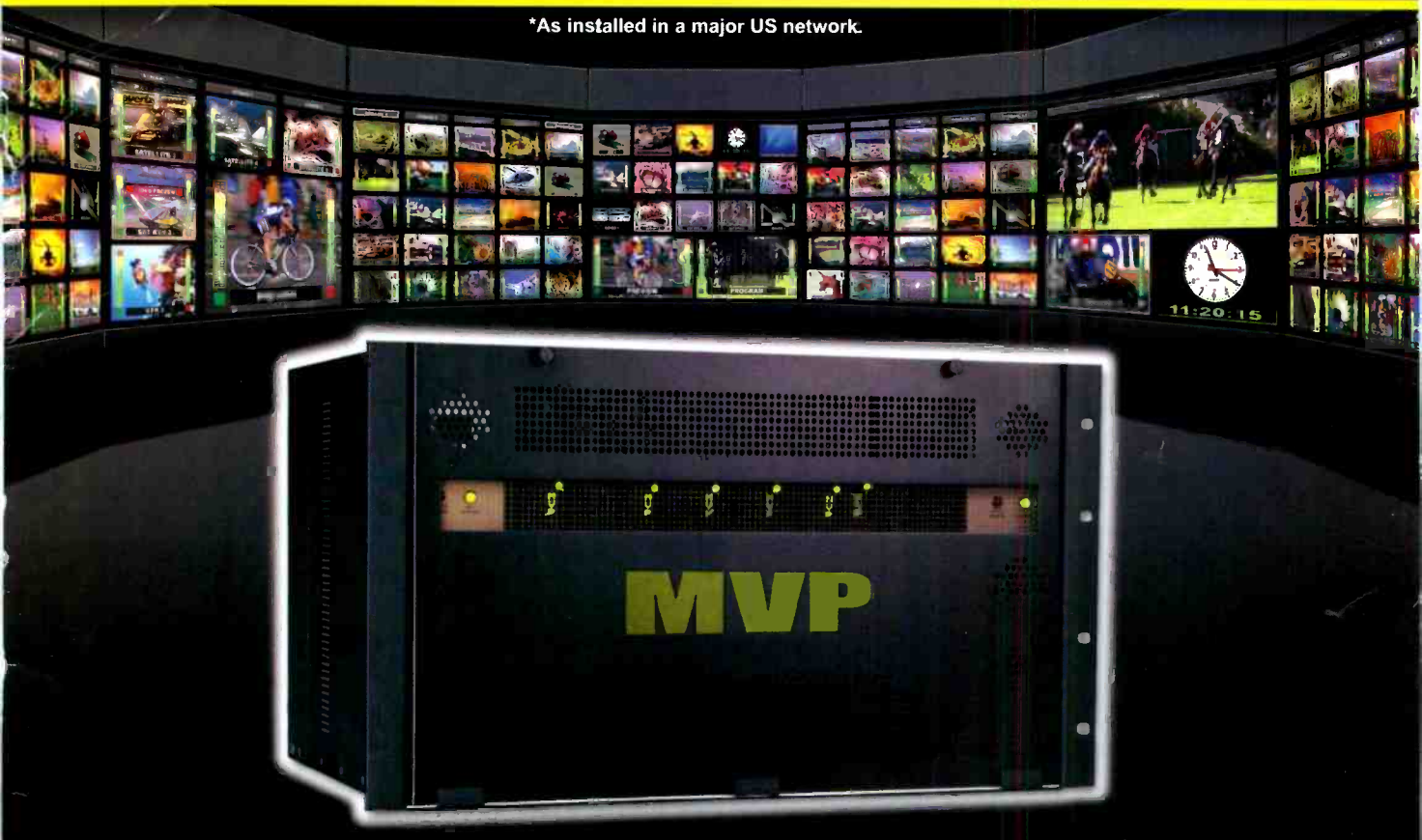

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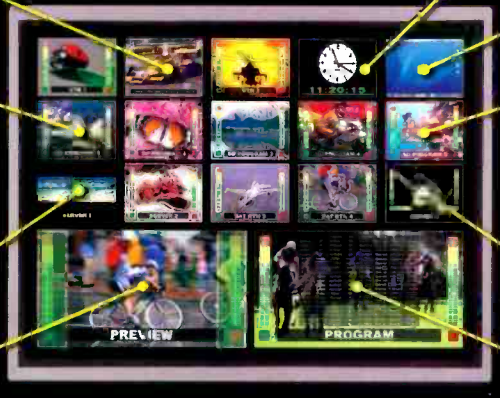

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