SEPTEMBER 2008

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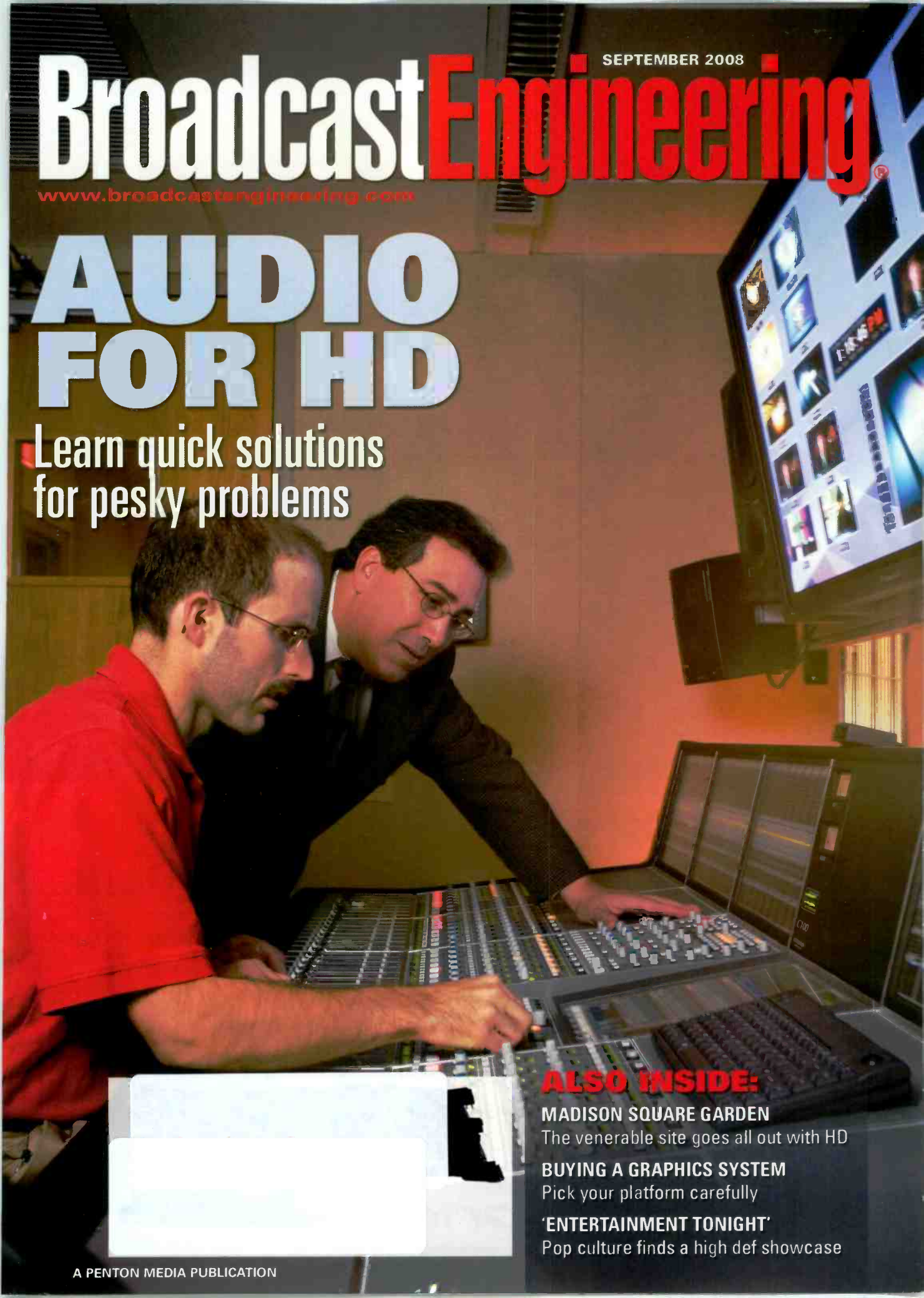
AUDIO FOR HD

Learn quick solutions for pesky problems



ALSO INSIDE:

MADISON SQUARE GARDEN
The venerable site goes all out with HD

BUYING A GRAPHICS SYSTEM
Pick your platform carefully

'ENTERTAINMENT TONIGHT'
Pop culture finds a high def showcase

A PENTON MEDIA PUBLICATION

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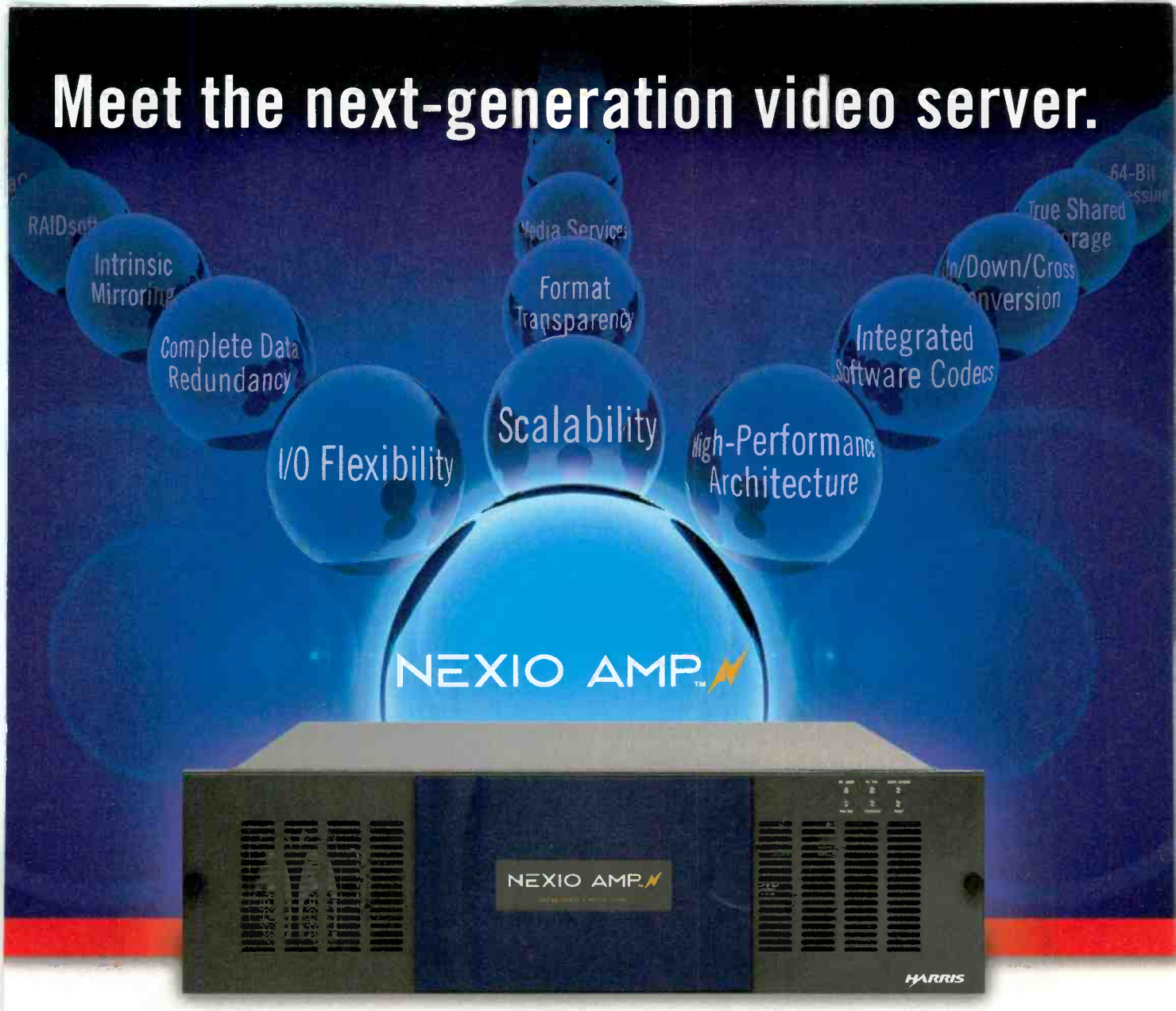

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- **High-performance architecture — Real-time, multistream, 64-bit processing**
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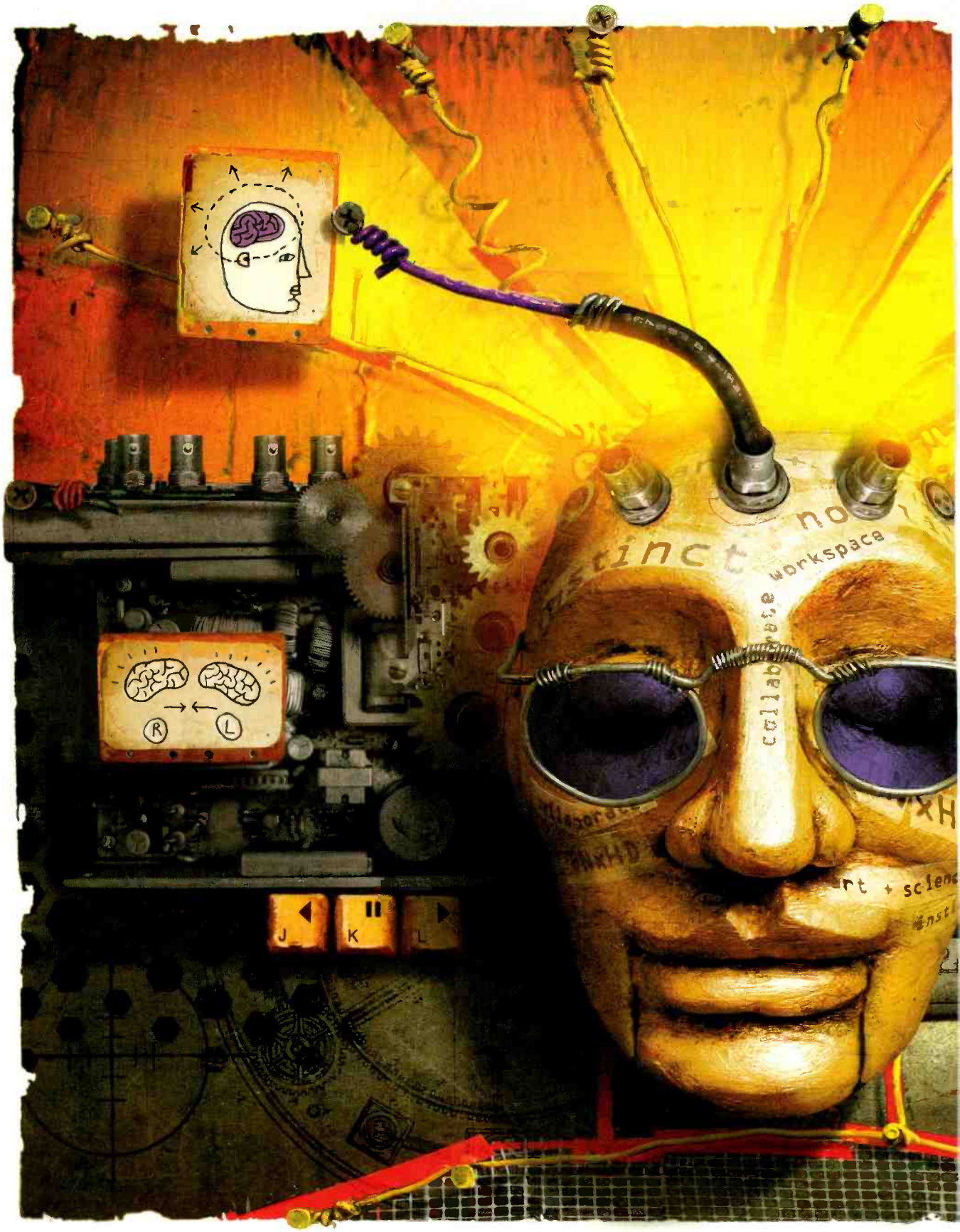

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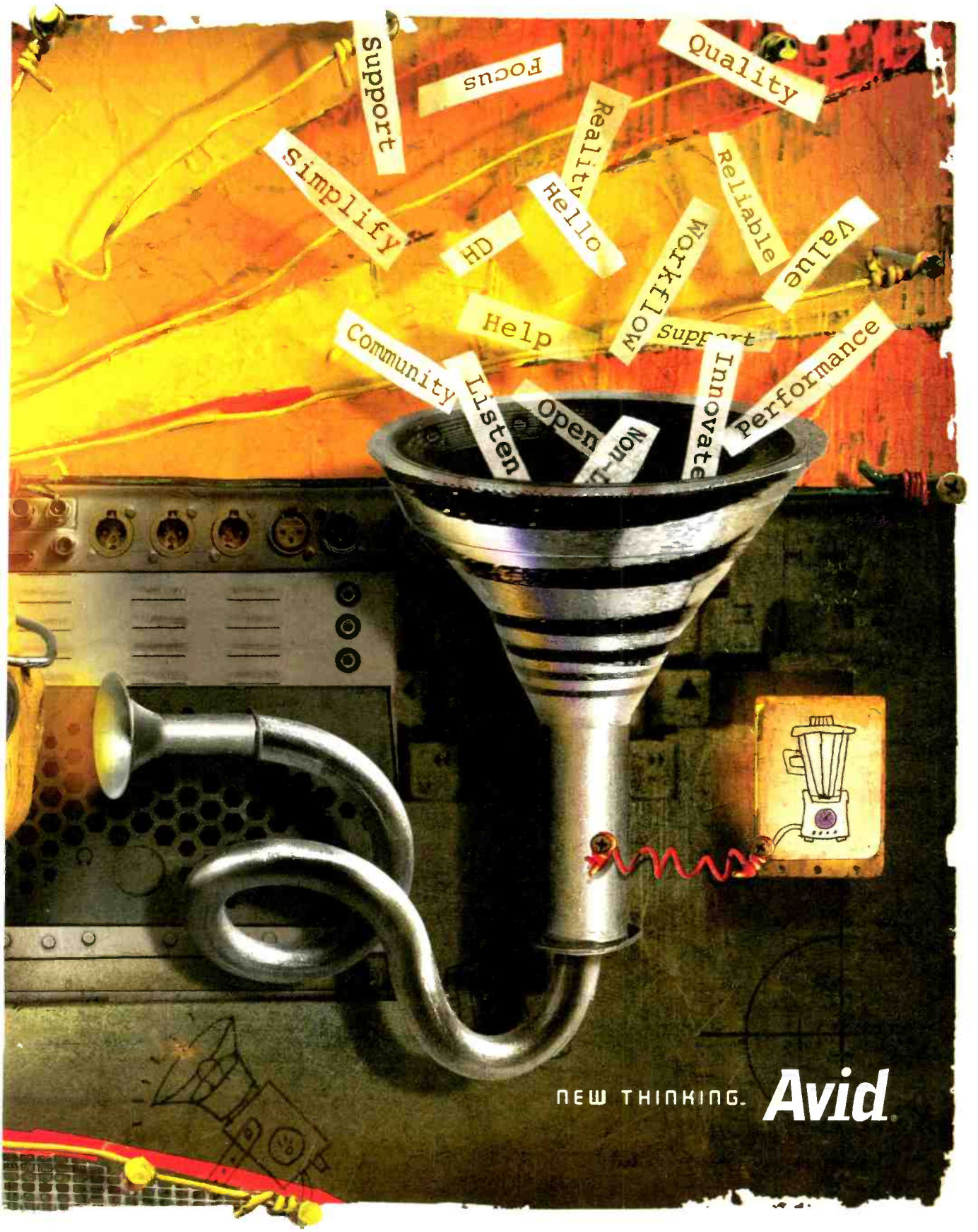

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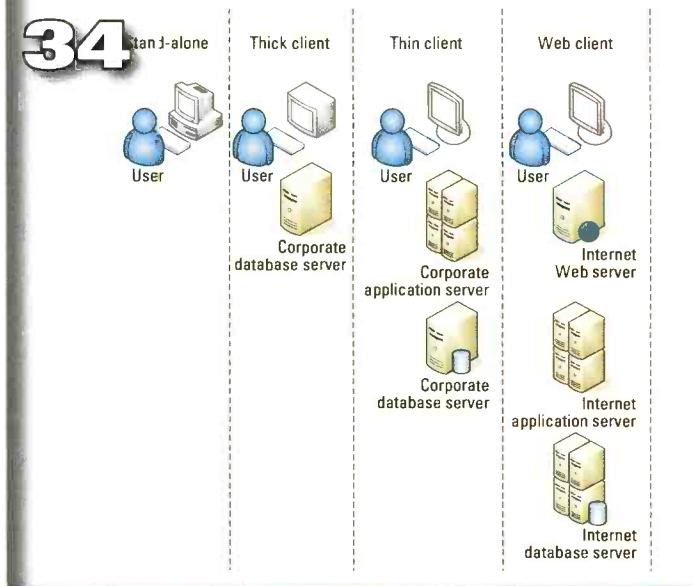
SEPTEMBER FREEZEFRAME QUESTION

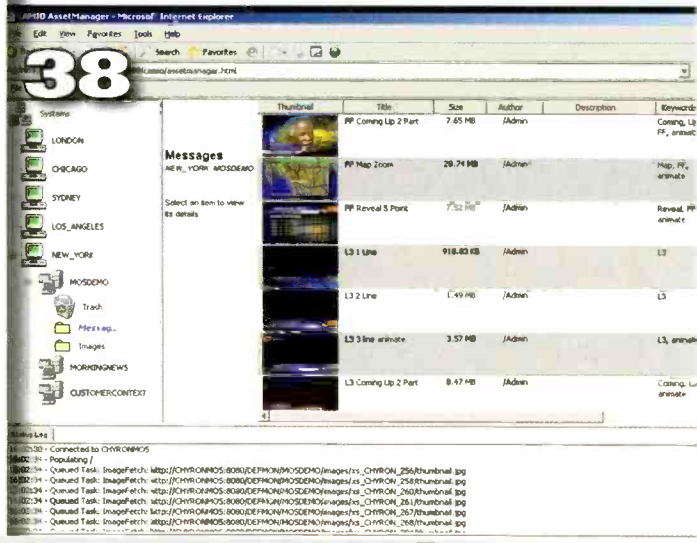
When it comes to buying a new video server, there are at least two key specifications to think about when calculating server uptime.

Consider Av = 100 percent x MTBF/(MTBF+MTTR), where Av is system availability, MTBF is mean time before failure, and MTTR is mean time to repair.

Therefore, when thinking only about system availability, which attribute (MTBF or MTTR) is the more important one for identifying highly available systems?

The answer is on page 8.





even **twins** have their own **personalities.**

the beauty of P2 HD in two new handhelds

Like twins, Panasonic's new AG-HPX170 and AG-HVX200A full production quality P2 HD handheld camcorders are as alike as they are different. They both offer a 13X Leica Dicomar zoom lens; 1080i/p and 720p and 4:2:2 independent-frame recording; variable frame rates; a new, advanced 3-CCD progressive imager with spectacular quality; and the reliability and flexibility of a fast, file-based workflow.

Why might you prefer one over the other? The HVX200A features a DV tape drive in addition to two P2 card slots, allowing you to move easily from SD to HD and from tape to solid-state. If you have already transitioned to a solid-state file-based workflow, the two-slot HPX170 offers additional high-end features, including HD-SDI, metadata input, Dynamic Range Stretch and a 5-year limited warranty (upon product registration).

The HVX200A and HPX170. Distinctly different, yet uniquely alike. Learn more at **www.panasonic.com/p2hd**.

AG-HVX200A	AG-HPX170
• 11 variable frame rates	• 20 variable frame rates
• 4.2mm – 55mm	• 3.9mm – 51mm
• Lightweight – 5.5 lbs	• Lightweight – 4.2 lbs
• 3.5" flip-out LCD	• Waveform/Vectorscope
• 21 HD and SD formats	• 3 focus assist functions

P2HD when it counts

Panasonic ideas for life

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ON THE COVER:
At Madison Square Garden, engineer Joseph Malespina and chief engineer Michael Mitchell rely on the SSL C100 HD console for the facility's multichannel audio.

SEPTEMBER FREEZEFRAME ANSWER

In general, MTTR becomes the more important metric when computing Av and providing a highly available system. However, as A. Kovalick notes in his book, "Video Systems in an IT Environment," "... adding another 9 in terms [of reliability] may cost as much as a factor of 10 in equipment costs at the 99.999% level ..."

Al Kovalick's book, "Video Systems in an IT Environment" is available from Focal Press.

The Firsts Just Keep On Coming...

What else would you expect from the #1 router company in the business?

Utah Scientific has been bringing you breakthrough innovations for more than 30 years. Here are just a few of our most recent milestones:

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2008 – *The first 1k X 1k router in a single equipment rack – The UTAH-400/XL*

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When you're responsible for the transition to HD news at one of the country's largest TV station groups, you need to ensure seamless integration of SD and HD material. That's why Sinclair's Mark Nadeau put Kahuna™ at the heart of his HD transition strategy.

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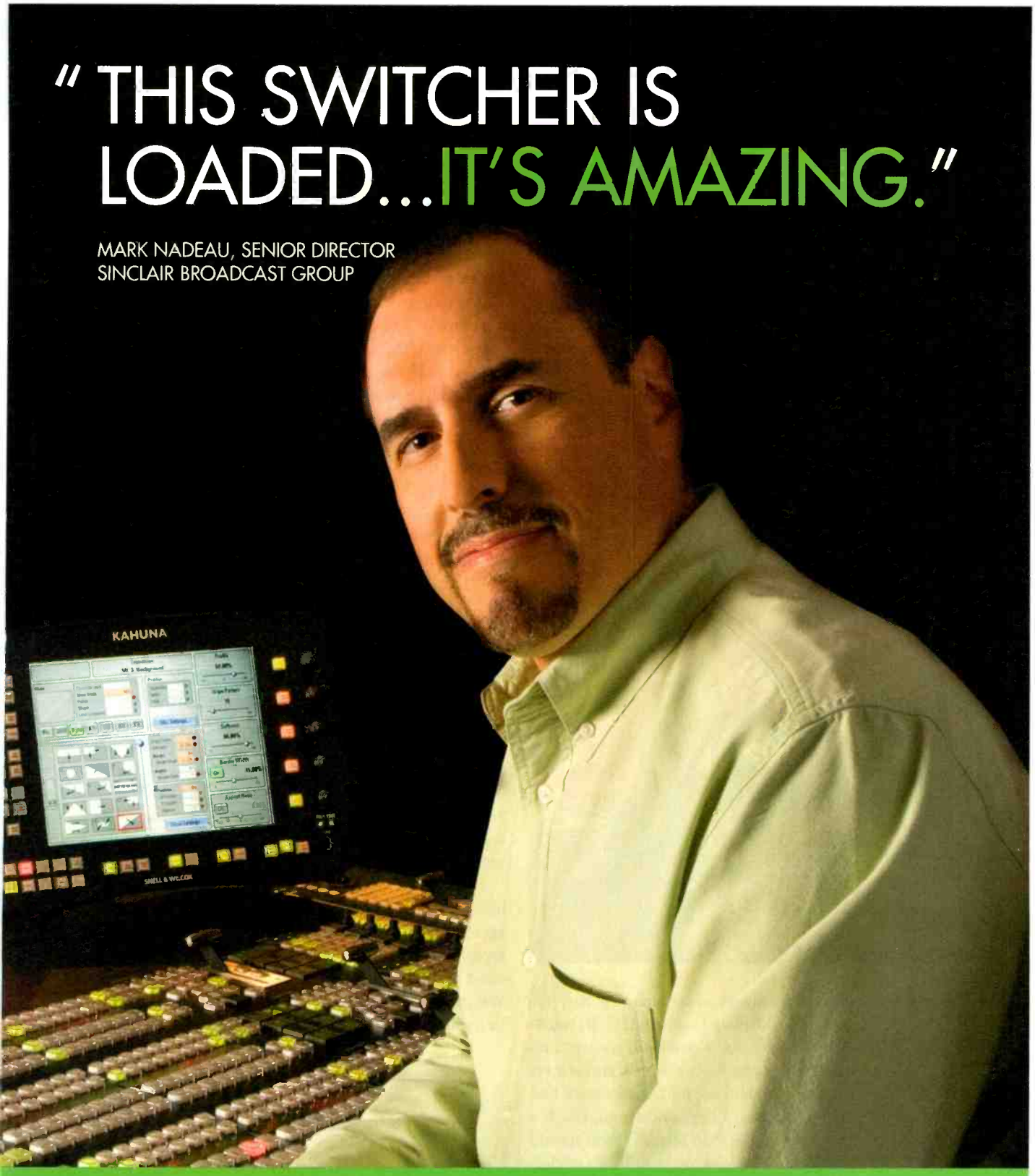
"THIS SWITCHER IS LOADED...IT'S AMAZING."

MARK NADEAU, SENIOR DIRECTOR
SINCLAIR BROADCAST GROUP



SINCLAIR BROADCAST GROUP STANDARDIZES ON KAHUNA FOR MOVE TO HD NEWS PRODUCTION

Putting Pictures to Work

SNELL & WILCOX™

Recycling

I recently spent an entire day cleaning my basement. One result was a small mountain of old computers and electronics to be trashed. My first thought was to simply stack it on the curb on trash day. One call to the refuse company junked that idea.

They informed me that my community had an electronics recycling program. A call to the city told me that this was true, but the cost was $10 per computer or monitor and $25 per TV set. Man, what I considered trash was going to cost me a fortune to get rid of.

It seems that everyone must become a recycler these days. Actually, broadcasters were among the first to help eliminate dangerous chemicals from landfills.

Broadcast Engineering readers older than 50 may remember the days of polychlorinated biphenyl (PCB) transformers. PCB-containing oil was a common coolant and dielectric used in high-voltage, high-power transformers and capacitors. Power companies and broadcasters had millions of these devices in use. A key concern was fire. If a transmitter building containing PCB transformers should catch fire, the station could be looking at millions of dollars in damages, lawsuits and soil reclamation costs.

Now, it seems, we're on the cusp of another environmental disaster — disposal of computers and other electronic waste, or e-waste for short. Some studies estimate that the number of obsolete computers in the United States will soon be as high as 680 million units. As few as 5 percent of people recycle their computers, compared with a 42 percent rate for overall solid waste and a 70 percent rate for major appliances.

Here comes U.S. Congress to the rescue. Sens. Ron Wyden, D-OR, and Jim Talent, R-MO, have introduced S. 510, a bill that would provide for a temporary tax credit to help jumpstart a national recycling infrastructure. In the House, Reps. Mike Thompson, D-CA, and Louise Slaughter, D-NY, coauthored H.R. 425, a bill that would impose a $10 fee on certain electronics products to finance a grant program administered by the U.S. Environmental Protection Agency.

Some states have already adopted laws requiring the product manufacturer to be responsible for bearing the cost of recycling used electronics. California has imposed a tax of $6 to $10 on the sale of most computers. Best Buy, HP, Staples and other electronics dealers have implemented recycling centers or will take back electronics for a fee.

Imagine an engineer trying to drop off an old model 300 production switcher at Best Buy for recycling. The engineer says, "Sure, I bought this here. It's an original DIRECTV satellite receiver." Trying to recycle an old Ampex ACR-225? Say, "Yep, this was my first Beta VCR."

In May, the U.S. Postal Service began providing postage-paid envelopes to anyone wanting to recycle e-waste. These envelopes could be used to mail cell phones, digital cameras, inkjet cartridges, MP3 players and PDAs, among other things, for recycling. The postage is paid by Clover Technologies Group, a firm that recycles, remanufactures and remarkets inkjet and laser printer cartridges and small electronics.

Perhaps you could break down those larger electronics, like that production switcher, into envelope-sized packages. Stuff those thousand or so parts into multiple envelopes, and let someone else take care of the recycling. One word of warning: Be sure to remove any station call letters. You probably don't want to be identified. Now, that would be bad PR. BE

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

MULTI-IMAGE OUTPUTS

Rethink multi-image expandability

Kaleido-X is simply the most expandable multi-image display system, with expansion all the way up to 1152 video inputs and up to 128 multi-image outputs. This unmatched scalability is delivered without impacting its 'best in class' image quality, layout flexibility, and robustness. The very best monitoring, without limitations. It's time to rethink what's possible.

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Rethink what's possible

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Battery-powered digital TVs

Dear editor:

I've got a few comments on your July issue. Regarding your editorial, "A DTV Service Pack," I think the biggest problem we TV broadcasters face is the confusion about the conversion. In our market, I'm concerned that after Feb. 17, 2009, all our viewers will not be served. This is through no fault of our own, but because cable and satellite has complicated the reception issues. Satellite says, "You'll still get your NBC," but it's unclear in our area which NBC station they will get. I'm concerned many will not get their local signal.

I'm also finding that viewers are very undereducated on antennas. When I grew up in Toledo in the '50s and '60s, my parents and I had a rooftop antenna, and we routinely watched UHF and VHF signals in Detroit from 60mi away.

Now I talk to people 6mi away who don't know what they need to get, where to get it and how to properly install an antenna system. Perhaps public education is needed in this area? Perhaps some enterprising author could produce a book or a downloadable PDF?

Regarding Allen Pitts' letter to the editor about the need for battery-powered digital TVs, I have an old computer battery backup connected to a small Sharp DTV, which serves as my emergency receiver. It has served me well, twice. A small connector parallels the battery, allowing me to put a second battery into service.

But Allen does bring up a good point. The consumer does need a small, portable device. I would also suggest that there is a market for a receiver that would pick up audio only from DTV broadcasts. Such a receiver could be used for both broadcasters in cuing and communications, for revenue with additional audio program streams, and as a public service for the blind.

For example, a station sending out weather radar on its second channel could easily set PIDs so that a third channel uses the video from the second, while taking a different unique audio source. This way, you're not adding more bandwidth retransmitting the same signal twice.

I see this as the solution for reading services for the blind, as well as local services. Perhaps stations could even find revenue streams by sending out audio for radio stations, Web broadcasters, educational institutions, local government, or even kiosks at local malls and public places. Imagine going to the mall and seeing the weather radar while being treated to promotional audio pieces about what will be on the news tonight or what is happening in the community.

But getting back to the point, the industry needs a product — a good versatile product!

Frederick R. Vobbe, VP/CO
WLIO Television
Lima, OH

The discussion continues

Dear editor:

In response to a letter to the editor published in your July issue on battery-operated digital/flat-screen televisions, I can't help but wonder if this person has ever heard of power inverters or generators. If power loss is an issue, you have many choices today.

I'm sure the industry is looking at a way to make small flat-screen digital tuner TV sets. Until this happens, remember some of the newer high-end laptop computers already have built in tuners. I really think it was a question of what Americans will settle on before we start making them by the thousands.

So, go shopping for that genny or a mega-power inverter, study your power formulas, and get creative, America!

Roland Becker

Dear editor:

In your July issue, Allen Pitts' letter to the editor states that there are no battery-powered digital TVs for people to use in emergencies. Allen Pitts is wrong. Insignia makes a battery-powered DTV receiver, model NS-7HTV.

Richard D. Bogner

Brad Dick responds:

Hmmm ... That depends on your definition of "available."

The receiver you mention appears to be a discontinued model. Yes, I did find one available on eBay, but it's used. A further brief search turned up no new models available for sale in stores I'm familiar with.

However, since the article appeared, other readers have claimed that two other models are available.

Test Your Knowledge!

See the Freezeframe question of the month on page 6.

MOBILE TV

THOMSON
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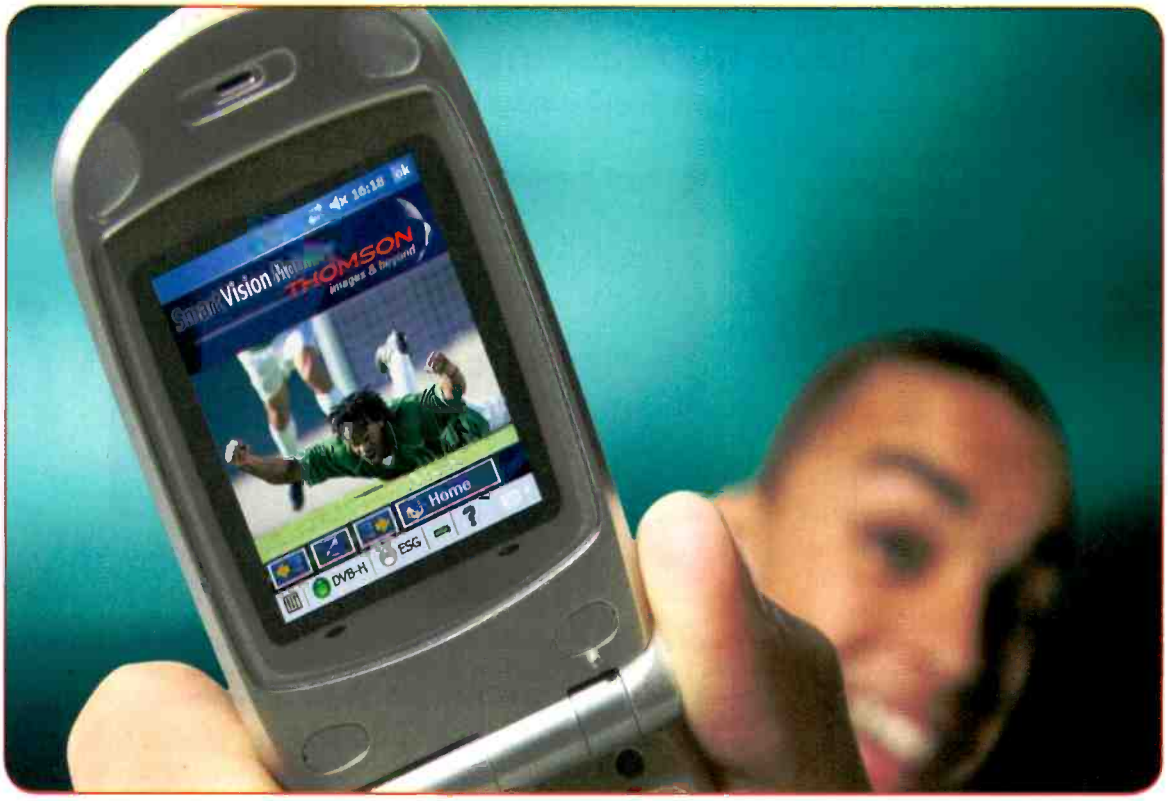

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Thomson's flexible service platforms that enable new revenue streams and deploy Mobile TV services to the devices YOU choose. Open standard compression products that squeeze the best quality content into your available bandwidth. And, broadcast transmitters that optimize output power to reduce your network costs.

Build your Mobile TV service with enterprise-class solutions from Thomson, the only provider with true end-to-end solutions from content pre-purposing to transmission.

No guess work, no science experiments.

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ATSC II

The new ATSC standard for mobile/handheld devices may have far-reaching implications.

BY CRAIG BIRKMAIER

In recent years, the consumer electronics industry has been striving to make HDTV a bigger part of the annual Consumer Electronics Show (CES) in Las Vegas. Corporate one-upmanship has driven consumer electronics companies to develop ever-larger HDTV screens. At the 2008 CES show, Panasonic's 150in plasma display dwarfed competitors, not to mention the people who came to see it.

Next January, when CES returns to Las Vegas, the big news could be the introduction of mobile and handheld devices with tiny screens. The devices could receive over-the-air broadcasts using the new mobile/handheld DTV standard that is nearing completion by the ATSC (ATSC-M/H).

Those who rode the mobile DTV demo buses at NAB got a preview of what these devices may look like and how well the new ATSC-M/H standard works in demanding environments, such as the high-rise canyons along the Las Vegas strip. In short, all of the demos worked well, and one could see that the CE industry is ready to expand its offerings beyond the mobile handsets designed to work with competitive mobile TV offerings from the cell phone industry.

At the CES show, Panasonic showed off a 150in display, dwarfing competitors and people. The display magnified the extremes in distribution methods needed to get content to big screen HDTV, legacy SDTVs and mobile devices.

Perhaps the most interesting aspect of these demos is that the new ATSC-M/H standard, which will be known as ATSC A/153, goes far beyond an upgraded physical layer specification for the modulation required to deliver robust bit streams to mobile devices. These demos were built atop the ISO H.264/MPEG-4 Part 10 video compression standard, and they offered a variety of data services that can be delivered to M/H devices, including those built into vehicles with in-dash displays and car theater systems.

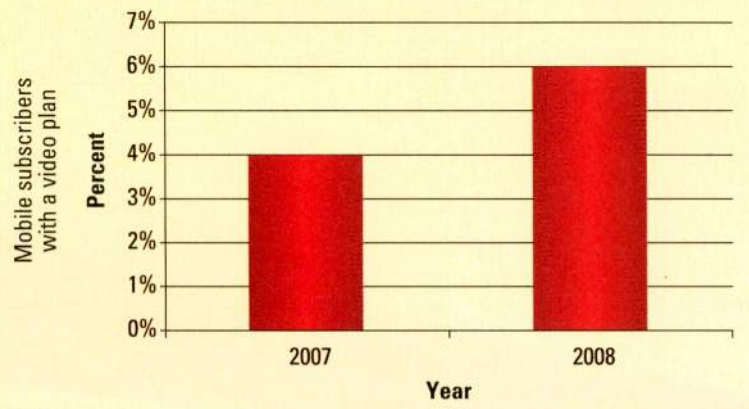
A/153 could more appropriately be called ATSC II. While being backward compatible with the existing 8-VSB/MPEG-2-based standard, virtually every aspect of the standard is being updated in an eight-part document that may approach 900 pages. And many of these updated capabilities could find their way into new TVs and new services from broadcasters that can be targeted at any M/H-compatible device.

One area in particular may be the sleeper in this new standard — the ability to deliver non-real-time (NRT) services to local cache for asynchronous viewing. While this is technically possible today using the A/90 Data Broadcast Standard, the ability

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

Number of mobile subscribers with a video plan increasing

Today, 6 percent of mobile customers pay for video capability.



Source: Nielsen

www.nielsen.com

The Ultimate File-Based Audio Processor. Now with New Upmixing Functionality.

Dolby DP600 Program Optimizer

For file-based broadcast and postproduction environments, the Dolby® DP600 Program Optimizer ensures loudness consistency from program to program, between programs and commercials, or between the channels within your service. Postproduction, terrestrial networks, affiliates, and cable, satellite, and IPTV operators can equally benefit from the DP600, which automatically analyzes and normalizes the loudness of programs in standard broadcast file formats.

The DP600-C version adds faster-than-real-time encoding, decoding, and transcoding of Dolby Digital, Dolby Digital Plus, Dolby E, and MPEG-1 LII formats.

New for both DP600 configurations is an optional software upgrade that adds intelligent file-based upmixing functionality based on a newly developed Dolby algorithm. It automatically creates 5.1-channel programs from stereo or Lt/Rt sources, and easily integrates into a work profile along with loudness correction, encoding, decoding, or transcoding.

The Dolby DP600 Program Optimizer is the complete audio processing answer for file-based work flows that saves time and money. For more information, visit **www.dolby.com/dp600**.

DP600 and DP600-C Applications

- Broadcast media file QC and loudness correction
- Broadcast media file transcoding
- File-based program upmixing
- VOD file analysis and loudness correction
- Loudness correction for digital program insertion (DPI)

to reach M/H devices reliably is likely to cause broadcasters to rethink their legacy business model, which in turn could have an effect on services for the big screen TV as well.

A new platform for TV broadcasting

All of this could not come at a better time for local broadcasters, who are facing a range of challenges as the end of the NTSC era approaches. Those challenges include:

- declining ratings for traditional TV fare, both at the network and local levels;
- declining local spot sales in an increasingly competitive media marketplace;
- network demands for reverse compensation; and
- the prospect that major content producers may use the Internet to deliver their content directly to consumers, bypassing broadcasters.

While the first ATSC standard offered many possibilities for new broadcast services, a decade later, the reality is that the only major changes have been the gradual shift to HDTV programming with multichannel audio, and the ability to simulcast additional services.

Now that HDTV receivers can be found in a sizeable percentage of U.S. homes, and the cost to produce HD programming is comparable to that of legacy SDTV production, the multichannel services are turning to HDTV tiers to keep existing subscribers and attract new ones. Both DIRECTV and DISH Networks will offer more than 100 HD channels by the end of the year, and cable systems are scrambling to keep up.

Broadcasters using the ATSC-M/H standard will compete with current services delivered to cell phones like this Samsung Instinct.

Many broadcasters hoped that HDTV would reinvigorate an industry in decline. However, it has not had a significant impact on ratings. Although, in some markets where stations moved to HD newscasts and HD news acquisition, there have been viewer shifts to the stations that upgraded to HD. The delivery of entertainment and news content in HD is now expected, and stations that ignore this reality face the risk of further ratings declines.

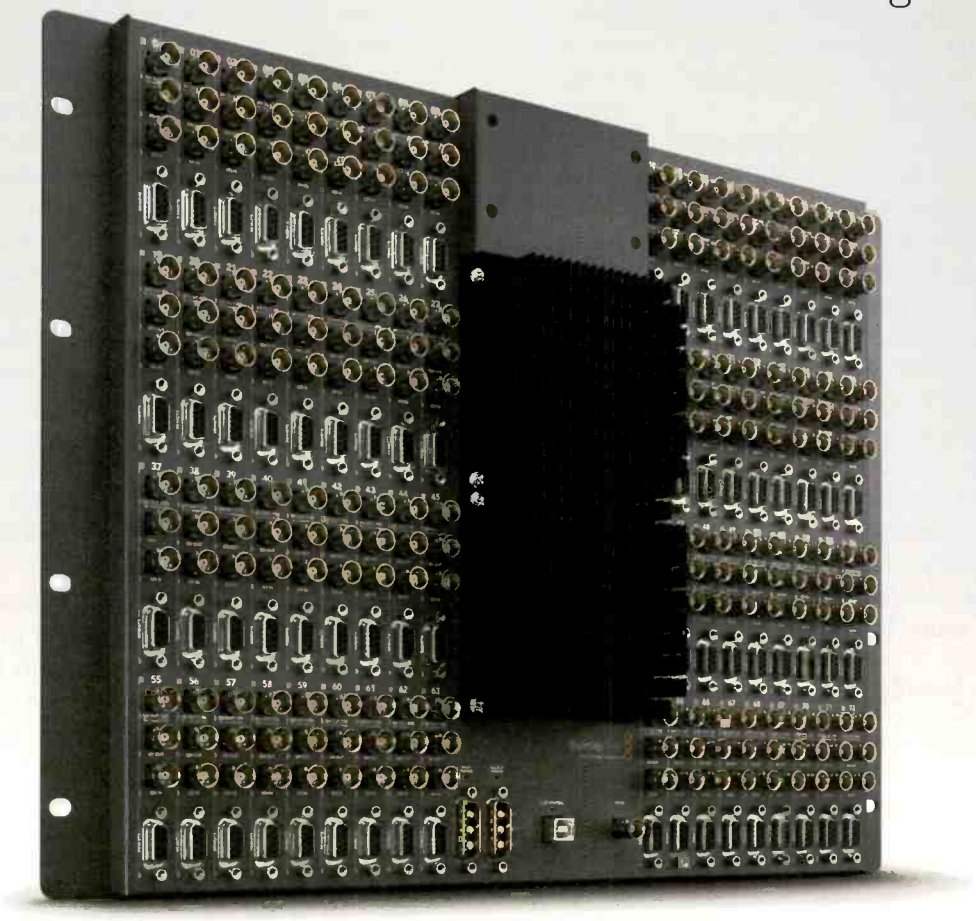
The ability to develop new services using an updated ATSC standard has the potential for those broadcasters willing to risk real innovation to reinvent the medium. This brings to mind the heady days of early TV broadcasting, when the networks discovered that radio with pictures was not what the public was looking for. An entirely new infrastructure for TV production had to be created, and new programming formats developed to bring the new medium into every U.S. home.

Much the same is likely to be true as broadcasters experiment with the ATSC-M/H standard and learn how to use it to compete with services now being delivered to M/H handsets, such as Apple's iPhone and the Samsung Instinct.

The first ATSC standard was limited by the subset of features that were implemented by CE manufacturers who were not yet challenged by an IT industry transitioning from the PC to a new generation of mobile devices that keep adding new capabilities. A prime example is the lack of support for many of the advanced audio services in the ATSC standard because manufacturers only included a single audio decoder in their products. Two decoders are required for many of these enhanced services.

Now the CE industry is scrambling

Blackmagicdesign



Introducing the world's largest affordable SD, HD and 3 Gb/s SDI router!

Eliminate complicated manual video patching forever! Broadcast Videohub is a powerful broadcast grade routing switcher featuring a massive 72 inputs, 144 outputs, 72 deck control ports, auto switching SD, HD, and 3 Gb/s SDI, in a compact rack mount chassis only a few inches thick.

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With 72 inputs and 144 outputs, Broadcast Videohub has enough SDI connections for 72 edit systems or decks. With twice as many SDI outputs, each user can have a completely independent SDI output for monitoring. This means you can monitor direct from any equipment in your building without effecting routing! 72 deck control ports are also included for a complete routing solution.

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Broadcast Videohub handles mixed SD, HD and 3 Gb/s SDI connections all on the same router at the same time. Broadcast Videohub detects when an input changes, and automatically sets all the outputs connected, to match the changed input. SDI re-clocking and output SDI slew rates will also change automatically.

World's Highest Quality

With exciting new 3 Gb/s SDI connections built in, Broadcast Videohub allows twice the SDI data rate than normal HD-SDI. Use 3 Gb/s SDI for high resolution real time 2048 x 1556 feature film editing. 3 Gb/s SDI has full compatibility with SD, HD and 2K in 4:4:4 or 4:2:2 all with a single BNC cable.

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Broadcast Videohub uses software control panels that run on Windows™ and Mac OS X™ for "routing control" right from your editing system desktop! Broadcast Videohub connects to any computer via USB and is then shared over your local network. Router labels can be changed from any computer and are fully unicode compatible for foreign language support.

Broadcast Videohub

$14,995

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as well, trying to keep up with IT industry companies that are becoming consumer electronics companies themselves.

We can expect to see a wide range of mobile TV products in the coming year. We may also see some of the features of the new ATSC-M/H standard finding their way into the TV in the family room. As silicon vendors add support for the M/H standard to their chips, these chips may be used in big screen TVs as well. This could help broadcasters develop services that can be delivered using features of the M/H standard to all TVs, not just mobile devices.

For example, a movie download service for fixed receivers could be delivered using the more efficient 8-VSB modulation and the newer, more efficient H.264 video compression algorithm.

For this to work, broadcasters will need to change their thinking. Legacy thinking dictates that broadcasters only support those features that exist in nearly every TV. To survive, broadcasters must be willing to take the risk of developing services that will only be supported by a subset of receivers, in hopes that this will drive demand for ATSC II receivers.

Who knows? The additional training signals in the M/H standard may eventually help improve reception for the legacy 8-VSB signals that broadcasters will continue to use because of the much higher bit rate efficiency. At the same time, use of the M/H standard will result in a significant bit penalty that may put even more stress on services delivered using what remains for 8-VSB broadcasts.

The M/H standard is moving through the final phases of documentation and balloting, and a final draft version is expected to be elevated as a candidate standard by the end of the year. Public demonstrations and private tests have and will continue to take place as the new standard is finalized. These tests are designed to examine both the performance of the standard and to determine what kind of services the public may find compelling. The Open Mobile Video Coalition recently announced its financial support for the required field and lab testing of the complete candidate standard. (For more information, see "Web links.")

Based on limited feedback about these tests, it appears that the M/H standard will require considerable overhead. For the most robust quarter rate modes, it is expected that about 18 percent of the bits allocated to the service will be available for actual service payloads. In the half rate mode, this will increase to about 38 percent of the service allocation.

Interesting times

You are about to be given another chance to turn the ship around. Those who are on a sinking ship may want to retire or jump into the lifeboats and let a new generation of TV broadcasters create a new wireless medium. This is, after all, the major competitive advantage of broadcasting over the multichannel subscription services. BE

Craig Birkmaier is a technology consultant at Pcube Labs.

? Send questions and comments to: craig.birkmaier@penton.com

Web links

- The Open Mobile Video Coalition *www.omvc.org*
- "OMVC expands support for mobile digital television tests," UPI.com *http://tinyurl.com/5p7m5e*
- "ATSC M/H standard developing at rapid pace," ATSC *http://tinyurl.com/65ew7e*
- CES *www.cesweb.org*

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Children's TV Act

A station was fined $20,000 for broadcasting an insufficient amount of children's programming.

BY HARRY C. MARTIN

The FCC has issued its first fine to a television station for failure to have a sufficient amount of children's educational or informational (E/I) programming, as opposed to failure to have sufficient record-keeping with regard to such programming. The Class A TV station was hit with a $20,000 fine for failure to air core children's programming for a portion of its license term. This failure, the FCC found, constituted a violation of Section 73.671 of its rules. The commission more than doubled the base fine for Section 73.671 violations from the standard $8000 to $20,000.

Defining the rule

This fine was levied despite the fact that the rule cited does not contain an absolute requirement for three hours per week of core programming. For purposes of the kidvid rules, core programming is defined as E/I programming for children ages 16 and under, which is:

- aired between 7:00 a.m. and 10:00 p.m.;
- a regularly scheduled weekly program;
- at least 30 minutes in length;
- described in the station's children's television programming report;
- listed in information provided to program guide publishers; and
- broadcast with the E/I logo or bug.

Section 73.671 of the commission's rules specifies that a station that broadcasts an average of three hours per week of core programming will be presumed to have met the requirements of the Children's Television Act, and it can have its license renewed routinely by the FCC's staff. According to the rule, a station may demonstrate that it has fulfilled its obligations through an alternate package of programming that shows an equivalent commitment to the educational needs of children. Further, the rule specifies that a station that does not meet the processing standards for routine renewal will be referred to the full commission, where the licensee will be provided a full opportunity to comply with the Children's Television Act.

Where the station went wrong

In this case, the record showed that while the station sought out quality E/I programming, it neglected to air core programming on a regular basis for approximately three years. However, the station did undertake other initiatives for children. The licensee did not begin airing core children's programming until midway through its seven-year license term.

The licensee submitted information to the commission about its other efforts for children, but the commission did not take the additional information into account. Moreover, the staff did not refer the matter to the full commission as the rule provides. Instead, the staff's decision to issue a $20,000 fine states that the failure to broadcast at least three hours per week of core programming constitutes a willful and repeated violation of Section 73.671 of the rules. There was no discussion of the fact that the rule establishes an average of three hours per week as a processing standard, not an absolute requirement. And there was little discussion of how the staff arrived at the amount of the fine beyond stating that the base fine is $8000.

The station neglected to air core programming on a regular basis.

This case, whether or not it was decided correctly and whether or not it was the conversion of a mere processing standard into a mandatory programming dictate — a possible violation of the First Amendment — nevertheless underscores how important it is for stations to continue to air at least three hours per week of core E/I programming. BE

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

? Send questions and comments to: harry.martin@penton.com

Dateline

- Oct. 1 is the deadline for TV stations in the following states and territories to file their biennial ownership reports: Alaska, Florida, Hawaii, Oregon, the Pacific Islands, Puerto Rico, the Virgin Islands and Washington.
- Oct. 1 is the deadline for TV stations and Class A TV stations in the following states and territories to place their 2008 EEO public file reports in their public files and post them on their Web sites: Alaska, Florida, Hawaii, Iowa, Missouri, Oregon, the Pacific Islands, Puerto Rico, the Virgin Islands and Washington. LPTV stations originating programming in these locations, which are not required to have public files, must post these reports on their Web sites and keep them in their station records.

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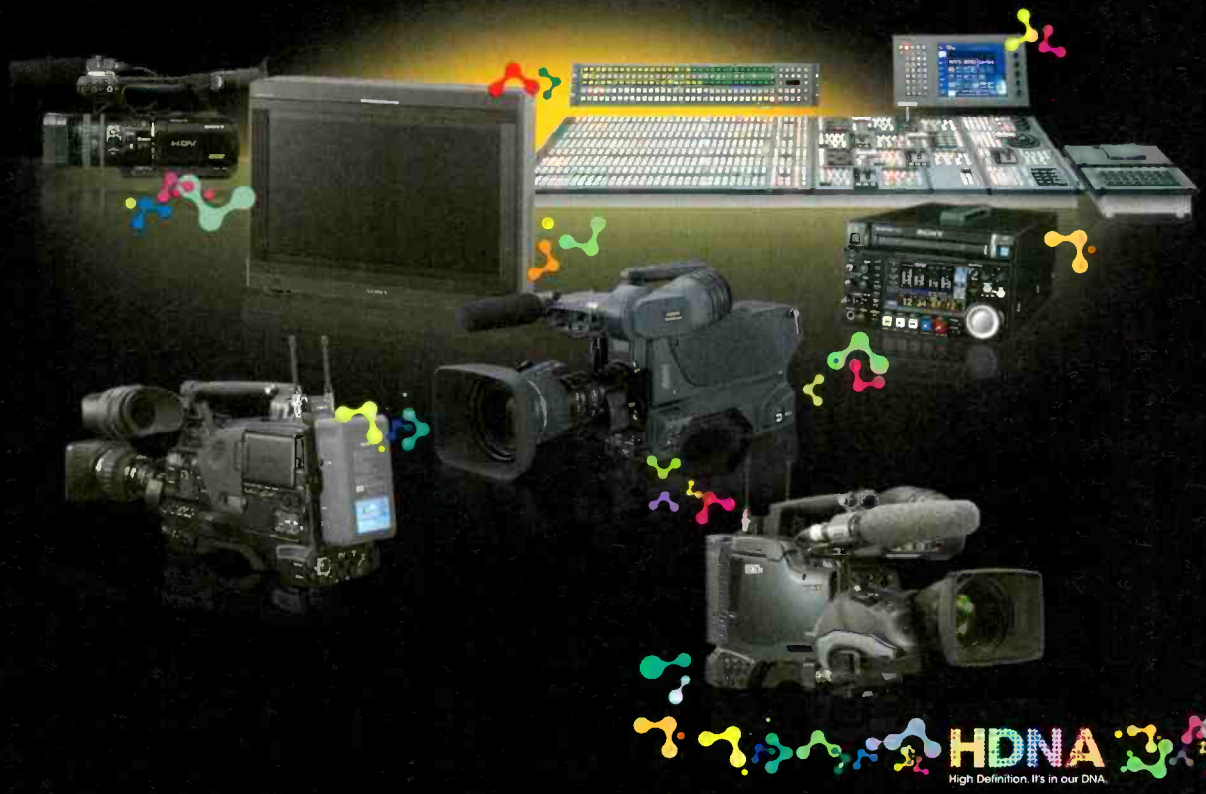

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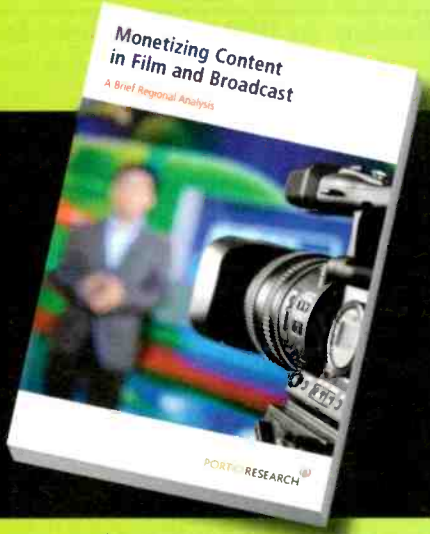

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DTV multichannel transmission

The model allows for flexibility in delivery.

BY ALDO CUGNINI

Digital transmission brings with it a host of new possibilities — and headaches for those unprepared to make the most of the opportunities. The flexibility of DTV means that the delivery medium can be tailored to suit the particular business model of each broadcaster, and the basis for this lies in multichannel transmission. This dynamically reconfigurable platform offers multiple programs within a single transmission, each with multichannel sound. Planned correctly, the service can vary on a daily basis, so it's important to know some of the tools available, both for systems, video and audio.

Major and minor channels

In 2004, the FCC incorporated by reference ATSC PSIP Standard A/65B into its rules. By this action, the following PSIP elements were made mandatory: the master guide table (MGT), the system time table (STT), the virtual channel table (VCT) and the first four event information tables (EITs). While information in the first two is usually of limited interest to the broadcaster, the next two are critical. The FCC regulations say that the VCT must contain the NTSC channel number for each major channel entry, as well as other stream and service information, and that correct program titles are expected. This forms the basis for TV receiver (and user) channel navigation.

In order to reduce viewer confusion, the VCT defines a lookup table that can point virtually to the old NTSC channel for which the station has already established an identity. It also provides a mechanism for automatic redirection, for those stations that transition their current DTV channel to a different DTV RF channel. The VCT also enables the concept of major and minor channels, i.e., the method by which multichannel transmission is realized.

The EIT contains the program schedule information that is needed to form a program guide and can cover events up to 16 days in the future. As the timing of some events may change even at air time (such as for live sports events), it is conceivable (and useful) that the schedule may change on a moment's notice. While A/65 does not require an update rate of the EIT, broadcasters asked the FCC for clarification on the transmission requirement.

The FCC Order on Clarification adopted May 29, 2008, responded, "While we encourage stations to update the EIT as rapidly as possible when overages or other circumstances result in changes to scheduled programs, our rules and policies do not require that updates be accomplished in real-time." Of course, it is in the broadcaster's best interest to update this information in a timely manner, but practical operations may not always allow this.

PSIP makes the DTV world go 'round

The PSIP contains the following structure for each program, which is identified by a packet ID (PID):

- VCT, with channel number (internal designation), service name, NTSC channel number, ATSC channel number and virtual channel number;
- elementary stream video descriptors, e.g., bit rate, resolution and aspect ratio;
- elementary stream audio descriptors; and
- PCR PID, which addresses a unique program clock reference for each PID, and allows each program to have its own time base.

ATSC PSIP allows the use of 100 minor channel numbers for DTV

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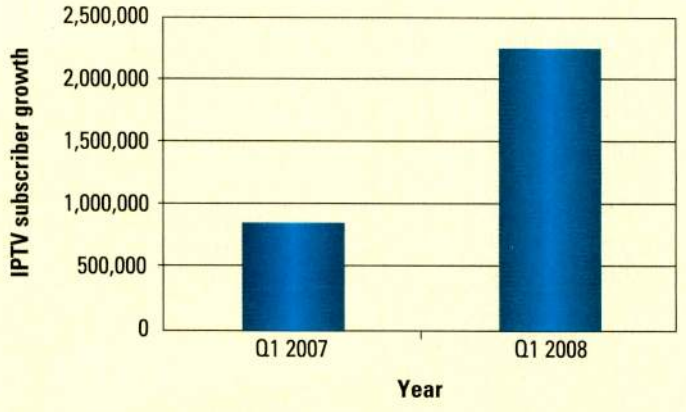

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video (or DTV audio-only) service. This means that as many as 100 DTV subchannels can be encapsulated within one ATSC transport stream (i.e. one transmission channel). Of course, efficient operation on a fixed-bandwidth transmission will usually mean a total number of channels far below this limit. At the same time, subchannels may come and go during the broadcast day, so it is useful to have an extensive range of channel numbers from which to identify the different program services.

Figure 1. DCC allows for targeted advertising. The idea of addressable commercials is simple. Take four homes watching the same sports channel in the same neighborhood. At the break, each home is fed different commercials based on its demographic and other targeting characteristics. When the program resumes, they are all on same sports channel — never knowing they left it.

Directed channel change

Dynamic channel management becomes especially relevant if the broadcaster elects to use directed channel change (DCC). With DCC, the ATSC standard provides the capability for a program to push the receiver to a new subchannel.

One interesting use of this could be for targeted advertising, where multiple versions of an advertisement are sent on different subchannels. (See Figure 1.) With a DCC-capable DTV, the receiver can be instructed to change to a different virtual channel if the user has enabled the feature and has provided individualization information during the setup process of the receiver. In fact, the receiver can be directed to change to an entirely different RF channel.

In order to define the behavior of the receiver, PSIP includes a DCC table. With this, the requested channel change can be unconditional, or can be based on geographic, demographic or other content selection criteria. In addition, the context of the channel change can tell the receiver whether it should remain on the new channel or return to the original channel after a set period of time or upon a return direction.

In order to remain transparent and avoid viewer confusion, such channel changes may be hidden from the viewer, and the temporary virtual channels may be hidden from the user's program guide display. Of course, switching bit streams is not a trivial task, especially if a seamless switch is desired. But ATSC (i.e. MPEG) includes splice point fields in order to accomplish switching without artifacts.

Multichannel sound's implementation challenges

While the subject of multichannel sound has been covered here extensively, some key elements bear repeating as we approach the February 2009 transition date. One fundamental issue is the way that audio will be reproduced in the viewer's home.

Continued on page 32

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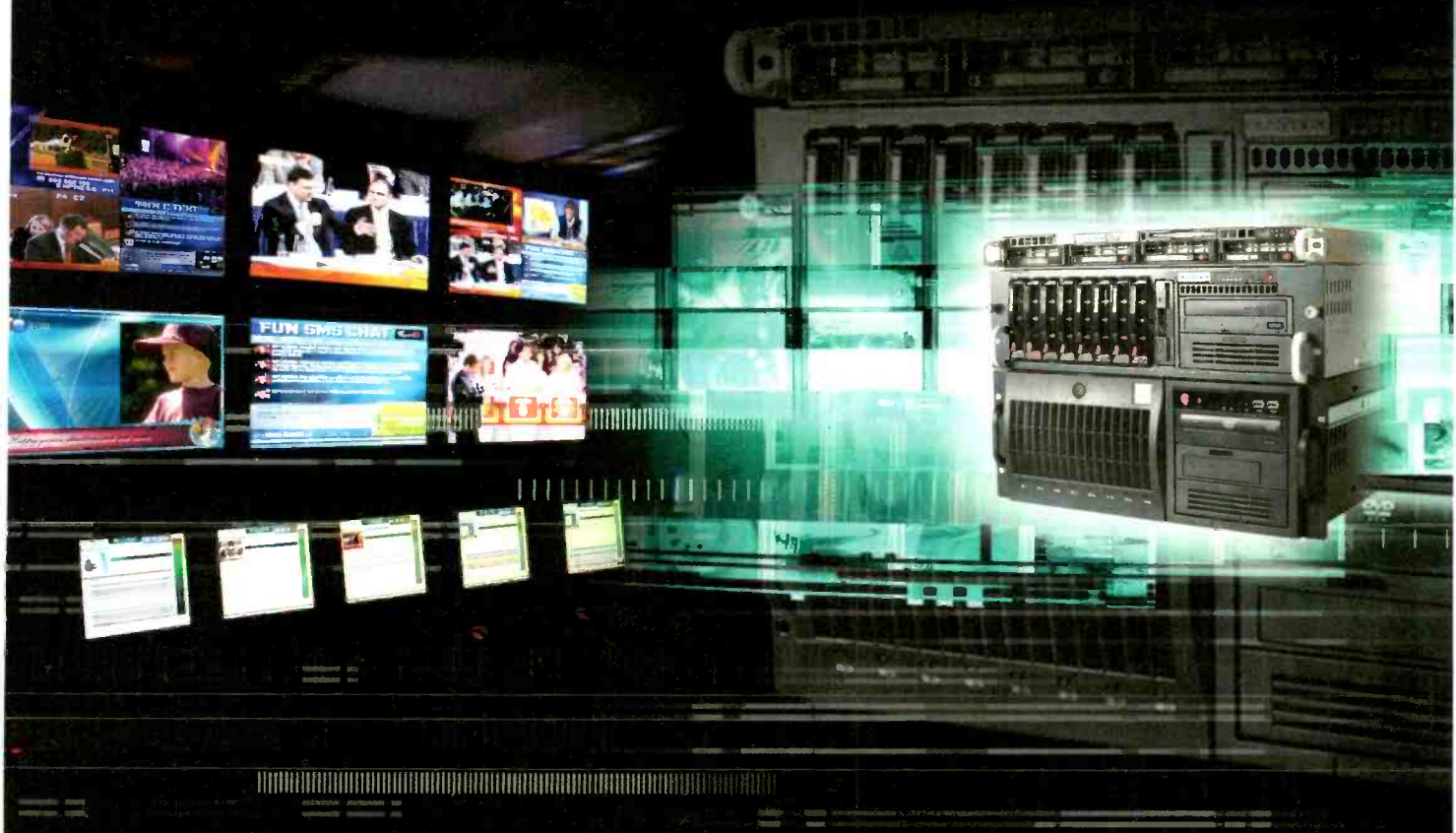

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Continued from page 28

Of course, a 5.1-channel transmission will not always be listened to on a full 5.1 system. But the choice of reproduction depends on a combination of factors: the mix and setup at the encoding end, the viewer's equipment and the viewer's choice (or unintended default) of how to operate their equipment. This means that downmixing — the reduction of 5.1 transmitted (or original) channels to a fewer number of listened ones — can occur with unintended consequences, including missing material or the dreaded stereo "hole in the middle" where dialog (and other material) is either missing or spatially misplaced.

It is especially important to understand and monitor all downmix possibilities: mono, stereo (left-only/right-only, or Lo/Ro), downmix to left-total/right-total (Lt/Rt) followed by Pro Logic decode (as occurs on some home equipment), and of course a full 5.1 presentation. (See Figure 2.) The LFE channel is usually discarded during downmixing — wherever it occurs — so one must be careful about what is placed in this channel, as stereo and mono listeners will not hear it.

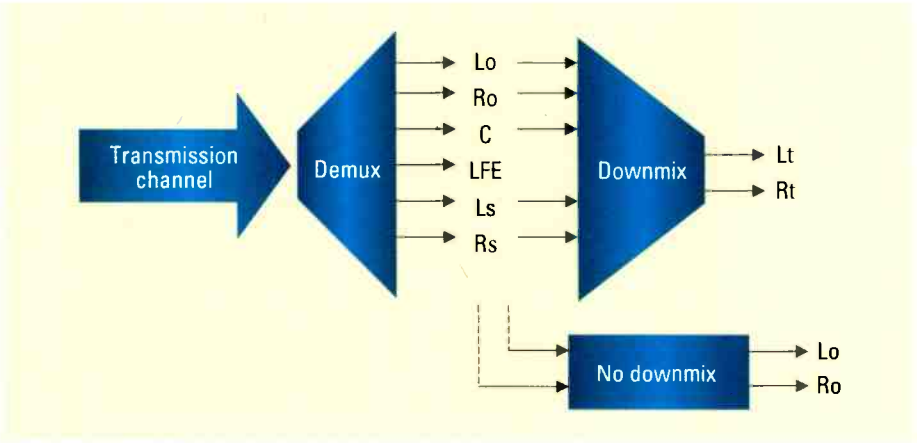


Figure 2. Without a correct downmix, viewers can miss out on dialog and critical effects.

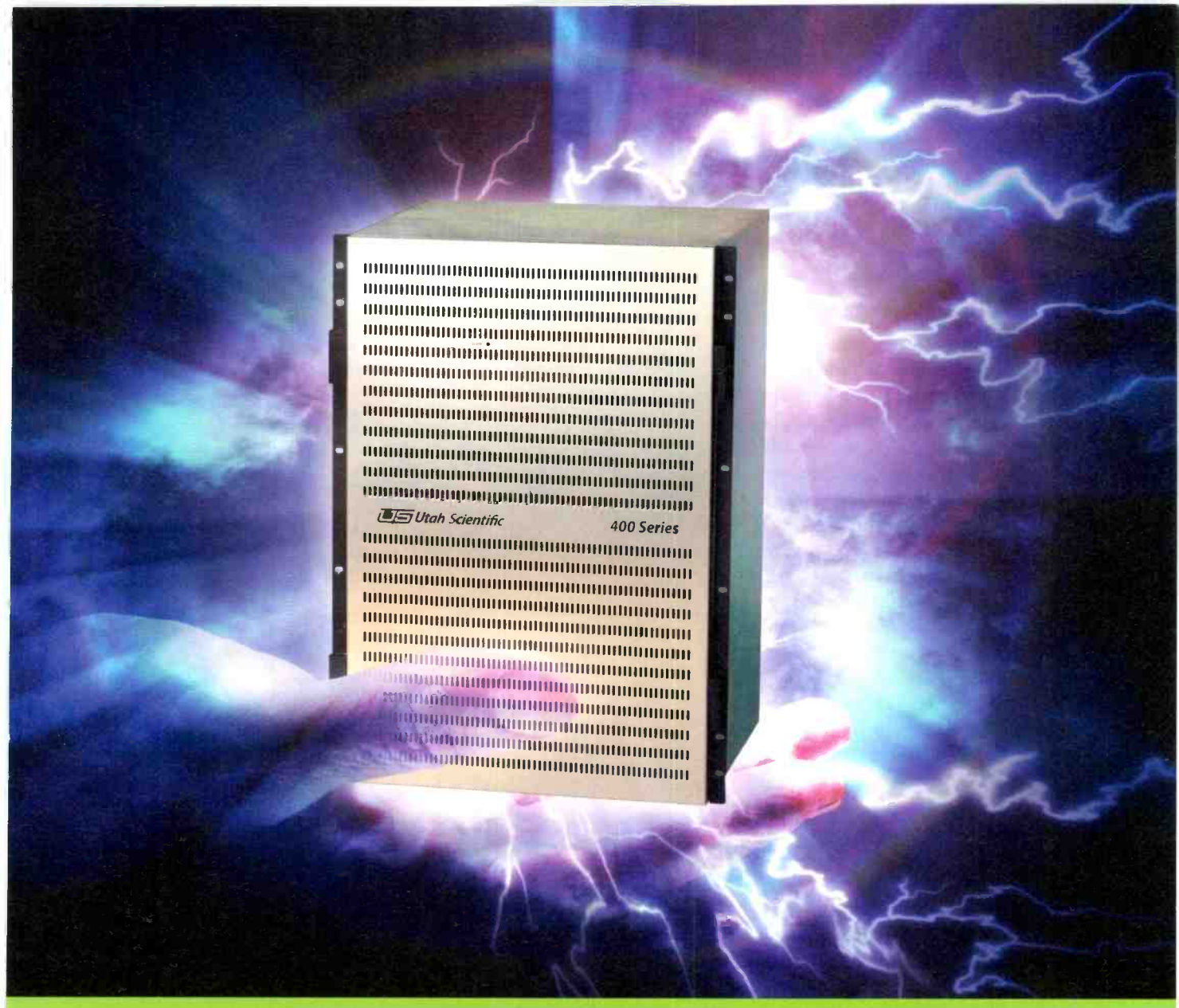
In the broadcast plant, both HD-SDI and SDI interfaces provide for 16 channels of embedded audio. This means that the entire multichannel audio package can be kept tightly integrated with the video — an important factor when trying to minimize audio/video lip-sync errors.

Also, keep in mind that two types of metadata (containing dialog level and dynamic range control information) can exist in the plant — one being a subset of the other. Consumer metadata contains information for one audio program of up to 5.1 channels of audio and is found only inside a Dolby Digital (AC-3) stream. The metadata connectors on Dolby equipment produce and accept only professional metadata, which contains up to eight consumer metadata streams.

Additional information about metadata and Dolby Digital (AC-3) can be found in ATSC A/54, available at *www.atsc.org*. Also, the ATSC Implementation Subcommittee IS-SEWG Audio Group has generated many documents covering the subject of multichannel audio. Joining the group would be a great way to get an in-depth understanding of the subject, and keep up with new developments and solutions. BE

Aldo Cugnini is a consultant in the digital television industry.

Send questions and comments to: aldo.cugnini@penton.com



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Software architectures

The style you choose affects the entire facility design.

BY BRAD GILMER

Software architectures can have a big effect on facility design, especially for broadcasters. Anytime applications work with video, it is important to pay attention to how and when this demanding data is moved within the facility and how much processing power is required.

Types of architectures

Software designers have developed many architectures over the years. Different applications in a broadcast facility fall into four categories:

- *Stand-alone applications* run entirely on the system in front of the operator.
- *Thick-client applications* run on the system in front of the operator, but require access to a server or other outside connection, typically for access to data.
- *Thin-client applications* run primarily on a server, but have a small piece of software running on the system in front of the operator.
- *Web client applications* run on a server, either internal to your company or over the Internet, and are accessed via a Web browser.

Figure 1 shows each of these types of applications. Table 1 lists these four categories with a rough classification of the amount of network bandwidth consumed by the application, the relative security risk, the amount of CPU load, the amount of data access load, the amount of server CPU load and the server data access load. These architectures result in different requirements for your networks, the type of desktop computers you deploy and the types of servers required.

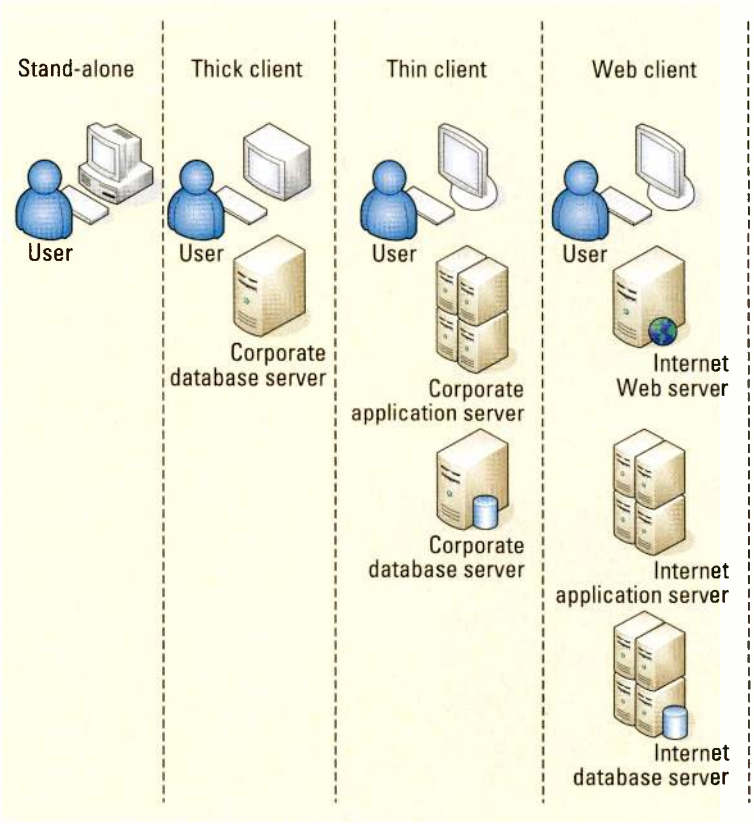

Figure 1. This simplified diagram illustrates the most common types of software architectures for broadcast facilities.

Stand-alone systems

In a stand-alone system, everything you need to run the application is contained on the system in front of the operator. Think about a

	Stand-alone	Thick client	Thin client	Web client
Network bandwidth	None	Low/moderate	Low	Moderate
Network security risk	None	Low	Moderate/high	Moderate/high
Desktop CPU load	High	High	Low	Low/moderate
Desktop data access load	High	Moderate	Low	Low
Server CPU load	None	Low	High	High/extreme
Server data access load	None	Moderate/high	High	High/extreme

Table 1. The differences between various software architectures and their effect on critical network and hardware design factors

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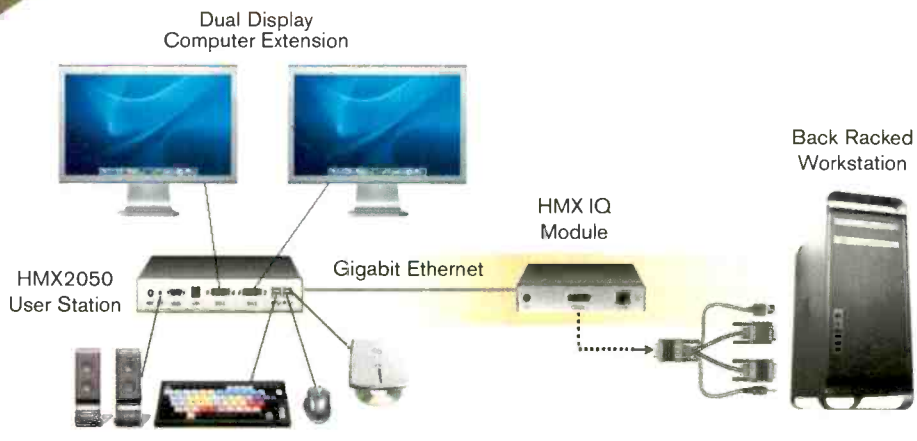

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desktop video editing application, for example. Assuming that the project you are editing is stored on the local hard disk, you can edit without a connection to any other resources. Given the lack of a network connection, no network bandwidth is required, and there is no network security risk.

However, because all of the application processing is done on the desktop, the CPU load is high. Also, all of the data is stored locally, so the local data access is high as well. An external server is not involved; therefore, the server CPU and data access loads are zero.

Thick-client systems

In a thick-client system, the client does all of the processing but it is connected to some other resource, typically a database, to access shared data. The amount of network bandwidth required by a thick client depends on the application. Most of the traffic is transactional, so the bandwidth requirements are usually low to moderate. Because the thick client requires a network connection, security is more of a concern. However, most thick-client applications connect to resources inside a corporation, so most of the security risk is mitigated by a corporate security structure.

All of the application's processing is performed by the client; therefore, the desktop CPU load is high, but the amount of data moving on the network is low to moderate. All of the data processing is done on the desktop client. As a result, the server CPU load is low, primarily consisting of user authentication and simple file transfer tasks. The server acts as the central repository for data, and most of these applications are multiuser, so the server data access load can be moderate to high depending on the number of users involved.

The thick-client application can run on a conventional desktop, and the server may not require a lot of processing horsepower. However, if the application is used simultaneously by a large number of users, the server data I/O demands may be high.

Thin-client systems

In thin-client systems, the software designer offloads processing from the desktop to the server. The goal is to allow the deployment of less expensive desktop systems, while concentrating processing power in a central server. Typical thin-client systems run a lightweight application on the desktop and do the heavy lifting at the corporate application servers. An example of a thin-client application is an airline reservation system.

Usually, the only data flowing on the network in these systems is display and keyboard data, so the required network bandwidth is low. In most cases, these applications run within a corporate environment, and sometimes the clients are dedicated to the application, making security less of a concern. However, in other applications, this data is sent across the Internet to remote thin clients.

Data sent from terminal application software is usually unencrypted, so anyone with a bridging network connection and a packet sniffer can see everything that is typed and displayed. Desktop CPU and data access are low, but server CPU load and data access load can be high, perhaps high enough to require the use of multiple servers and load-sharing schemes.

Web client systems

The Web client is an evolution of the thin client. As Web technology has become ubiquitous, many system designers have transitioned their thin-client applications to be Web-based. This means that the only client you need to access an application is a Web browser. The typical moderate- to large-size Web server application can be quite complex. You may find a Web server pulling output from several application servers, which in turn access data from various database servers.

The original idea of the Web browser was to shift the complexity and cost from the desktop to the server environment while using a readily available standardized thin client. For many years, this shift was successful. Recently, however, there has been an increasing trend to load up executable code on the Web client through ActiveX, Flash and other technologies. As a result, some of the load is shifting back to the desktop client. For example, if you browse video on your desktop, a minimalist system will not provide satisfactory results because it takes a fair amount of horsepower to decode and display video on a desktop. So, while in the past Web clients were similar to thin clients, that distinction is going away as the desktop is asked to do more.

Network bandwidth requirements for Web clients used to be relatively low, but with the increase in desktop video viewing and client side processing in Web applications, bandwidth requirements have increased. It is now common for Web clients to execute code that is delivered over the Web, so security is important. Furthermore, unless you use a VPN or a secure Web connection, the data you type into the Web browser is sent in the clear where bad guys can easily read it. The desktop CPU load used to be fairly low with Web clients, but demand has been growing, especially with desktop video applications. The desktop data access load is still relatively low.

On the server side, even moderately successful Web sites can place high demands on server systems, especially if streaming video is involved. Interestingly, video streaming applications are not CPU-intensive, even on fairly large Web sites. However, the data access load is extreme. On the other hand, search engines, online reservation systems and other processor-intensive applications can require a large amount of CPU resources in the Web environment. BE

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

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Graphics systems

Buying a live-to-air graphics system today requires extra planning.

BY RICH HAJDU

In the good old days (10 or so years ago), buying a live-to-air graphics system was much simpler than it is now. A facility selected a character generator that had the most bang for the buck, including real-time operation, creation tools, fonts and a basic newsroom interface. Although the CG was only one element of a graphics infrastructure that might include expensive paint and animation systems, DVE, still store, and clip playback, file format inconsistencies made it very much an island unto itself.

Fast-forward to today. With the advent of ultra-fast CPU technology, graphics acceleration and ever increasing storage capacity, the newest breed of CG is a powerful system capable of creating, aggregating, managing and distributing graphics content.

Basic systems

Today, almost every high-end system uses nonproprietary components and will output SD, HD or both on each channel. Most systems are Windows-based, enabling the user to take advantage of many Windows features, including fonts and file management. The hardware is generally a standard PC or a rack-mounted industrial style PC with a dual-core processor, an I/O card and an off-the-shelf graphics accelerator card with enhanced 3-D capabilities. If the I/O card is also a frame buffer and has on-board processing, it can handle certain real-time functions, thereby freeing the CPU for other tasks. This is almost essential if a single system with two independent HD streams is required.

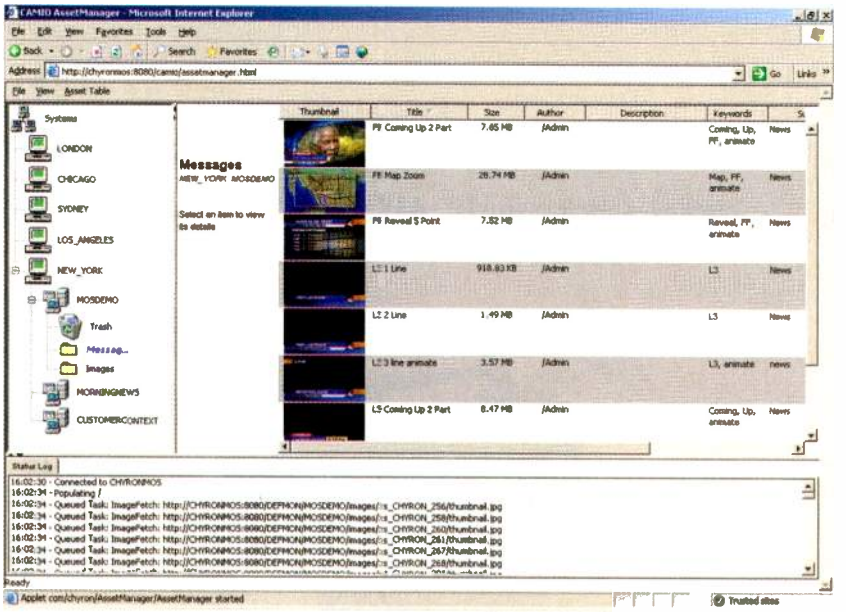
Some systems with still and clip playback or locally stored media files also have large drive arrays, although any RAID component will reduce the active storage space.

Most systems also have dedicated keyboards available as an option. Recalling messages numerically, quickly changing functions and manual control or override can occur immediately without ALT or SHIFT key functions. In a live environment like sports, a dedicated keyboard is essential.

One point that should not be overlooked is placement of the equipment. Although the rack-mounted chassis may be placed in the control room, there will be fan noise. With multiple dual-core processors, graphics accelerator boards and I/O cards, as well as drive arrays, multichannel systems may have up to six fans of varying sizes. The Catch-22 is that serial keyboard extenders are good for only a specified length and must be tested and approved for the system being purchased.

As with all video gear, don't forget the audio. A graphics system should have embedded and AES audio available. Also, many systems allow capture and playout of WAV files, and some systems enable an audio mix function, which is important for bumpers, snipes, fade in/out or a duck under.

Relay bypass is important in a master control environment, and GPI/O, although not a new technology, is still a handy tool enabling external control of almost any function.



Chyron's HyperX 2 HD CG offers CAMIO asset management for creation, insertion, tracking and playback of any graphic required for MOS, including 3-D objects.

Creation software, control and interface

Because most systems are Windows-based, there is some similarity between all systems. Every CG has a canvas with a palette and a file manager. But take a closer look, and the software is quite a bit different in all systems. While every system has basic features, some systems import 3-D

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files, and some both create and import files.

There is no easy way to determine which software is best. It depends entirely on the method of operation at the specific installation. To know for sure, you have to see the systems in action. Almost every manufacturer will do a Web-based demo, as well as supply free trial software that runs on any PC. A system that is deemed acceptable still may require an on-site demo, so all aspects of the product can be tested in real time.

Today, many facilities use standard products like Adobe's After Effects and Photoshop, Autodesk's 3ds Max and Maya, and others to create graphic objects. A useable feature is the ability to import those files without conversion and manipulate them within the CG graphics program.

Every graphics system has a video and audio clip playback scheme. Most use software coder/decoder, or codec, technology to enable many different types of clips to be imported and played back. Common codecs include WMV, MPEG and QuickTime. Although AVI is referred to as a codec, it is really a container format that a number of different codecs may use. In any case, software codec technology is flexible and generally enables new codecs to be added. Some systems also use a hardware-based codec. Although almost certainly proprietary, the hardware codec is stable and reliable. The best of both worlds will include hardware and software codecs.

There is no easy way to determine which software is best. It depends entirely on the method of operation at the specific installation.

Most DVE moves are done in a production switcher, but high-end graphics systems generally include a DVE. This enables a full effect and transition to be accomplished within the system, freeing up the switcher for other functions.

A critical component of the graphics system is its ability to interface well with many different devices. The most obvious is MOS for news. MOS interface enables a reporter or journalist, with no graphics skill, to browse, edit and insert graphic elements from lower thirds to stills and clips directly from his or her workstation, generally

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International Broadcast Equipment Exhibition

Period: Nov. 19th (Wed.) to Nov. 21st (Fri.)
at Makuhari Messe, Japan

New Breeze:
The Next Generation Media Potential and Change

Numerous technologies surrounding the broadcasting industry have rapidly evolved. As a result, the boundary between broadcasting and communications has been becoming extinct and/or fusing. In this turbulent environment, the broadcasting, communications and IT industries have been preparing for the digital TV switch over.

Inter BEE:
Pointing toward Future Media Technology

The Japanese broadcasting and electronic equipment industry has been contributing substantially to the progress of broadcasting, imaging and acoustic technologies worldwide. HDTV, which symbolizes this contribution, has matured into a mainstream medium all over the world. Inter BEE has played an important role in the promotion of technological development and obtained notable results together with NAB in the United States and IBC in Europe; from now on, it will push forward this globalization process by enhancing its alliance with Asian countries, where great progress is about to take place and its overall market size is expected to expand greatly.

Inter BEE 2008:
Touch the Evolutions and Feel the Changes

"Inter BEE 2008," which will celebrate the 44th gathering of Inter BEE, will take place at Makuhari Messe from November 19th through 21st. It will present to the public state-of-the-art technologies related to advanced broadcasting/imaging/acoustic equipment, with a major emphasis on HDTV, as well as applications and solutions at an all-in-one venue. Reflecting today's global technological trends, a wide range of advanced technologies proudly developed by Japan will also be exhibited.

In harmony with the equipment to be exhibited, various events have been planned, including the "Inter BEE Forum," to which domestic and foreign experts active at the forefront of the broadcasting, imaging and acoustic business will be invited, and the "Asia Content Theater," which will show excellent productions from Asian countries.

Support Provided to Foreign Attendees

We will set up a user-friendly website, where a complete set of information on the exhibited equipment and events will be available to all attendees, and we will also offer a press service, which will make it easier for media people to gather material and dispatch their reports.

In the vicinity of Makuhari Messe, which is the venue for this gathering, there are various hotels and restaurants. It also has excellent traffic links to and from the center of Tokyo. Thus, one can easily reach areas in downtown Tokyo, such as Asakusa, where one can experience traditional Japanese culture, and the world-famous Akihabara Electric Town. The attendees can enjoy not only Inter BEE, but also sample a wide variety of uniquely Japanese experiences.

On-line registration is also possible at the following web site:

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Management/Contact: Japan Electronics Show Association
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Tel: +81-3-5402-7601 Fax: +81-3-5402-7605
E-mail: contact@inter-bee.com

using an ActiveX component. Many systems enable independent MOS playlists to be controlled across multiple devices from a central location.

MOS generally does not include interface to a station automation system. That functionality is available, but is difficult to implement because news is a live event and many times incorporates last minute changes.

The Inscriber G7 from Harris offers dual-channel SD/HD playout, clip and still management, DVE, 3-D capabilities, and MOS interface.

Another major change is the use of centralized graphics content creation, storage, management and distribution. In this model, a graphics department is centrally located and serves many facilities. Each facility may have its own look and feel, but in reality more organizations are opting for a centralized solution.

There are many benefits to this model, including a graphics center, less manpower, common creation techniques and software utilization, and the ability to have quick access to all graphics content. The model creates certain problems, too. How is a graphic requested? How long does it take for that graphic to be produced? If the requested graphic is not available, is there a placeholder to alert the user when it will be available? How is the actual content sent to the graphic device at the facility?

All these questions are answered if the graphics system has its own graphics management system, or it can be an element in a third-party system. Even if centralized graphics management outside the facility is not an issue, think about how many graphics devices are used internally. The same lower third for news could be used in a master control branding situation, as could time and temperature bugs, station logos and IDs, and "coming up next" promos. The ability to "create once, use many" is essential for timeliness and efficiency. Of course, this also means that specialized branding devices must be able to share content with the main graphics device.

Keep in mind that the product purchased today must live in an ever expanding graphics environment. It must have the features necessary for eye-popping graphics, as well as the capabilities that will ensure expansion of interface and management functions. A smart purchase today will ensure the return on investment every organization is seeking. BE

Rich Hajdu is a 30-year television industry veteran, with experience in remote and broadcast production, sales and management.

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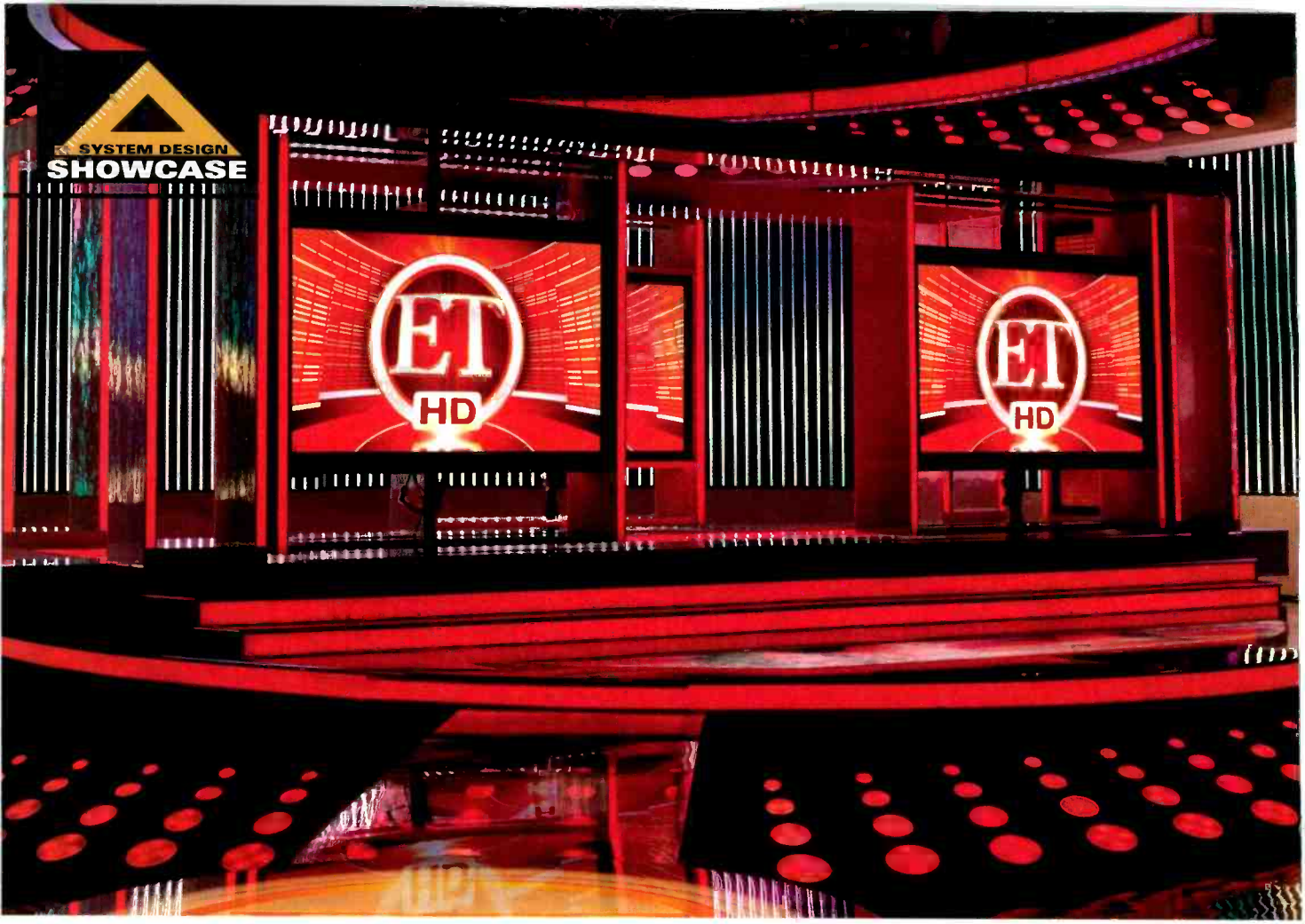

'Entertainment Tonight' gets an HD makeover

BY MICHAEL GROTTICELLI

With its storied history that began in 1981, CBS Television Distribution's "Entertainment Tonight," or "ET" for short, became the first in its genre to broadcast in HD. The show officially aired its first 1080i HD episodes on Sept. 8.

Along with "The Insider," the show has moved to CBS Studio Center, in Studio City, CA, after 25 seasons at Paramount Studios in Hollywood. The "ET" and "The Insider" executive offices and newsroom are now in the former Todd-AO scoring stage where numerous films — including "The Blues Brothers," "Schindler's List" and "Pirates of the Caribbean: At World's End" — have been scored.

The move was precipitated by the parent company CBS' split into two separate divisions in 2006, resulting in "ET" and "The Insider" being wholly owned by CBS Television Distribution. At that time, "ET" and "The Insider" were already discussing to improve the production capabilities, according to Dan Henry, executive in charge of production for both shows. If they were going to move, he said, now was the time to go HD.

Following discussions that began in 2006, system integrator Teklogic, in West Hills, CA, did a relocation/upgrade feasibility and workflow study, which included a detailed budget analysis. Preliminary design began after NAB2007, and a detailed design followed in October, with on-site installation starting in March 2008.

Henry and his team weren't looking to reinvent the wheel. The main issue was how best to achieve their goals of operational efficiency and a streamlined production capability to get news content on-air (and online) quickly while staying to true to the existing and highly successful workflow. Teklogic's challenge was how to incorporate the existing workflow using current HD technology. Often it found that the technology wasn't

On Stage 4, two cutting-edge sets were designed and built by Steve Bass. The sets were made for the HD widescreen experience and feature four 103in plasma displays, a walkway between the two sets and LED lighting to set different moods.

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quite there yet, which resulted in many evenings of brainstorming and design reviews.

The new file-based facility shines

The show originates from an all-HD-SDI infrastructure, which includes more than 150mi of coax and fiber cable. The newsroom alone is now three times the size of its former space. The 12,000sq-ft Stage 4 houses two new HD sets, as well as lighting and camera control. Stage 5 provides another 12,000sq ft for 28 nonlinear HD edit bays, two rooms for Digidesign Pro Tools, two technical operations centers, two master control rooms, two transmission control rooms, two voice-over rooms with three voice-over booths, nine graphics workstations and three promo creation rooms.

Shown here is one of two technical operations centers that monitor a variety of incoming feeds. Photo courtesy John Joannou/Teklogic.

Three new buildings were built to accommodate two production control rooms, a central equipment room and engineering workshop. There are also several separate talent suites, wardrobe, make-up and a large tape vault housing the company's historic videotape library.

CBS Television also supplies "ET" content to other regions such as Canada. The new infrastructure greatly streamlines this process and avoids time-consuming and costly dubs.

LED lighting sets the mood

Construction began on the existing Stage 5 in January. The two cutting-edge sets on Stage 4 are specifically designed for the HD widescreen experience and feature four 103in plasma displays, a walkway between the two sets and lots of LED lighting to set different moods. These new sets, designed and built by Steve Bass, were installed in mid-June, and the crew began technical run-throughs in early August.

Designing a forward-looking infrastructure

The shows' editors and producers were used to working exclusively with tape, having to make duplicate copies of images and segments in order to develop each show.

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The new system is based on an all-HD Avid environment with 28 Nitris suites sharing 192TB of ISIS storage and using an Avid Interplay workflow. Interplay controls a Masstech archive solution with a Spectra Logic archive library using IBM LTO-4 tape drives. The library is set to provide storage for the next two years, and its modular design allows for easy future expansion leveraging new developments in tape library formats.

Using shared storage and server technology from Avid and Thomson Grass Valley, the more than 200 staff members now work concurrently on various parts of the shows as it comes together in the production control room. This is an important step forward, as at any given time, at least seven editors are developing that day's show — in most cases working right up to the last seconds before airing. For the "ET" crew, speed and efficiency is critical. There have been more than a few instances when editors were working on segments of the show as the first half was being fed via satellite and fiber to markets across the country for airing.

In order to maintain a high quality, editing is based on the Avid DNxHD 145 compression codec with a built-in infrastructure to accommodate other compression formats. Photo courtesy John Joannou/Teklogic.

Adding to this frenetic environment, edit bays are dedicated to the show's open, bumpers and promos, and several editors work exclusively for the show's online Web site. In the new facility, the team can share resources using the Interplay, allowing producers and editors to browse low-res proxy clips from any desktop in the building and retrieve the full-res versions after an EDL has been established.

Because reporting the story first often means higher ratings, it's important to get material into the system as soon as possible. To support this workflow, the company has purchased several Sony XDCAM HD cameras for use in the field. Once footage is acquired, four digitizing stations within the technical operation centers are used to ingest material onto the network immediately. This allows editors to begin working as the video is uploaded.

An all-Avid HD production workflow

In order to maintain a high quality for its video images, Avid post editing is currently based on the DNxHD 145

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8-bit media compression codec with a built-in infrastructure to accommodate other compression formats. The "ET" and "The Insider" facility at CBS Studio Center is one of the largest all-Avid HD facilities in North America.

The two identical production control rooms are capable of taking control of the stage and cameras independently or on a shared basis. Each control room includes a fully loaded Sony MVS8000G switcher, a Studer Vista 8 sound mixer with embedders and de-embedders, a configurable LCD monitor wall with an Evertz MVP multiviewer, four channels each of Avid Deko and Thunder graphics, and a Thomson Grass Valley K2 networked storage server system with seven record and 21 playout channels controlled by Editware edit controllers. Two standalone K2 servers act as primary and backup program playout servers under Crispin control.

The equipment room features an Evertz EQX (576x576 HD/SD/ASI) router and control system as well as an NVISION 256 port router, which moves the hundreds of feeds around the facility. Photo courtesy John Joannou/Teklogic.

The entire facility uses embedded audio. Facility-wide distribution is handled by an Evertz EQX 576 x 576 HD/SD/ASI router capable of performing video/audio breakaways by de-embedding and re-embedding audio, an Evertz 256 x 256 time code router and an NVISION 256 port router. The Vista 8 mixing console is connected to the EQX via a MADI interface, allowing for channel swapping via the built-in router embedders and de-embedders.

An RTS ADAM system connects all edit suites, master control, TOC, voice-overs, production control, graphics workstations, lighting and camera control, wireless stage party-line system, and outside dial-up lines into a unified intercom system. An Image Video tally control system interfaces to the MVS8000G switcher and EQX router, providing an elaborate tally system with real-time mnemonic display period. More than 110 servers and computers are accessible from multiple locations through an Avocent KVM switch.

There are nine dual-quad Mac-based graphics workstations, with 20 dual-quad Apple XServe systems supporting the render farm, plus 96TB of NetApp

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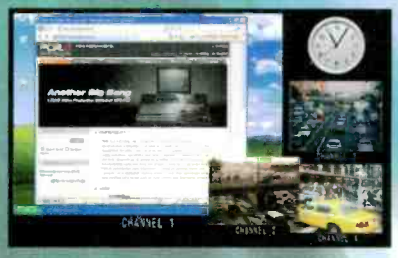

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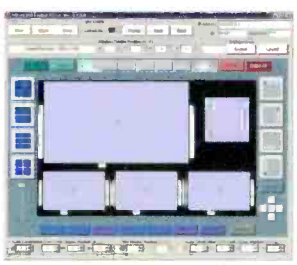

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storage. This network is accessed by more than 250 seats of Avid iNEWS in the newsroom and throughout the facility. An all-digital in-house cable system is tied to the lot's existing Motorola-based headend cable system.

A new 5m steerable satellite antenna was installed at the broadcast center satellite farm. Access to all the antennae in the satellite farm is made available via an Evertz L-Band router and Crystal Computer remote satellite control software. Fiber runs between the show and broadcast center (home to stations KCBS/KCAL) to provide bidirectional HD-SDI feeds and Ethernet connectivity. The show also has fiber connectivity to CBS NY and CBS TV City.

The vast newsroom at the new CBS Studio Center site includes 250 seats of Avid iNEWS software and supports both "Entertainment Tonight" and "The Insider." Photo courtesy John Joannou/Teklogic.

Mining a deep archiving

CBS Television Distribution has installed a constantly expanding deep archive where finished programs are stored long-term. Historic video clips are continually being repurposed to lend perspective to breaking news stories. They're also used for "ET's" anniversary and celebrity specials, which air periodically.

Although it is undergoing a massive digitization project, the company's current tape vault holds about 500,000 tapes, 350,000 of which are stored on-site at the new CBS Studio Center site. The archive was brought into the file-based work using a joint library system from Masstech and Spectra Logic, which is modular and can be expanded as needed. This will make repurposing easier and more cost-effective.

For 28 years, "ET" has been at the forefront of TV production by providing viewers with timely and exclusive content while staying on top of the latest technology and using it to gain a competitive advantage. Although "ET" and "The Insider" continue to enjoy high ratings, adding the improved image quality of HDTV is critical to their future success, both on TV and on the Web. BE

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

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"ET"/"The Insider"
Dan Henry, executive in charge of production
Linda Bell Blue, executive producer

Teklogic
John Joannou, president
Esteban Ortega, lead project engineer
Debra Vos-Reyna, project manager, operations and procurement

Technology at work

Apple XServe server
Avid
- Deko graphics
- Digidesign Pro Tools DAW
- DS Nitris edit software
- iNEWS newsroom computer system
- Interplay asset management
- ISIS storage
- Thunder graphics production server

Avocent DSR1022 KVM switch
Canon
- KH21ex5.7 IRSE HDgc series lens
- HK10ex4.5B and KJ21 HD field lenses
- XJ27 x 6.5B and HJ11 x 7.3 HD studio lenses

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- 256 x 256 time code router
- MVP and VIP multiviewers
- Terminal equipment with VistaLink
- XRF6 L-Band router and remote control software

FOR-A DCC-70HS HD color correctors
Leader
- LV 5800 waveform monitor
- LV 7700 rasterizers

Masstech archive
NetApp graphics storage
NVISION 256 port router
QTV MSP17, MSP15 and MSP12 prompters, and Qmaster software
RTS ADAM intercom
Sony HDC-1500 HD studio cameras
- MVS8000G production switcher
- XDCAM HD field cameras
- PDW-1500 disk recorder
- HDW-M2000 recorders

Spectra Logic Spectra T960 archive library
Studer Vista 8 audio mixer
Thomson Grass Valley K2 video servers with networked storage

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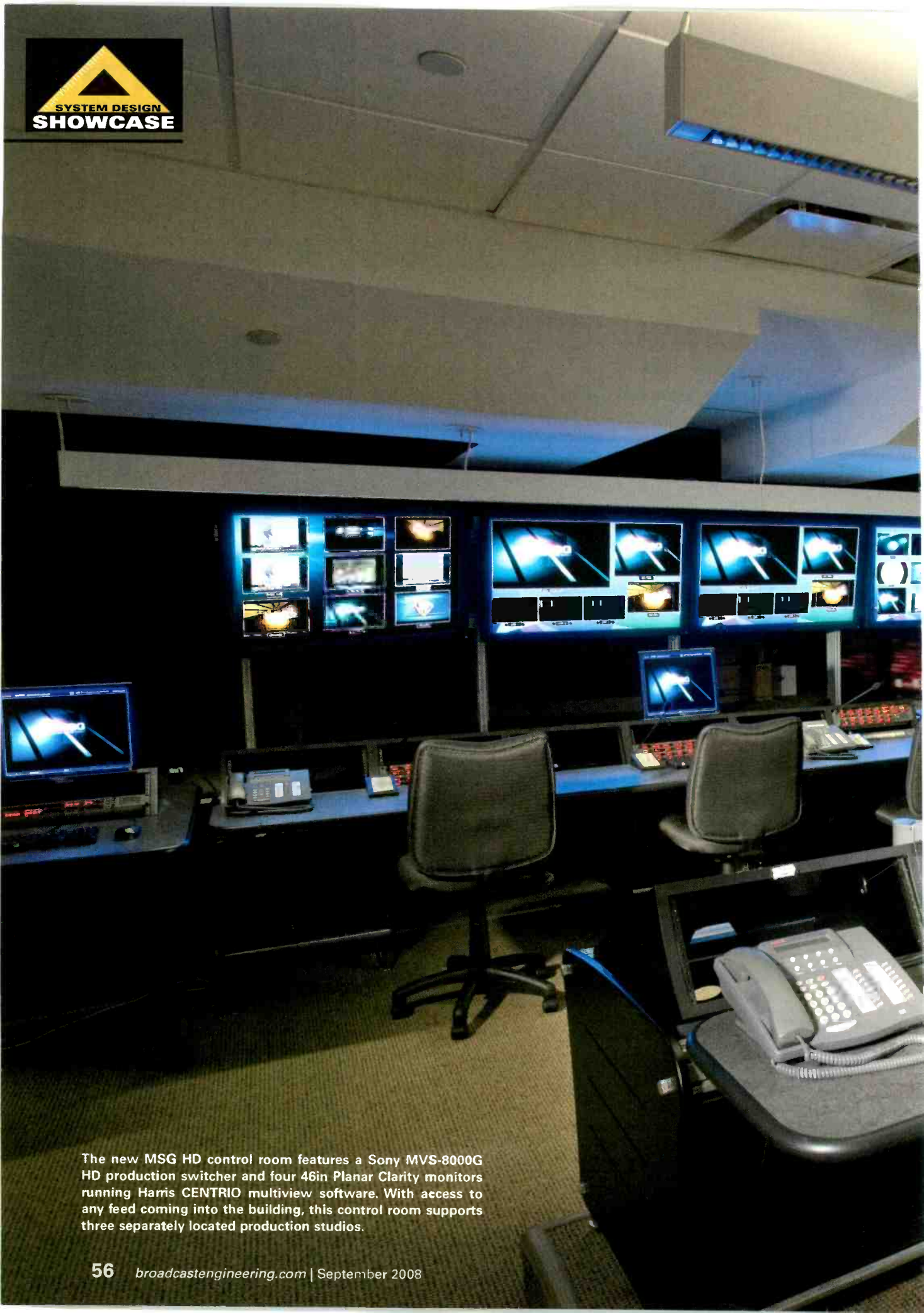
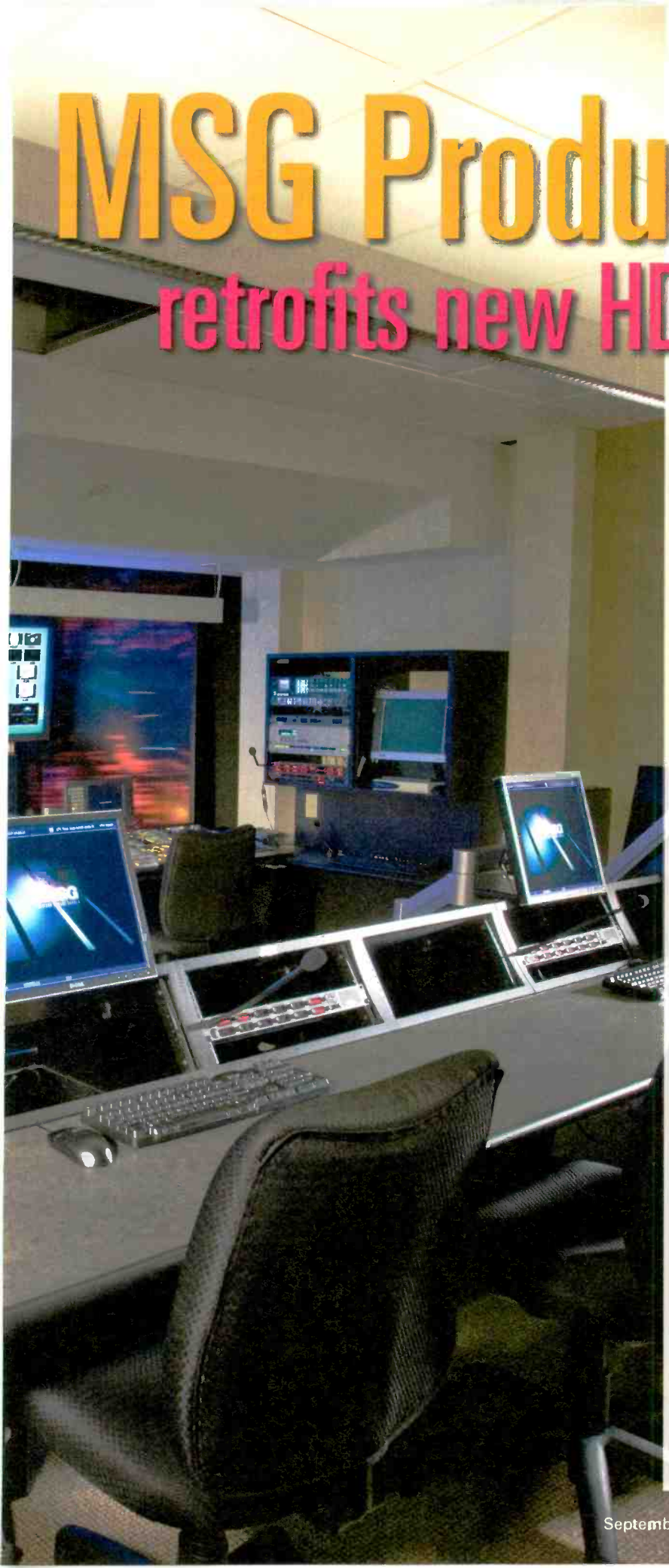


The new MSG HD control room features a Sony MVS-8000G HD production switcher and four 46in Planar Clarity monitors running Harris CENTRIO multiview software. With access to any feed coming into the building, this control room supports three separately located production studios.

MSG Productions retrofits new HD facilities



BY MICHAEL GROTTICELLI

To say that Madison Square Garden (MSG) Productions in New York City is a pioneer in live HD sports production is an understatement. Since 1998, it has been at the forefront of 16:9 camera framing and focusing techniques, at a time when others were fumbling with upconverting programming and simply getting a digital signal on the air.

Its coverage of New York Knicks basketball games, as well New York Rangers, New York Islanders and New Jersey Devils hockey games, have long been delivered live via cable in the 1080i HDTV format. That's possible thanks to the support of mobile production companies like National Mobile Television and Game Creek Video. However, in-studio pre- and post-game programs and most of the graphics elements at commercial breaks (as well as the commercials themselves) were upconverted from standard-definition digital, due to a lack of affordable equipment and the costs of upgrading other areas of the company to HD.

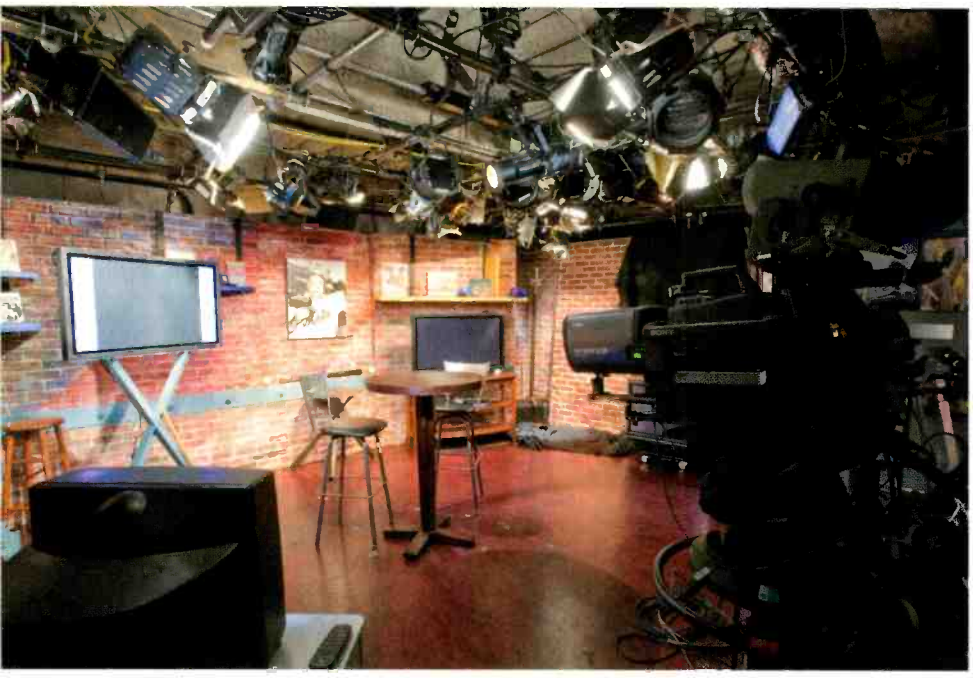
MSG produced these SD elements from an aging digital production facility. The equipment, including a Sony NewsBase system and control room, is mostly obsolete. By all accounts, it was in need of an upgrade. (Years ago, the Garden had four control rooms in-house.)

In 2005, Michael Mitchell came onboard as chief engineer, with a mandate from upper management to update the equipment. As several regional sports channels came onto

Game coverage and highlight reels are put together with the four Harris Velocity workstations. An additional six Velocity ESX software-only versions help develop pre-built packages and player profiles for insertion into the game coverage.

the scene, it was clear that MSG had to hold on to its leadership position in HD sports. The new facilities produce programming for two of Cablevision's regional 24-hour sports channels: MSG and MSG Plus (formerly Fox Sports Net New York). During busy sports nights, there's overflow into additional channels, MSG2 or MSG Plus 2.

Initial design discussions in 2006 have resulted in new HD studios and control facilities within the famous Garden in New York City. There's also a new feed ingest area (complete with a variety of formats, including a Sony 1in VTR), networked HD editing and multichannel audio rooms, as well as new graphics suites and a server/operations area. All are designed to expand its HD program offerings while supporting live HD events, which could include entertainment at the famed concert hall in the future. Although most of its filed material comes in on some form of videotape now, the company will continue its migration to a tapeless production environment after the renovation with the addition of Sony XDCAM HD optical disc and solid-state camcorders.



Each of three nearly identical production studios features two Sony HDC-1550 HD cameras with Canon 22x7.3 lenses and a small set that can be changed quickly when necessary.

A portable retrofit

Added to the challenge of retrofitting HD facilities in existing analog space is the recent announcement by Cablevision that the Garden will undergo a complete renovation in the next few years. This means that the new facilities will be moved to a new production center near the midtown location from which some Garden systems will be remotely controlled via fiber-optic cabling.

The new HD facilities include a Harris NEXIO server system linking multiple Harris Velocity NX and Apple Final Cut Studio HD craft edit systems disbursed throughout the fourth floor working on a shared storage network. A control room features a Sony MVS-8000G HD switcher and an audio suite with a new Solid State Logic (SSL) C100HD digital audio console. Throughout the facility space was used efficiently, and it was all accomplished in a short period of time.

The best part is that it's all HD-compatible and ready to be moved when necessary. This was no easy feat considering Mitchell's team started with existing facilities, so they couldn't change any walls. In six months, beginning in January 2008 (working from a design by New York architect Hans Knutzen Associates), they installed 30,000ft of Belden video cable, 20,000ft of Ethernet cabling and the equipment necessary to fill out the various rooms.

When Your Production is on The Line

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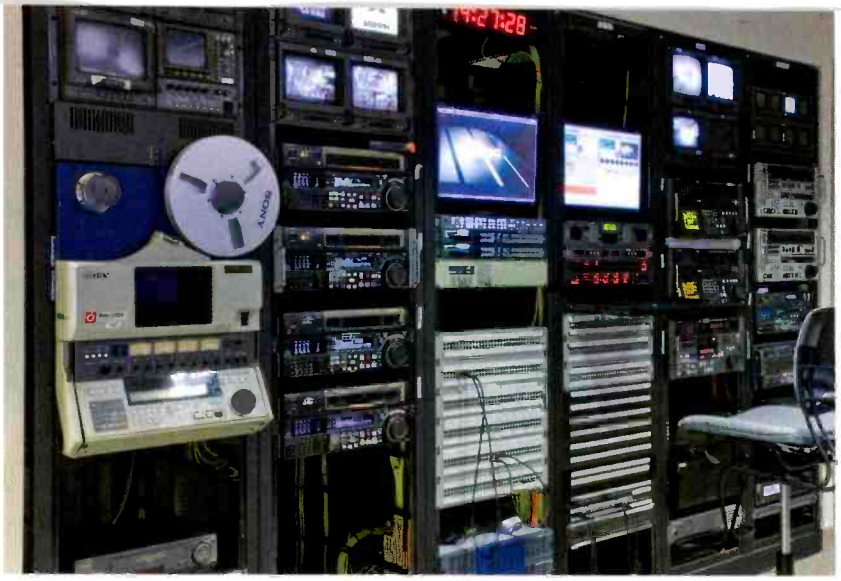
Major league HD production

Located on the building's fourth floor, the airy control room boasts a Harris CENTRIO multiviewer system that displays a myriad of configurations and dozens of feeds on four Planar Clarity 46in Baycat 1920 x 1080 LCD monitors. With access to any feed coming into the building, this control room supports three separately located production studios, each with two Sony HDC-1550 HD cameras (with Canon 22x7.3 lenses) and a small set. The HD control room can also access an existing SD control room on the other side of the building for larger productions.

The new HD facilities are based on a Harris Platinum router with 128 x 128 I/O matrix distributing full baseband HD video with embedded audio. This was installed to handle the in-house HD production needs, while an existing Thomson Grass Valley Trinix router (256 x 256) handles most of the live game feeds (both home and away). An Avocent switch located in the facility's machine room allows engineers to easily reconfigure the control and monitor software interface of the routers and servers from a single location.



Game elements from around the country are collected in the feed/ingest area, which features support for a variety of formats, including a Sony 1in VTR (far left).

A Harris NEXIO server (capable of storing 617 hours of HD at 80Mb/s, MPEG-2, 4:2:2) is configured with eight input channels and 16 outputs, but it can be set up to ingest 12 feeds simultaneously while outputting 16 channels. This is helpful when basketball and hockey seasons are in full swing.

Think about it.

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Collaborative production using remote facilities

In addition, during the fall and winter, live games are captured in New York City (or arrive via satellite or fiber), compressed with the NEXIO system, and then sent to Cablevision's Rainbow Network Communications (RNC) some 25mi away in Bethpage, NY. Many times games come into the RNC facility first (via its extensive earth station) and then are sent to MSG in NYC for editing highlight reels before being inserted into select programs. Packages can be turned around quickly and made available for air by the end of the first quarter of a game. In addition, for those viewers that miss the game live, MSG also produces a shortened 60-minute ("In 60") version of each game, as well as a two-hour replay.

In Bethpage, a dedicated master control area at the RNC facility is used to insert commercials, add graphic elements and then send it on to the various Cablevision cable television platforms. Games are also carried on satellite services as well as on other tristate cable systems.

Game elements from around the country are collected, and highlight reels are put together quickly with the four Harris Velocity workstations. An additional six Velocity ESX (software-only version) help develop highlight packages and player profiles for insertion into the game coverage. HD titles and lower-third graphics are mainly created with a Chyron HyperX system, while the Final Cut Pro systems, linked to an Apple Xsan server with 27TB of storage capacity, store repurposed graphics. AJA Video KONA image capture cards are used extensively in this workflow as well.

Nearline content (audio and video program elements used most frequently) are stored at 35Mb/s on an Isilon InfiniBand server with 48TB (or 1248 hours) of HD capacity. Older content is archived on a server in Bethpage. Content is managed locally with Harris content management software, where editors and producers can search and locate clips stored on the Isilon server and move them over to the online NEXIO servers to an individual workstation as necessary. Content is tagged with edit and media IDs to streamline this process.

Sports sounding good

While MSG continues to distribute its games, talk shows and other programs with embedded AES digital audio signals, the stereo feed is automatically converted to full 5.1 (plus 2) surround sound at the RNC facility using multiple Dolby Surround multiplexing encoders. The group is basing its entire multichannel audio production on its

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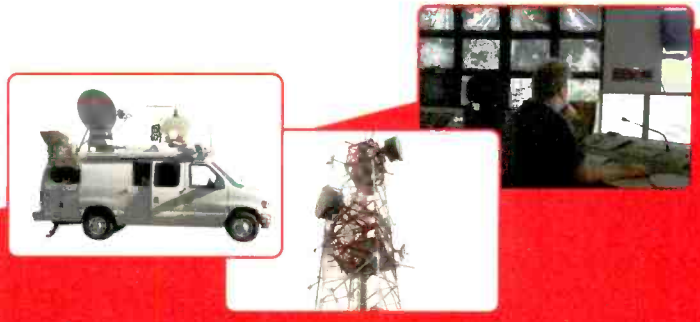

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new C100 HD console. The board handles embedded audio signals today and can easily be used to mix full surround sound in the future.

The console also handles all of the audio production for the two in-house studios, where stereo boom mics and wireless lavaliere mics are used. The console's ability to store settings for different shows and configurations has helped the crew save time. This allows a variety of staff and freelance audio operators to sit down and run the board without any prior training.

The console is part of an overall strategy for simultaneous, multiroom, networked audio production. Expanding on this, the media team is planning to install SSL Stagebox remote mic preamp units throughout the facility once it's renovated. This will allow the C100 console to mix audio feeds coming from anywhere a Stagebox is located. This will enable the group to provide bands playing a concert in the main hall with a fully mixed DVD and/or CD by the end of the show that night. This is something the company has never been able to do before.

To round out conversion to digital audio, MSG Media also replaced its plant intercom with the Riedel Artist 128 system. The system incorporates all the control functionality required and serves as a digital router as well. It easily interfaces to the Gardens' house Riedel intercom system, as well as to the systems used in its partners' mobile production unit trucks.

Although a lot hinges on how the final renovation of Madison Square Garden turns out, much of the equipment now installed will help the company keep up with a highly competitive genre. HDTV is what makes sports special, and the group continues to lead with its technology and premium content. Mitchell said his team is serious about HD and all that it can bring to the company. The new facilities and enthusiastic support from management to get it right are a testament to that. BE

MSG has based multichannel audio production around a new SSL C100 HD console. The board handles embedded audio signals today and will be used to mix full surround sound in the future.

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

Design team

MSG Media
- Mike Bair, president
- Lydia Murphy-Stephans, executive VP, programming and production
- Jerry Passaro, sr. VP, network operations and distribution
- Michael Mitchell, chief engineer
- Joe Malespina, engineer
- Andrea Cummis, engineer

The Manhattan Crewing Company
- Ray Bucceri, chief design engineer
- Michael Ferentinos, project manager
- Chris Hewson, president/CEO
- Justin Francione, electronics system engineer

Technology at work

ADC patch bays and connectors
AJA Video KONA cards
Apple
- Final Cut Studio HD workstations
- Xsan storage system for graphics

Avocent system configuration and monitoring router
Belden HD cable
Canon HD lenses
Chyron HyperX graphics
Dell E6420 workstations
Dolby E encoders
Extreme Networks BlackDiamond 12800R Series Fibre Channel switch
Front Porch Digital DIVArchive system
Harris
- CENTRIO multiviewer display systems
- H-Class content management software
- NEO and 6800 series signal processing modules
- NEXIO servers
- Platinum HD router
- Velocity ESX edit software
- Velocity NX edit systems
- X75 aspect ratio converters

Isilon InfiniBand storage system
Middle Atlantic equipment rack enclosures
Panasonic DVCPRO VTRs
Planar Clarity Baycat 46in 1920x1080 LCD monitors
Riedel Artist 128 intercom system
Solid State Logic C100 HD console
Sony
- HDC-1550 HD cameras
- HDW-M2000/20 VTRs
- MVS-8000G switcher

Switchcraft connectors
Thomson Grass Valley Trinix router
TVLogic LVM-240W LCD monitors
Vinten
- Osprey Elite pedestals
- Vector fluid heads

Keeping the power on

Preventative maintenance goes a long way.

BY DON MARKLEY

There is an old joke that has been floating around the industry for years. It claims that a station chief tested the standby power plant every week for years by starting it and running it for a short time. When the day came that the power actually failed for the first time, he couldn't get the generator online; it seems that the starter button was worn out.

That doesn't mean you should stop doing maintenance. In truth, the entire primary power system needs ongoing service. The time involved and frequency of the work may be different than for the RF or video systems, but it's an absolute must.

Primary power system

The primary power system includes at least four smaller systems in a modern television transmitting facility. The main disconnecting switch enables the delivery of primary power to the entire plant. That switch may also contain fuses or a circuit breaker in accordance with the system design. The design should include a short circuit analysis by a professional engineer. In the simplest terms, the short circuit test determines the maximum current that would flow if the power mains were shorted after the main disconnect. The switch, fuses or circuit breaker must then be designed to actually break the circuit if a short occurs.

The entire primary power system needs ongoing service. The time involved and frequency may be different than for RF or video systems, but it's an absolute must.

The maintenance on this part of the system is relatively minor. It's necessary to keep the inside of the box clean and rodent-free. In addition, thermal imaging should be done at least every two years to check for hot connectors or failing components. Use appropriate protective clothing and devices when opening this unit to comply with OSHA requirements. Again, calculations are needed to determine the extent of such protection.

Transfer switch

The next system in line is the transfer switch between the commercial mains and the auxiliary power plant. Maintenance includes occasional activating, which could occur when the entire auxiliary plant is exercised. Without other indication of failure, keep everything clean. Again, thermal imaging on a periodic basis will show overheating contacts of components.

Standby generator

Start the standby generator itself periodically. Operate it under load until the engine and generator reach normal operating temperatures. The frequency of such testing is as recommended by the individual manufacturer. In addition to running the unit, check the vital liquids. That includes the lubricating oil and coolant. The manufacturer will specify the actual coolant to be used. Tap water is never recommended. The coolant will normally contain additives to prevent rust and corrosion.

Fuel system

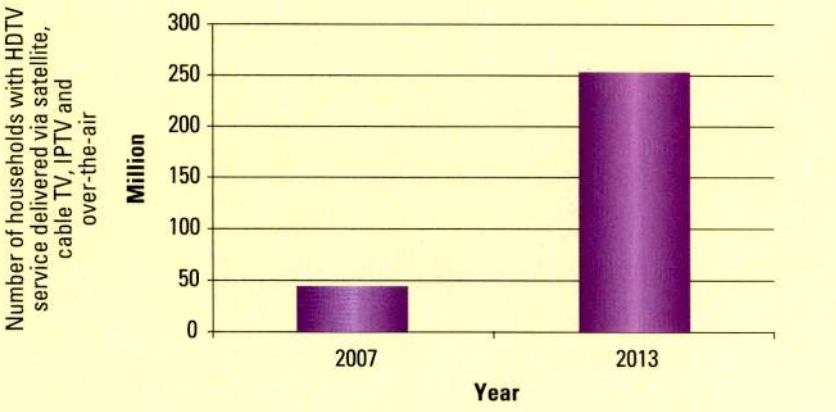
The fuel system varies from plain old gasoline to diesel, propane and natural gas. Generally, the type used is selected at the time of the original installation. Conversion between some fuels is possible by the manufacturer or dealer but not for such a change as from gas to diesel. Propane and natural gas only require minimal servicing. Gasoline works well if the

FRAME GRAB

A look at the consumer side of DTV

The number of HDTV homes to reach 255 million by 2013

At the end of 2007, there were an estimated 45 million HDTV homes.



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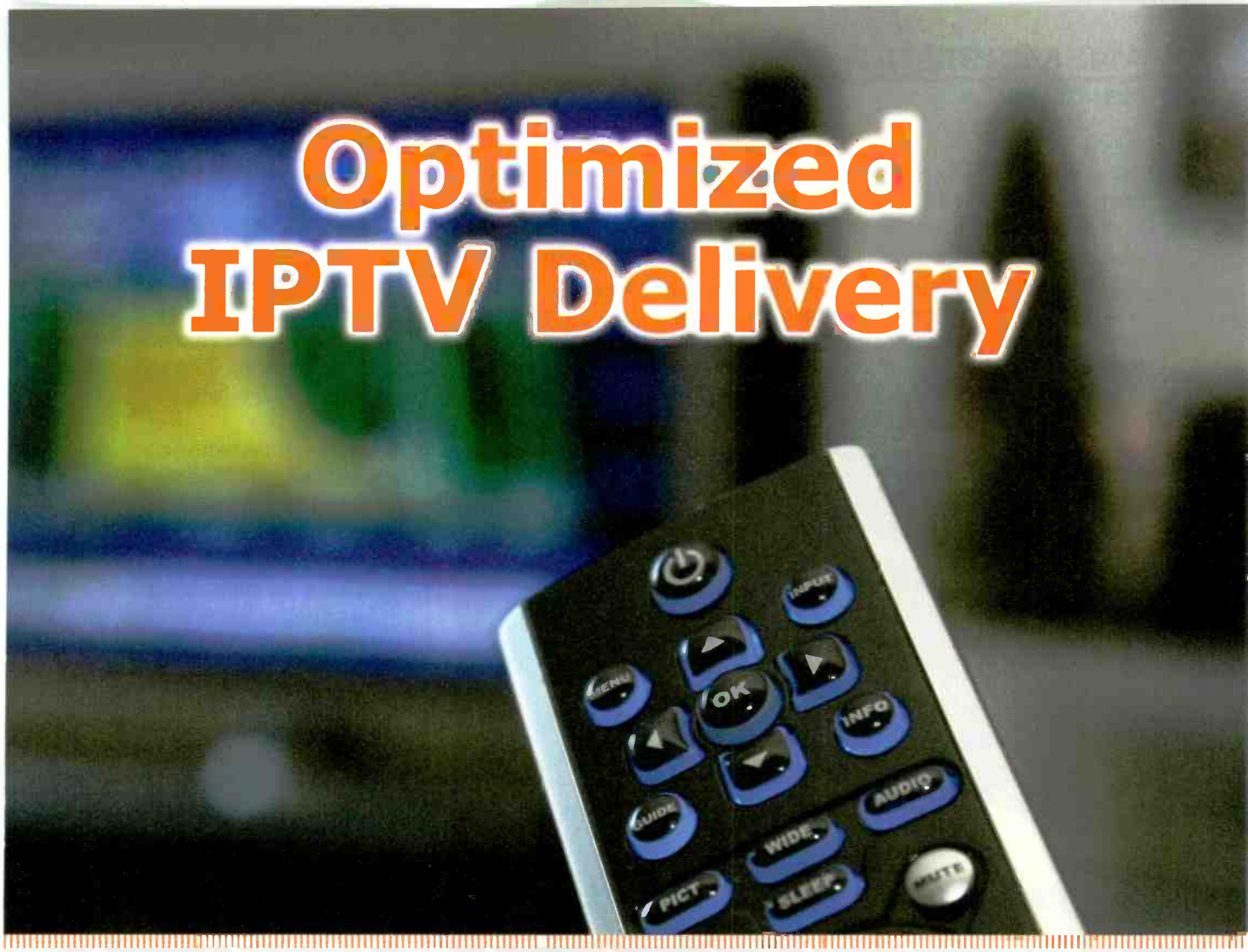
KTUD, VegasTV, in Las Vegas relies on a Toshiba G8000 UPS and a flywheel made by Pentadyne.

system is regularly operated. Problems can occur when the gas isn't moved through the lines. If it's allowed to sit there, gasoline will cause residue to accumulate inside the lines and, if used, the carburetor. Diesel fuel tends to allow microbes to grow in the tank until they totally plug up the fuel system. This can be avoided by using one of the common additives available from your local part store or truck stop. The use of such protection in diesel fuel is almost mandatory in both the storage and the day operating tank.

UPS

The uninterruptible power supply (UPS) units filter and regulate the primary power. In case of failure of the main power source, they maintain the needed power output until the generator is online and capable of accepting the load. To keep everything



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going during that gap, they use either batteries or a flywheel and generator.

If batteries are used, the obvious maintenance includes cleaning off all corrosion from the posts and connectors. If the batteries are not the sealed type, the liquid levels must be maintained and the charge confirmed. There is no excuse that will placate the front office if the system won't function because you allowed the batteries to die. The charging circuits must be checked regularly as well as the battery charger on the standby power plant.

Some new UPS systems use a high-speed flywheel with a generator to supply the interim power. The flywheels operate in a sealed environment, which is often pressurized with a suitable gas. There isn't a lot to do on the flywheels other than to follow the manufacturer's direction for returning it to the factory upon failure. Although high-tech, the new designs of these units are physically small, quiet and highly reliable.

General maintenance

So, what should you do to check and maintain power systems? Cleanliness is important inside the various cabinets. You'd be amazed how much damage mouse or rat occupancy causes.

Thermal imaging of all parts of the system should be done on a periodic basis to catch failing components before they cause off-the-air time. Check the standby power plant as recommended by the manufacturer. The entire system should be tested on a periodic basis. At least once or twice a year, shut down the primary power by opening the main disconnect. If all goes as planned, you shouldn't notice anything wrong in the equipment. I recommend performing this test during the wee hours just in case something doesn't go well. The idea of trying to explain what happened to management when the station went down during high paying time is simply unthinkable.

Keeping the standby and primary power systems in good condition is relatively simple. Maintaining these systems is straightforward and doesn't require much time. If incorporated into a regular maintenance schedule along with that for the rest of the transmitting equipment, everything can be done in a few hours per month. However, no maintenance will likely cause a lot of hours to be blown, as well as a possible job, if the system doesn't provide the necessary functions to keep the stations on the air during power failures. BE

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

Send questions and comments to: don.markley@penton.com

WHEN THE CURTAIN GOES UP

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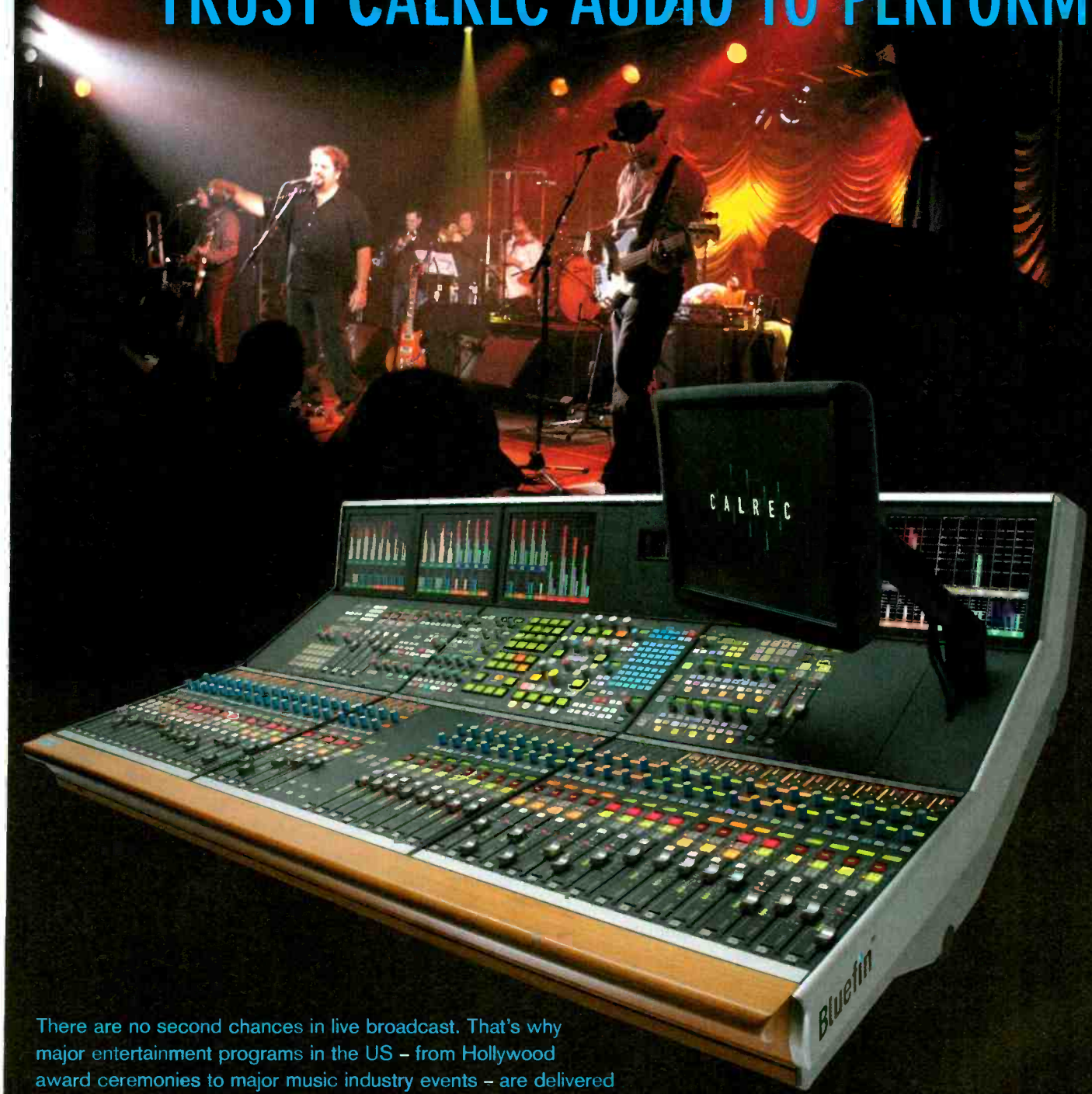

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Putting Sound in the Picture

Routing systems

Distributed routing and media networks will change the way content is distributed in a facility.

BY PHIL CIANCI

With the wide variety of audio and video formats in a digital broadcast facility, routing systems have evolved beyond their fundamental function: to allow switching of real-time signals from any source to any destination. Conversion between analog and digital, embedding and deembedding audio, up- and downconversion, transitions, and auto failover capabilities can now be incorporated into routing equipment, simplifying workflows and reducing the need for discrete conversion equipment.

Yet, with the use of compression technology, traditional baseband facility signal routing has been augmented by the addition of a new dimension: file-based audio and video routing over a media network. In fact, with file-based acquisition, multicast channels and Web distribution, content may never exist in the uncompressed domain. This integration of IT and broadcast systems has extended the routing and distribution infrastructure; media networks must be considered in audio and video routing system design.

System evolution

Early SDI routing systems were designed for SD 601 serial digital signals. As HD-SDI found its way into broadcast operations, the first HD-capable routers only supported the 1.485Gb/s HD data rate; separate SD and HD distribution was required. Similarly, SDTI, SMPTE 310 and ASI routing was either not possible or required a dedicated routing infrastructure.

Over time, auto-sensing capabilities were implemented, and SDI routers became SD/HD-agnostic. As broadcasters demanded more versatility, router I/O cards became available to support ASI, SMPTE 310 and SDTI.

SDI speeds continue to increase. 1080p60 has spawned 3Gb/s standards. Vendors have addressed the 3Gb/s requirement by exploiting the modular design of their routing systems. Existing routers with backplane and connection schemes capable of supporting 3 Gb/s bandwidth can be upgraded by replacing input, output and cross-point circuit boards in existing frames.

A limitation to increased data rates, however, is the existing cable infrastructure. Due to eye pattern degradation, existing coaxial cable run lengths may not support 3Gb/s data rates. This may create problems if a facility migrates to 1080p60-based production or desires to implement faster than real-time HD-SDI signal distribution.

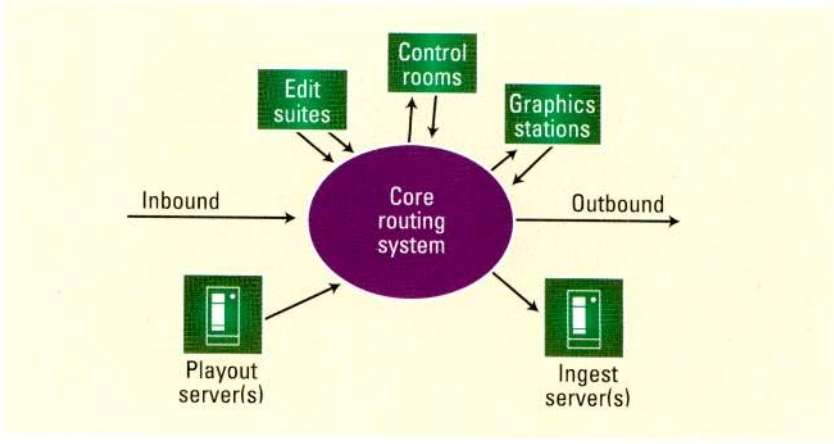

Figure 1. Centralized routing system architecture

1080p60 signals may be able to be distributed over existing cabling. HD-SDI capable cable lengths will be cut in half for 3Gb/s signals. Installation of reclocking distribution amps may not be possible for existing cable runs. Additionally, these are RF signals in the L and S bands, where existing cable crimps, wire nicks and tight

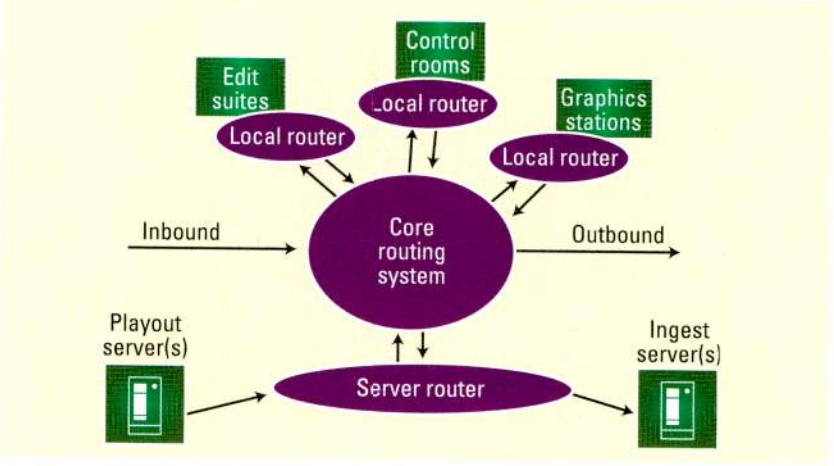

Figure 2. Spoke and hub, local and centralized routing architecture

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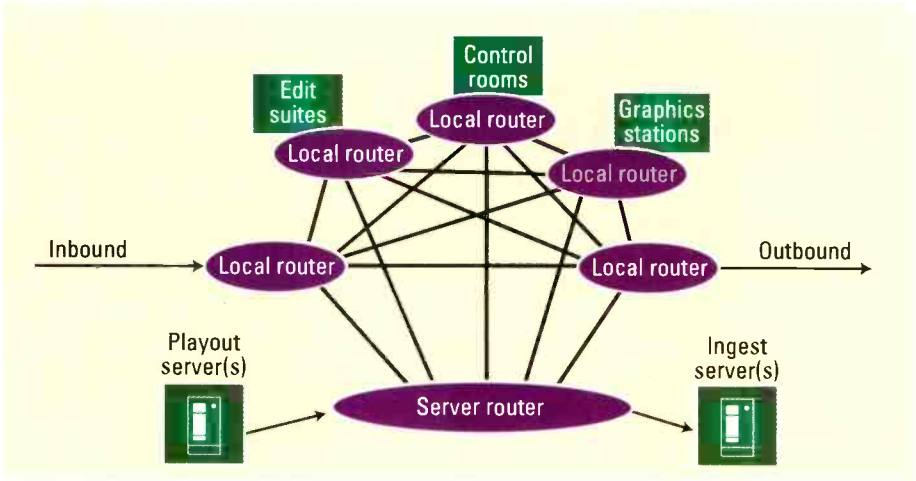

Figure 3. Distributed routing topology scenario

bends can easily degrade a signal.

Routing topology

Maximizing source availability is desired in broadcast operations. This has led to a distribution infrastructure where one large house router is fed every source and feeds every destination, as shown in Figure 1 on page 72. Frequently, the physical router is partitioned into physically dispersed frames, with redundant signal paths. In this way, if one portion of the router fails, signals can be routed through a secondary path, ensuring uninterrupted operations.

There is a trend to augment the centralized router with small local routers that serve control rooms, quality control, ingest, edit and graphic areas. (See Figure 2 on page 72.) Local control panels are configured with limited source and destination cross-point control.

Taking this approach further leads to distributed baseband routing systems where there is no centralized house router. Instead, many smaller routers are strategically interconnected based on workflow and scheduling. Figure 3 illustrates a brute force implementation of distributed routing. The local routers are connected in a fully meshed network. The number of dedicated interconnections grows exponentially as the number of local routers increases. The result is the significant decrease of the number of source/destination connects because of the need for ports dedicated solely to router interconnection — not a very real-world implementation.

Let there be light

Consider a distributed routing system where each SDI input and output port can handle a full 1.5Gb/s SMPTE 292 serial signal. Now add an "uplink" capability, a fiber port with data rates of 10Gb/s, 40Gb/s or higher.

Rather than dedicated baseband interconnection, Figure 4A on page 76 shows how the use of a dedicated high-speed meshed optical core can solve the interconnect problem. All ports on the router are now source/destination; only the uplink handles inter-router distribution.

The key is to guarantee data rates by using time division multiplexing (TDM). In this way, each group of data (cell) from an HD-SDI signal is assigned a data slot (time slice) in the data stream over a single light frequency. Multiple streams of aggregate HD-SDI can be Coarse Wave-Division Multiplex, increasing the number of real-time HD-SDI signals that can be transferred between distributed routers.

As a backup in case the high-speed core becomes saturated, a few router ports can be dedicated to baseband

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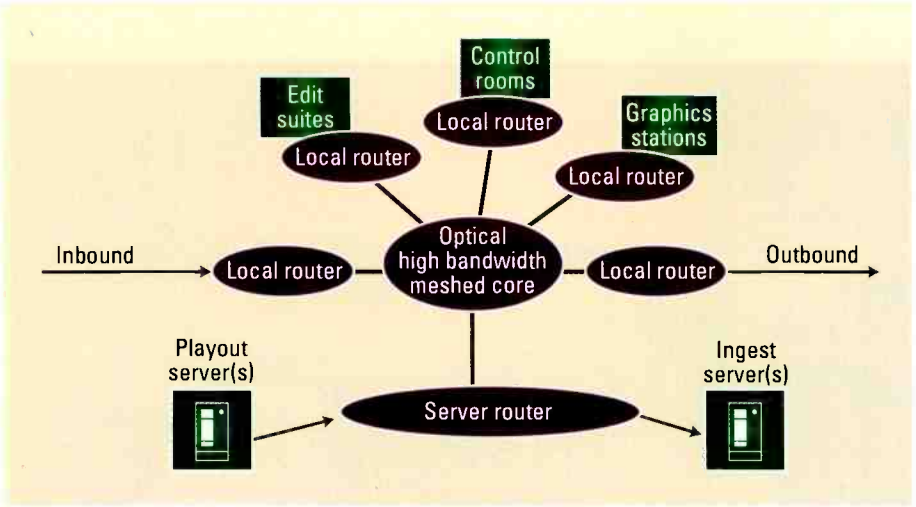

Figure 4A. Distributed routing with high bandwidth "uplink" capabilities

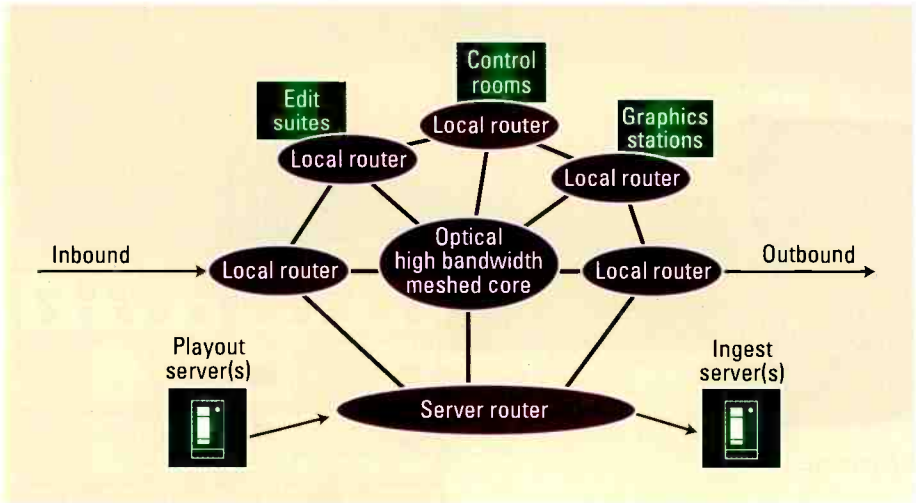

Figure 4B. Distributed routing with high bandwidth "uplink" capabilities and baseband routing ring

interconnect of the local routers. Figure 4B shows a ring interconnection topology. In a worst-case scenario, baseband signals can be routed anywhere over the ring

File-based routing

As acquisition and production move away from tape-based workflows, there is an opportunity to distribute compressed content in file format. Many cameras now support file-based acquisition; play to air is increasingly from media servers. As content is repurposed over the Web and included in DTV multicasts, it may never exist as baseband audio and video.

Figure 5 on page 78 illustrates an integrated traditional and IT routing system. Ingest and playout servers are already connected to the media network. The key additions are codecs with network interfaces that are IP-compatible. Content may be transferred from source to destination over the media network. Centralized storage is accessible from the network, and content can be routed there as well.

Naturally, there are issues to resolve. Content consists of essence and metadata. The essence/metadata association must be managed during content movement. There can be problems

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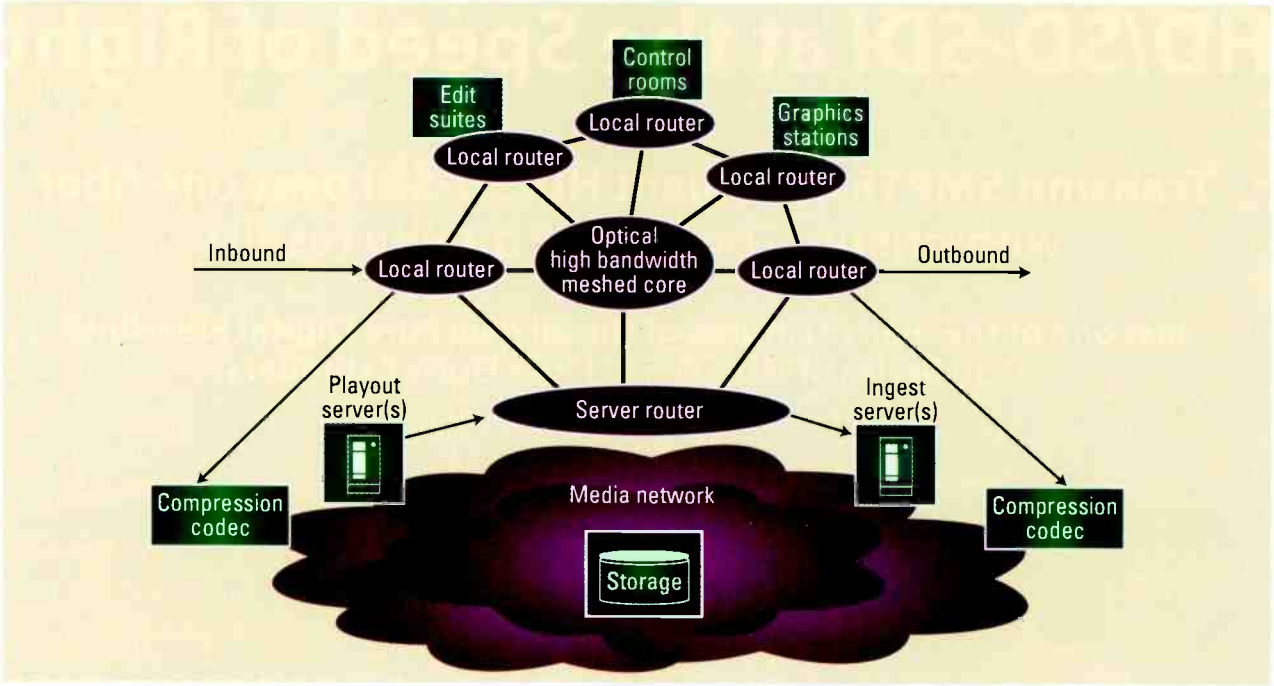

Figure 5. A BE/IT routing topology

with real-time delivery of content to servers. Network congestion must be avoided by verifying bandwidth with rigorous testing, and efficient routing protocols that guarantee Quality of Service are necessary. Compression, decompression and transcoding will add processing delays and affect lip sync.

Configuration and control

Distributed routing and the inclusion of the media network will make system configuration and control significantly more of a challenge. In a centralized routing topology, an input is sent directly to an output — a straightforward source A to destination B switch. In a distributed scenario, point A to B may make a number of "hops" from router to router over a switched connection.

Optical TDM routing is complicated. Each switching node in a distributed architecture must demultiplex, then switch the signal of interest to a time slice that has as its destination the desired output port. This may entail a number of hops, each requiring a demux, switch and remux. This makes SDI routing more and more like IP packet routing. However, using TDM, packet jitter is non-existent, but latency increases with each hop.

Design-friendly configuration applications will be the only effective way to configure a distributed routing system. There will be the need to view systems as physical sources and destinations managed by logical "level" assignments across distributed resources. This will require careful planning and an understanding of workflows.

IP addressing schemes for devices and control panels must be carefully planned so that they do not conflict with existing network addresses and so that there are sufficient addresses reserved for future expansion. Suffice it to say that static IP addresses will be necessary.

Ready for prime time?

Although not presently available on the broadcast equipment market, there have been discussions, white papers and R&D efforts to develop BE/IT hybrid router systems. However, distribution and routing of uncompressed signals will not disappear anywhere in the near future. There is also a lot of legacy analog audio and video material to keep in mind.

Switched GigE has enabled distribution of compressed content to workstations and servers. However, 1Gig is limited. At best, four streams of content at 200Mb/s can be simultaneously transferred, provisioning 20 percent header routing, control and file validation information.

If 10GigE paths are switched to servers and workstations, more than one uncompressed 1.5Gb/s HD stream could be supported. 100Gb/s is close to standardization and commercial deployment and may support 50 1.5Gb/s streams.

With 10GigE paths to devices on a 100GigE network, the integration of SDI and IP routing in broadcast facilities becomes attainable. The limitations of dedicated ports to distributed routing nodes can be resolved with 100Gb/s single-cable interconnects. It is not all that far-fetched; 40Gb/s Infiniband and OC 768 exist now. A 100Gb/s link has recently been implemented between New York and metro Washington, DC.

It is time to plan ahead for the inevitable, all file-based production workflow. The routing of compressed content should be considered as part of the overall facility routing system. **BE**

Phil Cianci is a design engineer for Communications Engineering, Inc.

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Audio FOR HD: Common problems, simple cures

BY MICHEL PROULX

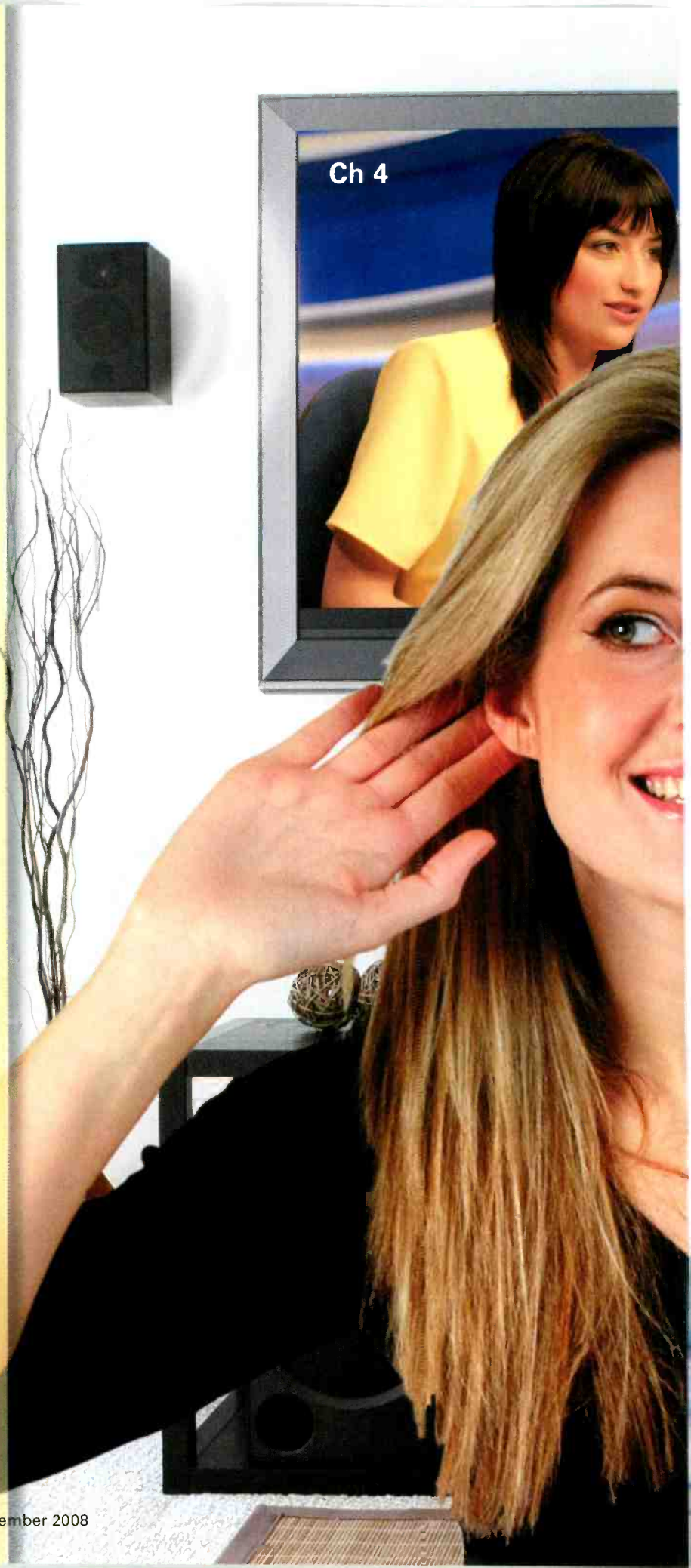
Time and time again multichannel audio, rather than video, causes the most problems when transitioning to HD. Audio is a common cause for both audience complaints and technical difficulties at television facilities. Two of the most common complaints from HD viewers are:

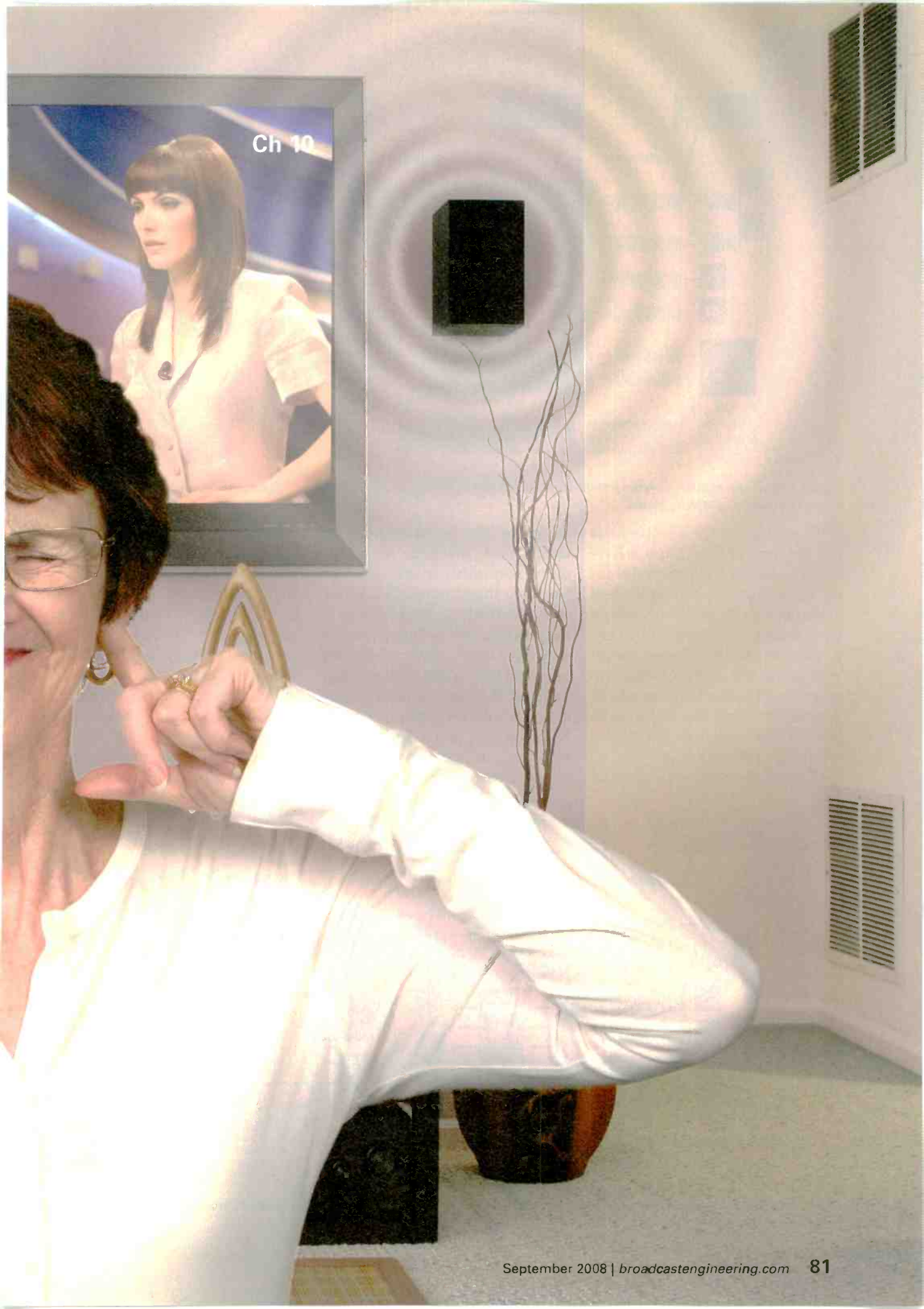
- audio level variance between channels, and variation from segment to segment; and
- inconsistent 5.1 presence, with surround sound appearing and disappearing between channels and between program segments.

Let's look at the causes of these issues and then review several solutions.

Managing audio levels

A promising feature of the Dolby Digital (AC-3) delivery system is the built-in loudness control mechanism. This feature, commonly known as dialog normalization, was created to allow broadcasters to operate at different loudness levels, with the differences in loudness managed in the home by the Dolby Digital (AC-3) decoder. The general idea was that all program content would include a metadata parameter called dialnorm, indicating the nominal level of the dialog in the program. The dialnorm value is presented

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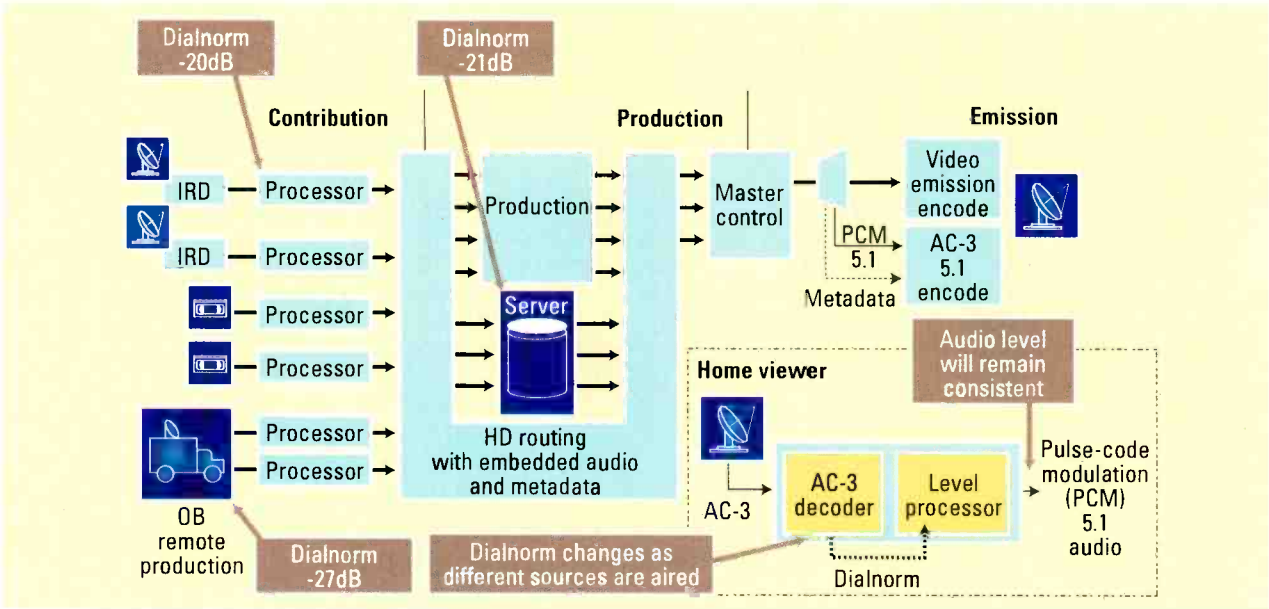

Figure 1. Dialnorm metadata value travels throughout the broadcast chain and enables the home receiver to compensate for changes in audio operating levels.

to the AC-3 encoder, which then sends it to the home decoder. There, it is received and applied to the decoded audio signal in order to modify the level of the program. As the viewer changes from channel to channel, or as the broadcaster switches from segment to segment, the associated dialnorm value is used by the audio decoder to dynamically adjust the overall audio level so that consistent loudness is maintained. (See Figure 1.)

However, it seems that instead of helping to iron out interchannel and intersegment loudness issues, the dialog normalization feature has often made things worse. This is generally the result of inconsistencies in the dialnorm setting during program creation or when video is received and processed by a facility. This may happen when the content is first created, if the value is not set properly, or during incoming feed processing or ingest, when audio metadata may be removed by equipment or the wrong value applied. Similarly, during production or in master control, the dialnorm values may not be set properly (left at default), or the audio may be modified but the dialnorm values are not properly readjusted. The net effect of these different possibilities is that the audio levels heard by the viewer are often adjusted using incorrect dialnorm values and will therefore be unstable and inappropriate. (See Figure 2.)

The three most common solutions to this audio loudness problem are

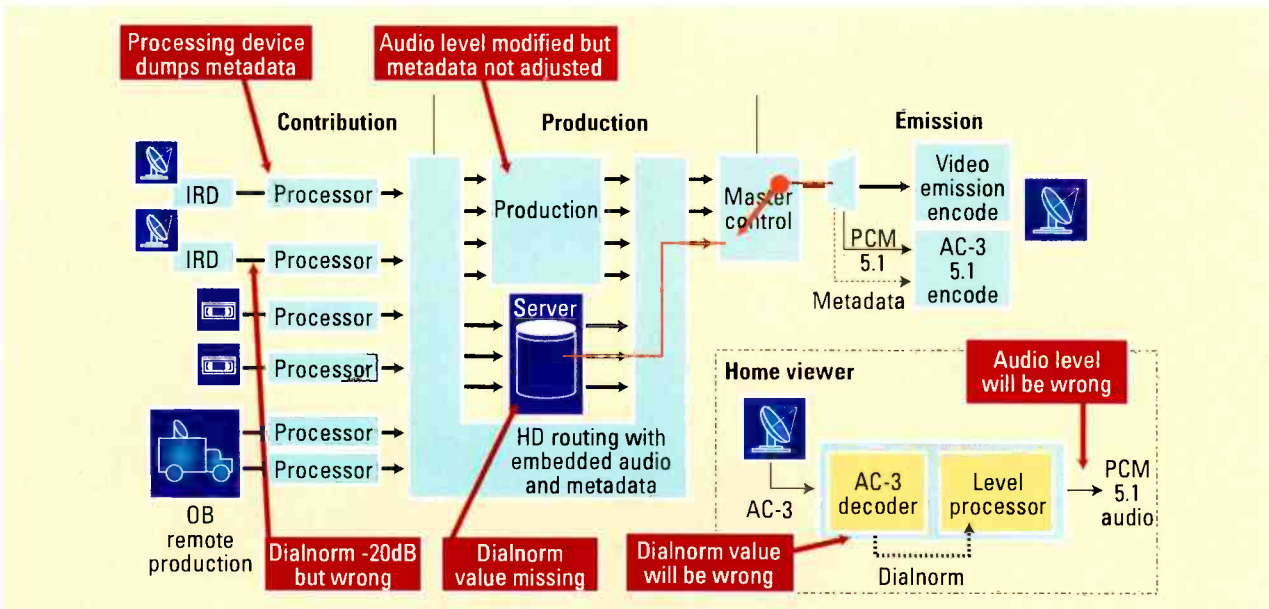

Figure 2. Dialnorm metadata are often wrong, dropped or not properly updated, resulting in incorrect levels at the home decoder/receiver output.

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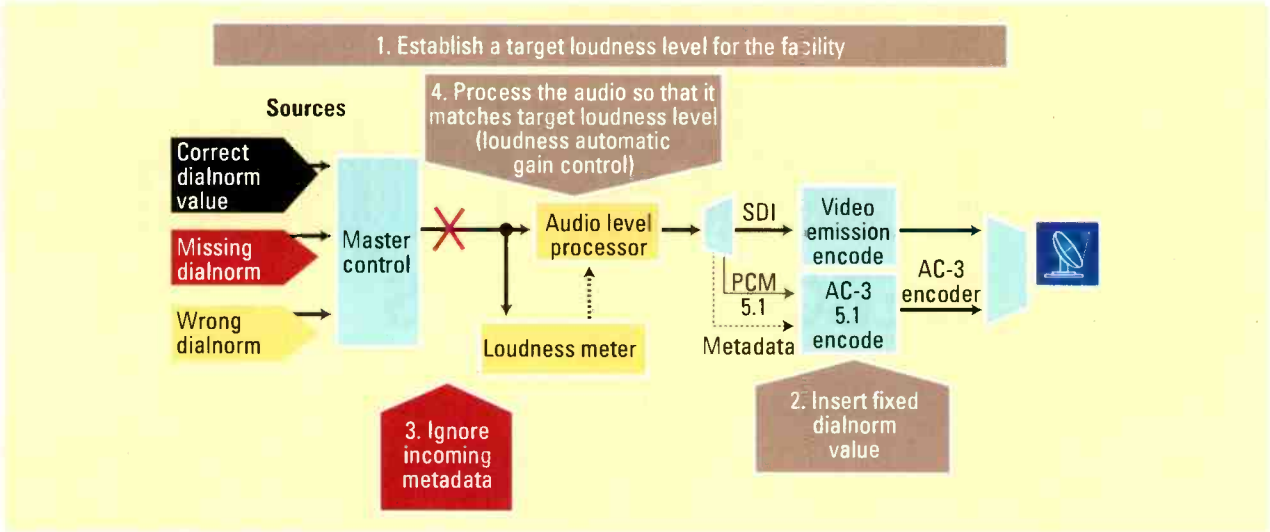

Figure 3. Loudness measurement and on-the-fly audio level controls

dynamic metadata, static metadata, and loudness measurement and on-the-fly audio level control.

Dynamic metadata

This solution relies on a combination of good production practices. It makes sure that all content created or ingested has the proper dialnorm value, as well as good equipment design, which ensures that metadata is maintained throughout the facility and is delivered to the emission encoder. This model has recently become more effective due to the soon to be ratified SMPTE 2020 standard, which specifies a way of transporting Dolby metadata in the ancillary space of HD-SDI and SD-SDI video.

However, it is still not practical for many facilities. This is because broad-

casters must ensure that all the audio processing used in their facility passes and adjusts audio metadata if the audio content is modified. Unfortunately, the reality is that many HDTV facilities use a large number of devices that were designed and deployed before SMPTE 2020 existed, making it impossible to ensure metadata survival throughout the chain.

Static metadata

At the other end of the range of possibilities, this model involves producing all content to a known dialog level and setting the corresponding dialnorm value statically at the Dolby Digital (AC-3) emission encoder. This requires close collaboration with external content providers to make sure all the content provided is mixed to the target loudness level. For non-live content delivered on tape or file, it is possible to measure the loudness of the entire program and reprocess the audio to make sure it meets the target dialog level. But for live content, or content that is delivered in real-time as a stream, it is not possible to reliably perform this task. This is because the dialog level is a function of the entire program or segment, and the entire program or segment must be received before the dialnorm value can be accurately known.

Loudness measurement and on-the-fly audio level control

The third possibility is to ignore incoming metadata and add a device at the end of the chain, which measures the program loudness and either sets the dialnorm value accordingly or processes the audio to meet the target dialnorm value. (See Figure 3.) This scheme is roughly equivalent to an automatic gain control (AGC) on the output of a facility, using loudness as the control signal.

However, because loudness is a measurement that is supposed to be integrated over a long period of time, ideally the entire duration of the program or segment, this method can be problematic. For example, in a quiet scene, the loudness level and even the dialog loudness level could be temporarily low. If this low level is used as a cue to increase the audio level, and if the quiet scene is followed by a louder scene, then the audio loudness increase will be amplified. This will likely result in an abnormal, undesirable rise in the level of audio.

Hence, applying the loudness control too quickly will create a pumping of the audio levels. All of this goes against the original intent of the dialog normalization and dynamic range control of the Dolby Digital format.

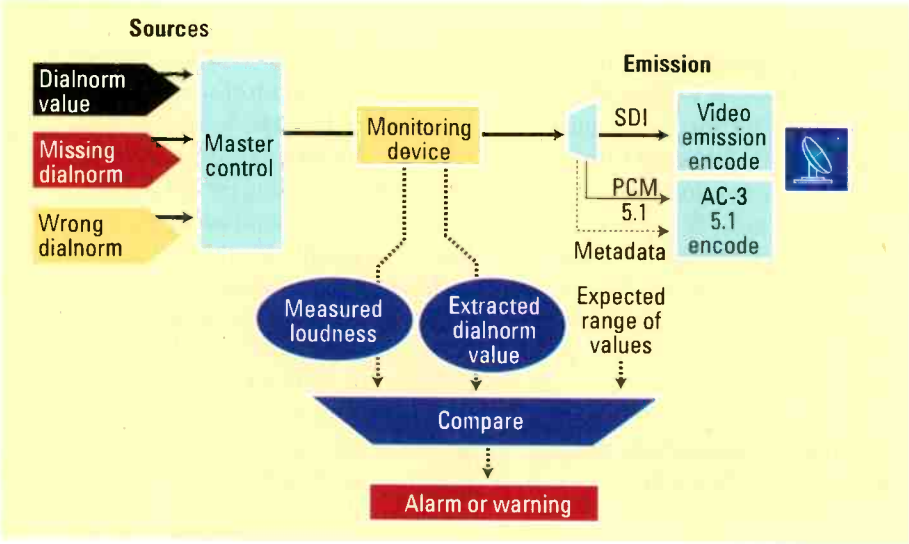

Figure 4. Audio loudness and dialnorm monitoring

Double-checking with loudness monitoring

Ultimately, the best solution to loudness problems will depend on the individual facility and especially on the broadcaster's level of control regarding incoming content, particularly live or streamed content. In all three of these solutions, it is recommended that audio loudness is continuously measured and compared to the outgoing metadata value, be it static or dynamic. (See Figure 4.)

There have long been dedicated devices for measuring loudness, although they add to the complexity of the channel chain. Hence, some broadcast equipment manufacturers now integrate loudness measurement inside other devices that are commonly present in the output chain. These products provide continuous measurement of audio loudness and extraction of the dialnorm metadata value. The measured loudness and the extracted dialnorm value are compared against each other and against configured operational targets. Then an alarm or warning is reported if the values diverge too much for a specified time duration, thereby offering improved audio control.

Maintaining 5.1 channel continuity in master control

Let's now consider the second issue of integrating legacy stereo material and 5.1 surround-sound material. Early

As an alternative, the broadcaster can send 5.1 surround sound to viewers by employing a technique often referred to as upmixing.

HDTV broadcasters initially elected to air a mixture of stereo and 5.1, depending on the original material. This resulted in viewer confusion and dissatisfaction as the program switched in and out of 5.1 surround, depending on the show segment. (See Figure 5.)

An an alternative, the broadcaster can send 5.1 surround sound to viewers by employing a technique often referred to as upmixing. This allows stereo material to be converted to 5.1 by synthesizing

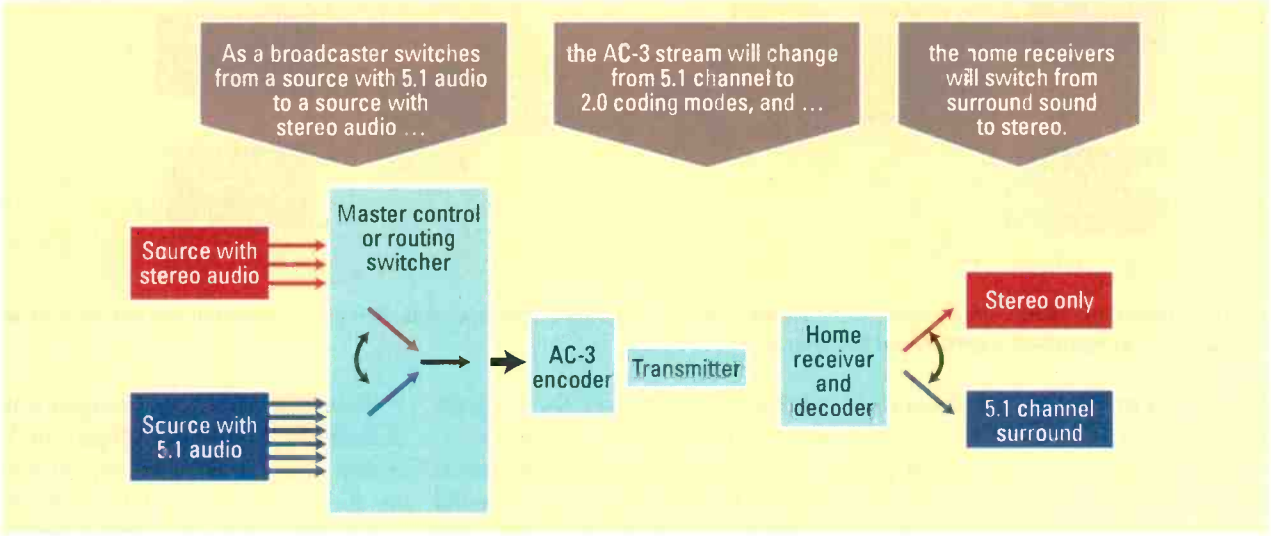

Figure 5. Switching from stereo to 5.1 results in a corresponding change at the home.

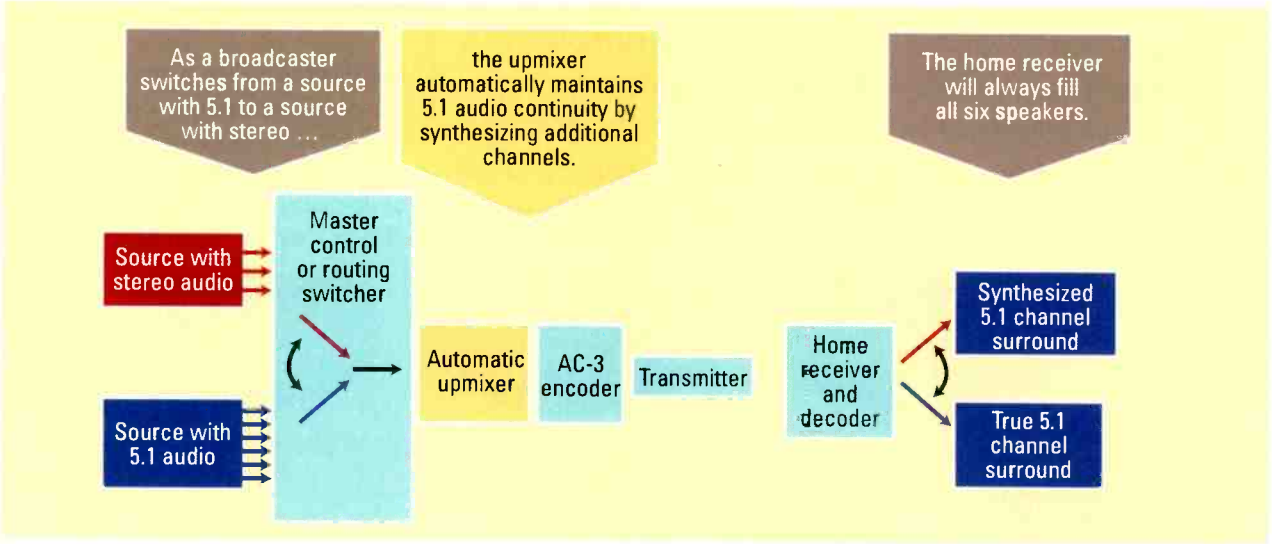

Figure 6. Audio upmixing in master control ensures that the outgoing audio stream is always 5.1, allowing the home receiver to always fill all speakers regardless of the source.

the center, surround and LFE channels. (See Figure 6.)

The criteria for a good upmixer include:

- *Dynamic adaptation.* The upmixer automatically adjusts the synthesis algorithm depending on the program content (dialog, action and music).
- *Auto-sensing.* It automatically detects whether the input is 5.1 or stereo, and it seamlessly and silently switches the synthesis in and out as required.
- *Downmix-compatible.* The upmixing is designed for homes with surround-sound listening configurations, as well as those with stereo televisions. In homes with stereo audio, the incoming 5.1 signal is converted back to stereo, or

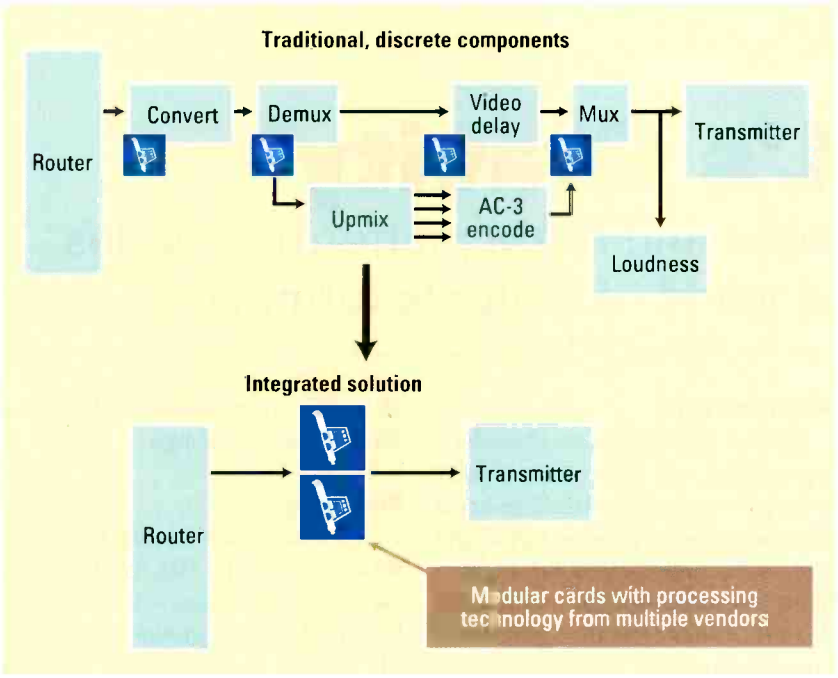

Figure 7. Integrated solutions that combine technology from multiple vendors result in simpler systems.

downmixed, by the decoder or receiver. Hence, it is imperative that the synthesized 5.1 is compatible with an eventual downmix in stereo homes.

Conclusion

The main reason that multichannel audio has proved so demanding for facilities is not necessarily because of the increased channel count from two channels for stereo to six channels for 5.1. It is mainly because of all the additional technology required to receive, process and deliver 5.1 audio throughout the broadcast chain. Using industry standards, such as Dolby Digital (AC-3) and SMPTE 2020, has helped to improve interconnection and operation across multiple audio devices from multiple vendors. However, a more effective solution is to use fewer devices, thus reducing costs and simplifying systems. (See Figure 7.)

Looking ahead, we can be optimistic that there will be fewer troublesome HD audio issues, as facilities start to deploy more advanced audio processing technologies. It should all add up to fewer headaches for engineers and fewer complaints. Now that's progress! BE

Michel Proulx is the chief technology officer for Miranda Technologies.

SSL's Gravity

The news production and MAM platform provides stability in a world of multiple formats.

BY PETE WOOD

The demands of running modern cable and network TV news programming are unique and challenging because of the multitude of content formats coming in on everything, including high-end HD, cell phone and Internet. Ready access to this live material and the ability for many geographically scattered users to have simultaneous access to that material in multiple formats have become mandatory.

With the expanding role of remote collaborative production and increased availability of HD video, Web-enabled proxy-based access to content at low bandwidth is essential in a production workflow. To meet these needs, Solid State Logic created the Gravity news production and media asset management platform, unifying all the elements of the modern news production workflow.

Architecture

An important consideration in selecting a system is its architecture. Gravity is designed on an open standards-based Windows architecture with scalable and user configurable GUIs. User workstations, encoders, storage, transcoders, decoders and servers may grow from one to hundreds in single incremental units. These components can reside either locally or in remote locations around the world. (See Figure 1.)

The user may specify any number of levels of hierarchy and access security for the entire system. Content storage can grow to virtually unlimited capacity and can be designed to varying levels of redundancy. Because this system can be configured to eliminate any single point of failure, it can automatically and seamlessly switch to back-up mode without interruption. The system's Media Manager regularly checks all system components and hardware for errors and warnings.

Formats

The system easily handles format diversity like SD and HD, file-based and live, 16:9 and 4:3, plus a slew of codecs by simultaneously producing multiple file formats and resolutions within a single video ingest process. It can also simultaneously create multiple output video formats, seamlessly, without rendering. Users can store the high-res version while it creates the proxy version for network-based access.

All ingested content, regardless of resolution, is simultaneously accessible for browsing, logging, monitoring, searching and editing on the same timeline, with the user-specified output automatically determining the conversion requirements. Aspect ratio formats are automatically converted or

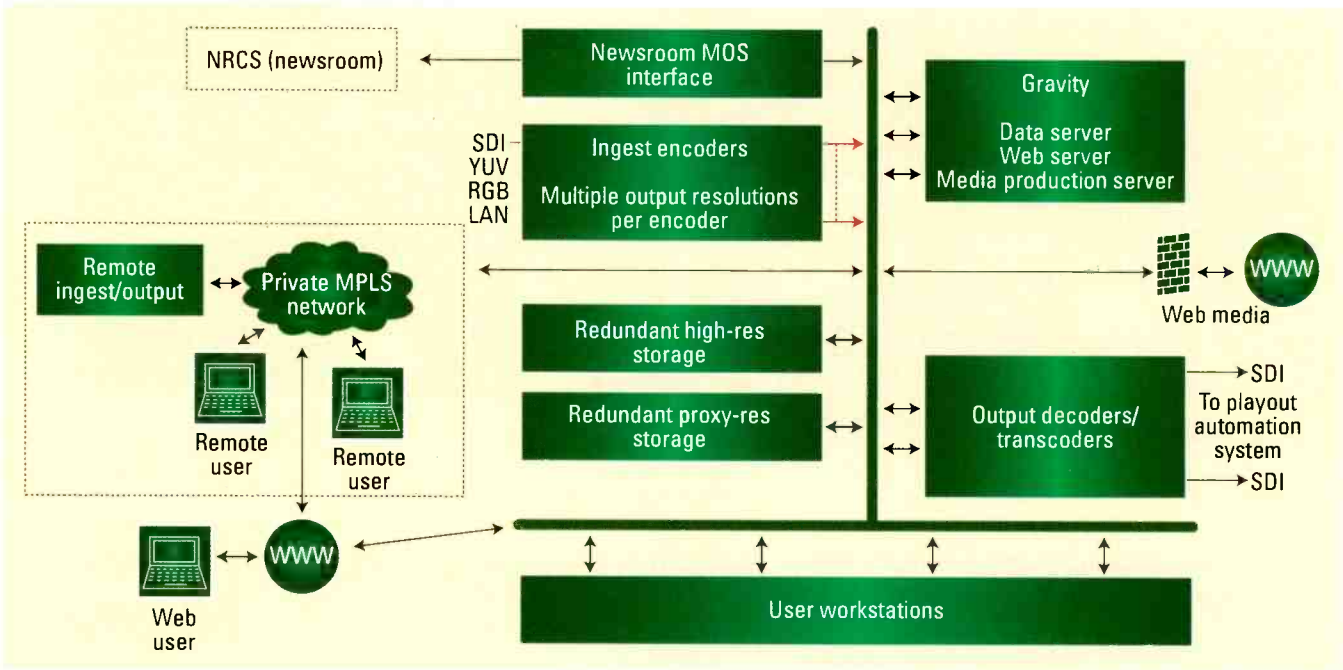

Figure 1. The modular Gravity system consists of a central bureau core system comprised of multiple encoders and decoders, server and storage, system monitoring, and asset management. This networks to multiple sites located nationally or globally via the MediaWAN Backhaul.

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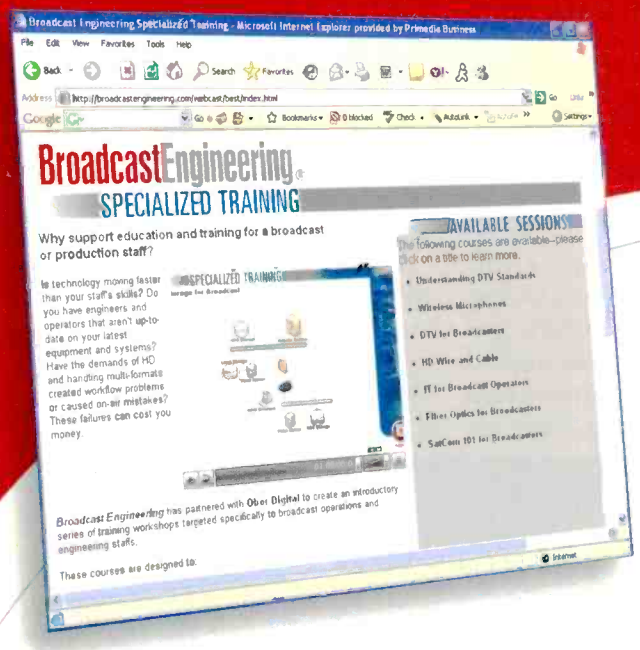

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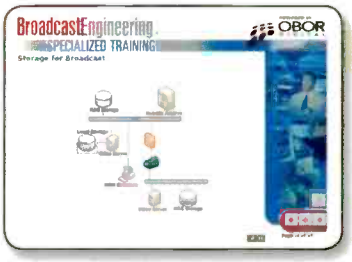

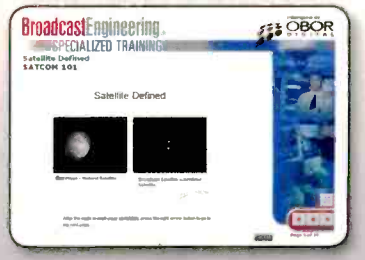

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not converted, depending on the user's needs. This lets users work in a format-transparent environment, with freedom to use content easily and quickly. The content, rather than the format in which it was shot or encoded, once again becomes the driver of workflow.

Speed

Due to the live nature of the news business, immediate access to incoming video content is hugely valuable to producers and editors. Incoming material is typically encoded within two seconds of the start of the recording. A user can be viewing and cutting footage that's virtually live, finishing the edit before the live event being encoded has ended.

Gravity Asset Manager allows users to monitor the flow of data throughout the system and access a comprehensive suite of content management tools.

Ease of use

Interface simplicity and functional flexibility are also essential to getting material into a system quickly and accurately. Users can schedule single or multiple events as a one-time or recurring encode at any time. Colored indicators provide at-a-glance status of all encodes while displaying user-entered metadata on the evolving timescale. This display enables the user to clearly view and track the status of all existing and future encodes from a single monitoring station.

Editors appreciate editing software with comfort in function. This characteristic of making edit operations easy, fast and familiar is central to the design of Gravity's Package Production Tool (PPT) editing function. The PPT offers flexibility in edit functions with immediate reach to the most essential functions. In addition to a customizable keyboard that lets editors assign their favorite editing functions to familiar keys, the PPT also offers an on-screen/monitor scrubbing function.

Because all functions within the system are render-free and performed in real time, work can continue uninterrupted without waiting for saved projects to render. This speed is matched by a full-featured editing tool set that includes hundreds of real-time video and audio transitions and filters; splice, slip and slide function; multiple video and audio tracks; and unlimited undos.

Another PPT function that newsrooms will deem essential is the tool's ability to seamlessly hand off material to external craft editors for additional post-production work or transfer to distribution or archive systems. The user needs only to think about editing the material, not the technology of file formats and publishing requirements.

Management

The ability to manage and monitor the movement and status of vast quantities of media content is essential to efficient news operations. The asset manager excels in these areas by leveraging its powerful SQL database. In

addition to standard file IDs and user input fields, the project administrator can use customizable readouts to track and report on the overall production status from ingest to editing through saved versions and content as published. Customizable fields are also supported for enhanced integration into third-party applications.

One of the system's most exciting capabilities is its real-time file proxy creation and distribution. This functionality allows access to, and editing of, server content, both file and live, from any authorized and enabled desktop either via Web interface or enterprise licensed workstation. Producers and editors make all their creative decisions with the proxy files. When the story is finished, the proxies act as a blueprint for the instantaneous conformation of the full-resolution server files for on-air play-out. The finished piece can also be instantly transcoded into multiple resolutions and file formats for distribution to multiple platforms on demand.

It's no secret that producers love having video on their desktops, and proxies have become a necessity for bringing in and working on more than one signal at a time. SSL offers proxy generation and editing capability that fits in perfectly with the multiformat newsroom workflow.

Planning

News organizations planning to invest in a new media production and file management solution should consider the following:

- Know your workflow and requirements, and their potential for growth. This is paramount for evaluating any news production solution in detail.
- Anticipate and expect changes in formats, codecs, workflows and file data management, and look for solutions that not only adapt to, but readily facilitate change.
- Recognize the importance of seamless integration to third-party applications that enhance workflow efficiencies and hand off distribution of metadata and media.
- Look for clear, well-designed and readily adaptable asset management and scheduling tools. These tools will greatly improve your production management.
- Remember that proxy capabilities are important for supporting a geographically diverse reporting team. Your producers and editors in the field will thank you for fast desktop access to content files.

Those keys are the backbone of the Gravity system, creating a total solution for television news organizations to use to their advantage. BE

Pete Wood is business development manager, media production systems for Solid State Logic.

NVISION's NV8576

The large-matrix, multiformat router ensures signal integrity.

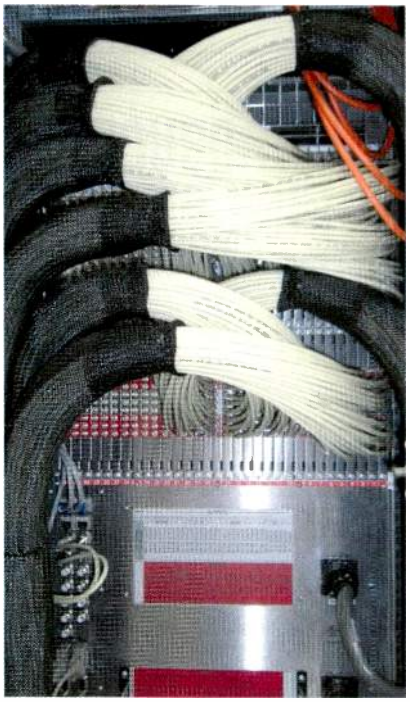
BY PAUL GREENE AND DON MORGAN

The need for large-matrix routers is driven by the increased availability of video distribution channels to meet consumer demand for a richer offering of video services. This in turn increases programming volume as well as playout capacity. Another factor is the gamut of audio and video formats: SD-SDI, HD-SDI, DVB-ASI 3Gb/s and synchronous or asynchronous AES audio.

Until now, a router size of 512 x 576 was sufficient, but today, routers need to scale up to 1152 x 1152 for many applications. The router must also ensure signal integrity, full redundancy protection and power management to guarantee uninterrupted, on-air operation. The NVISION NV8576 large-matrix digital multiformat router addresses these requirements.

Frame size and linear expansion

The NV8576 router design is efficient in both vertical rack space and depth, two critical factors for installation planning. The frame supports 576 x 1152 in a single 32RU. At 16in deep, there is space to install the 1728 cable capacity of the router in a conventional 30in to 36in deep rack.



DIN 1.0/2.3 connectors on large routers provide connector densities two to three times that of conventional BNCs, enabling the use of shorter traces in the matrix design and major rack-space savings.

Traditionally, doubling a given matrix size requires four frames with external input DAs and secondary switches. With NVISION's linear expansion of large HD video routers, all input DAs and secondary switches are internal, eliminating the need for extra cabling and rack space. A 1152 x 1152 router is created using two 32RU frames, each configured 576 x 576, interconnected with high-speed differential expansion cables.

Routers need to scale up to 1152 x 1152 for many applications. The router must ensure signal integrity, full redundancy protection and power management to guarantee uninterrupted, on-air operation.

The active internal DAs and secondary switches provide high-quality signal integrity and stability in the router, including 3Gb/s data rates. Passive splitters and combiners could be considered, but can create termination problems. For example, if a connector is removed for any reason, the impedance for the other output is compromised.

Multiformat capability

The router can be configured as video-only, audio-only or a mixture of the two in one frame. Signal formats include SD-SDI, HD-SDI, DVB-ASI 3Gb/s and synchronous or asynchronous AES audio. Fiber I/O connectivity is supported for long-haul applications, such as tie lines between trucks or studio links in large facilities.

Impact block and redundancy

Large-matrix routers can create big impact blocks if not designed correctly. In the NV8576, inputs are in groups of nine, and outputs are in groups of 18. This design results in small router I/O cards that improve signal performance and are mechanically stable. While I/O can be managed in small blocks, large router crosspoint cards can represent a significant failure point. This challenge is remedied by a full N+1 redundant crosspoint option. In the event of the complete removal of a crosspoint card (288 x 288), a spare card capable of completely replacing the removed card can be activated in a single vertical interval. Thus, the largest impact block in the system is a single input or output card.

Most routers today use a square matrix architecture that is framed for equal numbers of inputs and outputs,

such as 288 x 288. Square routers work well for routine applications but are limited for other applications such as large monitor walls. Typically, this implementation burns valuable router output space. (See Figure 1A.)

An alternative design is the rectangular matrix with larger output capacity than input capacity, as in the NV8576 router. Figure 1B shows a rectangular router with twice as many outputs as inputs, while occupying the identical rack space as the square matrix. This design supports additional output applications without burning core router output space.

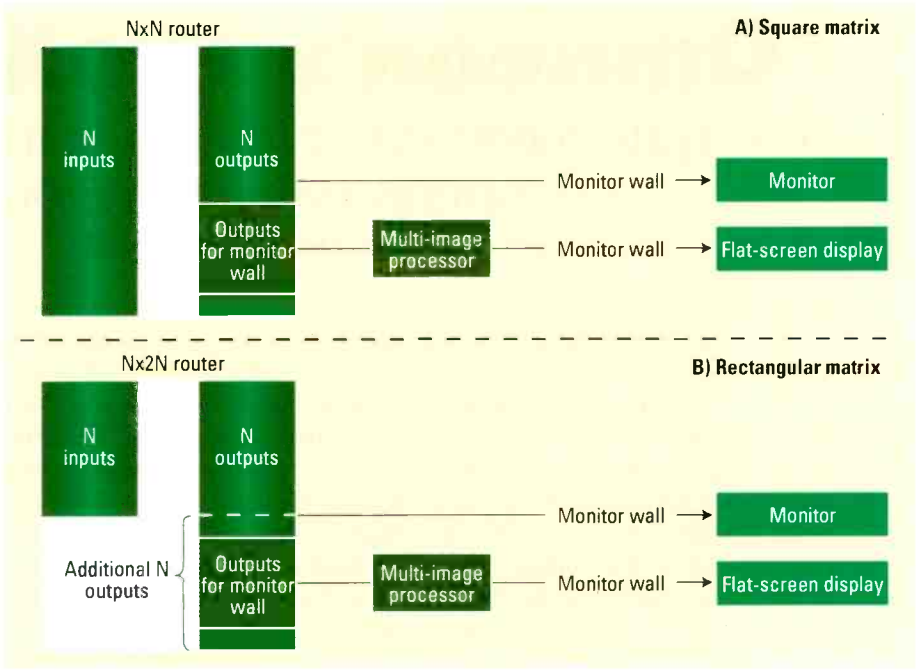


Figure 1. Square vs. rectangular frame design

Signal integrity and connector density

Signal path length is critical to the transmission of high-speed digital signals. With 3Gb/s signals, the dielectric absorption of the Flame Retardant 4 (FR-4) printed circuit board (PCB) material renders the signal unrecoverable within short trace lengths. Internal signal path length must be as short as possible to ensure the best signal integrity. (See Figure 2.)

Internal signal path length must be as short as possible to ensure the best signal integrity.

Also, the proven use of DIN 1.0/2.3 connectors on large routers provides connector densities two to three times that of conventional BNCs. These connectors enable the use of shorter traces in the NV8576 matrix design, along with major rack-space savings.

Power and cooling

Power levels inside the routing frame should remain low so that a catastrophic short-circuit event cannot occur (arc welder effect). Multiple branches of DC power from the power supplies ensure that no single branch carries more than 170W or 3.5 amps within the router frame.

The cooling system consists of front-removable fan trays located in the top and bottom of the frame. Air is ingested through a vent in the center front of the frame, and the exhaust comes from the top and bottom rear. An additional rear cooling duct supports fiber I/O options. The fans have temperature speed control and use a magnetic-bearing squirrel-cage design.

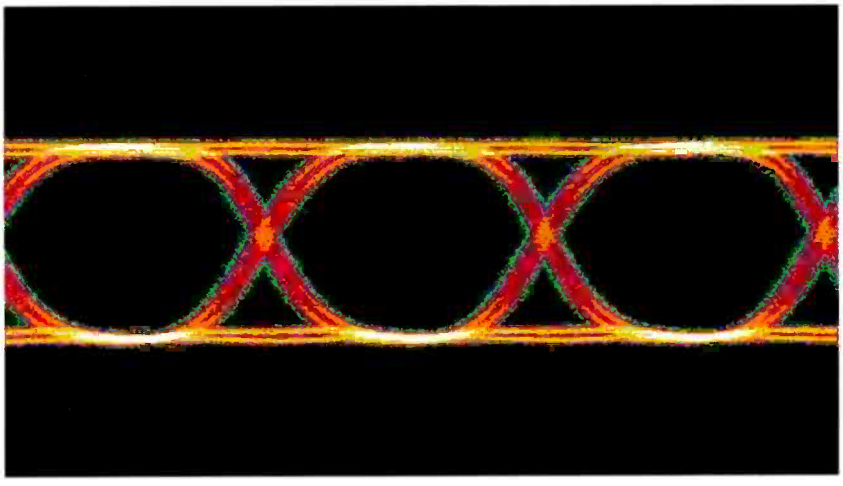


Figure 2. 3Gb/s eye pattern through NV8576

Conclusion

As in the NV8576 router, the linear expansion of a large-matrix multiformat router gives broadcasters the largest number of inputs and outputs (1152 x 1152 at 3Gb/s) for today's and future broadcasting requirements, and within only two 32RU frames. The router architecture ensures signal integrity, full redundancy protection, power management to avoid catastrophic equipment failure, and there's no reliance on external distribution. Expansion from one frame to two frames in the field enables an uninterrupted, on-air, upgrade path that is unique to this router design. BE

Paul Greene is product manager, routers, and Don Morgan is senior systems engineer for NVISION.

Omneon's ProXchange

The system performs high-speed transcoding within a central storage environment.

BY SIMON ELDRIDGE

The need to transcode video and audio material from one format to another has been with us since the early days of video recording. The process of carrying out transcodes, though time-consuming, has always been rather straightforward from the operator's point of view; content would be moved between systems by playing it out of one device in one format and rerecording it into another device in a second format.

Today, the transcoding landscape has changed. In one sense, it is now a more simple process in that most content is digital and file-based, so the lengthy playout step is not necessary. Often, transcodes can be done in faster than real time. Unfortunately, there is a new complicating factor. With the proliferation of new distribution channels — the Web, IPTV and mobile phones, for example — there has been a corresponding explosion of new formats. The end result is that while transcoding can be done more easily, the sheer volume of transcoding strains existing infrastructures.

With so many formats, wrappers and third-party applications, intensive transcoding is something that must happen in practically all broadcast operations. The problem is that transcoding, like most media processing tasks, requires a tremendous amount of computing power and often requires manual intervention. This places an undue drag on the efficiency expected from a file-based workflow. The more distribution platforms you wish to support, the more workflow duplication you have. Efficient transcoding requires an advanced computer architecture.

The solution

ProXchange is a transcoding system for the Omneon MediaGrid active storage system that is designed to convert media between multiple formats. The application takes advantage of the storage system's advanced, object-based architecture to enable high-speed, high-performance processing. The key to the speed and

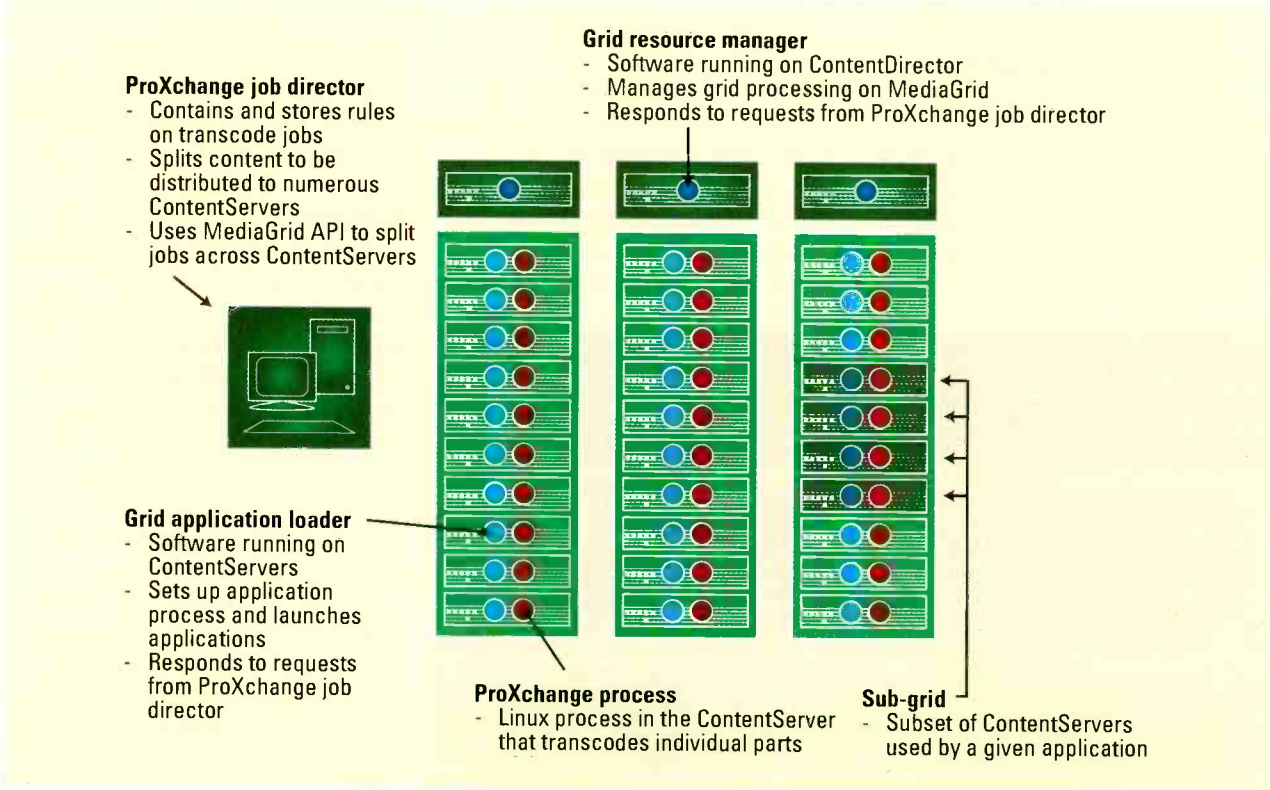


Figure 1. Grid processing architecture for ProXchange and MediaGrid

performance is that the sophisticated, grid-based infrastructure of the MediaGrid enables the burden of individual processing jobs to be divided across multiple available servers.

Another advantage of the application is that it performs transcoding on media while it remains in place in central storage, eliminating the need for standalone systems and time-consuming transfers between systems. Additionally, the transcoding system minimizes the need for human intervention because users can configure its rules engine to convert specified content automatically from one format to another. The increased performance, simplification and streamlining of the workflow increases overall efficiency.

With the use of grid processing, ProXchange can transcode multiple content streams simultaneously at speeds faster than real time.

The technology

The transcoding system uses the additional processing speed obtained through grid computing, which enables applications to run across a pool of individual servers efficiently using hardware resources to yield improved application performance. With the use of grid processing, ProXchange can transcode multiple content streams simultaneously at speeds faster than real time.

The basic storage building block of the system is the ContentServer, which houses and manages multiple disk drives. ContentServers are X86-based servers that run standard Intel processors and have a specific amount of system memory. These resources are used to manage the disks and file slices in storage, but there is, in fact, more power available than what is required purely for storage management. By using a software Applications Programming Interface (API), applications can take advantage of the spare processing capacity that resides in the ContentServers.

The main advantage of building a transcoding application on a grid processing framework is that it affords the ability to use multiple processors in parallel, squeezing better performance out of them. In addition, grid computing methodology means more resiliency: In a grid-based system, a transcoding task can be completed even if a computing node is lost.

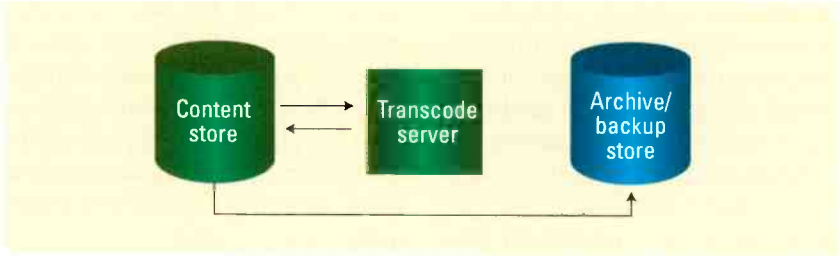


Figure 2. ProXchange architecture prevents content movement between discrete storage and processing systems.

The ContentServers operate by connecting right to the grid network, accessing content directly. There is no need to move files to a dedicated content-processing server. This results in reduced network traffic and saves time and bandwidth. In fact, the grid processing framework ensures that network bandwidth is never a limiting factor on transcode performance.

More workflow efficiency derives from the establishment of rules for automatic conversion of media on the grid. Once a set of rules has been applied to a specific directory in MediaGrid, the transcoding system automatically begins processing any files appearing there. The system can produce multiple output formats and control parameters like bit rates and output directories. For example, it can take MPEG-2 50Mb/s I-Frame content, automatically create a transmission copy in MPEG-2 12-Mb/s Long GOP, and at the same time create an H.264 clip for distribution to IPTV or the Web. Full monitoring and reporting informs users about the progress of their jobs.

Transcoding is often something that is controlled by a higher level application like media management or automation. With this in mind, Omneon has made available a comprehensive API that allows third-party applications to take advantage of all of the ProXchange functions. This API is also presented via XML (eXtensible Markup Language) over HTTP (HyperText Transport Protocol) such

The grid processing framework ensures that network bandwidth is never a limiting factor on transcode performance.

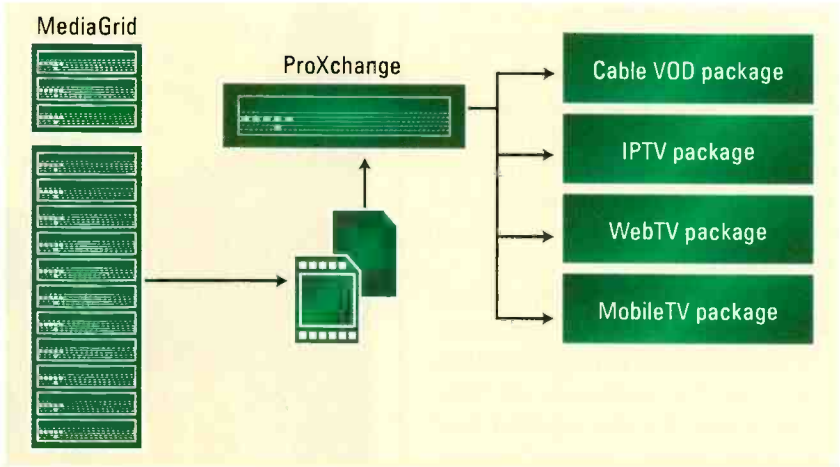


Figure 3. Typical ProXchange workflow for content provisioning to multiple distribution platforms

that integrated applications are not limited to integration from a particular operating system or programming language, nor do they require custom libraries. In addition, the transcoding system is fully integrated in to the Media Services Framework, making all transcode functionality available via a Web services interface.

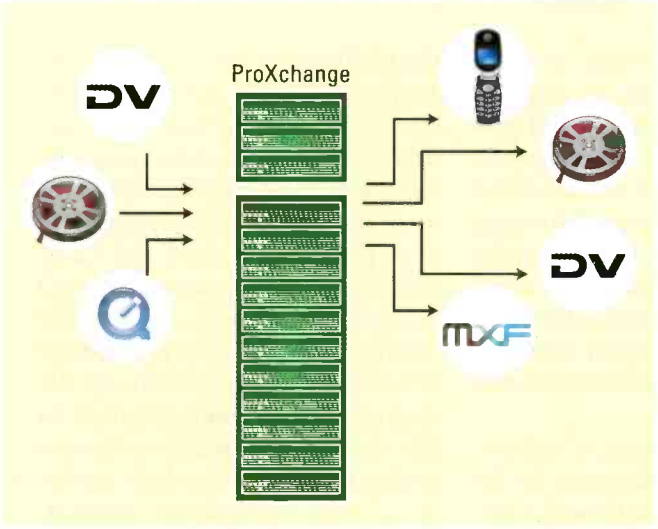


Figure 4. Sample ProXchange input and output format

Finally, because the system processes media within the storage environment, it is by definition well integrated, requires only a modest footprint, and is cost-effective to implement and maintain.

Summary

With the explosive growth of both file-based workflows and new media formats, the need for transcoding and the attendant high levels of processing power will continue to grow. Keeping up with increasing transcode requirements while maintaining workflow efficiency requires powerful computing performance. ProXchange takes advantage of the performance offered by grid computing to meet the challenge, providing faster content processing; simplified and streamlined workflow; enhanced resiliency; and cost-effective implementation, operation, and maintenance. BE

Because the system processes media within the storage environment, it is by definition well integrated, requires only a modest footprint, and is cost-effective to implement.

Simon Eldridge is the product manager for Omneon.

Panasonic's HPX500

The camera provides solid performance without breaking the bank.

BY BARRY BRAVERMAN

For shooters grappling nobly to make sense of, let alone make a living in, the HD morass, the Panasonic HPX500 is a practical option. Delivering better than good performance at a reasonable price, the camera is at the forefront of a new trend in economical middle-market broadcast camcorders. It offers HD shooters a rugged full-featured 2/3in 3-CCD option that won't break the bank.

Of course, one can evaluate camera performance in many ways, but in the realm of HD, the crucial point is a camera's ability to respond adequately in low light. This capability, coupled with its interchangeable optics and remarkable low cost, largely accounts for the camera's appeal across several market sectors.

This appeal can also be attributed to the camera's robust feature set, which is similar in many aspects to the HVX200A. These now well recognized features include adjustable (not variable!) frame rates, 32 different recording modes and true 4:2:2 DVCPRO HD recording at 720p and 1080i resolutions. In addition, the camera offers HD-SDI and genlock, and it embraces the notion of a world-class camcorder that can shoot 24fps/25fps 50Hz/60Hz. For itinerant shooters like myself who frequently work in Europe and around the world, this is a major improvement over the HVX; I never appreciated having to track down a 50Hz model HVX when working overseas.

The camera, however, is compelling for a more crucial reason. For the first time in a camcorder with interchangeable optics, the nagging and often devastating issue of chromatic lens aberration is addressed. Chromatic lens aberration is no small matter in HD as a camera's higher resolution resolves greater picture detail along with inherent lens defects.

The HPX500 is a modestly priced 3-CCD camcorder that performs well in low light. The major reason: a 2/3in imager with resolution akin to the HVX200 but with concomitant larger pixels.

Outfitted with four 32GB cards, the HPX500 can shoot 320 minutes on a single load at 720p24 native mode.

Camera basics

The HPX500 is a four-slot 2/3in camcorder with a 3-CCD 620K pixel imager. While this resolution may not seem impressive compared with the multimillion pixel imagers gaining favor at the top end of the industry, the fact remains that the camera exhibits at least two stops better performance in low light than its diminutive HVX sibling. My testing using a 17 percent grey chart and CDM reference chart indicates a true ISO rating of at least 640, a respectable rating on par with most professional SD camcorders. This means that SD shooters transitioning (finally!) to HD via the HPX500 will not have to endure the anemic low-light performance typical of most low- and mid-range HD camcorders.

Of course, in order to achieve this enhanced performance at a relatively low price, there must be a few compromises. The camera's advanced low light response can be partly attributed to the larger imager and pixels, which like coarse grain film allows higher speed albeit at reduced resolution. Incidentally, the native resolution of the 2/3in imager is identical to the HVX200; the 960 x 540 grid (with green pixel offset) offers decent

NTSC's ragged edge once concealed the ugly artifact, but no more. For HD shooters, chromatic aberration is often seen along high-contrast edges like the horizon line (above). Thanks to chromatic aberration compensation (CAC) introduced in the HPX500, mediocre lenses can appear sharper and free of nettlesome chromatic aberration fringing.

but hardly stellar vertical resolution. Still, for most shooters, such a compromise makes sense; the camera exhibits a much wider dynamic range than the HVX and thus finds greater applicability and usability in less than ideal conditions, where many of us earn our daily chow.

The peril of chromatic aberration

Mediocre optics with elevated chromatic aberration are the bête noire of today's HD shooter. This common aberration affects the quality of our images more than anything else, including recording format, frame rate or even which manufacturer's logo appears emblazoned on the side of the camera. Thankfully, chromatic aberration compensation (CAC) introduced by Panasonic in the HPX500 can provide some desperately needed relief to this pernicious menace.

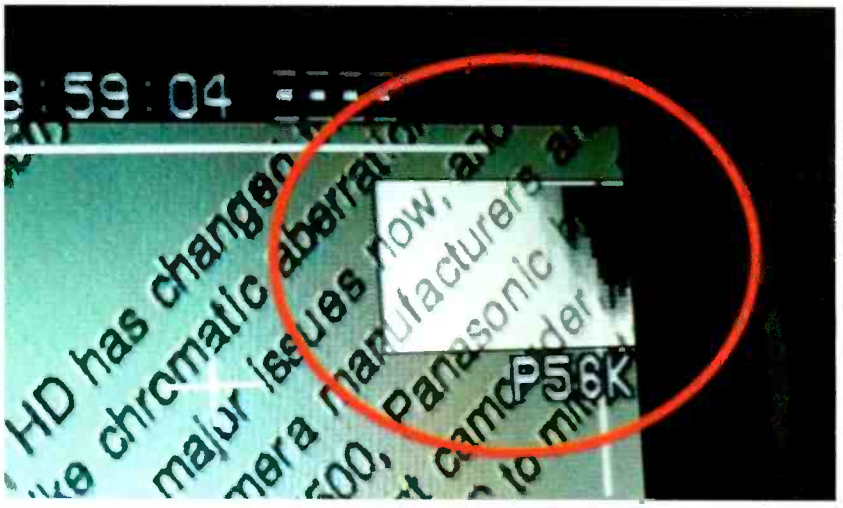
Chromatic aberration is not pretty, and no one mistakes it for art. The objectionable color fringing is present to some degree in all lenses regardless of price. From a manufacturer's perspective, chromatic aberration is extremely difficult to control. The apparent fringing is worse in low-cost lenses, owing to their inherent compromises in design and materials.

It is common knowledge among HD shooters that sub-$10,000 lenses are not as sharp as pricier optics due largely to chromatic aberration. It was logical, therefore, that Panasonic would alleviate chromatic aberration first in these low-cost lenses, and then deal with the other problems like mechanical and tracking inaccuracies. The fact is that complex lenses require more elements to provide adequate chromatic aberration correction. This extra cost in manufacture is inherent to intricate zoom lenses still mainly assembled by hand and, thus, not feasible at modest price points.

The HPX500 recognizes the make and model of a CAC-compatible lens and applies the required correction from a list of stored profiles. As more CAC lenses become available, their profiles can be added to the HPX500 directory (above).

In coming years, other camera manufacturers are sure to follow and implement their own CAC strategy. A CAC lens mounted on the HPX500 provides a distinct signature. The

Finding focus in the standard 1.5in SD viewfinder can be an exercise in futility. The optional 2in 16x9 finder often seen with the HDX900 is a much better choice.



The HPX500 focus assist uses a histogram akin to a waveform to facilitate finding critical focus.

camera reads the make and model of the lens and applies the necessary digital correction from its onboard library of lens profiles. Currently, there are several CAC lenses available, including two 16X models from Canon and two 17X models from Fujinon. Shooters can disable CAC if they wish by simply deleting the profile or unplugging the lens from the camera, the desirability of disabling CAC being of dubious value and not recommended. CAC profiles cannot be created or modified by the user.

Viewfinder woes

Unfortunately, I've seen and worked previously with the HPX500's 4:3 SD viewfinder. The tiny 1.5in model performed less than well on the XDCAM HD PDW-F330, and it performs just as poorly here on the HPX500. Sure, price pressure forces manufacturers to make hard choices, but shooters, especially HD shooters, must have clean, crisp viewing for critical focus, so skimping on a viewfinder offers little comfort or rationale. Maximizing peaking in the stock VF only helps a little, as the low-res monochrome

The Panasonic 7.9in LH80W features a built-in waveform, red line peaking and pixel for pixel — all functions that will work on any camera, not just the HPX500. On the HPX, the monitor can serve as an EVF patching directly into the camera's VF port.

image is quickly obliterated and rendered unrecognizable.

Luckily, Panasonic offers a 2in 16:9 viewfinder as an option for an additional cost, and I strongly recommend it. Keep in mind the camera's VF output is SD in any case, so the SD limitation applies regardless of which viewfinder is actually mounted.

The best solution may in fact be the Panasonic BT-LH80W 7.9in electronic viewfinder. As an EVF, the 80W displays all customary VF functions, including zebras and the various camera setup info. The monitor powerable from the camera's rear 1.5A jack provides ample focusing assists, including pixel for pixel and red peaking. Note that the LH80W base price of under $3000 does not include HD-SDI support, which is available as an option.

Conclusion

Everywhere we look as shooters, HD has changed the rules of the game. Many SD concerns that were once minor, such as chromatic aberration and less than stellar viewfinders, are suddenly major issues now. In the HPX500, Panasonic recognizes the inherent compromises that go into a modest broadcast HD package. The company has endeavored to develop new and innovative strategies like CAC to mitigate the impact of these compromises on-screen. BE

Barry Braverman is a veteran cinematographer. His latest book, "Video Shooter," is available from Focal Press/Elsevier.

CalDigit's HDPro

The 2.6TB RAID system provides reliable data storage.

BY STEVE MULLEN

Two editing trends have come into conflict with the release of Intel's Dual Core 2 processor. Laptops now have the computer power to support online HD editing. This has led many to abandon tower computers in favor of laptops such as Apple's MacBook Pro. Editing multistream HDV, with its 3.5MB/s data rate, is well within the capabilities of these lightweight systems.

However, with Apple's release of its ProRes 422 codec, along with increasing use of the Apple Intermediate Codec (AIC), hard disk bandwidth requirements have increased so significantly that laptop-based, multistream, real-time editing is no longer possible.

One solution is to store media on an external RAID that plugs into a laptop whenever users need to edit. CalDigit's HDPro is a plug-in RAID that offers capacities from 2TB to 8TB.

System features

The entry-level HDPro has a 2TB capacity and includes a PCIe interface. All HDPro systems are compatible with MacBook Pro, Mac Pro, G5 and G4 computers, as well as Linux and Windows workstations.

The chassis can hold up to eight drives and uses load-balancing power management to divide the workload between two power supplies. (See Figures 1 and 2.) Power management enables the system to continue working in the event of a power supply failure. It supports eight, 3Gb/s, SATA channels. An integral Intel XScale core that includes up to 2GB of 64-bit DDR333 cache memory drives these channels. (The default cache is only 256MB.)

Unlike Fibre Channel, SCSI, FireWire and eSATA RAID storage, the PCIe interface connects directly to the host computer's bridge chip. A direct link to system RAM eliminates the latency introduced by these other interfaces.

The system's integrated controller includes an environment monitor processor that monitors and manages all aspects of the system, including the hard drives, RAID set controller, controller cache, fan, power supply and enclosure temperature. A front-panel LED display provides visual feedback, and an audible alarm signals a controller or drive failure. It can also send users an e-mail error notification.

CalDigit's RaidShare utility is used for both setup and monitoring. Because it is based on TCP/IP, users can monitor and manage the RAID storage from anywhere.

With a four-lane interface to the host, and each lane delivering up to 250MB/s, a RAID 5 system delivers up to 200MB/s. Of course, that performance depends on a long list of other factors, including PCI bus traffic, host RAM available for I/O buffers, tasks — including decompression/decoding — competing for CPU cycles, stripe size, and the type of RAID employed.

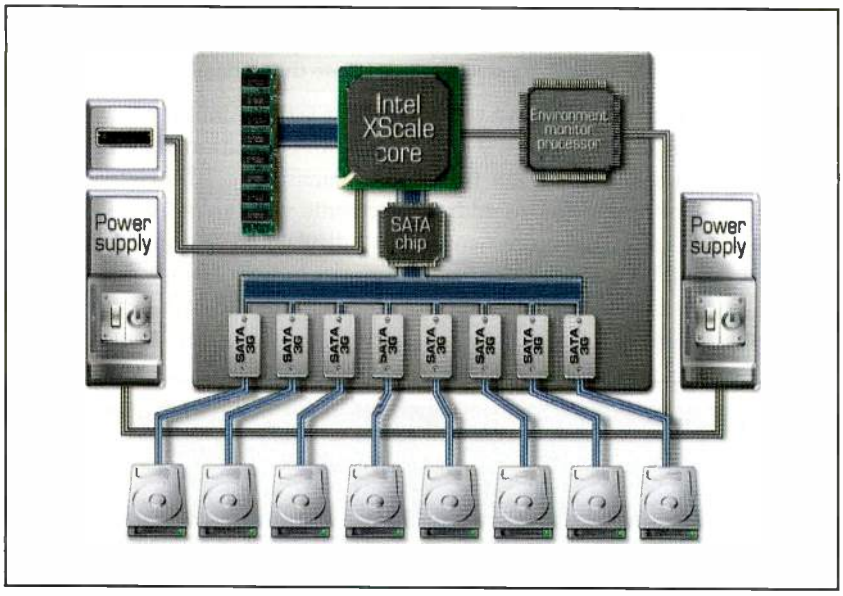


Figure 1. The HDPro's chassis holds up to eight drives and uses load-balancing power management to divide the workflow between two power supplies.

RAID 0: Performance

A RAID 0 provides maximum performance and requires at least

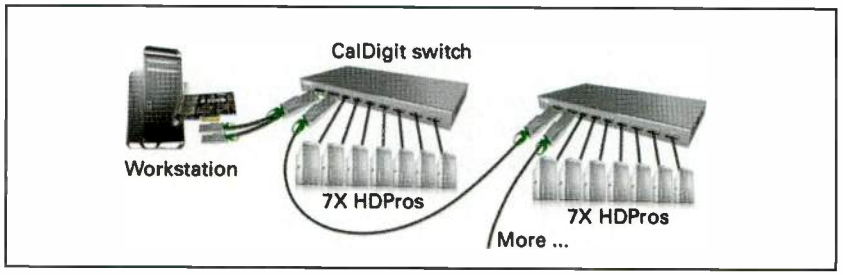
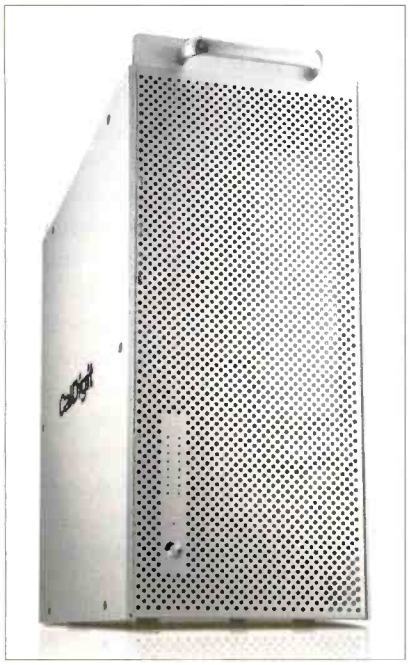


Figure 2. The HDPro switch can expand the number of RAID towers.

a pair of drives. A software or hardware controller will sequentially cycle data blocks across all available drives. The probability of a RAID 0 failure increases in direct proportion to the number of drives. Thus, the chance that users might lose data with an eight-drive RAID 0 array is eight times higher than with a single drive used for media.



Adding CalDigit PCIe switches, each of which supports up to seven systems, offers users an unlimited media pool.

Eight drives	250GB	320GB	500GB	750GB	1000GB
RAID 3	2.00TB	2.56TB	4.00TB	6.00TB	8.00TB
RAID 5	1.75TB	2.24TB	3.50TB	5.25TB	7.00TB
RAID 6	1.50TB	1.92TB	3.00TB	4.50TB	6.00TB

Table 1. HDPro eight-drive maximum data capacity

RAID 1: Safety

To increase RAID reliability, a RAID 1 configuration can be used. The software or hardware controller mirrors data on other drives, thereby cutting the chance of data loss by half. Unfortunately, storage capacity is also cut in half.

RAID 3, 5 and 6: Performance and safety

The weaknesses of RAID 0 and RAID 1 are overcome by configuring drives as RAID 3, RAID 5 or RAID 6. All three types of RAID distribute data across multiple drives. RAID 3 employs controller-moderated parity bits written to and read from a single drive dedicated to parity data.

The system supports RAID 5 by distributing parity bits across all drives in the array. Performance is increased compared with RAID 3 because parity data are stored using RAID striping. Because parity data requires disk space, a system's data storage space is less than the RAID's total capacity. (See Table 1.)

A RAID 5 array will survive one defective drive. For example, I pulled a drive from the HDPro while playing a nine-stream loop. After notifying me of the failure, playback continued without issues.

A RAID 6 system, where parity bits are distributed on a pair of dedicated drives, can sustain two hard drive failures. For this reason, RAID 6 is a valuable option for video production.

My 2.56TB review unit had eight 320GB drives — each with a 32MB cache. It was shipped with a four-lane XpressCard/34 interface that I plugged into my MacBook Pro.

Using AJA's benchmark program, I measured performance using the RAID 5 shipped configuration. Measured performance was, as promised, near 200MB/s. Write speed was measured at 165MB/s and the read speed was 171MB/s.

Intel 2.33GHz Core 2 with 2GB RAM			Number of streams		Dynamic real-time aggregate data rate
Codec	Sample width	Per-stream data rate	Dynamic real-time-enabled	Safe-enabled	
HDV 1440 x 1080 4:2:0	8-bit	3.5MB/s	Nine	Eight	32MB/s §
XDCAM EX 1920 x 1080 4:2:0	8-bit	4.9MB/s	Nine	Six	44MB/s §
DVCPRO HD 1280 x 1080 4:2:2	8-bit	14MB/s	Three	Three	42MB/s ‡
ProRes 422 HQ 1920 x 1080 4:2:2	10-bit	26MB/s	Three	Three	78MB/s ‡
AIC 1440 x 1080 4:2:0	8-bit	14MB/s	Two	Two	42MB/s §
Uncompressed 1920 x 1080 4:2:2	8-bit	125MB/s	One	One	125MB/s
Uncompressed 1920 x 1080 4:2:2	10-bit	166MB/s	One	One	166MB/s

Table 2. Measured Final Cut Pro 6.0.2 multistream performance for the HDPro running as RAID 5. The § represents Interframe decoding, and the ‡ represents intraframe decompression.

Color correction on both clips			Maximum dissolve duration	
Codec	Resolution	Sample width	Dynamic real time	Safe
Uncompressed	1920 x 1080	8-bit	2.5 seconds	2.0 seconds
		10-bit	0.5 seconds	0.5 seconds

Table 3. Dual-stream dissolve performance

After I configured the HDPro as a RAID 6, its capacity fell to about 1.9TB. Measured performance, however, remained the same with a write speed of 161MB/s, and a read speed of 171MB/s.

Multistream performance

Despite its wide use for media storage, RAID has a weakness. Data access times become longer when there are more drives in the RAID. This is because whenever a disk seek is required, typically all drives must initiate a seek. Multiple stream audio and video playback compound this source of RAID performance loss. For this reason, I tested the system to determine its ability to play multiple data streams.

Multistream playback, of course, increases playback engine overhead. Overhead is also significantly increased when interframe or intraframe decompression is required.

Multistream playback, of course, increases playback engine overhead. Overhead is also significantly increased when interframe or intraframe decompression is required. Both sources of overhead decrease the number of supported playback streams.

Table 2 shows measured Final Cut Pro 6.0.2 multistream performance for the HDPro running as RAID 5. (All tests were conducted with six audio channels.)

These data are important because intermediate codecs, such as Apple's ProRes 422 and Avid's DNxHD, are increasingly being used because they eliminate uncompressed video's massive storage burden and huge disk bandwidth requirement.

One might assume that because this system supports only a single uncompressed stream, users would be limited to cuts-only, real-time editing. Thankfully, this is not entirely true.

HDPro bandwidth beyond that required for a single stream supports prefilling the memory buffers maintained by the NLE. To confirm this, I checked the ability of the system to support dual-stream transition effects. (See Table 3.)

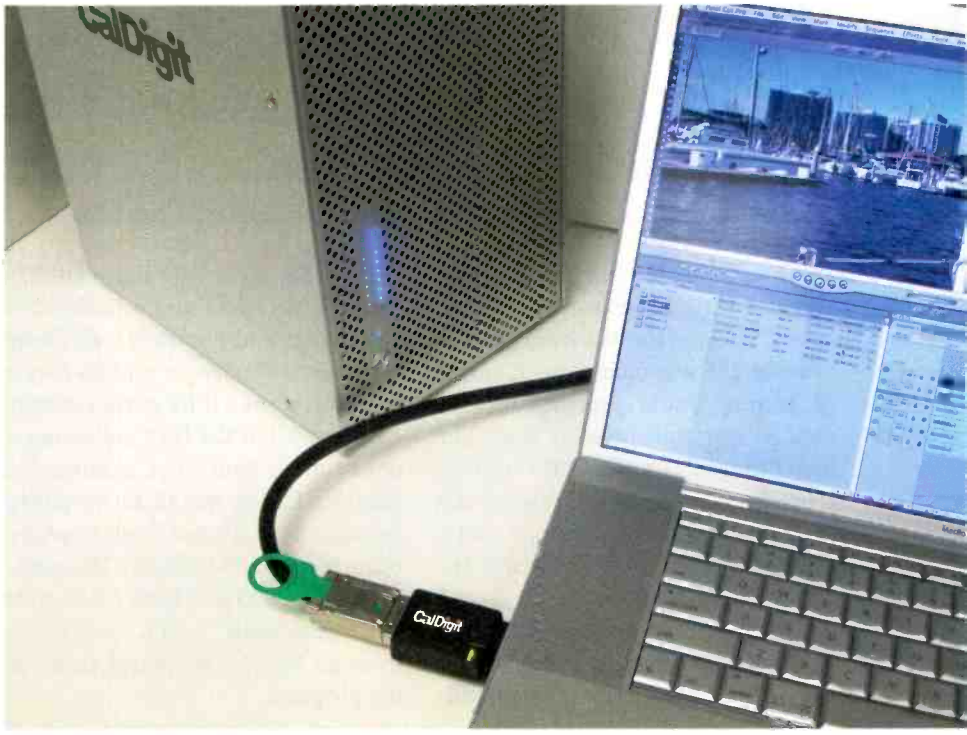
To provide a comparison for the HDPro benchmarks, I measured read/write performance of the 5400rpm, 120GB drive in my MacBook Pro 2. These data clearly show why the drives shipped in most laptops are inadequate for intermediate codec, multistream, editing.

Conclusions

From a reviewer's viewpoint, the pair of PDF files CalDigit supplied did not inspire confidence. Not only could I not find documentation on the system's multicolor LEDs, the two files provided conflicting coverage of the RaidShare utility.

Thankfully, I encountered no problems with the HDPro RAID itself. There are, however, inherent problems with the CardExpress/34 interface card. First, the card is not hot-swappable. I had to restart my laptop each time I wanted to use the HDPro. However, that was a mere annoyance compared with the second problem.

An HDPro provides reliable, high-performance data storage.



The 2.56TB HDPro has eight 320GB drives, each with a 32MB cache. Using a four-lane XpressCard/34, users can plug the unit into a laptop.

Once the CardExpress/34 is seated, its connection can be broken far too easily. A slight inward pressure causes a bus disconnect in preparation for ejection. Conversely, a slight outward force causes disconnect, as part of a cable safety release. During testing, the interface accidentally disconnected several times. In a darkened editing suite, it would be almost impossible to avoid disconnects.

Laptop owners may find CalDigit's chainable, 2TB, dual-drive, FireWireVR RAID a safer solution even though its performance is only half that of an HDPro. For Mac and PC owners with tower systems, an HDPro with either a PCIe or PCI-X interface provides reliable, high-performance, data storage. BE

Steve Mullen is owner of Digital Video Consulting, which provides consulting and conducts seminars on digital video technology.

MultiMerge at KENS-DT

Neural Audio's processor solved this station's issue of 2.0 audio interspersed in 5.1 surround programs.

BY JERRY PAONESSA

Like many other television outlets transitioning to digital transmission, KENS-DT was facing the dilemma of keeping audio properly distributed in our transmission feed. The San Antonio, TX, CBS TV affiliate station had to integrate regular stereo content with 5.1 surround material that was being transmitted in the CBS network feed.

The DTV station's technical configuration is fairly simple. The station has a pair of Harris HD IRDs provided by CBS, a pair of Dolby DP-572 Dolby E decoders and a Dolby DP-569 digital audio encoder, all ahead of a Harris Flexicoder and an Evertz 12 x 2 router as a DTV master control switcher. All of the DTV switching is done under Sundance automation control. Doing metadata switching between network and local programming was not so difficult. The problem was how to deal with 2.0 content that CBS itself would intersperse through the 5.1 surround audio in the program.

The options

In order to solve the dissonance in the transition between the stereo and Dolby content, the engineering staff initially attempted to extract external metadata from the incoming signal and apply it to the final audio encoder, a DP-569. We connected a cable from the "metadata out" port on the DP-572 and connected it to the "metadata in" port on the DP-569. That worked for a while, until CBS became more sophisticated in its switching methods. After that update, if we persisted in using the

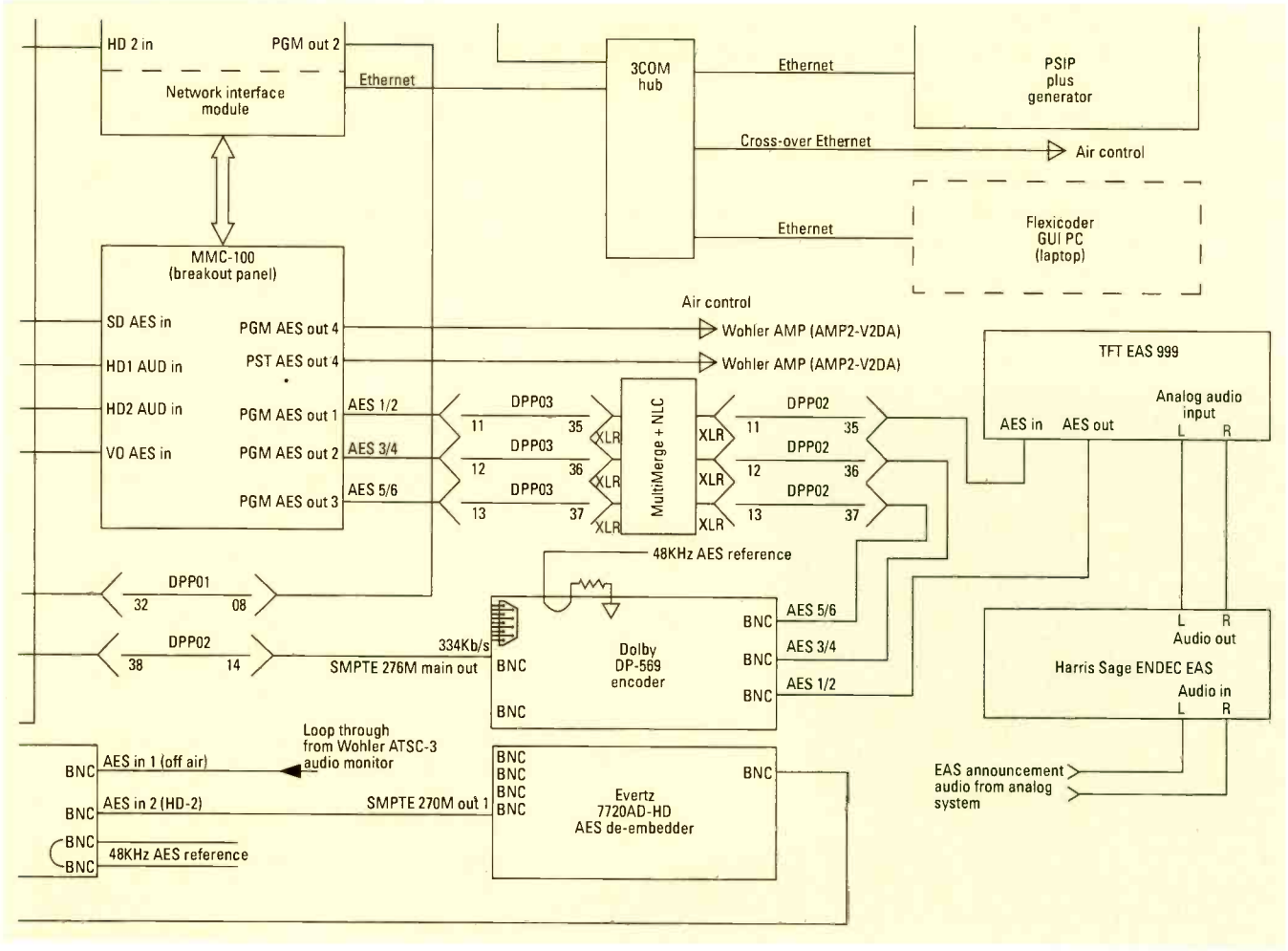


Figure 1. Neural-THX Surround MultiMerge + Neural Loudness Control (NLC) setup

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metadata extraction method, the encoder would often fail to switch back to 5.1 surround from 2.0 stereo. That left us with nothing but the front surround channels on the air instead of the full 5.1 surround.

Another alternative to automatic metadata switching left the encoder in 3/2L mode all the time, causing dramatic spatial and level shifts whenever the program content changed between 5.1 surround material and 2.0 stereo commercials and local content. This was unacceptable.

The team also fired a GPI closure during stereo programming, switching the audio encoder into its 2.0 mode. This at least was better than allowing the broadcast audio content to be all over the landscape, so to speak. Although, it introduced another manual operation to an operator's already busy workload.

The Neural-THX Surround MultiMerge + NLC system enables broadcasters to simultaneously distribute a 5.1 and 2.0 stereo output.

By mid-2005, the station's engineering team had no idea how to automatically transition between mixed audio formats. The thought of using mixers and surround audio detectors was not appealing and would have been a primitive solution at best. Plus there was no solution to the problem of how to reliably record HD content with 5.1 surround audio for delayed broadcast.

Then, Reed Wilson, an A. H. Belo technology manager, suggested a solution that was successful for WFAA-TV in Dallas. The Neural-THX Surround MultiMerge from Neural Audio is a way to automatically and seamlessly switch between 2.0 and 5.1 audio content.

The install and setup

My initial research on the MultiMerge suggested that it was a plug-and-play device. We would simply switch it on and place it in the digital audio stream between the multichannel output of our master control switcher and the input of the Dolby audio encoder. The unit would do the rest. We set up a range of inputs and outputs on our audio patch panel and awaited delivery of the device.

As with any digital device requiring synchronization between audio and video, it is important to provide AES reference to the Neural-THX. With a stable reference, you can be certain the lip-sync adjustments remain where you put them. The station team used a standard AES silence at 48KHz applied to the word clock input on the back of the unit.

The setup illustration in Figure 1 on page 110 shows the MMC-100 (MasterPlus) AES audio outputs as they pass through one jack field onto the audio processor and finally to the DP-569. For EAS events, the DP-569 is switched to 2.0 stereo operation through a GPI closure to pass EAS audio from the TFT 999, and it is switched back to a Neural 5.1 preset (which we created) once the EAS event concludes.

Now we switch multiple HD sources using a 12 x 2 router controlled by GPI from our automation system. And instead of audio from the MMC-100, we now have a final demultiplexer card that separates out three AES pairs for delivery to the unbalanced 75Ω Neural-THX inputs.

The front panel is clean and uncluttered, with simple status indicators, an LED display showing the type of audio input and a separate audio bar graph for each audio channel. The meters can be switched to show input or output.

Since installation, we have upgraded to the new Neural-THX MultiMerge + Neural Loudness Control (NLC). It has all-unbalanced AES audio inputs and outputs, simplifying cabling to and from our final audio demux and the encoder.

The initial on-air test

When we tested the system for the first time, we were already broadcasting a CBS network show in Dolby 5.1 surround. When we inserted the device into the program stream at the end of a commercial break, the audio processor immediately recognized the Dolby 5.1 audio stream and passed it through without alteration. It doesn't add coloration or change the 5.1 audio. It was completely transparent to the stream.

We eagerly awaited the next commercial break, which was a pod of four national ad spots in stereo delivered by the network and part of the program itself. The MultiMerge reported the input switch to 2.0, but seamlessly continued to deliver simulated 5.1 surround audio in the stream. The viewers did not detect that there had been a change, and surround channels actually reproduced convincing audio from the 2.0 stereo input. This capability was a definite plus in solving our audio problems.

When we transitioned from network programming to local material, the transition was equally seamless. The local stereo audio remained as full and rich as the network surround content had been, and the spatial distribution of all audio channels likewise remained consistent, delivering a pleasing listening experience. The upgraded model with NLC has level control capabilities to deliver audio with consistent quality and at the correct level.

With no particular adjustments to the final audio encoder, the first audio processor delivered an excellent performance just by virtue of its presence in the program stream. But to make the audio sound its best, we created a preset for the audio processor in the Dolby encoder, which we named Neural 5.1. This preset guarantees that the metadata settings remain consistent, which in turn assures seamless, transparent operation at all times. And since adding the version with NLC, the station team can create individual operating profiles based on a number of presets built into the unit.

The user manual is helpful for getting the desired presets loaded and modified to suit local needs. KENS knew it wanted to retain the open sensation of 5.1 surround audio without too much processing. However, the station wanted control over the sometimes aggressive loudness in a few local commercials. Through experimentation, the team reached a compromise that keeps the commercial blasters reined in while holding on to the dynamic range of the surround audio. Once the target dialnorm was set to -22dBFS, most of the -23 preset was very close to where we wanted it.

The needs	Properly integrate local stereo content to a network's 5.1 feed
	Properly deal with stereo content that the network intersperses through the 5.1 audio
	Solve dissonance between stereo and 5.1
	Keep audio properly distributed in the final transmission feed
	Deliver consistent audio quality to viewers
The solution	Automatically and seamlessly switch between 2.0 and 5.1 audio content
	Reside in the digital audio stream between the multichannel output of the master control switcher and the input of the Dolby audio encoder
	Employ the Neural-THX Surround MultiMerge + Neural Loudness Control
The results	Automatic detection of 5.1 encoded audio stream
	Completely transparent, without any alteration to 5.1 audio content
	Automatic detection of 2.0 audio stream
	Once 2.0 is detected, continues to deliver simulated 5.1 surround audio in the stream
	Viewers do not detect switch from 5.1 to 2.0
	Surround channels reproduce convincing audio from 2.0 input
	Applies equally to the network's and affiliate's stereo content switching
	Seamless and easy integration within standard infrastructure
	Easy to use and operate
	Delivers consistent audio quality and entertainment experience

Table 1. A summary of the situation experienced by the engineering team at KENS-DT

Conclusion

The station has experienced only minor issues with the MultiMerge and the MultiMerge +NLC upgrade since installation. (See Table 1.) Like most new equipment, it was necessary to upgrade the firmware to the latest version.

With the MultiMerge + NLC, the station has the best-sounding audio of any DTV station in the San Antonio market. Other stations in the market are forced to switch their audio between 5.1 and 2.0 on a regular basis. The spatial shift when listening to them as they switch is exactly what we avoid by using the this system. It is truly a plug-and-play device, requiring little maintenance or adjustment once configured. BE

Jerry Paonessa is assistant director of technology, broadcast media, for KENS-DT, a CBS affiliate in San Antonio, TX.

Wire in broadcast

Changes over the years have it poised for light speed.

BY JOHN LUFF

Wire is one thing every media facility has, and it usually has several different kinds. Fifty years ago, RG59 coax was all a broadcaster needed. Monochrome analog video didn't have frequencies above 4.5MHz, and the graceful roll-off of high loss cabling was usually hard to detect because facilities were much smaller, requiring shorter runs. For long runs, low loss cable was available, but it wasn't important until the early 1960s when NTSC and PAL began to take hold. To carry color information, subcarriers were layered on the composite signal at the upper end of their spectrum. It was important to control loss in cabling, so manufacturers designed cables for the application.

When the broadcast industry moved toward a digital future, that change was huge. The maximum frequency in a signal no longer made much sense due to the digital nature of the signal, but it is generally accepted that a cable needs to operate at twice the bandwidth of the fundamental of the signal. Initially, that meant that cables for SMPTE 259M had to support twice the composite digital bit rate of 143Mb/s (about 300MHz), or twice the component digital bit rate of 270Mb/s, which would require nearly 0.5GHz.

At the frequencies needed for SD signals, the cable is an RF transport. At HD bit rates (starting at 1.485Gb/s), the frequency is in the microwave band. 1080p signals transported on SMPTE 424 at 2.97Gb/s need systems capable of passing 6GHz. Satellites work at lower frequencies.

Frequency variations

Clearly some things are different at those frequencies. Using true 75Ω connectors is no longer a suggestion; it is a necessity. Properly handling cable is critical. Figure 1 shows what happens to the performance of a cable when a series of deformations are made at repeating 10ft intervals (return loss is shown).

At the frequencies involved in analog systems, all the same effects happen, yet in many cases, the results are nearly impossible to find. But now the impairments can cause an entire system to demonstrate bit errors that seem to be inexplicable and could affect all of the cables in a bundle.

How far one can send a signal in a facility depends on the signal and the type of wire. SMPTE 292 specifications show a loss of 20dB at half the clock frequency as the nominal acceptable value and a return loss value of 15dB. According to SMPTE 292M-2006, the return loss "shall be greater than 15dB over a frequency range of 5MHz to the clock frequency." Modern hardware can equalize for considerably more loss, but if you leave headroom, it is wise to stick with this guideline. The actual distance a cable can perform is related to the loss of the cable, and different types of common cable are shown in Figure 2.

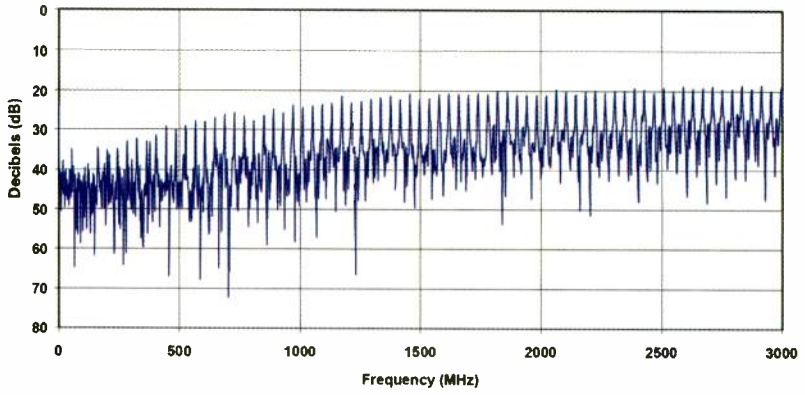


Figure 1. Return loss with periodic impedance discontinuities

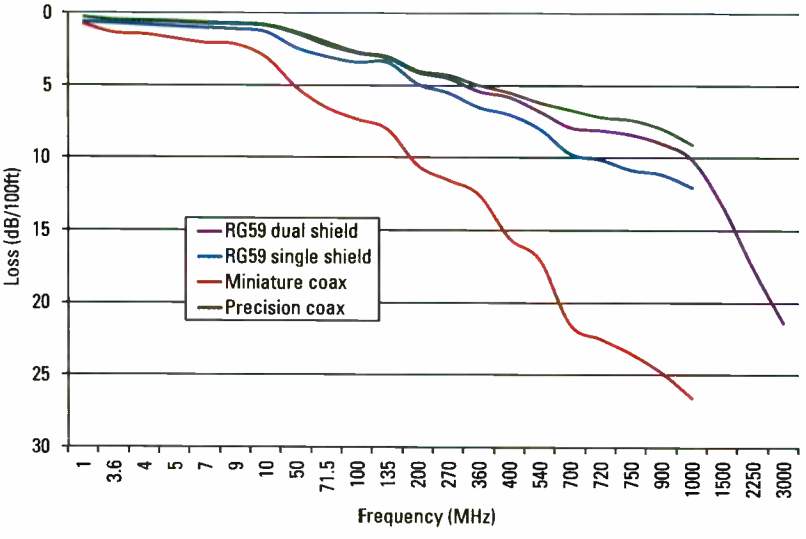


Figure 2. The distance a cable can perform is related to the loss of the cable.

Note that miniature coax approaches the loss specification much quicker and is not even rated at HD frequencies. Neither is precision coax, which is suitable for carrying high-quality analog signals. But RG59 dual-shield coax is rated up to 3GHz. Carefully read the specifications on any cable to be sure it is suitable for the application. The options expand for short cable runs, but when it comes to long runs of more than 50 percent of the capability of the interconnect system, it is critical to select the right product and ensure it is carefully installed.

It's not just coax anymore

As IT-based systems invade broadcast facilities, it is important to learn all aspects of that technology. The instructions for installing coax are similar to those for installing high-quality, high-bandwidth data systems, but they are not the same. The cables are not as mechanically robust as thicker coax cables. Pull strength limitations of the cable make it important to use less force when pulling it into location. Bend radius is key. If cables make too sharp of a bend, the association between pairs can be disrupted, seriously affecting performance. Cables with bonded pairs help, but proper installation is critical.

With GigE becoming prevalent in broadcast plants and 10GigE increasingly being used, an engineer might wonder if he can reuse existing Cat 5 cabling. It depends on how long the cable is and how it was installed. Cat 6 cabling should be installed instead. Cat 5 cabling nominally is designed for about 100MHz, while Cat 6 should handle 250MHz. Cat 6a extends to 500MHz and is suitable for 10GigE. As with the coax discussed earlier, these applications push the interconnection into the domain once only used for RF transmission. The technology of both the wire and the receivers/transmitters has come a long way to make this possible.

We are approaching the point where the bandwidth of the signals transmitted around a plant will require fiber for transmission over anything more than short distances. SMPTE 424 (2.97Gb/s) works on the best coax for only 220ft (usable range of just over 100ft), and some coaxes will provide well under 100ft of practical interconnect. The next set of standards, for 4:4:4 coded 1080p signals among other signal types, carries 10Gb/s, a rate impractical for copper interconnection (see SMPTE 435). Our next jump will truly be to light speed. BE

John Luff is a broadcast technology consultant.

Send questions and comments to: john.luff@penton.com

August cover

Editor's note: On our August cover, we ran an image of one of the control rooms at the FOX Business Network. We would like to credit Rob Galgano at TBC Consoles for creating that computer-rendered image. In addition, we would like to credit TBC Consoles for providing technical furniture to the FOX Business Network. Needless to say, issues of ergonomics, operator efficiency, reach to critical components and sightlines to monitors are important contributions to facility workflow. We regret the omission in our August issue.

PT0760M — DK-Technologies

Multichannel waveform monitor designed to operate in the OB market, as well as the studio and master control areas of a facility; equipped with up to four auto-sensing HD/SD video inputs, full audio metering and audio de-embedding of up to 16 channels; available with an in-built rasterizer and quad splitter that enables the meter to provide picture preview to a single HD monitor while providing the output of the waveform and audio meters to an additional screen.

800-421-0888
www.dk-technologies.com

IPEdit — EVS

Video editing system delivers real-time performance through a new server-based architecture; offers complete timeline editing without rendering; long-form editing is available for quick program fixing, while short-form editing can be used for highlights creation; up to four audio group tracks provide flexible audio editing, including audio swap, mute and volume automation.

973-575-7811; www.evs.tv

SBT3-9200 — Streambox

Rack-mount video transport system provides full-motion, full-frame 1080i/720p HD broadcast video and audio over data rates ranging from 515Kb/s to 20Mb/s; features advanced networking capabilities, including robust FEC.

206-956-0544; www.streambox.com

Twister — Panther

In an updated version of the dolly, the steering geometry was enhanced and the drawbar improved for smooth-running steering; the body of a platform dolly can be enlarged, not only by its length and width but also height; features a strengthened push bar; six different positions for assembly on the dolly (even sideways) give additional support to the operator.

818-764-1234; www.panther-gmbh.de

MediaPort 5220 series — Omneon

Ingest module delivers all of the SD functionality of the 5320 series, with up to four channels of SD record and play in the same 1RU package; supports SD MPEG-2 encoding and decoding at rates from 3Mb/s to 50Mb/s; fully upgradable to the corresponding models in the 5320 family through a simple software upgrade; offers broadcasters full protection for their SD investment today without requiring expenditure for HD capabilities until needed.

408-585-5000; www.omneon.com

iTX Edit — OmniBus

Editing system meets the demands of news and sports applications, with an emphasis on speed and ease of use; does not require a render of the finished edit before it is taken to air, as the playback engine can render the EDL in real time, with vision and audio effects, stills and captions.

303-237-4868; www.omnibus.tv

Portal Media Center — Orad Hi-Tech Systems

Playout system enables the consolidation of live video feeds, clips, stills, 3-D graphics, text and audio within a single playout environment; identifies the on-air source and actively associates assigned textual content to that media without engaging the production switcher, multiple DVE channels, the character generator or the video server.

201-332-3900; www.orad.tv

Connect IPx8 — Riedel

19in/1RU intercom-over-IP system converts eight bidirectional AES or analog signals into IP data and vice versa; available in three versions, offering different interface options; the Cat 5 and coax versions are for connecting panels and other AES signals, while the AIO version is ideal for the connection of four wires and other analog sources; can connect up to eight standard Artist 1000, 2000 or 3000 series control panels with full functionality to an Artist matrix via an IP network.

914-819-0495; www.riedel.net

CopperHead — Telecast Fiber Systems

Fiber-optic system mounts directly onto any portable camera, delivering both digital (SD-SDI or uncompressed HD-SDI) and analog video to a remote base station up to 20mi away; does this over a single fiber cable that is one-tenth the weight of ordinary coaxial or triax cable; transports all of the bidirectional audio, return video, sync, intercom, data and control signals required for remote broadcasts.

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

Inscriber G7 — Harris

HD broadcast graphics system features a newly designed graphics engine; delivers 2-D and 3-D real-time graphics in SD or HD over two channels; with integrated clips, stills and DVE, the G7 drives third-party specialized applications without needing a separate playout device.

800-442-7747
www.broadcast.harris.com

SL120 — Axon Digital Design

SD logo inserter features a preset-based logo recall function through a flexible user interface and local storage; multiple logos, including animated ones, can be selected through the Synapse menu, a dedicated Ethernet port or by GPI; includes two individual logo inserters; Inserter 1 has 16 presets for full-screen 720 x 576/480 logos or 384 x 216 400 frames of animation; Inserter 2 has 32 presets for 384 x 216 400 frames of animation; can be easily upgraded to handle HD signals.

+44 118 974 04; www.axon.tv

GefenTV HDMI v1.3 Repeater — Gefen

Repeater sits between two HDMI cables, allowing the signal to be transferred beyond its 2m specified limit; high-quality visuals with all of the new HDMI v1.3 features, including deep color with DTM Master Audio and Dolby TrueHD audio formats, are delivered without delay; recommended for shorter-length installations.

818-772-9100; www.gefen.com

Type-S — Shotoku Broadcast Systems

Control panel for the company's remote camera systems expands to support up to 16 camera channels; uses the same features and interface as the company's TR-8S; includes state-of-the-art panel keys, a high-contrast LCD that indicates the current status of all cameras in the system, and clear, bright LED displays.

310-782-8491; www.shotoku.tv

Kahuna 1 M/E — Snell & Wilcox

HD multiformat production switcher offers the performance of the Kahuna production switcher, but at an entry-level price; 3RU mainframe accommodates a 1M/E card set; enables seamless, real-time mixing of SD and HD video in any format; designed for live mobile, studio and news productions; provides large input and output capacity with four full effects keyers — each with chroma keyer — and resize capabilities.

212-481-2416
www.snellwilcox.com

FreeSpeak 2.0 — Clear-Com

Intercom system uses digital wireless technology based on a cellular architecture that offers license-free communication; can allow as many as 20 beltpacks to roam seamlessly between remote active antennas; new version doubles the system's beltpack capacity; offers increased IFB functionality and improved group operations between beltpacks, party lines and other external inputs.

510-337-6600
www.clearcom.com

C2-2355A — TV One

Universal video switcher/scaler provides scaling in any direction between standard video, HD-SDI, DVI or analog computer and HDTV signals; includes features such as picture-in-picture, edge blending, chroma key, luma key, mixing and genlock.

800-721-4044; www.tvone.com

RWED-516-U — Jampro Antennas

Compact TV mask/filter combiner incorporates four-port directional filter/combining that can be used as a mask filter or as a constant impedance-combining module for high-power UHF TV broadcasts; has a cross-coupled design that accommodates adjacent channels, meets stringent filtering standards and provides constant impedance performance in adjacent channel applications, as well as channel separations greater than 15 channels.

916-383-1177; www.jampro.com

eClips — Fast Forward Video

Cost-effective and easy-to-use DVR for live broadcast production; provides instant, on-the-fly access to video still/clip stores, animated graphics and audio clips in a single compact package; available for either SD or HD (SDI) broadcast; provides large touch-screen controls; supports a 16:9 aspect ratio for HD production.

949-852-8404; www.ffv.com

Copper C2 — Digital Rapids

Data delivery software transfers media and data files faster than FTP; new network topology increases the efficiency of transfers to multiple recipients with multiple simultaneous connections, parallel transfers and simultaneous send/receive.

905-946-9666
www.digital-rapids.com

AG-HMC151E — Panasonic

AVCHD tapeless professional handheld camera incorporates the design concept of the DVX100 and features a newly developed Leica Dicomar zoom lens, providing a wide angle; weighs 4.5lb; the AVCHD format allows the camera to record HD digital AV data on SD/SDHC memory cards with the MPEG-4 AVC/H.264 codec, providing a robust and convenient tapeless operation.

201-392-4127
www.panasonic-broadcast.com

MBP-100CK — FOR-A

Chroma keyer features two internal video delay lines, an internal still store, and two independent, multilayering downstream keyers; includes an auto chroma key function that makes it possible for even a novice operator to produce clean chroma key effects by automatically adjusting its parameters; minimizes the need for manual fine-tuning by handling skin tones, wardrobe and hair color variations.

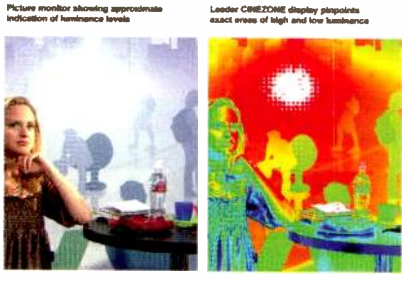
714-894-3311; www.for-a.com

BC-2000 D — AEQ

Multiplexer inserts and extracts digital or analog, mono or stereo, audio channels in E1/T1/J1 or Ethernet data transmission flows; the audio channels can be linear, or compressed for better use of the link; the link capacities that are not used for audio can be employed for data transport.

954-581-7999
www.aeqbroadcast.com

CINEZONE — Leader



Luminance display system uses color coding to represent luminance values; allows efficient confirmation of lighting levels without needing complicated waveform representations; highlights are marked in red, mid-gray levels are displayed in green and shadows in blue; user-settable facilities are provided for scale adjustments, allowing the exclusion of specific zones from the display for better user visibility; optional for the LV5800 and LV5380; offered as standard on the LV5330.

714-527-9300; www.leaderusa.com

Fusion F2 — Sonnet Technologies

Portable storage system designed for on-location video capture or remote use; now available in a 1TB version; delivers up to 134MB/s read and write sustained data transfer rates; bus-powered to enable its use when grid power is unavailable; consists of two 2.5in drives mounted sidy-by-side in a rugged, aluminum enclosure slightly larger than two stacked CD cases; the drives are individually shock-isolated to prevent cross-coupled vibration; features two eSATA data connections; draws power from a computer's FireWire port.

949-587-3500
www.sonnettech.com

Flypack — Calrec

Audio console enables all digital signal processing, power supplies and I/O interfacing to be housed in a compact double rack, which allows the control surface to be mounted on top; available on the Omega and Zeta consoles; designed for use in places where a mobile truck cannot get or is prohibitively expensive to ship, providing high-end broadcast facilities in otherwise impenetrable locations; uses military-spec connectors to ensure fast, reliable and rugged connectivity.

+44 1422 842159; www.calrec.com

ProductionVIEW HD — Vaddio

Camera control system handles demanding live broadcast or staging events; integrates PTZ camera control and multiformat HD/SD live switching with real-time graphics and effects into an easy-to-use control console; redesigned surface gives system users real-time knobs and buttons to control functions; produces only one frame of delay — a critical requirement where image magnification is used.

763-971-4419; www.vaddio.com

SANmp — Studio Network Solutions

Storage area network sharing system enables computers to concurrently share massive amounts of data over high-speed fiber and iSCSI storage networks and record and edit directly onto the storage system; does not require servers or metadata controllers.

314-733-0551
www.studionetworksolutions.com

FishFace — Polecam

Submersible pan-and-tilt camera housing can be used to a depth of 13ft on the Polecam or independently down to 33ft; features a carbon fiber support arm that incorporates drainage holds, which allow the boom to flood and clear quickly; offers 360-degree pan capability and the same unrestricted movement as a standard Polecam dry head; allows a split O-ring cable gland to be used to seal cables without having to break existing connections.

323-633-7033
www.polecam.com

AERO.air — Linear Acoustic

10-channel TV audio processor features built-in Dolby Digital encoding; includes a loudness controller, upmixer and metadata manager, as well as full-time, two-channel downmixing to support legacy analog paths; built-in AutoMAX processing fixes two-channel audio that is broadcast wrongly signaled as 5.1 channels; accepts 5.1 network audio, two-channel local audio, and digital or analog auxiliary/EAS stereo audio.

717-735-3611
www.linearacoustic.com

CTV series — Radio Frequency Systems

Center-fed colinear antennas feature 500W input power rating and 6dB gain; series' four antennas are suitable for multichannel operation and together cover the full range of UHF mobile TV frequencies from 470MHz to 806MHz.

203-630-3311; www.rfsworld.com

IP-Probe v3.7 — Bridge Technologies

Software upgrade provided free to existing IP-Probe owners; records transport streams into files; extends capabilities of TR 101 290 analysis to provide full ATSC, DVB and PSIP support; features protocol view that provides a breakdown into unicast and multicast streams and the number of unicast streams present.

+47 22 38 51 00
www.bridgetech.tv

InFILE — SysMedia

The latest version of the company's subtitle embedding software adds full broadcast-quality, open-caption subtitles in any language to a digital media file as part of a software-only file-based workflow; this new open-caption capability extends the software's functionality to cover traditional burnt-in translation subtitles as well as closed-caption formats (teletext, Line 21 and DVB); works with SD and HD MPEG-2 video files.

+44 1293 814 200
www.sysmedia.com

CMR-8500 — Comtech EF

Encapsulates IP data into multiprotocol format for distribution over an asynchronous serial interface; well-suited for high-speed data applications; the unit's 1RU rack-mountable platform is equipped with two GigE inputs and dual ASI outputs; capable of network throughput up to 155Mb/s and an aggregate packet processing of 140,000 packets per second.

480-333-2200
www.comtechefdata.com

PDW-F335K/2 — Sony

Camcorder offers, at the flick of a switch, the choice of shooting 50i/59.94i/23.98P/25P/29.97P pictures in DV and HD; balanced to fit a user's shoulder; uses XDCAM Professional Disc, allowing users to mark scenes manually and review scenes by selecting their thumbnail images on the color fold-out screen; using the 50GB Dual Layer Professional Disc, recording times are increased to more than three hours when shooting DVCAM and to 2.5 hours when shooting high-quality HD.

201-930-7330
www.sony.com/professional

C100 HD-L — Solid State Logic

A preconfigured console and I/O system designed to meet the needs and budgets of local broadcasters; a 32-fader version of the C100 HD-S slimline console; offers up to 192 audio channels, enhanced ergonomics and more faders within space-restricted control rooms; ideal for news, sports, outside broadcast and post.

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

XL H1S — Canon

Camcorder provides expanded connectivity by incorporating HD-SDI (SMPTE 299M)/SD-SDI (SMPTE272M) output with embedded audio and time code; offers a raw, uncompressed 1.485Gb/s signal for live production environments, SMPTE time code input and output terminals, and a genlock output terminal for multicamera shooting situations.

516-328-5000
www.canonbroadcast.com

SHARE-HD — HaiVision

Network video recording system supports synchronized, multistream HD recording up to 10 HD or 20 SD streams and both stream- and time-based metadata; captures multiple streams simultaneously and can replay these multistream sessions to performance decoders, set-top boxes or soft players; controllable via Web interface or remotely through third-party control systems.

514-334-5445; www.haivision.com

Viz Video Hub v1.2 — Vizrt

Plug-and-play media asset management system provides extended support for the Viz Link workflow and Escenic's Web publishing system; offers an integrated Viz ingest manager module, which automates the recording of incoming feeds onto Viz Engine video servers.

212-560-0708; www.vizrt.com

9084 — Cobalt Digital

HD/SD-SDI RGB color corrector supports offset, gain and gamma, with YCbCr proc controls and frame synchronizer; can process HD/SD-SDI signals in all formats; color correction can be applied to an entire frame or subregion; includes on-card storage of 16 presets.

217-344-1243
www.cobaltdigital.com

OpenMedia 3.5 — Annova Systems

Newsroom system offers wire ingest, scripting, rundown and on-air management, as well as integration capabilities that expand journalists' choices for video production, graphics and playout systems with a network of partners such as Chyron, Dalet, EVS, HP, Orad, Sony, VCS and Vizrt; features new Event Calendar module.

+49 89 158 155 0; www.annova.de

FastBreak NXT Entry Level Edition — Sundance Digital

Automation system manages information and controls content in the broadcast master control room; integrates database management with frame-accurate control of video servers, tape transports, switchers, routers and other common peripherals; built specifically for one- or two-channel operation; ideal solution for small-scale call letter broadcasters, cable, college, government and public access channels.

972-444-8442; www.sundancedigital.com

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Email: sales@shootview.com Web: www.shootview.com

TTR BAYSAVER HD 4x1 HD/SD ROUTING MATRIX

The TTR BAYSAVER HD is a four input stand alone HD/SD routing matrix housed in a self contained small 180 x 190 x 40mm box. The standard unit comes with four Looping inputs, dual outputs and a local control panel. There is an optional RS232C control module available if required. The BAYSAVER HD has been designed to full SMPTE 292M, SMPTE 344M and SMPTE 259M specifications, and switches in the vertical interval but will switch immediately if no reference signal is present. TTR unit employs automatic sample rate detection on the input equalizers allowing a mixture of HD / SD signals in the same unit. Front panel LED's indicate signal presence and control activity.

- Broadcast specification
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- Vertical interval switching
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TTR www.ttr.co.uk or email: sales@ttr.co.uk
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Help Wanted

ASSISTANT CHIEF ENGINEER

FOX 17 in Nashville, TN is seeking an Assistant Chief Engineer. You should have an in depth knowledge of digital and analog technologies as used in a broadcast environment. For more info and to apply online please go to **www.fox17.com** to the Station Info section. EEO/Drug Free

Help Wanted

MAINTENANCE TECHNICIAN

WATE-TV6 in Knoxville has an immediate opening for a Broadcast Maintenance Technician. Candidates must have a degree from an accredited electronics school or college with 10 years experience in broadcast maintenance. Qualifications include being able to troubleshoot analog and digital broadcast electronic equipment to the component level in cameras, video tape machines, switchers, microwave, transmitters, and associated terminal equipment. Candidates must also have an understanding of computers and microprocessors as they apply to broadcasting equipment and servers. VHF and UHF transmitter experience a plus. Must have a General Class FCC license and SBE certification. Interested parties send resumes and salary requirements to: WATE-TV6, ATTN: PERSONNEL, ENGINEERING JOB #08-07, P.O. BOX 2349, KNOXVILLE, TN 37901. No phone calls, please. EEO Employer.

GENERAL MANAGER
Sutro Tower, San Francisco

General and technical management of multi-tenant broadcast tower company. Competitive salary and benefits. See **www.sutrojob.com** for detailed description and application instructions or request by mail to: General Manager, Sutro Tower, Inc. 1 La Avanzada St., San Francisco, CA 94131. Sutro Tower, Inc. is an Equal Opportunity Employer.

CHIEF ENGINEER

Supervise day to day operation and maintenance of stations. Experience in design, installation, repair, and operation of all technical systems and TV station equipment. College degree preferred. Experience in electronics is required. Send resume to KWES-TV, PO Box 60150 Midland, TX 79711 or to **hr@kwes.com**. EOE

MAINTENANCE ENGINEER

WLIO in Lima OH, is seeking a maintenance engineer to be a second to the Chief Engineer. This is not an entry level position. Compensation is commensurate experience beginning at $45,000. Benefits include health, dental, vision, 401K, & life insurance, Some on-call hours in rotation with other staff engineers. Applicant needs to have a good electronics background. Responsibilities include maintenance and installation of studio and control room equipment, UHF analog and VHF digital transmitter, and news equipment. Resumes to Frederick Vobbe, WLIO Television, 1424 Rice Avenue, Lima, Ohio 45805. E-mail resumes must be in Word97 or PDF with no macros to **fvobbe@wlio.com**. *No* phone calls, please. WLIO is an equal opportunity employer.

Help Wanted

SCOTTY, WE NEED WARP SPEED NOW!

A growing enterprise, Sovereign City Communications, LLC™ seeks a Chief Broadcast Engineer to oversee our new, state-of-the-art facilities. The successful candidate must have experience in network radio and in start-up situations. A working knowledge and/or experience with Axia, Audio Vault and Music Master broadcast systems a plus. Ideal candidate is 1/3 MacGyver, 1/3 Scotty, 1/3 Einstein. Minimum 3-5 years experience preferred. Sovereign City is an equal opportunity employer. Submit resume to: **jobs@sovcity.com**

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The Chief Engineer position requires extensive experience in maintaining & troubleshooting a wide variety of broadcast equipment. Thales transmitters, remote translators, microwave and studio equipment, Wolfcoach satellite truck, video servers and IT infrastructure, 40 ft. video production truck. Must exhibit an advanced knowledge of electronics, digital technology, networking, computer and network security, station automation, RF systems as well as studio and remote production. This position is part of the senior management team. The individual must be, diligent, dedicated and driven. Must have at least 10 years experience in the maintenance and operation of broadcast RF equipment. Trade school, military training or college degree preferred. SBE certification or equivalent credentials desired. Send resume to **info@ksbitv.com** or fax: 405 631-7367. If you are an Assistant Chief ready for the next step, or you are a Chief needing more appreciation for your abilities, this may be the job for you.

CHIEF ENGINEER

ABC affiliate KQTV, St. Joseph, MO seeks a Chief Engineer. Candidate should have experience with VHF transmitters, microwave equipment, all studio related and ENG equipment. Position requires an individual with management skills as well as strong hands on capability. Major responsibilities will include managing and involvement in the daily repair and maintenance of studio/transmitter, maintaining operating budgets, capital project implementation and maintenance of in house computer network. Salary is commensurate with experience. Send cover letter and resume to Rick Stolpe, Nexstar Broadcasting, Inc., 62 South Franklin Street, Wilkes-Barre, PA 18701. EOE.

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Active format descriptor

Don't leave home without it!

BY ANTHONY R. GARGANO

Are you ready for active format descriptor (AFD)? Or maybe you're already sending it with your content. You should be. AFD codes will play a significantly important role in how content appears to your viewers.

Simpler times

Some of us remember simpler times. Signals were analog, there was only one aspect ratio, and viewers received signals over-the-air or via cable, which at worse, frequency-converted a signal to a different channel slot. Back in those days, the viewer essentially saw what broadcasters transmitted — subject to the vagaries of the transmission path or the cable operator's trunk amplifier gain settings.

Remember those third-order distortion products that manifested themselves by appearing as faint video lacking horizontal and vertical sync, seeming to float through the background? I won't get into the signal processing characteristics of those early television receivers and what they did to your signal! But certainly one constant was aspect ratio — 4:3 format was 4:3 format was 4:3 format. Oh, some of those old receivers would underscan or even overscan the raster, but fundamentally it was all 4:3. Even those early, fully round CRTs were masked to 4:3.

A cornucopia of technology

Let's look at what viewers have today with regard to video display and device technology. In addition, let's discuss what they use to view that signal you take such painstaking care to deliver in its richest, full frame video fidelity. Come February, many viewers will be using a new device called an analog converter box. Current statistical surveys vary, but most indicate that about one-third of total TV households have HDTV, and that number will continue to grow at double-digit rates. Unfortunately, slightly less than half of those households are actually viewing HDTV signals on their expensive HD sets, but that's another matter.

DTV receivers represent a virtual cornucopia of digital processing techniques and display options for handling digital signals. Thanks to the continuing price drop of true HDTV receivers, 4:3 DTV receivers and enhanced-definition TV (EDTV) receivers have gone by the wayside, but there is still a generation of them being used. 16:9 HDTV receivers offer the viewer a variety of options for handling 4:3 formatted content, from pillarbox to stretch to cropping. 4:3 DTV receivers for 16:9 content typically offer letterbox, a 14:9 or even a full crop. Are you confused yet? Imagine the poor consumer who is viewing 4:3 letterboxed content on a 16:9 display and winds up with a double-boxed picture — black bars on all four sides!

Then there are many viewers who do not rely on off-air reception. Instead they subscribe to a cable, satellite or telco fiber system. Those carriers take a broadcaster's precious signal and demodulate it, remodulate it and statistically multiplex it. In other words, they do anything they can to squeeze it into the smallest possible, bandwidth-stingy bit stream. Oh, and along the way they may decide to do an extra format conversion for you.

AFD to the rescue

Enter AFD. AFD is a set of standardized codes adopted by both the ATSC and SMPTE. They can be embedded in an MPEG stream or in a baseband SDI signal. These codes define information about aspect ratio and active picture characteristics. As most consumer manufacturers of receivers and set-top boxes support AFD, it is now an effective tool for broadcasters. It communicates to appropriately enabled receivers and set-top boxes and lets them know how to display the attached content. The codes enable the best display on both 4:3 and 16:9 television sets of content transmitted in either format and can dynamically control downconversion circuitry, which formats widescreen 16:9 pictures for display on older 4:3 receivers.

In addition to its comprehensive format control capabilities, AFD also provides signaling controls for active picture information. Active picture codes identify the active video in the coded picture as well as the protected area that must be shown. A significant amount of program material is shot today in a "shoot 16:9, protect 4:3" capture mode. As such, information outside of the protected area at the sides or the top can be lost in 4:3 crop without impairing the intent or meaning of that particular scene.

What's in store

We will be living in a world of mixed display and resolution formats for many years, with AFD being a powerful tool during this period. Content provided to broadcasters has or will soon have embedded AFD codes. Broadcasters need to ensure they insert appropriate AFD codes in their own locally produced content.

Yep, things used to be a lot simpler, but would you really want to go back to watching next Sunday's football game in plain old analog 4:3 NTSC? BE

Anthony R. Gargano is a consultant and former industry executive.

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