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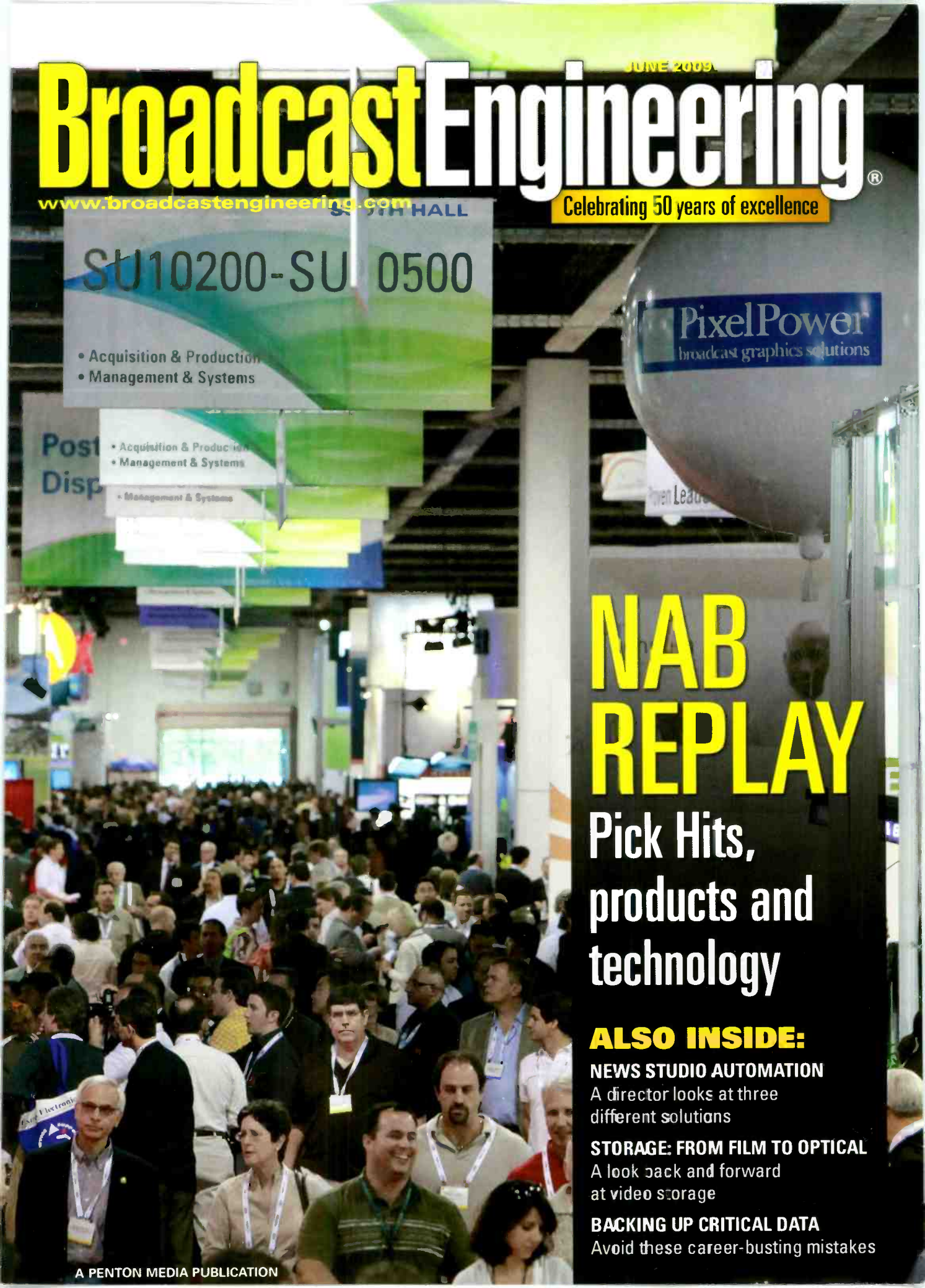

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ON THE COVER:

At the 2009 NAB Show, *Broadcast Engineering* awarded 34 annual Pick Hit Awards to the best new products that would provide technical and financial improvements to a broadcast facility.

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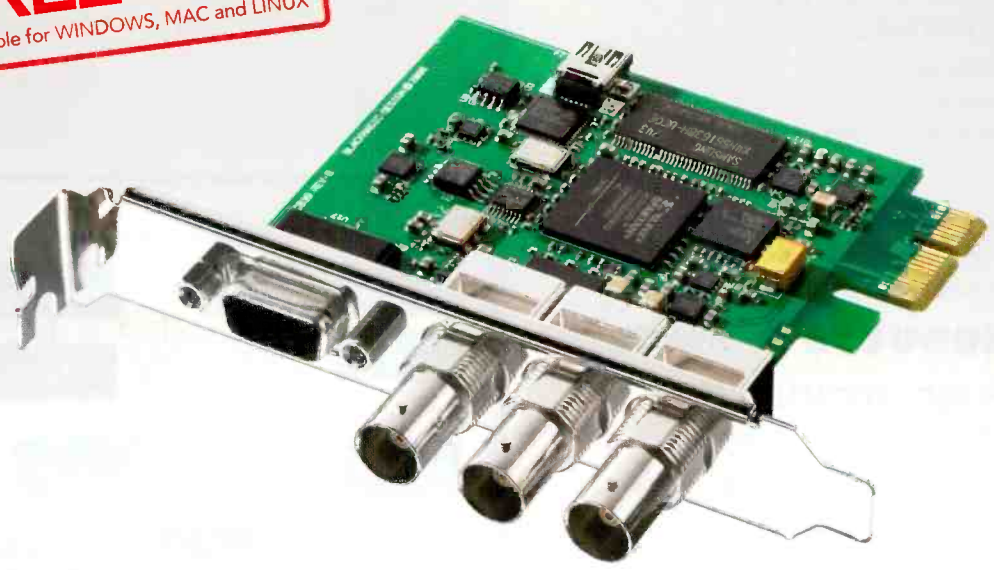

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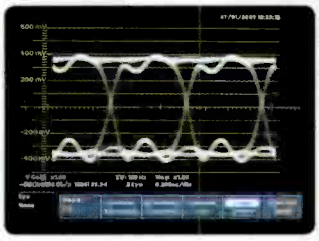
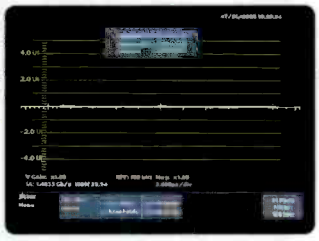


SDI Jitter Performance in HD



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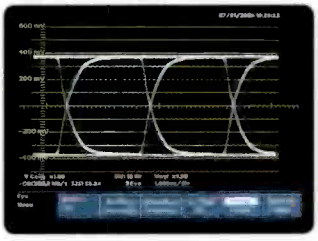

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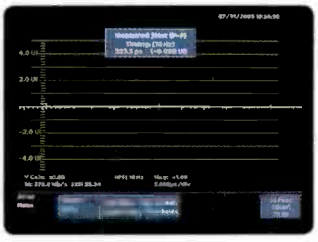

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DEPARTMENTS

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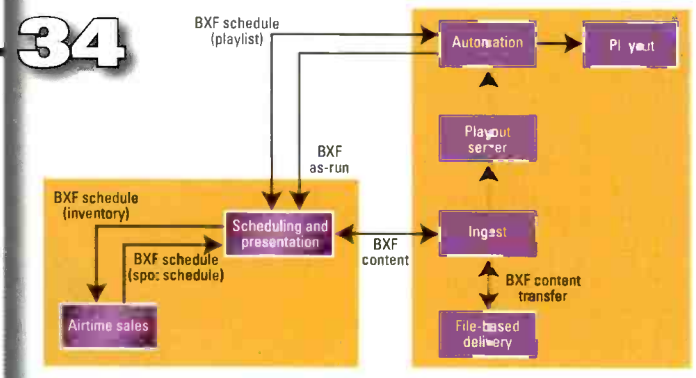
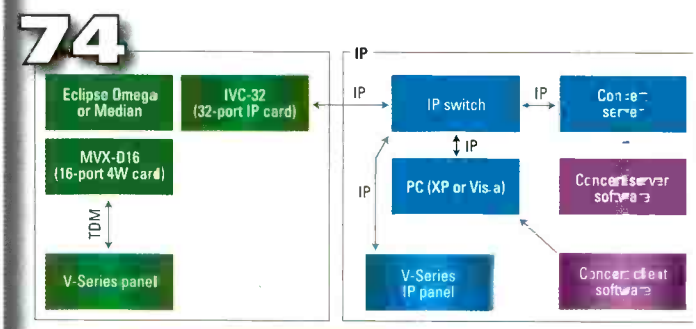
FAST FORWARD!

Some NLE vendors initially promoted the idea that long-GOP MPEG-2 was difficult to decode, therefore making editing cumbersome. Fortunately, today's enhanced NLEs support various types of MPEG-2, and *Broadcast Engineering's* Steve Mullen shows editors how to take advantage of those solutions to effect a higher-quality and faster workflow.

Look for it all in July's issue of *Broadcast Engineering*.





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Widget TV

There's a new competitor coming to your viewers' TV sets: the Internet. No, I'm not talking about the Internet being viewed on a computer; I'm talking about your audience being able to watch Internet content on their big-screen televisions.

It's been possible to connect the Internet to televisions for several years, but the technology hasn't been user-friendly. That's about to change.

Beginning with the January CES Show, several TV set manufacturers have demonstrated high-speed Internet connectivity combined with an array of on-screen widgets to support online viewing. At the NAB Show, Adobe showed a variety of widgets and content tools to support Internet viewing on Samsung televisions.

Yahoo! has developed what it calls Internet@TV, a service supported by set makers LG, Samsung, Sony and Vizio. This service will display Yahoo!'s Widget Channel, but with such portals will come Twitter and eBay along with a host of other things viewers may not want on their TV sets.

The goal of these vendors is to eliminate the need for an external set-top box (and, of course, to control the interface) for the delivery of broadband content. The solution will eliminate the requirement for a Roku or Blockbuster box to rent movies from the likes of Amazon, Netflix and Blockbuster, or to watch Internet content, which could include YouTube's new HD videos.

The latest aspect of getting Internet content onto televisions is the introduction of widgets. A wide variety of companies want to provide these connectivity gizmos on your TV set. In addition to Yahoo!, other players, including Intel and MySpace, have plans for widgets that let viewers chat and send messages through their televisions. Disney is reported to soon be incorporating widgets as clues into shows such as "Lost."

But with all the snipes, scrolling tickers and logos that already appear on-screen, are widgets something that viewers will embrace? These vendors think so.

Unfortunately, along with all the hoopla there remains that pesky issue of compatibility. Sony calls its Internet service Bravia Internet Widgets; Samsung calls its solution the Internet@TV content service platform; and Panasonic offers a service called VeraCast — three similar, but likely incompatible, services.

Further complicating the rollout is that Panasonic and Sony TV sets won't display all Internet content. Their sets can tune into only that content specifically selected by the respective manufacturer. Not surprisingly, both companies want to remain gatekeepers.

Broadcasters are intimately familiar with what happens when you have conflicting standards. Once quad tapes died, there was little compatibility between broadcast products. Even today, files often must be converted to another format before they can be edited or transmitted.

For the geek viewers, purchasing one of these new TV sets and expecting a seamless experience will be more akin to hoping your computer's operating system won't at some time bite you. It will.

Even so, broadcasters need to recognize that the Internet is coming to viewers' TV sets, and they will have to compete on those terms. If stations want to play in that space, they will need to provide more content and metadata in an Internet-friendly format.

I can hardly wait to click on some widget and watch the hourglass spin and spin until I'm presented with: Abort, Retry, Ignore. BE

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

Rethink multi-viewer quietness

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Video servers

Dear John Luff:

I've got two comments regarding your statement in the "Video servers" article in the May issue. You stated, "Servers were initially deployed to fix the inability of analog cart machines, based on analog video recorders, to play back-to-back 10-second spots."

First, while the 10-second limitation was certainly true of the RCA TCR-100 2in quad cart machine, that was not the situation with the Ampex ACR-25. The ACR-25, also a 2in quad cart machine, could not only run back-to-back 10-second spots all day, but also you could run a 60in, a 30in and a 10in any order all day. In fact, a 60 could run, followed by a 10 and then followed by the same 60 again.

The ACR-25 was an incredible machine. It was the 2in quad cart version of the AVR-1, a 2in quad reel-to-reel beauty. The AVR-1 and the ACR-25 used vacuum columns for control of the tape. There were no idler arms and no capstan pinch roller. The AVR-1 shuttled tape at 500in per second and locked from a dead stop in 10ms. It was a roll and take machine. The same was true with the ACR-25: roll and take.

I believe that server deployment was caused by the need for a nontape-based playout system — no mechanical tape paths to worry about, no heads to wear out, no head clogs, etc.

I enjoyed the article, John!

Don Murray
Retired after 40 years in Miami TV
(35+ years at WTVJ, the NBC O&O)

John Luff responds:

You may be right about the ACR-25 and back-to-back 10s, but the context was actually Betacart- and Odetics Betacam-based hardware when servers first were employed. By that time, most quad spot delivery was gone, though not all.

I remember the AVR/ACR well. I was in the first Ampex AVR-1 training class in 1973. Taught by Jim Alford, the class was amazing! I had the first three production machines, which presented a "co-development opportunity."

By the way, Ampex guaranteed five-frame lockup, about 150ms — though two to three frames was typical. Lockup in under one frame was not possible because it had to read at least one frame pulse to predict the tape position and correct it. Tape acceleration was about 500in/sec/sec, which made rewinding 10s pretty quick. If I remember correctly, when doing back-to-back 10s, it skipped rewind until time was available later.

More on servers

Dear John Luff:

You may recall we spoke recently at the Snell booth at NAB regarding the earliest video server. You earlier implied that the Tektronix PDR-100 was the first practical server, and I agreed.

I was in Malaysia in 1994 working to establish a new TV station, City Television in Kuala Lumpur for the Negeri Sembiulan Royal Family. It was to be fully component digital, and I was looking for a more suitable way to deliver the interstitial elements in conjunction with a VTR cart machine. At Asia Broadcast in 1994, Odetics demonstrated the TCS90 cart machine with a PDR-100 under Odetics automation. The PDR-100 was set up as a cache and would store up to about 50 minutes of "Betacam-quality" video.

I saw the unit again at IBC in September 1994, when we agreed to buy the setup. Odetics promised delivery at the end of 1994. Singapore Broadcasting Corporation placed an order before us but were not prepared to take delivery. So City TV Malaysia took the first unit from the factory at the end of 1994. Tektronix told me that the first PDR-100 was sold through Odetics as a cache. And Tektronix at that time confirmed with me that we took the first PDR-100 from the factory.

The interesting thing in the context of your May "Video servers" article is that the first PDR-100 with the TCS90 worked in conjunction with Panasonic D-5 machines. So the first PDR-100 had SMPTE-259C interfaces for video with analog audio. I required embedded audio, and to facilitate this, I employed Techniche (later acquired by Leitch) analog-to-SDI embedded interfaces so that the PDR-100, along with the D-5s, could record and playback embedded audio. This device was on-air by early February 1995.

I thought I should jot this down and send it off to you. Perhaps most servers were originally used in analog environments, but not the first!

Terry Harvey
Director of engineering and technology
WSIU Public Broadcasting
Southern Illinois University

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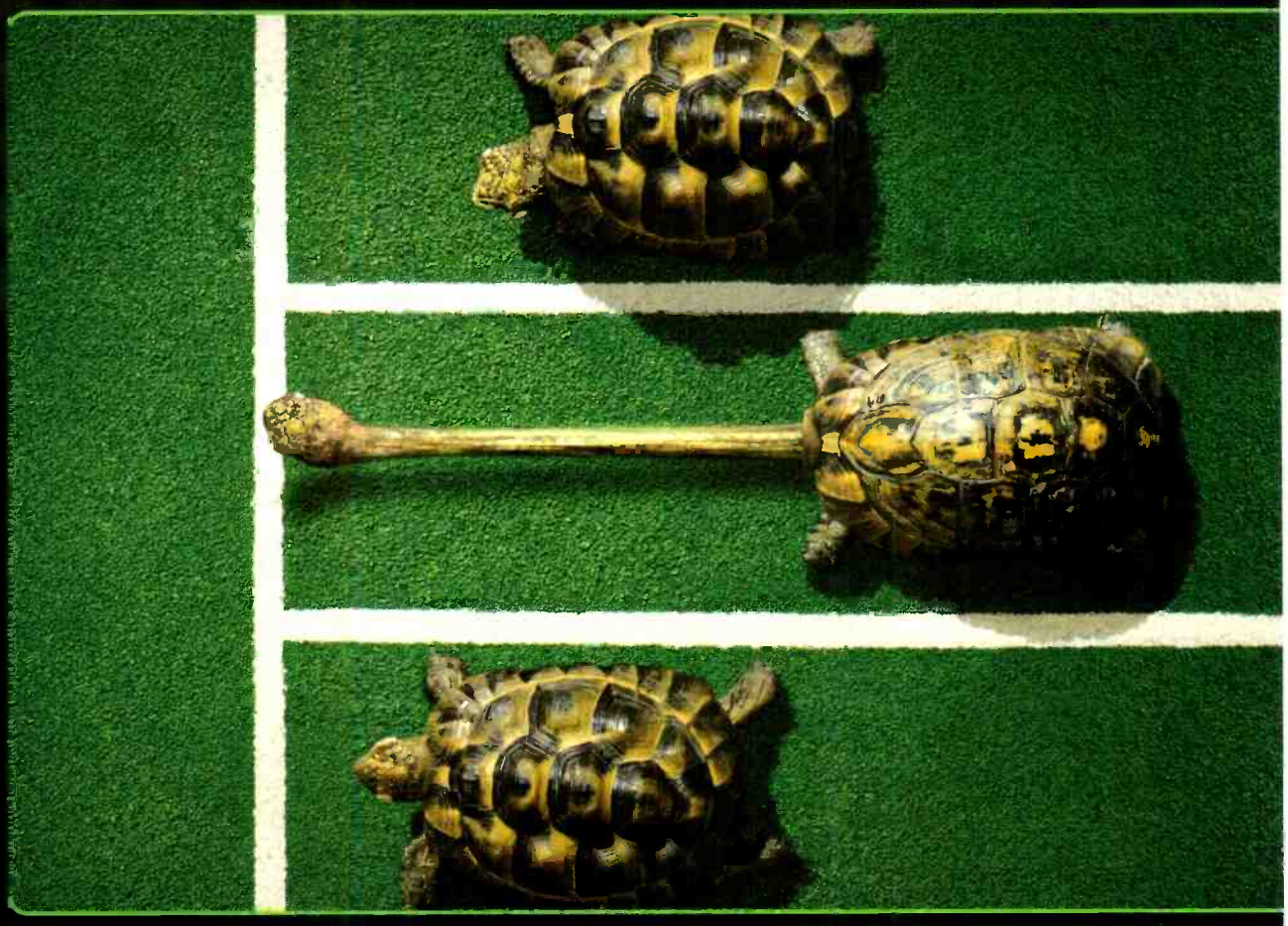

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Spectrum reallocation and the TVBD ruling

What does it mean for wireless microphone users?

BY JOE CIAUDELLI

Recent changes in FCC policy are affecting operation of wireless microphone and monitoring systems in the United States. It's important for production professionals to understand these changes and apply best practices to ensure reliable operation of their equipment.

Wireless mics primarily operate on frequencies in the UHF TV spectrum. They are considered licensed broadcast auxiliary devices a broadcaster or broadcast content provider may operate on locally vacant TV channels. For example, channel 25 (536MHz-542MHz) is not used for TV broadcast in Boston. Therefore production may operate approximately eight wireless mics tuned to different frequencies between 536MHz and 542MHz.

It's important to remember that two separate and distinct issues have been progressing in parallel: the digital dividend and the TVBD ruling, aka the white space debate.

Digital dividend

This relates to the reallocation of TV channels 52-69 (698MHz to 806MHz), generically called the 700MHz band. Once analog TV terminates, all full-power TV broadcast will be consolidated below channel 52. The 700MHz range will partially be used for emergency communications in channels 63, 64, 68 and 69. The rights to use the majority of the remaining channels were auctioned to telecom companies such as AT&T, Verizon and Qualcomm to provide what is being termed as advanced wireless services (AWS). This raised billions of dollars for the federal government and was therefore called the digital dividend. Although the FCC has not made a final ruling (as of this publication date), it looks imminent that wireless mics will have to vacate this range. The pro audio industry has been lobbying for a grace period to allow operation of existing equipment beyond the DTV transition date.

The 700MHz band can be subdivided as:

- *Emergency communication channels:* 63-64 (764MHz-776MHz) and 68-69 (794MHz-806MHz).
- *Auctioned spectrum:* 698MHz-758-MHz and 776MHz-788MHz. The telecom companies have not completed building the infrastructure for their AWS. AWS will probably become active at the end of this year in major cities and will then eventually spread. Functional, 700MHz wireless mics will continue to work reliably for many months after the DTV transition date, maybe even years in some parts of the country.
- *Block D:* 758MHz-763MHz and 788MHz-793MHz scheduled for future auction. Block D was envisioned to be used as a private/public partnership. It did not solicit a minimum bid in the FCC auction, probably because the winner would have had to share it with municipal agencies. Therefore, it is not allocated to any one entity yet. Functionally, these frequencies look clear for wireless mics for the foreseeable future, until the FCC successfully auctions Block D.

The bottom line is wireless mic users will lose access to the 700MHz band. The bright side is that as more analog stations terminate their broadcasts, this will open some TV channels below 698MHz. (See Figure 1 on page 14.)

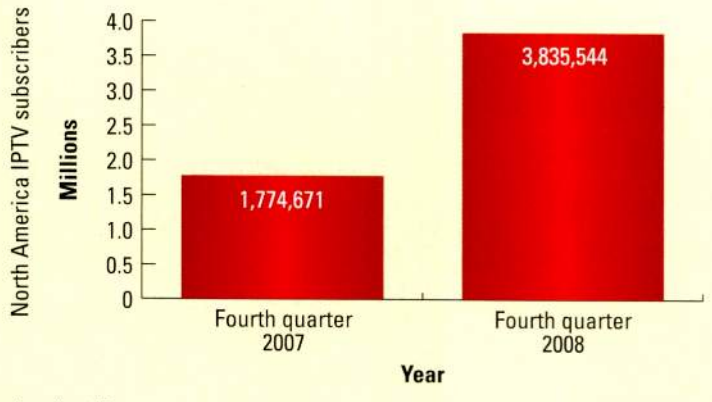
TVBD ruling (the white space debate)

In November 2008, the FCC released its rules allowing a new class of unlicensed consumer electronic products to operate in locally unused TV channels, just as wireless mics have done for years. These forthcoming products have previously been

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

IPTV subscriptions increase

The U.S. IPTV market grew 113 percent in one year.



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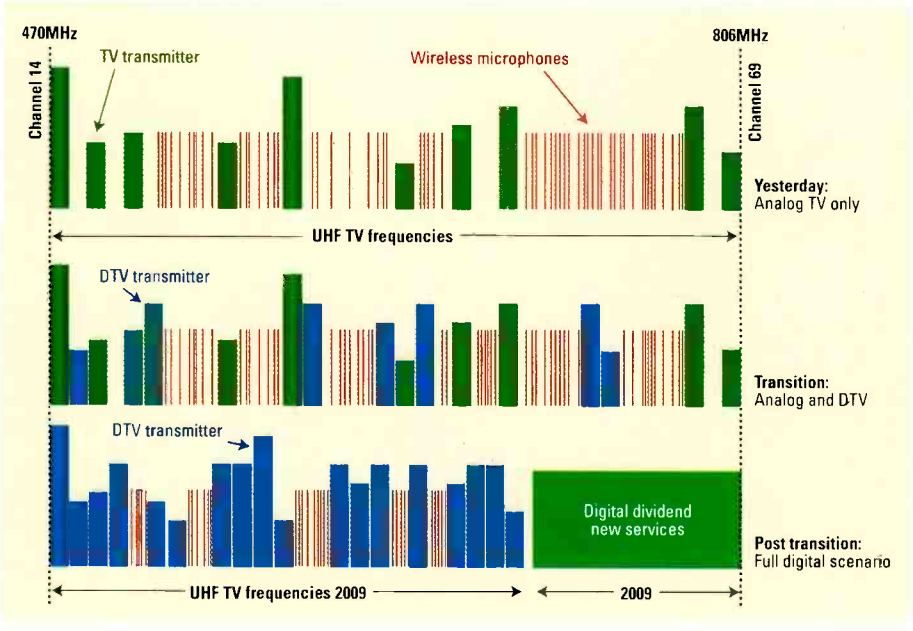

Figure 1. With television's transition to digital, wireless mic users will lose access to the 700MHz band. But it will also open some TV channels below 698MHz.

referred to as white space devices (WSD) but are now called TV band devices (TVBDs). They will mainly be used as broadband access devices.

TVBDs are categorized as:

• *Fixed.* These are allowed to operate with effective radiating power up to 4W on channels 2-51, with the exceptions of channels 3, 4 and 37.

• *Personal/portable.* Due to their mobile nature, these devices are the most concerning for production professionals. However, portable TVBDs are restricted to channels 21–51 and are also not allowed in channel 37. (Channel 37 is a reserved channel for radio astronomy and medical telemetry.) They are limited to 100mW operating power or 40mW if operating in a channel adjacent to an active station. This moderate power will reduce their range and therefore the possibility to cause interference.

Licensed operation of wireless mics takes precedence over TVBDs. TVBDs must coordinate around active licensed wireless mic systems. The rules include several safeguards to avoid interference to wireless microphones.

TVBDs must include the ability to scan the airwaves to sense wireless microphones (in addition to TV stations). Until they can demonstrate through proof of performance that they can reliably sense wireless mics and avoid causing interference, they must also use a geolocation/database system. TVBDs must use location sensing in conjunction with a database of registered broadcast license assignments. The database will also include a list of protected areas for wireless microphones such as entertainment venues and sporting events. TVBDs must first access the database to obtain a list of permitted channels in the area before operating. A TVBD that lacks this capability can operate only under the direct control of a capable TVBD.

Personal/portable devices will be barred from channels from 14-20 (470MHz-512MHz). In addition, in 13 major markets where certain channels between 14 and 20 are used for land mobile (municipal and public safety) operations, two channels between 21 and 51 will be reserved and available for wireless microphones. These will be the first open (non-TV) channels above and below channel 37.

This means, at minimum, 16 wireless mic or monitoring systems (eight in each TV channel) can be used simultaneously in any venue. When using equipment with high linearity (extreme suppression of harmonic distortion known as intermodulation) the number increases to at least 20 systems (10 in each TV channel). Protected areas will be able to operate many more channels.

Multistage and studio properties can also effectively increase the number of systems in use through:

• *Physical distance and transmitter output power management.* This can be augmented by a balance of other techniques such as shifted coordinated frequency sets (same frequency spacing but offset by 100kHz or more), zone isolation (natural or enhanced shielding between rooms), directional antennas and filtered distribution systems.

• *Time multiplexing.* This involves using systems in different rooms at different times.

New approach

There are a couple of techniques that

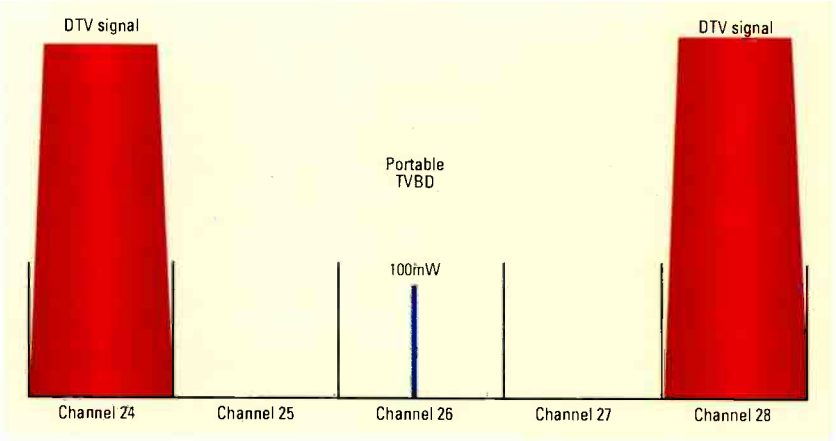

Figure 2. A city with three consecutive vacant channels should operate wireless mics in the middle channel.

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can be used to ensure maximum protection from portable TVBDs. If a city has three consecutive vacant channels, operate wireless mics in the middle channel. (See Figure 2 on page 14.) This will force the TVBD to operate on a channel adjacent to an active TV broadcast, which means it will have to operate at its lower 40mW output power. (See Figure 3.)

A portable TVBD approaching a production area should sense wireless audio systems as soon as possible. The effective radiating power of mobile wireless mic transmitters is often diminished by shadowing and body absorption, especially with a body pack transmitter. Conversely, a monitoring system with a stationary transmitter using an antenna fixed in a high position provides a more stable signal. If it is operating at the maximum allowable power of 250mW, a portable TVBD should sense it from much farther away compared with lower power, mobile wireless mics. (See Figure 4.) This approach is a bit different from what was often recommended in the past. However, this technique allows a monitoring system to act as a beacon, adding a level of protection for wireless mics within the same channel.

The reduction in available spectrum plus forthcoming TVBDs creates new challenges for production professionals. However, through careful planning and adherence to best practices, even large, multichannel wireless audio systems will be able to operate reliably. BE

Joe Ciaudelli is a consultant for the professional products industry team at Sennheiser.

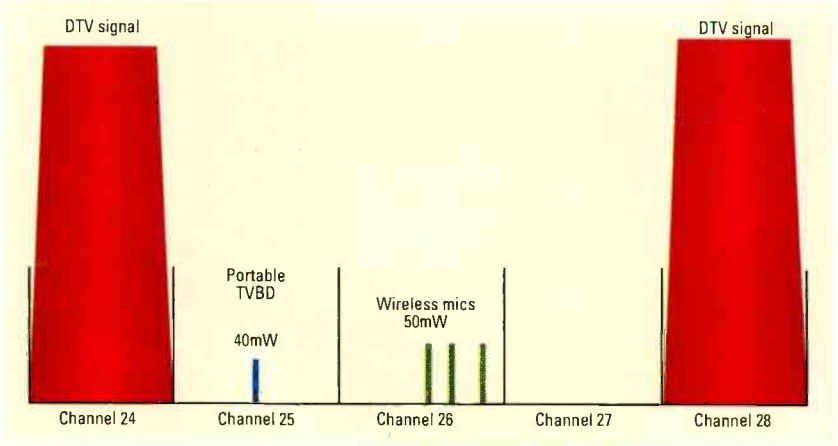

Figure 3. Operating on the middle channel forces the TVBD to operate on an adjacent channel at its lower 40mW output power.

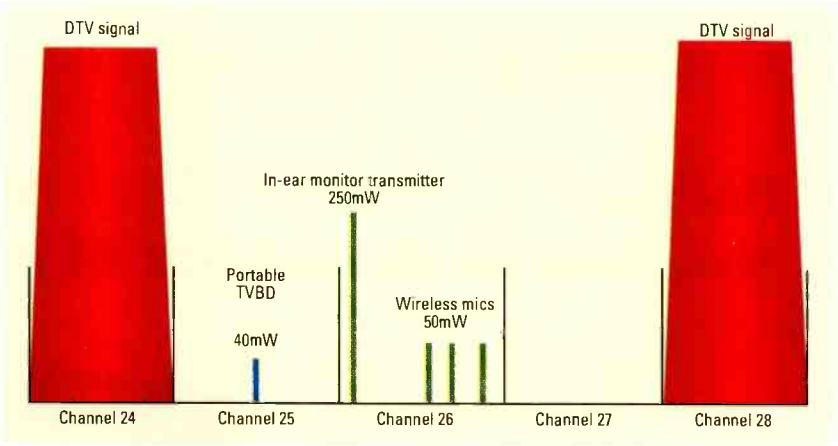

Figure 4. Operating at a maximum allowable power of 250mW, a portable TVBD should sense a monitoring system from much farther away.

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Ownership reporting

Find out how new ownership reporting rules may affect your station.

BY HARRY C. MARTIN

The FCC revamped its rules and related forms for reporting the ownership of commercial broadcast stations. All commercial stations, including previously-exempt LPTV and Class A stations, are subject to the new rules. The FCC also proposed ownership rule changes for noncommercial stations.

Commercial changes

All ownership reports for commercial licensees will now be filed by a single filing deadline — Nov. 1 — and will reflect data as of Oct. 1. This abandons the longstanding requirement that ownership reports be filed on a staggered basis.

All commercial licensees will be required to file ownership reports. This means that LPTV, Class A, single individuals and partnerships composed exclusively of individuals — all groups previously exempted from ownership reporting requirements — are now subject to the requirement.

Certain less-than-controlling interests previously deemed unreportable will now be required to be included.

The Media Bureau is now authorized to perform random audits "to ensure the accuracy of reports."

NCE and LPFM changes

The commission has proposed that noncommercial educational (NCE) licensees be required to include "gender and racial/ethnic" information in their ownership reports. (Form 323 for commercial stations already requires the submission of such data.) Additionally, LPFM licensees, historically exempt from ownership reporting, would lose that exemption. Recognizing that many NCE stations are licensed to nonprofit, nonstock organizations that are not covered by conventional notions of "ownership," the FCC acknowledges that it will have to come up with a workable definition of ownership in the NCE context.

Purpose of the changes

The FCC's purpose in adopting the new rules is so it can better assess and effectively promote diversity of ownership in the broadcast industry. According to Acting Chairman Michael Copps, the state of broadcast ownership is "shameful" because the media "are still deficient when it comes to reflecting the diversity of America." And that "shameful state of affairs" will "continue until more women and minorities actually own stations and set their own policies." His sentiments were echoed by Commissioner Jonathan Adelstein. In a considerably more restrained statement, Commissioner Robert McDowell expressed cautious support for the concept of obtaining "more precise and reliable" ownership statistics while making clear that he did "not entirely agree with every word" in the FCC's order.

While these rule changes deal only with information gathering, if the FCC is looking toward a race-, ethnic- and gender-based system of regulation of broadcast ownership, it will have to confront thorny issues.

Practically speaking, how is the term "minority" to be defined? While some may justify race-based regulation as necessary to address a perceived problem of "underrepresentation," what does underrepresentation mean? If the government is trying to eliminate underrepresentation, how will it know the job has been done?

Conceptually, the FCC will have to examine the concept of "diversity" which, according to Copps and Adelstein, is a matter of urgent concern. How is diversity defined? How can a governmental agency identify it? How can it determine what level of diversity is enough? And how does that agency propose to monitor and maintain the level of diversity that it believes is necessary? BE

Harry C. Martin is a member of Fletcher, Heald and Hildreth, PLC.

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

Dateline

- Aug. 1 is the deadline for noncommercial TV stations in Illinois and Wisconsin to file their biennial ownership reports. As detailed in the accompanying text, biennial ownership reports for commercial TV stations will be due on Nov. 1 unless that date is extended. The Aug. 1 and Oct. 1 filing dates for ownership reports for commercial stations have been suspended.
- Aug. 1 is the deadline for TV stations and Class A stations in the following states and territories to place their 2009 EEO public file reports in their public files and post them on their Web sites: California, Illinois, North Carolina, South Carolina and Wisconsin. LPTV stations originating programming in these states, which are not required to have public files, must post these reports on their Web sites and keep them in their station records.
- Also on Aug. 1, TV stations (except Class A stations) in Illinois and Wisconsin, regardless of the number of persons employed at the station, must electronically file an EEO midterm report using FCC Form 397.

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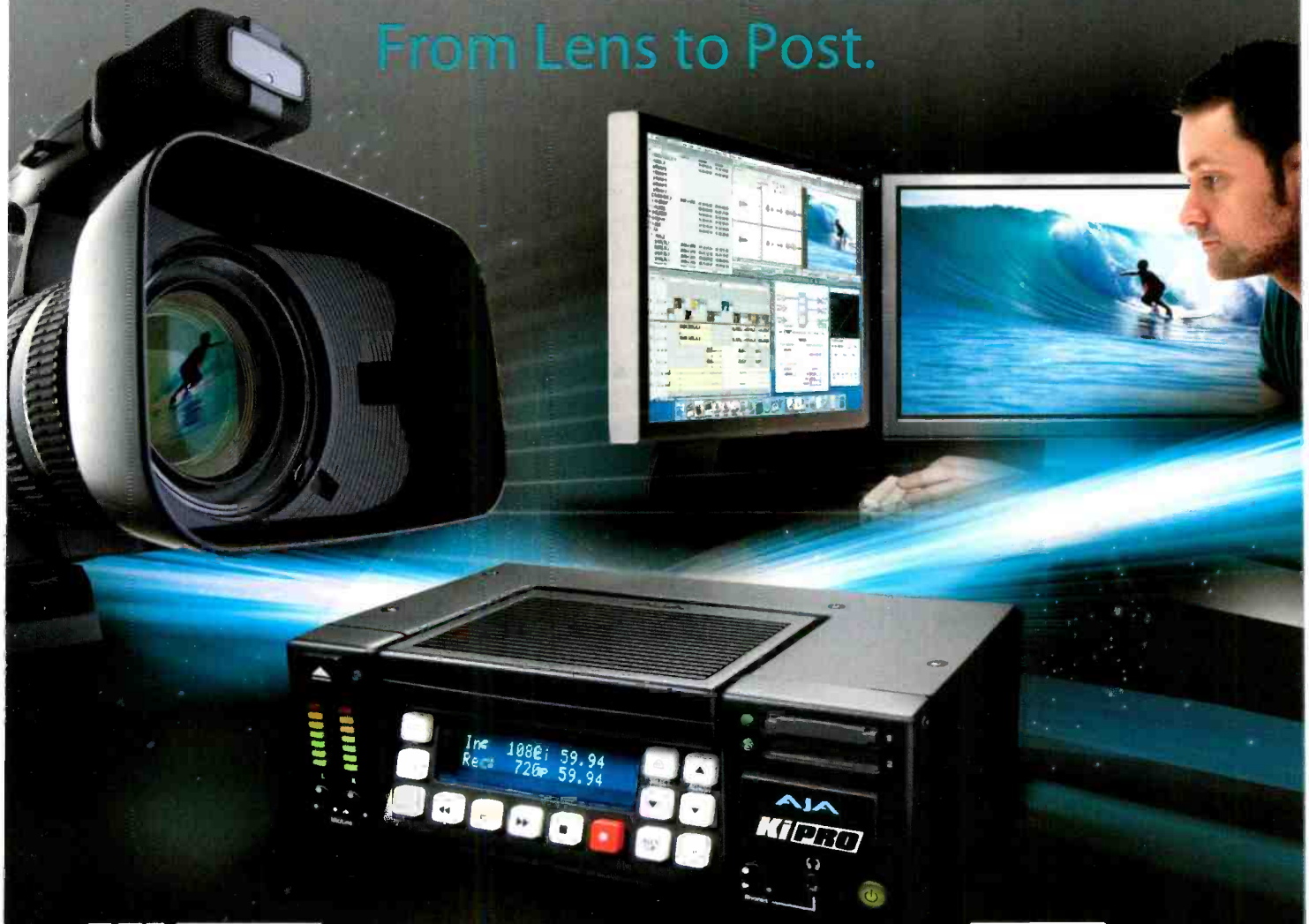

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D-A conversion

Step one to digital is converting analog signals into digital equivalents.

BY ALDO CUGNINI

By the time you read this, more than 20 million digital converters will have been purchased and installed in U.S. viewers' homes, and a large number will have been distributed throughout the world as well. Despite their small size and cost, the units pack a considerable amount of technology into a simple-to-use package. While the functions of these units are very similar to those in an integrated TV, the specific application to support legacy analog 4:3 televisions means there are some important differences. This month, we'll take a look at the functional elements of these units, as well as how digital-to-analog (D-A) conversion works at the circuit level.

Typical converters

The functional structure of a typical DTV converter is shown in Figure 1. While some converters may combine several of these functions into integrated silicon, or even implement the functions in software on a digital signal processor (DSP), the basic elements remain the same.

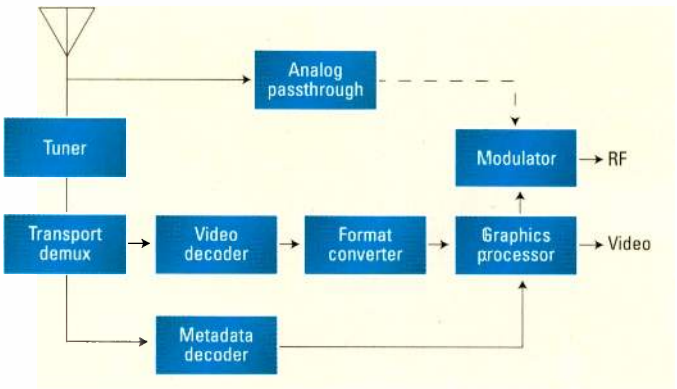

Figure 1. Shown here is a typical DTV converter. (The audio path is not shown.)

While the tuner in a DTV converter is similar to that in an integrated DTV (or HDTV) receiver, the technical requirements for converters sold under the U.S. converter box program are more stringent. As set forth in the U.S. Dept. of Commerce's NTIA *Rules* for coupon-eligible converter boxes, these units must meet a technical specification that includes minimum requirements for RF sensitivity, phase noise immunity, interference rejection for co-channel, first-adjacent and taboo channels, burst noise immunity, and multipath rejection.

The transport demultiplexer in these units parse the data stream into its constituent video, audio and data elements, and also conveys the important synchronization data that is used to properly reconstruct the video and audio programs. The video decoder takes the MPEG-compressed video data and converts this to viewable video.

Video format converter

A format converter is needed to display all source material properly on a 4:3 television. This conversion includes several different functions, such as scaling, resampling, interlacing and cadence conversion. Scaling is used, for example, to resize a 16:9 image to fit on a 4:3 display, and can be done in various different ways: linear, squeezed or zoomed.

Because analog television broadcast uses a fixed sampling grid, and digital broadcast allows the use of many other sampling grids, resampling is required when downconverting from the digital source formats. And, resampling requires some degree of digital filtering to avoid objectionable aliasing. However, in order to produce a low-cost

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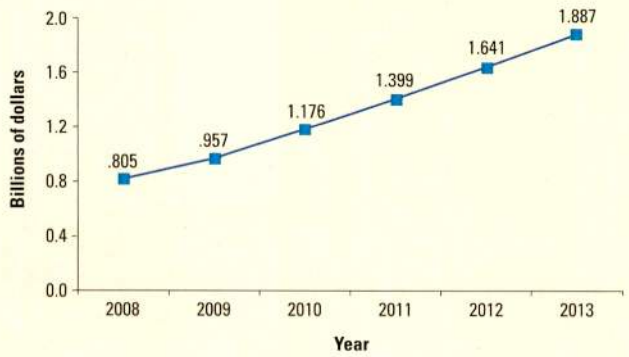

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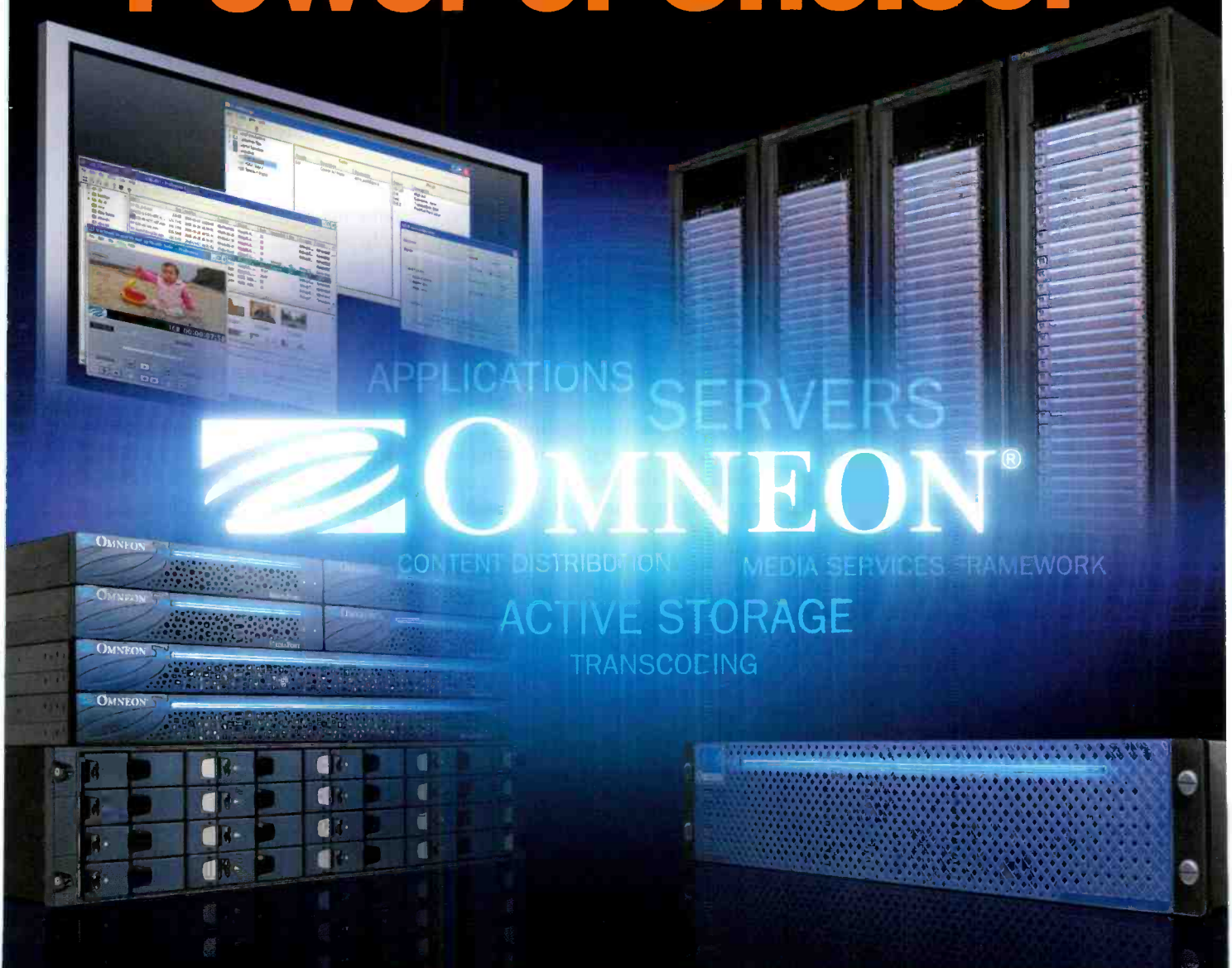

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product, a very simple filter may be employed, resulting in some amount of visible artifacts. Also, since digital broadcasts can use progressive scan, an interlacer is needed to display progressive video on an analog TV, and this may additionally introduce vertical-temporal aliasing. Finally, a 3:2 cadence converter can be used for film pulldown to 30Hz (for NTSC) because film-rate encoding is an allowed transmission format.

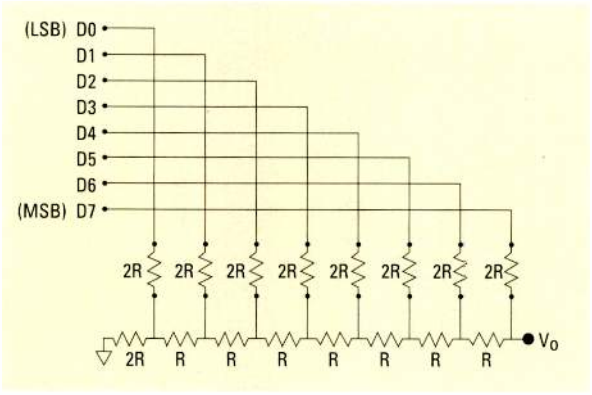

Figure 2. A digital-to-analog converter circuit

Metadata decoder, graphics processor, modulator

The digital transport stream also contains metadata that conveys program and system information that can be used to provide the user with tuned channel and program information, and other program-related information such as closed captioning. A graphics processor then uses this information to generate a graphical interface for the viewer. Ultimately, a component such as a Digital ENCoder (DENC) converts the digital video to the appropriate analog output interface format, with proper sync and color burst, for presentation to either an RF modulator, or baseband output to a video display. A modulator is needed to interface with a tuner-equipped analog TV; alternatively, baseband video outputs can be used to interface with the composite inputs on a TV.

In order to provide legacy support for analog broadcasters continuing their analog transmissions after the analog cutoff date, an analog passthrough is also provided on some units. This allows the user to bypass the converter and continue to receive analog broadcasts on the analog TV.

D-A video signal conversion

Buried within the video output function (within the graphics processor in our example) will be a basic circuit element — the digital-to-analog video converter itself, called a video D-A converter or DAC. In order to convert the digital representation of a signal to an analog one, a circuit such as the R-2R resistor ladder shown in Figure 2 is often integrated within a D-A chip.

The output signal appearing at V_O will be a stepwise approximation of the video signal, also known as a zero-order hold version of the sampled signal. This signal then requires an analog lowpass filter to remove the sampling harmonics; the filter can also be compensated to counteract the inherent $\sin(x)/x$ response of the zero-order hold circuit. In practice, the linearity of this type of D-A converter will depend on the accuracy of the resistor ladder network, something that is not difficult to do using modern silicon fabrication techniques.

Another type of D-A converter is the *Binary Weighted DAC*. In this circuit, each bit of the parallel digital input switches on or off a weighted current source; these currents are then added together and converted to a voltage, forming the analog output. As before, filtering is needed for proper signal construction. One critical characteristic of D-A conversion is the linearity of the converter. If the voltage associated with each bit is not precisely generated and summed, the resulting signal will have distortion associated with it.

For video signals, nonlinearity can be tolerated to some extent, but not so with audio. With audio signals, an oversampling converter can be used to both simplify the D-A conversion and to lower the quantization noise of the signal. This is because upconverting the signal to a very high sample rate will spread the quantization noise over the entire sampling spectrum; thus, the final lowpass filter will remove a great deal of the quantization noise. In addition, the D-A converter can be constructed using a pulse-width modulation scheme that will result in a very high linearity of the conversion. This is not practical for video circuits, however, due to the extremely high sampling rates that would be required.

In practice, the video D-A converter within a DTV converter or receiver is integrated within the DENC chip mentioned earlier. This device takes 8-bit multiplexed 4:2:2 YC_bC_r video at a 13.5MHz rate and converts this to *Y/C* video (for S-Video interface), or CVBS (composite video blanking signal), for composite or RF interface. To support low-end TV sets that are subject to cross-color artifacts, the luminance signal can be notch-filtered at 3.58MHz (NTSC) or 4.43MHz (PAL). A similar notch filter is also available to prevent problems with the sound carrier. Both of these filters, as well as the chroma interpolation filters (needed to convert 4:2:2 sampling to 4:4:4), are implemented digitally within the DENC. A D-A converter on the same chip (usually 10 bits to account for addition of the *Y* and *C* signals) then provides the final analog output.

D-A converter boxes are an important part of the digital transition strategy for broadcasters, enabling all consumers to afford keeping up with this technology easily. Within these units, D-A converter technology provides support for analog displays. However, as integrated TVs and digital interfaces such as HDMI become more commonplace, we may eventually arrive at the situation where analog video signals are no longer present in any of these devices! BE

Aldo Cugnini is a consultant in the digital television industry.

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Backing up critical data

Follow these steps to keep your facility on-air.

BY BRAD GILMER

When it comes to protecting data, broadcasters have it rough. Not only do they face all of the normal IT issues with protecting important desktop business data, but increasingly they are faced with protecting vital data having to do with on-air operations.

As broadcasters think about protection, it may be useful to divide the areas of concern into protecting on-air programming, meaning video, audio and closed captioning, and protecting the data having to do with the operating systems that get video to air, meaning automation and other systems.

Protecting programming

For many broadcasters, especially those just moving to server-based playout technology, it's important to decide how to protect the programs and commercials stored on the server. Most broadcasters keep tape as a backup for a while, and in some cases, videotape is kept as the backup method indefinitely. However, for many broadcasters, the move to server-based playout was driven by a requirement to do things that could not be done with a tape-only facility. Some of these drivers are a request from management to reduce staff, or to provide multiple feeds from a consolidated master control facility.

Whatever the motivation, broadcasters frequently find that after being on servers for a while, videotape is unsuitable for backup. Or they discover that videotape serves as a backup of last resort, meaning that the facility functionality will ultimately suffer if the operators must revert back to videotape. Finally, there is a cost to maintaining videotape as the backup of choice. This cost shows up in maintaining the videotape library, tape machines and sufficient tape-based playback facilities to actually be able to execute a tape-based backup plan. If retaining videotape as a backup is not feasible for many broadcasters, then what is a good way to protect this vital data once it moves into the server environment?

The obvious answer is a one-for-one backup plan; all content on one server is duplicated on a second server. This backup plan is simple and intuitive, and the only real issues are cost and ensuring that the two servers really contain identical content.

If you can't deploy redundant playback servers, all is not lost. When thinking about protecting data, it pays to decide what the most likely failure modes are and protect them. The two components most likely to fail in servers are the power supply and the disk drives. Buying a server with redundant power supplies is a good idea, especially if you do not have a backup server. When it comes to disk drives, professional quality broadcast servers employ a scheme that provides protection from disk drive failures, most typically through RAID technology. There are different levels of RAID, but generally, RAID 5 is used. In this configuration, data is striped across several disks. As the data is written, parity data is calculated and recorded as well. If a drive fails, the RAID array can recreate the missing data by using the data from the remaining disks plus the parity data. Figure 1 on page 24 illustrates RAID 5 along with two other common RAID configurations.

An important point when considering RAID is that if a drive fails,

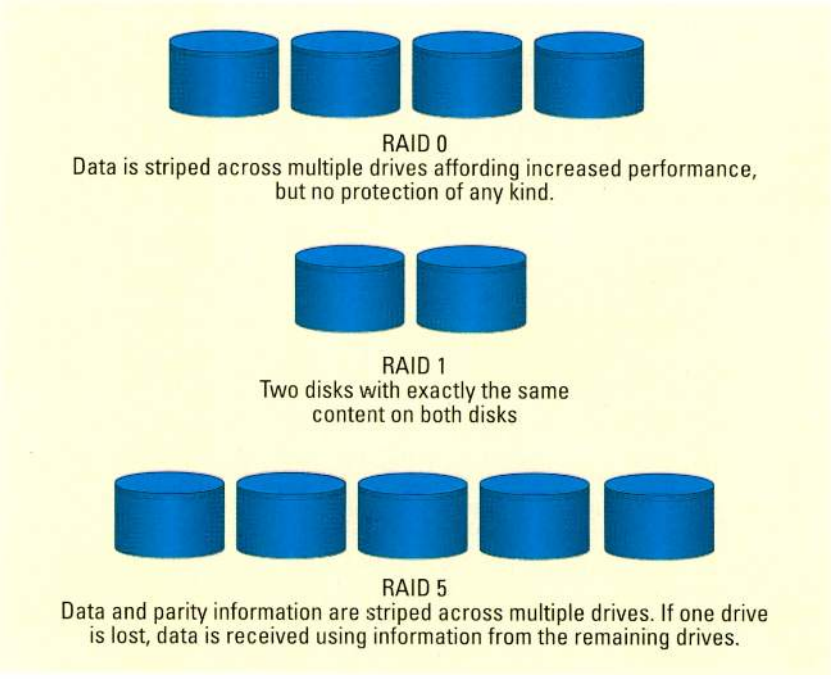
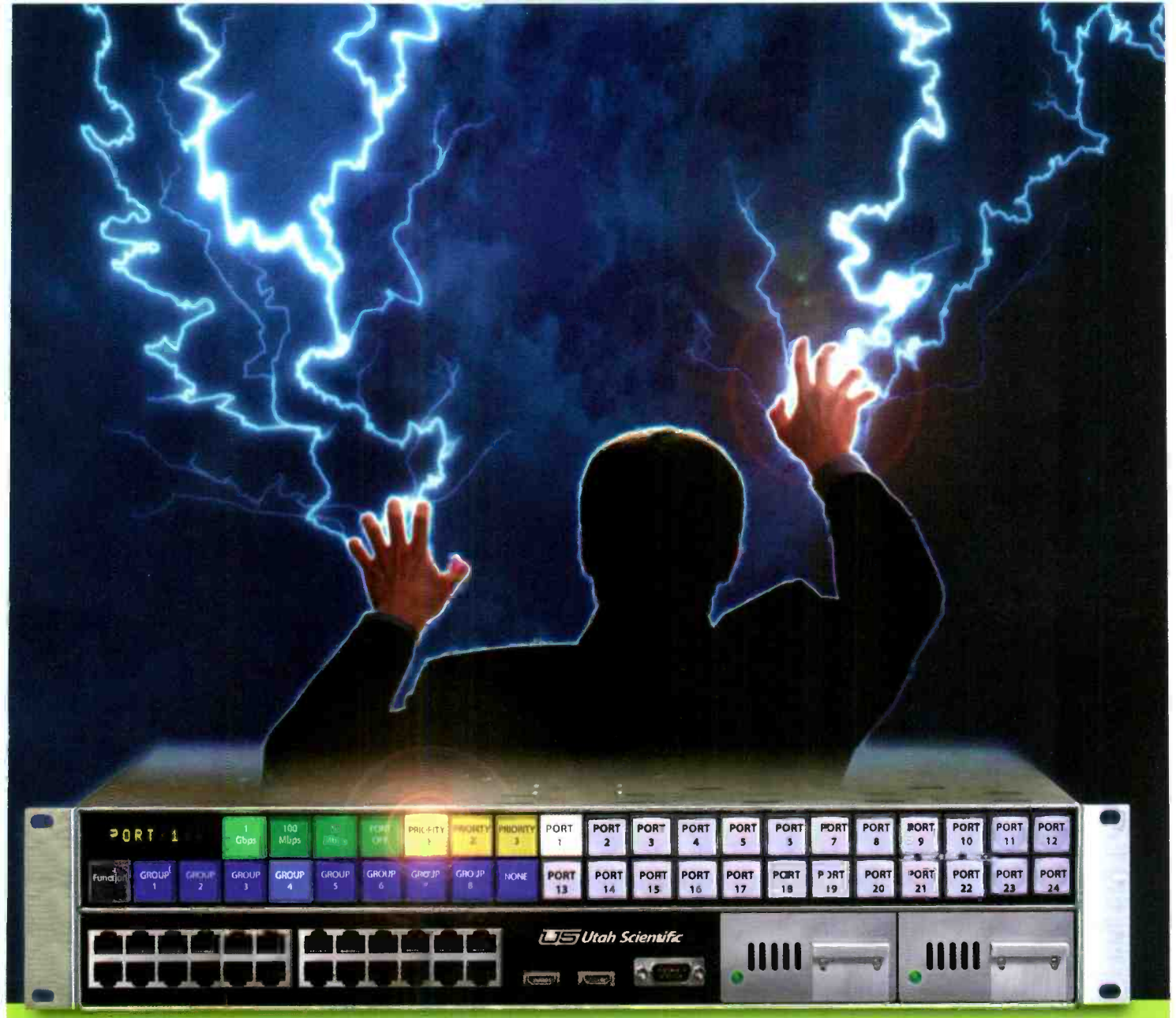


Figure 1. Many different RAID schemes exist. The two most commonly encountered by broadcasters are RAID 1 and RAID 5. RAID 1 mirrors all data onto two disks. RAID 5 stripes the data across multiple disks. You may hear about RAID 0 as well. RAID 0 stripes data across multiple disks to provide increased performance, but provides no redundancy in case of disk failure.



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the technology is so good that the operator will never notice unless he is looking at error logs or is notified by monitoring software. If a second drive fails before the first one is replaced, the failure will be catastrophic: All data on the drives will be lost. So it is extremely important to take advantage of all notifications provided by the server manufacturer regarding disk failures.

It is also key to understand what it takes to replace a drive and to rebuild the data so that the drive is back online. Many servers will rebuild the data on the new drive in the background, but some will not. Also, note that it may take a long time for the process to complete. This means that the system is vulnerable during the rebuild period. Another question to ask is whether the system performance is restricted during the rebuild process. In other words, if you lose a drive and replace it with a new one, are there things you cannot do because the server is busy rebuilding the drive?

To further protect the data, some RAID systems allow you to purchase extra drives and designate them as hot standbys. This means that a drive is instantly available if another drive fails — well, not quite. Actually, the drive is instantly available, but it does not contain any data. The system must still rebuild the data on the new drive. But in this case, you will reduce the exposure to a second drive failure by beginning the rebuild process immediately rather than waiting until someone notices the error and physically replaces the failed drive. Understanding RAID and its limitations can be an excellent way to protect yourself from drive failures in video servers.

Protecting the most important data

As I said earlier, when broadcasters think about protecting data, they almost invariably think about protecting the content. But there is other data that may be even more important than protecting the content itself. Most facilities contain some form of automation. In some cases, an automation failure means that normal operations cannot continue, and the on-air look suffers.

Again, a one-for-one backup is a simple solution, but in this case, not only is cost an issue, but controlling one server from two automation systems presents nontrivial issues. Also because most automation systems operate from a centralized database, it's critical to ensure that this centralized database remains available and that its data is protected.

One way to protect a centralized database is to store the data on a RAID drive, just as you would your content. While this may be sufficient, consider what it would mean if you lost all of the automation data. How long would it take you to reingest all of the material? How long would it take you to enter all of the metadata required to get the content on the air? This database is so important and the ramifications of losing it can be so serious that a belt-and-suspenders approach is appropriate.

Many different database technologies exist. One technology is SQL. It supports something called database replication. Replication allows the SQL server to duplicate the database onto a database running on another server in near real time. In fact, it is possible to design server/database systems such that the loss of one database or server is transparent to the application accessing the database.

Although database systems attempt to protect you from data corruption, errors can occur. And, of course, few systems will protect from human error. For these reasons, it is important to maintain a rolling backup of the database system. How frequently you back up this database depends upon how quickly it changes, but I would

recommend making backups at least once every 24 hours and keeping each backup for one week.

No matter how you decide to protect the automation database, invest the time to understand where the database resides and what protections are provided by your vendor. Finally, if you need to enable the backup database, switch over to the backup during a noncritical time to ensure that everything works properly, and be sure that the process you follow to change over is well documented.

Protecting critical apps

Lastly, consider how to protect your facility from the loss of a critical on-air application such as automation or ingest. If you dig into the automation system design, you may find that while all of the content is stored on RAID servers, the automation system software and automation database are all running on a single consumer disk drive. If that drive fails, you will be one busy maintenance guy.

Moving the database over to a stand-alone database server takes care of the database vulnerability, but what about the automation system itself? Of course, if you have the original CDs that the automation system came from, you can install a new drive and then reload the automation application. But all this takes time. A simple, low-cost solution is to buy a second drive just like the one in your system. During a maintenance period, install the drive in the automation computer, load the operating system and the automation software. Complete the configuration of the automation, and verify that everything is working properly. Shut down the system, and put the original drive back into the computer. Carefully label the backup drive, document what you did (including noting the version of the OS and automation software on the drive), and put it on the shelf. Now if the automation computer drive fails, all you need to do is install the backup drive, and you are back on the air. 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

On-air graphics push the limits of imagination ... at a price.

BY MICHAEL GROTTICELLI

In today's highly competitive television environment, on-screen graphics continue to be a key channel differentiator. There's no graphic too sophisticated or complex for today's audiences — be they high-definition, 3D, full-motion branding bugs or multilayered titles that transition on and off the screen in highly creative ways, or fully interactive maps and charts tightly linked to the Web that provide real-time updates of information and a clear message for the story being presented.

The ante continues to be increased for what can be done on screen to help tell a story or enhance a live broadcast. With the advent of widescreen HDTV sets in consumers' living rooms, static 2D images no longer cut it if you want viewers to take notice. The competition for eyeballs among sports broadcasts is especially tough, where full-motion images now take the place of player headshots, virtual technology is ubiquitous, and 3D models move in an out of the screen seamlessly.

A wide variety of cable channels now use full-motion logos or live video mapped on top of a program to promote another upcoming show, generated with a single channel branding solution. National news programs are getting high-tech with interactive maps that can zoom in to a particular street with the touch of the on-set plasma screen. CNN aired a holographic-like effect that virtually placed an off-site reporter in the studio for an interview with the show's host. So it appears there's no limit to what can be accomplished with the right art direction.

For years, stations at the local level have not been as innovative with their newscasts, preferring simple over-the-shoulder graphics. This is beginning to change, as ratings have become harder to come by. We're seeing multilayered 3D opens and bumpers being used like never before. However, stations now have fewer resources and are forced to do more with less staff, so there are limitations. The economy has not helped this scenario.

KCTV, the CBS affiliate in Kansas City, created this full-motion, 3D open with Vizrt software.

Finding the right model

Vendors in the space are working hard to provide tools that allow producers and graphics artists to design at all levels of multilayered sophistication to create new types of graphics in an intuitive way. This has resulted in a number of options for broadcasters, depending upon the business model and production workflow desired.

In addition to whiz-bang effects, manufacturers are also focused on making broadcasters as productive as possible by enabling all members of the staff to collaborate in the process. There are several workflow models being deployed among their respective product lines: single-box solutions, networked systems approach and a software-as-service (SaaS) subscription model whereby graphics tools are provided in a Web-based environment that are hosted by the manufacturer.

The Avid Deko line of character generators and graphics engines has been a mainstay of the broadcast business for many years. Teicia Gaupp, market segment manager for on-air graphics at Avid Technology, says that broadcasters want the ability to centralize the graphics creation process so that there's no duplication of efforts. There's also a need for distributed access of graphics among multiple departments of a media company, be it a single local station or a main network (broadcast or cable) production facility.

With the emergence of the MOS protocol several years ago, journalists using an Avid iNEWS or AP ENPS newsroom computer system now had the ability to create a graphic using prebuilt templates and then link that graphic element to a particular story. Because the templates are designed by a single artist, it also keeps a consistent brand image onscreen. And the same graphics can be saved in multiple formats that can be used in both TV programs and print campaigns. But the real driver of template graphics is that it allows

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Avid's Deko product line now accommodates the need for distributed access of graphics among multiple departments of a media company.

a station to maintain or increase graphics productivity without hiring more graphic artists.

Today, this access to graphics tools within the Deko product family has been extended to the editor, allowing the person cutting the video to create and insert graphics elements. This includes the latest Deko 3000 software, which supports the industry-standard FBX and Collada 3D formats, and enables users to import and playback 3D models and animations. This again saves time and money.

Virtual graphics

Orad Hi-Tech Systems has been a long-time player in the virtual set community. The company has moved aggressively into the sports broadcast arena, offering 3D title graphics and virtual insertion technology for interactive charts, graphs and even advertising. CBS Sports has used Orad's MVP enhancement tools for some of its live football and tennis broadcasts, enabling producers to zoom in and highlight a single player or play in real time. CBS also uses Orad's First Down Line system, which uses sensor-free image processing tracking technology to superimpose the yellow line and other virtual graphics over the playing field.

Shaun Dail, vice president of sales and marketing for North America at Orad, says resources (money and graphic artist talent) are the biggest hurdles stations are faced with when it comes to graphics production. In general, the companies that invest in newer technology are the ones gaining the highest ratings.

The company recently introduced an on-air graphics, branding and CG system that supports 3D as well as SD and HD resolution. It comes with a built-in tutorial on how to build different types of graphics. This type of low-cost channel branding box is offered by a variety of master control switcher vendors, including Evertz, Grass Valley, Harris, Miranda Technologies, Omneon, OmniBus Systems and Utah Scientific. EVS and Pixel Power offer similar products, in addition to their graphics and on-air display systems.

One of the latest graphics technologies from Orad is InterAct, a 3D graphically driven touch-screen system that works with any plasma or LCD display. The company has also developed a chromakey monitor that can control virtual objects within a virtual set. Another new Orad virtual technology, AutoCatch, enables a live telecast to keep a virtual ad in the shot. When a director takes a different camera angle, the system automatically remaps the image into each shot.

Cost-effective models

For broadcast networks and independent station groups across the country, sharing resources and reducing redundant processes has become standard production practice. These days, if you want to stay competitive, you have no choice.

For the Media General Broadcast Group, this philosophy has been extended to the creation of a centralized on-air graphics production initiative

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CNN used Vizrt's holographic-effect technology during the presidential elections in 2008.

and the implementation of an innovative workflow that saves capital and gets packages on the air faster. In the news business, faster time to air means higher ratings.

From its Broadcast Division headquarters in Richmond, Virginia, Media General has put together a team of digital design artists that produce design elements for the entire station group. It supports 23 full-power television stations in various midmarkets across the Southeast United States. The group is helping each station beat its respective local competition with the latest breaking news story and improving the on-air look of its diverse newscasts — all with fewer resources and less duplicate processes than the company used in the past.

Known as Media General FX (MGFX), the graphics hub is providing Media General stations with every type of on-air graphic element, from over-the-shoulder headshots to 3D maps, program bumpers and teases. They're using template-based graphics authoring and workflow tools from Miranda Technologies, in tandem with other graphic creation systems (After Effects, Photo Shop and Curious Maps), to create and distribute standard- and HD graphic elements in both the 4:3 and 16:9 aspect ratios. Participating stations simply order graphic elements from MGFX, and they become available via the Internet, sometimes within minutes of the request.

MGFX general manager Jim Doyle says that while economics certainly played a large role in setting up the project, the current driving factor is trying to achieve an inherent efficiency in how graphics are produced and used across the station group. It has helped Media General improve the quality of its newscasts and increases the quantity of graphics available to its stations on a daily basis.

Other stations groups, such as Sinclair Broadcast Group, have deployed similar centralized graphics production hubs.

With a rich history steeped in hardware- and proprietary software-based graphics systems, the name Chyron has been synonymous with on-air graphics for many years. This

year, while the company continues to offer its stand-alone HyperX systems for graphics production, it has also taken a decidedly different approach to helping station groups create graphics economically.

The company's Axis Web-based graphic tools provide a "Distributed Centralization" strategy that the company said brings stations substantial cost savings. The new software-as-service concept leverages "cloud" computing, whereby graphics elements are stored in a remotely located server, controlled by Chyron. The idea behind cloud computing is that it allows broadcast groups to have access to the high-quality graphics tools, via subscription licenses, without buying the actual hardware and software normally required. Gannett's 23 stations have adopted the Axis SaaS model and are using it on a daily basis.

How much is too much?

Remember that graphics can become too distracting. When CNN used the Vizrt holographic-effect technology during the presidential elections in 2008, it was not without some consternation. Executives at CNN apparently felt they needed to ensure that viewers knew the virtual reporter was not in the studio, so they defocused the edges of the virtual effect. This made the interviewee looks cartoonish, like a cheap "Star Trek" analog video effect.

During NAB, Vizrt and a company called STATS presented a live demonstration at the company's booth, which showed how problematic the technology can be for an inexperienced "guest" to use the system. The audio delay between an interviewer and interviewee can be quite disarming for someone not used to it.

The technique requires that a semi-circle of small cameras is positioned around the guest standing against a green screen in a remote studio. In the main studio, a single camera is fitted with special sensors that help position the virtual guest next to the live guest. The system uses STATS' video processing and tracking technology, in tandem with Vizrt's real-time tracking and rendering software. The impression of the holographic interview is completed in fractions of a second, and multiparticipant interviews are possible.

With current graphics technology, anything is possible given the right budget and talented artists. It all depends on the desired audience and the on-screen image you are trying to portray. Ratings and revenue will follow. BE

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

Examine workflows

Implementing BXF can be advantageous for your organization's flow.

BY CHRIS LENNON

A common misconception about the Broadcast Exchange Format (BXF) is that the technology is what's so interesting about it. While the technology and capabilities of BXF are indeed impressive and considerable, the workflow aspects are the most compelling. They are the most likely to have the biggest effect on organizations implementing BXF.

Few broadcasters decide to introduce new technology without a solid business case to support it. It can be expensive and disruptive if done without properly examining the reasons behind the implementation and the likely impact on the way business is conducted. Clearly, an understanding of the technology is required, but one must also consider how the technology will affect the people and workflows that it touches.

A good initial goal is to understand what you are trying to accomplish with a technology such as BXF. Do you hope to cut costs? Do you want to find new revenues? Is your plan to streamline operations? Once you identify your objectives, you can appreciate the deeper effects of the technological change on your organization.

It is critical to comprehend the significant workflow changes that something like BXF implies before rolling it out across your organization. Above all else, workflows with formerly loosely and poorly connected processes will be brought closer together with systems integration rather than interoperability being the key.

For example, many wonder whether BXF means that traffic and scheduling starts controlling automation. The answer is not simple. BXF does allow traffic and scheduling to dynamically update events on automation's playout list, exchange content metadata and automatically exchange content transfer information. This automates many previously manual processes. Whether it means that traffic and scheduling is taking over automation is up to how a particular organization chooses to adjust its workflow, staffing and even structure in response to the implementation of BXF. (See Figure 1.)

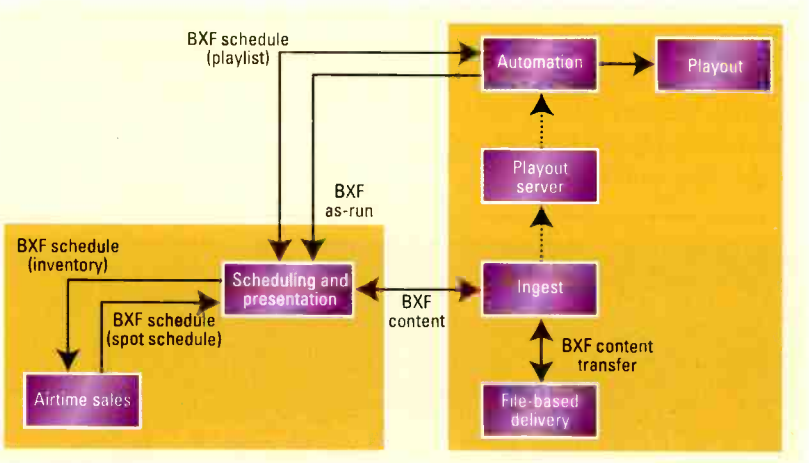


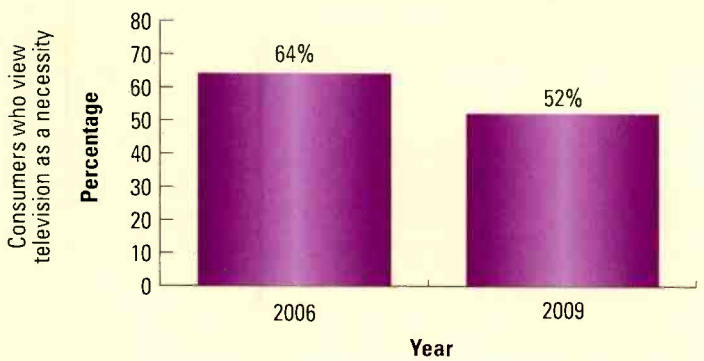
Figure 1. A typical broadcast workflow with sales, scheduling and playout linked by BXF data exchange

FRAME GRAB

A look at the consumer side of DTV

Televisions are less of a necessity for Americans

52 percent view TV as a necessity, down 12 percent from 2006.



Source: Pew Research Center

www.pewresearch.org

The capabilities of BXF

Schedule/as-run is the most commonly referenced component of BXF. The main benefit that BXF offers is the ability to dynamically tie together scheduling and playout areas so that

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changes in one area are automatically reflected in the other. This way, day-of-air program or commercial content changes can be made easily and seamlessly in scheduling — and playout is aware of these changes quickly and automatically. On the flip side, immediate as-run notification is also possible using BXF.

Content metadata can be easily shared among systems using BXF. The depth of content metadata supported is quite deep, both for program and nonprogram (commercial) content. This allows for more automated ingest procedures, as well as better synchronization among systems dealing with content metadata.

With content (both program and commercial) increasingly being delivered as files, the need to manage the transfer of this content in an automated fashion becomes more important. BXF allows systems to exchange transfer information and to automate the movement of content from source to destination.

With these three main areas of capability in mind, it is important to consider which parts of your organization would be affected by the introduction of BXF.

Sales

Clearly, the biggest impact here is in the area of schedule/as-run. The ability to make day-of-air changes to the schedule provides the sales team with greater flexibility in responding to customers' needs. The benefits here are potentially many, as are the workflow effects of automating this process. However, there's more than that. Allowing sales to make day-of-air changes has ripple effects. Among those may be pricing of spots, policy on what changes are permitted (perhaps a $1500 increment in revenue justifies a substitution of spots), and how close to air such changes can be permitted (again, a policy decision, not a technical one).

One other area in which BXF impacts sales is through its support of nontraditional revenue. This refers to ad revenue from items other than 30-second ads. BXF is equally adept at supporting sponsored logos, squeezes, voice-overs and any number of other nontraditional forms of advertising.

Again, before unleashing the sales force on all of these sources of revenue, it's important to consider the effects of booking more of these types of ads on other parts of the operation, such as traffic, playout and billing.

Scheduling

It all comes down to increased control over playout, which in itself can result in dramatic changes to the way scheduling is performed. When day-of-air changes are permitted, one must ensure that the extra work of initiating those changes is justified

by the incremental revenue associated with those changes.

Simply making schedule changes is only the first step. You must also have the content in place and ready to play out for newly placed ads. BXF can help with content and content transfer functions, but it is important not to overlook this key requirement.

Playout

Does BXF mean that everyone related to old-style playout and automation is out of a job? Probably not, but it does mean that they will be able to focus on the most important aspect of their job — ensuring that the on-air product is of the highest quality.

Although BXF enables increased automation of formerly manual processes, it can also complicate playout by placing increased demands on it. More frequent and complex schedule changes, along with the content movement and metadata demands implied by these, can put additional strain on the infrastructure and systems you use for playout. Be sure they're up to the task.

Ingest

Increased automation in content metadata exchange and the transfer of content results in more automated and accurate ingest of material. Though it may mean reduced headcounts, it also frees up people from mundane tasks like ingest so that they can focus on more critical items directly connected to revenue.

Billing

Near real-time as-run information is not only a boon to sales, but also to billing. There's more to it than that, though. Benefits run the gamut from simpler reconciliation to more accurate billing and fewer discrepancies.

The most important thing to remember is that billing is downstream of almost every BXF-related workflow change you introduce within the organization. However, it's easily overlooked. There can be great advantages to billing as a result of using BXF, but there can also be trickle-down effects that complicate things at this level.

Conclusion

This overview is to get you thinking about how BXF may impact your operation. The best way to get started is to consider an alternate meaning of the BXF acronym: Begin by examining flows. Remember, technologies such as BXF are great, and, if implemented thoughtfully with regard for their workflow impacts, they can be powerful. However, if simply put in place with a "let's see how this works" attitude, your results may not be what you hoped for. BE

Chris Lennon is director of integration and standards for Harris Broadcast Communications.

Managing HDTV sound

5.1 audio implementation requires comprehensive understanding.

RANDY CONROD

Proper management of 5.1 surround-sound audio is the latest challenge facing broadcasters as they continue to enhance the overall HDTV experience in the home. In many ways, managing the rollout of 5.1 audio is proving to be more difficult for engineers than the HDTV rollout itself.

Defining audio

To help define the terms used today in audio processing, Figure 1 lists typical audio types (including a future 7.1 surround-sound scenario), and Figure 2 on page 41 lists the typical audio conversion types (encoding, decoding, upmixing and downmixing).

The process of compressing audio into a non-PCM compressed signal is typically called encoding; when it is decompressed back to PCM, it is called decoding. A downmixed signal may or may not have additional inaudible information that can be used for a downstream upmix. Downmixed signals are monitored in stereo unless the signal needs to be upmixed for monitoring purposes (Pro Logic I and II, DTS Neural Surround), and non-PCM signals sound like white noise when monitored.

Monitoring audio

The majority of "true" 5.1 audio is provided by tapes or ingested via satellite in today's HDTV systems. One of the first challenges is the monitoring of the audio. Options include downmixing the 5.1 surround sound or setting up a 5.1 amplifier and speakers. There is also the issue of how to monitor a mono mix of the stereo signal, as well as Dolby E, Dolby Digital AC-3 and Pro Logic II signals as they are encountered. All of these scenarios have to be carefully considered.

In many ways, managing the rollout of 5.1 audio is proving to be more difficult for engineers than the HDTV rollout itself.

Audio provided as three PCM channels, either as AES or embedded into the SDI signal, can be downmixed for monitoring in stereo or in surround sound. A downmix will be provided in most cases (5.1 + 2.0) and is required in the monitoring chain. Audio that has been compressed using Dolby E technology must be decompressed. However, this can lead to lip-sync issues because the compressed non-PCM audio may or may not be prealigned for the one frame of delay apiece incurred during compression and decompression. The picture monitor also can impart its own delay, which may or may not help the lip-sync timing.

If the audio was compressed into Dolby Digital AC-3, decompression is not recommended, because this signal is meant to be decompressed once in the home environment. If recompressed, artifacts will result in lower quality.

Pro Logic also may need to be upmixed for monitoring. Figure 3 on page 42 shows the various types of monitoring required.

Lip sync

Lip sync is proving to be another issue in 5.1 audio delivery. It has been said that today's larger screen sizes make it easier to see lip-sync issues. If this is true, lip sync becomes even more apparent in HDTV and surround sound. A broadcaster or cable/

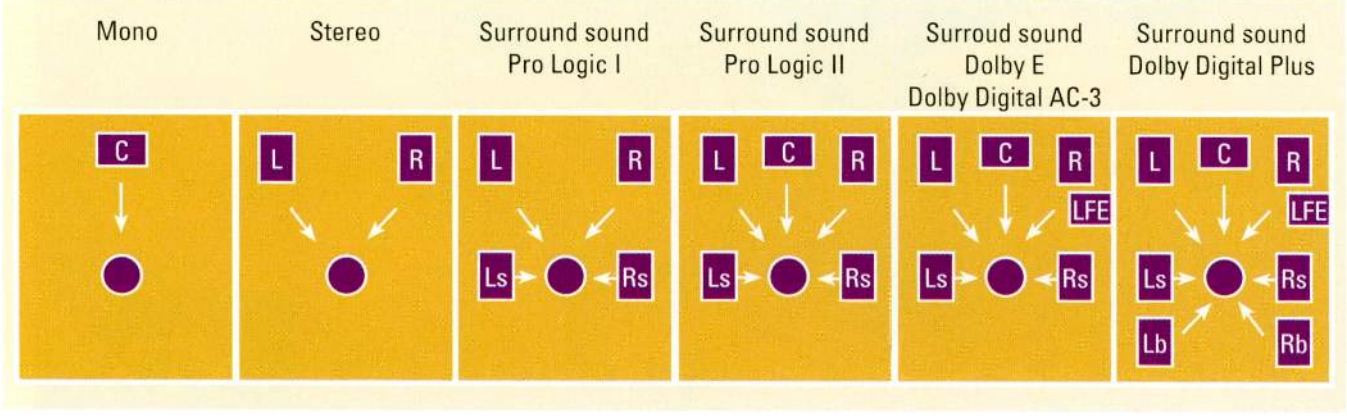

Figure 1. Monitoring setups for various audio types

The 2010 World Cup will be hosted in South Africa with football matches being played in 10 stadiums. The DVB-S2 standard and Comtech EF Data's CDM-710 Broadcast Satellite Modems will power the video uplink services between the 10 stadiums and the broadcast hub, enabling the bandwidth-efficient transmission of the tournament's HDTV coverage to billions of viewers globally.

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satellite distributor can control lip sync up to the point it is decoded in the home environment, and many lip-sync errors can be predicted, measured and repaired using today's technology. There are methods of placing a known video and audio test signal, passing it through a system and then offsetting to the measurement.

Processing audio

Another pressing issue is what to do if 5.1 surround sound is not provided within the content. There are two methods with which to address this issue. The purist's method is to continue to move stereo audio into the home environment. However, dynamic audio metadata is used to signal the receiver in the home for the 2.0 stereo or 5.1 surround-sound content. This is known to cause clicks, pops, muting and other issues in the home, because not all receivers react to audio metadata in an inaudible fashion.

The other method is to upmix the audio from stereo to 5.1 surround sound. It is important to perform listening tests to determine whether the upmix sounds natural in the surround-sound domain. Also, listen for any audible artifacts when the input transitions between 2.0 and 5.1. Upmixing provides a constant surround-sound experience in the home environment through the use of static audio metadata.

Moving audio in today's facilities can be simple if the audio is embedded. It becomes more complicated if AES interfaces are used. Today, 75Ω unbalanced interfaces are mostly used, with occasional use of balanced 110Ω interfaces. Existing embedded audio equipment handles all four groups of embedded audio (16 total channels, four per group), but interfacing to older embedded audio equipment can cause problems because all four groups may not be handled.

Even if an older-generation embedder/de-embedder handles two groups, the other two may not be identified properly. This can cause issues with newer embedders/de-embedders that can handle four groups of audio. A guard band for embedded Dolby E must be implemented so there is an alignment between the video and Dolby E header for proper de-embedding downstream relative to the video. Also be aware of old de-embedders in a system because they may not de-embed the audio phase aligned across the three PCM channels for surround sound. This will affect the surround-sound audio.

If interconnection is considered a minor annoyance, then the mapping of the audio across many channels can be downright problematic, because an industrywide standard does

Number	Type	Mix	Transport	Technique	Monitor	Type	Comment
Eight	Digital	7.1	AES (PCM)	Compressed (non-PCM)	L, C, R, Ls, Rs, Lb, Rb, LFE	Dolby Digital Plus	One-pass VBR
Six	Digital	5.1 + 2.0	AES (PCM)	Compressed (non-PCM)	L, C, R, Ls, Rs, LFE plus another two channels	Dolby Digital E	Multiple-pass VBR
Six	Digital	5.1	AES (PCM)	Compressed (non-PCM)	L, C, R, Ls, Rs, LFE	Dolby Digital AC-3	One-pass CBR
Six	Analog or digital	Stereo	Lw, Rw	Water-marked	L, C, R, Ls, Rs, LFE	DTS Neural Surround	One pass
Five	Analog or digital	Stereo	Lt, Rt	Matrix	L, C, R, Ls, Rs	Pro Logic II	One pass
Four	Analog or digital	Stereo	Lt, Rt	Matrix	L, R, Ls, Rs	Pro Logic I	One pass
Two	Analog or digital	Stereo	Lo, Ro	Two channels	L, R	Stereo mix	
One or two	Analog or digital	Mono or stereo	Lo, Ro	One or two channels	C or L, R	Descriptive video	Mono, double mono or stereo mix
Two	Analog or digital	Add to mix	AES (1)	Two channels	Ls, Rs, Lb, Rb	Natural sound	Added to the mix for enhancement purposes
One	Analog or digital	Mono	AES (2)	Two single channels	C	Mono mix	

Figure 2. Typical audio types detailed

Number	Type	Mix	Transport	Technique	Monitor	Type	Comment
Eight	Digital	7.1	AES (PCM)	Compressed (non-PCM)	L, C, R, Ls, Rs, Lb, Rb, LFE	Dolby Digital Plus	One-pass VBR
Six	Digital	5.1	AES (PCM)	Compressed (non-PCM)	L, C, R, Ls, Rs, LFE plus other two channels	Dolby Digital E	Multiple-pass VBR
Six	Digital	5.1	AES (PCM)	Compressed (non-PCM)	L, C, R, Ls, Rs, LFE	Dolby Digital AC-3	One-pass CBR
Six	Analog or digital	Stereo	Lw, Rw	Water-marked	L, C, R, Ls, Rs, LFE	DTS Neural Surround	One pass
Five	Analog or digital	Stereo	Lt, Rt	Matrix	L, C, R, Ls, Rs	Pro Logic II	One pass
Four	Analog or digital	Stereo	Lt, Rt	Matrix	L, C, R, Ls	Pro Logic I	One pass
Two	Analog or digital	Stereo	Lo, Ro	Two channels	L, R	Stereo mix	
One or two	Analog or digital	Mono or stereo	Lo, Ro	One or two channels	C or L, R	Descriptive video	Mono, double mono or stereo mix
Two	Analog or digital	Add to mix	AES (1)	Two channels	Ls, Rs, Lb, Rb	Natural sound	Added to the mix for enhancement purposes
One	Analog or digital	Mono	AES (2)	Two single channels	C	Mono mix	

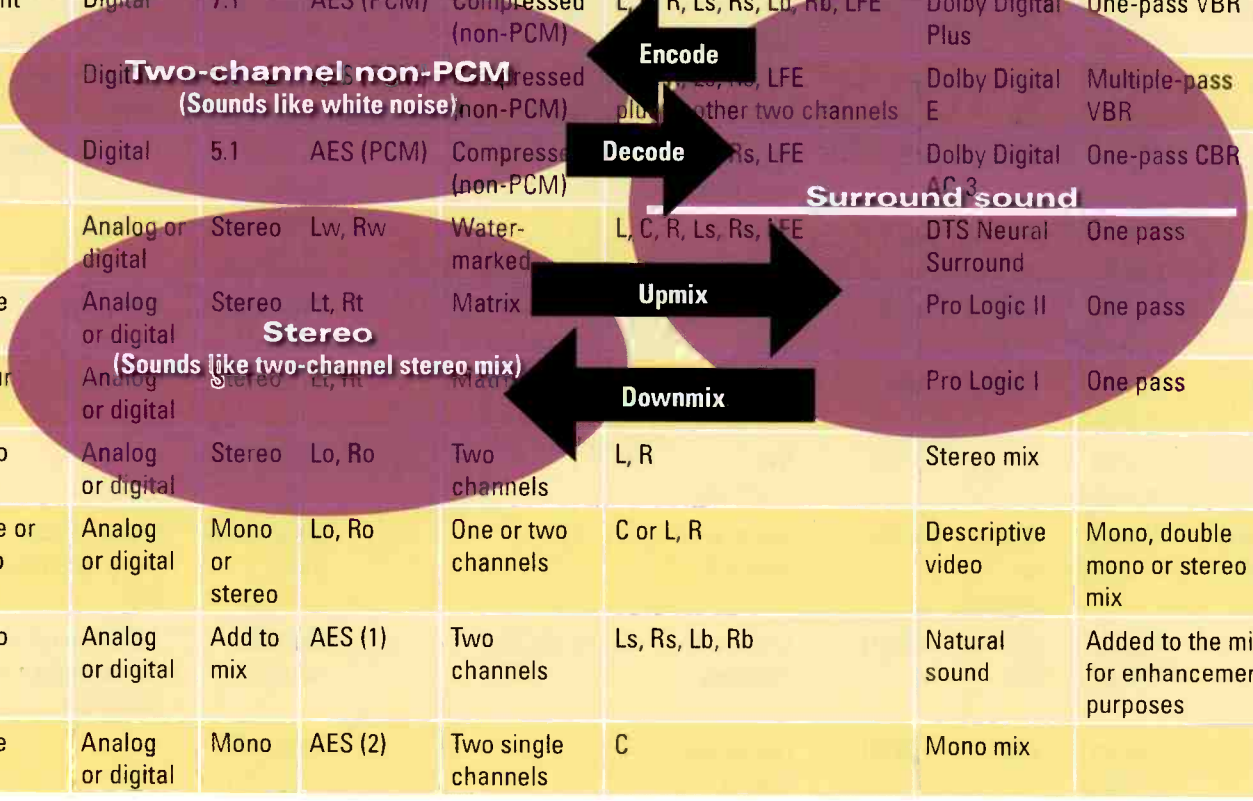

Figure 3. Typical audio conversion types

not exist. TV networks have different ways of processing and mapping audio. Equipment that can easily be routed for audio processing is necessary whether the interface is AES or embedded, and using detection can assist with the different mappings. PCM and non-PCM can be detected, but identifying Dolby E versus Dolby Digital can be difficult.

Other than the 5.1 + 2.0 scenario that exists for stereo and surround sound in today's content, there is also secondary audio information that must be considered, which may be another language or descriptive video. Stereo or an upmix can be provided in cases where 5.1 is not present; however, handling the secondary audio program requires additional audio processing. If no descriptive video audio content exists, it is typically substituted by the stereo signal or a sum of the stereo signal.

5.1 in the home environment

Even if the audio is provided as 5.1 in the home environment, proper setup of the home receiver is necessary to ensure the best possible sound. Speaker placement and level alignment are important, as is the setting of the Dynamic Range Control (DRC). This will eliminate the need to reach for the volume button on the remote control every time the audio is too loud or soft.

Conclusions

There are many considerations for audio processing in today's 5.1 systems. Accommodations for monitoring the various forms of audio must be made. Lip sync will continue to rear its ugly head as systems become more complex, so a solid understanding of where lip sync can go wrong is critical.

The procedures for mapping the various channels of audio at the input and output of a system must also be well understood, and it is critical that processing be in place to handle every scenario. Audio can be transported as AES or embedded, PCM or non-PCM, and stereo or surround sound, and there may be other content that needs to be considered such as a secondary language or descriptive video.

The complications that may arise from either the purist's or nonpurist's methods of upmixing stereo must also be understood, because there may be audio metadata and upmixing issues that create unnatural sound. And, of course, correct home receiver setup is critical for the best possible surround-sound experience. BE

Randy Conrod is product manager of digital products for Harris Broadcast Communications.

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www.360systems.com

Ki Pro — AJA Video

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530-274-2048; www.aja.com

Tahoma LE-4 — Apantac

Multiviewer auto-detects four video inputs; supports DVI, HDMI and VGA outputs up to 2048 x 1080; incorporates a built-in Cat X extender, which allows digital 1080p signals to be extended up to 115ft.

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256-430-4000; www.avocent.com

Floorman — BAL Broadcast

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+44 1782 717840; www.bal.co.uk

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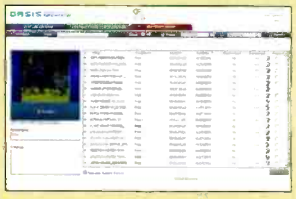
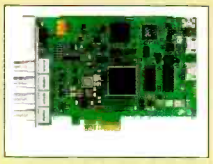


Content distribution system bypasses satellite deliveries of news by allowing content producers to buy, sell and exchange broadcast-quality video over the Internet; ties into local TV stations' production processes and gathers local content automatically.

949-253-9000; www.bitcentral.com

Decklink HD Extreme — Blackmagic Design



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www.blackmagic-design.com

CynerG² — Compix

HD-ready, dual-channel graphics system available in analog, SD-SDI and HD-SDI models; operators can leverage the functionality of both channels to create multiple overlays with the system's built-in downstream keyers; features more than 260 effects.

949-585-0055; www.compix.tv

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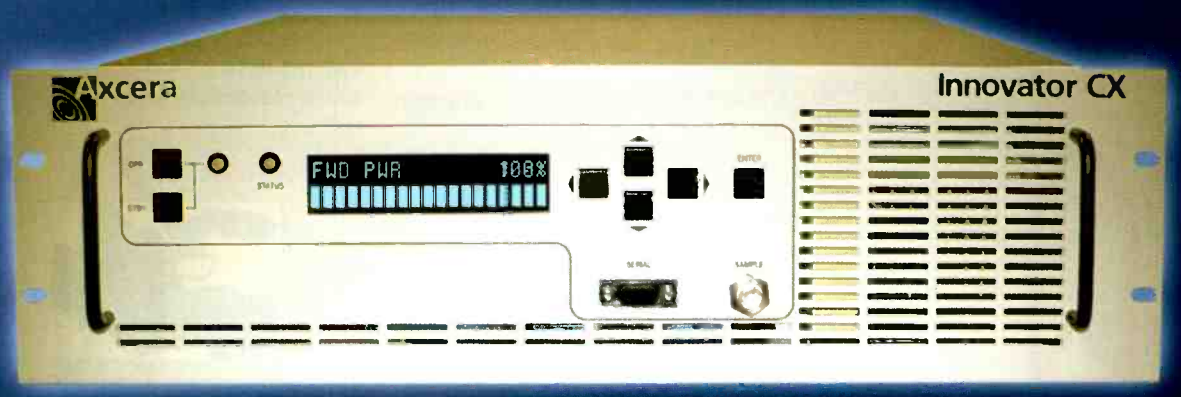

Axcera offers complete end-to-end DTV conversion solutions for Community Broadcasters. These systems are designed to get your digital signal on the air quickly, with Axcera quality at a very reasonable price.

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PICKHITS

PICK HIT BroadcastEngineering 2009

Atem — Echolab

Features of the 1 M/E 3Gb/s 1080p/60 production switcher include four upstream and two downstream keyers, as well as Echolab's SuperSource crosspoint and Stinger transitions; this makes it possible to build a composition of as many as 11 layers; offers 10 mixed-format inputs with built-in synchronization and scaling so that every input accepts SD or HD signals.

978-715-1020; www.echolab.com

STINGRAY ESR-UDP series — ERI

Dual polarized broadband UHF panel antenna features corrosion-resistant construction and custom-designed antenna support structures; modular construction facilitates ease of installation and custom modification; offers wide radiating slots and a completely enclosed, pressurized, internal feed system.

812-925-6000; www.eriinc.com

IntelliTrak — Evertz

Lip sync analysis technology measures the lip sync error between the audio and video by analyzing the content in real time; does not introduce any type of watermarking or flag insertion into the stream; designed for on-air use; works with all types of audio and video signals.

877-995-3700; www.evertz.com

IP-9500 4.0 — Fujitsu

MPEG-4 AVC encoder enables the simultaneous transmission of HD signals using 4:2:0 and 4:2:2 chroma subsampling, allowing broadcasters to efficiently use either format based on their existing infrastructures; integrates a process for maintaining nondegraded 4:2:0 chroma resolution to preserve picture quality throughout the entire communications link.

408-746-7000; www.fujitsu.com

K2 Summit/K2 Dyno — Grass Valley

K2 Dyno replay controller, coupled with the K2 Summit production client, is designed to help sports producers and other professionals capture live events and instantly replay HD content at variable speeds.

530-478-3000; www.grassvalley.com

Kayenne — Grass Valley

Production switcher family offers up to 96 inputs and 48 outputs in a single frame; offers from 1.5 to 4.5 mix effects; features six keyers per M/E and 20 channels of DPM, including a four-channel eDPM with two combiner outputs.

530-478-3000; www.grassvalley.com

Maxiva — Harris

Transmitter range consistes of two product families: the Maxiva ULX series of liquid-cooled transmitters for high-power UHF applications and the Maxiva UAX series of air-cooled, solid-state transmitters for low-power UHF transmission.

800-231-9673
www.broadcast.harris.com

I-asigN — Hi Tech Systems

Software configures the asigN control panels, which can be connected to a wide range of equipment to provide push-button switch control as an alternative to computer keyboards and mice.

+44 1256 780880
www.hitechsys.co.uk

DVB-1700 — J7 Broadcast

LCD monitor is able to monitor and decode both MPEG-2 and MPEG-4 streams; provides a high-resolution display of the compressed DVB-ASI stream.

408-782-9514
www.j7broadcast.com

GY-HM700 — JVC

Compact, shoulder-mounted HD camcorder records directly to inexpensive SDHC memory cards in the QuickTime format for Final Cut Pro, and optionally to SxS media compatible with Sony's XDCAM EX format.

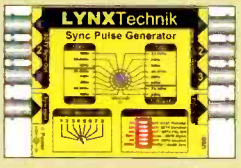
973-317-5000; www.jvc.com/pro

1x1 Bi-Color — Litepanels

Soft, high output light uses both 3200°K and 5600°K LEDs in a single housing; lets users quickly dial up any color as well as adjust color temperature instantly.

818-752-7009
www.litepanels.com

Yellobrik SPG 1707 — LYNX Technik



Portable sync generator features genlock with full cross lock capability; provides three HDTV tri-level sync outputs as well as three SDTV bi-level sync outputs; supports all SD, HD and composite (PAL/NTSC) video formats.

661-251-8600
www.lynx-technik.com

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PICKHITS

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Kaleido-X16
Miranda

Ultra-quiet 1RU multiviewer has 16 video inputs, two multiviewer outputs and an integrated 16 x 2 router; can be used with 3Gbps/HD/SD and analog video; provides 3-D stereoscopic monitoring with signals that conform to SMPTE-372M or SMPTE-425M Level B.

514-333-1772; www.miranda.com

BXX-14
Neutrik

With the standard XX-Series XLR connector providing for cable diameters of 3mm to 8mm maximum, the BXX-14 XLR bushing and chuck-style strain relief provide for today's use of larger cable diameters.

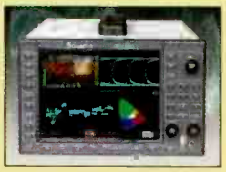
732-901-9488; www.neutrik.com

MediaDeck GX
Omneon

Channel playout solution combines video server playout, graphics and advanced audio processing, operating under the control of an automation system; seamlessly unites three key components of a typical channel chain: the MediaDeck transmission platform, a branding and master control module, and template-based graphics software.

408-585-5000; www.omneon.com

OTM 1000
OmniTek



Waveform monitor and signal generator is compatible with all single- and dual-link SDI formats at 270Mb/s, 1.5Gb/s and 3Gb/s; contains an optional physical layer analysis package, providing jitter measurements and a production eye diagram display for 3Gb/s signals.

+44 125 634 5900; www.omnitek.tv

AG-HPX300
Panasonic

Low-profile, shoulder-mounted HD camcorder records to P2 solid-state media; features individual-frame AVC-Intra recording and variable frame rates; relies on three 1/3in, 2.2-megapixel MOS image sensors.

201-392-4127; www.panasonic.com

SxE
Phabrix

Handheld test and measurement instrument contains a generator, analyzer and monitor with support for 3G-SDI, HD-SDI and SD-SDI; displays eye and jitter diagrams with filter selection for timing and alignment measurements on its 4.3in 16:9 color TFT screen.

+44 1635 255494; www.phabrix.com

Decimator-Quad
Redbyte Design

Mini 3G/HD/SD-SDI four-to-one quad split or downconverter with four-to-one input multiplexer offers a choice of either an NTSC or PAL output, linked SD-SDI and composite outputs, and four 3G/HD/SD-SDI inputs with auto-detection.

949-597-1053
www.redbytedesign.com

Mach HD
Snell

Compact HD/SD motion-compensated standards converter is equipped with up/down/crossconversion and synchronization capabilities; packages the company's motion-compensated standards conversion in an entry-level product that lets broadcasters make a smooth transition to HD transmission.

818-556-2616; www.snellgroup.com

HSC300
Sony

HD studio camera is compatible with Sony's existing large lens adaptors; can be used with triax cable runs of up to 1300m; features a 2/3in Power HAD FX CCD with 2.2 million pixels; switchable between 1080i and 720p 50/60Hz, with 525i and 625 SD modes available from the camera head and CCU.

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

Pipeline HD Dual
Telestream

Two-channel hardware encoder captures HD video from SDI tape or live sources and encodes it in real time to HD editing formats, including Avid DNxHD, Panasonic DVCPRO HD and Apple ProRes 422.

530-470-1300; www.telestream.net

VuLink VL300
VubIQ

Wireless uncompressed video link eliminates the need for a cable connection for video transport with no compression or coding of the video stream; transports uncompressed HD video up to 100m at 1.485Gb/s.

949-226-8482; www.vubiq.com

AMP 1-16 series
Wohler

Out-of-the-box 3G audio management and monitoring system manages, monitors and meters up to 16 channels of audio simultaneously; features include a proprietary loudness metering system, and live mute and solo modes.

510-870-0810; www.wohler.com

For expanded Pick Hits coverage, visit our Web site at www.broadcastengineering.com

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Audio highlights

There were plenty of new digital products at NAB.

BY COLLIN LAJOIE, ASSOCIATE EDITOR

It was clear by the attendance in the North Hall, where many of the audio companies resided, that audio definitely was not playing second string to other technologies at this year's NAB Show.

DTV-ready monitoring

Continuing the DTV transition, many companies showed new or updated audio monitoring systems. Wohler Technologies introduced the AMP2-16-3G, an audio monitor that displays up to 16 channels of embedded audio within a single 3Gb/s signal. It permits near-field

Wohler AMP2-16-3G

monitoring for any mix of stereo and mono sources in a 2RU package and supports demuxed outputs of eight AES pairs on BNC connectors, as well as a reclocked loop output of the 3Gb/s signal.

TSL unveiled its PAM1-3G8, a compact, multichannel Dolby D/E monitor. The 1RU unit supports all standards up to and including 1080p 60Hz and enables comprehensive monitoring of discrete 5.1 or Dolby encoded audio. The front panel features bar graphs for loudness, plus Dolby metadata information. It has internal loudspeakers, stereo downmix capability and displays incoming video.

For master control rooms, Studio Technologies showed the 76DB/77B surround monitoring systems, which offer multisource selection, dialnorm support, one-touch access of stereo and mono downmix, channel solo and level adjustment. They also provide both analog and digital speaker outputs. The Model 76DB Central Controller is rack-mountable and offers two surround (5.1) and three stereo (two-channel) digital inputs that are compatible with AES3 sources. The unit directly supports sample rates of up to 192kHz and bit depth of up to 24.

Audio consoles

Calrec introduced the new Apollo, which integrates an updated version of its Bluefin technology, Bluefin2. At 48kHz operation, Apollo provides up to 1020 channel-processing paths, 128 program busses, 96 IFB/track outputs and 48 auxiliaries. At 96kHz, it offers 510 channel-processing paths, 64 program busses, 48 IFB/track outputs and 24 auxiliaries. It also features OLED displays, touch screens and light-emitting knobs, in addition to an integrated Riedel Artist intercom system.

Solid State Logic featured the C10 HD console, which offers many of the benefits of the C100 HD but is designed for smaller stations. The C10 HD integrates all DSP signal processing and operating hardware into a convection-cooled control surface.

Wheatstone introduced three new consoles. For major market opera-

Wheatstone D-5.2

tions, the D-5.2 accommodates up to 146 faders. For small and midmarket stations, the D-8 surround-sound console is a full-featured 30-fader mixer with touch-screen control. Finally, the company's D-16 is an updated version of its D-12 with eight

added aux sends, all sized for small rooms and OB trucks.

Encoding

Harris showed the integration of DTS Neural Surround UpMix, DownMix, MultiMerge and Loudness Control options into its audio and video processing products.

Jünger Audio Level Magic

Jünger Audio showcased its Level Magic technology, which provides a fully integrated workflow for managing surround sound and Dolby coded 5.1 audio signals in production, ingest and playout environments. The company also showed the C8086-8, an eight-channel DSP card that incorporates a Dolby Metadata Generator option, which enables users to verify, modify or generate metadata, including dialnorm.

Dolby's new DP569 audio encoder supports encoded bit ranges of 56kb/s to 640kb/s and channel configurations from mono to 5.1 channel surround sound. The unit features selectable sample rate converters on the inputs and is capable of creating SMPTE 339M time stamp data bursts for sync with downstream equipment. Designed for DTV and disc-authoring applications, it supports all metadata including the Dolby Digital Surround EX flag that enables downstream consumer A/V receivers and decoders to recognize the format.

Mics and wireless systems

Audio-Technica introduced the BP896, a subminiature, omnidirectional condenser lavalier measuring only 2.5mm in diameter. It also showed the BP4071L shotgun mic, which provides greater directionality even though longer shotgun mics typically become omnidirectional.

Wireless mics were in many booths. Lectrosonics featured its D4 digital wireless system, with a four-channel point-to-point design that operates in the ISM band of 902MHz-928MHz. The system has both analog and digital I/Os and is extremely portable. AKG showed its DMS-700, which operates with two frequency bands, each band providing a tuning range of up to 155MHz. Sennheiser introduced the 2000 series, featuring Ethernet addressability and integrated antenna splitting for up to 16 channels. BE

New camera technology

Shooters can get higher quality at a lower cost.

BY ANGELA SNELL, ASSOCIATE EDITOR

When it comes to cameras, today's broadcasters are looking for both cost-effective and high-quality solutions. At NAB 2009, manufacturers provided plenty of new products that meet both goals.

HD quality for less moola

Canon introduced the new BU-50H, a turnkey HD lens-camera system that features an indoor pan/tilt head, a built-in 20X zoom lens and a 3CCD HD. The system offers control of the pan-tilt head, lens functions and key video adjustments. It outputs an uncompressed HD-SDI (or SD-SDI) signal. Each SD (VBS) signal and HD-SDI signal can be output simultaneously, enabling the HD-SDI signal to be recorded while the SD signal is used for monitoring. In addition, it features a genlock function for video system synchronization.

Grass Valley announced the LDK 3000 camera designed for studios and production facilities that need to shoot high-quality HD, but are on a tight budget. The series uses the company's Xensium CMOS imagers and is built on the same physical platform and to the same standards as the LDK 8000. The camera features three 2.4 million pixel CMOS imagers, allowing the camera to switch between 1080i and 720p. A low-cost option also enables users to shoot film-style in 25p and 29.94p. The LDK 3000 also uses an HD triax transmission system, permitting about 0.75mi cable runs.

Ikegami showed its affordable, portable multiformat HD CMOS camera supporting both 1080i/720p HD formats, lower power consumption and a reduced operating temperature. The docking-style camera comes packaged with the new CCU-890T camera-control unit for triax connectivity.

Panasonic caught the attention of NAB crowds — and *Broadcast Engineering*'s Pick Hit judges — with its new 10-bit, 4:2:2 HD AG-HPX300 camcorder. The 8lb shoulder-mount

Panasonic AG-HPX300

camera records to P2 solid-state cards. It relies on proprietary 1/3in 3-MOS sensors and features 10 stops of dynamic range, interchangeable lenses and the choice of AVC-Intra 100 and AVC-Intra 50 compression. It also offers a 1/2in LCOS color viewfinder, low power consumption (18W with battery and light), and it can capture individual frame images in 100Mb/s DVCPRO HD quality.

Sony brought to NAB the new HSC300 camera, which uses triax cable, making it compatible with current cable installations. The camera is compatible with Sony's existing large lens adaptors and can be used with triax cable runs of up to 0.8mi.

Sony HSC300

It features a 2/3in Power HAD FX CCD with 2.2 million pixels and is switchable between 1080i and 720p 50/60Hz, with 525i and 625 SD modes available from the camera head and CCU. The camera offers comprehensive image controls with wide dynamic range and a 14-bit A/D. The HSC300 was also a *Broadcast Engineering* Pick Hit winner. (Turn to page 44 for a full listing of the Pick Hit winners.)

With the growing trend in one-man-band journalism, broadcasters are looking for inexpensive cameras that are lightweight and easy to use. JVC unveiled its new compact shoulder-mount professional camcorder, the GY-HM700. This Pick Hit winner records directly to SDHC memory cards in the QuickTime (.MOV) format and optionally to SxS media. It allows instant editing of recorded material without file conversion. Users can drag video clips directly from the storage media onto an NLE timeline. The unit provides two memory card slots providing more than six hours of continuous HD recording at 35Mb/s.

JVC GY-HM700

Low-cost lenses

Fujinon introduced the XA50X9.5BE-SM HD telephoto lens designed to work with ENG-style 2/3in HD cameras. The 45lb lens features an integral camera supporter that does not require additional camera gear to hold the lens.

The lens has 50X magnification and a 9.5mm-475mm focal length, which can provide a tight shot at 100ft. A remote-control 2X extender is standard. The maximum relative aperture is 1.7 from 9.5mm to 311mm and only 2.6 at 475mm. The minimum object distance is 9.8ft, and the lens features the company's Digi Power digital servo control system. BE

ENG at NAB

IP connectivity sparks interest at the show.

BY PHIL KURZ, "ENG UPDATE" E-NEWSLETTER WRITER

The NAB Show opened this year about two-and-a-half weeks after Sprint-Nextel filed its latest update with the FCC on the status of 2GHz Broadcast Auxiliary Service relocation. A major takeaway from the filing was reflected on the exhibition floor of the Las Vegas Convention Center: The industry is on the downhill side of the relocation project.

That's not to say that a lot of work doesn't still remain. However, the net effect of having more than 50 percent of the 2GHz BAS licensees in possession of the radios, controllers, antennas and other equipment needed to complete the job is allowing both engineers and vendors to focus on other newsgathering and RF concerns.

Newsroom on the go

One such concern is extending the reach of the newsroom to the field, essentially transforming a reporter's laptop into just another terminal on the newsroom's network. Internet connectivity brings this concept to life and, as an added bonus, gives budget-conscious stations a way to communicate with and control technology in the vehicle, thus reducing technical headcount required in the field.

This concept isn't new. Broadcast Microwave Services, Microwave Radio Communications and Nucomm have shown ENG IP-connectivity solutions for at least three years. However, new this year was the heightened interest by broadcasters in ENG IP connectivity. As John Payne IV, VP of engineering for Nucomm and developer of the company's Messenger IP encapsulator/decapsulator put it, "We might have been a bit ahead of our time a few years ago when we rolled this [Messenger] out, but with the BAS project winding down, we've seen a lot of broadcasters beginning to recognize the value of connecting via IP with their ENG vehicles."

Besides highlighting Messenger, Nucomm introduced its ProQ Low Latency Audio Multiplexer designed to work with the ProQ Receiver to create a complete digital IFB. The system can multiplex up to eight IFB channels, requiring just 200kb/s of the ATSC signal. Audio is encoded with MPEG Layer 1 and Layer 2 audio encoders, multiplexed with GPI, Ethernet and RS232 signals and inserted into the transport stream.

RF Central introduced its new Sky Definition HD Traffic Camera System, a turnkey package combining a mountable Canon BU-45H HD camera, handheld laptop running IP remote control software, cables and an outside weatherized cabinet with an HD RFX-CMT-II 2GHz transmitter.

Furthering its IP newsgathering products, Vislink News and Entertainment, a new company that brings together Advent Communications, Link Research and Microwave Radio Communications, introduced the MRC AMG2100 Advanced Mobile Gateway. The bi-directional ENG gateway provides IP connectivity over a variety of wide area network paths, including 8VSB, WiMAX, EVDO and UMTS for file transfer and remote control. The company also introduced the MTX5000 ENG transmission system, which combines SD/HD encoding, software-definable multimode modulator, IP encapsulation and transport and remote control.

Nucomm ProQ

Broadcast Microwave Services introduced its new DiversaTracker diversity tracking antenna system. The system combines the company's diversity DR6000 receiver with a six-way antenna system, including five panel antennas providing 360-degree coverage and a high-gain GPS-steered antenna. Available for both SD and HD links, the antenna system is aimed at applications where it's necessary to track a source, such as a blimp-mounted camera and transmitter.

GMS introduced the Messenger 2 Decoder (M2D), rounding out its M2T COFDM camera-back transmitter system introduced last year. The M2T relies on AVC H.264 encoding and data slicing to deliver robust performance with no more than 45ms latency. The new companion demodulator fully supports AVC H.264 and the company's data slicing approach. BE

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Pro LCD monitors

New technology provides more options.

BY ALDO CUGNINI, DTV CONSULTANT

Sony Electronics added two new models to its line of Trimaster LCD monitors for critical evaluation and broadcast video production. The PVM-L2300 23in broadcast-grade monitor is the newest entry in the series, and the BVM-L170 17in panel is Sony's second entry in its series

Sony PVM-L2300

of LCD master monitors for critical evaluation applications, joining the BVM-L230 monitor already used in film and video production. Both monitors incorporate a 10-bit 120Hz LCD panel, nonlinear cubic conversion imaging technologies, 12-bit signal processing engine, optical feedback stability systems and automatic calibration operation.

The PVM-L2300 monitor has 1920 x 1200 resolution and a 10-bit driver. It is designed for broadcast and video production, capable of reproducing images consistent with its BVM-L series counterparts but at a greatly reduced price. The only significant difference from the BVM-L series is the use of a cold cathode fluorescent backlight system.

Both models support multiple color standards, including SMPTE-C, EBU and ITU-R BT.709. The BVM-L170 also supports D-Cinema and the expanded gamut color space offered by Sony's F23 and F35 digital cinematography cameras. The new monitors accept multiple sources, including video signals from analog composite to Dual-Link HD-SDI, PC signals from VGA to WUXGA via DVI-D and HDMI interfaces for the PVM-L2300 (VGA to full HD for the BVM-L170.)

Panasonic Broadcast is making the case that its new 25.5in BT-LH2550 professional LCD monitor offers performance comparable to Sony's 23in BVM-L230 monitor, but at a fraction of the price. A side-by-side comparison of Panasonic's monitor with Sony's BVM-L230 in the Panasonic NAB booth was quite compelling in its color and contrast performance.

The BT-LH2550 multiformat LCD production monitor features an In-Plane Switching (IPS) panel and full 1920 x 1200 HD resolution. The LH2550 offers a wide color gamut, surpassing the ITU-R BT.709 standard by 30 percent, and also delivers high contrast and brightness (1000:1 contrast ratio), 10-bit processing and a wide 178-degree viewing angle. The monitor features a full range of professional level inputs, including two auto-switching SDI (HD/SD) inputs (with switched output), component

JVC GM-F

and RGB and adds a DVI-D input. Additional tools include vectorscope and waveform monitor functions, a split-screen function that simultaneously displays two images side-by-side from two different type video inputs and built-in calibration software that allows the monitor to be calibrated without using a PC.

JVC introduced the GM-F series LCD HD displays that provide full HD 1920 x 1080 pixel resolution, enhanced motion sensor technology, high contrast ratio and an ultra-slim front bezel of 15mm (17mm on the 52in model). In addition to broadcast viewing applications, the three new models — GM-F420S, GM-F470S and GM-F520S — have applications in security and control room applications, digital signage as well as in retail, hotel and public exhibition areas.

LED arrives

Christie showed what it says is the world's first LED-based SXGA+ and WUXGA resolution projection display system, purpose-built for control room and video wall applications.

The new Entero LED is an LED-illuminated one-chip DLP product line that features a "zero maintenance" design. The LEDs are rated at more than 50,000 hours, providing more than five years of operation. The projector features built-in automatic brightness and color management. It also has the ability to automatically match color and brightness for every cube, across the entire display wall, on a continuous basis.

With 600 ANSI lumens of brightness, the LED projection engine is capable of illuminating Christie's 50in, 67in and 72in display cube platforms. Also, these cube platforms feature cross-prism optical screen technology for high brightness and wide angles of view. Sealed optics eliminate the need for dust filters, while heat pipe cooling technology minimizes audible noise. BE

Graphics systems

3D graphics were abundant at NAB.

BY SUSAN ANDERSON, MANAGING EDITOR

At the 2009 NAB Show, several products were on display that allow the creation of 3D graphics elements. Here are some hightlights.

Pixel Power demonstrated several new products. Pete Challinger, the company's CEO, said its new BrandMaster branding switcher puts advanced broadcast graphics directly at the point of transmission. This reduces the complexity of the signal path and streamlines the channel branding process. The result is reduced equipment, power consumption and total cost required to deliver uniquely-branded broadcast channels. The system provides real-time 3D and multichannel DVE, dynamic text and live video from internal or external sources and can be mapped to sophisticated 3D models with keyframe animations. Pixel Power also showed its LogoVision, a graphics playout device. With three models, the system can be sized to fit a range of playout channels. The graphics capabilities include multilayer static and animated logos, clocks and text crawls. A full range of options are available, including 2D DVE, external key and fill input and EAS functions.

Avid returned to NAB this year showing CG/graphics systems with new 3D capabilities and Version 5.2 of Deko 3000, an on-air graphics package that supports the industry-standard FBX and Collada formats. It enables users to easily import and play back a broader range of 3D models and animations from applications such as Autodesk 3ds Max, Autodesk Softimage 7.5 and MAXON CINEMA 4D. Now, users can leverage existing skills and toolsets without having to burden staff with learning new 3D tools.

Avid Deko 3000 Version 5.2

Users can import 3D models into Deko and combine the models with live and editable text and image layers, which automatically map to the replaceable textures from the original. The model maintains specialized 3D treatments for geometry, lighting and animation and plays out as expected in the Deko environment. Power Clips are mapped to 3D models, enabling high-end visual effects like animated logos or headshots without the need for costly third-party support to get them on the air.

Chyron showed the latest addition to its production graphics systems — the HyperX³. The 2D/3D character generator and graphics platform is driven by the Lyric PRO 7 3D

creation and playback application. The system includes an advanced feature set of software designed for the easy creation of 3D pie charts, bar charts and financial charts. It allows two channels of real-time HD graphics to be played out together, including full frame QuickTime and AVI files.

Making its NAB debut was the Harris Inscriber Connectus. The graphics management solution allows users to streamline and centrally manage their graphics workflow. Media content can be published from any system on a local or wide area network, or across the Internet, giving operators complete control over where and how resources are stored and distributed. Once published to a centralized graphics server, media content can be manually retrieved or scheduled to be pushed automatically to specific locations throughout the network.

Harris also showed the Inscriber G7, a graphics system that simplifies workflow while achieving high levels of graphics quality. The G7 is capable of producing up to two channels of real-time 3D high-definition graphics from a single 4RU system. It enables integrated 2D and 3D DVE, MOS integration, hardware- and software-based clip playback and video capture.

Systems solutions

Also on display at the show were several systems solutions. Algolith announced the launch of two new products. The XVC-1001-UDC is an up/down/crossconverter with built-in SD/HD frame sync. The combination UDC solution reduces costs and simplifies workflow while providing high-quality imagery and aspect ratio settings. The card supports active format descriptor (AFD) signaling for automatic management of aspect ratio and can generate AFD packets based on the aspect ratio settings.

The second new product is the XVC-1011-UC upconverter. The card provides SD-to-HD conversion plus signal cleaning. It offers advanced motion-adaptive deinterlacing, antialiasing filter, cadence correction and per pixel deinterlacing. Users can automatically delay all 16 channels of embedded audio to maintain lip sync while also processing closed-caption and time-code information.

Algolith has a unique approach to productizing. Called the One Card, One Price, More Choices program, customers can purchase any card solution today and then later reconfigure that same card into a totally different product — at no additional cost. How's that for flexibility?

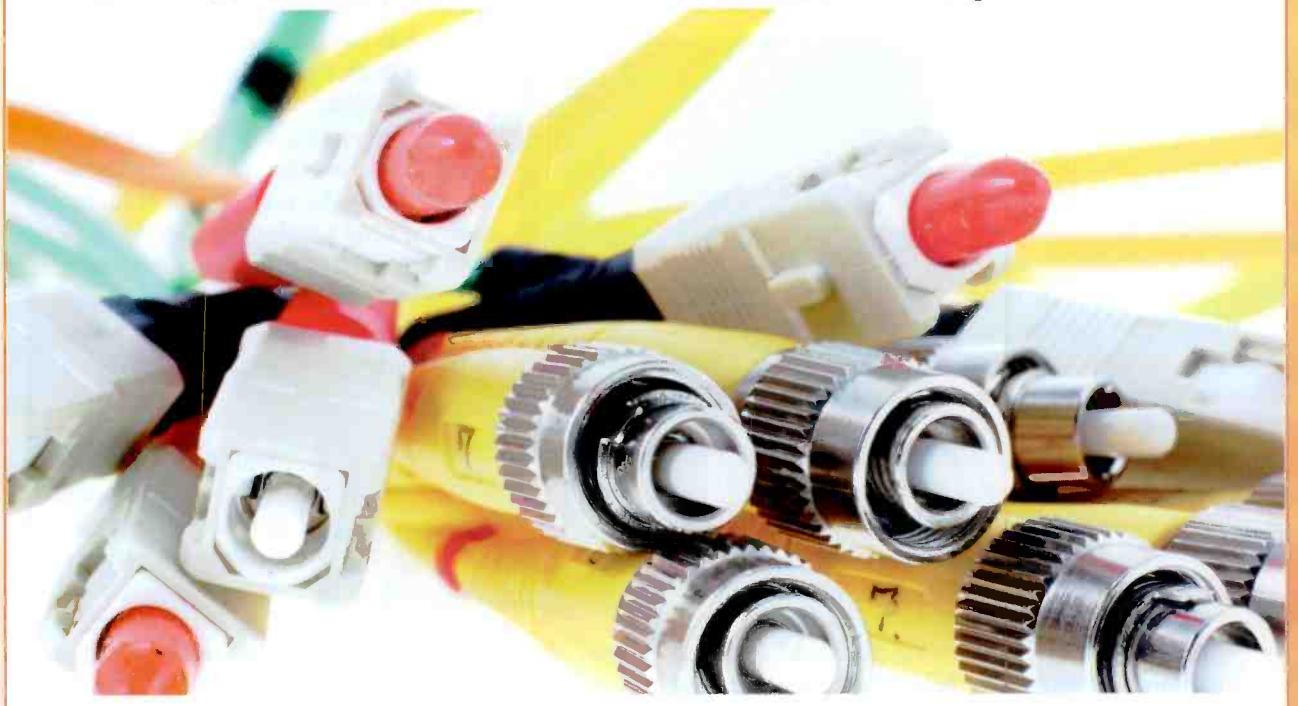
AXON introduced 30 new modules for 11 different applications in the company's Synapse line. Most modules can be upgraded to HD 3Gb/s. The SD and HD/SD versions can be upgraded to handle 3Gb/s signals, making them the ideal solution for broadcast facilities that want to be prepared for future 1080p operation. The new modules consist of 3Gb/s-capable keyers, frame synchronizers, dual-channel upconverters and dual-channel crossconverters.

Also shown was the AXON TRACS compliance recording system. This eight-input 1RU device encodes all inputs to MPEG-2 or MPEG-4 for storage via FTP on third-party servers. The system can monitor live and in real time, including video, audio, Teletext and closed-captioning content, across an entire network. Search and playout functions are easy to use.

The company also announced a dual AES/EBU backup switcher with integrity checking. The 2AI48 contains two completely individual paths with main and backup inputs. Automatic backup can be triggered by an ACP or separate loss of input, audio silence, clipping or CRC errors. The switcher operates with a 48kHz sample clock locked to B&B ref or word clock ref, provides adjustable audio gain and phase control with adjustable audio delay of up to 1300ms in 1ms increments. BE

BroadcastEngineering presents the

ESSENTIAL GUIDE to fiber optics



Optical fiber has become the transmission medium of choice for most communications networks primarily because of its advantages over other communications media in bandwidth and distance capability. But for many applications, fiber has other characteristics that make it the best choice. It is immune to electromagnetic radiation, so it's used in noisy electrical environments. Fiber-optic cables are very small, making it easy to run cables in restricted areas, for example, in historic buildings or across streets and sidewalks.

Fiber has other characteristics that allow it to be tailored to specific applications. It can be used with different types of light sources for various applications, allowing the use of inexpensive LEDs or vertical-cavity surface-emitting laser (VCSEL) for short links or more expensive, higher-powered lasers for long-distance links. Many users don't realize that fiber can carry either analog or digital signals and that many video links, wireless antenna systems and hybrid fiber-coax (HFC) CATV systems are actually analog. Digital transmission, of course, is more efficient, allowing easy multiplexing of many signals over one pair of optical fibers.

How fiber-optic systems work

How does fiber transmit signals? To start, it's useful to understand how an optical fiber transmits light. The fiber has two parts: the core, which carries the light; and the cladding, which is made of a different optical material that traps light in the core by a process called total internal reflection. (See Figure 1.) Attenuation of the light inside the core is caused by scattering and absorption.

The attenuation of the light is a function of the color or wavelength of the light. Most fiber-optic systems operate in the infrared where the attenuation of

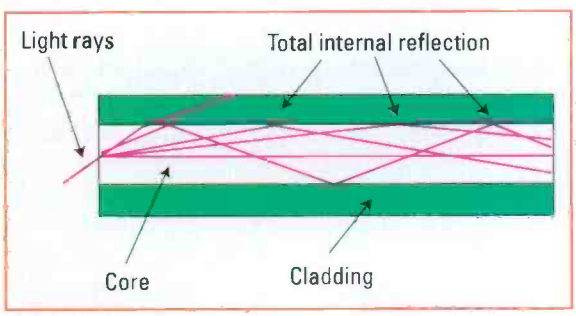


Figure 1. An example of total internal reflection

A closer look:

Fiber signal distribution at the Emmy-awarded Red Bull Air Race

The Red Bull Air Race World Championship is an outstanding motorsports production providing both a live event for hundreds of thousands of spectators and a thrilling HD broadcast production, which is broadcast in more than 60 countries. In recognition of the "Outstanding Technical Team Remote," the Red Bull Air Race World Championship received a Sports Emmy Award from the National Academy of Television Arts & Sciences at this year's Emmy Awards.

The demands on the technical infrastructure of such a production, which includes the setup of a mobile airport including a control tower, are enormous. The signal backbone infrastructure for video, audio, communications and data of such a production plays a key role, because it directly affects all other areas of the production. Since the 2009 season, this infrastructure is based on MediorNet, a new fiber signal transport solution that includes routing and signal processing. MediorNet was officially introduced by Riedel Communications at this year's NAB. Riedel Communications' rental division, being the largest technical supplier of the Red Bull Air Race, already switched the fiber backbone of the Air Race production onto MediorNet prior to the product's official launch in April.

MediorNet is a new fiber-based network solution that pushes fiber signal transport beyond simple point-to-point links by offering a real network solution. In addition to signal transport, the system allows routing of any incoming signal to any output or even to multiple outputs. This can be achieved by just a mouse click in the configuration software or, even more conveniently, by a router control system.

The communications and video signal infrastructure of the Air Race production usually covers large areas. Video signals are needed at several locations for various applications, such as broadcast production, race control and video wall production. Therefore, MediorNet's network approach, which is capable of point-to-point and multipoint routing, is the ideal basis for such applications.

Time is a crucial factor for setup of the event installation and has a direct effect on the production costs. MediorNet's integration of various cabling infrastructures, such as video, audio and data into one network, significantly reduces time and effort in installation. Besides time, weight is another relevant issue for the Red Bull Air Race. With races in 10 different countries around the globe, the reduction in weight through the use of fiber instead of copper cables translates directly into lower transportation costs. In addition, MediorNet's onboard signal processing and conversion also result in less transportation costs because it eliminates the need for various external devices such as upscalers and downscalers or multiviewers. All these features within MediorNet are software-based, so they can easily be expanded in the future without any changes to the hardware.

MediorNet mainframes are connected via Link Cards, which go directly into the mainframe. They're available with and without integrated CWDM multiplexing, providing a bandwidth of up to 76.5GB/s on a single fiber link. MediorNet's standard fiber transceivers have an optical budget of 18dB minimum, allowing for distances of up to 25 miles (40km). The Link Cards can also include external optical signals and transport them transparently through the system.

How does MediorNet work?

MediorNet provides an innovative combination of electrical TDM multiplexing and optical CWDM multiplexing. Each MediorNet frame contains a processing card, which handles 16 4.25GB/s high-speed ports. So each carrier frame within MediorNet is 4.25GB/s. To optimize the bandwidth usage of the carrier frame, MediorNet divides the carrier into subframes with 6.1MB/s bandwidth, which correspond to the smallest signal to transport: AES3 audio. The subframes can be filled with any type of video and audio signal or control data. Each native signal is sliced into 6.1MB/s segments. MediorNet transports these slices to one or multiple destinations in real time. At the destination, MediorNet recreates the native signal and provides additional software-based signal processing and conversion features. The processing card allows the individual routing of all native signals within the 16 4.25GB/s ports, resulting in a router for 32 x 32 720p/1080i signals, 184 x 184 SD-SDI signals, 27,000 x 27,000 AES signals or any combination of these.

high fiber count cables, up to 2000 fibers or more, align the fibers into ribbons to provide the maximum number of fibers in a small cable.

All outdoor cables have dry powder or gel filling to prevent moisture damage. Outdoor cable construction is designed for the individual installation, with attention paid to how the cable is being installed, for example, pulled into conduit underground, direct-buried by plowing-in, installed aerially or even under water. Constructions include strength members for pulling the cable under tension or hanging it on poles and may include armor to prevent damage by rodents or rocky soil.

Premises cables are all required to have jackets that are flame-retardant to prevent spreading fires or emitting toxic fumes. Because premises cables do not need to withstand harsh outdoor environments, they are smaller and lighter. Just be certain that the flammability rating is appropriate for the intended installation.

Termination: Connectors and splices

Cables are terminated with connectors that allow ties to other cables or transmission equipment. Splices are generally used for permanent connections, either concatenating cables on long outdoor runs or splicing pigtails on single-mode fibers for termination.

Most systems today use one of three connector types: SC, a snap-in connector with a 2.5mm ferrule; ST, a bayonet locking connector with a 2.5mm ferrule; or LC, a tiny snap-in connector with a 1.25mm ferrule. All provide similar performance in loss and reflectance with a physical-contact (PC) ferrule finish, but the SC and LC are available with an angle-polished ferrule (called SC/APC or LC/APC) that minimizes reflectance for extremely high-speed or analog video on SM fiber. Connectors can be installed in the field by attaching to the fiber with adhesives and polishing the ends, or using prepolished connectors that are spliced onto the fibers.

Splicing can be done by fusing or welding fibers together (fusion splicing) or aligning and crimping fibers in a holder (mechanical splicing.) Fusion splicing is cheaper when making lots of splices, has better performance and is used almost exclusively with single-mode outdoor cables, but requires expensive tools (fusion splicer and cleaver). Mechanical splices are more expensive per splice, have poorer performance, but require only inexpensive tooling.

Installation

Installing fiber-optic cables is no harder than any other cable, as long as the installer has been properly trained. Fiber-optic cable plants use hardware (cable trays, conduit, patch panels, etc.) similar to — and sometimes identical to — that used with copper cabling, but the variety is so large that it is important to consult with the cable manufacturer to understand all the choices.

SC, ST and LC connectors

After installation, all fibers in all cables must be tested with a light source and power meter for loss to confirm proper installation. Longer runs and spliced cables require testing with an optical time-domain reflectometer (OTDR), a fiber-optic radar, to verify splices and ensure that no damage is done to the cable during installation.

Documentation

The most important part of any fiber-optic cable plant design and installation is proper documentation. Documentation provides the information needed to buy components, install the cables, verify proper installation and provide the data needed in case it is ever necessary to repair damage to the cables. Contractors and installers must be given documentation so they know what to install and what defines the quality of the installation. No project should ever be started unless documentation is properly prepared and updated every step of the way.

Additional information on fiber optics can be found in the Online Reference Guide from The Fiber Optic Association, the professional society of fiber optics, at *www.thefoa.org/tech/ref/*.

Jim Hayes is author of "The Fiber Optic Technicians Manual" and co-author of "Data, Voice and Video Cabling." He currently serves as president of The Fiber Optic Association.

optical fiber is lower, primarily at 850nm, 1300nm or 1550nm where the light is invisible to the human eye. Some fiber-optic systems have enough power to be harmful to the eye, but because the light is invisible, you won't know until it's too late. Never look into a fiber unless it's been checked with a power meter to ensure no light is present.

Secondly, a fiber-optic transmitter converts an electrical signal, analog or digital, to an optical signal. Digital pulses from connected electronics are converted to pulses of light from an LED or laser

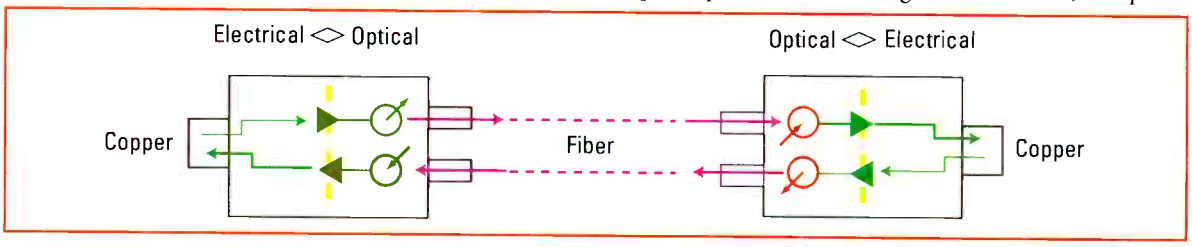


Figure 2. Fiber-optic data link

and coupled into the fiber. Analog electronic signal inputs are used to modulate a light source to mimic the electronic input and likewise can be coupled into the fiber. At the far end, a photodiode converts the incoming optical signal to an electrical signal, amplifies it and then presents it to the system electronics.

Simplex signals such as security camera outputs or connections to digital speakers require only one fiber, but duplex links, like most communications links, generally use two fibers carrying signals in opposite directions. It's possible to use only one fiber, but the components needed to create a bidirectional link are generally more costly than using two fibers. (See Figure 2.)

The quality of the transmission over a fiber-optic link is generally determined by how much signal is received by the detector in the receiver. With digital signals, we speak of bit error rate (BER) but it's just the inverse of the well-known analog signal to noise ratio (SNR.) The BER is low or SNR high (both good) when the receiver has the proper amount of optical power. If there is too little receiver power, the SNR is low or BER is high because the noise is high compared with the incoming signal. Too much power at the receiver will cause overloading and distortion (just like speakers), so the BER goes up quickly. (See Figure 3.)

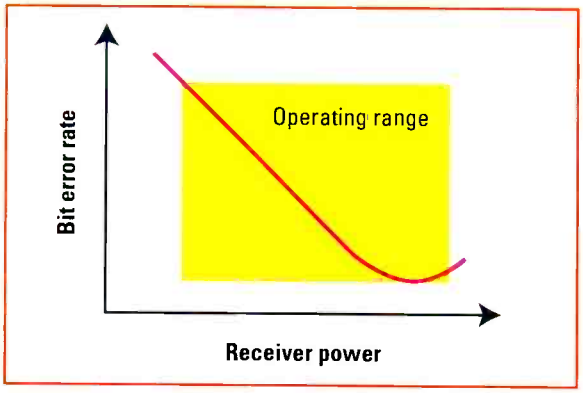


Figure 3. Too much power at a receiver causes overloading and distortion, and the BER goes up quickly.

The receiver power must be just right, which is a function of the transmitter power, the loss in the fiber-optic cables and the sensitivity of the receiver. Manufacturers design data links using particular transmitter/receiver pairs that can operate over a range of optical power, and those particular devices determine the required characteristics of the cable plant.

To understand this, optical power needs to be defined. Optical power is like voltage in electronics, except it's measured in decibals (dB), like sound. Optical power is a logarithmic function; a change of 10dB is a factor of 10, 20dB is a factor of 100, etc. Absolute optical power is measured in dBm or dB referenced to 1mW. Optical loss or attenuation is measured in dB, a relative measurement.

The difference in the transmitter output and the receiver sensitivity is the dynamic range of the link, which is called the link loss budget. These are important specifications for any fiber-optic transmitter/receiver pairs or complete data links.

For example, a laser transmitter with 0dBm output and a receiver with a sensitivity range of -10dBm (overload) to -30dBm (minimum for useful SNR or BER) has an operating range of 10dB to 30dB loss in the fiber-optic cable plant. That is, it must have the transmitter attenuated by at least 10dB to not overload the receiver but not more than 30dB so that the SNR is high enough at the receiver. In this example, if the fiber-optic cable plant has less than 10dB loss, it will be necessary to add an attenuator at the receiver to reduce the power. If the loss in the cable plant is more than 30dB, a more powerful transmitter, more sensitive receiver or lower loss cable plant is needed.

With this knowledge, the engineer can start selecting a transmission system for his or her needs. If designing his or her own equipment, the engineer will choose transmitters and receivers. If purchasing systems or equipment, he or she may choose modules that convert the current electrical signals into optical signals (called media converters) or turnkey systems. Either way, the hardware decision will be based on communications needs: analog or digital, signal types (Ethernet, audio, video, etc.), bandwidth and distance of the link.

Choosing the right fiber

Just like copper cables, fiber comes in types optimized for the application. There are three basic types

of fibers: multimode step-index, multimode graded-index and single mode. (See Figure 4.) Within each basic type are different grades of fiber.

Multimode step-index has the highest attenuation and lowest bandwidth, making it appropriate for shorter, slower links. The most widely used

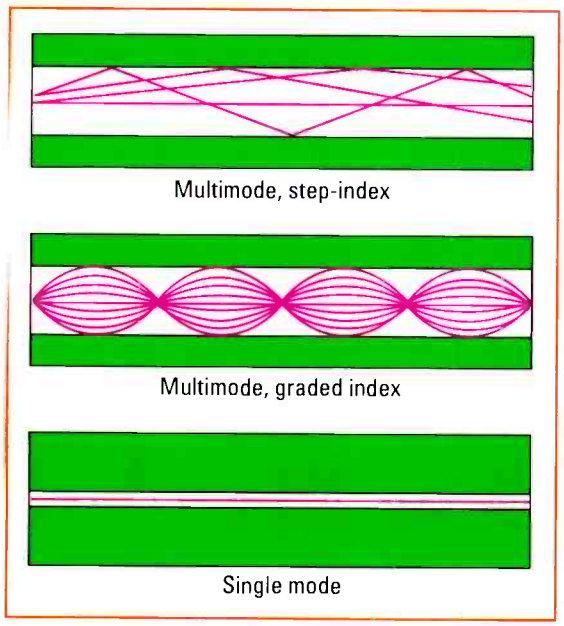


Figure 4. Fiber types

multimode step-index fiber is plastic optical fiber (POF), which is the fiber of choice for industrial robots, consumer electronics and the entertainment systems in millions of automobiles. The capability of POF is similar to that of Cat 5 UTP, and the cost is about the same too.

Most premises cabling systems, like LANs and security cameras, use all-glass multimode graded-index fiber. The graded-index glass core of this fiber gives it hundreds of times more bandwidth than POF and much lower attenuation. There are three common varieties of this fiber, distinguished by the diameter of the core and the bandwidth. All these fibers have an outside diameter of the glass fiber of 125 microns (about .0005in, slightly larger than a human hair). Core sizes are either 62.5 microns or 50 microns, so the industry calls them 62.5/125 or 50/125 fiber.

For most of 20 years, 62.5/125 multimode graded-index fiber (now called OM1 fiber) was the most widely used. It worked well with the inexpensive LED sources used for premises links and had adequate bandwidth for networks with speeds up to 200Mb/s such as Fast Ethernet. When Gigabit Ethernet was introduced, LED sources were too slow, so a new laser called a VCSEL was used.

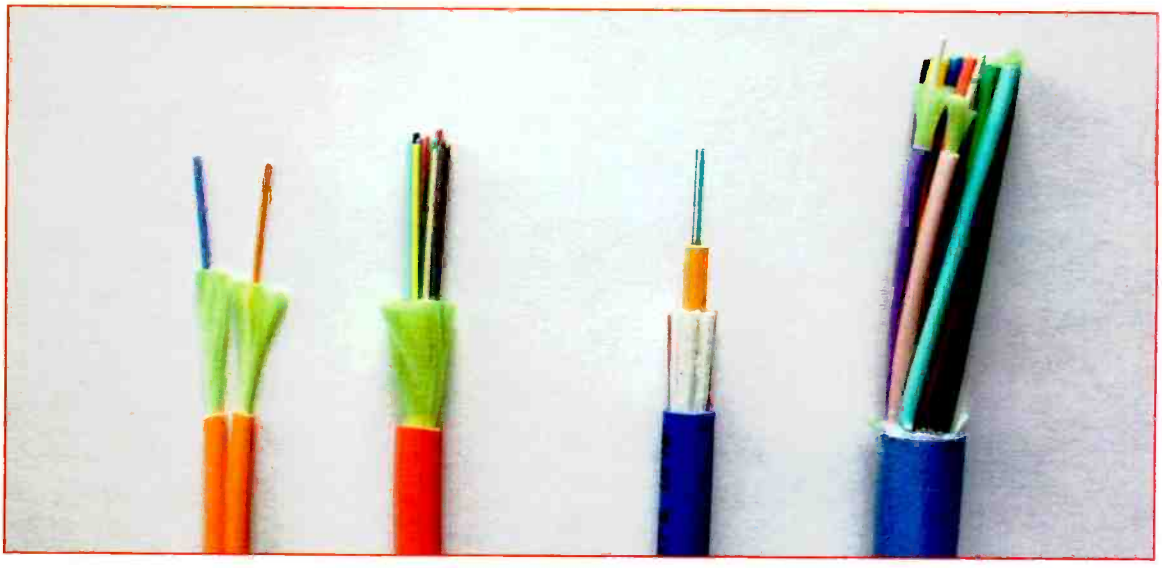
The limited bandwidth of 62.5/125 fiber brought back an older fiber design, originally used for early telephone systems that offered better performance with lasers, called 50/125 fiber (now called OM2 fiber). Fiber manufacturers soon introduced a new 50/125 fiber optimized for lasers with even higher bandwidth (called OM3 fiber).

While there is still plenty of 62.5/125 fiber in use, new installations are more likely to use 50/125 fiber, especially the higher bandwidth laser-optimized OM3 version. The slightly higher cost is easy to justify for most applications because of its upgradeability.

Very high-speed (>10Gb/s) or long-distance (>1km-2km) links use single-mode fiber, which has very low attenuation and virtually unlimited bandwidth. However, the laser sources needed for single-mode fiber are more expensive, making single-mode links too expensive for shorter or slower applications.

Cable choices

Cables are designed to protect the fibers from damage by moisture or other harm in the environment in which it is installed. Most outdoor cables are loose-tube construction, where fibers are encased in small plastic tubes inside the cable. Very



Fiber-optic cable types, from left to right: zipcord, distribution, loose tube and breakout

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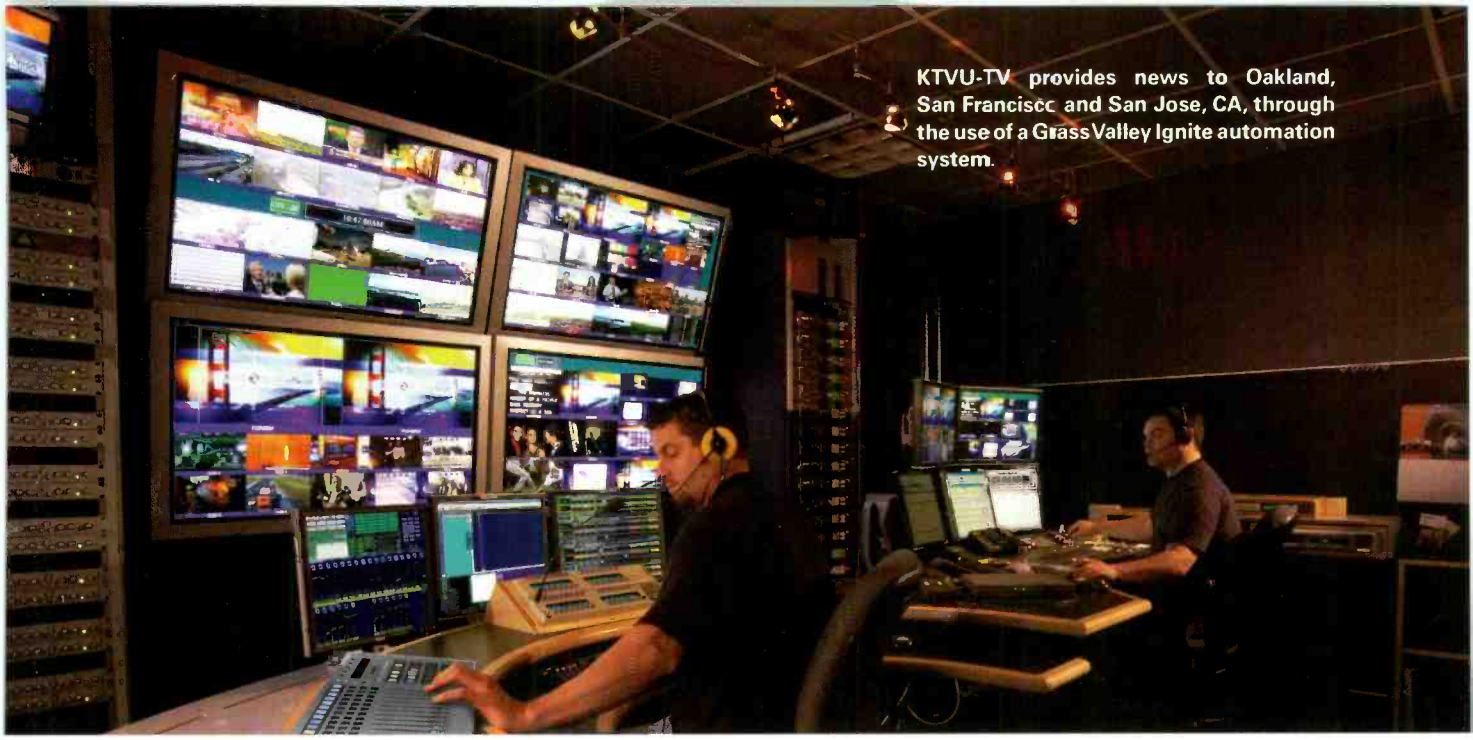

KTVU-TV provides news to Oakland, San Francisco and San Jose, CA, through the use of a Grass Valley Ignite automation system.

Using studio automation

A director compares the Grass Valley Ignite, Ross Video OverDrive and Sony ELC.

BY GAYLE GALVEZ

It is an interesting time to be in local news. I remember an old-timer telling me more than 15 years ago, "Just you watch: TV will be going the way of radio." Many years ago, it took a whole crew to create a radio program. Now that's not the case: With broadcast automation, that old-timer's statement is becoming a reality. Production automation is basically a system created to automate and facilitate the execution of a show, such as a newscast. What used to take a team of people can now be performed by a few people or even an individual.

There are three companies (as of the writing of this article) that have created an automated production system: Grass Valley Group's Ignite system, Ross Video's OverDrive and Sony's ELC (Enhanced Live-production Control system). I direct with both the Ignite and the OverDrive systems, and am familiar with the ELC. The steps of automation are the same in all three: training and setup, coding, and execution.

Training and setup

To keep the language clear, let's call a show element an event. In a traditional control room, the director calls each event, and the crew creates that event on the fly. With automation — because there is little to no crew — each event has to be premade so it is available to be recalled for a show. Automation systems do not come with premade events; users need to build and customize their own events. Ignite has a type of event called a TMX, OverDrive calls an event a Template, and ELC calls it a Cue. I like analogies; they can make the comparison of complicated concepts more manageable. Let's use a pizza analogy to demonstrate the differences between a TMX, Templates and Cues, where an event is like a pizza. Building a TMX is like making a pizza with the type of dough, crust, sauce, cheese (the base), and all the toppings you want on it, and then putting it in the refrigerator ready to cook. When building a Template, you only make the base and put it in the refrigerator. It is only before you're ready to code that you put on the toppings. What are the toppings? The toppings are devices with multiple settings, namely camera shots and audio. With Cues, you make the whole pizza, but you can change the toppings and the base.

Let's use the example of a dissolve to camera three on a two shot with anchor mics. When building a TMX or a Cue, the event will include the transition, the dissolve to camera three, camera three set to a two shot, and the anchor mics will open. When building a Template, you build a camera three Template. Everything but the transition is determined during the coding process.

Coding

In order to prepare a show, the director first codes the show. Coding enables the system to create a list of events in

the correct order. Coding with OverDrive or ELC involves, on the whole, dragging and dropping. Coding with Ignite involves typing. ELC and OverDrive require coding at the script level. From the rundown, you open the story displaying the script.

For OverDrive, a plug-in tool is opened displaying a list of numbered picons (picture icons for identification). Picons are square images with a few descriptive words associated to a specific Template. The desired picon — in this case the camera three picon — is dragged and dropped into the script. The picon is replaced by two elements in the script: A grommet (a small character of text) appears on the right side of the script, and a MOS ID along with other information appears on the left.

Returning to the pizza analogy, this is where the toppings are added. The camera three Template is modified to include the two-shot camera setting, along with the desired mics and/or music. Coding for the ELC is similar: opening a plug-in tool, and then dragging and dropping a Cue into the script. However, if the Cue has a wrong element (i.e. a wrong mic) you can edit it, or any element of the Cue, for that specific story. No other cues will be affected. When using Ignite, a show is coded at the rundown level. Codes are placed in a specific column of the rundown. Using the same example (a dissolve to a two shot on camera three) you could type "d2-3," "d2shot3" or "dissolve2-3" depending what you decide will be the code. There can be multiple codes for the same event. This would be analogous to having multiple names for the same type of pizza. Duplication may result in thousands of codes. For all three systems, the refrigerator has limited space. A benefit of not having totally finished pizzas is that fewer pizzas are stored, and because there are fewer pizzas, it is easier to find the right pizza.

Ross Video's OverDrive automation classifies each event as a Template.

Master rundowns can be precoded with reoccurring events, reducing coding time. If the same event occurs at different times in the show, you can copy a grommet or copy the code and paste it in the script or rundown as often as the event occurs. This can speed up the coding process. But coding at the script level has a drawback: You must look inside each script to see if the story has been coded. Other users such as a writer or producer may accidentally erase or add grommets. Hidden codes in blank lines of the rundown might go undetected. When coding at the rundown level, you can see at a glance if each story was coded, and codes are less likely to be changed by others.

Execution

A playlist is a list of events. ELC and OverDrive have a vertical playlist. The on-air event is shaded one color with the next event in another. Ignite has both vertical and horizontal playlists. The horizontal playlist displays the TMXs. Your place in the playlist is marked by a vertical line, where the next event is located to the right of the vertical line.

Keys on a regular keyboard are used to perform a show with OverDrive. Transitions such as a cut, dissolve, or any transition listed from a drop-down window, can be chosen on the fly. Lower thirds are added and

Sony's ELC automation system names events Cues.

removed by hitting an assigned key on a keyboard. Because transitions are determined at the coding level when using Ignite, you can hit a single button to play each event. There are many options to play an event: You can step on a foot pedal, click a virtual or physical button or hit alt+spacebar. Lower thirds are added by clicking on a virtual button on the virtual switcher or hitting a customized physical button. Transitions are also built into Cues so an event is played by hitting a physical button. When changes are made with ample time to recode, the OverDrive or ELC playlists update as soon as the cursor is off the storyline in the rundown. However, once an event is in preset, the event will not update. With Ignite, you must wait for an indicator button to light, indicating a change. Hitting that same button updates the playlist. Both update situations have their advantages.

A main concern when switching to an automated system is breaking news. But what is breaking news? It's an unexpected added story. All systems can quickly add new events as fast as hitting a button. By design, there are buttons customized specifically for breaking news that can be easily accessed. For any automated system, a master or shell rundown can include precoded elements regularly used during breaking news at the bottom of the rundown in a floated state. These can be moved up and unfloated to the appropriate position. Time might be needed for an animation to cue, but that delay would happen with or without automation.

Many issues or mistakes are blamed on the system that are unwarranted, especially in the beginning months of using the system. Automation systems do work. Adjustments must be made when switching to an automated system, just like adjustments were made when switching from manned to robotic cameras. Not everything done previous to automation will stay the same, and work patterns will need to change by more than just the director. As a director, asking which system is better is like asking which pizza is better. It all depends on your taste. BE

Gayle Galvez is an automation consultant and television director.

Photo A: Ampex demonstrates the VR-2000 server, circa late 1950s. Photo courtesy Ampex/ Wayne E. Carlson. Photo B: Sony's VP-1000, circa early 1970s, was a first-generation U-matic top-loading, play only deck with basic functionality. Photo courtesy LabGuy's World. Photo C: In 1935, German company Allgemeine Elektrizitatsgesellschaft (AEG) in Berlin developed the AEG Magnetophon. Photo courtesy EMTEC Group.

STORAGE:

From film to optical

BY COLLIN LAJOIE

Throughout the 1940s, television really began to come to the forefront. Producers were looking at the recently developed tape technology in an effort to apply it to television, for the same reasons Bing Crosby had applied it to radio — rebroadcast and editing capabilities, according to Paul Cameron in his article "VTR Technology" in the *Broadcast Engineer's Reference Book*.

Crosby had invested $50,000 in a small startup called Ampex after seeing the technology AEG Magnetophon Signal Corps engineer John Mullin had brought back from Germany following World War II, according to Cameron.

In the late '40s, Mullin approached Crosby about applying this tape technology to video, and, with Ampex, he developed a prototype in the early '50s that led to the introduction of what is widely recognized as the first video recorder, Ampex's VR-1000, in 1956, Cameron says.

"The breakthrough that Ampex had was a two-fold breakthrough. One was that they came up with the concept of using spinning heads," says Mark Schubin, technical editor for *Videography* magazine. "But [unlike what the Germans were doing with spinning heads during World War II] what Ampex did was have the heads spin transversely across the tape, and there were four heads, which is why the machines got known as quadruplex machines." With the advent of this quadruplex machine came the 2in quadruplex videotape and ability to edit TV content.

"The early form of videotape editing was with a razor blade — splicing, the same as with film editing," says Anthony Gargano, industry consultant. "It was the actual cutting and splicing of the videotape."

Videotapes, and their corresponding machines, continued to develop through the '60s, with slight technological differences, until about 1970 when Sony introduced U-matic.

"U-matic was really the all-time champ because Sony itself sold, over the life of the U-matic tape ... well over 1.5 million U-matic machines," Gargano says.

Originally designed to be a consumer product, but failing to excel in that area because of its size and cost, the 3/4in tape held one hour of content, according to Schubin. From there, various analog videotape formats were introduced, including Sony's 1/2in Betamax in 1975; Bosch's 1in Type B in '76 (which, according to Gargano, became the standard in Europe); Sony and Ampex's 1in Type C in '76; JVC's 1/2in VHS in '76; and Sony's 1/2in Betacam in '82.

Digital videotape

Digital videotapes came into play in the late '80s with the introduction of Sony's D1 and the first digital videotape recorder, followed closely by D2, which recorded a PAL or NTSC signal with

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no compression and used 19mm tape. Both formats were relegated mainly to post-production applications.

"[D1] used 3/4in tape, just like the U-matic — large reels, but [it was] amazing that you could have a cassette that recorded what we refer to today as 4:2:2 video," Schubin says.

Cameron says digital videotape continued to develop to include Sony's 1/2in Digital Betacam in 1993; 1/4in DV and MiniDV in '95; Panasonic's 1/4in DVCPRO in '95; Sony's 1/4in DVCAM in '96; Sony's 1/2in Betacam SX in '96; JVC's 1/2in Digital S in '96; Sony's 1/2in HDCAM in '97 (adding to the burgeoning interest in HD video); Panasonic's DVCPRO 50 in '98; Sony's 1/2in IMX in 2000; and Sony's MicroMV in 2001.

IT and storage

IT and broadcasting technologies have converged many times throughout the years, yet the IT industry has never specifically tailored products to target the broadcast market. But there may be a reason for this. According to market research firm IBISWorld, in 2008, the approximate industry revenue of the computer and peripheral manufacturing industry was about $62 billion, whereas the TV broadcasting industry came in at about $37 billion. Years ago, the disparity was even greater.

"No storage technology has been invented, other than the videotape ... for television purposes. All of the storage technologies that we talk about, linear data tapes and so forth, hard disc, were not invented because of video; they were invented for something else, and television co-opted their use," says John Luff, broadcast technology consultant.

In September 1956 (the year of the introduction of the first videotape recorder), the first model of the IBM 350 disc storage unit was released — a large cabinet that was part of the even larger IBM 305 Random Access Memory Accounting system. Jumping ahead to 1973, IBM released the 3340 direct access storage facility, codenamed "Winchester," which featured a smaller, lighter read/write head that could ride closer to the disc surface.

"It was IBM that developed the Winchester drive, and that was the underlying technology for all the hard drive-based products," Gargano says. "RCA developed CED; that was capacitive head pickup technology, which actually required contact with the disk surface."

Then beginning in the early '90s, innovations in storage systems in the IT world also revolutionized those in the broadcasting space with the introduction of redundant array of independent disc (RAID) systems. These allowed the coordination of multiple hard disc drive devices to provide

higher levels of redundancy and performance than could be achieved with a single drive. The emergence of smaller, more powerful drives also helped the proliferation of RAID storage arrays, which became fairly standard in the mid-1990s, according to a 2003 article in *IBM Systems Journal* by R.J.T. Morris and B.J. Truskowski. And with the improvements in computer technology in the '80s and '90s, storage area network (SAN) and network-attached storage (NAS) enabled IT technologists, as well as broadcasters, to work with shared storage over a computer network, according to the article.

First NLE and video server

According to Schubin, the emergence of what could technically be considered the first storage and playout server system goes back to the evolution of editing and a partnership between CBS and Memorex.

"This company called CMX, which was a joint venture between CBS and Memorex … came up with a machine [the CMX 600] that even today is mind-boggling in its technology," Schubin says. "So here we are at the end of the 1960s, and they have taken hard drive disc packs, which the discs themselves were about the size of a microwave oven, and the disc reader, or drive was about the size of a washing machine. So it's like sticking a microwave oven on top of a washing machine."

These packs, Schubin says, could record about a half-hour's worth of black and white video onto disc drives and play them back. The offline editor's interface consisted of a light pen with a photo sensor that would allow the editor to click things off the screen immediately by touching it with the light pen, and that would create an edit decision list (EDL) in the computer.

"Well, the question was, how do you get that information over to the online editors? So CMX built an online editing system," Schubin says. "This is in the era before floppy discs, so there was no way to transfer the information over to the computer in the online edit room except by punched paper tape, which was what teletypewriters used."

Editors would then take these massive stacks of punched paper tape, he says, from the offline room to the online editor, and they would redo the edits on the actual content that was to go to air. And so the CMX 600 is widely recognized today as the first nonlinear editor.

Then in 1988, in line with the introduction of the first digital videotape recorder, now-defunct Editing Machines Corp. (EMC) had the idea of editing within a computer.

"So [what] they came out with didn't really catch on," Schubin says. "But the following year, another

company came out with the concept of nonlinear editing a little more thought out than the EMC version, and that company was called Avid. So that was Avid's first product."

According to Schubin, the initial Avid product was an offline editor that would eventually take the place of many U-matic machines. And as technology improved, with the introduction of 8in floppy drives down to 3.5in floppy drives, the EDL was transferred from offline to online editing via disk. The quality of the Avid system then improved to the point that the online edit stage wasn't necessary, Schubin says, and that's when it went from being a nonlinear editor to a server.

But the Avid system, and similar systems from companies including Abekas and Ampex that eventually replaced the tape cart system in broadcast facilities, was being used mainly for production, according to Don Craig, CTO and co-founder of Omneon.

"Prior to 1990, the 'servers' were used strictly for production applications, and it was companies like Abekas and Ampex who made very special-purpose [systems]. They weren't called servers; they were just called disc recorders, recording relatively short clips that were used in production," Craig says.

In the broadcast space, beyond production, it was time delay that helped popularize the use of video servers, according to Luff. "Time zone delay was actually one of the first things servers were used for. People were using it for delay of content for rebroadcast either on the same day or literally just a time zone delay — set an input channel recording and one hour later start an output channel playing the same video, and it becomes a continuous loop," Luff says. "The earliest uses of servers had absolutely nothing to do with backup and had everything

to do with cache, which time delay is really just a long cache."

Craig worked with a company called Tektronix.

"In the early '90s, we started to see very compact and practical applications of JPEG2000-based compression techniques, and that coupled with the performance we started to see with the 3.5in tape drives was what enabled the [Tektronix] Profile to happen," Craig says.

According to Craig, the creation of Profile came out of a merger between Tektronix and Grass Valley, because they were looking to build a platform rather than just an application. The first incarnation of Profile supported four channels of video for a total of 32GB of storage.

"It had to act like a tape machine, and it had to act like four tape machines in one — that was really the selling point," Craig says. "So for the price of one tape machine, you could have four tape machines in one; the only catch was you couldn't remove the tape." The fact that there was no removable tape didn't bother many broadcasters upon Profile's introduction.

Soon after the release of Profile, Craig left Tektronix to work abroad, but returned in 1998 to co-found Omneon. "Our initial goal was to do transmission servers along the lines of Profile, but with more comprehensive network I/O," Craig says. "The notion with Omneon was we'd interconnect everything with a computer network, and the initial products were done with IEEE 1394, or FireWire. So [adhering to] the decisions in 1998, we elected to use Fibre Channel for disk I/O, we elected to use FireWire 1394 for video interconnect within the system, and we elected to use Ethernet for control and file transfer to these systems."

Using FireWire, there was no connectivity limit on the number of devices that could send and receive video within the context of one server, according to Craig. And that's how Omneon set itself apart from Profile, which under Grass Valley was relaunched as the K2 line in 2005, adding some clustering features to the original design, Craig says.

The future of storage

Luff believes that optical storage is likely to be adopted in the near future, once the technology is proven and it becomes cost-effective, primarily because light "is in order of magnitude, shorter wavelength, so you can put that much more data in a same volume optically than you can with any other kind of electrical signal." The adoption of optical may become as commonplace as fiber, for much the same reason.

Craig, on the other hand, has a healthy amount of skepticism about the medium.

"By the time the years roll by and this optical stuff ends up practical, magnetic for sure will be long past it, and I think solid state is going to catch magnetic. Then it'll be interesting to see how it goes. My guess is in 10 years, it'll all go solid state."

Schubin essentially disregards "new" storage media and instead points to a concept of storage migration presented in a paper by Dave Cavena for Sun Microsystems. "[Cavena] said screw the technology; forget about the media. Instead, assume that you're going to constantly migrate your technology. So instead of getting the world's best hard drives, get the world's worst hard drives. Because with enough redundancy, they'll still store the data, and they're bound to last five years," Schubin says. "And then every three years, technology is going to change, and you just buy whatever happens to be the cheap technology. The idea is that you're always storing only the data; you don't care about the storage mechanism because you're only going to be changing it." BE

Collin LaJoie is an associate editor for Broadcast Engineering.

Clear-Com I.V.Core

Open creative horizons with intercom communications over IP-based networks.

BY PATRICK MENARD

As the broadcast industry continues to adapt to an all-digital workflow, the advent of IP-based systems has proliferated on almost every level, from capture and editing to distribution. One major area of broadcast where IP has not yet penetrated, however, is intercom. Most facilities still rely on existing, hard-wired, time-division multiplexing (TDM)-based architecture intercoms, which deliver dependable and quality performance but are expensive and difficult to extend into new or remote production areas. Until recently, delivering intercom capabilities over IP was not a viable option, simply because the audio quality was not good enough for broadcast purposes.

Yet the inherent cost-savings of delivering intercom over IP are an intriguing prospect, especially in the current economic environment. The flexibility of IP is also a draw, especially when broadcasters seek to upgrade their existing production and studio space through expansion into new areas of their current facilities or remote centers. The question then becomes: How can a broadcaster take advantage of the innate cost-savings in using its existing IP-based network to deliver intercom capabilities without sacrificing audio quality and the reliability of a traditional TDM-based intercom system?

Real-time intercom over IP

To address this situation, Clear-Com has recently acquired a different and advanced form of IP technology called I.V.Core (Instant-Voice Core), a set of building blocks and engines that enable real-time, dynamic and nonblocking intercom capabilities over standard IP networks. (See Figure 1.)

To date, I.V.Core is fully embedded into the company's Concert software-based intercom system, delivering audio-over-IP capabilities to new and traditional intercom systems. The associated hardware link is through the IVC-32, a 32-channel IP matrix card for the Eclipse Version 5.1 digital matrix system Median and Omega frames. The IVC-32 effectively connects Concert users on computers and Clear-Com V-Series IP panel users on a LAN or WAN to the existing, hard-wired intercom infrastructure.

This technology effectively expands the intercom footprint within a broadcast environment while addressing remote locations through an existing IP network and the Internet. For example, a remote production truck with Internet capabilities can actively access the intercom system back at the studio, or a creative team at the main office can link up to the studio while a production is in session. Armed with a laptop, USB headset (or embedded microphone and speaker) and a connection to the Internet, the computer screen now becomes a "soft panel" intercom system. This avenue opens up intercom communications to a wide range of users and locations, increasing productivity and allowing for more creative participation with a production.

I.V.Core is based on a decision-making engine that optimizes routing over standard networks, provides support for wideband codecs delivering high-quality audio, and features proprietary noise reduction and error recovery algorithms. Using AES 128-bit encryption for secure audio transmission, the system works over both wired and wireless packet-based networks such as the Internet.

While typical TDM-based and other IP systems simply mix or switch data, the I.V.Core bases its intelligent routing decisions on the audio needing to be routed, in effect making it an intelligent priority system. This maintains a low latency in the core while keeping control over network bandwidth. Only the active audio signal gets directed from source to destinations, allowing for efficient network-bandwidth utilizations that in turn permit the system to use wider-band codecs for a given system size. This is of great benefit to installed IP systems that are constantly bandwidth challenged through extensive traffic.

When combined with additional error recovery and noise reduction

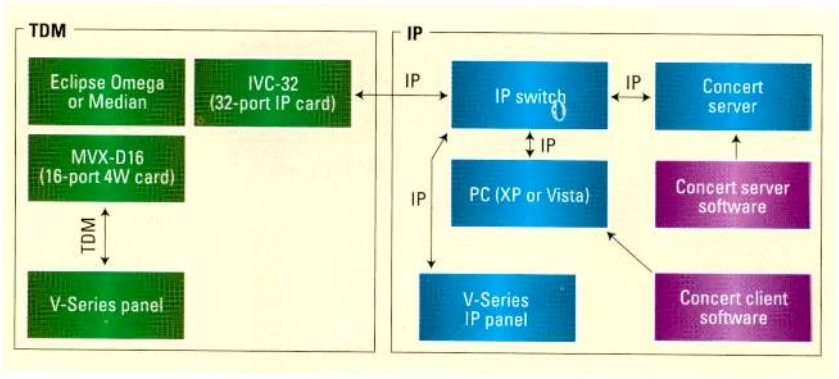

Figure 1. Clear-Com's I.V.Core is a set of building blocks and engines that enable real-time, dynamic and nonblocking intercom capabilities over standard IP networks.

algorithms, the user can now experience high-clarity and low noise voice communication, even when using challenging connections such as the Internet, where IP-traffic priority is not guaranteed. With a client engine that sends and receives voice packets, the I.V.Core is capable of simultaneously handling several voice communications. It allows many clients to connect at the same time, forming a complete intercom network operating over standard IP. This technology can also scale much more effectively to higher numbers of users while maintaining a high tolerance to poorer quality or traffic-laden IP networks.

Current IP products are built using traditional and TDM-based connection protocols such as Session Initiation Protocol (SIP) or H.323. As a result, they do not adapt well to IP-connection problems such as Network Address Translation (NAT) and firewall traversal (present on most IP networks today because the nature of NAT is to hide an entire private address space behind a single IP address in, say, a more public space). The I.V.Core protocol uses only one IP connection port for linking all IP clients, simplifying the IT management while making audio (QoS) management possible by prioritizing audio packets in one IP port, making it a good choice for widely used NAT protocols. In addition, the protocol supports fixed IP and DHCP, offering more flexibility to the configuration.

Embedding the I.V.Core technology into intercom systems enables communication for broadcasters needing to expand intercom access into places where cabling may be cost-prohibitive. With the addition of a new high-density IP card for its Eclipse Matrix range, new users can now plug in to this new network from their IP-based, TDM-based intercom panels or Concert soft panel. The overall interoperability of the technology yields greater access by more users, enhancing creative flow and streamlining communications.

In this challenging financial environment, broadcasters are faced with mandated equipment and facility upgrades to meet the needs of the all-digital broadcast future, against a backdrop of dwindling resources. The I.V.Core technology, as expressed through the company's Concert Version 2.0 software and related hardware interfaces, addresses the broadcaster's need to restructure facilities and increase content production, while keeping a watchful eye on the bottom line. BE

Patrick Menard is director, worldwide sales, Concert, for Clear-Com Communication Systems.

Energy-efficient lighting

Compact fluorescent and LED lighting can reduce both studio heat and required power in broadcast facilities.

BY JOHN LUFF

One thing about television: It is first and foremost an analog medium, even in its digital representation.

Now that I have your attention, or ire, let me explain. Television begins and ends with light. Lenses gather photons and focus them on sensors, which is undeniably an analog process (quantum mechanics aside). Even when computer graphics create the images, simulated lighting is used to get the human eye and brain to equate the CGI to the effects of light on real scenes. Images are thus captures. These are then transmitted and finally displayed, again turning electrons back into photons. This results in analog light that we perceive. Our perception might be time- and place-shifted from the analog experience, but it is nonetheless the purpose of television to replicate an analog perception of a scene. Indeed, one German word for television, Fernsehapparat, literally translated is "farseeing apparatus."

Without lighting, we would not be able to make images. Therefore, it seems logical to conclude that lighting for television (and film) is best done when it is not noticed — when it is replacing natural light in natural scenes so as to make the brain think that the images are constructed in the real world.

Energy-efficient fixtures have multiple benefits

Next to high-power transmitters, light has historically been the most voracious user of energy in a TV operation, not considering the time diversity usage patterns for a studio. In the early days of color television, the rule of thumb was that studios consumed between 50W and 100W per square foot of production space. In a 60ft x 80ft production studio, that amounts to more than 400,000W on the high end. Today, the *NAB Engineering Handbook* still recommends 55W, in any event a consequential amount of power to which one must add the power that HVAC systems contribute. Development of advanced camera sensors has contributed to a huge improvement in sensitivity, which allows lower light levels. Modern cameras list sensitivity 10dB better than a decade ago, and the transmission through lenses is better due to improved materials and much larger elements.

Lighting system technology took a large step toward improved energy efficiency when compact fluorescent studio lighting was introduced in 1981. Traditional incandescent lighting consumes up to 90 percent more power for equivalent light output. Heat generated is proportionally lower as well. There is no free lunch, of course. Dimming fluorescents requires special dimmers and, unlike point source lights like Fresnels and other focusable fixtures, they offer different artistic results. You would be hard pressed to light a TV drama with fluorescents, but a TV news set can be illuminated by mostly, or all, low-energy fixtures. Lighting with alternatives to incandescent fixtures is different enough that planning an installation and executing a lighting plan should be done by someone with experience.

The bulbs used in fluorescent fixtures are not the same as you would

WPEC-TV in West Palm Beach, CA, recently became the first studio to light its entire news studio with LED fixtures from Litepanels. The station now draws only 3kW with the studio fully lit, compared with 52kW from the Tungsten fixtures.

find in a hardware store. They are available for 3200° K applications as well as 5000° K. A second benefit is the exceptionally long life of at least 8000 hours. The net effect is a huge economic advantage in operating cost when all factors are considered.

LED — the path from consumer to broadcast?

Over the past year, there has been a lot of press about LED lighting for consumer applications. I have installed some myself with good results, albeit in a kitchen, not a studio. Automobile LED headlights and broadcast tower LED lights have become available recently. Their expected life greatly exceeds fluorescent, at 50,000 to 100,000 hours in some applications. Like fluorescent, they are not a point source at high power. Thus, for studio applications, they are more likely to show up in area lighting, cyclorama lighting and soft lights first. Several companies are now distributing fixtures with an array of high-power LEDs. They are very energy-efficient, and some are dimmable. A 50W LED luminary is reputed to put out the same light as a 650W Fresnel, though not the same pattern of illumination.

It is important to consider more than just the light level and operating efficiency, particularly with a new technology. When compact fluorescent technology first was used in television, many were skeptical that colorimetry and the throw patterns available would work for broadcast use. Experience has proved that it is a workable technology. LEDs need to be evaluated by the same inexorable approach. They inherently are not wide spectrum devices, but some manufacturers have developed proprietary packages, which include phosphor coatings on the package that provide better spectral response and more even illumination. LED lighting has penetrated photographic studio applications recently, and it is now starting to show up in broadcast fixtures.

At this time, LEDs have one serious trade-off that must be evaluated. Though they last an incredibly long time, they are very expensive. It is reasonable to expect that over time, as production volumes ramp up, the cost will come down. In no small measure this is because manufacturers are betting on consumer applications driving volume production rapidly upward. Like other pieces of the television puzzle, such as the camera, we benefit when huge amounts of research goes into consumer products that can be repurposed directly or leveraged into broadcast products.

LED lighting has penetrated photographic studio applications, and it is now starting to show up in broadcast fixtures.

Dimming 101

Lastly, controlling studio lighting with dimmers is a virtual requirement for effective creative control. For incandescent fixtures, dimmer sizes and types are highly evolved, and systems are quite standardized. Using newer high efficiency technologies renders large dimmers, in the multiple kilowatt range, rather redundant, or at least gross overkill. Dimmers appropriate for LED and compact fluorescent luminaries are available, and their capacity is appropriately a fraction of what we are used to dealing with.

Lower long-term cost, less environmental impact, with acceptable compromises is not a bad place to go in our energy-conscious economy. **BE**

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Broadcast Engineering, June 2009, Vol. 51, No. 6 (ISSN 0007-1994) is published monthly and mailed free to qualified persons by Penton Media, Inc. 9800 Metcalf Ave., Overland Park, KS 66212-2216. Periodicals postage paid at Shawnee Mission, KS, and additional mailing offices. Canadian Post Publications Mail Agreement No. 40612608. Canada return address: Bleuchip International, P.O. Box 25542, London, ON N6C 6B2. POSTMASTER: Send address changes to Broadcast Engineering, P.O. Box 2100, Skokie, IL 60076-7800 USA. CORRESPONDENCE: Editorial and Advertising: 9800 Metcalf, Overland Park, KS 66212-2216 Phone: 913-341-1300; Edit. fax: 913-967-1905. Advert. fax: 913-967-1904.

Decisions, decisions

TV news is losing viewers to the Web. What can we do?

BY ANTHONY R. GARGANO

Some recent newspaper headlines include: "WUSA Drops Weekend Morning Newscasts," in the *Washington Post* on Jan. 7; "WYOU-TV Pulls Local Newscast" in the *Republican Herald* on April 4; and "Local KBIM-TV Newscast Going Off the Air" in the *Roswell Daily Record* on Dec. 10, 2008.

Broadcasters are forever at the initial brunt of economic downturns. One of the first things to get the axe at most companies is the advertising budget. As a result, and indeed as I have written previously in these pages, this reduction in advertising at the very beginning of a slump in the economy results in the broadcast industry being a leading indicator of the start a new recessionary cycle. Now, on the heels of several years of belt-tightening and heavy capital expenditures for DTV upgrades comes the mother of all recessions, and broadcasters are finding no notches left on that increasingly tightened belt.

Is local TV news losing the battle for eyeballs?

As a result, that last bastion of original programming and typically the largest provider of station revenue, local news, is now taking huge hits under the banner of cost reductions. Reducing the costs of news operations is one thing, but completely eliminating news broadcasts altogether? That draconian tactic is being implemented more and more today, and while it may provide instant accounting gratification, it really begs the question of whether this approach is in the best long-term interests of the station.

Recent years have seen a number of actions by stations to reduce the cost of news. The 11 p.m. or late night newscast at one time was a completely new production vis-à-vis the early evening newscast. Today we see more and more 6 p.m. newscast footage repurposed for 11 p.m. and entire 6 p.m. segments simply being rebroadcast at 11 p.m. One recent study found that 47 percent of stations repeat news segments.

But once you start worshipping at their altar, the gods of cost reduction demand continuing sacrifice. Thus, enter unique new approaches to reducing the cost of news. Welcome to the world of Joint Sales Agreements (JSAs), Shared Services Agreements (SSAs) and duopolies (single ownership of multiple stations in the same market). Call them what you will, but the result is the same — simplifying for the sake of brevity, the news operations of two or more stations merge into a single entity that provides all the newscasts for each of the stations that are part of the agreement. So, vanilla they may be, at least newscasts on each station continue. Such agreements aren't limited to smaller markets or independent station groups.

In Philadelphia, the FOX and NBC O&Os have gotten together to share news story video. Instead of each station sending a news crew out to cover a story, now a single crew can go out and provide the same video feed to both stations. What's the next step? FOX and NBC plan to roll out this same concept in New York, Chicago, Los Angeles, Dallas and Washington, D.C., later this year. Ah, but what about those ever demanding gods of cost reduction?

Welcome to the virginal sacrifice stage of adoration. Content has been repurposed, news operations have been merged — what's left? Aha! How about eliminating newscasts entirely? And, that's where we are today. If you are losing viewers to cable news channels, why would you want to hasten the process? If more and more people are relying on the Internet for news, why would you want to confirm they are making the correct switch? There really are broadcast viewers out there. Radio Shack just released its first-quarter 2009 results. In the worst recession since the 1930s, its profits were up over last year! What did the company attribute it to? The sale of DTV converter boxes.

Verizon is readying the launch of FiOS1, a New York City local news channel for its fiber-optics system. Why? Because it believes that news sells, and news attracts viewers. Many stations use their newscast to drive viewers to their Web site. How about using the Web site to drive viewers to their on-air channel? Why are some broadcasters so focused on expeditiously creating their own demise?

Fortunately, not all is doom and gloom. Here are other headlines from markets as diverse as Idaho Falls, DMA 163, and Milwaukee, DMA 34: "KIFI Goes to HD News Broadcast" in the "*Idaho Business Review*" on March 6; "Channel 4 is First Local Broadcaster to Air Newscasts in HD" in the *Milwaukee Journal Sentinel* on April 7; and "KTLA Channel 5 Expands News Operations" in the *Los Angeles Times* on April 1.

Perhaps then all is not lost for local broadcast news. On one side, TV news is becoming irrelevant, and eliminating the costs of the news operation will allow the station to remain on-air. The opposing view finds TV news to be vital and vibrant; smart marketing and promotion as well as creating a good product utilizing the latest technology can best the competition. Where do you stand? BE

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

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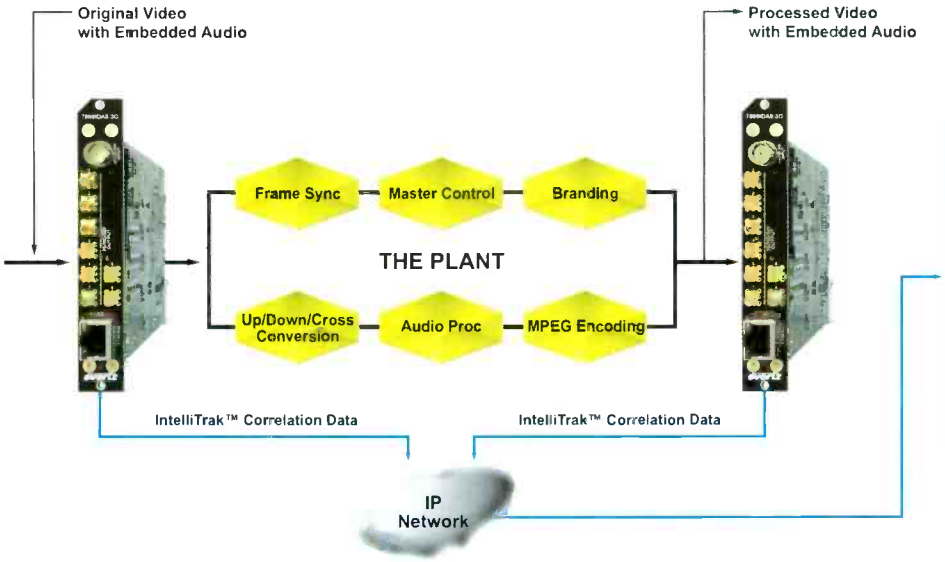

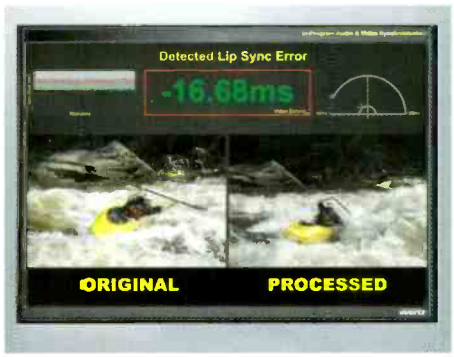

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