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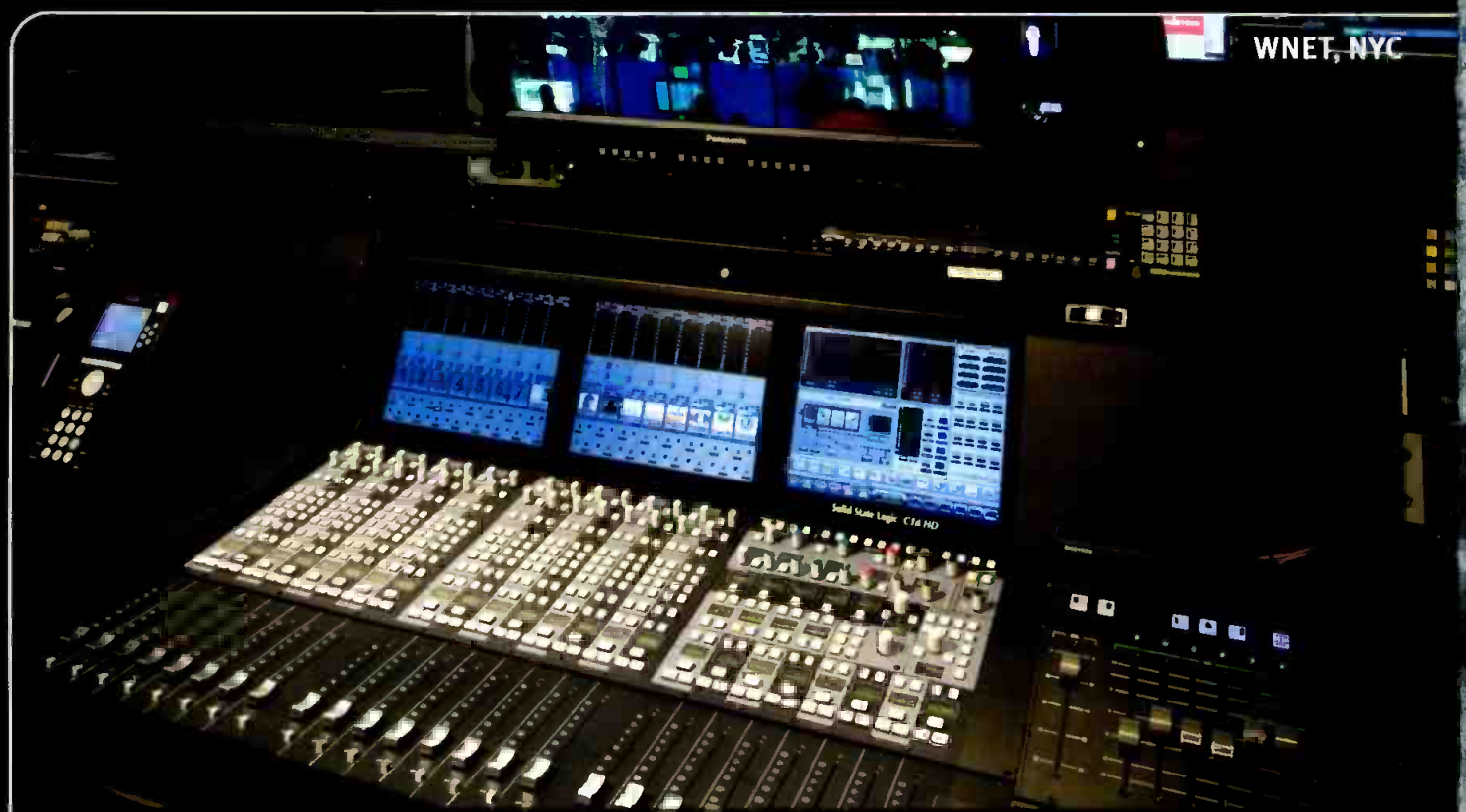

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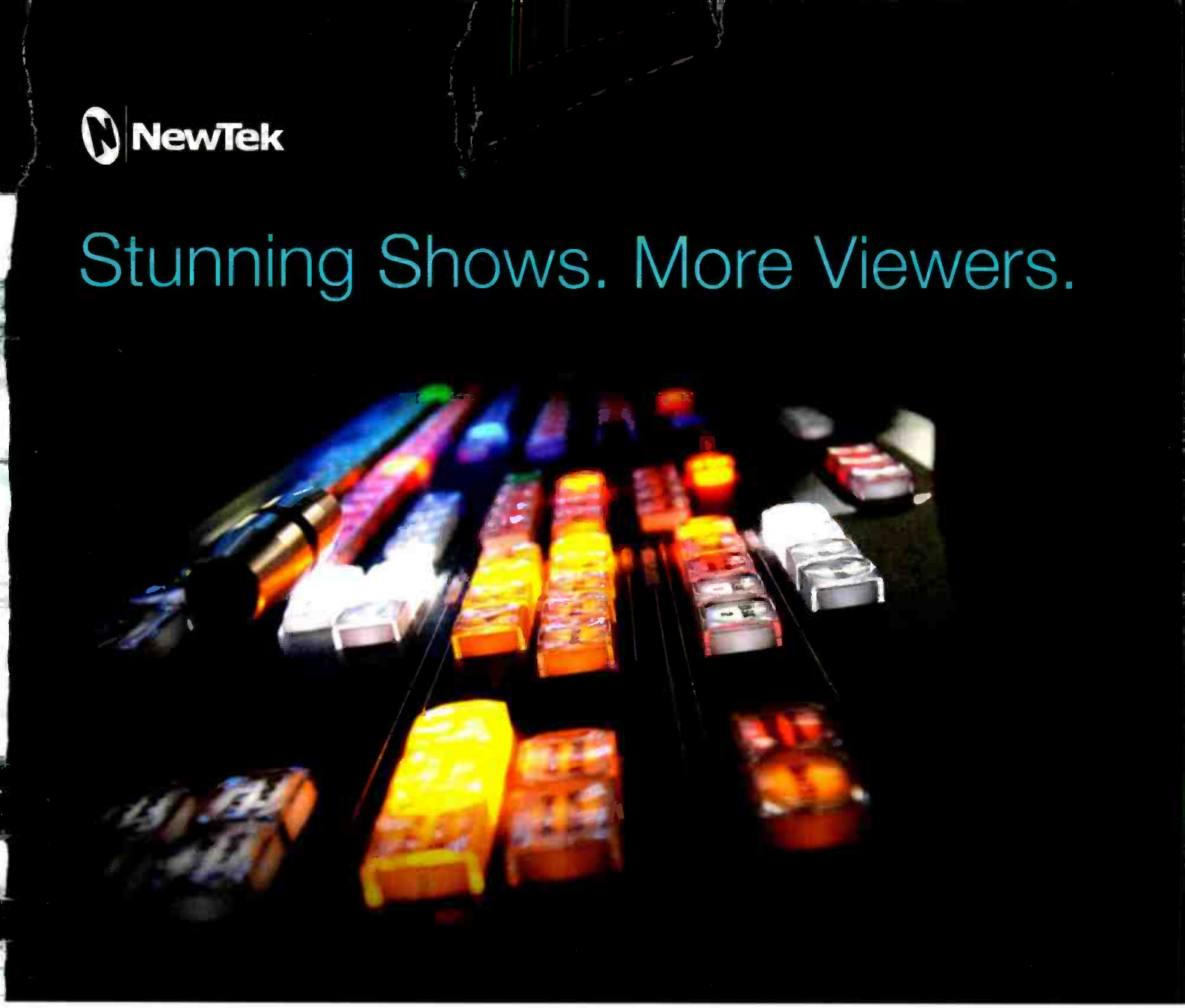

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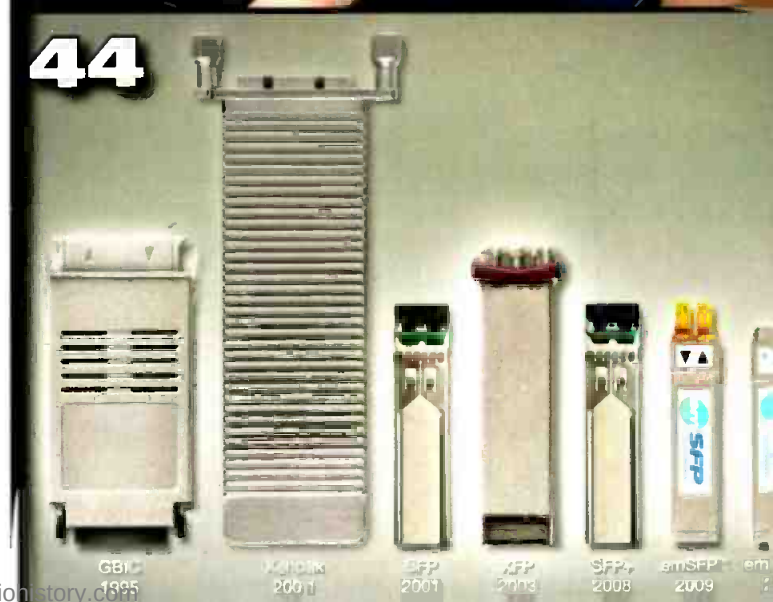
ON THE COVER:

Teddy Demilew, Wohler engineer, performs MPEG TS monitoring using one of several lower-cost video monitors placed throughout a media facility. This new trend offers greater flexibility.



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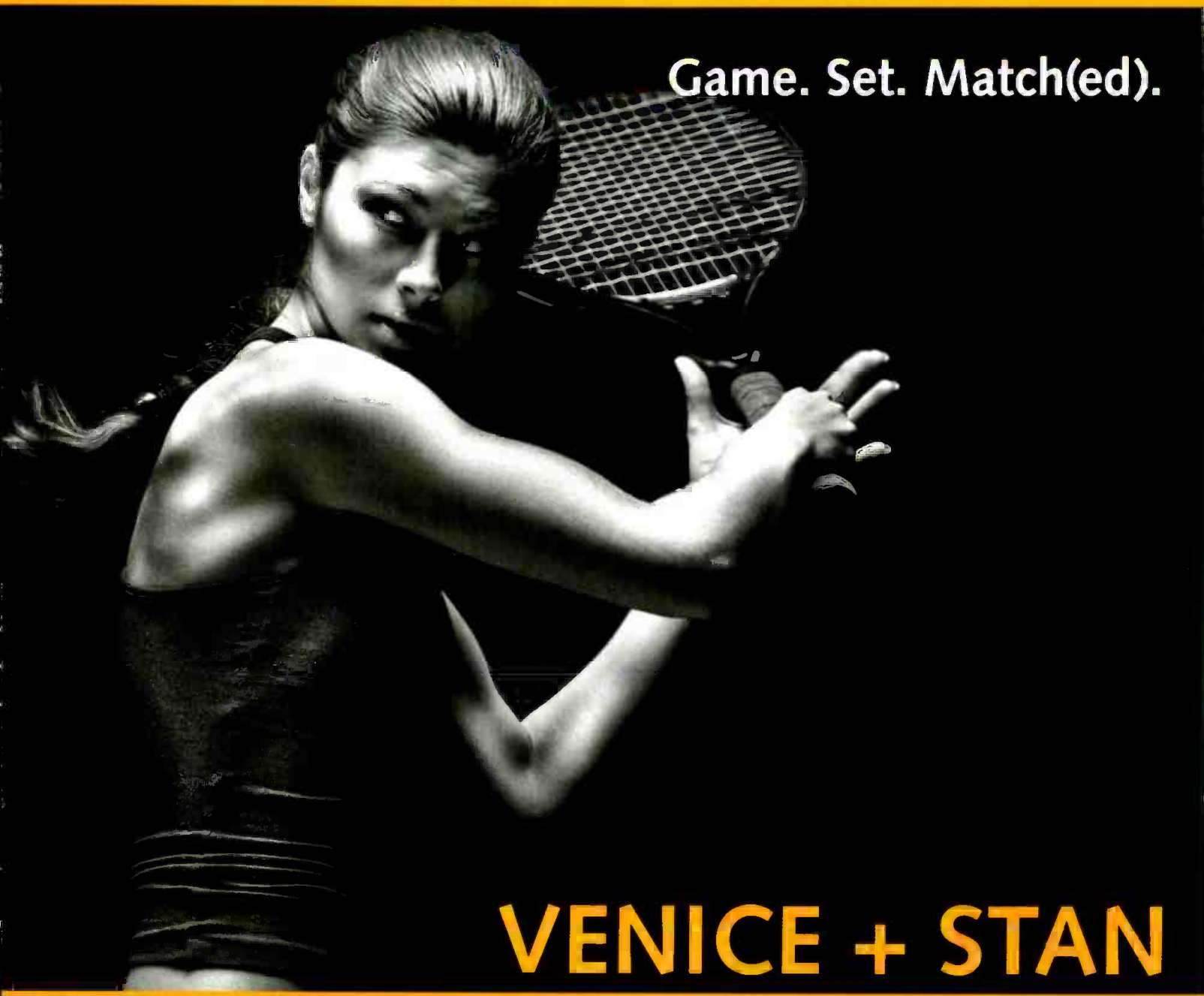

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Squeeze play

Way back in July 2010, I predicted a good future for Google TV. That anticipation of success for Google's IP content delivery network appears to have been overly optimistic. Even so, this week's list of press releases included one from Sony announcing a new version of Google TV, and one from Harman for a remote control that implements Google TV. In addition, you can hardly buy a DVD player that does not come equipped with a trial subscription to Netflix, VUDU, Hulu and a range of other IP-delivered content channels.

Apple remains hesitant to deliver on the oft-rumored Apple TV. That may be because its former leader, Steve Jobs, once said, "The television industry fundamentally has a subsidized business model that gives everyone a set-top box, and that pretty much undermines innovation in the sector." Consumers continue to face challenges in getting free OTA content — with the emphasis on free. It is increasingly difficult (read that as expensive) to watch the local news.

As broadband and cable TV companies begin seeing some customers move to Internet-delivered content, they are taking steps to curb that appetite. Because most of today's broadband contracts provide unlimited download (except for speed), consumers have little reason to control their IP cravings. It's like the all-you-can-eat restaurant — salad to steak to dessert — with few restrictions.

While the jury remains out on whether consumers will switch to an OTT delivery model, the cable companies are taking steps to be sure that doesn't happen. For instance, customers of Time Warner Cable in San Antonio are now encouraged to adopt a diet-restricted Internet consumption model. Customers who agree to a 5GB/month download limit get a $5 monthly discount. If, however, they go over that limit, they are charged an additional $1 per GB. Says Jon Gary Herrera, local TW spokesman, "We're moving away from one-size-fits-all."

For broadcasters, what's hidden in this business model is that viewers could find themselves paying twice for what used to be free OTA content. Because the majority of consumers purchase both television and Internet service through the same vendor, the CDN has no incentive to cut viewers any deals. It's the "You can pay me now or pay me later" scenario.

As much as this annoys me, few things in this world are not based on consumption. The grocery store doesn't let customers have 10 heads of lettuce, but charge for only one. Nor can someone raid the grocery store meat counter for steaks and expect to pay for hamburger. Most of what we buy is based on how much we use — water, electricity, gas, etc. Yet, for some reason, many expect broadband IP to be provided on an all-you-want basis. Your local CDN is here to be sure that does not happen.

The solution to squeeze-play pricing is competition. Unfortunately, content delivery remains an uncompetitive business model. While I have the option of selecting from three cable companies and two satellite companies, there are no separate broadband providers. I am effectively forced to accept an all (TV plus Internet)-or-nothing approach from vendors. And, not surprisingly, prices between vendors are pretty much the same.

Getting local OTA broadcast content into American homes used to be easy and free. Now, it is neither. Broadcasters appear to again be stuck between the proverbial rock and hard place when it comes to delivering content to viewers. BE

EDITORIAL DIRECTOR
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Dual SDI to HDMI Mini Converter for 3G/3D/HD/SD

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Like today's Olympians, broadcasters are better than ever.

BY MICHAEL GROTTICELLI

Fast, efficient and agile. Those three words were surely part of virtually every athlete's mantra at the 2012 Summer Olympic Games in London, July 27 – Aug. 12. They could also be used to describe the strategy of broadcasters and production companies around the world — including NBC Olympics in the U.S. — for capturing, sharing, transmitting and streaming live and prerecorded HD (and some 3-D) images and getting them in front of viewers wherever they may be.

In addition to traditional broadcasters, this year's Games saw live and recorded coverage streamed online from Yahoo!, AOL and Google to cell phones and other portable devices from telcos AT&T, Verizon and other international mobile video services.

David Mazza, senior vice president, engineering for NBC Olympics, a division of the NBC Sports Group, said after more than two decades of Olympics coverage, his team knows how to stay fast, efficient and agile.

"Every Olympics, we get better at this in terms of acquiring and producing content, and presenting it to viewers in ways they want to watch it," Mazza said. "Although the distribution platforms have increased exponentially, the ways in which we prepare packages for these platforms has not changed that much. Efficiency in how we do everything is the key."

The fast, efficient and agile connections (using adaptive bit-rate distribution) employed to bring the Games home included a minimum of 100Mb/s as to accommodate multiple HD channels. NBC Sports, the U.S. rights holder this year, presented more than 100 channels across its various platforms. Most featured live coverage, according to Mazza. Internally, the network employed more than 40 bi-directional channels of contribution material between London, NBC's New York City headquarters at 30 Rockefeller Center ("The Highlights Factory"), and its NBC Universal Cable Network facility in Englewood Cliffs, NJ. Four trans-Atlantic 2.4GB pipes served as the main backbone.

NBC Sports, the U.S. rights holder for the London Games, presented more than 100 channels across its platforms.

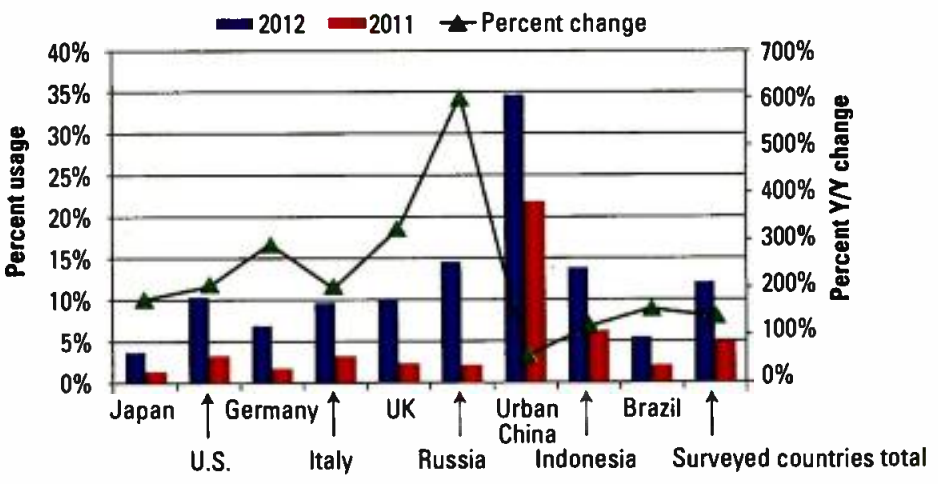
The "Highlight Factory," which was responsible for creating highlights content presented across the Web, cable set-top boxes and mobile devices, used Sony's Media Backbone, an SOA-type workflow platform designed to streamline production by leveraging metadata associated with each clip.

All content captured at the venues was edited at the International Broadcast Centre (IBC) at the northwest corner of the Olympic Park in London. Then, it was transmitted to the 30 Rockefeller Plaza and Universal Cable Network facilities—where commercials and graphics were added, and

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

Tablet TV/video usage doubles

Around the world, tablet usage for TV and video consumption more than doubled in 14 regional markets year-over-year between 2011 and so far in 2012. In the U.S., usage increased more than threefold in that period.



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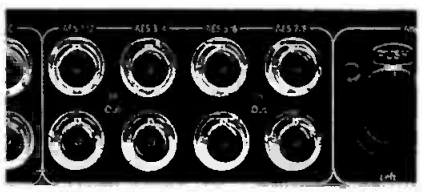

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programming was distributed as required. Both of these NBC facilities used their previously installed bases of more than two dozen Grass Valley Trinix routing switchers and Encore control systems to make it happen. In addition, both facilities had large, installed bases of older Grass Valley Profile, and the latest-generation

Hundreds of broadcasters edited and redistributed Olympics content inside the International Broadcast Centre.

K2 Summit servers that record, store and distribute the Olympic content. These installations included extensive use of the Grass Valley Time Delay Application, installed on the K2 Summit servers, to target delivery to different time zones across the U.S.

Making sense of it all

Making sense of the literally thousands of audio and video assets coming out of London to support an increased amount of TV, Web and mobile video platforms is an enormous task. NBC Olympics planned to cover every sport and every single competition — which was being streamed live online or telecast by NBC and its affiliated cable networks in the U.S. (This began with the Great Britain vs. New Zealand women's soccer game on July 25, two days before the opening ceremony.) In total, the network televised more than 5500 hours of the 2012 Olympics, with 272 hours on the main NBC channel alone. That's almost 2000 hours more than it offered U.S. viewers of the 2008 Beijing Olympics.

Olympics everywhere

Coverage was provided across NBC, NBC Sports Network, MSNBC, CNBC, Bravo, Telemundo, NBCOlympics.com, two specialty channels and the network's first-ever 3-D coverage via Comcast Cable, DirecTV and other outlets. NBC passed through a 3-D feed from the host broadcaster, Olympics Broadcast Services (OBS), and rebranded it. Fans who wanted to see streams online had to verify that they were paying cable or satellite subscribers. While most live streams were archived, reruns of high-profile events to be shown on the network were not available until after the West Coast broadcast.

Since its acquisition by Comcast, NBC Universal renamed the Versus cable channel the NBC Sports Network. There, it presented much of the Olympics programming that, in recent games, was seen on USA Network. The NBC Sports Network showed an average 14 hours of content per day, focusing on team sports like U.S. men's basketball and gymnastics.

An international organization set up for the Games, The Olympic Broadcasting Services London, produced more than 200 hours of 3-D coverage, including the Opening and Closing Ceremonies, gymnastics, diving, swimming and more. It was the first time the Games were distributed in the U.S. in 3-D. (Limited 3-D coverage was used overseas during the Beijing Games.) The BBC broadcast the Opening and Closing ceremonies as well as the men's 100m Final in 3-D, and made it available free to viewers in the UK with compatible television sets. Grass Valley LDK series HD cameras and servers helped bring these stereoscopic images home.

Panasonic supplied its AG-3DP1 shoulder-mount 3-D camcorder and 3-D monitors (including the 3DL2550 and 910) to produce the first HD 3-D live broadcast in Olympic history.

Compression efficiency

A number of innovative and spectrally efficient approaches, including the use of latest compression algorithms (such as JPEG 2000, H.264 and H.265), made more bandwidth available to broadcasters than at any prior Olympics. Ericsson, Harmonic, and others provided the encoders, decoders and multiplexers necessary to get more data through the pipeline and make it all work.

MOG Technologies supplied its centralized ingest solutions to NBC Olympics, which used the company's mxfSPEEDRAIL F1000 ingest system to conform the captured clips from Sony XDCAM stations, and deliver the output to dozens of multi-platform distribution servers. The F1000 also enabled the handling of growing files, saving time for editors when sending EDLs for conform, merging sub-clips from several LongGOP sources. In addition, the mxfSPEEDRAIL S1000 SDI recorder was used to capture simultaneously to an Avid Interplay and ISIS storage system and Harmonic MediaGrid, allowing files to be immediately available in the editing suite (both onsite in London and back home in the U.S.).

Universal 1080i HD

London's IBC was located inside the London Olympic Park, just outside London. From there, hundreds of broadcasters established a home base from which to edit and redistribute content. All images were handled in the 1080/50i HD format. The 3-D coverage was transmitted as two 1080i signals to make a stereoscopic image in viewers' homes (with compatible TV sets and glasses).

Panasonic's DVCPRO HD was once again chosen as the official recording format for capturing the London Games. These Games marked the 10th event (counting both Summer and Winter Games) since Barcelona in 1992 that a Panasonic format has so been designated. This year, Panasonic said, various broadcast outlets used more than 1000 of its cameras, more than 300 recorders and more than 100 professional monitors.

Sony Electronics provided a range of HD broadcast and production technologies for the NBC Sports Group, including: HD studio

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and portable cameras, switchers, OLED monitors, decks, microphones and workflow management systems. Cameras included the latest HDC-2400 and HDC-2500 models for field and studio productions at the IBC in London, with content fed to Sony XDS-PD1000XDCAM stations and PDW-F1600 XDCAM decks.

About 30 XDCAM PDW-F800 cameras were used primarily for ENG use, complemented by 10 portable PMW-EX3 XDCAM EX camcorders for capturing pre-Games interviews and press conferences as well as other activities. Also, Sony's MVS-7000X and MCS-8M production switchers handled feeds between the IBC and various athletic venues.

NBC Sports used Sony series OLED monitors for critical evaluation, as well as LCD display monitors. Other gear supplied included Sony ECM-77BC lavalier and ECM-680S uni-directional microphones.

Several international broadcasters and production companies used Grass Valley LDK 8000 Elite and LDK 8300 Super Slow-motion HD cameras and its K2 Dyno HD Replay systems. Others used Ikegami HL-79E HD cameras, HD monitors and related technology.

Digital audio was captured and broadcast in 5.1 surround sound and stereo, depending upon the country. Owing to new efficiencies, this year's Games employed eight audio control rooms, down from the 17 built for the Beijing Games, because more all-digital OB vans were available on site.

Flexible signal distribution

At the IBC, Miranda Technologies provided its NVision hybrid routers, Kaleido multiviewers, Densite' infrastructure equipment (including signal conversion, fiber and media cards), and iControl signal and facility monitoring technology.

Audio was also a major part of these Olympics, and companies like Linear Acoustic, TSL Professional Products, Wohler Technologies and others provided their respective equipment to various broadcasters. TSL supplied the BBC with more than 40 of its PAM2 multichannel audio monitoring units for use within the IBC. Linear Acoustic supplied dozens of similar-capability units to NBC Olympics, both in London and the U.S.

For broadcasters and photographers alike, Anton/Bauer sent hundreds of its Dionic HC and Dionic HCX batteries to London. The company, which said it supplied equipment for the 20th year, has also supplied its biggest capacity chargers, the TM4 and DUAL 2722 models.

Onsite service

In addition to gear, most equipment vendors established onsite service centers, where customers could see company representatives stationed in and around the IBC — supplying broadcasters with 24/7 access to products, repair, service and support, as well as on the ground.

"We're more efficient now and can do more things than we ever could before," Mazza said. "But, some things never change. The basic video production and transmission principles are still in place, but everything is handled as a digital file.

"The Olympics is still a huge undertaking, but we've gotten really good at making it happen, both financially and technologically."

Of note: The NBC network paid $1.18 billion for the rights to telecast the Olympics, and had roughly 2700 people on site. The Olympics under NBC made money until 2010, when the Vancouver Winter Games lost an estimated $223 million. London is expected to lose more than that. BE

Micheal Grotticelli regularly reports on the professional video and broadcast technology industry.

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New rules

The FCC's online public file regulations and new ASR rules have gone into effect.

BY HARRY C. MARTIN

On Aug. 2, 2012, the FCC's new online public file regulations for all television and Class A TV stations went into effect. NAB asked the D.C. Circuit Court of Appeals for a stay as well as permanent relief from the new rules, but its petition for a stay was denied on July 27, less than a week before the Aug. 2 effective date of the new rules.

The FCC's cloud-based facility was supposed to be fully operational prior to the Aug. 2 effective date. The system was to undergo further "screen-sharing" demonstrations July 30-31. A previous demonstration, on July 17, was successful. Once the FCC's database is fully operational, licensees will have to start uploading all *newly created* documents required to be placed in the public file. Exceptions to this requirement are letters and e-mails from the public and, in some but not all cases, political file materials. Licensees will have six months in which to upload required *pre-existing* public file documents to the online site.

Pre-Aug. 2 *political file* materials are exempt from the online file requirement.

Pre-Aug. 2 *political file* materials are exempt from the online file requirement. With respect to post-Aug. 2 political materials, there will be a staggered implementation system as follows: Stations affiliated with one of the top-four commercial networks *and* located in a top-50 market must start uploading post-Aug. 2 political documents as soon as the FCC's site can receive them. All other TV stations — i.e., top-50 stations not affiliated with ABC, CBS, Fox or NBC and all non-top 50 market stations — have until July 1, 2014, to begin uploading their political files.

Thus, as of this writing, it appears that the FCC's new database will be operational and ready to receive public file materials as early as the Aug. 2 effective date of the new rules.

New ASR rules in effect

In June, the FCC's revised antenna structure registration (ASR) rules went into effect. This is important for anyone planning to build *any* new tower that would have to be registered. With some exceptions — *e.g*, towers subject to the jurisdiction of another federal agency's environmental review process — registrants now need to do the following to assure their registrations comply with FCC environmental standards:

- File a partially-completed Form 854 in the FCC's ASR system. This form will contain information previously required on Form 854, plus tower lighting information and specification of the date on which the registrant wants the FCC to post the application on the agency's website for comments.
- Publish a notice of the filing of the application in a local newspaper or by other means. A public comment period will then be open for 30 days.
- If the FCC staff concludes that no additional environmental review is required, the applicant will amend its application to reflect (a) if not previously provided, the FAA's study number and issue date, (b) the date of the local public notice and (c) a certification that the proposed construction will have no significant environmental impact.
- If, after considering the Form 854 and any public comments, the FCC decides that more review is warranted, it will require the submission of an Environmental Assessment (see 47 CFR §§ 1.1308 & 1.1311), which will take additional time for the staff to evaluate before the registration can be approved. BE

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

Dateline

- On or before Oct. 1, 2012, noncommercial TV and Class A stations in Alaska, Florida, Hawaii, Puerto Rico, Oregon, the Virgin Islands, Washington and the Pacific islands must file their biennial ownership reports.
- On or before Oct. 1, 2012, television stations, Class A TV, LPTV stations and TV translators in Florida, Puerto Rico and the Virgin Islands must file their license renewal applications.
- On Oct. 1, 2012, TV and Class A TV stations in Alabama and Georgia must begin their pre-filing renewal announcements in anticipation of an Dec. 3, 2012, renewal application filing date.
- On Oct. 1, 2012, television and Class A TV stations in the following locations must post their 2012 EEO reports on the FCC's website (see story above): Alaska, Florida, Hawaii, Puerto Rico, Oregon, the Virgin Islands, Washington and the Pacific islands.

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

Monitors and displays

What features make a pro monitor "pro?"

BY ALDO CUGNINI

It was not too long ago when we were considering whether flat panels would overtake the venerable CRT in utility and function for professional applications. Believe it or not, that day has already passed. This month, we'll summarize the state of the art for professional monitors and displays, and take a deeper look at some of their characteristics.

Monitor grading provides a ready reference for pros

There are essentially three "grades" (also called "classes") of broadcast monitors used in a professional TV production environment. The most rigorous functional requirements are for Grade 1 monitors, which are reference devices for high-grade technical quality evaluation of picture capture, post production, transmission and storage. Grade 1 displays reproduce the highly accurate colors required by the most demanding monitoring applications, including camera control, color grading and content evaluation. EBU Tech 3320 recommends that in a Grade 1 monitor, the black level should be adjustable to be below 0.1cd/m² (nits), the full screen (sequential) contrast ratio should be above 1000:1, and the simultaneous (within-a-picture) contrast ratio should be above 200:1. Grade 1 monitors should present pictures at a D65 reference white, and Grade 1 and Grade 2 monitors should have no visible pixel defects.

Advanced capabilities such as video processing and color calibration technology provide support for multiple color standards.

In addition to an analog baseband interface, pro monitors typically have HD-SDI digital interfaces, and more models are now including DVI and/or 3G-SDI. A typical 17in monitor can provide 1600 x 900 resolution at 1080p with 4:2:2 10-bit support. To provide the needed bandwidth for 4:4:4 color, a dual-link HD-SDI is often available. Additional professional features include focus assist, markers, waveform and vectorscope monitors, time code display, closed caption decoding and display, 1:1 pixel mapping modes, audio de-embedding and mixing, and SDI routing, as well as loudness metering and control.

A split-screen function that simultaneously displays two images side-by-side from two different video inputs can be used for multicamera setups as well as for comparing processed and original images. Built-in calibration software allows a monitor to be calibrated with a built-in sensor, without using a PC.

3D LUTs provide higher processing accuracy

In addition to adjustable backlight and gamma control, advanced monitor capabilities such as video processing and color calibration technology provide support for multiple color standards, using OEM and third-party 3D LUTs (look-up tables). Monitor (and camera) users are often confused by color LUTs. Historically, cameras have incorporated gamma correction to compensate for the nonlinear signal-to-perceived-luminance characteristic of consumer CRTs. With the proliferation of LCD displays, this gamma is now reproduced in the display electronics to maintain compatibility with existing cameras. This compensation, to each of the decoded R, G and B signals, is done through a one-dimensional lookup table (1D LUT), or an equivalent real-time digital signal-processing algorithm. (See Figure 1 on page 20.)

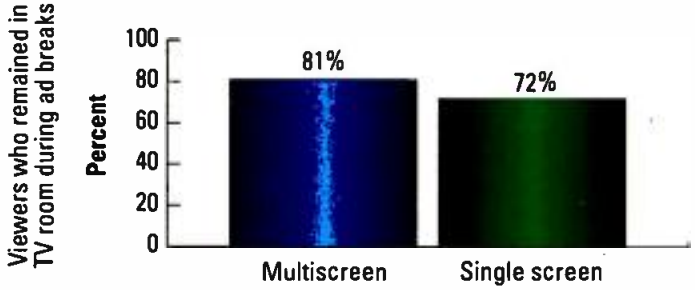
Camera operators, in setting up black, white and gamma levels, are adjusting the picture colorimetry, which introduces a transfer function

FRAME GRAB

A look at tomorrow's technology

Multiscreen use boosts ad exposure

A study conducted in the UK found that multiscreen viewers were more likely to stay in the TV room and sit through commercial breaks.



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Securing content

Better infrastructure knowledge means better security decisions.

BY BRAD GILMER

In the professional media industry, one fact is clear: Everything we do is about getting content to viewers, wherever they may be. The end goal, of course, is to make money off of this transaction. Clearly, if we do not have content or our content is compromised in some way, then this transaction breaks down, with serious financial consequences for the media companies involved.

This fundamental equation drives everything we do: CONTENT + VIEWERS = $$$. That is why you see the film and music industries constantly struggling with new technologies and opportunities that threaten this model. The issue of content piracy is vast, encompassing technology, legal and moral issues. Because of space constraints, we are going to have to take a different tact in this column. We are going to limit our discussion to what a broadcaster can do to ensure that content is always available, thus ensuring the success of the equation above. Specifically, in terms of securing content, what can the average broadcaster do? What steps can a broadcaster take to ensure that content is available when it is needed (not missing) and that content is not copied or stolen?

Where is the real problem?

I would posit that when it comes to content theft, broadcasters are not the problem. Why? Because, with a few exceptions, by the time most broadcasters have access to content, it has already been released by content creators in other domains, be it theater, DVD or through high-quality Internet distribution. Ten years ago, this might not have been the case, but now theft of content from broadcast facilities is the least of content producers' worries. Before the advent of HD and commodity, high-quality consumer storage and viewing devices, broadcasters had access to content that could be extremely high-quality — and they still do. What is different now is that everyone has access to this same, high-quality content. If we are talking about securing content, and theft from broadcast facilities is not a major industry concern, then exactly what are the problems that broadcasters face in this area?

Chiefly, the biggest area of concern for broadcasters is ensuring that content is secured so that it is always available when needed. As such, the challenge is to secure content in a way to ensure that it is not accidentally erased, moved, lost or otherwise unavailable when on-air time arrives. Most vendors already provide solutions to this problem, which usually come with a price. Let's look at this more closely.

It is important to keep a big-picture view in mind when thinking about securing content. There are many options open to the broadcaster, and as I said, almost all have associated costs. So, it is good to constantly ask whether the cost involved in a particular solution is justified by the risk of a loss of content. It may not be necessary to have every content system backed up; it may not be necessary to provide high availability on all computer networks in your facility.

This fundamental equation drives everything we do: CONTENT + VIEWERS = $$$.

As Figure 1 shows, another way to think about the worth of cost to secure content is to look at what your options are at any given time in the broadcast process, and what the cost to replace

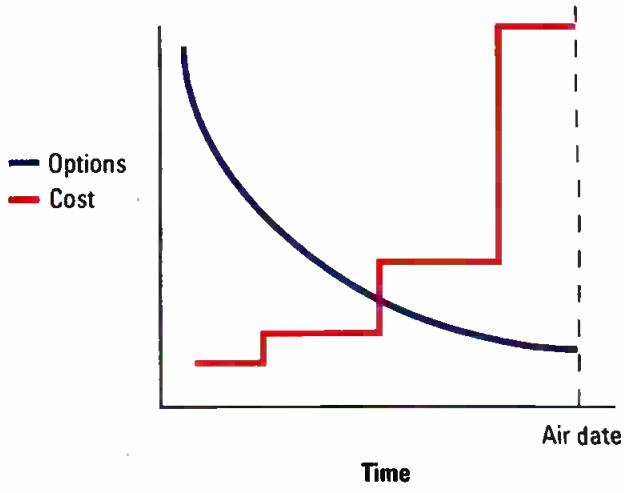

Figure 1. As the air date approaches, options decrease and costs increase in order to replace lost content.

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lost content is at that stage. Consider a commercial.

When a commercial order is placed, copy instructions (instructions that describe when and how commercials should air) are forwarded to the broadcaster. About the same time, commercial content arrives at the station. If the content fails to arrive or is faulty in some way, there are a number of options for replacing it, and the cost of those options can be low. However, as time goes by, the number of options narrows, and the cost of the remaining options increases.

For example, early in the process, content might be replaced simply by sending another copy of the commercial by mail. However, later in the process, you might have to use overnight delivery or a satellite feed. Ultimately, if the commercial cannot be replaced, the cost of the lost content is equal to the selling price of the commercial air time. Once the time has passed, no amount of money can bring it back. Naturally, it makes sense to spend more money to ensure the security of the content as it gets closer to air.

Steps to take

There are specific steps you can take to ensure content security:

• *Know your infrastructure inside and out.* You cannot understand what your options are regarding ensuring content is available when you need it if you do not have people on staff who understand your infrastructure well. This includes having people who understand how vendor products such as automation systems and servers work. Unfortunately, there has been a tendency in broadcast facilities to cut technical staff, but it is difficult to ensure content security if you do not have good technical people.

• *Study systems and architectures so you know what your options are.* You should not only understand how your facility operates, you also should seek out opportunities to learn about other facilities and architectures. Visit other facilities, and attend local SMPTE, SBE or other broadcast forums where you can learn what others are doing about ensuring content security.

• *Establish architecture patterns based on system designs that work well.* Once you have looked at your own facility and studied other facilities to determine what works best, seek to establish architectural patterns — reusable templates for system designs. Needless to say, these templates should be proven designs that work for your organization. Take the time to not only educate your staff, but also to explain the benefits of these patterns to others in your company, business and financial people, for example. When you have buy-in from a large number of people, these patterns can simplify decision-making.

Understand what high availability means, and that high availability does not have to mean high cost.

• *Ensure that you have a range of patterns with different levels of protection and cost.* As discussed above, you will need a range of designs. Not everything needs to be completely redundant. Not every system needs RAID storage. Plus, it is not possible to justify the unnecessary costs of employing these systems everywhere in your facility. Be prepared with a variety of designs that allow flexibility in the amount of content security provided. Remember, at some points, content security may be as simple as dropping a tape in the mail.

• *Study and actively discourage architectural anti-patterns.* Surely you have seen (and maybe participated in) designs that should not be repeated. These are called anti-patterns. Study any failures of content security, and when you find something wrong, do not just fix it. Instead, actively discourage that design from ever being used again at that point in your content chain.

• *Understand wh*
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simply, when you are close to air, co
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are some expensive solutions that d
provide reliable systems. But, in som
cases, two lower-reliability systems an
a suitable changeover design migh
provide a cheaper high-availabilit
solution compared to a single syste
designed to be extremely reliable.

For example, consider disk drives. In some special applications, you can purchase specially manufactured disk drives that have high MTBF. Those drives could be put into a RAID array. Of course, you could then mirror multiple arrays to ensure the same content is stored on more than one RAID device. However, after this, you might end up with a storage solution that costs thousands, or even tens of thousands of dollars. And, because of chained dependencies, it actually has a lower availability (due to design complexity) than a simple two-disk mirror with an LTO tape backup. Be sure you do not get caught down in the weeds and lose sight of the larger high-availability picture.

• *Continuously review systems and options.* Technology is moving so fast, and capabilities of consumer devices are increasing at such a fantastic pace that you can never come up with a set of solutions for your broadcast facility and then take a year off. Continue evaluating designs and technologies that improve content security. Look for the tipping point at which it makes sense to replace systems or change your approach due to improved technology. BE

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

? Send questions and comments to: brad.gilmer@penton.com

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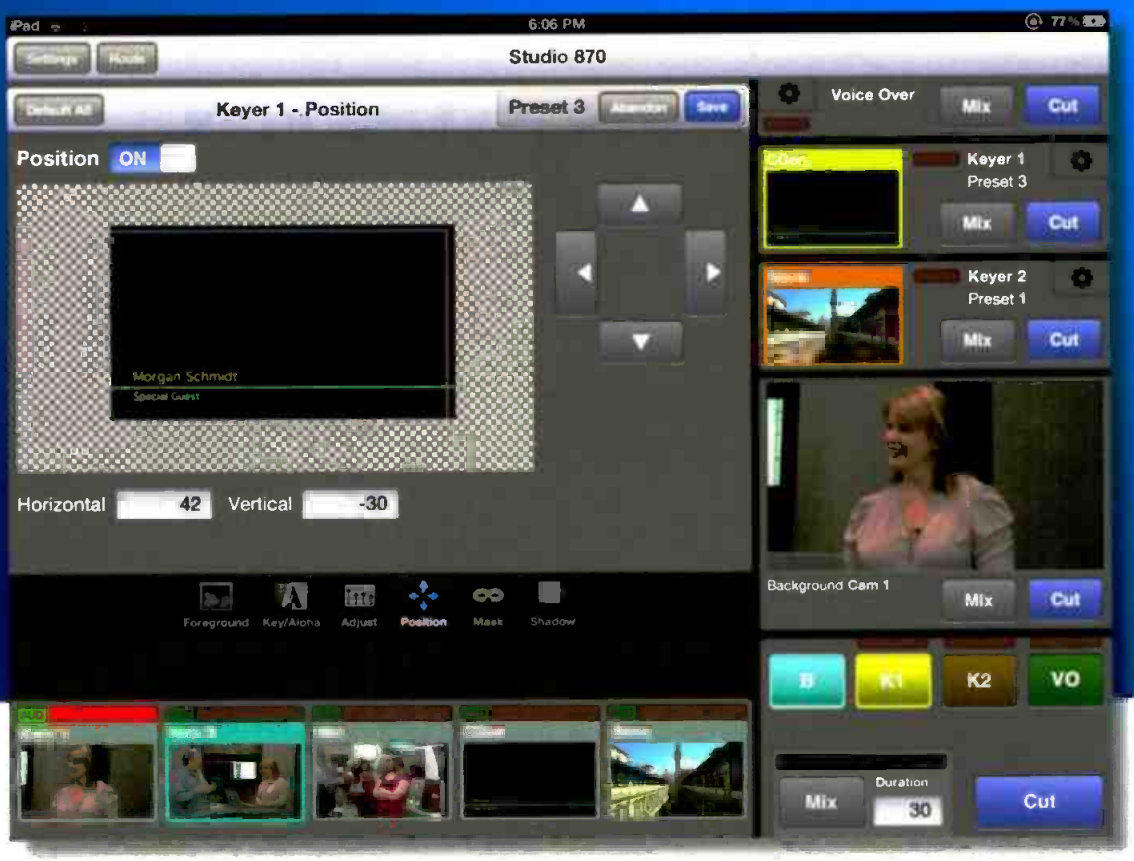

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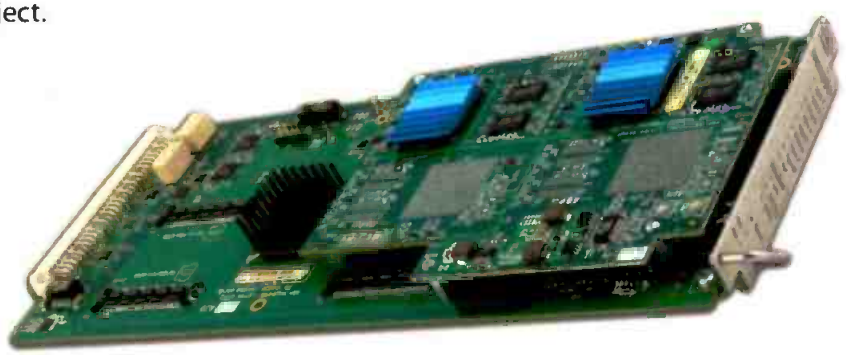

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Comparing loudness meters, part 1

A test reviews the ITU BS.1770-2 and CBS algorithms.

BY ROBERT ORBAN

EDITOR'S NOTE: With this article, we begin a series of high-level presentations from industry experts on issues of importance to the science and practice of broadcast and production technology. We are pleased to launch the Broadcast Forum with an in-depth examination of loudness and measurement with a feature article by Robert Orban.

In 2009, the ATSC released "Recommended Practice: Techniques for Establishing and Maintaining Audio Loudness for Digital Television (A/85:2009)." This was later updated as A/85:2011. A/85 specifies use of a long-term loudness meter based on the ITU BS.1770 algorithm for measuring the loudness of DTV broadcasts.

In December 2011, the FCC adopted rules implementing the CALM Act[1], which, by law, forbids commercials from being louder than non-commercial program material. The new FCC rules incorporated ATSC A/85 (and, by implication, the BS.1770 meter) as an objective means of verifying that the rule was being obeyed.

Because loudness measurement per BS.1770 uniformly integrates all program material, quiet passages tend to lower the measured value. To prevent this, the ITU added gating to the BS.1770 standard, which was revised as BS.1770-2 in March 2011. The gating causes the meter to ignore silence and to integrate only program material whose loudness falls within a floating window extending from the loudest sounds within the specified integration period to sounds that are 10dB quieter than the loudest sounds. This is because humans tend to assess loudness based on the louder sounds in a given program. As of this writing, ATSC A/85 has not been updated to incorporate the BS.1770-2 standard.

The ATSC A/85 2011, ITU-R BS.1770-2 and EBU R 128 documents are available as free downloads and can easily be located with a search engine.

CBS loudness meter

For many years, Orban has used the Jones & Torick loudness controller and loudness measuring technology[2] in its products for loudness control of sound for picture. Developed after 15 years of psychoacoustic research at CBS Laboratories, the CBS loudness controller accurately estimates the amount of perceived loudness in a given piece of program material. If the loudness exceeds a preset threshold, the controller automatically reduces it to that threshold. The CBS algorithm has proven its effectiveness by processing millions of hours of on-air programming and greatly reducing viewer complaints caused by loud commercials. Orban first licensed the CBS algorithm and began using it in products in the early 1980s.

Humans tend to assess loudness based on louder sounds in a given program.

Comparing meters

Because the ATSC recommends the BS.1770 algorithm, many broadcast and cable engineers facing the problem of controlling broadcast loudness have wondered how the CBS and BS.1770 technologies compare. An earlier version of an Orban white paper compared the CBS and BS.1770-1 (non-gated) meter. This presentation was revised in March 2012 to incorporate results from tests using the BS.1770-2 algorithm and EBU - TECH 3342 "Loudness Range" algorithm. The new measurements were performed using Version 2 of the Orban Loudness Meter[3]. This article compares the CBS and BS.1770-2 meters because it is expected that the ATSC will eventually update A/85 to specify BS.1770-2, which will more closely harmonize A/85 with its European counterpart, EBU R 128.

A/85 and R 128 differ significantly in philosophy and recommendations. Probably the most important difference, A/85 asserts that the loudness of a so-called "anchor element" (which is typically dialog except in programs emphasizing music, like live concert recordings) is most important, while R 128 asserts that the integrated loudness of the entire program is most important[4] and, therefore, program loudness should be normalized based on an integrated BS.1770-2 measurement. The philosophy behind A/85 is similar to that of Dolby Laboratories, which, for many years, has asserted that dialog anchors most film and television programs, and that listeners set their volume controls to make dialog comfortably intelligible[5]. (Orban agrees more with A/85 than with R 128.)

The purpose of this paper is to present, using both meters, comparative measurements of the output of

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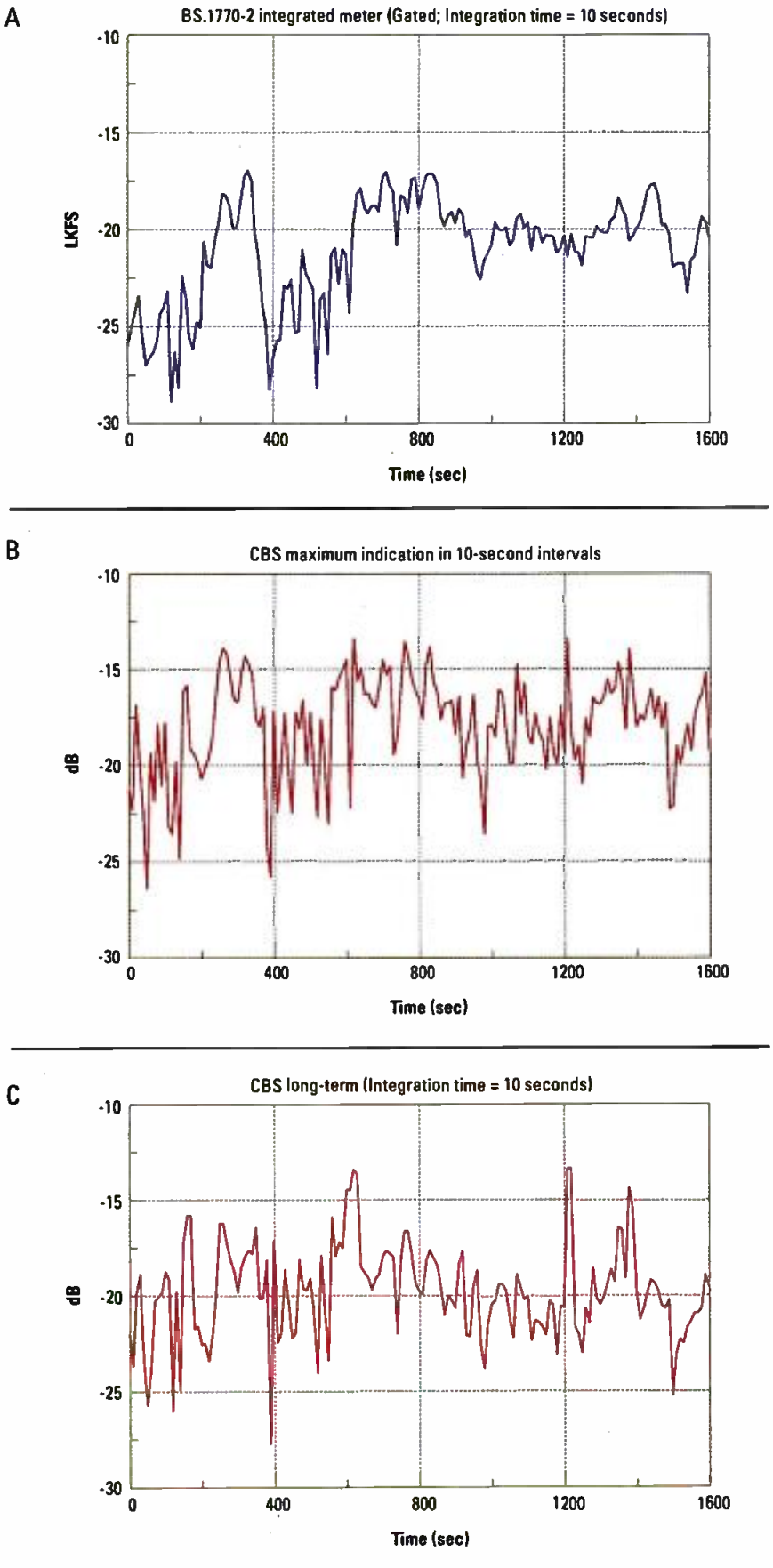

Figure 1: This shows unprocessed input and the peak output of the BS.1770 and CBS Loudness Meters in each 10-second interval as a function of time.

Orban's current audio processors[6] with the latest refinement of the CBS loudness controller technology.[7]

Test setup

A stereo recording of approximately 30 minutes of unprocessed audio from the output of the master control of a San Francisco network station was applied to the 2.0 processing chain of an Optimod-Surround 8685 processor, set for normal operation using its TV 5B general purpose preset. The digital output of the processor was applied to the digital input of an Orban 1101 soundcard, which was adjusted to pass the audio without further processing and to apply it to an Orban software-based loudness meter that simultaneously computes the BS.1770-2 Integrated loudness and CBS loudness. The first 750-second segment of the program material was a daytime drama with commercial and promotional breaks, while the remainder was local news, also with commercial and promotional breaks.

The BS.1770-2 meter was adjusted to produce a 10-second integration window in which, per the BS.1770 standard, all data are equally weighted. The CBS Loudness Gain control was set to -3.12dB. Data logged every 10 seconds and included the maximum meter indication produced by both the BS.1770 and CBS meters in each 10-second interval. (See Figure 1.) This produced 165 data points, which were imported into a scientific plotting application.[8]

Orban's experimental long-term loudness measurement, based on the CBS meter and first published in 2008, was also included in the measurements and is also shown. This algorithm attempts to mimic a skilled operator's mental integration of the peak swings of a meter with "VU-like" dynamics. The operator will concentrate most on the highest indications, but will tend to ignore a single high peak that is atypical of the others. This algorithm can be seen to share certain characteristics with the

consistent than it is when the histogram is spread out into more bins.

With all meters, the histogram of the unprocessed audio shows a wide spread. This is consistent with the EBU Loudness Range measurement for the entire clip, which was 16.5LK, while the LRA for the daytime drama alone was 19.2LK (including commercials). The BS.1770-2 Integrated loudness was -20LKFS, integrated over the entire measurement period, although the inconsistencies between the loudness of program material and commercials are large enough to make this 30-minute measurement essentially meaningless.

In general, the loudest parts of the unprocessed audio are commercials and promos, both network and local. These are anywhere from 5dB to 10dB (or LK) louder than the rest of the program material. This inconsistency was not a problem because the station in question was using an Orban automatic loudness controller on-air, which smoothed out loudness differences before its input.

While the general shapes of the CBS and BS.1770 loudness vs. time curves are similar, there were some significant differences. For example, at approximately 1250 seconds, the CBS measurement shows a sharp loudness spike that was caused by a network news report that was equalized to emphasize frequencies around 2kHz to 3kHz, where the ear is most sensitive. The BS.1770-2 measurement did not indicate this as being louder than the surrounding program material although to our ears, it clearly was. BE

Robert Orban is chief engineer, Orban.

EDITOR'S NOTE: This Forum paper will conclude with "Part 2, Measured Results," in the September issue of Broadcast Engineering *magazine.*

FOOTNOTES:

1 The CALM Act applies only to U.S. broadcasters and cable providers.

2 Jones, Bronwyn L.; Torick, Emil L., "A New Loudness Indicator for Use in Broadcasting," J. SMPTE September 1981, pp. 772-777.

3 This software is available for free download at http://orban.com/meter/.

4 EBU – TECH 3343, "Practical guidelines for Production and Implementation in accordance with EBU R 128," version 1 (February 2011), p. 29

5 Riedmiller, J., Lyman, S., Robinson, C., "Intelligent program loudness measurement and control: what satisfies listeners?" AES Convention Paper 5900, 115th Convention (October 2003)

6 Optimod-Surround 6585 and 8685, Optimod 6300 (with version 2.0 and higher software), and Optimod-PC 1101 and 1101E (with version 2.0 and higher software).

7 For a further discussion of the CBS and BS.1770 technologies, see http://orban.com/meter/Technology.html. The ATSC A/85:2011 document also discusses the BS.1770 algorithm.

8 PSI Plot: http://www.polysoftware.com/plot.htm

9 Unfortunately, two terms for the same loudness units have been used in different standards documents. For convenience, we will use LK and LKFS (as used in ATSC A/85); these units are the same as LU and LUFS (used in EBU R 128 and BS.1770) respectively.

JPEG 2000, from master to archive

The codec provides useful features for broadcasters.

BY JEAN-BAPTISTE LORENT AND FRANÇOIS MACÉ

Today's broadcasters are looking for the highest image quality, flexible delivery formats, interoperability and standardized profiles for interactive video transport and workflows. They also have a vested interest in a common high-end format to archive, preserve and monetize the avalanche of video footage generated globally.

This is the story behind the rapid adoption of JPEG 2000 compression in the contribution chain. Standardized broadcast profiles were adopted in 2010 to match current industry needs (JPEG 2000 Part 1 Amendment 3 — Profiles for Broadcast Application — ISO/IEC 15444-1:2004/Amd3), ensuring this wavelet-based codec's benchmark position in contribution.

In parallel, these broadcast profiles have also filled the industrywide need for compression standards to archive and create mezzanine formats, allowing transcoding to a variety of media distribution channels. The ongoing standardization process of the Interoperable Master Format (IMF) by SMPTE based on JPEG 2000 profiles brings the adoption full-circle.

The U.S. Library of Congress, the French Institut National de l'Audiovisuel (INA) and several Hollywood studios have selected the codec for the long-term preservation of a century of audio-visual contents.

JPEG 2000 is different from other video codecs. MPEG and other DCT-based codecs have been designed to optimize the compression efficiency to deliver video to viewers via a pipe with limited bandwidth. JPEG 2000, with its wavelet transform algorithm, brings features not only for image compression efficiency, but to give also the user better control and flexibility throughout the image processing chain. The codec provides unique features that are not available in any other compression method.

JPEG 2000 under the spotlight

JPEG 2000 is based on the discrete wavelet transform (DWT) and uses scalar quantization, context modeling, arithmetic coding and post-compression rate allocation. JPEG 2000 provides random access (i.e. involving a minimal decoding) to the block level in each sub-band, thus making it possible to decode a region, a low-resolution or a low-quality image version of the image without having to decode it as a whole.

JPEG 2000 is a true improvement in functionality, providing lossy and lossless compression, progressive and parsable code streams, error resilience, region of interest (ROI), random access and other features in one integrated algorithm. (See Figure 1.)

In video applications, JPEG 2000 is used as an intraframe codec, so it closely matches the production workflow in which each frame of a video is treated as a single unit. In Hollywood, its ability to compress frame by frame has made this technology popular for digital intermediate coding. If the purpose of compression is the distribution of essence and no further editing is expected, long-GOP MPEG is typically preferred.

Broadcast processes

JPEG 2000 brings valuable features to the broadcast process, including ingest, transcoding, captioning, quality control or audio track management. Its inherent properties fully qualify a codec for creating high-quality intermediate masters.

Post-production workflows consist of several encoding/decoding cycles. JPEG 2000 preserves the highest quality throughout this process, and no blocking artifacts are created. Moreover, the technology supports all common bit depths whether 8, 10, 12 bits or higher.

JPEG 2000 enables images to be

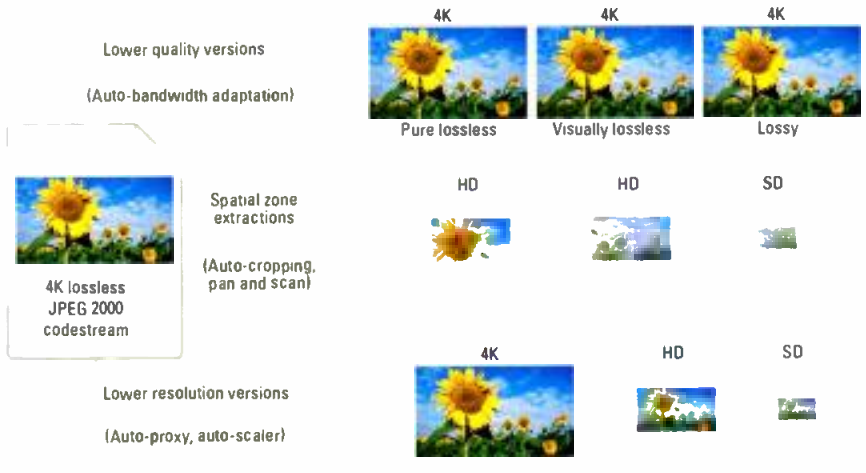

Figure 1. Many resolutions and different picture quality files can be derived from a single JPEG 2000 master.

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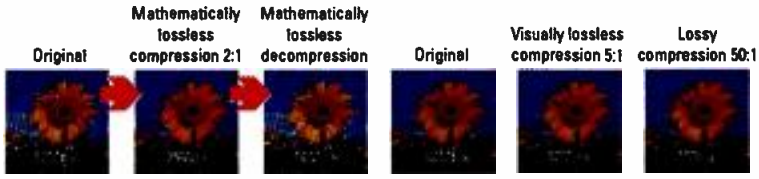

Figure 2. Support for lossless or lossy compression gives the broadcaster more options.

compressed in lossy and visually or mathematically lossless modes for various applications. (See Figure 2.) Additionally, its scalability allows a "create once, use many times" approach to service a wide range of user platforms.

The technology also enables improved editing: Even at the highest bit rates, its intrinsic flexibility makes it user-friendly on laptop and workstation editing systems, with a limited number of full bit rate real-time video tracks. Improving computing hardware is certain to increase the number of real-time layers.

Since JPEG 2000 is an intraframe codec, this prevents error propagation over multiple frames and allows the video signal to be cut at any point for editing or other purposes.

Easy transcoding appeals to high-end applications where workflows vastly benefit from transcoding to an intermediate version. JPEG 2000 ensures a clean and quick operation when bit rate is at a premium. Professional viewers have labeled correctly transcoded 1080p JPEG 2000 files compressed at 100Mb/s as "visually identical" to the original 2K footage. Furthermore, the wavelet-based JPEG 2000 compression does not interfere with the final — usually DCT-based — broadcast formats.

Last but not least, several standards specify in detail how the JPEG 2000 video stream should be encapsulated in a number of widely adopted containers such as MXF or MPEG-2 TS.

Professional wireless video transmission

Wireless transmission is often challenged to improve its robustness in broadcast. Uncompressed HD wireless transmission is often seen as complex, for even if a 1080p60 transmission (3Gb/s) were possible wirelessly, it would be quite difficult to add the necessary FEC and encryption to the data stream. Of all the compression algorithms available in the market, JPEG 2000 is seen as one of the top contenders for the following reasons.

JPEG 2000 is inherently more error resilient than MPEG codecs. The codestream can be configured so the most important data (the lowest frequency data contains the most visually significant information) is located in the front, while successively higher frequency, less important data can be placed in the back. Using appropriate FEC techniques, the lower frequency data can be protected while less protection can be applied to the higher frequency data, as errors in the higher frequency bands have much less effect on the displayed image quality.

Also, similar to the contribution, the low latency of JPEG 2000 is something that would be practically impossible for wireless systems using an MPEG system based on long GOP coding.

Long-term preservation

The broadcasters and video archivists are looking for long-term digital preservation on disk. In most cases, the source material is not digital, but film that needs to be scanned or high-quality analog videotape. As such, a destination digital format must then be selected.

Key requirements often include reducing the storage costs of uncompressed video while still maintaining indefinite protection from loss or damage. Moreover, the format should preferably enable digitized content to be exploited, which means providing flexibility — workflows again — and security. For these reasons, several studies and user reports claim JPEG 2000 to be the codec for audio-visual archiving.

Several reasons make JPEG 2000 a codec of choice for audio-visual archiving:

- The JPEG 2000 standard can be used with two different wavelet filters: the 9/7 wavelet filter that is irreversible and the 5/3 wavelet filter that is fully reversible. The 5/3 wavelet filter offers a pure mathematically lossless compression that enables a reduction in storage requirement of 50 percent on average while still allowing the exact original image information to be recovered. The 9/7 wavelet filter can encode in lossy or visually lossless modes.
- The scalability allowing proxy extraction, multiple quality layers, is of huge interest to ease client browsing and retrieval or transcoding and streaming.
- JPEG 2000 is an open standard that supports every resolution, color depth, number of components and frame rate.
- JPEG 2000 is license- and royalty-free.

The future

Several initiatives are pushing the industry beyond today's HD: NHK Super Hi-Vision, also called 8K and UHDTV, the Higher Frame Rates in Cinema initiative by James Cameron and Peter Jackson (up to 120fps), 16-bit color depth, and the numerous manufacturers that are now offering 4K technology.

The need for efficient codecs has gained significant attraction amongst the industry. The future of JPEG 2000 is bright as it is an open standard that requires less power, consumes less space in hardware implementations and generally delivers greater scalability, flexibility and visual quality than other codecs. An increasing number of manufacturers, broadcasters and producers are using JPEG 2000 implementations to adapt today's industry to these new challenges. BE

Jean-Baptiste Lorent and François Macé are product managers at intoPIX.

pieces as time went on. Staying with one vendor (Avid) for most of their post-production needs made a huge difference. Unlike their previous systems, all of the products they would choose to implement represented a single, pre-configured solution whose individual pieces were guaranteed to "play as a team" and perform in concert with one another.

"We looked at what the local regional sports network and other broadcasters in the area were doing to see what technology they were using, and they were all using Avid systems," Hodges said. "We knew we would be sharing our HD content with them, so it had to be more than acceptable to them. It had to match their content perfectly, in terms of image quality and production values. And our team management supported the effort to put quality ahead of price."

Building a solid video foundation

Renovating existing facilities located inside the park, the team made the move to HD operations with a new video production control room (complete with a Sony MVS-8000 multiformat HD switcher) located near home plate and a new series of edit bays along the third-base line. The control room supports the park's new video scoreboard, TV highlights and some of the live streaming feeds the team sends out during a game. This advanced control room is connected via fiber to an edit suite of seven edit bays, about 700ft away. There's also one edit bay adjacent to the control room and two other workstations located in the park's administration offices, about 1000ft away.

The team's camera complement includes several Sony HDC-1400 HD cameras on tripods, Panasonic AG-AF100 and AG-HVX200 HD cameras roaming the park, and a Canon 7D DSLR for specialty documentary work. All of the footage captured with these cameras is natively recognized by and easily edited on an Avid Media Composer workstation.

Chris Gargano, senior director of marketing and entertainment for SFG Productions, said the team produces content throughout the year — not just during the season — so the equipment has to stand up to the rigors of daily production.

"We're creating content for the scoreboard, radio and television commercials, TV shows, and Internet content — both on-demand and live streamed — and it's all generating new revenue," Garano said. "The use of video is critical to achieving our goals. Multiplatform sports marketing

The SFG Productions team uses 13 workstations running Avid Media Composer software to finish a variety of video packages and local TV shows.

Stereo audio elements, including live voiceovers and sound effects, are all created in-house.

Once they have been ingested into the system, all assets can be accurately tracked through the Avid Interplay using metadata tags (input during the logging stage) associated with each piece of content.

and the use of video are important to most teams today."

Indeed, today the department — which employs 15 people full-time and uses another 20 freelancers for every game day — produces about 10 hours of original programming a year, in addition to supplementing the live coverage by the local Comcast SportNet Bay Area sports channel with short pieces from the game to provide color. It produces popular shows such as "Inside the Clubhouse," as well as 30 live webcasts, game roll-ins, short documentaries and player interviews. All are edited on 13 workstations running Avid Media Composer (5.5.3) software.

Interleague Interplay

The team also makes extensive use of an Avid Interplay system, with which it ingests, manages and repurposes content stored on a newly installed (in February) Avid ISIS 5000 system with 96TB of capacity.

"It's a lot of storage space, but the team feels, and rightly so, we will fill it up in a very short time frame," Hodges said, adding that the team is in the process of digitizing years' worth of game tapes and will probably be at it "forever."

Once the tapes have been ingested into the system, all assets can be accurately tracked through the Avid Interplay using metadata tags (input during the logging stage) associated with each piece of content. With the Interplay, the team captures files in MXF wrappers and uses its media tools, such as Access and Assist, to help streamline the editing process.

Working on the Media Composer, the staff can place any format on the timeline and begin editing immediately. That's important because it often has to turn around pieces quickly (sometimes in as little as 10 minutes) for the scoreboard during games. With version 5.5.3, the staff can work with footage shot at different frame rates (24fps, 30fps and 60fps). Before, Hodges said, it was a real challenge to mix and match the different signal types.

As per Major League Baseball rules, when the staff produces content for mobile devices, it creates an MPEG-4 file and sends it via FTP to MLB's headquarters in New York City for public distribution to the variety of mobile video platforms.

A seamless future

For SFG Productions, the eventual goal is to make many of the production processes automatic, so that, for example, content can be created on the Media Composer, Chyron HyperX graphics added via a template and then sent directly to an EVS sever for playout on the scoreboard.

The department is now also looking at LTO-5 data tape for long-term archiving and the new Avid Interplay Sphere, a real-time "universal access" technology that will allow it to edit and finish packages remotely from Spring Training (in Scottsdale, AZ), using assets stored in San Francisco.

"It's important that we keep up with the technology and use the latest tools to our advantage," Hodges said. "When we made this initial investment in the scoreboard and edit rooms in 2007, it was to support a new HD scoreboard. At that time, we were using different vendors for different things. It was a hodgepodge of technology that required a lot of manual labor. With our new equipment and system design, we feel we are better able to handle whatever the team throws our way."

It's incumbent upon the team to keep fans thinking about the San Francisco Giants, no matter where they are.

MVP

With today's baseball fans exposed to all types of video content in their living rooms and elsewhere, it's

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SYSTEM DESIGN SHOWCASE

A new HD control room located near home plate is connected via fiber to an edit suite of seven edit bays, about 700ft away.

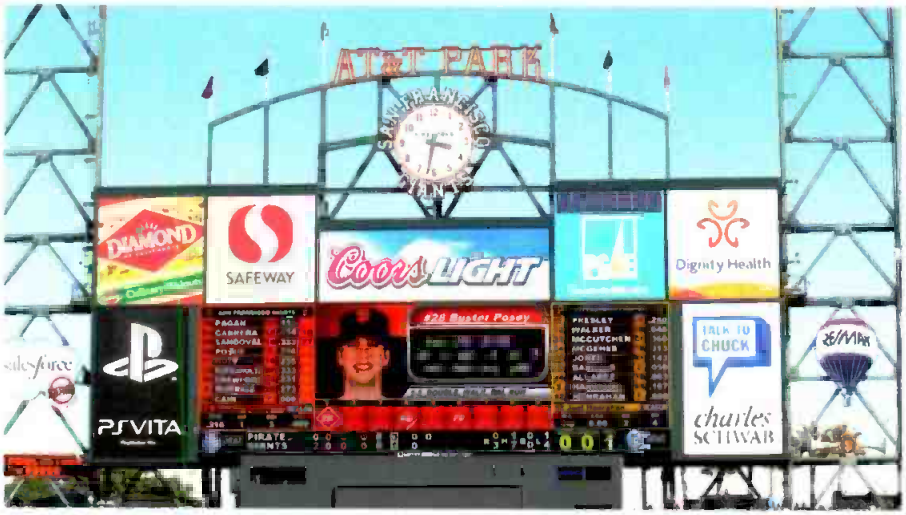
Video helps San Francisco Giants put best face forward

BY MICHAEL GROTTICELLI

For the video production department at Major League Baseball's San Francisco Giants — known as SFG Productions — the game is so much more than balls and strikes. It's about supporting a brand across a multitude of distribution platforms (live and on-demand) and generating new revenue from outside sources. They also have to create a captivating experience for the fans in attendance at AT&T Park, the team's home.

Paul Hodges, executive producer of SFG Productions, said over the years the video production department had been using a disparate collection of broadcast gear that required a lot of manual and time-consuming processes — and some duplication — to get things done. It was unwieldy, but it worked. Then, in 2007, the team installed a new HD video scoreboard in center field, and everyone began to envision the possibilities.

With the help of Cutting Edge, a systems integrator in San Francisco, Hodges and his team set about to design a new, file-based production workflow that would achieve all of their goals for new A/V technology applications and more, in the most cost-effective way. Yet, and Hodges emphasized this strongly, image quality was of paramount importance. So, they eschewed lower priced, off-the-shelf solutions that some other teams have implemented and continued to add new "broadcast-quality"



A new control room featuring a Sony MVS-8000 production switcher, Chyron HyperX graphics systems and an EVS XT2 server supports the live HD video scoreboard at AT&T Park.

incumbent upon the team to keep fans thinking about the San Francisco Giants, no matter where they are. That's where SFG Productions comes in. With a high on-base percentage (it covers all the bases) and an eagerness to embrace the latest video technology for the good of the fans, it could be the team's most valuable player. BE

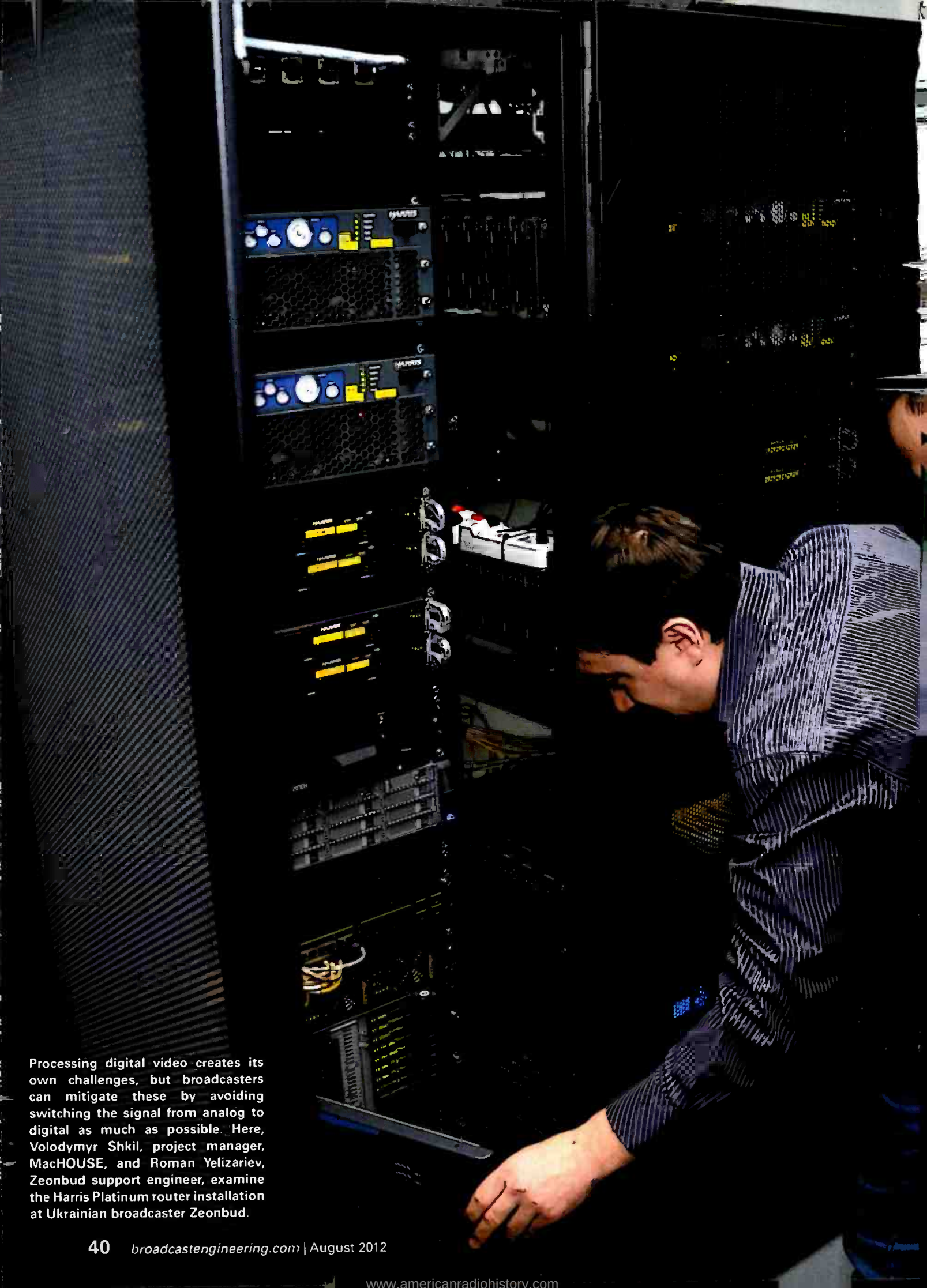
Michael Grotticelli regularly reports on the professional video and broadcast technology industries.

Design team

SFG Productions:
Paul Hodges, executive producer
Chris Gargano, senior director of marketing and entertainment
Brad Martens, digital media coordinator
Cutting Edge:
Brian Botel, founding partner/project manager

Technology at work

Avid Interplay system, ISIS storage array, Media Composer workstations
Canon 7D DSLR camera
Chyron HyperX graphics
EVS XT2 server
Panasonic AG-AF100 and AG-HVX200 HD cameras
Sony HDC-1400 HD cameras, MVS-8000 production switcher



Processing digital video creates its own challenges, but broadcasters can mitigate these by avoiding switching the signal from analog to digital as much as possible. Here, Volodymyr Shkil, project manager, MacHOUSE, and Roman Yelizariev, Zeonbud support engineer, examine the Harris Platinum router installation at Ukrainian broadcaster Zeonbud.

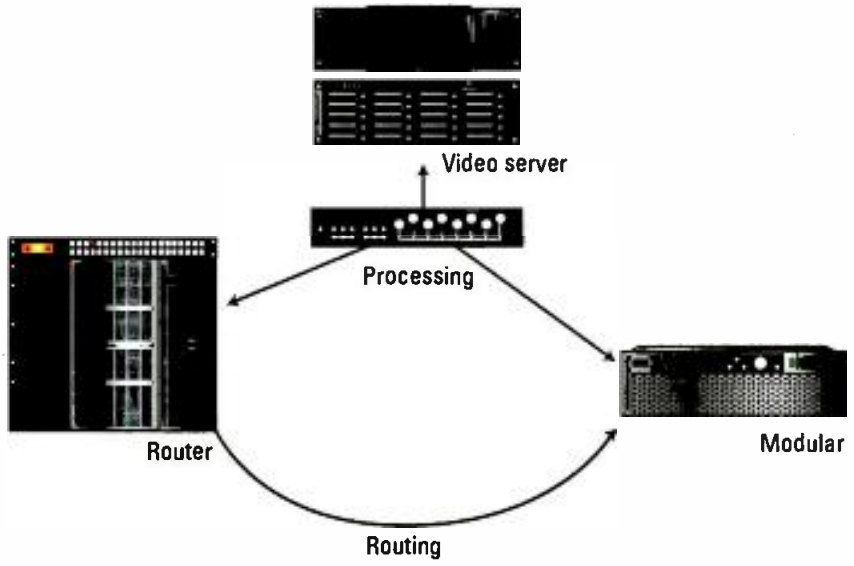


Figure 1. Shown here is the processing paradigm shift. Today, more products incorporate processing functions, eliminating the need for intervention by engineers and leading to a paradigm shift in plant design.

functions? Of course, technical directors will always want their show to look its best and will tweak a little here and there, but that is where it should stop. Once the show has been created, there is no reason to change it for standard television distribution, short of adding in some localized branding. The key is in the setup. Normalize as much as possible within your plant, and give operation people the chance to fix bad feeds when needed (which should not be often, except in live situations).

Keeping this consistency in plant digital video means that video processing (including timing) can increasingly be of the one-time-setup variety. Technology advances have eliminated the need for an engineer to adjust every process continually, enabling hands-free operation — and creating a clear paradigm shift (as shown in Figure 1) in plant design.

The server paradigm shift

Let's look at this paradigm shift in more detail by using video playout servers as an example. Ingested video can be stored in many formats — 480i, 720p, 1080i. The trick here is to define at the output port what format is needed. Let's say it is 720p. Video stored in 480i will be scaled, and color space changed, and pillar-boxed (or stretched) based on AFD codes and the user's preset parameters — all automatic and hands-free. Software-based video processing running in real time on multiple CPUs in the video server make this conversion possible. In some cases, branding and multiviewer functions are also incorporated into servers.

The new breed of router incorporated video processing circuitry on the input side of the router, which enables all outputs of a single source to be corrected together.

The router paradigm shift

Functioning with a single routing switcher and one set of patch panels was inconceivable in the analog days. Although the switch to digital enabled broadcasters to keep audio and video together on a single coax, the advance came at a price. Looking again at the adoption curve, it was a royal pain to have outboard embedders, de-embedders and separate AES routers to handle the initial wave of serial digital — not to mention all the fun with processing the occasional audio breakaway.

For fully HD plants, having every signal needed (including timecode) on a single coax was a dream come true — especially when the new breed of routers started to have breakaway audio capabilities. The next logical step was adding video processing into routers. This type of processing circuitry is typically on the input side of the router, which enables all outputs of a single source to be corrected together and is akin to having a proc amp on incoming router feeds. Processing such as optical-to-electrical and electrical-to-optical conversions also is incorporated directly into the router as I/O options.

Multiviewers typically feature extensive video-processing capabilities to scale dozen of pictures onto large flat-screen displays. The integration of multiviewer technology into routers takes advantage of internal routing and eliminates the need for external cabling. Many of these multiviewers are used for on-air operations employing external master-control switching. Master-control systems typically have to perform considerable processing in order to seamlessly mix signals before going on-air. As most of the

Multiviewers typically feature extensive video-processing capabilities to scale dozen of pictures onto large flat-screen displays.

Multiviewers integrated directly into routers reduce the need for external video processors.

Video processing

Routers with built-in processing functionality have simplified operations.

BY STAN MOOTE

When I discuss video processing with engineers, their specific needs are definitely varied. But one common factor does exist, which is that video processing typically gets lumped into two categories: one-time setup and operational. One-time setup is usually carried out during the plant commissioning or studio setup: Although there may be some presets as programs change throughout the week, there are typically few modifications after the initial configuration. The second category of video processing allows for operational control. Back in the good old days, this generally entailed simple stuff like proc amp controls.

But the move to digital has complicated processing functions. Going 100-percent digital simplifies matters (notice I said 100 percent); it is the mixed-mode transition era that makes operations so difficult. Let me give you a simple example using audio.

In analog, there were many "plant standards," which made it rough to move audio from plant to plant. In digital, it's simple: Full scale is 0dBFS — not +10dB, not even +4dB; all 1s are defined at 0dBFS. The trick here is to always keep the audio in digital — right from the mixing board. The minute it hits analog again, the signal needs to go through analog-to-digital converters, which is where the nightmare begins; both levels and phasing are bound to get messed up. The same goes for NTSC and PAL composite video; someone's fingers are typically on the input proc before the converter to "fix up" the video before conversion to digital.

Going 100-percent digital simplifies matters; it is the mixed-mode transition era that makes operations so difficult.

So let's zoom out a little into your future plant being 100 percent digital. Will you still need proc

The evolution of the pluggable module

HDTV launched fiber into the broadcast mainstream.

BY RENAUD LAVOIE

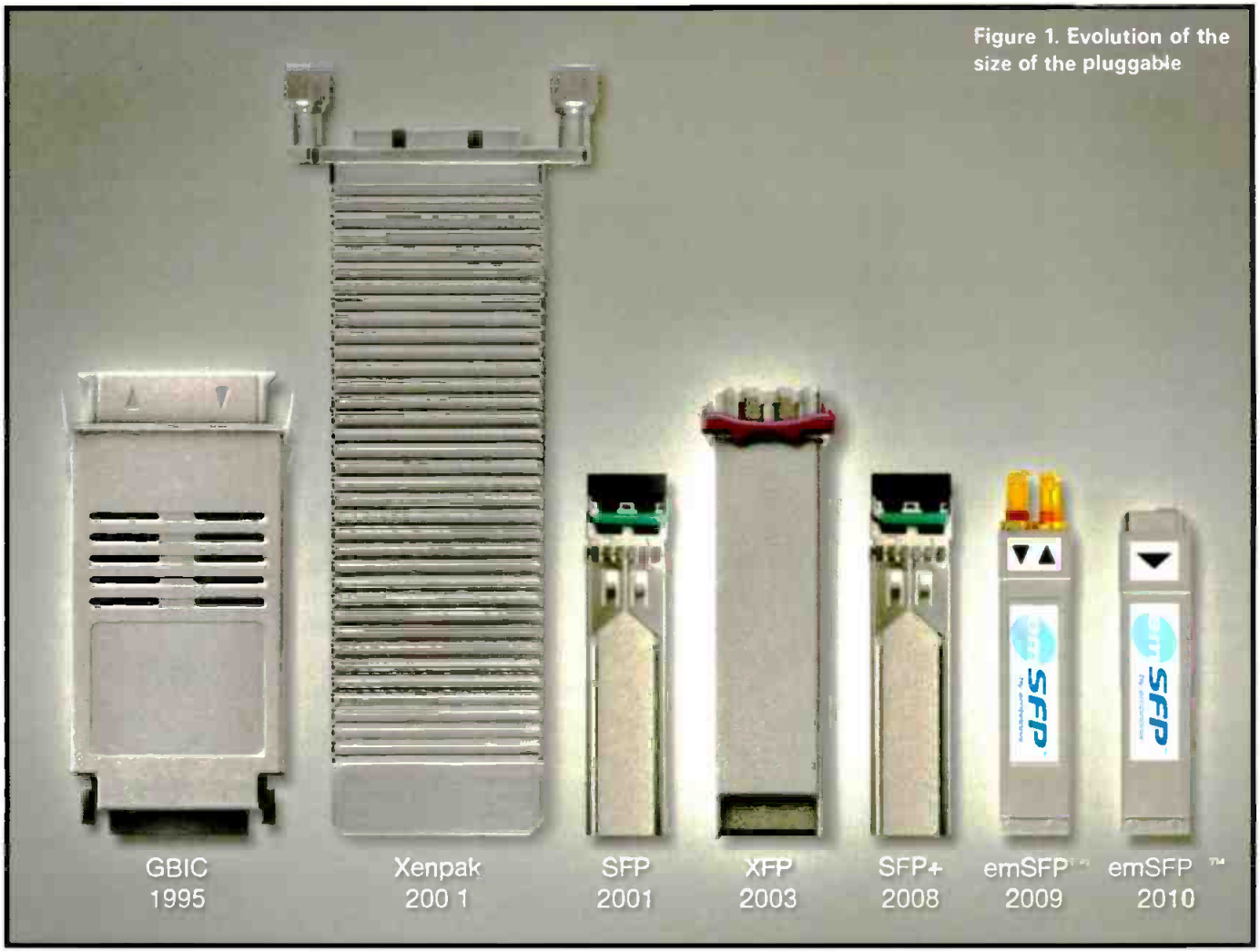


Figure 1. Evolution of the size of the pluggable

The video broadcast market is a niche market with multiple complexities and particularities. Two common examples are pathological data encoding schemes and 75Ω coaxial cable. The following article relates the evolution of pluggable modules in telecommunication and their migration into the broadcast market. The article will cover the various types of modules, the pros and cons of these components, and the introduction of new pluggable technologies in the broadcast space: the video SFP and the emSFP.

Pluggables in the telecommunication market

The main reason behind the pluggable is simple. Historically, systems designers had to choose between fixed copper ports or fixed optical ports for physical I/O applications. Each designer struggled with the decision of how many copper and how many optical (single-mode or multimode) ports were needed to support LAN, WAN and the new SAN markets.

This might sound familiar for equipment designers, users and integrators as we are faced with these decisions more often than not. This dilemma was present in the 1990s for telecommunications systems until fiber physical connections became dominant. However, the challenge is still present for broadcasters today. Coaxial cable is still the dominant physical layer connection, but fiber and twisted pair streaming mediums are supported in almost every new system deployment.

Therefore the question arises: How can a designer/manufacturer/integrator create a uniform platform supporting multiple physical mediums?

Telecom OEMs responded to this request by creating the pluggable

The shift moves bidirectionally; for example, while processing functionality has moved into video servers and routers, routing has also moved into processing platforms.

sources typically come from the router, newer additions such as clean/quiet switchers incorporated directly in the router are ideal for simple switches or master-control backups.

The modular-platform paradigm shift

Literally thousands of different types of processing modules have been developed in the broadcast industry alone. Typically, these are standalone modules, with perhaps some type of centralized controller; they usually are connected up with cables on the back of the frame to cascade functions. In some cases, manufacturers even produced some mini routing switcher cards to go in the frame.

Thanks to Moore's Law, we are getting more and more complex processing functions on a single module — in many cases, even multiple channels of video running on the same module.

This sophistication has now stepped up yet another level. The designers of newer platforms that now combine traditional studio processing with transmission and compression functions have also figured out how to seamlessly integrate video routing and IP routing as well. External cables are not required to interconnect modules; it is all done with built-in configuration tools — providing total integrated solutions from a stack of modules.

The processing paradigm shift

Again, thanks to Moore's Law of processing capability doubling every two years, both video and audio processing is now scattered between software and hardware, operating in standalone and integrated applications. Proc amp controls exist in practically everything, but what about the proc amp knobs?

Gone are the days of running a panel per feed into the control room. Control systems are highly functional and intelligent — able to discern crosspoint information, source IDs and the metadata for each essence. The operator no longer needs to understand the complete signal path.

It is up to the plant designer to ensure that I/O loops are not created, such as by one operator changing input levels on the router and another correcting it by changing the output levels. These are all standard processing details that need to be kept in mind to avoid loss in signal quality.

In summary, whether you are undertaking a complete new plant design, adding in a new area, performing an upgrade or just switching up to HD, it is worthwhile to take note of this video-processing paradigm shift. The shift moves bidirectionally; for example, while processing functionality has moved into video servers and routers, routing has also moved into processing platforms.

The complete switch to digital — along with Moore's Law — has made this possible. Although plant designs continue to become more complex on a functional level, these new advancements are making installations and reconfigurations much simpler, and greener too! BE

Stan Moote is vice president of business development at Harris Broadcast.

form factor, starting with the GBIC and migrating to the SFP, Xenpak, XGP, XPAK, X2, XFP, SFP+, etc. (See Figure 1.) With the convergence of telecom and media industries, particularly in the past five years, the expertise and experience of telecom has been quickly adopted in the broadcast sector with the SFP and now the emSFP.

RAS

Reliability, availability and serviceability (RAS) have been key factors for Fibre Channel transport. The strong penetration of 4.25Gb/s Fibre Channel disc interconnect puts enormous pressure on manufacturers to support both copper and fiber interfaces. The response of Compaq Computers, Sun Microsystems, Vixel Corporation and AMP was the gigabit interface converter (GBIC). (See Figure 2.) This interface gave the full flexibility of copper, multimode fiber and single-mode fiber without changing the hardware platform.

The GBIC was accepted in 1999 and became a valuable option for new systems in Fibre Channel deployments. The extra flexibility sparked interest in the networking industry as well. The '90s also showed the popularity and acceptance of the SC-style (subscriber or standard) connector, followed by the ST (straight tip) and FC (ferrule) connector. The newest connector style during this time was the LC (Lucent) connector measuring roughly half the size of the SC. Prior to the introduction of the SFP, some manufacturers created the small form factor (SFF) module, but it was not pluggable. (See Figure 3.) Unfortunately, the limitations of the SFF were quickly identified. Because the SFF had to be soldered on

Figure 2. GBIC versus emSFP (right). Images courtesy of Embrionix.

Figure 3. SFF (top) versus optical emSFP (bottom)

the board, it limited ease of use, interchangeability and in-field repair. The parameters of RAS were not met.

The SFP

The GBIC had some limitations in speed with a maximum 2.125Gb/s data rate. And it was large — approximately 1in x 2.5in. But industry acceptance pushed 14 manufacturers to create a new and improved pluggable. A new Multi-Source Agreement (MSA) was formed in 1999 to address the need for faster and higher density modules, and the SFP was born. The SFP supported faster rates up to 4.25Gb/s and a reduction in size (approximately half the size of the GBIC). Even so, the SFP and the GBIC both used 20-pin blind-mate connectors, allowing for a logical migration from GBIC to SFP.

During the time of introduction, the only type of pluggable configuration was the transceiver (1-IN/1-OUT), hence the MSA specified a transceiver pin assignment only. For the broadcast industry, requirements are slightly different. Video signal configurations follow unidirectional configuration and are rarely evenly distributed between inputs and outputs. For example, a core broadcast video router in a facility rarely has an equal number of input ports versus output ports. Naturally, a non-MSA standard was introduced allocating pinout assignments for dual-output and dual-input I/O configurations. The following table shows a comparison between the MSA and non-MSA pin assignments. (See Figure 4.)

The SFP interface includes multimode and single-mode fiber via LC connector, copper interfaces such as HSSDC2 cable and 50Ω coax cable. The main function of the SFP was signal conversion from electrical to optical transmission. Additionally, it could be used to extend the reach of electrical signals over longer copper cables with careful cable driver design. Traditional video SFPs serve the same purpose.

The advanced emSFP is a more intelligent pluggable, offering a rich set of new features. For example, it can include features such as measuring eye diagrams and signal power level diagnostics. Or it can provide NTSC/PAL conversion to and from analog, or HDMI conversion to and from SMPTE SDI data streams. The advanced feature set and processing of these modules, combined with

	Transceiver (MSA) (Data com)	Transceiver (Non-MSA) (Video)	Dual transmitter (Non-MSA) (Video)	Dual receiver (Non-MSA) (Video)
PIN#	ex: EB30CSRT-LM	ex: EB30CSRT-LN	ex: EB30CS2T-LN	ex: EB30CS2R-LN
1	VEE	VEE	VEE	VEE
2	TX_FAULT (VEE)	VEE	NC	Rx2-
3	TX_DIS	NC	NC	Rx2+
4	MOD_DEF(2)-SDA	VEE	VEE	VEE
5	MOD_DEF(1)-SCL	SCL	SCL	SCL
6	MOD_DEF(0) - PRESENCE (VEE)	SDA	SDA	SDA
7	Rate (NC)	VFF	VFF	VFF
8	LOS	RX1_LOS	Tx2+	NC
9	VEE	NC	Tx2-	NC
10	VFF	NC	Tx2_DIS	NC
11	VEE	VEE	VEE	VEE
12	RD-	Rx1-	NC	Rx1-
13	RD+	Rx1+	NC	Rx1+
14	VEE	VEE	VEE	VEE
15	VCC	VCC	VCC	VCC
16	VCC	VCC	VCC	VCC
17	VEE	VEE	VEE	VEE
18	TD+	Tx1+	Tx1+	NC
19	TD-	Tx1-	Tx1-	NC
20	VEE	Tx1_DIS	Tx1_DIS	NC

Figure 4. MSA and non-MSA pinout for SFP and emSFP

the modularity of the SFP form factor, provides the configurability and flexibility demanded by the broadcast and media industries in a single, comprehensive system.

The SFP continues to prove its success through its rapid adoption by numerous manufacturers and users in the broadcast industry. Even today, more than 100,000 SFPs/SFPs+ are sold per month. As mentioned earlier, the SFP bit rate was limited to 4.25Gb/s, but the demand and requirements for 10Gb/s have been known for some time, and solutions are beginning to emerge. To be widely adopted, multiple new standards, one of which is the Xenpak, have been, and are being, developed.

Past solutions

The market continued to ask for more than pluggable compatibility. The demand for higher speed, lower power and smaller packages was unabated. The parallels of these technology requirements are seen throughout the industry. For example, processor speeds are always increasing, with smaller die sizes and decreased overall power consumption. With growing network traffic requirements driven by cellular and wireless Internet access, providers needed to find a good pluggable system to address the quickly increasing need for more bandwidth.

Figure 5. Xenpak versus emSFP (right)

One of the first attempts was the Xenpak, a 2in x 4.5in pluggable module capable of transmitting and receiving four pairs of 3.125Gb/s data transmission. Due to the 8b/10b encoding overhead, the usable bandwidth was only 2.5Gb/s. Still, with four pairs at 2.5Gb/s, 10Gb/s pipes were possible. The Xenpak did have one big advantage: It did not need a cage. The standard relied on a PCB cutout to align the module. (See Figure 5.)

But the Xenpak was too expensive, still too bulky and used too much power for the LAN/SAN environment. XGP, XPAK and X2 were created in an effort to meet the demanding new criteria. Similar to audio loudness control, every OEM vendor thinks their implementation, or specific algorithm, is the best for a number of reasons. In the end, users decide what is best for their facilities, and the need for a standard drives compromise.

Standards, regulations and certain industry agreements are put in place to ensure a common system that enables widespread adoption of a technology and, therefore, a much larger market for all the vendors. By 2002, the industry was hoping the X2 and XPAK MSA would find a common ground and merge in a single system. Unfortunately, both were developed around the Xenpak and did not gain acceptance in the industry.

Figure 6. XFP form factor versus emSFP

The successful XFP

By 2001, great progress in the optical component industry allowed the miniaturization of Receiver and Transmitter Optical Sub-Assemblies (ROSA and TOSA). (ROSA and TOSA will be discussed in a future article for *Broadcast Engineering*.) Today, these ROSA and TOSA are widely available at 10Gb/s speeds and higher. These components directly modulated or responded to light at 10Gb/s, thereby eliminating the need for the XAUI protocol carrying four pairs at 3.125Gb/s. The XFP MSA specification started in 2001, with 10 members. It outlined a small and efficient pluggable with specification 1.0 established in September 2002. (See Figure 6.)

Keeping pace with technology, smaller ROSA and TOSA optics were developed shortly after the XFP MSA specification. In 2008, the SFP was modified to handle more power and the higher 10Gb/s bit rate to become SFP+. Once again, the SFP form factor became the market leader. The new SFP+ supported 10Gb/s and up to 1.5W of power, requiring special cages with heat sinks to dissipate the thermal load.

The SFP+

The SFP+ is similar to the SFP. The main differences are the 10Gb/s optical transport speed and a slightly modified SFP housing for dissipating more heat. The mechanical differences increase power dissipation capacity to 1.5W and offer better signal integrity for the high-speed differential data. This data is carried over impedance-controlled traces run between the SFP+ module and the host system. A more robust connector was specified, and the new cage supports an optional top-mounted heat sink offering improved cooling for both convection and forced air applications. (See Figure 7.)

Figure 7. SFP+ cage with heatsink

Today, in addition to 1310nm and 1550nm wavelengths, the entire spectrum of CWDM and DWDM wavelengths are supported. This enables extremely high data rate transmission on a single fiber. High-power lasers at the transmitter combined with increased receiver sensitivity for PIN diodes enable long fiber links. Avalanche Photo Diodes (APDs) now fit inside the SFP+ cage, so they can be used as well. This increased power budget enables transmission distances of 100km, or more, without a repeater depending upon the unique aspects of a given system or fiber link.

The pluggable in the video broadcast/media market

As discussed earlier, the transceiver SFP was not popular in the broadcast and media industry for a number of commercial and technical reasons. Video transmission over fiber was expensive and only used for niche applications. But with HDTV, serial digital video speeds of 1.5Gb/s launched fiber into the mainstream of broadcast and media industries. Manufacturers first built their own electrical-to-optical (E2O) and optical-to-electrical (O2E) converters with discrete components. Hurdles such as pathological signal performance often impeded development. Careful design techniques were required to manage the high DC content of the SDI signal. Products that did offer error-free operation required entire circuit boards on components. They were bulky and expensive.

These early converters were inflexible and lacked real-time diagnostics. At this same time period, around the year 2000, rich, internal diagnostic features were not typically integrated with core equipment such as routers, multiviewers, cameras or production switchers.

Even though HDTV launched in 1998, it was not until 2004 that the first optical SFP (V_SFP) and SFF (V_SFF) for the video industry were developed that were capable of meeting the demanding requirements of the SMPTE SDI signals. In 2007, the broadcast industry looked to enable 1080p video signals pushing the data rate to 3Gb/s for SDI data transmission. And more companies started

Figure 8. emSFP products line 2012

to provide SFPs that were capable of managing 3Gb/s data and the video pathological signals. In addition to transceivers, dual transmitters and dual receivers were developed to more closely meet the needs of the broadcast and media industries.

Today, many suppliers offer basic optical SFPs. When manufacturers select optical SFPs, various factors must be taken into account: optical launch power, receiver sensitivity, mechanical robustness, internal diagnostics, and, of course, price and lead time.

Basic digital diagnostics are defined in the SFP MSA specification. The diagnostic information is accessible via a serial, industry standard, I2C bus. The host system can then control basic SFP parameters such as transmitter enable and get information from the SFP such as internal temperature, voltage or receive signal strength.

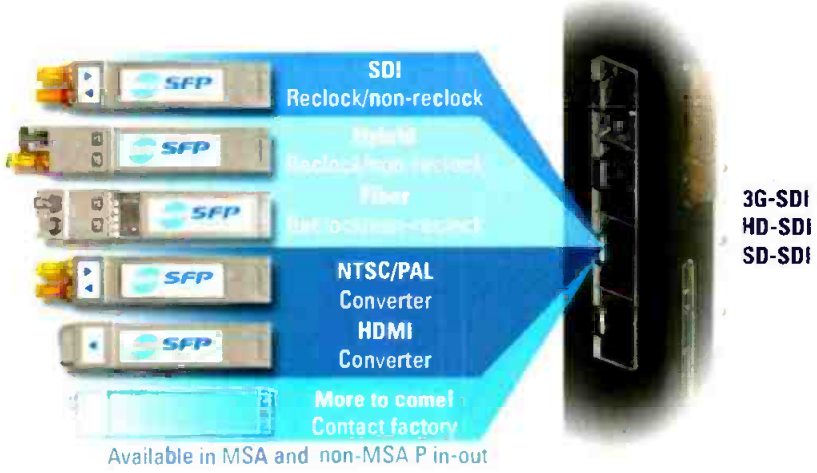


Figure 9. emSFP offering

The SFP brought various benefits to both manufacturers and users:

- Interoperability between equipment for fiber transmission;
- Simplified stocking and management of inventory;
- Small footprint for both products and inventory storage;
- Faster mean time to repair (MTTR);
- Faster time to market for product design.

The embedded SFP (emSFP)

The SFP is great for basic O2E and E2O for fiber, but copper cable is still widely deployed and must be supported, and standard SFPs do not help with system integration. If a facility or

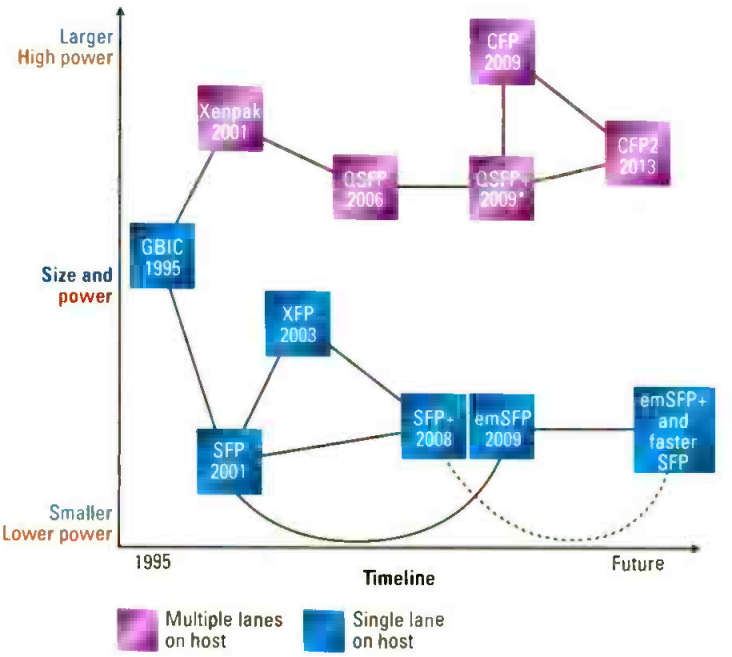


Figure 10. Pluggable timeline

installation needs to handle multiple physical layers and different signal standards, you may need multiple converters. The emSFP was created to fill this need and to build one unique platform to support exactly what the user needs.

The emSFP product line covers the standard coaxial cable, fiber optic, CVBS (NTSC/PAL) to SDI conversion, HDMI-to-SDI conversion and ASI-to-IP encapsulation. These features enable a high level of integration in the core platform and a new level of flexibility for manufacturers and users.

In every case, these modules convert a serial SDI signal to the required physical layer format and transmission standard and protocol. These modules permit users to build a product today and future-proof the platform by upgrading the emSFP, not the core.

Internal I2C communication with the SFP allows easy integration with SNMP monitoring and control software applications.

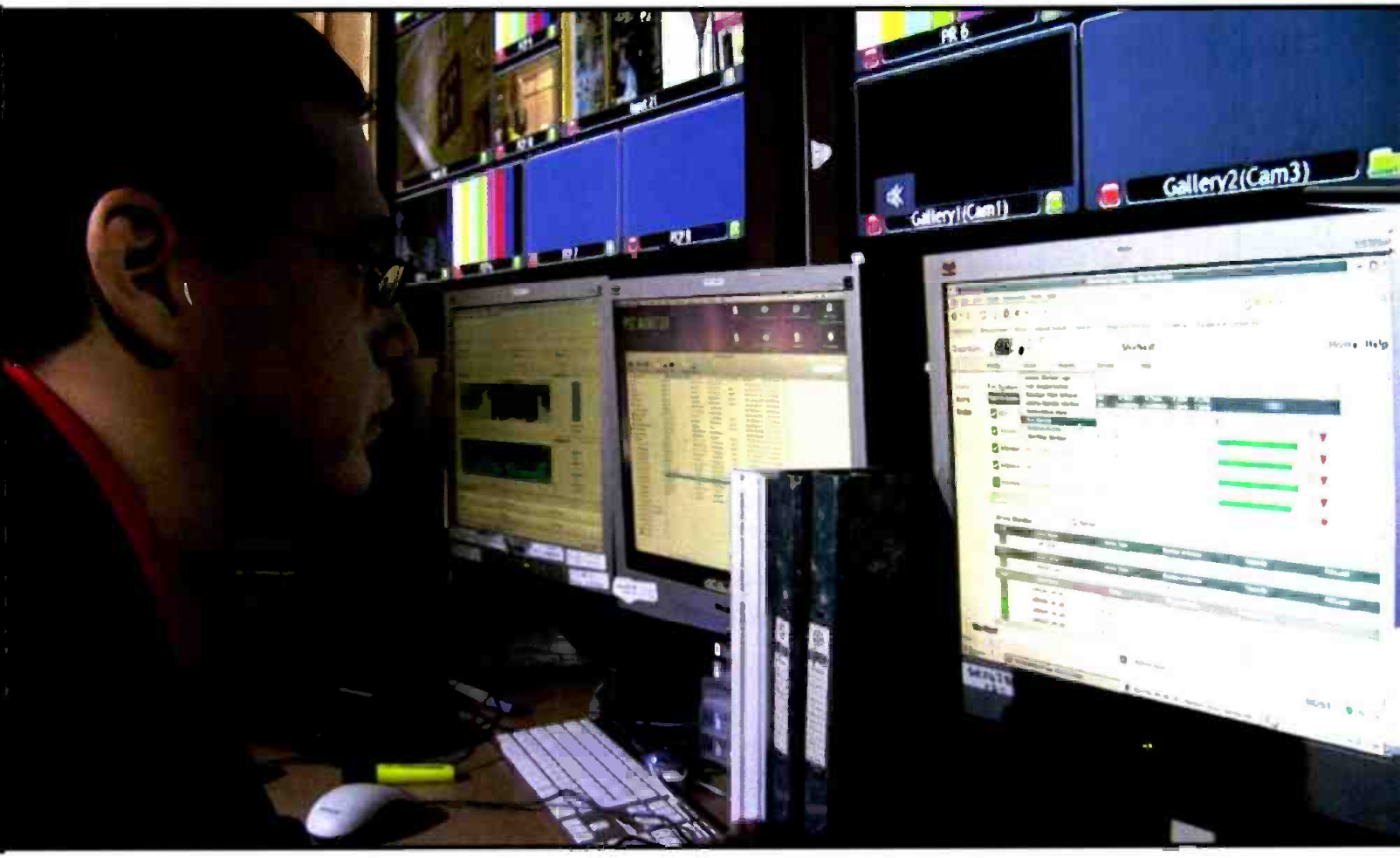
RAS for the broadcast and media industry

We have explored the history and timeline of pluggable modules, covering key components that shaped the telecom, broadcast and media industries. (See Figure 10.)

SFP and SFP+ modules have proven to be the most accepted and widely used pluggable technology in telecom, and now broadcast. The constant demand for higher speed, more processing and flexibility, and lower power continues to shape the role of the SFP, emSFP and SFP+ in broadcast and media. The technical teething pains and RAS fundamentals that successfully shaped and contributed to the growth and success of networking worldwide are now available to the local broadcaster. BE

Renaud Lavoie is president and CEO of Embrionix.

SAN and NAS



Here are two approaches to shared file-based workflow storage.

BY JANET LAFLEUR

Whether you are managing operations at a call-letter station with a half-dozen edit stations, or at a broadcast giant with hundreds of editors, architecting the storage supporting your facility's file-based workflows is a business-critical task. Video editing places higher demands on storage than any other file-based application, requiring streaming performance for large files starting at 3.5MB/s for SD to 165MB/s per stream for uncompressed HD. And, with today's higher-resolution formats, streaming video data demands even more performance from storage systems, with 4K requiring 1210MB/s per stream — 7.3X more throughput than HD.

Traditionally, this level of performance could only be met by high-performance disk storage directly attached to the editing workstation. The downfall of directly attached storage (DAS) is that it silos content on to individual computers. (See Figure 1 on page 52.) Sharing large

With a SAN, such as Quantum's StorNext shown here, a pool of high-performance storage is divided and allocated to individual servers.

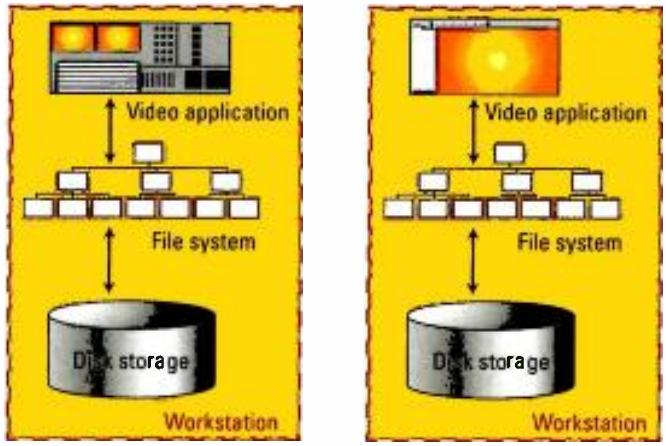


Figure 1. This shows a high performance disk storage directly attached to an editing workstation. The downfall of directly attached storage (DAS) is that it silos content on to individual computers.

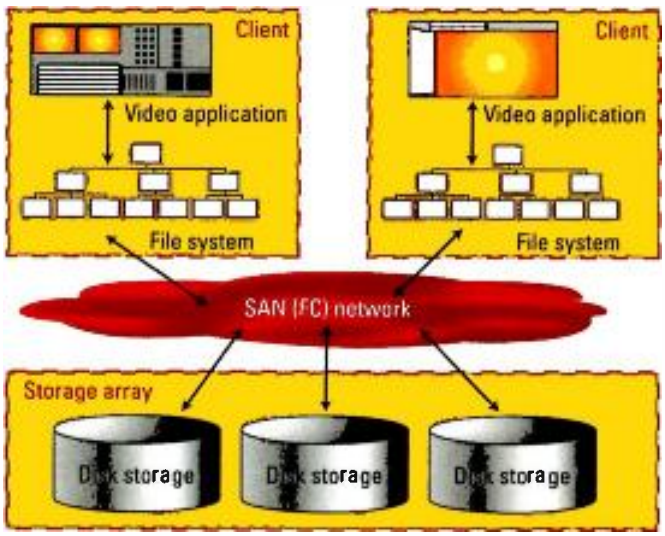


Figure 2. A shared Storage Area Network (SAN) is one of two principal options in solving space and cost issues related to making large files available to multiple editors. In a SAN, a pool of storage is divided and allocated to individual servers.

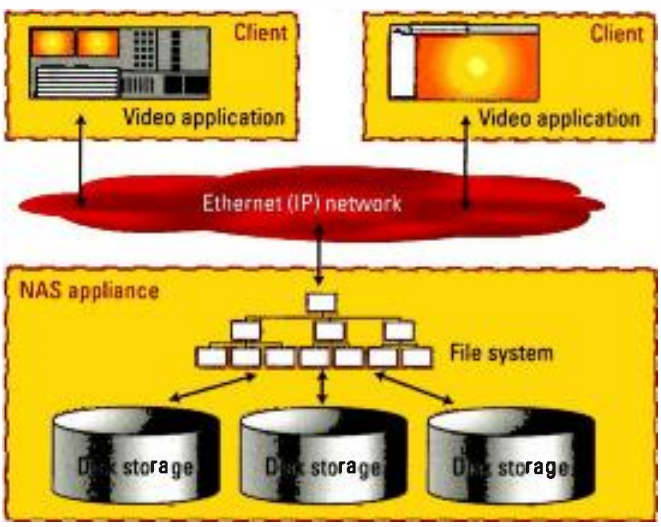


Figure 3. A Network Attached Storage (NAS) system is connected to all desktops, workstations and servers on a standard Ethernet network and controls data access by managing user privileges, file locking and other security measures.

media files between editors or moving the content to the next step in the workflow requires manually copying files across the network or resorting to the "sneakernet" solution of copying content on removable media to move it along the workflow. The result is expensive: Duplicate copies of large files double the storage capacity, and waiting for file transfers reduces the productivity of highly-paid editors.

High-performance shared storage systems were designed to solve this problem, and today there are two principal options: shared Storage Area Network (SAN) file systems and scale-out Network Attached Storage (NAS) file systems. (See Figures 2 and 3.) Based on fundamentally different architectures, each offers advantages and disadvantages that should be carefully considered before choosing a storage system for your workflow.

Block-based storage over Fibre Channel

With a SAN, a pool of high-performance storage is divided and allocated to individual servers. Users and applications can only access storage through allocated servers. This works well for databases, but not for media workflows where files are shared by teams working on different workstations.

Shared SAN file systems break the silos by adding file system functionality without adding a file system layer. (See Figure 4.) Access to data on the shared volumes is carefully controlled for data integrity, often by a separate server that manages file locking, space allocation and access authorization. Placing this server outside the data path, instead of between the client and the storage, eliminates a potential bottleneck and improves overall performance of the storage solution.

To deliver blocks over a network fast enough, SANs also use a storage-specific network standard, Fibre Channel, with its own dedicated

switches, cables and protocol. The Fibre Channel protocol delivers SCSI commands between the server and the SAN's disk systems just as it would a locally attached disk.

File-based storage over Ethernet

NAS devices are purpose-built file servers designed to make sharing files between individuals and groups more efficient and secure. Since a NAS is connected to all the desktops, workstations and servers on standard Ethernet network, the NAS controls data access by managing user privileges, file locking and other security measures.

NAS devices provide data access to clients running different operating systems through a file system layer such as a Network File System (NFS) or Common Internet File System (CIFS). Because NAS devices use the existing Ethernet network, instead of requiring a special Fibre Channel storage network, deploying NAS storage is generally less expensive than a comparable SAN solution.

The downside of presenting data through a file system layer is that NFS and CIFS, the most commonly used

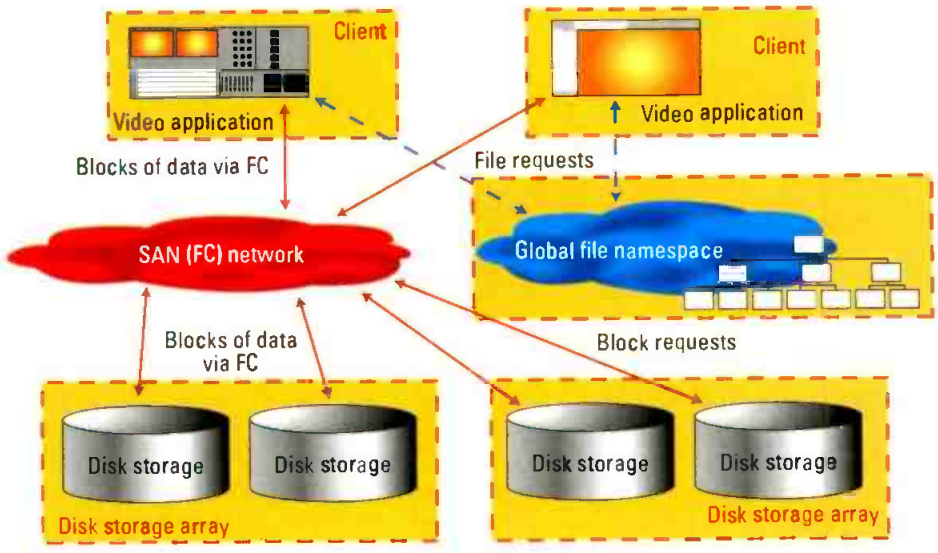


Figure 4. Shared SAN file systems break silos by adding file system functionality without adding a file system layer. Access to data on the shared volumes is carefully controlled in order to preserve data integrity.

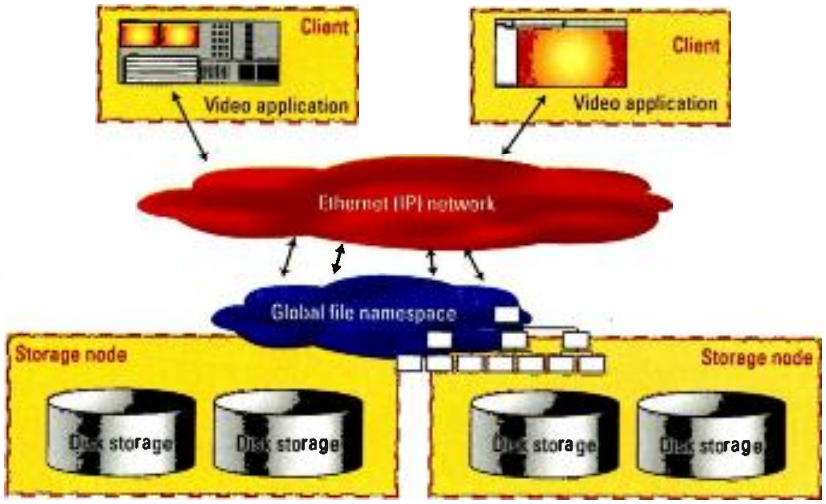


Figure 5. In order to boost NAS performance, file systems can be clustered or distributed, combined with a building block storage architecture. This architecture is referred to as "scale-out" storage.

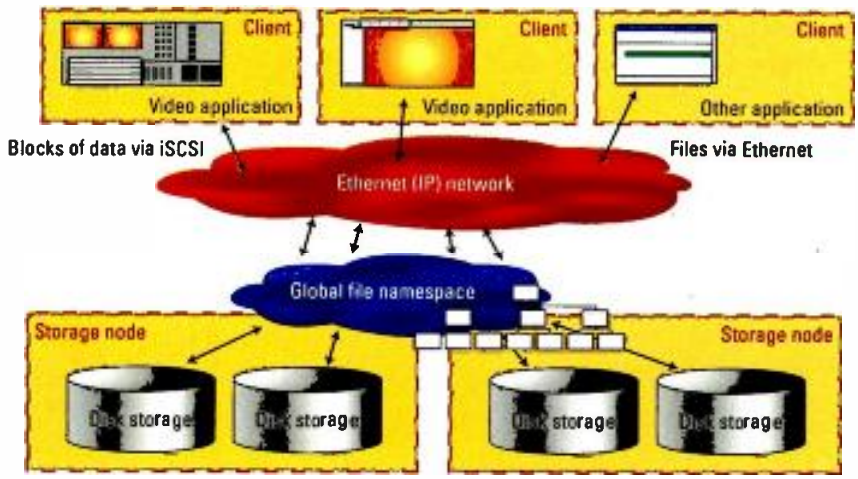


Figure 6. Some vendors have modified their NAS platform to allow block-mode access through iSCSI, an Ethernet-based protocol.

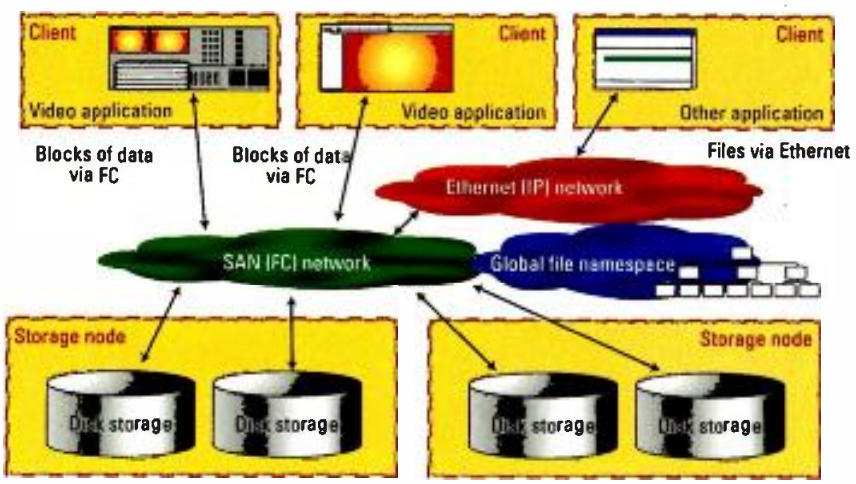


Figure 7. A NAS file system on top of a SAN. The standard NFS or CIFS protocols can be replaced with another one optimized for streaming media.

protocols, are not optimized for large files of streaming data like video files. Also, the file data is transferred over Ethernet, a packet-based protocol that allows for latencies in the delivery of files, unlike Fibre Channel, which was designed to deliver blocks of streaming data with low-latency. Newer standards like 10Gb Ethernet approach SAN network speeds, but do not improve latency.

Faster file-system performance

One approach to boost NAS performance is clustered or distributed file systems, often combined with a building block storage architecture referred to as "scale-out" storage. (See Figure 5.) The clustered file system distributes data across the nodes in the scale-out storage, which spreads the data access load across more processors and more I/O connections.

By aggregating I/O across a cluster of nodes, each with its own network connection, scale-out NAS greatly improves performance over traditional NAS. However, even the industry-leading solutions can only reach up to 400MB/s for a single data stream, whereas SAN solutions can provide the 1.6GB/s performance required for editing streaming video files at resolutions at or greater than 2K uncompressed.

Best of both worlds?

Another approach, often referred to as "unified storage," is to support both file-based NAS and block-based SAN access from the same storage system. Unified storage allows facilities to consolidate their storage and eliminate storage silos, giving applications the choice of attaching to storage using either IP or Fibre Channel protocols, depending on the applications' performance requirements.

Some unified storage systems layer a NAS file system on top of SAN storage, offering true SAN-level performance for block-level access. Other vendors have modified their NAS platform to allow block-mode

access through iSCSI, an Ethernet-based protocol. (See Figure 6.) While iSCSI has made performance gains due to faster 10Gb Ethernet networks and beyond, it hasn't been widely adopted for video editing workflows.

One unified storage approach that works well for file-based workflows is to layer a NAS file system on top of a SAN, but replace the standard NFS or CIFS protocols with one optimized for streaming media, such as the DLC proprietary format from Quantum. (See Figure 7.) With this architecture, an optimal media workflow that aligns the performance needs with the cost of the storage infrastructure can be created.

In an ideal storage strategy, a single storage pool can be shared throughout workflow, but accessed according to the performance vs. cost requirements for each workflow application.

Fibre Channel access

To meet the high-performance storage demands of full-resolution video content, a SAN with Fibre Channel connections should be deployed for video editing workstations, ingest and playout servers, and any other workflow operation that requires the 700MB/s per user read or write performance needed to stream files at 2K resolution or above. With a SAN solution that includes a shared file system, files can easily be shared between editors or amongst steps in the workflow.

High-speed Ethernet access

Facilities with farms of transcoding or rendering servers that require streaming performance at approximately 70MB/s to110MB/s should look to high-performance storage that offers high-speed Ethernet access, either through a scale-out NAS or block-level storage with a specialty NAS protocol optimized for streaming media.

Standard Ethernet access

Producers and other staff who primarily access low-resolution proxies, images, scripts and other text documents can connect to the storage from their desktops through the standard NFS or CIFS file systems over standard Ethernet connections of 1GbE or less.

Finally, high-performing disk systems are sold in both NAS and SAN configurations. Often it's the access mechanism — the network type, protocol and number of connections — that drives the overall performance. The smartest, easiest to manage, lowest-overall cost solutions offer shared storage that allows facilities to choose the network and protocol that makes the most sense for each workflow activity, from high-speed SAN over Fibre Channel to standard NAS over Ethernet. BE

Janet Lafleur is the StorNext product marketing manager, Quantum.

Teddy Demilew, Wohler engineer, performs MPEG TS monitoring using one of several lower-cost video monitors placed throughout a media facility. This new trend offers much greater flexibility.

MPEG TS monitoring

Lower-cost monitors change the economics of multi-platform delivery.

BY BRIAN PETERSSON

Perhaps no other trend is doing more to shape today's media landscape than multiplatform content delivery, driven by the explosion in mobile devices and consumers' growing and insatiable appetite for content they can access "anytime and anywhere." Broadcasting operations that were designed for traditional, linear transmissions are becoming much more complex, with many more elements being added to the transmission chain and the requirement to deliver every possible transport stream — satellite, cable, free to air, Web streaming, and delivery to different platforms including 4G mobile devices. Troubleshooting transmission problems has never been more critical or more time-consuming.

As broadcasters and content providers grapple with adapting their operations to multiplatform delivery, they have placed a premium on finding alternate test-and-measurement systems that can offer a simplified interface while providing an adequate level of signal analysis. Placed throughout the media facility, lower-cost video monitors that incorporate MPEG-2 and MPEG-4 TS monitoring offer much greater flexibility in monitoring and analyzing video, audio and metadata at any point in the signal flow, whether inside or outside the central HD-SDI infrastructure.

This article will discuss the latest advances in chipset and technology development that are enabling compact, affordable MPEG monitoring solutions. By providing integrated support for DVB-ASI, MPEG-2 and MPEG-4 transport streams, these new monitors

are playing a critical role in helping broadcasters and other content providers improve the efficiency and agility of their monitoring operations — and, ultimately, the integrity of the final signal they deliver to viewers.

Multiplatform MPEG monitoring

MPEG monitoring equipment is not a new fixture in media facilities; in fact, it has always been a requirement in any operation that relies on some type of MPEG transport stream for content delivery: free-to-air stations, pay-TV networks, video over IP and mobile-TV providers. Traditional MPEG monitoring systems are high-end and expensive and are designed for detailed, byte-by-byte analysis; fault logging; and display of each MPEG stream.

In an operation with multiple transport streams, with different transcoding formats and resolutions required for different device types, it is not feasible or cost-effective to install a high-end monitoring system for multipoint probing of every stream. The ideal solution, therefore, is a low-cost monitoring platform that can perform a sort of triage on

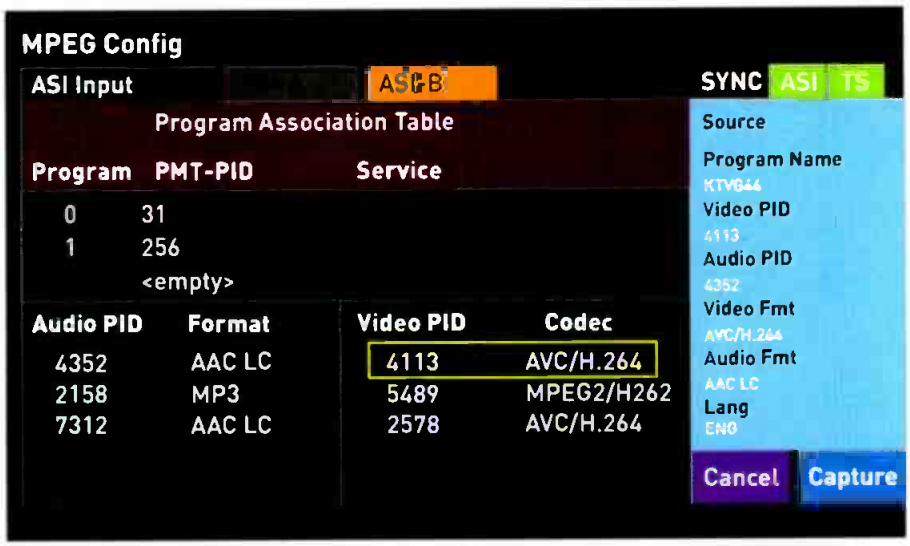


Figure 1. Multiplatform operations often use lower-cost monitoring systems to check for faults at key points in the transmission path. One such point is analysis of MPEG errors — including missing stream PIDs — capable of preventing user devices from properly decoding content.

the stream at key points in the transmission path by interrogating it at a basic level, and then handing the signal off to higher-end equipment if a fault condition is detected.

At the most basic level, monitoring provides selection and decoding of the video image and associated audio to allow confirmation of the content, especially if it is being delivered in multiple languages, such as is the case in global sports. The next level of monitoring should provide basic analysis of MPEG errors capable of preventing user devices from properly decoding content. These include packet header errors, such as sync byte or continuity count (which indicates dropped packets), or program mapping errors such as program allocation table (PAT), program map table (PMT), or missing stream PIDs, such as the one shown in Figure 1 on page 57.

Advanced monitoring capabilities include detection of black screen, lost or frozen video, or loss of audio

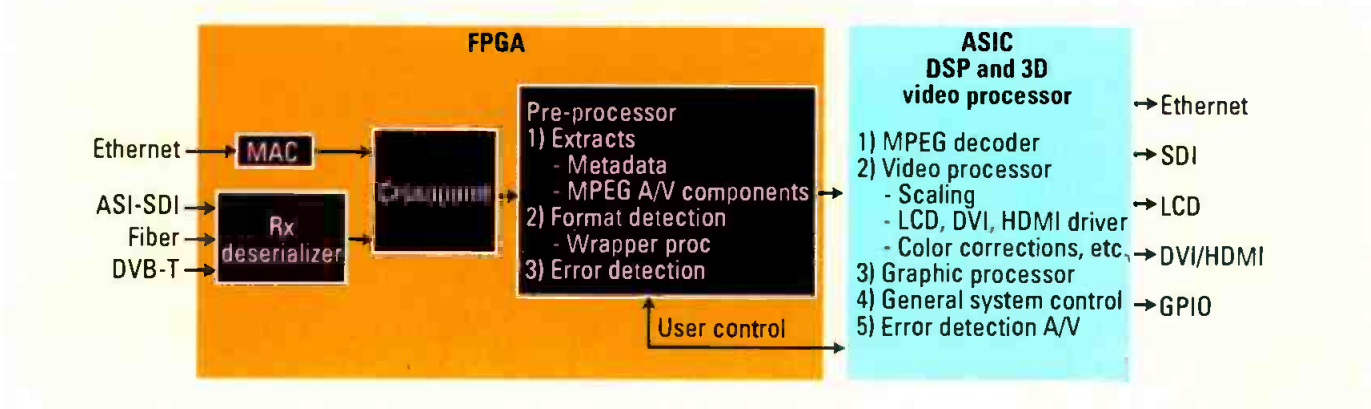


Figure 2. Newly developed chipsets working in tandem with FPGAs decode input sources in a variety of MPEG flavors and identify anomalies in the TS wrapper.

from the decoded MPEG streams. In each of these cases, errors should be reportable both locally by the monitoring device and remotely to an operator and/or QC process equipped to further diagnose and correct the errors. Once an error has been reported, a high-end, advanced monitoring device can provide a logged, detailed analysis of the source of the fault.

Lower-cost multistream monitoring

New, lower-cost devices for monitoring MPEG transport streams owe their existence to the explosion of chipsets for smartphones, tablet computers and other mobile devices. Working in tandem with field-programmable gate arrays (FPGAs), as shown in Figure 2, these chipsets provide a powerful one-two punch for the resource-intensive tasks of decoding MPEG-2 and MPEG-4 input sources and identifying anomalies in the TS wrapper. Typically, these chipsets can accommodate the many flavors of MPEG, including MPEG-2, MPEG-4 H.264, and JPEG2000.

In monitoring systems that work at the "triage" level, the FPGA pre-processes the packet by breaking out the rudimentary stream and performing cursory analysis of the wrapper to identify potential transmission errors. At this base level, the monitor can flag subset errors that might impair decoding and cause artifacts in the decoded picture, or those that will prevent the content from being decoded altogether. The FPGA passes the unwrapped elementary components of the MPEG video and audio content for decoding by a hardware-based MPEG decoder — typically comprised of an ARM or DSP processing core and a custom 3-D video/graphic hardware engine — which outputs the MPEG content to baseband video and audio for either local or remote monitoring.

Other important considerations

In evaluating available multistream MPEG monitors, media operations should factor in other important attributes. First, for an operation with many distribution points at remote, unmanned sites, the system should enable remote monitoring and alarming via the Internet. The monitoring devices (if physical product) or user interface (if software-based), should be simple and intuitive.

In the event of error detection, the monitor should provide automatic notification to an external device, or posting of an error message on the monitoring device itself, transmission of an automatic email notification or text message to a mobile phone, or SNMP trap. The monitor should also provide a clear onscreen display of the stream experiencing the error. Many current monitoring platforms provide for capture and forward of an offending clip or datastream so that further analysis and error correction can be performed. BE

Brian Petersson serves as video design engineering manager at Wohler Technologies.

QMOD-SDI modulators

The HD-SDI modulators create a virtual HD SDI/RF routing system for two Georgia TV studios.

BY EDWARD KOTHERA

Professional Communications Systems (PCS) had the unique task of building an in-house broadcast facility for two separate TV station groups sharing the same facility — WJBF (ABC) and WAGT (NBC) in Augusta, GA.

The new building, which previously was a Barnes & Noble bookstore, houses both studios and control rooms, each with separate master controls. All share one broadcast core and a central newsroom.

In the process of designing the newsroom, both stations needed the flexibility to route any off-air channel or house source into any given monitor in the newsroom or studio, or to other staffers and locations in the facility. The distribution system needed to be scalable for adding new viewing locations within the facility in the future.

Using HD-SDI for distribution was considered at first, but it was expensive. Each drop required a home-run feed with re-clocking as needed, a dedicated output on the HD router and an HD-SDI interface for each prosumer TV.

Television Park houses WJBF-ABC and WAGT-TV. The newsroom is equipped with the ability to monitor regional, national and local news feeds, allowing producers to keep up with what's happening outside the walls of the building.

Instead, it was decided to route HD-SDI as 1080i HDTV channels over a facility-wide RF network. Contemporary Research's QMOD-SDI HD-SDI modulator was the key to the solution. In the past, this option was out of the question, as converting

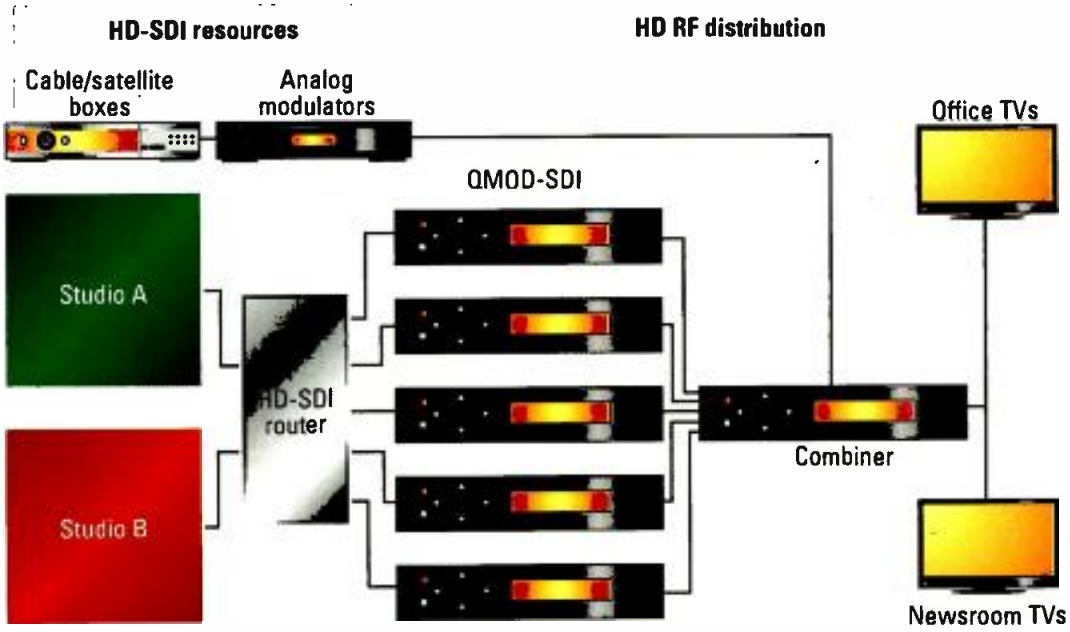


Figure 1. WJBF and WAGT employ five QMOD-SDI units, which are fed from a central SDI router.

SDI to digital cable channels required several components linked together at a cost of about $12,000 to $15,000. The QMOD-SDI does it all — HD-SDI 1080i/720p ingest, MPEG encoding and RF QAM channel output — for less than $3000 per channel.

In this application, five QMOD-SDI units were employed, fed from the central SDI router, with the option to add more router/RF channels in the future. (See Figure 1.) What was gained is a virtual HD-SDI video switcher that uses RF to reach any number of users at the site. Any input can be sent to any channel at any given moment, so anchors and staff in the newsroom can view anything on the system, including live studio video and broadcasts from local and national news programming.

The QMOD-SDI does it all — HD-SDI 1080i/720p ingest, MPEG encoding and RF QAM channel output — for less than $3000 per channel.

Integration was easy to perform. The five modulators and the QCA9-33 active combiner from Contemporary Research took up only three rack spaces, generating minimal heat and drawing little power. The front-panel text display and menus made it easy to define the frequency and options for each channel. After combining, the QMOD channels were then merged with other QAM channels on the in-house cable system. The site can easily add four additional channels on the existing combiner, and can add more with additional combiners.

The only video and control technology needed for each user was a standard HDTV display and the channel up/down buttons on the remote controller. In addition, the site can easily add new channels and branch the RF coax feed to new TV monitors in the future. BE

Edward Kothera is regional manager, Professional Communications Systems.

Matrox's MC-100

The mini converter combines multiple functions into an all-in-one system.

BY CHARLES AMYOT

Now more than ever, with the widespread use of HD and 3G along with SD, broadcasters are being challenged by SDI signal management issues. Mini converters are an integral part of SDI signal management and can be deployed in a variety of ways — for monitoring on affordable HDMI displays, for distributing and amplifying video feeds within an environment, for switching between two signals and, finally, for multiplexing two signals into a single cable to save wiring for transport. In addition, mini converters are increasingly becoming an important part of 3-D workflows for both monitoring and output purposes.

For roughly the price of a single mini converter, the Matrox MC-100 solves all five of these complex challenges in one device. The innovation in this product comes from the incorporation of multiple functions into a single unit — combining monitoring, distribution, switching, multiplexing and 3-D processing capabilities. (See Figure 1.) The unit supports a wide range of display resolutions through 3G, dual link, HD and SD-SDI.

Distribution and monitoring

The convertor lets the user input a professional-grade 3G, dual link, HD or SD-SDI signal and convert the signal to a consumer-grade HDMI format for inexpensive monitoring. For signal distribution, the unit takes a single SDI video feed and duplicates it on both SDI outputs, giving the user the ability to route a single feed to multiple locations. In addition, the MC-100 can amplify the signal by 984ft on SD-SDI, 328ft on HD-SDI and 230ft on 3G-SDI while maintaining the full SMPTE specification quality. This feature makes the unit ideal for sending SDI signals across large venues, such as football stadiums.

The unit can amplify SD, HD and 3G-SDI signals while maintaining full SMPTE quality.

Switching

Glitch-free switching in accordance with the SMPTE RP-168 specification lets the unit act as a true broadcast switcher. It is also a loss-of-signal switcher. The device can be configured to automatically and seamlessly switch to the second valid input if the first one is lost or becomes invalid. Downstream devices will keep recording or processing the signal without interruption. (See Figure 2.)

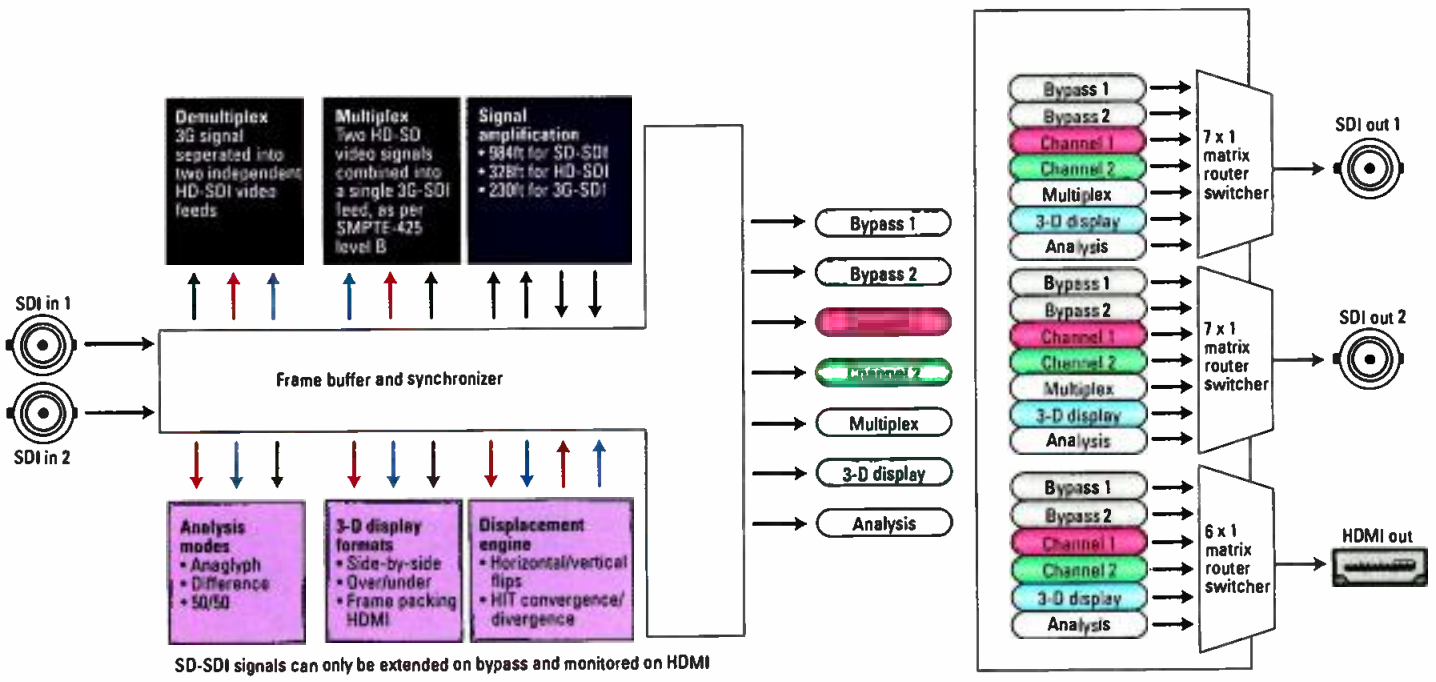


Figure 1. A single Matrox MC-100 can be used for monitoring, distribution, switching, multiplexing and real-time 3-D processing.

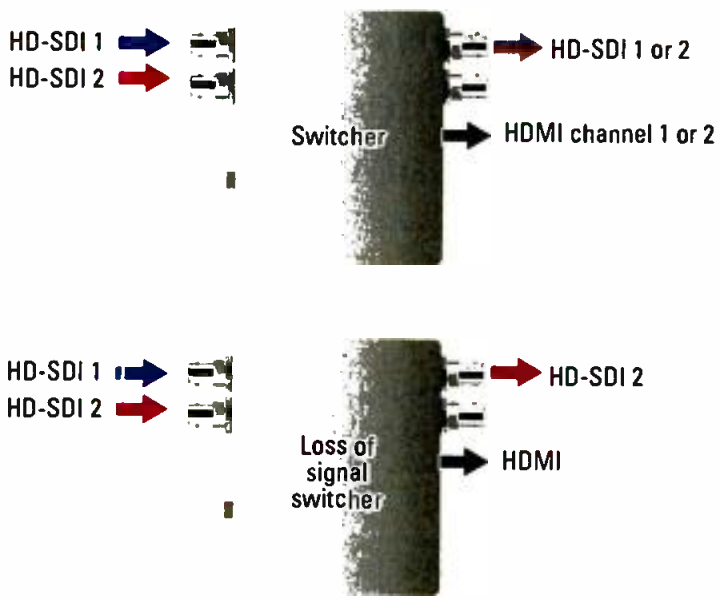


Figure 2. Shown here are configurations for glitch-free switching in accordance with SMPTE RP-168.

Multiplexing

The unit can also serve as a multiplexer and demultiplexer, giving the operator the ability to input two independent HD-SDI signals and combine them into one 3G transport stream. On the receiving end, a second converter — or another SMPTE-425M-compatible device — demultiplexes the signal, providing two independent HD-SDI video signals. This process reduces the wiring needed to distribute HD-SDI video by half.

3-D processing

When it comes to real-time 3-D processing, the convertor accepts left and right SDI image signal inputs. It outputs for program or monitoring in side-by-side or over/under modes on a single SDI cable. For monitoring on HDMI 1.4a, the unit supports side-by-side or over/under and frame packing modes. The device also includes horizontal image translation controls including pixel-based convergence and divergence settings. The images can be flipped vertically and/or horizontally as well as aligned with pixel-based vertical offset. Anaglyph, difference and 50/50 analysis modes are provided on SDI and HDMI. It features a built-in video frame synchronizer that is useful for 3-D production. After defining one of the video inputs as the reference source, the unit time base corrects the second video input and outputs the two video streams in sync.

There is no need to program the device with dip switch configuration or a computer connection.

Configure with on-screen display

For quick and efficient configuration, features are accessible through an on-screen display (OSD), controllable with three hardware buttons directly on the unit. There is no need to program the device with intricate dip switch configuration or a computer connection. Available by default on the HDMI output or optionally on both SDI outputs, the OSD gives access to every feature found on the device. User-defined presets can be saved to dip switches for even quicker setup.

Summary

The Matrox MC-100 mini converter maximizes efficiency for the broadcast engineer by consolidating multiple functions into a single device and solving a number of frequently faced challenges related to signal management. It is a valuable addition to any video professional's toolbox. BE

Charles P. Amyot is a product manager for Matrox Video Products Group.

TSL's Touchmix Pilot

The touchscreen monitor streamlines the handling of digital audio streams.

BY MARTIN DYSTER

Given the sheer amount of possible audio streams supporting live-event coverage and other applications, efficient audio signal monitoring is of critical importance to a broadcaster. In the past, production creative teams employed small rack-mount mixers, intercom panels and de-embedders to manage the vast choice of audio streams while monitoring router feeds, talkback, presenter, pre-hear, externals, talent, comms and PC sound cards.

This working model is still in play but offers inherent limitations, including inefficient use of rack space, limited channel count, slow access to multiple signals and reliance on a larger staff to handle the equipment. It is also chained to a particular rack of equipment, or spread through multiple locations that might not be ideally situated for an application.

Because the screen is connected via Ethernet, it can be located anywhere it's needed — in a facility, truck or remotely via the Internet.

With the industry's move into digital production, critical audio material is now embedded in an SDI datastream, making the existing method of monitoring audio streams not only outdated, but woefully lacking in capacity and flexibility. Although systems designers address this situation through a creative blend of diverse equipment from different manufacturers, solving this ubiquitous problem is of paramount importance. In an era where production staff and valuable rack space are limited commodities, the industry is in dire need of a dedicated system to tame audio signal monitoring.

The Touchmix Pilot's touchscreen features identical twin audio mixers with 10 stereo or 20 dual-mono-assignable input channels per mixer.

Hearing is believing

A broadcasting company approached TSL Professional Products with just such a conundrum. It wanted to solve its monitoring problem through an integrated approach that covered all the audio bases in one unit. This request led to TSL's development of the AVM-T-MIX (Touchmix) system. Essentially a rack-mount monitoring unit with integrated touchscreen display, it can de-embed audio from one or two SDI signals simultaneously and mix the demuxed audio with AES and analog signals from various sources. Individual levels are controllable, along with balance and pan adjustments for stereo or mono signals, for each source onto the monitoring output.

With Touchmix bringing all the audio streams together, TSL felt the time was right to introduce a remote touchscreen controller to accompany the system. Thus, the TSL Touchmix Pilot was born, and audio monitoring made its screen debut.

The new audio monitor places two full-featured audio mixing consoles in front of an operator who can access and process audio via touchscreen in a location convenient to him or her. Because the screen is connected via Ethernet, it can be located anywhere it's needed — in a facility, truck or remotely via the Internet — allowing a creative team in the main studio to monitor signals for a field operation, for example.

The touchscreen features identical twin audio mixers with 10 stereo or 20 dual-mono-assignable input channels per mixer. It offers a choice of user-selectable bar-graph meter scales, including BBC PPM, EBU PPM, EBU Digital, Nordic, VU and DIN. Any one of those 20 bar-graph meters can represent a mono, stereo, 5.1 surround signal or part of a 5.1 surround signal.

Importantly, embedded audio for up to two SDI streams can be de-embedded and processed with any other audio format, thereby eliminating the need to wire in an external de-embedding system.

The input section on the main rack-mount processor offers single (or optional dual-2SD only) auto-sensing; 1080p at 60Hz, 59Hz, 94Hz and 50Hz;

and an HD/SDI video input, with de-embedded audio monitoring from up to 16 channels for SDI signal one and eight channels from SDI signal two, group one and two only. Eight AES (eight pairs/16 channels) or four AES (four pairs/eight channels — 2SD only) inputs are available at 110Ω balanced or 75Ω unbalanced via optional CAB-D25-BNC cable. Eight analog stereo inputs are also available. This inherent flexibility covers a wide variety of production situations.

With operational simplicity as the goal, the input channels in mixer one can be set to work with the format of the incoming audio necessary for a particular production. This audio might be a mono analog signal, combined with the left side of a digital stereo signal and mixed with a full 5.1 surround stream that an engineer might want to control and output as a stereo downmix to a headphone. Simply by touching the screen, access to the pre-configured incoming signals (which are labeled at the top of each bar graph) is accomplished. In this section, operators can adjust the signal's level, pan and balance. The right-hand side of the screen allows operators to define the output signal as mono, stereo or 5.1 surround.

For example, a production team for a sports event in New York might be dealing with audio feeds coming in from many sources from within a facility, as well as external sources. The program feed might be in 5.1 surround, with multiple commentators from around the country sending in complete video feeds from a production studio, or mono audio via the Internet or smartphone. Or, talent might be in a studio in Arlington, VA, while giving live commentary on a baseball game in New York.

The monitoring system effectively combines audio signals from anywhere in the production chain into one unit.

The audio monitor gives the team a way to instantly gather and hear all the audio components, including comms. This audio helps the creative team decide on camera shots and cutaways to the stadium or studio.

With the audio system, the commentator can set up his or her own headphone feed, which might include onsite program audio, the director from the stadium broadcast facility, the interviewer in New York and the local director for a custom headphone mix. Configuration snapshots, whether simple or complex, can be loaded or saved instantly using onboard memory locations or via the onboard USB port in situations where different programs or events (e.g. London 2012) have different audio monitoring requirements.

Closing credits

The monitoring system effectively combines audio signals from anywhere in the production chain into one unit. This has the effect of reducing the need for comms panels, external mixers and de-embedder systems, thus reducing costs and saving on space.

In keeping with the trend toward working with reduced staff, the integrated monitor brings streamlined "leanback" audio monitoring operations to the wider creative team through an easy-to-use, intuitive interface. It works well in demanding, high-level broadcast facilities, as well as in smaller production studios and remote vehicles. Audio monitoring has finally made its screen debut. BE

Martin Dyster is head of audio at TSL Professional Products.

Shure's ULX-D

The wireless mic boasts audio quality with efficient bandwidth use.

BY GARY ESKOW

Searching for open channels can be a real problem, but finding a cost-effective wireless microphone system is, fortunately, getting easier. The Shure ULX-D Digital Wireless package offers outstanding audio quality and a robust structure. This system comes with either a lavalier microphone or a wireless version of the classic SM58. We reviewed the lavalier package.

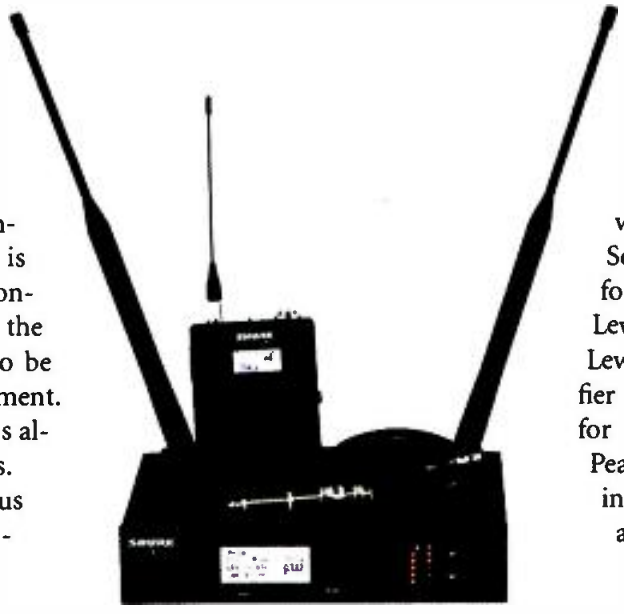
The front of the unit is uncluttered. Although the ULX-D is small, its sync, scan and edit controls are easy to access. Also, the LED screen is ample enough to be programmed in any environment. Brightness and contrast controls allow for personal display settings.

Navigating through the menus is easy. A clipping LED monitor is included, as well as gain controls that allow adjustment of the unit's output level. With golden ears, you won't need it, but the LCD panel displays the message "Tx OVERLOAD" when things get dicey on the input side.

The back of the device sports a pair of antenna inputs and both 1/4in and XLR line outputs. The mic/line switch lets you apply a 30dB pad if using the XLR output. An Ethernet port is included in case a router and network multiple units need to be hooked up together.

The transmitter is sturdy. Flipping open the top reveals exit and enter buttons. After dialing in the appropriate channel, you'll probably want to scroll down to the UTILITY function and lock in the settings to make sure that talent doesn't mess things up.

Setting gain structure is always crucial. As mentioned, the receiver sports up and down arrows that control output as well as a 30dB pad if you're communicating with your mixer via XLR connections. I prefer to use gain controls and hit a pad only when necessary. But, I was able to establish a clean audio path both ways.



A maximum of 14 ULX-D systems can operate out of a single 6MHz TV channel.

You're not going to record Kenny Chesney's next single with a lav mic, but the quality of this system was excellent for its intended purposes.

Of course, you're not going to record Kenny Chesney's next single with a lav mic, but the system's quality was excellent for its intended purposes. The product's manual says that the ULX-D operates on a 24-bit/48kHz digital pathway, and I'll take them at their word.

Big Lew's birthday bash

Bandwidth may not be a problem if you're working in central Alaska, but it is most other places. That said, a maximum of 14 ULX-D systems can operate out of a single 6MHz TV channel. So take that, Manhattan!

I didn't need that much room when I took this demo unit to Scotty's pub in Short Hills, NJ, for former New York Knicks ballboy Lewis Dorf's 60th birthday party. Lew asked if I had a mic and amplifier to use, so I took the ULX-D out for a test drive, along with an old Peavey practice amplifier I had lying in my studio. It worked like a charm as the guests who had prepared remarks traded the lav mic and transmitter and showered Lew with accolades and a few digs. In other words, the quality of the audio in this live situation was excellent.

Conclusion

Great audio specs and the ability to gang multiple units together makes the ULX-D Digital Wireless System a worthy entrant in the wireless microphone marketplace. BE

Gary Eskow is a composer, journalist and project studio owner. He also is the writer of Broadcast Engineering's *"Audio Technology Update" newsletter.*

Metadata

"Bits about bits" help broadcasters find and manage their content.

BY JOHN LUFF

During the time Phil Livingston, ex-Panasonic, and I worked together at AZCAR, we often shared sometimes silly e-mail messages about technology topics. Sadly, Phil passed away in 2006. But the messages we shared included one I still find quite amusing:

"Metadata is bits about the essence, which is the stuff we are watching, and thus is stuff about the real stuff. Metadata is also stuff about the stuff which can be stuffed into the stuff either as part of the stuff, or when not present, can be stuffed with bits that contain no stuff. ... Unfortunately, when no stuff is present, it may still be necessary to send stuff to tell the receiver that the bits are not stuff, though they may be a bit stuffed for syntactical purposes."

Defining metadata

Well, you get the point. Metadata is not a new concept, but in our industry the first real definition of how content and metadata relate dates from the SMPTE/EBU Task Force for Harmonized Standards for the Exchange of Program Material as Bitstreams, which completed its work in 1998. In the documents the task force created, essence and metadata are carefully defined.

Two types of metadata are in widespread use in our industry. Structural metadata is that which is necessary to decode and use the content. Identification of the type of compression, number of audio channels, coding parameters, colorimetry, resolution (temporal and spatial), and other technical data about a file, or stream, would be structural because without them the content might not be usable. It is possible that additional structural metadata might be added to a file during processing, especially if technical parameters are changed, or perhaps additional tracks added.

Descriptive metadata can be an enormous set of information, and in general, it increases throughout the production process. The time of capture from a camera's time stamps, geo-location information derived from GPS, scene and take numbering, and possibly script information might be saved with the essence. Over time, additional information might be added to make the content more easily searched. A simple example is a "good take flag," which could be added that might help winnow down the amount of content ingested during post production.

Metadata is truly "bits about bits," but it is much more, and critically important in our industry today.

Media asset management systems are often a source of a steady increase in the amount of metadata captured. A good example of such a system would be a sports logging system. Teams need to be able to search and categorize plays and thus add metadata that can grow during logging and use. For instance, a football team may want to add categories for offense and defense, plays in the "red zone," passes, runs, quarterback scrambles, sacks, penalties, key players (by name or number), and time on the clock.

It is important that it is possible to add metadata along the way. For instance, the first logger might only get a couple of categories (which team has the ball, clock, down, field position). A later analyst might add the play that was called, who ran, the results of the play, etc. A coach might add the play that was called, and so on. In entertainment production, other metadata might be added — for instance, scene continuity notes, color correction instructions, and so on. The ability to add metadata thus can be crucial to making the best use of the essence.

As a result, it is a critical step in designing a complete metadata and essence workflow to be aware that later changes and additions to metadata are expected. The most obvious example is to ensure that the metadata repository can be updated without changing the essence, and without losing the link between metadata and the essence to which it refers.

Clearly, it would not be a good idea to embed the metadata in the essence file if every time a change is made to metadata the entire file has to be stored again, and version numbers updated to reflect changed file content. This could result in explosive growth in storage needs in some cases.

Our football example begs to have the descriptive metadata stored in a separate repository, perhaps a database, with a reference to the essence file to which it relates. This allows small changes to be made with no impact to storage of the essence. This is sometimes referred to as a sidecar file.

Conversely, it makes no sense to put the structural metadata in a sidecar, which might make decoding the essence more complicated. In fact, one critical piece of structural metadata is the unique identifier linking

essence and metadata together, which of course must be stored with both.

Locating content

One content identifier often used is the ubiquitous SMPTE Unique Material Identifier (UMID). Although these are not globally unique and registered in a global database of all content ever created (which would be difficult, if not impossible), UMIDs are easy to generate and manage. Because they are locally generated, a camera can create an identifier on a mountaintop. This allows metadata to be referenced to that UMID-identified content later.

I have become convinced in the last few years that metadata may actually be more critical than some of the essence to which it refers.

I have become convinced in the last few years that metadata may actually be more critical than some of the essence to which it refers. One case is finding content. The structural metadata that identifies where essence is located cannot be corrupted. If it does, it may be at best difficult, and at worst impossible, to find the essence itself. A MAM database that allows content to be searched and retrieved must be carefully protected. If the location data is lost, essentially the essence itself becomes at best opaque.

The SMPTE/EBU Task Force related an additional concept, which is sometimes confusing to people in our industry, that of "wrapper." The wrapper concept is based in IT techniques and quite literally is a layer of structural metadata that surrounds the bits of essence and metadata. It allows the decoding and transport of content (defined by the Task Force as essence plus metadata) in a way that can be parsed by any application with knowledge of the wrapper syntax.

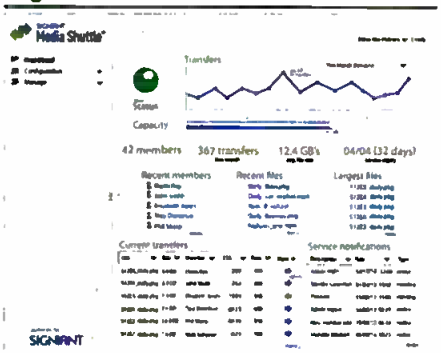
A standard wrapper does not guarantee the ability to decode the essence — because the receiving decoder might not understand, for instance, MPEG-2, only DV compression — but it will allow the structural metadata and essence to be retrieved from the file in a standardized way. The most obvious examples in common use today are Material Exchange Format (MXF) and QuickTime, though dozens of others exist.

To recap, metadata is truly "bits about bits," but it is much more, and critically important in our industry today. BE

John Luff is a television technology consultant.

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

Signiant — Media Shuttle



Designed to be a powerful, simple way to move large media files anywhere; gives any sized workgroup or enterprise the convenience and ease of use of public cloud-based file-sharing services, but without file size limits or security risks associated with storing high-value assets in the cloud; Media Shuttle's patent-pending technology can be configured in minutes and provides an easy-to-use, branded interface in the cloud while content stays within the secure control of the enterprise network.

www.signiant.com

Junger Audio — M*AP

Audio loudness processor combines an audio monitor controller and a loudness measurement device in one unit, thus providing comprehensive quality control and loudness monitoring; designed for quality checking surround (5.1) and/or stereo programs, the processor can be used for live monitoring as well as to ensure compliance with government regulations on loudness; comes with alarm signals that alert the operator when pre-set loudness thresholds are exceeded.

www.junger-audio.com

Avid — Avid DS 11

Editing, graphics creation, color correction and compositing system has been enhanced with new features such as hands-on color correction with Avid Artist Color integration, expanded file format and hardware support, 16 channels of embedded audio, and total conform to Media Composer 6 and Symphony 6; allows users to edit high-resolution media in real time — in master quality — using the high-quality compressed Avid DNxHD 444 codec; accelerates workflows by blending operations directly on the timeline to single or multiple clips or containers.

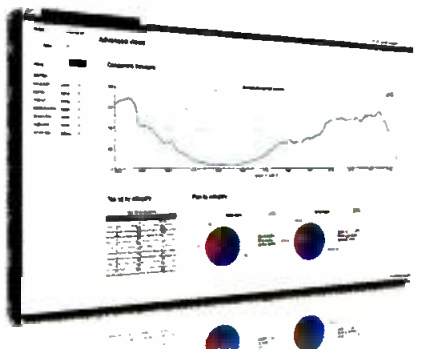
www.avid.com

Broadcast Pix — Multiscreen support

New multiscreen support for the 1 M/E Granite and Mica Video Control Centers; now, three "programs" can be generated using the system's program output and two enhanced PowerAux outputs, and each can be controlled by a separate panel or Soft Panel; the multiscreen technology is ideal for driving three image magnification screens, as each enjoys patented technology to maintain one frame of constant delay for continual lip sync throughout a presentation; PowerAux also can be used to produce any combination of I-MAG screens, Internet feeds and live television productions.

www.broadcastpix.com

Broadpeak — BkA100



Video delivery analytics system is designed to streamline an operator's CDN; enables operators to access key information located in the video streaming servers; provides the operator's support team with critical system monitoring information, the operations department with capacity planning details and marketing with the analytical results essential for building an effective marketing campaign; identifies important metrics, as well as the raw data necessary to compute them, and then provides a shared view of the material that can be accessed simultaneously by a virtually unlimited number of users.

www.broadpeak.tv

Roland Systems Group — V-800HD

Multiformat live video switcher is ideal for any live event or installation that requires the freedom to connect any type of source, whether it be digital or analog, computer or video format; features 16 inputs and eight channels of mixing with independent scalers on the input and outputs; allows users to connect any video format, including 3G, HD, SD, computer, digital, analog, SDI and HDMI; has built-in multiviewer with HDMI output; supports input/output resolutions up to 1080/60p, including 3G SDI.

www.rolandsystemsgroup.com

LYNX Technik — yellobrik OTX 1910, ORX 1900

Yellobrik OTX 1910 (shown here) is a fiber-optic transmitter for seamlessly sending analog RF L-Band signals over a single-mode fiber cable; offers a switchable 13V or 18V LNB power selector, which toggles between horizontal and vertical polarization; yellowbrik ORX 1900 is a fiber to L-Band receiver for accepting and restoring RF signals from a single-mode fiber; accepts a wide range of optical inputs — 1270nm-1610nm — and includes two RF outputs for signal distribution or monitoring; both yellobriks support L-Band ranges from 700MHz to 2300MHz.

www.lynx-technik.com

Chyron — SHOUT

Standalone software application enables broadcasters to bring social media commentary into their live broadcasts quickly and easily; gives one or more users the ability to monitor, select, adjust and route social media conversations to broadcast graphics systems either for on-air playback or for storage as data files for later use; multiple instances of SHOUT running across a facility can be used simultaneously by different staff members to view content and moderate the same playback list.

www.chyron.com

Camera Corps — SIMPLY SMPTE

Compact remote camera link allows any remotely controlled camera system in the company's product range to be operated over long distance via SMPTE 3K-standard electrical/optical cable; developed for use at large-scale OB events requiring long camera-to-base distances; remote link consists of a base unit and remote unit; powered by 110V or 240V AC; has an optical input for incoming video data; electrical inputs allow direct connection of analog genlock video and audio-frequency control data.

www.cameracorps.co.uk

Panasonic — F series

New generation of P2 solid-state recording media; includes support of recording up to AVC-Intra Class 200 of the AVC-ULTRA codec family; also supports all currently available codecs from existing P2 cameras and recorders, including AVC-Intra 100/50, as well as DVCPRO-HD/50/25; available in 64GB, 32GB and 16GB P2 cards; F series P2 cards offer fast transfer speeds (up to 1.2Gb/s); F series P2 media contain a flash memory error correction system, equivalent to a RAID system, to strengthen data retention reliability.

www.panasonic.com/broadcast

Thomson Video Networks — ViBE EM4000

New quad-channel multistandard version of the MPEG broadcast encoder is now available; developed for satellite, terrestrial, cable and IPTV applications; designed to provide optimized compression performance and greater flexibility and density; its capacity for four channels within a single 1RU chassis allows each channel to consume only 70W of energy; offers HD, SD, MPEG-4 AVC and MPEG-2 encoding capability.

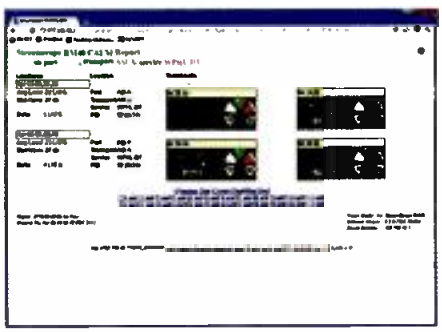
www.thomson-networks.com

Apantac — TAHOMA MiniQ

Compact multiviewer accepts and autodetects composite, SD, HD and 3G-SDI signals; supports DVI/HDMI and SDI outputs; displays embedded audio meters; supports the TSL protocol over IP and serial; can be used as a standalone quad-split multiviewer or expanded to a full system where up to eight hot-swappable TAHOMA-MiniQ modules can be combined in a 3RU rack frame with hot-swappable redundant power supplies.

www.apantac.com

Triveni Digital — StreamScope RM-40 CALM



Cost-effective DTV loudness monitor remotely monitors, measures, records and analyzes DTV streams in real time to ensure their compliance with the CALM Act; enables users to more rapidly troubleshoot audio loudness issues and deliver a higher quality of service to viewers; delivers a daily report that accurately identifies possible CALM violations for all services on a given transport — including IP, ASI, 8VSB and QAM.

www.TriveniDigital.com

Haivision — Viper 1.1

Compact appliance combines dual-channel HD encoding, low-latency secure streaming, video on demand and a contextual multichannel record-review-publish workflow — all within a single chassis; ideal for capturing, streaming and publishing events relying on multimedia sources; streams and records two real-time, full-frame-rate, HD H.264 streams containing either HD video or computer graphics content.

www.haivision.com

Shotoku Broadcast Systems — TP200VR

Features the company's reliable and accurate mechanical X-Y tracking technology; lightweight, high-capacity unit has a maximum payload of more than 176lb; supports a wide range of camera configurations; its perfect balance column and base are designed to offer maximum stability and operational flexibility; a foot-operated parking brake and single-action cable guard enable precise movements and control at all times for fast and easy positioning.

www.shotoku.co.uk

Blue Lucy Media — BLM Flexicart Service

Module provides for full Sony Flexicart control to facilitate bulk, unattended ingest of up to 70 tapes with a single VTR or 40 tapes with four VTRs by maintaining full operational control of an attached Flexicart, including tape movements and inventory management; an ingest schedule is matched against tapes in the Flexicart; Miura Acquisition then works through the tapes using the Flexicart Service for cart/robot tape operations and the BLM Ingest Service for ingest/file write operations; the unattended process runs until digitization is complete.

www.bluelucymedia.com

Eyeheight — CC-3D

Combines the features of a stereoscopic color corrector and legalizer in a single unit; allows unified control of both channels of a stereoscopic 3-D pair; the unit's adjustable color correction parameters include R, G, B and master gain and lift, plus selectable master or individual R, G and B gamma control with overall luma, chroma gain, hue rotation and black level; its integral legalizer automatically ensures that adjustments remain within industry-agreed singal levels; is capable of working at 1080i/50/59.94 or 1080p 23.976/24/25/29.97 high definition, 720p/50/59.94 intermediate definition, and 625/50 or 525/59.94 standard definition.

www.eyeheight.com

Autocue — Autocue Production Suite

Standalone live production system combines several components into a single cost-effective system; features include a vision and audio mixer, a playback device, a still store, a caption generator, a picture-in-picture processor, a chromakey processor, a logo/bug/ticker inserter, an output recorder and a multiviewer; an internal recorder allows program output to be saved directly to the media store.

www.autocue.com

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Editor, World Edition: David Austerberry, editor@broadcastengineeringworld.com
Managing Editor: Susan Anderson, susan.anderson@penton.com
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Sr. Marketing Manager: Kim Davidson, kim.davidson@penton.com
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Penton

Penton Media, Inc.
249 West 17th Street
New York, NY 10011
Chief Executive Officer: David Kieselstein, david.kieselstein@penton.com

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INTERNATIONAL

Europe
Richard Woolley
+44-1295-278-407
Fax: +44-1295-278-408
richardwoolley@btclick.com

Israel
Asa Talbar
Talbar Media
+972 (77) 562-1900
talbar@talbar.co.il

Japan
Mashy Yoshikawa
Orient Echo, Inc.
+81-3-3235-5961; Fax: +81-3-3235-5852
mashy@fa2.so-net.ne.jp

Asia Pacific
Tan May Ling
InterAct Media & Marketing
+65-9623-1405; Fax: +65-6265-3000
tmling@singnet.com.sg

REPRINTS

Wright's Media
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Finding 'Easter eggs'

Many miss hidden trade show floor product gems.

BY ANTHONY R. GARGANO

Remember those Easter egg hunts of childhood? As adults, some of us have found ourselves again exposed to them. In software, for example, an Easter egg tradition has developed. Program authors of everything from games to business software (having taken pride in their creations and wanting to demonstrate a good sense of humor) embedded hidden keystroke combinations or mouse click sequences that unveiled treasures from hidden games to videos. As software companies have become more sensitive to security issues, though, Easter eggs have disappeared.

I, for one, still like to hunt for them. One of my favorite places to look is at trade shows. Big names draw big crowds, and little names try to attract those same crowds with giveaways and free tchotchkes. Some little names even try new technologies and products. Lacking those, tchotchke it is.

The Easter eggs of trade shows are those tiny stands in obscure places, where you typically don't find a crowd, and the overhead sign is from an unheard of company or organization. At NAB this year, my Easter egg was under the banner of NICT, the National Institute of Information and Communications Technology.

NICT

NICT is an independent research agency of the Japanese government devoted to research and development in network, applied electromagnetic, and advanced information and communications technologies. Its chartered goal is improvement of societal lifestyles by advancing collaborative efforts among government, academia and industry. This obviously helps drive economic growth through the advancement of Japanese technology companies, thus the government sponsorship.

At NAB, NICT had a rather eclectic display of some fascinating technologies. One demonstration used darknet monitoring to view real-time network analysis of the global world wide web. Darknet monitoring is a method that observes network traffic targeting unused IP space in order to assess cyber attacks, such as scanning worms or large-scale denial of service attacks. Normally limited to defined networks, the NICT technology displayed this analysis for the entire global internet. Viewing the earth on a large-screen LCD that showed a multicolor, real-time visualization of the massive amount of cyber attack traffic emanating from Asia toward the United States was incredibly compelling to watch.

Trade shows are a great opportunity to join the crowds trying out today's latest products.

You may have experienced virtual reality at other shows. NICT has taken that experience to the next level. Its Multi-sensory Interaction System permits a virtual reality experience that included 3-D imagery, stereo sound, smells and touch. It was eerie to say the least, but the technology is highly practical as surgical training is a target application.

Exhibited in another part of the NICT stand was a millimeter wave wireless LAN operating at 60GHz. The system allowed for multi-gigabit data rates and was shown wirelessly streaming uncompressed HD. Conceptually, NICT showed using this technology throughout a home to create an extremely high-speed personal area network.

Holographic feel

Last, and most impressive, was the 200in screen displaying glassless 3-D. Behind the screen was an incredible array of 200 projectors used to display the imagery. NICT's impressive multiview technology not only created high-quality 3-D images, but ones with a holographic feel. A car, for example, shown essentially life-sized on the screen, was displayed in side view with its doors open. This allowed viewers to change positions and look around one of the open doors to view the car's previously hidden insides.

Sign of the future?

Such technology displays sometimes lead to naught. But, sometimes they provide a glimpse of what the future holds.

A number of years ago, one of my trade show explorations took me to a small stand that demonstrated a rudimentary prototype of plasma display technology. It was monochrome, full of artifacts and incredibly heavy and bulky. At other shows, I saw the first demonstrations of 4K video and then 8K video. I have also had the opportunity to view holographic video in what can only be described as early embryonic stage.

Trade shows are a great opportunity to join the crowds looking at and trying out today's latest and greatest products and technologies. And, while much is learned sitting in on conference and training sessions, you might want to next time take just a little bit and see what Easter egg you can discover in some out of the way, less-traveled space of the trade show floor. BE

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

? Send questions and comments to: anthony.gargano@penton.com

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Washington DC Sales
+1 703-330-8600
dcsales@evertz.com

New York Sales
+1 201-337-0205
newyorksales@evertz.com

UK Sales
+44 (0)118-935-0200
uksales@evertz.com

US West Coast Sales
+1 818-558-3910
uswestsales@evertz.com

South-East Europe Sales
+385 1-2001-665
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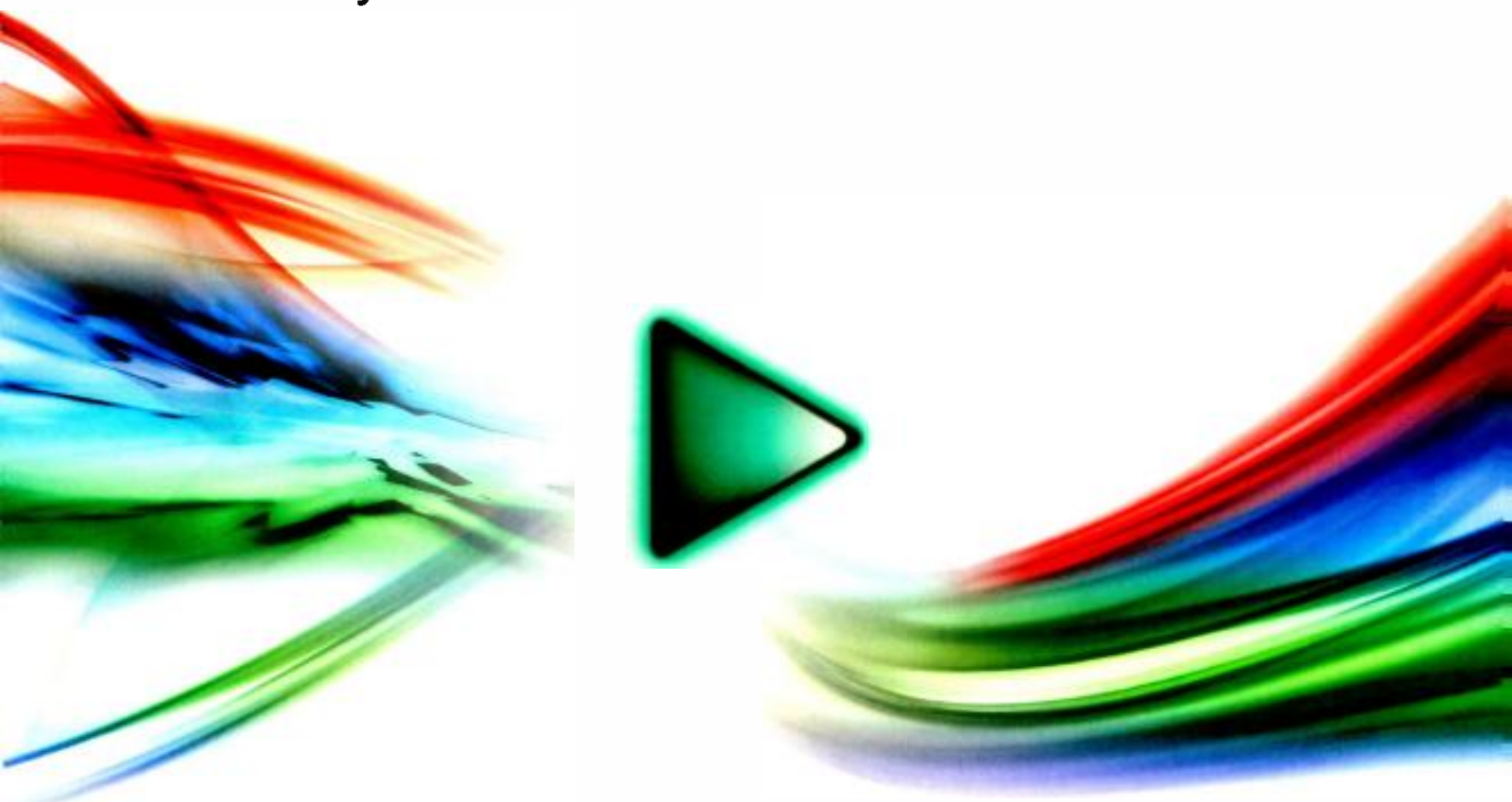

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