MAY 2009

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Chief Technical Partner, **BlueScreen LLC.**

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With a 30-year reputation for quality, Bob Kertesz relies on AJA at the heart of his workflow.

As Chief Technical Partner at BlueScreen LLC., Kertesz specializes in high-end compositing of live images. In fast-paced environments his array of AJA converters and the FS1 ensure he can meet whatever format and equipment challenges he faces. "A client shows up with an HD tape for an SD project? No problem," he explains. "He wants to integrate 720p footage into a 1080i show? No problem. He brings a camera with only component outputs and I need digital? No problem."

For a recent series of promotional spots for NBC's Amercian Gladiators, Kertesz created on-set pre-visualization compositing taking a feed from a Vision Research Phantom HD Camera. "Because of the tight turnaround time, and the talent involved, it was essential that we were working with equipment that was reliable and fast. The camera didn't genlock, so we had to have an on-set solution to feed its footage into the HD Ultimatte 11. The FS1 was essential for that purpose."

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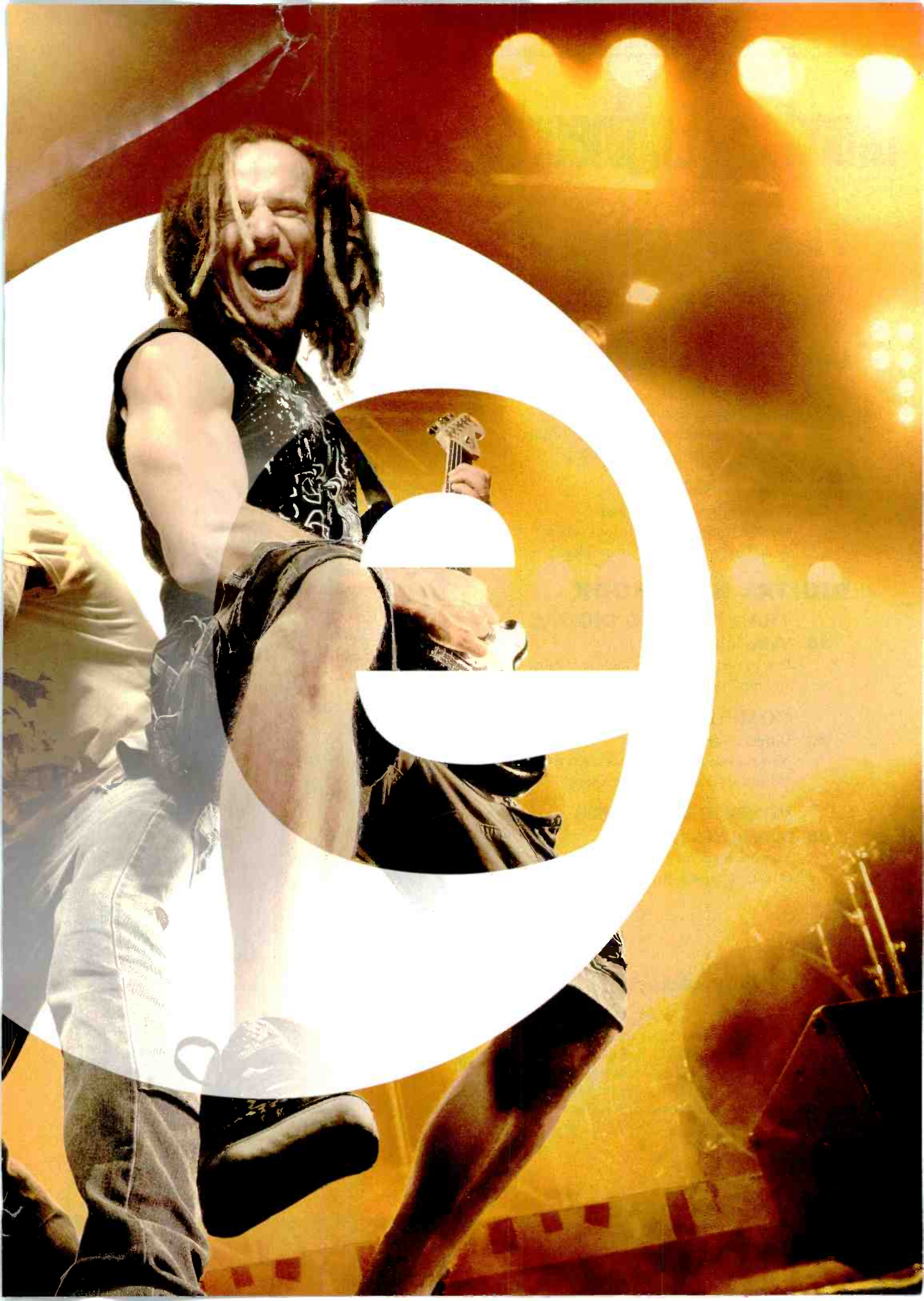

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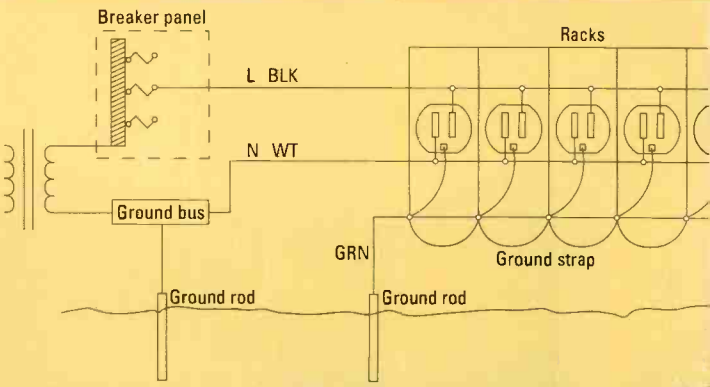
ON THE COVER:
Using MPEG-2 and MPEG-4 creates a multiformat workflow. Cover concept by art director Robin Metheny.

MAY FREEZEFRAME QUESTION

Broadcast engineers perform tasks that seem easy on the outside, but may actually require knowledge they don't have. That may include the wiring of AC power systems. Even if a licensed electrician runs the power to a rack area, broadcast engineers regularly build out the power distribution panels inside the equipment racks. Sometimes, they make mistakes that can have shocking results.

Review the schematic to the right.
What mistake has this engineer made?

The answer is on page 8.



Blackmagicdesign

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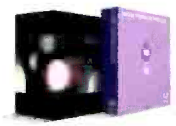

The new DeckLink HD Extreme is the world's most advanced capture card! With a huge range of video and audio connections plus a hardware down converter, and Dual Link 4:4:4/4:2:2 3 Gb/s SDI, advanced editing systems for Microsoft Windows™ and Apple Mac OS X™ are now even more affordable!

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MAY FREEZEFRAME ANSWER

As described in Glen Ballou's new book, "Handbook for Sound Engineers, Fourth Edition," NEC codes specify clearly how equipment cabinets and racks must be grounded. Per Article 250-95, safety grounding wire, which may be bare or insulated, must have a minimum size of #14 copper for a 15A or #12 copper for a 20A branch circuit. This grounding path must be bonded to the safety grounding system, not to building steel or a separate earth ground system. Separate earth grounds do not provide safety grounding.

In the drawing on page 6, note the racks are actually grounded to the earth, not to the breaker panel. If a short from the line to chassis ground occurs, the high impedance earth path may not provide sufficient conductivity to trip the safety breaker. This would expose anyone contacting the metal rack or device to potentially lethal currents. Just because you've connected everything to "ground" doesn't mean it's safely grounded.

The question on page 6 was adapted from Ballou's book, which is an excellent tutorial and reference guide on a wide variety of useful topics for any broadcast or sound engineer.

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Beware of the trolls

If you have purchased an ATSC-compliant television, hidden in that cost is between $20 and $30 in patent licensing fees, most going to Asian electronics companies and "patent trolls" — companies that buy up patents the first chance they get in efforts to corner the market. If your new set cost $1000, $30 doesn't sound like much. However, according to Myra Moore, president of research-consulting firm Digital Tech Consulting, about $11 to $12 of every set-top box sold goes to DTV patent holders. That's 39 percent of the total product cost!

TV set makers VIZIO and Westinghouse Digital have formed a consumer group called the Coalition United to Terminate Financial Abuses of the Television Transition,

or CUT FATT for short. The coalition claims that patent abuses by DTV manufacturers will result in American consumers being "overcharged more than $1 billion" on TV sets sold between 2008 and 2009.

Amos Snead, spokesman for CUT FATT, said, "We're not asking the FCC for price controls. What we're asking for is transparency." CUT FATT has asked the FCC to adopt a patent-pool system, much like those used in Europe and Asia that allow set makers to pay a flat rate of about $1 per set for the rights to all the necessary patents.

The FCC appears to be unprepared for any investigation into overcharges. In a 2008 congressional inquiry, former Chairman Kevin Martin said, "The FCC is shockingly ignorant of the technology the government forces Americans to buy." While the FCC had been notified of the possible overcharges, "... the FCC has not yet taken any action to investigate alleged abuses or impose appropriate remedies," he continued.

This issue of DTV technology rights ownership has always been cloudy. Rumors of who owned what and how much they would be paid were widely talked about, but without much clarity.

In a 2002 article by Keith Winstein, "MIT Getting Millions for Digital TV Deal," the author said, "MIT will receive $30 million from Dolby Laboratories, the result of Dolby's selection as the national standard for digital television audio in the U.S." He further noted the obvious self-interest of MIT professor of electrical engineering Jae S. Lim, saying Lim "... cast MIT's 1993 vote in favor of Dolby's technology in the television industry 'Grand Alliance' ... [Lim] is expected to receive more than $8 million from Dolby's payments to MIT, said Jack Turner, the associate director of the Technology Licensing Office."

Hmm. Would you vote for or against something that would pay you $8 million and your employer $30 million?

Now we get to a company called Rembrandt. This company (euphemistically a patent troll) holds a patent it purchased from AT&T (referred to as the 627 patent) that involves signal interleaving, a technology that is integral to the ATSC DTV system.

Rembrandt is now claiming in a series of patent infringement suits that it is entitled to 0.5 percent royalties on "all revenues derived from the use of the ATSC standard." Basically, this would be a 0.5 percent tax on all network and broadcaster DTV revenues. Companies currently being sued include networks ABC, CBS, FOX and NBC; large cable companies Adelphia, Cablevision, Charter and Comcast; and DTV set maker Sharp Electronics.

An excellent brief of the suit's history is available at the Web site of *Broadcast Engineering's* FCC Update writer, Harry Martin. (See *www.fhhlaw.com/memo_clients/2008/0408.pdf.*) Harry Cole, the article's writer, provides this perspective of the patent troll: "Rembrandt does not produce anything. It does not sell anything bought or processed, nor does it buy anything sold or processed, nor does it process anything sold, bought or processed, nor does it repair anything sold, bought or processed ... All the company does is speculate on patents, which it purchases on the secondary market in the hope that one such patent will hit it big."

Let's hope the DTV trolls meet our version of the biggest of the "Three Billy Goats Gruff" in court. Her name is Judge Judy, and she loves DTV. BE

Brad Dick

EDITORIAL DIRECTOR

Send comments to: editor@broadcastengineering.com

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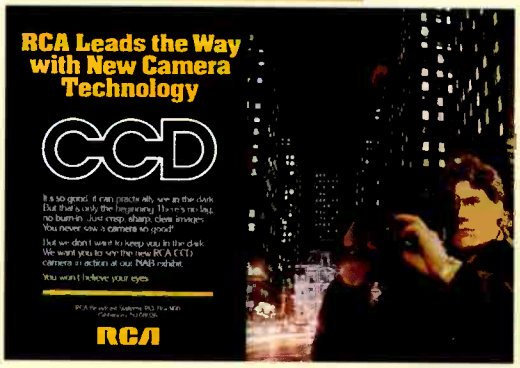
First camcorder and first CCD camera

Dear editor:

I enjoyed the two retrospectives on technology in the March issue — "The TV camera: Past, present and future" and "Tape machines." Remembering history cannot always be accurate. I am referring to the statement that John Luff made in the TV camera retrospective, relating to the first broadcast camcorder and first broadcast CCD camera.

Both firsts were by RCA. In 1981, RCA introduced the HCR-1 Hawkeye camcorder, a one-piece camera VTR package. The camera was built using an all-new 1/2in Saticon, manufactured by RCA. The VTR was built by Matashita, parent of Panasonic, using RCA's recording technology. The tape format was M type. The camera/VTR did not do well in the marketplace because of excessive bulk and a problematic tape format.



Sony's Betacam came out a couple of years later and put an end to the Hawkeye. The Hawkeye was also the first component-based recording system. Being YIQ was another reason for its failure.

Built on the upgraded Hawkeye II camera was the first broadcast CCD camera, the RCA CCD-1. It was introduced for sale at NAB in 1984. It used a frame transfer imager, which met the requirements of broadcasters.

The two cameras were the forerunners of today's ENG cameras.

Maurice Schechter
Chief engineer
DuArt Film & Video

IP addressing basics

Dear Brad Gilmer:

Thank you so much for writing the "IP addressing basics" article in the February 2009 issue. The article was well written and easy to understand. It is difficult for many of us with a broadcast and RF background to get a good grasp on this important aspect of this changing technology. Do you have any recommendations on further articles or books? Are you planning on writing more articles?

Again, thanks for the informative article.

Randall F Miller Jr.
Broadcast computer technician
Pennsylvania Public Television Network

Brad Gilmer responds:

Thank you very much for your comments regarding the article. I can recommend the following books, which will give you a thorough explanation of the topics I covered in the article and more:

- "Internet Core Protocols, The Definitive Guide" by Eric A. Hall
- "Routers and Routing Basics, CCNA 2 Companion Guide" by Rick McDonald and Wendell Odom

These two books are excellent sources of information on setting up networks.

Lip-sync solution

Dear Aldo Cugnini:

I just finished reading your "Managing lip sync" article in the March issue. In the last paragraph of your article, you state: "... but not all broadcasters and program distributors are willing or able to spend sufficient time or money in its solution, perhaps in part due to the difficulty of determining the actual effect on revenue."

Prior to DTV, I received 26 off-air analog signals at my home. Now, I receive one digital signal. So, I converted to Dish Network because I had no other choice. What I find amazing is that the satellite channels prepared for satellite delivery seem to have no lip-sync problems, but the broadcast signals converted for satellite delivery have huge lip-sync problems. It's not my desire to place blame because I have developed a perfect solution: I just switch channels or turn the TV off! Now, it stands to reason that if I'm not watching, I can't be exposed to broadcast station advertising. You tell me whether this will impact broadcast advertising revenue or not. Among the people I talk with, it's a bigger problem than the broadcast stations seem to be willing to admit, or accept.

Jerry Proctor

Test Your Knowledge!
See the Freezeframe question of the month on page 6.

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Vast distribution

Use simultaneous multiformat encoding for efficient content repurposing.

BY BRIAN STEVENSON

Distributing content to multiple viewing platforms is commonplace for almost all content rights owners in today's competitive and increasingly fragmented media environment. The expanding breadth of viewing devices is accompanied by divergence in the encoding formats and parameters required for optimal device compatibility. While traditional production and distribution platforms used a limited range of formats, little such consistency exists today. IPTV, Internet TV, broadcast, mobile phones and personal media players all have their own unique characteristics, and no one encoding format comprehensively serves them all. For any multiplatform distribution strategy, encoding to multiple formats, resolutions and bit rates is an unavoidable requirement. Factor in nondistribution formats for acquisition, production and archive, and the types of deliverables number in the dozens.

Just looking at one distribution platform, playback on a personal computer from the Web, leads to an array of format considerations. Compression formats common on the Web currently include VC-1 (the SMPTE standard related to Microsoft Windows Media), H.264 (also known as AVC, or MPEG-4 Part 10), On2 VP6 and Apple QuickTime. Technologies for building Web-viewing environments vary in which compression formats they support. Adobe Flash technologies support H.264 and On2 VP6, while Microsoft Silverlight supports VC-1 and H.264.

To reach the broadest audience possible across varying connection speeds and operating systems — and especially if syndicating the content — you may choose to offer Web-based content in multiple resolutions, bit rates and compression formats. Even if only a single format is used, recent enhancements in Web video delivery to dynamically adapt to variations in consumer bandwidth are dependent on the creation of streams in multiple bit rates and resolutions concurrently. You will likely also want to create a full-resolution archive copy of the content for future transcoding into additional new deliverable formats as required.

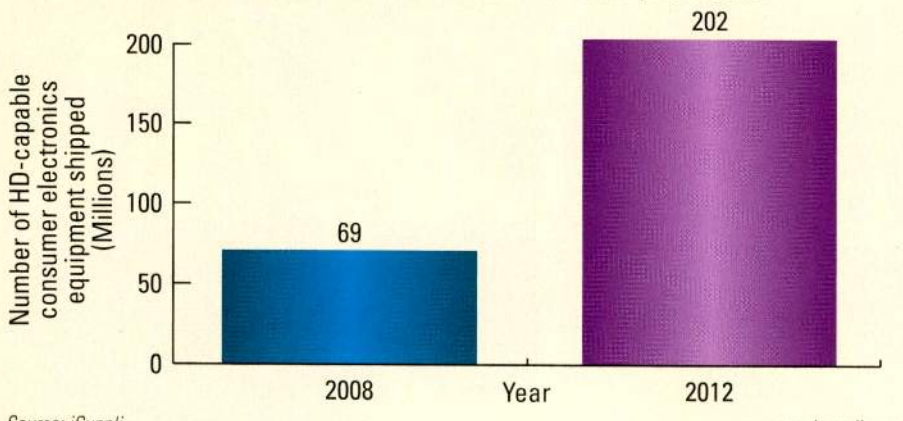
Efficiently repurposing content for these varying platforms and devices presents new challenges, and the encoding systems used to create these deliverables are critical points in the process. The quality, performance and efficiency of the encoders and surrounding workflow have a significant impact on productivity, costs, the viewer experience and the timely availability of content. It is no longer enough for an encoding system to be able to output just a full-resolution and proxy version. Efficient multiplatform output requires encoding solutions that optimally support multiple formats and target devices. Even better are solutions that can create these deliverables simultaneously in real time, where the total encoding time is the same as the duration of the content. Faster-than-real-time encoding can also be achieved when encoding from a nonlive source, such as existing mezzanine media files.

In this article, encoding primarily refers to creating file-based deliverables. The inputs to the encoder could be live sources (such as a video router), decks or existing media files, while the deliverables could be used for subsequent on-demand viewing or download on multiple devices, Blu-ray or DVD authoring, archive, or a plethora of other purposes. Most of the same concepts also apply to encoding for real-time distribution (such as broadcast or live streaming), although the breadth of compression and container formats used in file-based production and distribution far exceeds that used for live delivery.

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

Shipments of consumer HD electronics to rise

A threefold increase from 2008 to 2012 has been predicted.



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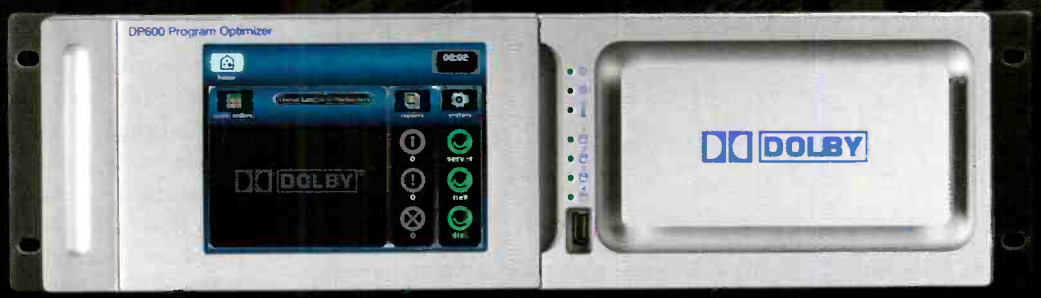

Intelligence is relative. Except when it comes to broadcast tools. Consider the **Dolby® DP600 Program Optimizer**, a flexible file-based platform for cable, satellite, IPTV, terrestrial TV, and postproduction environments. With capabilities to rival a full rack's worth of gear, the DP600 can encode, decode, convert, and transcode between a multitude of broadcast audio formats, and supports the next-generation technologies Dolby Digital Plus and Dolby Pulse. Add automated loudness analysis and correction with Dialogue Intelligence™, adaptive upmixing, and other innovations, and it's easy to see why the Dolby DP600 is, quite simply, in a class by itself.

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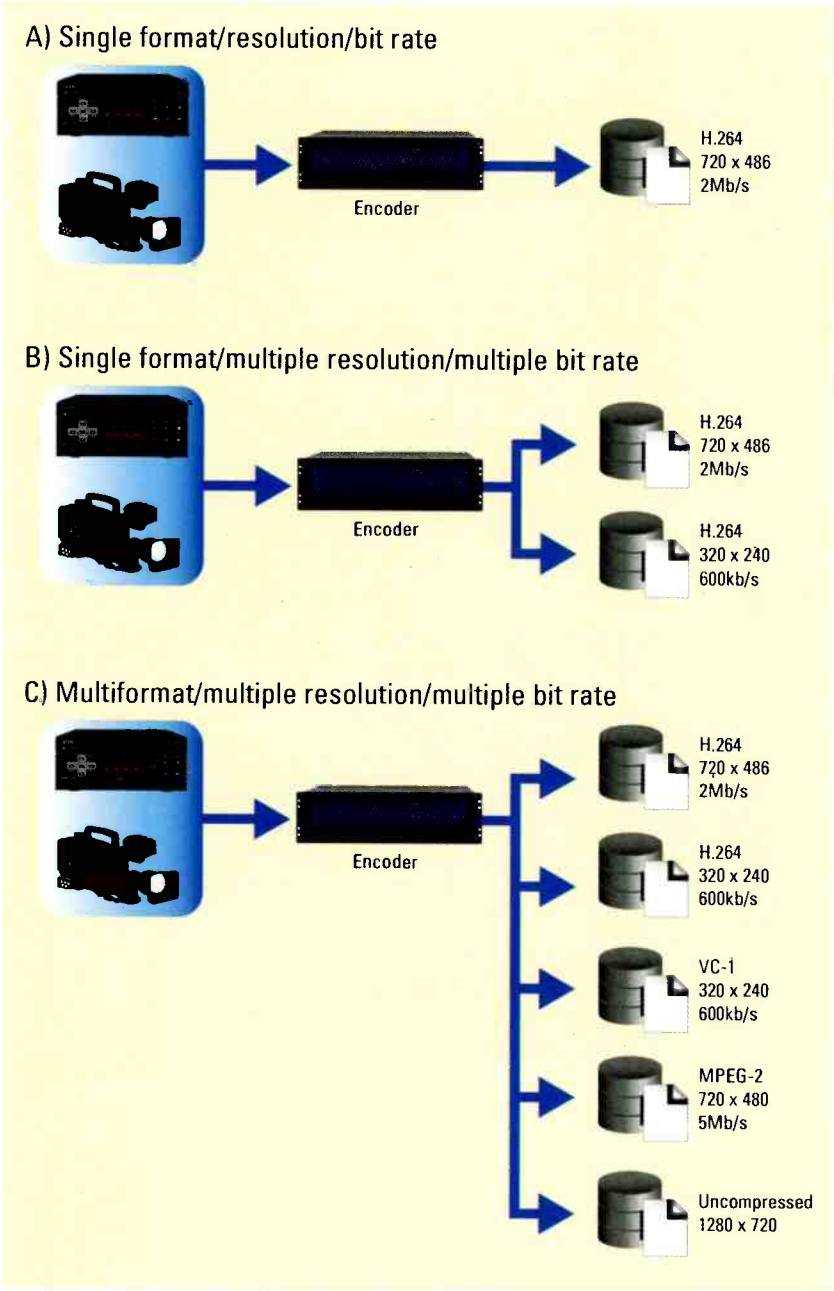


Figure 1. Encoders can differ significantly in their real-time abilities when capturing and encoding from a live source or tape. A) An example of an encoder that can output only a single compression format, resolution and bit rate at a time. B) An example of an encoder that can output multiple resolutions and bit rates concurrently but only in a single format. C) An example of an encoder that can output to multiple formats and output parameters simultaneously in real time.

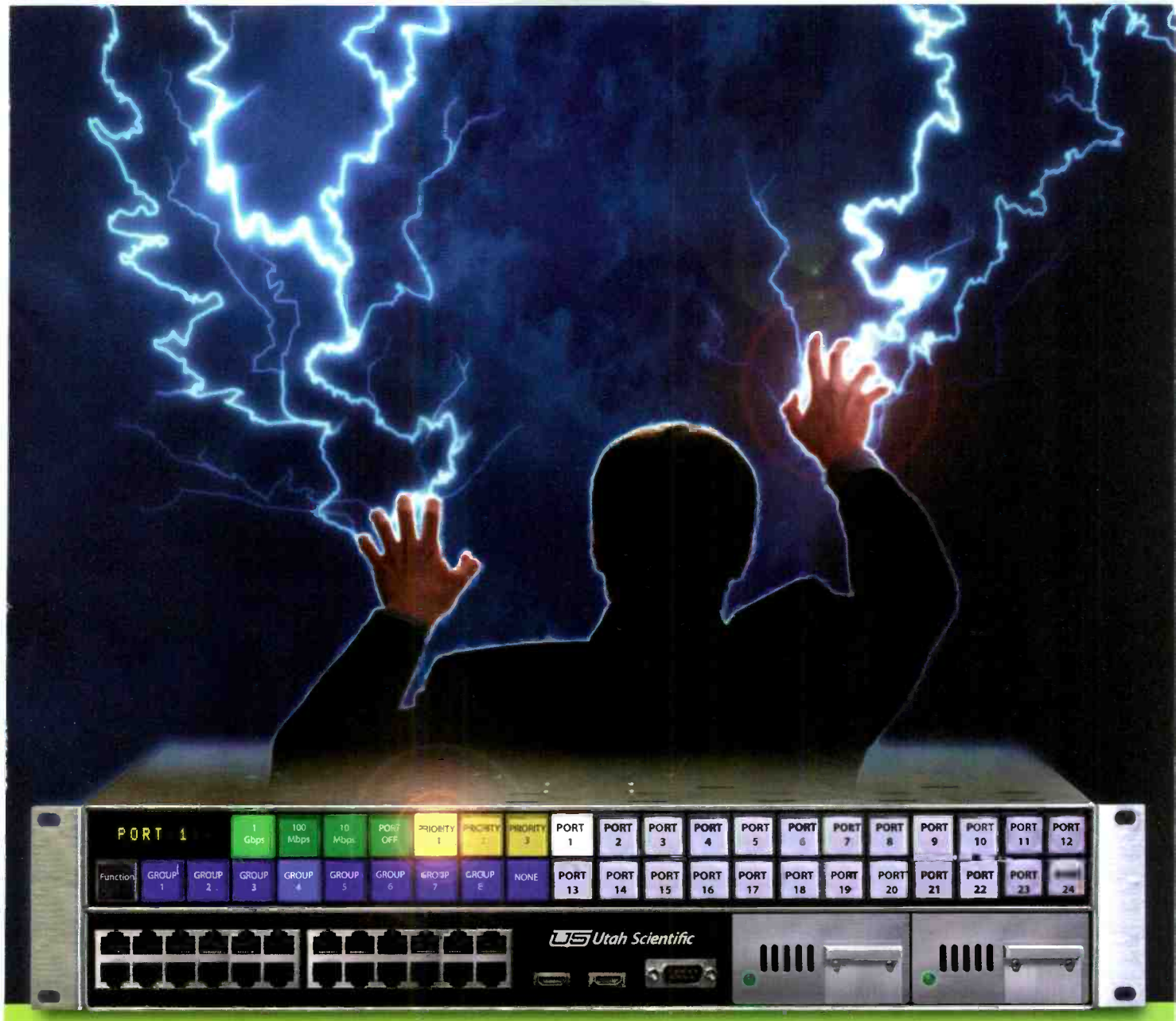
Real-time, multiformat efficiency

Most file-to-file transcoding solutions can create multiple output formats from a single source. However, when capturing and encoding from a live source or tape in real time, solutions differ considerably. (See Figure 1.) Some output only a single compression format, resolution and bit rate at a time. Others can output multiple resolutions and bit rates concurrently but only in a single format, while the most flexible solutions can capture and encode to multiple formats and output parameters simultaneously in real time.

This latter class of encoding solution offers numerous benefits:

- *Less equipment.* By eliminating the need for separate encoders for each format, multiformat systems reduce space and power requirements while lowering equipment acquisition costs.
- *Reduced operational complexity.* While separate encoders for each format could be deployed in parallel to achieve simultaneous deliverables, doing so adds to the complexity of the workflow. Automation requirements would increase to ensure that all encoding is perfectly synchronized, while any change to the combinations of desired deliverables may involve rerouting of signals between the encoders and reconfiguration of the settings on multiple systems.
- *Faster turnaround.* Systems that support multiple formats, but not concurrently, can still reduce overall equipment requirements, but require multiple passes from a repeatable source (such as tape) to achieve the desired deliverables. By performing multiformat encodes in a single real-time pass, significant time is saved.
- *Less wear on supporting equipment.* If the source content is tape-based, each additional ingest and encoding pass incurs another complete playout of the tape content, causing additional wear on the deck.
- *Flexible redeployment.* A broadcaster's encoding needs today may be very different in the not-so-distant future, and multiformat systems can easily be redeployed and repurposed. Significant changes in preferred deliverable formats (for example, from On2 VP6 to H.264 on a Web site) may also be transitioned by offering both formats in parallel on an interim basis to reduce viewer alienation.

While all of these benefits are advantageous operationally to the content provider performing the encoding, the speed of turnaround is particularly noteworthy, as timely availability of content is critical to audience acquisition and retention. Timeliness is particularly significant with news and sports content, but even extends to longer-form content such as episodic series.



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Hardware and software

For an encoder to ingest content from a live or tape-based source, it must have at least a basic hardware component to interface to analog or SDI sources. But, precompression image processing and the actual compression itself may be performed in hardware or software.

Systems relying solely on hardware compression tend to be limited in the breadth of supported encoding formats. Even where the hardware supports multiple formats, it may only be able to do one at any given time. Furthermore, while compression formats such as MPEG-2 are relatively mature, newer formats such as H.264 are still evolving, and new formats continue to emerge. While most hardware-centric encoders are firmware-upgradeable with certain extensions of existing formats, more dramatic extensions or completely new formats may require new hardware. As such, these hardware-centric encoders are not well-suited to multiplatform, multiformat applications, but may be appropriate for usages targeting a single platform (such as a live satellite channel).

Systems that combine hardware and software in a common computing platform offer greater flexibility in the breadth and upgradability of compression and container formats, as enhancements and extensions can be applied through software updates. Beyond the formats themselves, software-centric encoders may also provide more flexibility and robustness in the features surrounding those formats. Examples include automated distribution of the resulting deliverables (such as publishing to a Web site, or file transfer to distribution partners), branding, and content protection or usage tracking through watermarking and DRM.

Optimal effectiveness in multiformat encoding can be achieved through a combination of hardware and software processing. (See Figure 2.) A key step in high-quality encoding is preprocessing — essentially grooming the source signal prior to compression. Deinterlacing, video noise reduction and filtering are all examples of preprocessing functions that can significantly improve the quality and bandwidth efficiency of the compressed output. Performing preprocessing in hardware enables the use of more sophisticated algorithms over what could be achieved in real time in software alone. Furthermore, even basic software preprocessing algorithms consume processing time on the host system's CPUs. By performing the preprocessing in hardware, more CPU processing power is left available for the actual compression, increasing the number of outputs that can be created simultaneously.

Further contributing to efficiency in a hardware/software system, preprocessing settings common to all target outputs need only be applied once, with the preprocessing shared as input to all output compression algorithms.

Given the virtually limitless combinations of compression format, container, encoding parameters and quality settings for each deliverable, and unlimited number of deliverables, it's possible to exceed the real-time capabilities of even the most robust encoder. While systems comprised of integrated hardware and software may not have predetermined limits on the number of concurrent encodes, the CPU horsepower of the system imposes a practical limit. The number of simultaneous outputs the system can handle will vary depending on the combination of deliverables and the specifications of each. Advanced H.264 encoding, for example, is more computationally intensive than basic MPEG-2 encoding, so more outputs could be created alongside a full-resolution MPEG-2 than H.264.

When the desired combination can't be achieved in real time, workflow features of the encoder can still reduce the operational complexity and manual effort required. Automated features to ingest to an uncompressed or lossless intermediate and subsequently transcode it into the desired deliverables enable the desired results to be obtained without manual intervention. At the same time, it allows you to maintain the benefits of reduced equipment overhead, elimination of multiple playout passes and minimal operational effort. BE

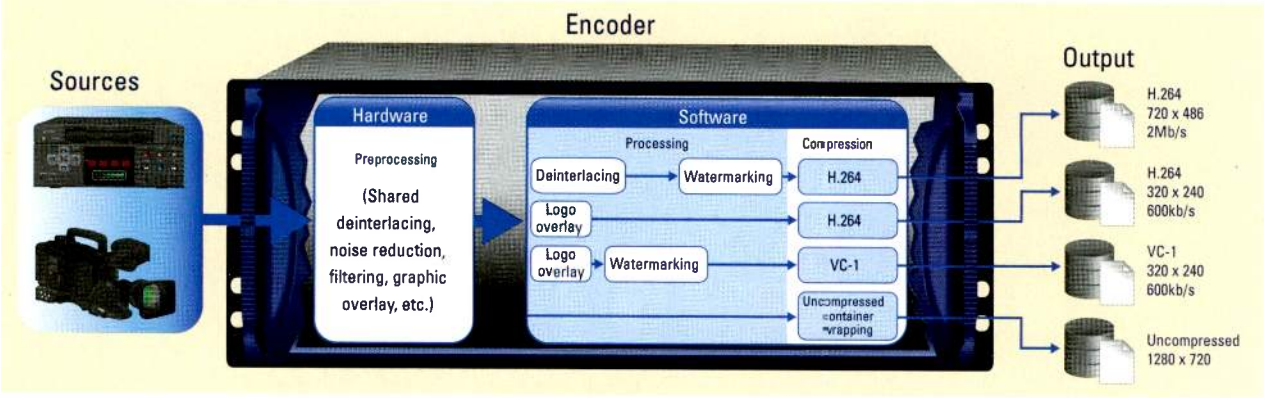
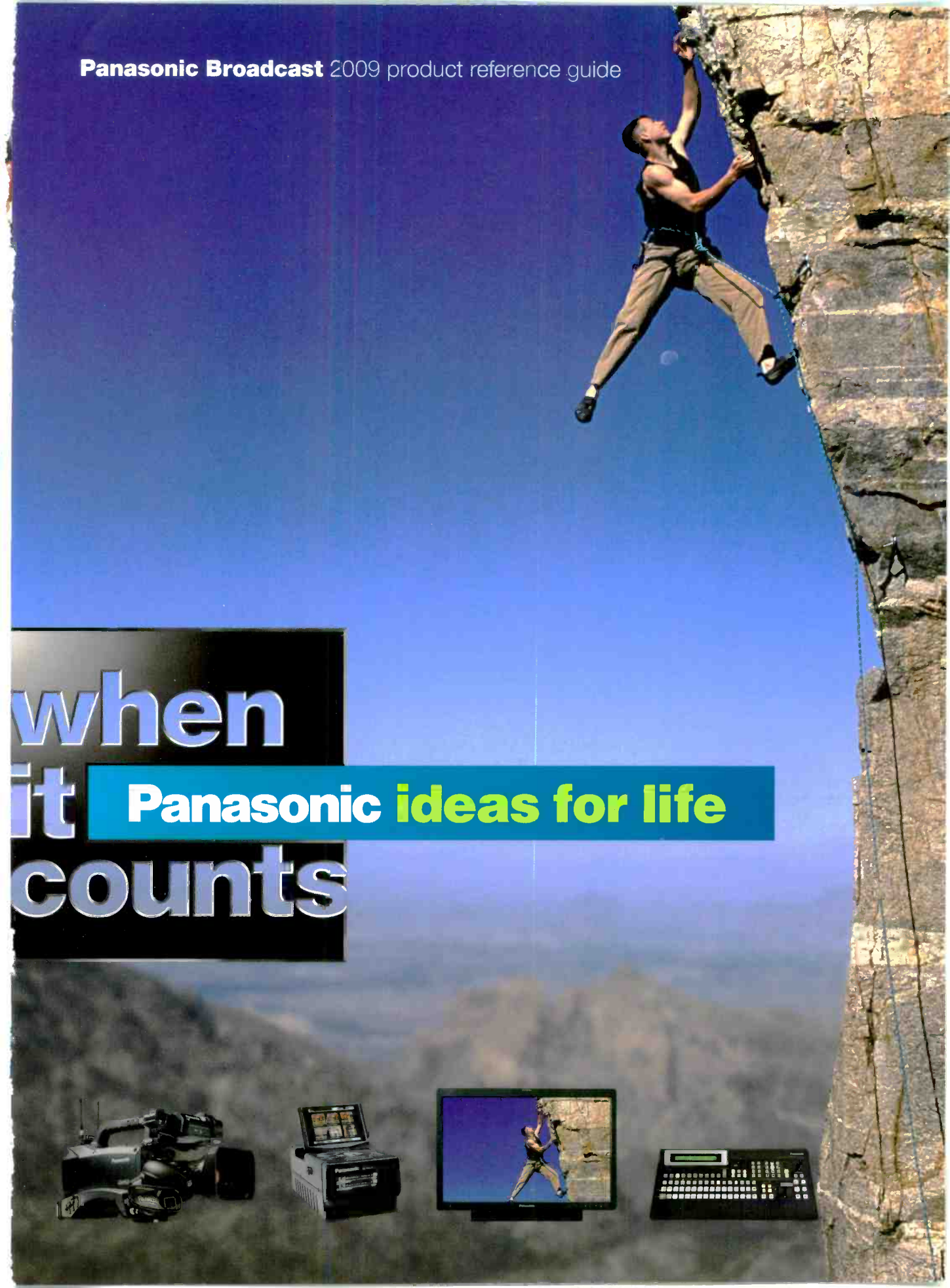


Figure 2. Combination hardware/software encoders provide the flexibility of software — enabling different formats and video processing for each of multiple concurrent real-time outputs — with the quality and performance advantages of hardware for shared preprocessing.

Brian Stevenson is the director of product management for Digital Rapids.

Panasonic Broadcast 2009 product reference guide



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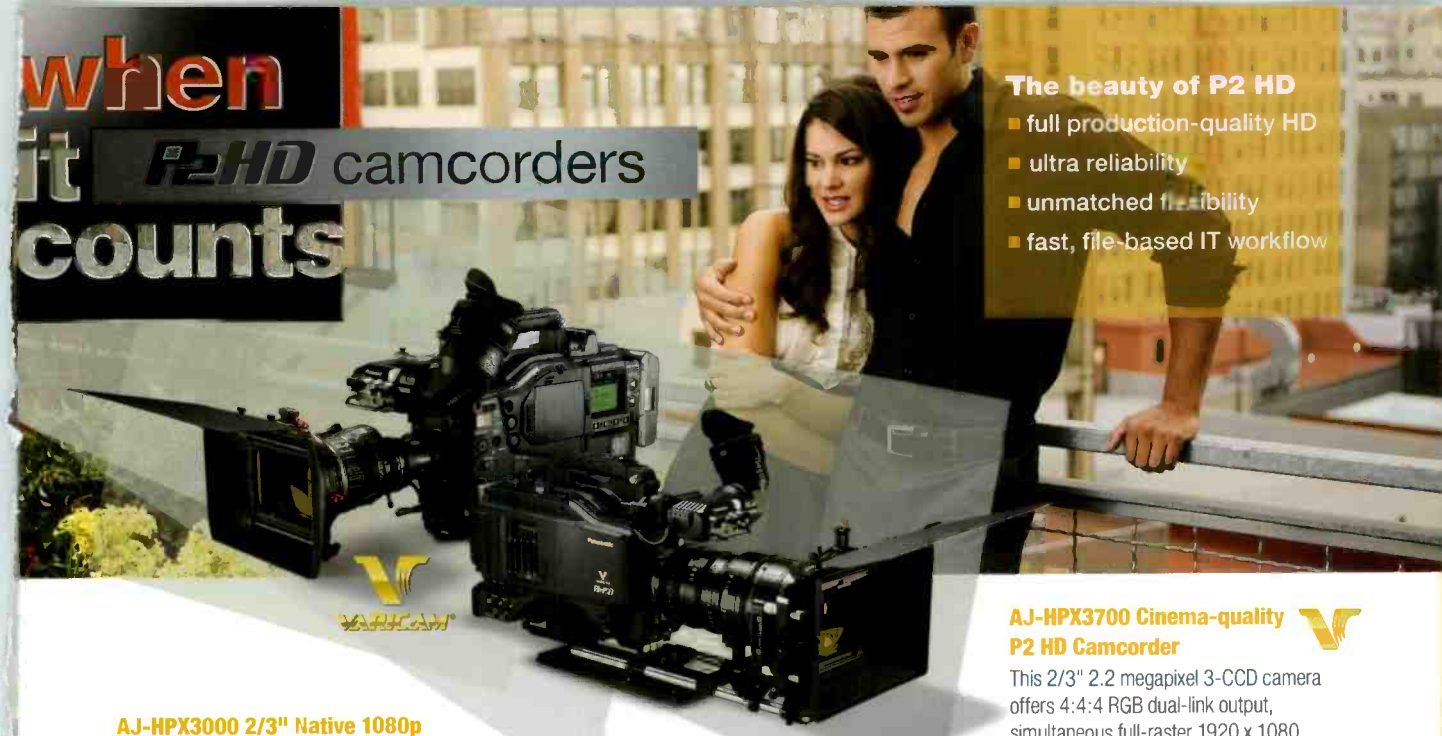
when it counts

P2HD camcorders



The beauty of P2 HD

- full production-quality HD
- ultra reliability
- unmatched flexibility
- fast, file-based IT workflow

AJ-HPX3700 Cinema-quality P2 HD Camcorder

This 2/3" 2.2 megapixel 3-CCD camera offers 4:4:4 RGB dual-link output, simultaneous full-raster 1920 x 1080 resolution recording with 4:2:2 10-bit sampling in AVC-Intra 100, and Film-Rec 600% to deliver high dynamic range and pristine images for movie and TV productions.

AJ-HPX2700 Solid-state P2 HD Camcorder

With high sensitivity and ultimate flexibility, variable frame rates (1-60fps), Film-Rec Gamma, three 2/3" native HD resolution CCDs and 14-bit A/D, the HPX2700 captures 720p images in full-raster 1280 x 720 resolution with 4:2:2 10-bit sampling in AVC-Intra 100. It is 1080p switchable and also supports DVCPRO HD and AVC-Intra 50.

AJ-HPX3000 2/3" Native 1080p Camcorder

A top-of-the-line camera for 1080 news and commercial production, the HPX3000 features three advanced 2/3" 2.2-million pixel CCDs to acquire full-raster 1920 x 1080 resolution, 4:2:2 10-bit images using advanced AVC-Intra or popular DVCPRO HD and DVCPRO50.

AJ-HPX2000 Ultra-versatile 2/3" Camcorder

A full HD native 1280 x 720 resolution camera with extraordinary sensitivity and three 2/3" imagers, the HPX2000 has a wide following in news and sports production. It offers exceptional quality video in more than 30 HD/SD formats, including 1080i, 720p, 480p, 480i and 576i. Five P2 slots allow extended recording times.

AG-HPX500 Affordable 2/3" Camcorder

Offering a unique combination of high-end features never available in a full 2/3" camcorder in this price range, the HPX500 records in more than 32 HD/SD formats and offers variable frame rates and four independent audio channels.

AG-HPX170 Fully Solid-state Handheld Camcorder

A 4-pound, fully solid-state, full production-quality HD/SD format handheld with independent frame recording. The HPX170 offers DVCPRO/50/ HD compatibility, a wide-angle 13X Leica Dicomar zoom lens, two P2 slots, HD-SDI and IEEE 1394 I/O, Waveform Monitor/Vectorscope, a time/date stamp function, and 20 variable frame rates.

AG-HVX200A 1/3" Handheld HD/SD Camcorder

A legend in the industry, this 5.5-pound unit offers a DV tape drive and two P2 slots so you can move easily from SD to HD and tape-to-file-based recording. This handheld features 1080i/p, 720p and 4:2:2 independent-frame recording and a progressive 3-CCD imager with biaxial pixel shift technology for stunning image quality.

new

AG-HPX300 1/3" P2 HD Camcorder with AVC-Intra

The 1/3" AG-HPX300 is the world's first highly affordable 10-bit 4:2:2 camcorder. With a 17X interchangeable CAC lens included and 2.2 megapixel 3MOS imagers, it records full-resolution 1080 and 720 HD, as well as SD content, in exceptional quality AVC-Intra, DVCPRO HD, DVCPRO50, DVCPRO and DV.

For more information, visit **www.panasonic.com/p2hd**

when it AVCCAM products counts

The AVCCAM advantage

- solid-state reliability and workflow
- longer record times
- easy HD playback in consumer devices
- recording on low-cost SD memory cards

AG-HMC150 Handheld 1/3" 3-CCD Camcorder

A professional-quality workhorse, the HMC150 records full 1920 x 1080 and 1280 x 720 images using three 1/3" CCD imagers. It features a 13X 28mm-to-368mm Leica Dicomar zoom lens; 60i, 24p and 30p recording in a full range of HD formats; and the exclusive PH mode for image quality beyond that offered by older HDV technology.

AG-HMC70 Shoulder-mount 3-CCD Camcorder

This lightweight, stable-shooting camera records 1080i onto standard SD/SDHC cards to ensure a fast, tapeless workflow. The HMC70 offers a 12X Leica Dicomar wide-angle lens; image stabilization; and A/V connections, including XLR inputs and BNC outputs.

AG-HMR10 AVCCAM Field Recorder/Player

This portable, handheld unit records stunning, full 1080 and 720 resolution images, including the highest quality PH mode (max. 24 Mbps). The HD-SDI input/output makes it ideal as a bridge or backup recorder for any HD-SDI-enabled camera. This battery-powered recorder/player features a 3.5" color LCD monitor for easy viewing of content and thumbnail images. It also offers an HDMI output. Available Fall 2009.

AG-HCK10 Compact Multi-purpose POV Camera Head

This ultra-small camera head, which teams exclusively with the AG-HMR10 recorder, features three 1/4.1" native HD resolution 3MOS imagers and connectivity up to 10 meters. It's ideal for production, sports coaching, healthcare, law enforcement, inspection, remote vehicle operation and more. Iris, focus, zoom control and power are supplied from the HMR10. Available Fall 2009.

new

AG-HMC40 Handheld 1/4.1" 3MOS Camcorder

A highly versatile and affordable handheld*, this less than 3-pound unit can record both HD video, as well as 10.6 megapixel still images. Using full 1920 x 1080 resolution, this 3MOS imager unit can record for up to 12 hours on a single 32 GB SD card. It records in 1080 in 24p, 30p and 60i and in 720 in 24p, 30p and 60p. Other features include a time/date stamp, focus assist, HDMI output and user-assignable focus ring. Available August 2009.

An ultra-mobile HD camera and recorder combo!

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*Shown with optional mic and XLR adapter.

when it counts

camera systems

AK-HC3500 1080i HD Studio Camera
This native 1080i studio camera system is ideal for studio/direct-to-air facilities and EFP. Incorporating 2/3" 2.2 megapixel IT 3-CCDs, a 38-bit DSP and a 14-bit A/D converter, the HC3500 delivers exceptional HD images in 1080/59.94i and 1080/50i.

AK-HC931B Multi-format HD/SD Studio Camera
Versatile studio/shoulder-mount EFP camera system features 2/3" 3-CCDs to deliver 1-million-pixel (1280 x 720) progressive scan resolution in both 1080i and 720p (switchable) and 480i SD (optional). The HC931B offers 38-bit internal processing, high sensitivity (F10 at 2000 lux) and a low smear of -130dB.

AK-HC1800N 2/3" 2.2M 1080i Multi-purpose 3-CCD Camera
The HC1800N delivers the highest-quality HD video possible in a compact, multi-purpose camera. Packed with high-end image controls and features, it offers Dynamic Range Stretch, 12-axis color matrix adjustment, extraordinary low light sensitivity (F10 at 2000 lux) and clarity (60dB signal-to-noise ratio; -130dB smear level).

AK-HC1500G 2/3" 1080i/720p HD Multi-purpose 3-CCD Camera
This versatile 3.3-pound camera captures exceptional video in 1080 at 24p/25p/30p/50i/59.94i and 60i and 720 at 50p/59.94p and 60p. It offers Dynamic Range Stretch, variable frame rates (4fps to 60fps) and a Cine-Gamma curve to produce film-like images.

AW-HE100 Integrated HD/SD Camera with Ultra-smooth Pan/Tilt/Zoom
All-in-one 1/3" 3-CCD camera with high-performance Real-Servo pan/tilt delivers smooth, fast, precise, quiet operation. A fast f1.6 zoom lens, 19-bit video processing DSP (digital signal processor) and 14-bit A/D converter enable the HE100 to produce exceptional HD and SD video in a wide range of lighting conditions. The HE100's elegant, rugged, ergonomic design; IR and high-speed RS-422; automated operation; and wide range of camera control adjustments make it easy to integrate and a pleasure to use.

new

AW-HE870 Affordable, 2/3" Multi-purpose HD/SD Camera
This cost-effective, high-performance, 2/3" HD/SD convertible camera supports 1080i/720p/480i image acquisition in a wide range of lighting conditions. Offers a high sensitivity of F10 at 2000 lux. The HE870 is compatible with most 2/3" HD/SD motor drive zoom lenses, all current Panasonic pan/tilts and controllers, and most third-party systems.

Super-smooth operation from an array of angles!

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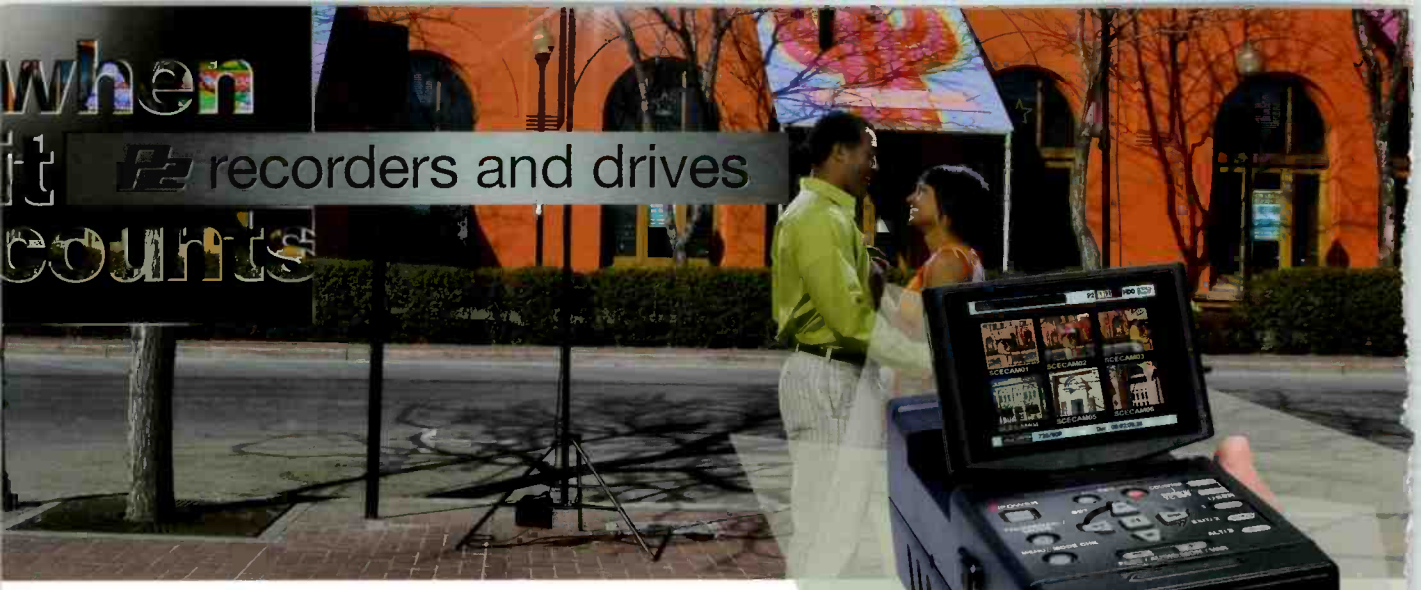

AJ-HPM110 P2 Mobile Recorder/Player

This 14-pound unit features six P2 card slots for unmatched recording times in DVCPRO HD/50/25 and DV format and provides full-raster 1920 x 1080 resolution, 10-bit, 4:2:2 AVC-Intra as an option. Its HD-SDI I/O (including 23.98psf and 24psf) allows it to be teamed with any HD-SDI tape or solid-state camera. Ideal for video village applications.

AJ-HRW10 Rapid Writer P2 Workflow Tool

This portable workflow tool dramatically simplifies access to P2 content and incorporates RAID 1 mirroring support. With slots for two 3.5" removable hard disk drives and a built-in AJ-PCD35, it can automatically transfer data from up to five P2 cards. Features a 5" LCD touch-screen with simple controls to preview content on disk or P2 cards.

AJ-PCD35 P2 Drive with PCI Express Interface

This five-slot P2 drive with a PCI Express interface (PCI-e) provides transfer speeds of up to 1.2 Gbps from as many as five "A" Series P2 cards simultaneously, and up to 800 Mbps off a single "A" Series P2 card to PCI Express-equipped desktop computers or ExpressCard-equipped notebook computers with a third-party adapter. Works with all P2 cards.

AJ-HPG10 P2 Gear Viewer/Player/Recorder

The lightweight, battery-operated P2 Gear provides viewing, backup recording and file management of P2 content. With two P2 card slots and a 3.5" LCD monitor, it offers immediate playing and viewing in multiple formats (1080i, 720p, 576i, 480i). The heavy-duty, shock-resistant unit is equipped with speakers and IEEE 1394, USB 2.0 and HD-SDI input/outputs.

AJ-PCD20P Five-slot P2 Drive

This five-slot internal/external drive saves time by providing easy access to and high-speed transfer of P2 content to a desktop or laptop computer. It offers IEEE1394b and USB 2.0 interfaces and Windows 2000/XP and Mac OS X support.

AG-HPG20 P2 Portable Recorder with AVC-Intra Recording

The affordable, fully solid-state P2 Portable recorder/player brings easy playback, recording and file copying of 10-bit, 4:2:2 content to the field or studio. Equipped with two P2 card slots and a 3.5" LCD monitor, the 2.5-pound unit lets you view content immediately in AVC-Intra or DVCPRO HD or in SD in DVCPRO50, DVCPRO and DV.

new

New, Economy "E" Series P2 Cards

Panasonic's new, economy 64GB, 32GB and 16GB "E" Series P2 cards offer a blazing-fast 1.2Gbps transfer speed and a significantly lower purchase price (less than $1,000 for the 64GB card (model AJ-P2E064XG)). You can expect approximately five years of usage from a rugged "E" Series P2 card.

For more information, visit **www.panasonic.com/p2hd**

when it counts

production-tough LCD monitors

BT-LH1760 17" 120Hz LCD Production Monitor

This 17" multi-format monitor features 120Hz double-speed drive – twice that of current LCD monitors – enabling it to handle fast-motion content exceptionally well and reduce image blur. The monitor offers a built-in Waveform Monitor/Vectorscope, and its advanced In-Plane Switching panel delivers exceptional black levels and stunning picture quality.

BT-LH1710 17.1" Multi-format Production Monitor

This versatile LCD monitor provides exceptional HD-quality images with best-in-class features, including built-in Waveform Monitor/Vectorscope, embedded audio and DVI-D input. The affordable LH1710 showcases the latest 1280 x 768 IPS panel, which provides stunning contrast and outstanding black levels and 10-bit image processing with color space settings of SMPTE, EBU, ITU-R BT.709.

BT-LH900A 8.4" Multi-format Color Production Monitor/Viewfinder

This slim, rugged, 4-pound, DC-powered LCD monitor greatly simplifies HD and SD monitoring on location or on a sound stage. It is equipped with two SDI inputs automatically detecting HD or SD, built-In Waveform Monitor, focus assist functions and Video/Cine-Gamma Conversion Table.

BT-LH80WU 7.9" 16:9 Color Viewfinder/Monitor

This versatile, wide-screen 3.3-pound HD/SD LCD monitor features high-resolution playback and advanced focus assist function for critical focusing in HD. Benefits include low power consumption, pixel-to-pixel mapping, built-in Waveform Monitoring and SDI/HD.

BT-LH2550 25.5" LCD Monitor with Extended Color Gamut

With a full 1920 x 1200-pixel In-Plane Switching panel, this production monitor features an expanded color gamut, exceeding the NTSC standard, to ensure vivid, true-to-life color for critical monitoring at a cost far less than premium-priced reference monitors. The LH2550 offers six color space settings – SMPTE, EBU, ITU-R BT.709, Adobe 2.2, Adobe 1.8 and D-Cinema – to expand the range of colors that can be viewed onscreen for applications ranging from broadcast and print to digital graphics and postproduction.

Panasonic production-tough monitors are perfect for the field or studio.

For more information, visit **www.panasonic.com/productiontough**

Photo of "In the Kitchen" with Alissa Bigelow (www.rustickitchen.biz)

The AV-HS400A and upcoming AV-HS450 offer powerful MultiViewers as a standard feature.

AV-HS450 16-input Multi-format HD/SD Switcher

This powerful, multi-format, expandable switcher offers 16 SD/HD-SDI inputs (standard) with dual-screen MultiViewer output, multiple keyers, aux busses, PIP, and 3D effects levels. It also offers built-in frame-synchronizers, four SDI outputs and two DVI outputs standard. The HS450 supports 1080/59.94i, 1080/24Psf, 1080/23.98Psf, 720/59.94p in HD and 480/59.94i in SD. Available Fall 2009.

AV-HS400A Live HD/SD Switcher with Enhanced MultiViewer

This versatile, compact 4- to 8-input switcher offers built-in 10-window MultiViewer preview, full 10-bit HD processing, optional up- and down-conversion and scaling I/O boards, 3D digital effects for video and keyer, camera control, frame synchronizers, aux bus, and powerful graphics/keyer functions.

AV-HS300G Compact Multi-format HD/SD Switcher

This portable, high-performance switcher features six inputs (five HD/SD-SDI and one DVI/RGB) and three outputs (three HD/SD-SDI), RS-422 control, ethernet connectivity, 12-volt power, and a built-in, 10-bit, 6-channel frame synchronizer. An optional 5-input HD-component board (model AV-HSB300) is available.

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Diversity rules proposed

The FCC is considering nondiscrimination provisions for all media advertising.

BY HARRY C. MARTIN

The Minority Media and Telecommunications Council (MMTC), a minority rights organization in the media field, has asked the FCC to impose on cable, satellite and telecommunications companies delivering multichannel programming the same prohibitions against discriminatory advertising practices as the commission has imposed on broadcasters.

Last year, the FCC adopted several diversity initiatives designed to ban race- and gender-based discriminatory practices. One of the new rules prohibits advertising contracts that contain "no urban/no Spanish" clauses through which stations and the advertiser agree not to air the advertiser's ads on stations with formats aimed at certain racial or ethnic audiences.

Last year's rules require broadcasters to certify in their license renewal applications that their advertising contracts do not discriminate on the basis of race or gender and that such contracts contain nondiscrimination clauses. Because the renewal certifications cover broadcasters' previous license terms, stations should already have taken steps to make sure that they will be able to properly certify.

The MMTC has proposed that those same prohibitions be extended to cable, satellite and telecom video systems. According to the group, the FCC should assure "platform neutrality" and "regulatory parity" between and among the various program delivery vehicles. Adopting a uniform approach across platforms may have a jurisdictional basis. Cable and satellite operators all use spectrum licensed by the commission, even if it involves — in the case of cable — merely auxiliary uses.

The proposal thus puts the commission in an uncomfortable position. As is clear from the adoption of the diversity initiatives last year, the commission is inclined to take aggressive steps to weed out discriminatory conduct (even though the precise nature and extent of such conduct has not yet been made a matter of record). Ordinarily, the FCC would be expected to support the MMTC's proposal. But the notion of "platform neutrality" is contrary to the commission's historic regulatory approach, which favors different formulas for different services. It is thus difficult to imagine the FCC embracing it. Moreover, the cable, satellite and telecom operators that would be subject to the proposed regulation would likely resist it strongly. While they may not object in principle to antidiscrimination initiatives, they certainly would object to the potentially broad spectrum of regulatory and paperwork burdens that might flow from "platform neutrality."

The FCC is under no obligation to act on the MMTC's proposal. However, the idea of promoting diversity and nondiscrimination is likely to appeal to the new FCC administration. The proposal is certainly one to watch.

Tower construction subject to agreement

The FCC recently castigated a broadcaster for not taking into account the requirements of the National Programmatic Agreement (NPA) when it filed an application for authority to construct a new tower. Under the NPA, an applicant must be prepared to demonstrate that it has considered endangered or threatened species, historic properties (by filing a Form 620 with the state historic preservation office) and the impact of construction on Indian tribal areas. NPA issues do not usually come up unless an application is challenged, but meeting NPA standards is nevertheless part of the application process. BE

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

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

Dateline

- June 1 is the deadline for TV stations in Michigan and Ohio to file their biennial ownership reports.
- June 1 is the deadline for TV stations and Class A stations in the following states and territories to place their 2009 EEO public file reports in their public files and post them on their Web sites: Arizona, Idaho, Maryland, Michigan, Nevada, New Mexico, Ohio, Utah, Virginia, Washington, D.C., West Virginia and Wyoming. LPTV stations originating programming in these states, which are not required to have public files, must post these reports on their Web sites and keep them in their station records.
- Also on June 1, TV stations (except Class A stations) in Michigan and Ohio, regardless of the number of persons employed at the station, must electronically file an EEO mid-term report using FCC Form 397.

planting the seed...

Outfitted with dual DM2000's, Record Plant Remote's "The Lounge" digital truck has been busy making waves at numerous live recording events across the country.

We caught up with Kooster McAllister, Owner and Chief Engineer of Record Plant Remote, to gather his thoughts on his Yamaha gear. Here's what he had to say...

"Coming from an analog background, having a lot of faders in front of me is comforting. All 96 tracks can be viewed and accessed on just two layers. Having the two consoles tied together make the DM2000's perform as one large format digital desk. It also gives me the added functionality of being able to call up effects, routing, auxes, etc from either center section making it easy to get around quickly.

In my line of work where you only have one chance to capture a live moment on stage, you must be able to count on your equipment not to fail. These consoles have withstood being bounced down the road from gig to gig and have always come through for me.

Most importantly, they sound great. Orchestral recordings I have done with them sound simply amazing."

— Kooster McAllister

www.yamahaca.com

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Video interfaces

Learn how to maximize interoperability and minimize errors.

BY ALDO CUGNINI

Professional digital interfaces continue to evolve in parallel with higher-resolution professional and consumer video formats. The once simple arena of analog connections now encompasses both compressed and uncompressed serial digital interfaces (SDI), with ever-higher transfer speeds. (See Figure 1.)

The SDI is a serial link originally standardized by SMPTE 259M. It is used to transmit uncompressed digital video over 75Ω coaxial cable and has a maximum data rate of 360Mb/s. HD-SDI is the second-generation version of SDI and allows transmission of HD (1080i and 720p) signals over the same 75Ω cables as SD-SDI. It handles rates up to 1.485Gb/s, and is defined by SMPTE 292M and ITU-R BT.656. Dual-link HD-SDI, defined by SMPTE 372M, uses two coaxial cables to provide up to 2.97Gb/s throughput while supporting up to 1080p resolution.

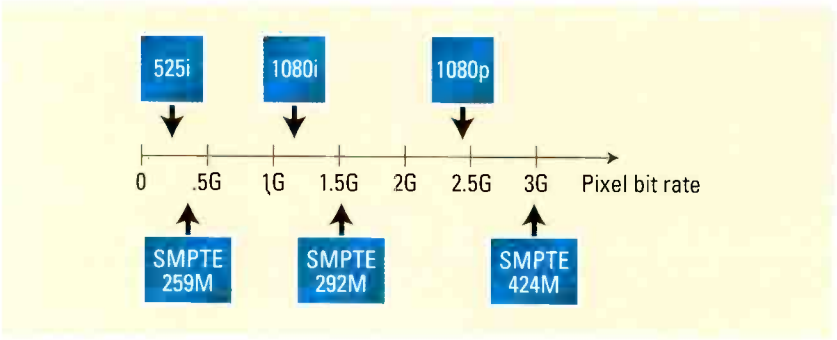


Figure 1. Serial digital standards are pushing ever-increasing bit rates.

3Gig-SDI is the latest version of SDI and allows transmission of 1080p60 HD signals (with a 4:2:2 sampling structure at 10 bits per sample) over a single 75Ω coax cable. Defined by SMPTE 424M, the single-link studio interface can reach a maximum bit rate of 2.97Gb/s and can be thought of as a multiplexed version of HD-SDI. A companion standard, SMPTE 425M, specifies the mapping of different video signals to the 3G physical interface, as well as the supported video formats, which are listed in Table 1 on page 34. A single, high bit rate video signal can be carried over the 3Gig-SDI link and is referred to by some users as Level A, for direct image format mapping. Alternatively, two lower bit rate signals could be carried, such as two SMPTE 292 HD-SDI, and referred to as Level B. However, these specific levels are not strictly a part of the standard.

This single-coaxial-cable solution, however, is currently limited to a cable length of about 90m, so SMPTE 435-3-2007 defines a 10.692Gb/s optical fiber interface for longer runs. Nonetheless, a demonstration in February at the Hollywood Post Alliance showed a 140m length of coax using 3Gig-SDI. This suggests the potential for new circuit designs to advance the state of the art.

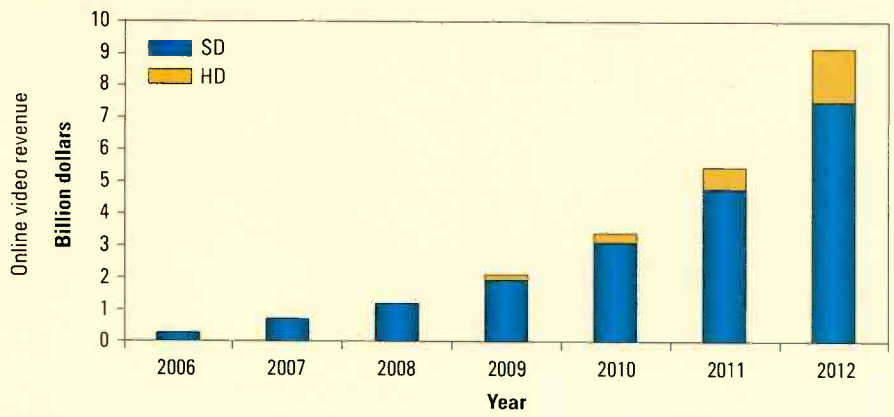
An alternative high-speed solution, proposed by the BBC, is to apply a mild, mezzanine compression to the HD-SDI signal, compressing a 1080p60 signal by a factor of about 2.5:1, so that it can be mapped into a legacy 1.5Gb/s HD-SDI infrastructure. This approach has led to the development of a related SMPTE standard, currently in the ballot process (at press time). The compression is essentially artifact-free, but it introduces a small delay of a few video lines and requires a simple encoder

FRAME GRAB

A look at tomorrow's technology

HD online video revenue to reach $2.2 billion by 2012

Revenue from HD online video will grow 189 percent in four years.



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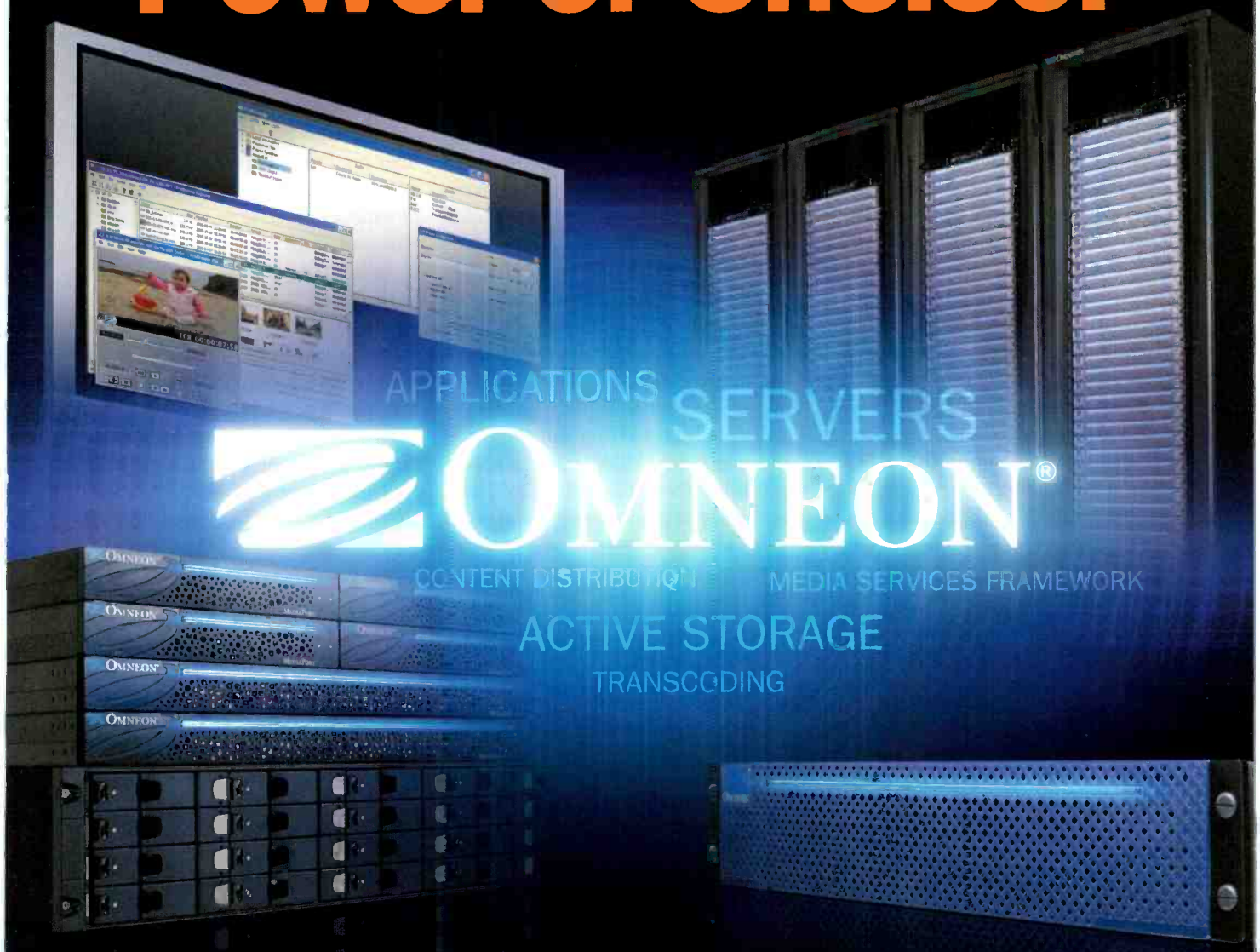

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and a decoder at each interface point.

An interesting feature of the proposed mezzanine codec is that the two most-significant bits of the 10-bit output can be used to carry a compatible interlaced version of the input picture. In this way, the compressed signal can be viewed as if it were standard 1080i video, making the content recognizable, although corrupted by noise. This makes it possible to monitor the signal (without a decoder) for the purposes of identification, and to provide a confidence check that the encoder is working. With full decoding, of course, the noise is not present.

Crossover applications

While the aforementioned interfaces are used almost exclusively in professional equipment, several interfaces that originated in consumer equipment are beginning to find their way into broadcast and production equipment. While these are not likely to replace SDI and similar interfaces, their growing popularity in display products are making them appear on an increasing number of professional displays.

IEEE 1394 (sometimes trademarked as i.Link or Firewire) was originally designed to support bit rates of up to 400Mb/s, but newer versions of the standard support speeds as high as 3.2Gb/s. Designed as a networked interface, IEEE 1394 is not limited to carrying video, and had been the interface of choice for DV-based cameras and prosumer HD equipment. IEEE 1394 now appears to be losing traction, however, to HDMI (High Definition Multimedia Interface) and USB.

HDMI, Digital Visual Interface (DVI) and DisplayPort are becoming de-facto display standards in consumer electronics and appear to be replacing IEEE 1394 for short-distance interconnects. HDMI1.3a supports a bandwidth of up to 10.2Gb/s, and optionally supports Deep Color with 30-bit, 36-bit — and 48-bit $Y'C_BC_R$, *xvYCC* and *sRGB* — signals. HDMI has gotten a strong foothold in the consumer market, and this is a big plus, considering the long lead times of CE companies investing in new technologies. And while HDMI runs are usually limited to about 15m, twisted-pair (Cat 5) can extend this to about 50m, and fiber can push this to over 330m.

DVI was developed to support high-resolution PC monitors. A single DVI link consists of four twisted pairs of wires, each carrying one red, green, blue and clock signal, supporting up to 24 bits per pixel. In addition, DVI is probably the only popular standard that optionally supports both analog and digital signals over the same connector. With a single DVI link, the largest resolution possible at 60Hz is 2.75 megapixels. Higher resolutions are possible by using a dual-DVI link (over a single cable), with alternate pixels transmitted on each

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Picture format	Signal format	Progressive frame rate	Interlaced field rate
1920 x 1080	10-bit 4:2:2 (Y'C'BC'R)	60, 59.94, 50	
	10-bit* 4:4:4 (R'G'B') 4:4:4:4 (R'G'B' + A) 4:4:4 (Y'C'BC'R) 4:4:4:4 (Y'C'BC'R + A)	30, 29.97, 25, 24, 23.98	60, 59.94, 50
	12-bit 4:4:4 (R'G'B') 4:4:4 (Y'C'BC'R) 4:2:2 (Y'C'BC'R)*		
1280 x 720	10-bit 4:4:4 (Y'C'BC'R) 4:4:4:4 (Y'C'BC'R + A) 4:4:4 (R'G'B') 4:4:4:4 (R'G'B' + A)	60, 59.94, 50, 30, 29.97, 25, 24, 23.98	
2048 x 1080 (D-Cinema)	12-bit 4:4:4 (X'Y'Z')*	24	

** Includes PsF (Progressive segmented Frame) format*

Table 1. 3Gig-SDI supported video formats, per SMPTE-425M

link. The maximum bit rate in single link mode is 3.96Gb/s and in dual link mode is 7.92Gb/s. A single link can therefore carry a 1920 x 1080p60 signal, and a dual link can support a 2560 x 1600p60 (WQXGA) display. Most high-end PC graphics boards supply one or more single or dual-link DVI connections.

DisplayPort is a relatively recent license-free digital audio/video interconnect, proposed by VESA to succeed DVI; it's primarily intended to be used between a computer and its display monitor. Because it's based on a micropacket protocol, DisplayPort may have an advantage over other interfaces by easing future expansion of the standard. The interface consists of a unidirectional main link for connecting A/V streams from source devices to sink devices, and a half-duplex bidirectional auxiliary channel used for realizing plug-and-play features such as equipment control. The main link may have one, two or four differential signal pairs (or lanes), offering a total raw capacity of up to 10.8Gb/s. Computer giant Dell is a strong DisplayPort supporter, and rumors have it that the company will include the interface on all products within two years.

Traditional USB 2.0 (high-speed USB) has already become the interface of choice for many computer peripherals, including storage media. It supports a maximum transfer rate of 480Mb/s. The new USB 3.0 specification (Super Speed) has already been completed, and USB 3.0 products are expected in late 2009. This version will increase transfer rates up to 5Gb/s.

Where's it all going?

Most production and broadcast video systems now include SD/HD-SDI, which supports up to 720p/1080i (uncompressed), and marketplace evidence suggests that video equipment is transitioning from HD-SDI to 3Gig-SDI. With 1080p video becoming the dominant video format in the future (and possibly the current de-facto production standard), transmission speed will be the bottleneck in any video interface. Research over the last two years has shown that 1080p can be done at an equivalent bit rate to current 1080i broadcasts, provided MPEG-4 (H.264/AVC) is used.

Despite the proliferation of displays with HDMI or DVI interfaces, studios will still need to test video quality on legacy analog TVs and monitors. So, don't count out analog component video interfaces — yet. BE

Aldo Cugnini is a consultant in the digital television industry.

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

Video over IP

New standards allow broadcasters to use video over IP for video transport.

BY BRAD GILMER

As network speeds and reliability improve, it is becoming more common for broadcasters to install and maintain transport circuits that employ video-over-IP technology. Moving video over packetized networks is not without issues, and the industry has responded by providing several standardized approaches.

In the context of this article, video over IP refers to a professional application in which video is transmitted over IP networks. The application is most often either contribution or distribution. With contribution, video originates at a remote location and is transported back to a central broadcast network facility for manipulation, branding and packaging. In the case of distribution, video is sent from a central broadcast network facility to other broadcast facilities or cable systems for ultimate transmission to the end user.

There are several challenges in transporting professional video over IP, including:

- Accurate characterization of losses on the network;
- Dealing with error characteristics of IP networks;
- Preserving timing relationships; and
- Developing a standardized approach to the treatment of network errors.

Network loss profiles

When putting together a video-over-IP transport solution, it is critical to understand the loss profile of the network. A loss profile tells you that errors occur, as well as whether the errors are single bit losses sprinkled randomly in time, or whether they are groups of errors lasting for tens or hundreds of milliseconds. It is important to understand the loss profile of the network in order to develop a strategy to deal with these losses.

It may be difficult — if not impossible — to get solid information about losses on the network without measuring it yourself. Fortunately, manufacturers have studied the loss profiles of various networks and determined the best strategies for dealing with these losses.

Error characteristics of IP networks

Internet Protocol is a self-routing protocol containing both the source and destination address in each packet. On nonmanaged networks, each packet is transported across the network individually, without knowledge of what route previous or future packets may take. At the IP layer, there is no concept that these packets are somehow related. Because of network congestion and other factors, packets may arrive out of order, they may be lost, or they may even be duplicated in the network. If you are using a closely managed, dedicated network that has been specifically designed to carry video and audio, in all likelihood, the network was designed to eliminate many of these issues.

Preserving timing relationships

Because packets may take different paths through a network from source to destination, and network switches and routers employ buffers that can have variable transit delay, any timing relationship between data in one packet and data in another packet is lost. Of course, video is a time-sensitive medium. Destroying the timing relationship between parts of a video frame can result in artifacts or no image at all. For this reason, all video-over-IP transport solutions include the carriage of timestamp information so that receivers can recreate the video timing relationship that was originally present at the video input at the output.

Standardized treatment of errors

Given that packets will be delayed, lost, reordered or duplicated, it is important that manufacturers come up with standardized ways to deal with errors. Some manufacturers have developed standards that address the transmission of video over IP, including treatment of errors. The SMPTE and the DVB have both described error correction methods.

Of course, because this is video, it may not be necessary to correct every bit error that occurs in transmission. In fact, some manufacturers use error concealment techniques to mask errors rather than repair each error.

A closer look at standards

As mentioned earlier, a SMPTE standard has been written for video-over-IP transmission. SMPTE 2022 is a multipart standard, meaning that it has different parts that may be used alone as separate standards, or the parts may be used together. SMPTE 2022 Part 1 is titled "Forward error correction for real-time video/audio transport over IP networks." As the title implies, the document describes a FEC method that can be used to protect video-over-IP streams. SMPTE 2022 Part 2 is titled "Unidirectional transport of constant bit rate MPEG-2 transport streams on IP networks." This document describes how to map video presented as an MPEG-2 compressed transport stream onto IP networks. To sum up, 2022-1 deals with FEC for MPEG-2 constant

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bit rate (CBR) streams on IP networks. 2022-2 deals with the mapping of CBR MPEG-2 streams onto IP.

The Video Services Forum (VSF) is currently working on several additions to SMPTE 2022. The first item is a scheme for transmission of variable bit rate (VBR) MPEG-2 streams over IP networks with FEC. This adds VBR transmission to the 2022 repertory. The VSF is also working on two additional documents that will cover high bit rate uncompressed transmission (HD) over IP and JPEG2000 compressed video over IP. Finally, the group is preparing a new FEC document that addresses the protection of the transmission of high bit rate streams on IP networks.

The European Broadcast Union is working on a document that will address standardized transmission of JPEG2000 streams encapsulated in MXF. The VSF and the EBU are working together to harmonize the approach to all of these standards in the hopes that manufacturers can make equipment that easily supports several of these transmission modes. (See Table 1.)

Standard	Short title	Status
SMPTE 2022-1	CBR FEC	SMPTE standard
SMPTE 2022-2	CBR MPEG-2 TS over IP	SMPTE standard
Not assigned	VBR MPEG-2 TS over IP	Submitted to SMPTE
Not assigned	Uncompressed high bit rate video over IP	In process at the VSF
Not assigned	JPEG2000 compressed video over IP	In process at the VSF
Not assigned	JPEG2000 compressed video encapsulated in MXF	In process at the EBU

Table 1. Standards and work in progress for video over IP

How real is video over IP?

All of this standards activity is fine, but can broadcasters actually purchase video-over-IP equipment that works? The answer is yes. Several manufacturers make SMPTE 2022-compliant products that move the video as compressed CBR MPEG-2 transport streams from one location to another over IP networks.

There is equipment available that moves JPEG2000 compressed high bit rate streams encapsulated in MXF files too, but as of yet, this equipment is not standardized because work on the standard is not complete.

When asking whether video over IP is real, you must also ask what sort of network is needed in order to use this equipment. These standards were designed with well-managed IP networks in mind. Before the work started, the VSF surveyed its members to determine what sort of well-managed IP connections were available to broadcasters. It turns out that if you know what to ask for, the links are pretty good. The VSF wrote these documents assuming that the equipment would be used on well-managed IP networks. The standards were not written with the generic Internet in mind.

Your transport carrier has products that work well and can support video over IP reliably. Furthermore, when that network capacity between facilities is not being used for video over IP, it can be pressed into service for other needs, such as to transfer large files or to provide IP telephony. BE

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

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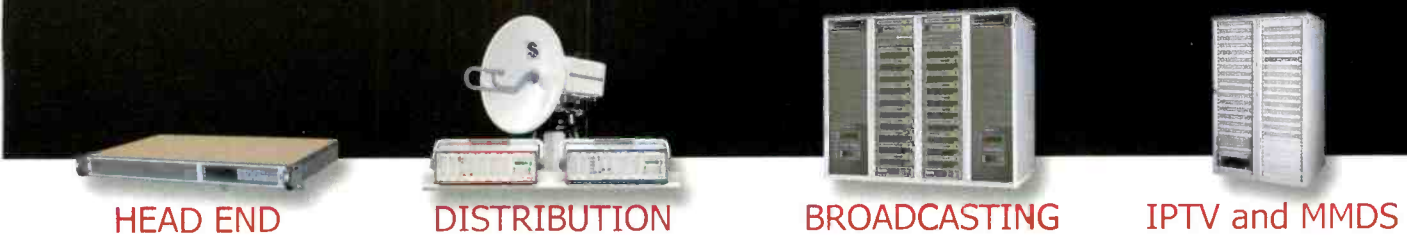

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Making mics last

Microphones are an investment. With a little care, that investment can pay off for many years.

BY STEVE SAVANYU

Our journalistic hero, caught in a bind on location, needs to pound a nail. No hammer in sight, he pulls out his trusty handheld interview mic (complete with station ID flag) and, like "MacGyver," quickly seats the offending nail, just in time to complete the interview and boost station ratings. We have all heard these stories, and although some microphones are fairly rugged, we would stop short of using one as a hammer.

In reality, a microphone is a precision instrument that, with a little care, can last many years. Today, broadcasters use many different types of microphones. Two of the most popular are dynamic and condenser.

You can improve the performance of dynamic microphones, such as the AE4100 from Audio-Technica shown here, simply by removing the headcase and cleaning out the debris.

Dynamic microphones

Dynamic microphones are a prevalent choice for handheld interviews, live vocals and some air studio uses. Characterized by their large physical shape, these inherently rugged microphones will take most of the abuse a field correspondent can dish out. The biggest issue with dynamic handheld mics seems to be with headcase grilles getting clogged and damaged. Simply removing the headcase, cleaning out the debris and replacing it can improve performance. Plus there's the hygiene factor: Cleaning the grille can help prevent the spread of germs. An external foam windscreen is also useful for protecting the headcase.

Don't overlook the microphone's connector. Over time, the connector insert may come loose with repeated use. Simply tightening the small setscrew that that holds the connector in place will do the trick. Because the threads in the insert are reversed, turning the screw to the right actually backs it out of the connector insert, securing it to the microphone body. A technician's "greenie" screwdriver is ideal for this task.

Condenser microphones

Condenser microphones with their extended response, low handling noise and ability to be miniaturized are commonplace on set and location. A far cry from the neck-worn lav mics of the last century, the new breed of subminiature lavaliers are practically invisible on camera and can outperform the best dynamic mics. Although these microphones are quite rugged, a little common-sense care can extend their lives. Here are some tips to make them last longer.

When using wired lavalier microphones, attach the power supply/module to the wearer with the power supply's clip. This keeps the strain off the smaller lav cable should the wearer decide to get up and walk with the mic. Store the mic with its cable coiled in a protective case, and resist the temptation to coil the mic and cable around the radio-mic transmitter pack. When wearing a radio-mic transmitter, secure the mic cable under the transmitter belt clip to take strain off the connector.

Some lavalier microphones come with an accessory kit that includes small "makeup caps" designed to slip over the microphone capsule. These are used to keep theatrical makeup from clogging the small element opening and damaging the mic. They also work well to keep other debris out of the mic and can be easily removed for cleaning with rubbing alcohol and a cotton swab.

Remember the "broadcast loop" technique for dressing a lav mic cable on a clothing or tie clip. (See "The

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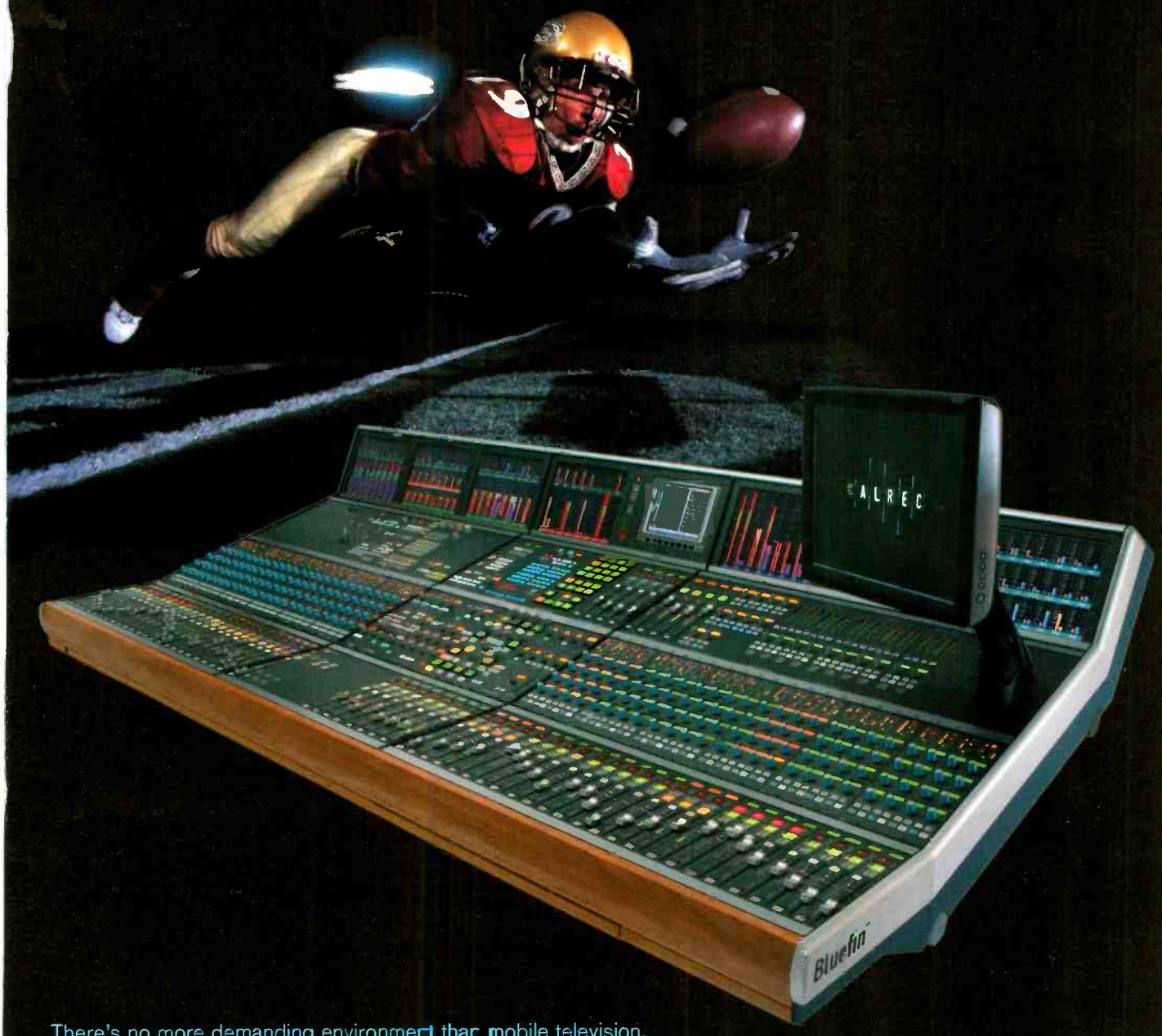

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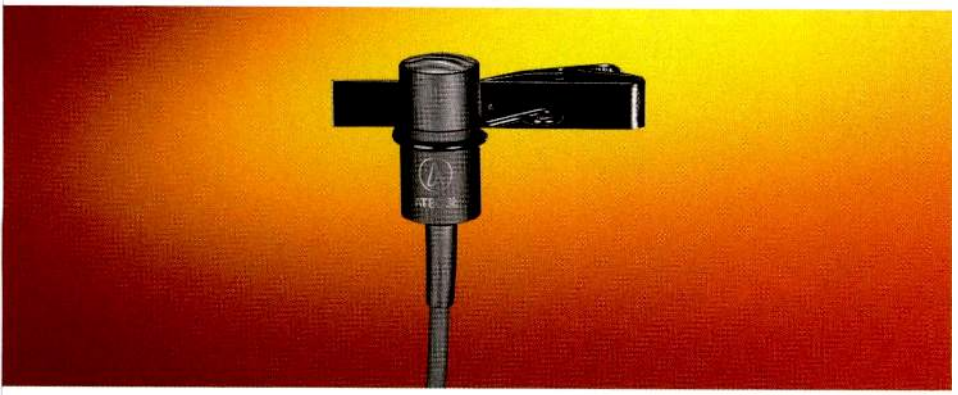

When using wired lavalier microphones, attach the power supply/module to the wearer with the power supply's clip. This keeps the strain off the smaller lav cable should the wearer decide to get up and walk with the mic.

broadcast loop" sidebar below.) Besides helping to minimize the pickup of mechanical sound transmitted up the wire, this helps lessen cable strain on the mic.

All condenser microphones require power to operate. Typically, this power supplies energy to a small amplifier circuit inside the microphone, although some condenser microphones use it to put the electrical charge on the capsule's backplate. Depending on the situation, this power can come from a microphone's built-in battery or up the microphone cable in the form of phantom power provided by the mixer, camera or an outboard power supply.

Even though the batteries will last in excess of 1000 hours of operation, when using battery-powered mics, make certain the batteries are fresh, especially for that critical production.

For microphones that require it, verify that the phantom power is switched on. I have been on locations where time was spent troubleshooting bad mic cables, only to discover that the phantom power was turned off at the mixer. When turning phantom power off or on, and when connecting or disconnecting condenser microphones, turn the input channel's level down to avoid nasty "pops" in the audio system.

Because the backplate and diaphragm in a condenser mic are charged (think capacitor), condenser microphones are more susceptible to moisture than are dynamic mics. When used in situations with high humidity, there is a chance that excess moisture on the diaphragm may cause sizzling sounds similar to bacon frying to be heard from the mic. Simply let the microphone dry out. Put a bowl of uncooked rice in a closed box with the mic to absorb moisture. Protect air-studio mics from excessive mouth moisture with a good pop filter or foam windscreen (also good for mic hygiene). Another way to extend the life of your production studio microphones is to cover them when not in use.

In extremely damp locations, consider protecting the microphones with an impenetrable moisture barrier. Yes, the lowly unlubricated condom works wonders for keeping moisture out without too badly affecting the response and pickup. During a recent Winter Games, more than 400 of these impenetrable barriers were sent to the site to protect shotgun mics from snow and ice.

A shotgun or rifle mic is shaped like a long narrow tube with a series of slots down the sides. Protect these mics by storing them in their manufacturer-supplied cases. An alternative storage method is to keep the mic (with its foam windscreen attached) inside a piece of PVC pipe the same diameter as the mic/windscreen and loose capped at both ends. Just remember not to carry these through airport security.

Another thing to consider when using phantom-powered mics is the mic cable. XLR connectors will wear out with continued plugging and unplugging. Sometimes they become intermittent, disrupting phantom power and causing all kinds of noises. Make it a practice to regularly check and maintain your cables and replace worn connectors as necessary.

Finally, if you find that your expensive studio mics just don't sound as good as they did when you bought them, consider sending them back to the manufacturer for a tune-up. Many manufacturers can provide this service. Often a good cleaning and adjustments by the service tech can restore a microphone back to factory specs, adding many good years of life to your mic.

Microphones are an investment. With a little care, that investment can pay off for many years. BE

Steve Savanyu is director of educational services for Audio-Technica.

The broadcast loop

Proper dressing of a lavalier microphone's cable can help minimize cable noise. This technique, called the broadcast loop, is one way to do it. Start by mounting the microphone in the mic clip. Make a small loop with the cable below the mic, and secure the cable to the clip.

Thread the cable up, around and back down behind the clip securing the cable between the fabric and back of the clip. Note that the cable goes down behind the loop. Finally, dress the cable under the wearer's clothing, out of sight.

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Out with the old

What can you do with your analog debris?

BY SUSAN ANDERSON

The shutdown date for analog television is right around the corner. That begs the question: What can you do with your analog debris?

Transmitters

"As far as the transmitters go, a lot of times that's a question of the vintage of the transmitter," says Jeremy Ruck, consulting engineer for Don Markley Associates. "If it's new enough to be converted to DTV, the stations will probably avail themselves of that."

Rich Redmond, director of strategic marketing for Harris Broadcast Communications, agrees.

"In many cases, what we've found is our customers are converting their analog transmitters for digital operation," he says. "They realized 10 years ago or so they needed to have reliable analog, so what they purchased had an upgrade path to digital."

This is the case with the Sinclair Broadcast Group. Harvey Arnold is the director of engineering for the group, which operates 58 TV stations in 35 markets. He says that over the past six years, the group has replaced many of its old analog klystron transmitters with new-generation IOT transmitters, which can be easily converted to digital service.

Shown here is a klystron analog transmitter used for KVTN Ch25 that was retired on Feb. 9, 2009. Not only is the transmitter old, but also the technology will not work on DTV economically. It is now being scrapped piece by piece, with some parts going to radio amateurs, while the rest are just metal scraps.

Some of the bigger market stations that had bought a new transmitter for both NTSC and DTV now have quite a bit of redundancy, more so than they'll probably need.

"So that becomes a question of shipping it somewhere else in the group," Ruck says. "There are a couple of groups we represent that are playing the transmitter, antenna and transmission line shuffle. That way, they can minimize the amount of capital they have to spend on equipment."

But what are your options if your

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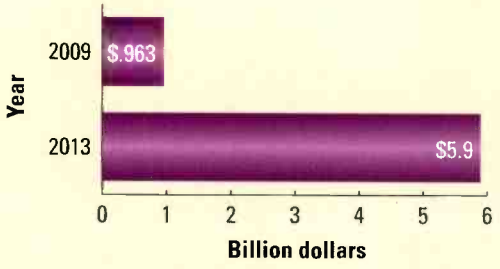

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analog transmitter is older? If it's in good shape, it may have some resale value. The challenge is finding a buyer.

"Whether you can find somebody that has a use for it, like a religious group or school that can use the equipment, is an issue," Ruck says. "If you can't, then you've got the extra cost of paying for the disposal."

Rolin Lintag, chief RF engineer for the Victory Television Network (VTN), says he's been working with mission organizations to see if they can use VTN's analog equipment.

"One TV network in Guatemala responded that they were serious in getting our transmitter and analog test equipment," Lintag says. "However, they got bogged down by customs duties that their government imposed on them, so they backed out."

Now, the station is repurposing some of the parts, like the heat exchanger and the pumps, for its other station that still uses IOT tubes.

"I tried to salvage some parts as well that we can still use, but the rest will go to scrap," Lintag says. "It is sad."

The Sinclair Broadcast Group has klystron UHF TV transmitters, some of which were more than 30 years old.

"They are basically useless and will be salvaged," Arnold says.

Pat Ingram, director of engineering for WBNS, says the station had an RCA TT-50 that was still operational after nearly 60 years.

"We disassembled it bolt by bolt and sorted the different metals," he says. "All of it was sent to recycling. There were quite a few pieces kept by the engineering guys as collectibles."

Towers and antennas

For a lot of antennas, the post-NTSC usage is going to be minimal.

"There could be a small market for used TV antennas, but these antenna systems are typically specific in design," Arnold says. "We expect there may be a small business for equipment brokers to sort out some possible matches vs. needs, but I do not see the reuse of antenna systems to be a big market.

If it's in good shape, it may have some resale value. The challenge is finding a buyer.

Remember that many of these analog antennas have been in service for 30 years or even longer and have served their purpose for many years."

Ruck adds, "If it's a panel antenna, those are usually broadband, so you could pretty much move it someplace else. When we start talking about the slot antennas, you've got a really

narrow market in which those can be used because they work on a particular channel. Most of those end up getting scrapped, assuming they take them down."

Removal of large antenna systems and transmission lines requires careful coordination to ensure safety and to make sure that other systems on the tower aren't damaged. And, the costs can be considerable. In some instances, the cost of paying recyclers to scrap antennas for materials outweighs the benefits. This holds true for the copper in antenna lines.

"The price of copper has come down significantly from its peak," Arnold says, "so broadcasters should not expect salvage sales to become a profit center for their company."

As a result, many broadcasters are leaving their analog antennas and transmission line in place, as long as the tower can handle the load or until the tower space is needed.

Andrew Suk, vice president of engineering and operations for Cordillera Communications, says that several of its systems were designed for adjacent channel operations and that its new DTV antenna was actually designed for analog and DTV service.

"In those locations, there will be no need to remove the analog antenna or feed line," Suk says. "In the locations that do have analog antennas and feed lines, we're not in a rush to spend the money required to remove those structures and will instead address them at opportunistic times."

In a situation where an analog tower must be completely removed — for example, because of lease requirements — Arnold says it's important to ensure that your tower crew has the experience and credentials to safely remove these heavy items, which weigh between five and 10 tons. Also make sure they have adequate insurance.

"Because of the complexity, we only work with established tower crews that have an excellent safety record," Arnold says. "Consider FAA notification requirements if the top-mounted antenna is removed. A lot of towers are in populated areas, so you can't be too careful."

With cost an issue due to today's economy, Arnold suggests coordinating tower work with other broadcasters that may be on the tower in order to reduce cost. That's what the Sinclair Broadcast Group is doing in all of its markets, whenever possible.

"With dollars tight, we're just trying to think smart," he says.

With the hurdles involved in the removal of analog equipment, don't expect to see broadcasters racing to take down their analog antennas on June 13. **BE**

Susan Anderson is the managing editor of Broadcast Engineering.

Securing broadcast networks

Concentric-ring network design protects LAN content.

BY JEFF PRINCE

Media and entertainment organizations face content management and protection challenges as they transition to a digital world. Content can be compromised at any step in the production, post-production and distribution process in what many in the industry acknowledge is a "leaky environment." And the stakes are high: Operators of broadcast video networks may be subject to stiff penalties along with loss of reputation if content is illegally distributed (for example, posted to YouTube) or transmission is interrupted.

Most organizations have security technologies such as firewalls and intrusion prevention systems in place at the boundary between their local area and wide area networks (LAN/WAN). These technologies provide a useful but limited set of controls in a business where content moves around the LAN, and contractors and clients may work on-site with their laptops.

Media companies need the ability to strictly control who gains access to their networks and what resources they're allowed to reach. This article details LAN-focused security procedures, technologies and solutions that enable media companies to preserve network uptime, protect client content and intellectual property, and ensure only authorized traffic reaches the transmission network.

Requirements for today's LAN

While business models and the types of services provided vary from one media company to another, there are a set of security requirements that are applicable across the board. These include the need to:

- *Restrict network access.* Only authorized users, such as employees, contractors or clients, should be granted access to the company network.
- *Prevent malware outbreaks.* IT needs to keep malware-infected devices, such as contractors' laptops not under its control, off the network.
- *Track all traffic on the network.* IT needs Layer 7+ visibility into network traffic to ensure only authorized applications and traffic types are being used on the network and to pinpoint the source (by user and machine) of any unauthorized traffic, such as Secure Shell (SSH).
- *Control access to data and resources by user role.* Once users are admitted to the network, IT needs strict controls regarding where on the network they can go and what resources they can reach based on their role. An employee in the accounting department might be restricted to business applications and servers, for example, while a guest is given Internet access only, and a freelance video editor is allowed to access select servers and content for post-production work. (See Figure 1.)
- *Document LAN usage.* Media organizations need auditing capabilities, including logs of who has accessed resources and the ability to easily document controls in place. Clients often ask for such documentation during bidding, in addition to auditors from industry organizations such as the Motion Picture Association of America.

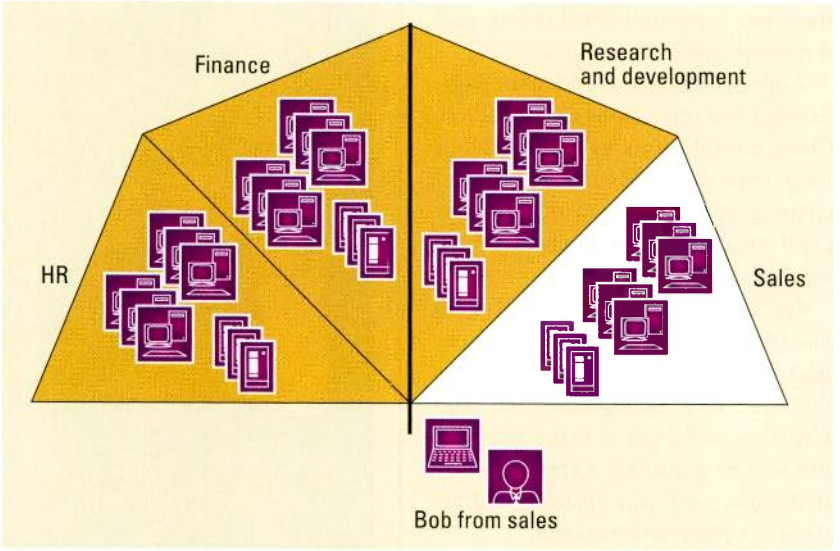

Figure 1. An employee in the accounting department might be restricted to business applications and servers, while a freelance editor is allowed to access select servers and content for post production. Image courtesy ConSentry Networks.

Organizations can meet these requirements — securing data as it moves around the LAN — with the right design strategy, technologies and network devices.

Circle the wagons

A network design based on concentric rings can significantly

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boost security by segmenting users and resources. Logically structuring the network in a tiered or "ring" fashion ensures that access in a given ring is strictly limited to those who need it and that certain types of traffic are restricted to parts of the network.

For example, business applications such as e-mail should be part of the outermost ring of the network, which is available to virtually all users, while the transmission network is the innermost ring and has highly restricted access.

The number of rings in the network and which resources, users and functions are allowed in each ring will depend on your company's business model and operations. For organizations that perform production and/or post production, applications that support these functions should be logically, if not physically, separate from the business portion of the network and the transmission network.

Between the production tiers and the outermost tier may be one to accommodate commercial transfers from partners. FTP might be permitted at this tier, for example, but not at the post-production or transmission tiers.

Keep in mind that each ring is a zone of control, created either physically or logically. Physical segmentation is a challenge and can prove ineffective if an unauthorized user gains entry to a restricted area and no user- or application-based access controls are in place. Virtual LANs are a common means to logically segment a network, but are cumbersome to administer, have no application awareness and can be circumvented by users plugging into a different LAN segment.

Media organizations need a set of technologies that let them logically segment traffic based on users and applications, allowing them to create a tiered network design that's granular, flexible and easy to administer.

Role	User account	Network resource access control					
		AD	DNS	File	Mail	Intranet	Internet
Unauthorized	Local	Allow	Deny	Deny	Deny	Deny	Deny
Visitor	Guest	Deny	Allow	Deny	Deny	Deny	Allow
Employee	Bob	Allow	Allow	Allow	Allow	Allow	Deny
Regular	Alice John	Allow	Allow	Allow	Allow	Allow	Allow
Evaluator	Tim	Allow	Allow	Allow	Deny	Deny	Allow

Figure 2. By verifying that users and IP devices are who/what they say they are and only admitting authorized users and devices to the LAN, authentication protects the network from unauthorized access.

Technologies to deploy

To address the requirements for securing the LAN, media organizations should consider deploying the following technologies.

• *Authentication.* By verifying that users and IP devices are who/what they say they are and only admitting authorized users and devices to the LAN, authentication protects the network from unauthorized access. Look for systems that leverage existing identity stores, such as Active Directory (AD) and RADIUS, to automatically learn each user's identity and role during authentication. This capability, known as passive authentication, ensures that users aren't burdened with additional log-in information. An authentication system should also support a browser-based captive portal to provide active authentication for contractors, guests and other users not known to the identity store.

The ability to identify a user's role during authentication makes it possible to apply control policies to that user following admission to the network. Another benefit is that management changes are centralized. Deleting a user from an identity store such as Active Directory results in revocation of all network access rights.

A robust, role-based authentication system also allows for differentiated LAN access for contractors, vendors, guests and employees, providing a first level of traffic segmentation. For example, guests may be restricted to accessing the Internet. (See Figure 2.)

• *Host posture check.* Performed at log-in time, host posture check prevents malware outbreaks by ensuring that users' computers comply with corporate standards and are running an approved operating system with current patches and fixes and an updated antivirus program. Look for a host posture check system that supports hosts not under corporate control and applies to all classes of users, including employees, contractors and visitors, without burdening IT.

A posture check solution should automatically scan hosts for malware, not just the presence of antivirus software. This step will prevent worms, DoS attacks and other malware from entering the network even if current antivirus software is detected.

• *Stateful (deep packet) inspection.* Maintaining state information enables a network device to track and forward traffic based on flows rather than packets, while deep packet inspection up through Layer 7 provides user identity and detailed application information, including events within an application such as the destination URL in an HTTP session or the file name in an FTP download.

A device that performs stateful deep packet inspection on all flows can correlate user, device, application, destination and other information, enabling IT to apply granular access control and quality of service policies

at the user and application level.

• *Role-based policies.* Knowledge of users and application-level visibility enable a system to tie all LAN activity back to specific users. As a result, IT can define rights and permissions, as well as control and enforcement actions, based on a user's role in the organization, ensuring tight access to applications, data and other resources on specific parts of the network.

By supporting user- and application-based traffic segmentation, role-based policies make it easy to implement a logically tiered network design with firewall-like traffic separation. In addition, the correct rights and permissions are applied to each user regardless of the access medium used or location from which they attach to the LAN.

• *Audit trail.* Robust auditing enables a system to retain statistics about all flows and display flows by user name, role, application, file or destination, greatly simplifying compliance and client reporting as well as troubleshooting and forensics. Look for an auditing system that provides key user data, including log-in/log-out time, applications run, transactions performed and resources reached.

It should also track security incidents, including those related to host posture checks, policy violations, authentication failures and malware events, and provide real-time and historical data as well as aggregated views.

Shopping for solutions

Securing the LAN internally is imperative for digital media providers, whose content can too easily "escape" and compromise transmission facilities. Fortunately, IT doesn't have to piece together a solution. A new class of application-aware devices makes it possible to embed directly into the LAN all the technologies and controls discussed above with minimum impact on users and IT resources.

Organizations that aren't making changes to their LAN can get user and application control with a drop-in appliance. Those planning a LAN infrastructure upgrade or refresh can deploy intelligent LAN switches, which combine high-performance LAN switching with user and application controls.

Both types of devices give media organizations the ability to control who gains access to the LAN and to segment traffic based on users and resources, providing the stringent level of LAN security required in today's all-digital environments. BE

Jeff Prince is chairman and CTO of ConSentry Networks and a managing partner at Prince Ventures.


Shopping Center

VIDEO ENCODING TECHNOLOGY

BY JOHN WATKINSON

Today's electronic imaging technology has come a long way from the first, pre-WWII, monochrome TV services that began the long-time competition with the cinema.

The invention of pulse-code modulation allowed analog signals to be expressed by binary number, which inevitably and irrevocably forged a link between computing and audiovisual information. Once audio and pixel information are expressed by binary numbers, the resulting data are distinguished from other types of data, such as text, only by the fact that they need to be reproduced with the original time base. Computing, which we now call information technology (IT), is adept at processing, storing and networking data. With the advent of error-correcting techniques like Reed-Solomon coding, such data could be preserved to arbitrary accuracy, although the result of the use of error correction in digital television broadcasts is that the compression artifacts are delivered accurately.

The spectacular growth of IT led to computers shrinking from the size of a house down to the size of a match head, along with a comparable reduction in price. As a result, computers today are essentially consumer products. One of the unfortunate consequences is the ubiquity of consumer-grade software that is quite unsuitable for anything important. Another consequence is that the television and cinema industries found the computer to be a double-edged sword because it helped them produce material more quickly and efficiently while at the same time presenting their audiences with an alternative medium in the shape of the Internet.

Compression techniques

Electronic images have always required a lot of bandwidth, and compression techniques have been used since the earliest days of television. The use of gamma allows the same perceived quality to be obtained at a lower signal-to-noise ratio. Color difference signals need less bandwidth than RGB. Interlace is a compression technique that results in well-known

artifacts. Composite video, such as NTSC, allows color in the same bandwidth as monochrome.

Information theory tells us that the greater the compression factor, the more complex the processing. While composite video and interlace are easily performed in the analog domain, the adoption of digital techniques allows greater complexity at lower cost. While the IT industry has lossless codecs that deliver bit-accurate pixels, the possible compression factors are not considered high enough for television. As a result, TV codecs are lossy. The decoded signal is not as good as the original. Compression also increases the characteristic time span of the signal. The four-field sequence of NTSC and the group of pictures in MPEG are direct parallels.

Compression can take place within individual pictures by identifying plain areas like sky or repetitive patterning. This is called intracoding or spatial coding. Compression can also take place between successive pictures, and this is even more successful when combined with compensation for object motion. This is known as intercoding or temporal coding. Groups start with an anchor picture and alter it to move forward. Some of the pictures are recreated by taking parts of earlier or later pictures, moving them across the screen to compensate for motion and only using new information for filling in the gaps. It could be likened to making a meal out of kitchen scraps.

Temporal coding is the more powerful of the two techniques, which is why delivery codecs run with long picture groups. Of course, long group coding makes production difficult. In order to perform any production step, the material first has to be decoded and then re-encoded. The problem occurs when a former "kitchen scraps" picture is encoded as an anchor. The generation loss is breathtaking.

So while long group compression is ideal for final delivery of video to the consumer, the generation loss due to temporal coding means you would only suggest it for production purposes if you had a serious conflict of interest. For questionability, it's right up there with using interlace for HD.

Moving image compression

It is disappointing that HDTV appears to be the same juddery old thing but with more pixels. The greatest technical shortcoming in television has always been the inadequate frame rates and the poor motion portrayal that results. The most tangible improvement in television comes not from increasing the static resolution, but from improving the dynamic resolution by increasing the frame rate. In a compressed delivery environment, given that temporal coding is more efficient than spatial, increasing the frame rate doesn't increase the bit rate much, whereas increasing static resolution drives the bit rate up dramatically without a corresponding quality increase.

For TV production purposes, intracoding gives editing freedom. Most videotape formats use intracoding for that reason.

At the time of writing this article, moving image compression seems to have settled into a number of basic applications. Digital cinema requires high pixel counts, and the contrast ratio possible in the cinema demands a greater number of bits in the pixel. On the other hand, digital cinema does not have a bandwidth problem. Cinemas can use fiber-optics networks or download data in non-real time to local file servers. Digital cinema exploits that freedom to use relatively mild compression techniques that produce pictures that are substantially free from compression artifacts. For production purposes, digital cinema recorders may use lossless or mild spatial coding.

Most TV viewing takes place with some ambient lighting, and as a result, the contrast ratio of television is much less than can be obtained in the cinema. This makes 8-bit resolution perfectly adequate. Broadcast television faces two bandwidth restrictions — one external and one self-made. First, the electromagnetic spectrum is needed for other purposes, and the spectacular growth of cellular telephones has made spectrum more valuable. Second, television broadcasters have decided that viewers want more channels, even though the constant amount of talent is thereby diluted. As a result, the compression factors used in digital broadcasting are high, and the level of artifacts is nothing to be proud of. For TV production purposes, intracoding gives editing freedom. Most videotape formats use intracoding for that reason.

Moving pictures viewed over the Internet tend to be downsampled and heavily compressed. This is a consequence of immediate and free access to an extremely wide range of material. Nevertheless, as the bandwidth available to Internet subscribers increases, the quality will improve.

One of the requirements for Internet use is a codec that allows the same material to be available in a range of qualities dependent on the bit rate available to the individual subscriber. Wavelet-based compression is usually superior in this respect.

Moving pictures by educated guesswork

There is no one ideal compression codec. The difficulty is figuring out how to make compression available to a wide range of applications and how to allow future developments to enhance the system without causing obsolescence. At one extreme, an electronic cinema compression system designed to work on a giant screen will need more powerful

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hardware and more memory than a system designed for a security camera. The way around this is to define levels and profiles in the system. Levels set limits on the amounts of processing power and memory needed to decode the signal. Profiles set limits on the complexity of the encoding and decoding. Obsolescence is avoided by adopting two steps. The first is to define the signal between the encoder and the decoder and not the encoder itself. The second is to make improvements in a way that is backward compatible.

A good way of visualizing compression is to consider that the decoder is equipped with tools that allow it to make an educated guess about what is coming next based on what came before. If the encoder contains a decoder, it must know what the decoder can predict and then sends only what couldn't be predicted. MPEG is an acronym for Moving Pictures by Educated Guesswork.

Clearly, if the decoder is equipped with more tools or those tools are more highly refined, the guesswork will be better, and the amount of unpredictable content decreases. So the development path from MPEG-1, through MPEG-2 to MPEG-4 represents the process of increasing and refining the toolkit. As MPEG-4 contains additional tools and refinements of what went before, then an MPEG-4 decoder automatically contains MPEG-2 and MPEG-1 decoders, and backward compatibility is achieved. If we compare like with like and look at the performance of MPEG-2 and MPEG-4 on conventional video inputs, we find that the extra predictive ability of MPEG-4 allows the same picture quality at a significantly reduced bit rate. H-264, also known as Advanced Video Coding (AVC), is the part of MPEG-4 that relates to conventional video inputs. This is likely to be a popular codec for delivery of HD.

The development path from MPEG-1, through MPEG-2 and MPEG-4 represents the process of increasing and refining the toolkit.

Whereas MPEG-1 and MPEG-2 work with entire pictures, MPEG-4 goes far beyond that. (See Figure 1.) In Figure 1A, a video coder expects as an input a complete picture repeating at the frame rate. Imagine that such a picture was the output of a graphics engine that was rendering images in real time. The graphics engine would compute the appearance of any virtual objects from the selected viewpoint using ray tracing. If the viewpoint or one of the objects moves, each video frame will be different, and the MPEG-2 coder will use its coding tools to encode the image differences. However, the motion of a virtual object could be fully described by vectors. In Figure 1B, an MPEG-4 encoder can handle the graphic instructions directly so that the rendering engine is actually in the MPEG-4 decoder. Once the appearance of objects is established in the decoder, animating them requires little more than the transmission of a few vectors.

MPEG-4 works with four types of objects. (See Figure 2.) Objects may be encoded as 2-D or 3-D data. 2-D objects are divided into video and still. A video object is a textured area of arbitrary shape that changes with time, whereas a still texture object does not change with time. Typically, a still texture object may be a background. Although it does not change with time, it may give the illusion of doing so. For example, if the background pixel array is much larger than the display, the display can pan across the background to give the impression of motion.

Figure 2 further shows that

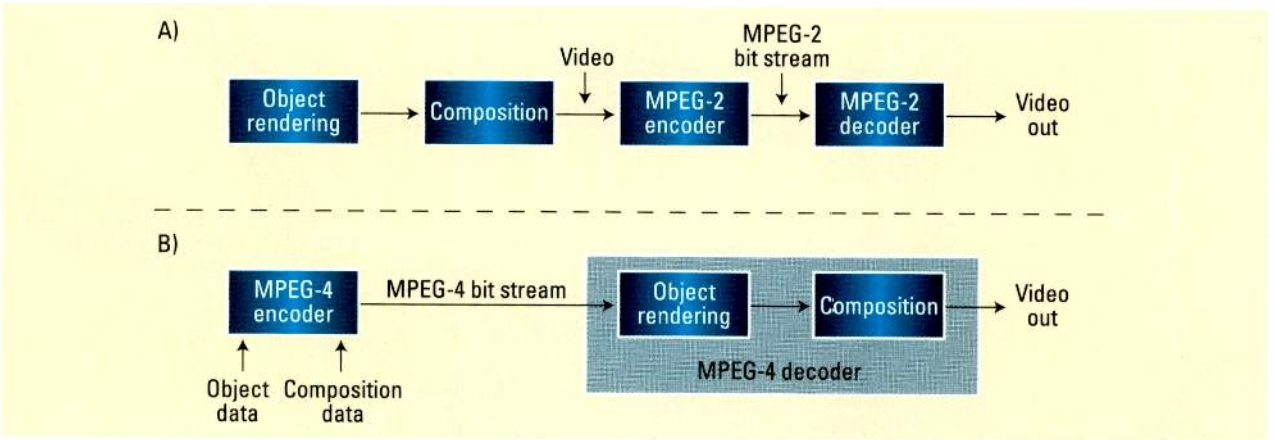

Figure 1. A) In MPEG-1 and MPEG-2, computer graphic images must be rendered to video before coding. B) In contrast, MPEG-4 may move the rendering process to the decoder, reducing the bit rate needed with the penalty of increased decoder complexity.

MPEG-4 standardizes ways of transmitting the 3-D shape of a virtual object, known as a mesh object, along with the means to map its surface appearance, or texture, onto that object. Generally, any shape of object can be handled. The decoder will recreate each object and render each one from the selected viewpoint. In parts of the picture where there is no object, the background will be keyed in. It should be clear that if the decoder is aware of the shape and texture of all relevant objects, the viewpoint does not need to be chosen at the encoder. The viewpoint might be chosen by the viewer in an interactive system such as a video game or a simulator. For applications such as video phones and video conferencing, MPEG-4 supports a specific type of mesh object that may be a human face or a human face and body.

Unlike the DC-based transforms of MPEG-2, the Dirac codec uses wavelets and so inherently works well in multiresolution applications. Dirac is available in intracoding versions for production purposes, as well a temporally-coded version for delivery. Developed by the BBC, it has the advantage of being royalty-free. BE

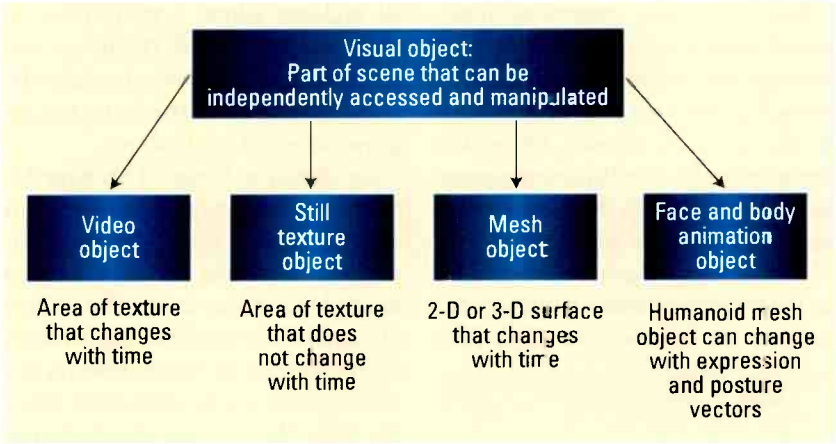

Figure 2. In MPEG-4, four types of objects are coded.

John Watkinson is a consultant in advanced technology. His most recent books are "The Art of Digital Video," "The Art of the Helicopter" and "The MPEG Handbook" available from Focal Press/ Elsevier.

Bycast StorageGRID 8

The solution provides long-term storage and preservation of digital assets.

BY ANNETTE SALIKEN AND DAVID SLIK

The transformation to file-based digital workflows in broadcasting has resulted in large, growing volumes of files that need to be stored and protected for long periods of time. These files are created and processed by various applications in the workflow chain, and it is common for organizations to store the files in siloed storage infrastructures, whereby a separate storage system is used for each application or geographic location. (See Figure 1.)

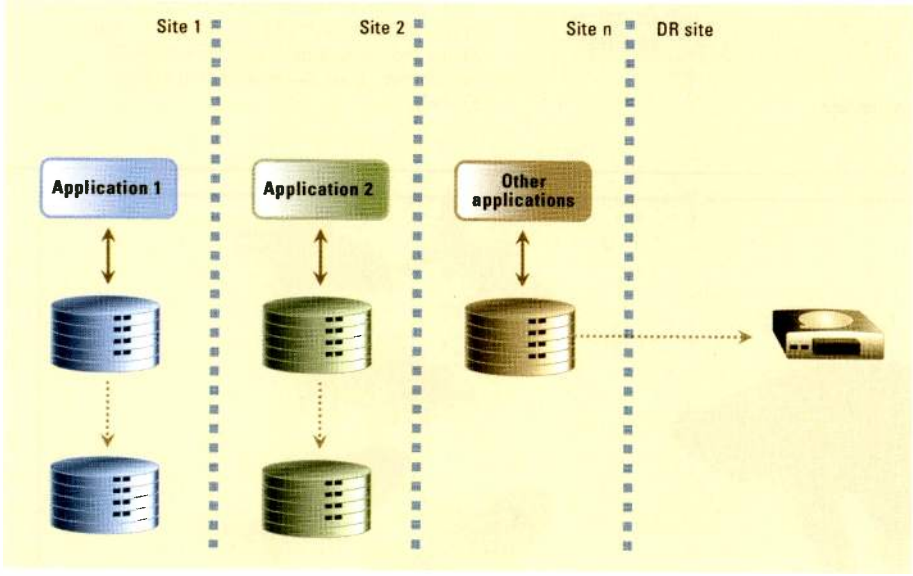

Figure 1. Siloed storage

Silos require additional investments for backup and replication products to protect against data loss. They also need tiered storage to enable movement of data to the most cost-effective storage devices over time. This siloed approach creates significant complexity, and increases the capital and operating costs of storage systems. Furthermore, using silos to store large amounts of data for long periods of time results in the following issues:

- *Insufficient data protection.* Traditional backup/restore is not suitable for large data volumes where the time-to-backup becomes prohibitively long. In the event of disaster, restoration can take weeks, months or even years. In addition, backup does not protect against alteration or corruption.
- *Downtime and unavailable data.* Given long retention times, faults will occur over the lifetime of the data. Silos are prone to single points of failure and require manual intervention to recover from a fault, increasing downtime that results in lost productivity.
- *Inadequate scalability.* The lifetime of files exceeds that of the storage hardware on which they reside. Silos require manual migrations from one hardware generation to the next, limiting an organization's ability to take advantage of dropping hardware costs.

The solution

Bycast StorageGRID 8 virtualization software for large-scale digital archives allows organizations to improve operational efficiency and avoid the pitfalls of siloed systems by consolidating and virtualizing storage across sites and applications.

As shown in Figure 2 on page 60, this solution manages heterogeneous storage devices, ranging from high-performance disk to tape, across multiple locations to create a unified file archive. It insulates applications from changes to the hardware, including equipment failure and obsolescence. The solution also facilitates the creation of fault-tolerant systems that can scale to tens of petabytes and hundreds of sites. Stored data are managed in accordance with user-configurable Information Lifecycle Management (ILM) policies that govern the automatic placement of content at geographic locations and storage tiers to meet the business needs of the organization. The solution simplifies the management of massive storage systems through automation, while ensuring the availability of data even during system downtime.

The technology

StorageGRID is an object-based grid storage system that stores unstructured data such as images, audio, video and documents. An object is any container of data and may have metadata associated with it. In the most common use case, an object is a file, and its metadata are the attributes of that file (type, name, path, etc).

Within this solution, objects are uniquely identifiable and stored in accordance with storage policies based on their metadata. These policies determine how many copies of the objects are stored, geographic placement of objects and storage tiers on which

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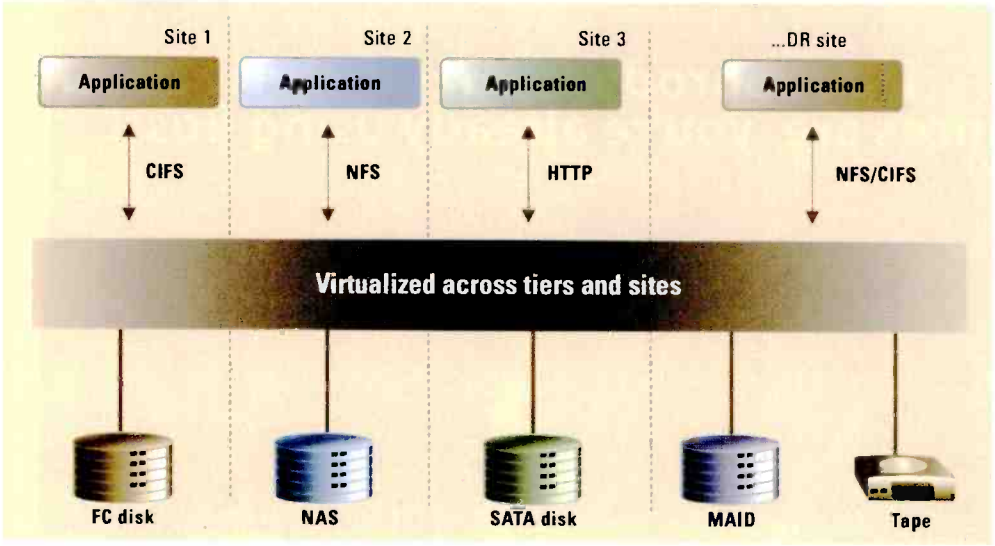

Figure 2. Virtualized storage

objects reside over time. Applications store and retrieve data from the grid via gateways that provide file or object level access over standard interfaces such as CIFS, NFS and HTTP. The solution can be deployed within one site or across multiple facilities, and objects stored at one site may be accessed at all sites.

Stored files are assigned unique digital fingerprints, which are used to verify integrity of data at the time of access, replication and movement between storage devices. Proactive checks performed in the background protect the integrity of inactive content. When a file is stored, the solution examines its metadata and enforces applicable storage policies. This allows dissimilar file types to be managed differently. For example, intermediate files associated with one project can be stored directly to tape, whereas models used in 3-D renderings may be kept on disk and replicated to a second site where a render farm resides.

Data protection and preservation is provided by enabling content to be replicated to multiple sites, and monitoring the integrity of data to guard against corruption. If a device or even an entire site is lost, it will automatically rebuild data from other replicas and validate its integrity. If corruption is detected, data is

automatically rebuilt from a known good copy.

By abstracting the hardware, the solution ensures that users are unaffected as new storage devices are added and old ones are retired. Migration from obsolete hardware to newer generations is automated and transparent. When a storage device is designated to be retired, its contents are automatically moved to newer devices without manual intervention, or changing file paths. Files remain where users and applications expect to find them.

StorageGRID addresses the shortcomings of the silos in three ways. First, it offers increased data protection. With configurable replication policies, the solution automatically stores redundant copies at distinct geographic locations. These, together with automated rebuild, eliminate the need for error-prone backup/restore procedures. Furthermore, comprehensive integrity checks protect data from corruption or alteration, thereby ensuring authenticity of data.

Second, it minimizes downtime. The grid architecture eliminates single point of failure. In the event of failures, or even when an entire site goes down, failover is automated, and operations continue. Automated disaster recovery protects against site, storage, or system failure and fully restores data to its original state.

Third, the system provides unparalleled scalability. The solution enables capacity and footprint expansion as needed, when needed. In addition, it allows organizations to take full advantage of decreasing hardware costs, increasing densities and new technologies through seamless hardware refreshes that do not require manual migration. Organizations can increase storage capacity, while reducing the footprint within the data center.

Summary

Challenges of long-term file storage can be minimized by choosing an archive system that consolidates and shares storage resources across sites and applications, rather than managing individual storage silos. With StorageGRID, organizations can use commodity hardware to create scalable digital archives that preserve and protect data, while reducing capital and operational costs of long-term storage. The solution also ensures consistent, reliable access to data for decades by delivering data protection, business continuity, automated disaster recovery and multisite access in heterogeneous storage environments. BE

Annette Saliken is director of communications and David Slik is chief architect for Bycast.

Winsted's workstations

Ergonomic workstations help KENW-TV in Portales, NM, transition to digital.

BY RANDY SMITH

As the June deadline for the digital transition looms, PBS networks nationwide are preparing for the future of digital television (DTV). Broadcast centers such as PBS affiliate KENW-TV in Portales, NM, are getting ready for the transition by incorporating digital technology throughout their facilities. The station recently built a new broadcast center that includes studios, digital transmitters and a master control room.

KENW-TV in Portales, NM, completely rebuilt its master control room, which now features custom, ergonomic Winsted workstations.

A custom erognomic fit

KENW enlisted Winsted to help design a complete upgrade of its master control room. The company's ergonomic workstations took the station's master control room on the campus of Eastern New Mexico University from analog to state-of-the-art digital.

When considering workstations for the new control room, the station visited the company's NAB booth at the advice of another vendor involved in the upgrade project. At the booth, the station found a new design concept that fit what it was looking for.

By using Winsted's free equipment layout software, WELS, Jeffrey Burmeister, director of engineering, and his team worked with the company's standard product line to define the essential elements of the workstation. Slim-Line consoles seemed to fit the station's basic requirements. Then, over a period of several months, KENW worked closely with the company's engineers to refine the design, creating a customized solution that was perfect for its needs.

The new master control room includes four workstations in a semi-arc and, according to Burmeister, has the look of a glass cockpit. Each workstation features three 19in ViewSonic monitors, and the entire setup faces a custom monitor wall with four large LCD displays and eight smaller LCDs.

From the new master control room, the station's staff can ingest programs from other networks, such as PBS, and record them to a server for use later. Then, the traffic and program departments determine when they will air. Next, the operators time and trim the programs for the station's automation system.

One workstation includes the master control switchers, which allows the operators to play the programs on the scheduled day and time. Another workstation enables the staff to monitor and control the operation of the broadcast transmitters remotely.

In addition to providing public TV programming for most of Eastern New Mexico and parts of West Texas, the KENW broadcast center provides telecollege courses and instructional programming for local primary and secondary schools, colleges and universities. The facility also serves as a training center for the university's telecommunications students.

With help from Winsted, the new facility has become a showpiece for the station. The new digital technology allows KENW to provide HD programming and monitor every aspect of day-to-day operations from a functional and attractive master control room. BE

Randy Smith is the president of Winsted.

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Video servers

IT has changed the functionality of modern broadcast video servers.

BY JOHN LUFF

It is no surprise that IT technology is increasingly penetrating broadcast TV operations. There are many reasons for this today, but when early broadcast video servers were introduced, IT was scarcely a consideration. At that time, there was little about a video server that was considered IT, except that it was run by a computer platform (actually more than one). Early video servers were really analog video recorders with motion JPEG recording technology inside.

The Newseum in Washington, D.C., uses Grass Valley K2 media servers, which provide file-based, IT-centric storage.

Servers were initially deployed to fix the inability of analog cart machines, based on analog video recorders, to play back-to-back 10-second spots. The video server could cache content and play it out on command, using the video cart machine as the storage engine and the server as the playout. It is no accident that bidirectional channels, which either recorded or played, were no problem. The cart machine could play content whenever it was loaded to two record ports, and two playback channels then played the recorded content in a continuous stream during the break. Clearly long-form content was not the intended use, and a few hours of content were a luxury.

Holistic systems rule today

Today, the mission of modern server systems is quite different. Full-length, long-form content as well as indeterminately short interstitials are mixed on a single timeline at will. Multiple channels, with seemingly no limits, can be added to storage systems that combine high-performance online storage with nearline spinning disk and offline robotic high-capacity archives. The holistic system is scalable from small edge servers built into network distribution systems to large systems providing content storage and management for major network facilities serving many channels.

Ultimately, this has driven development from digital islands into large IT-centric networks, with storage models adapted from mainstream IT approaches. There are, however, some aspects of server technology that are distinctly different from other IT applications. First is the isochronous nature of video. A delay in the delivery of your bank balance over a network is hardly noticeable, but jitter in data delivery to video playback will crash decoders in a heartbeat, literally. This puts unforgiving requirements on a video server's throughput. Data is usually striped across multiple drives, often in complex approaches, to assure sufficient bandwidth is always available to delivery data to outputs.

Another significant change is the evolution of file-based workflow. When content is produced using nonlinear editing, it is natural to want to deliver the files to playout channels without resorting to decoding to baseband video and reingesting in the playout system. It has been a long technological struggle to reach the point where interchange of file-based content between production and playout servers is practical, but with MXF, standardized by SMPTE, and the work being done by the Advanced Media Workflow Association, we have finally "arrived." Now it is common to directly mount editing platforms on the same storage system that serves playout ports, with edit-in-place capability, saving even the need to move files between storage systems.

We are approaching the time when spinning disk may be replaced by enormous pools of nonvolatile memory. This can provide superior access times, lower power consumption, lower maintenance and, thus, lower cost of ownership, though with high initial capital cost today. Using flash memory disks for high-performance local storage may be best accomplished with nearline pools of spinning disk to hold sufficient content, thereby making it a practical system. This might sound similar to the cache function that early servers performed for analog cart machines. It's funny how that concept will not die.

Future capabilities

Much can still be done to improve video servers in the future. Most, though not all, systems still rely on hardware codecs. At one time, encoding and decoding required too much processing power for software

codecs to be practical. However, as the power of processors increases, with dual quad core advanced processors readily available in desktop machines, it is quite practical to execute complex encode and decode processes without dedicated hardware. These improvements are arriving just in time to enable advanced codecs, like full-featured H.264 implementations, in software. This should allow performance to continue to increase without churning hardware in ways accountants find repugnant (engineers often see this as less of an issue).

As the nature of servers has switched to a distinctly IT-based approach, it is tempting to look for other processes that can be combined in logical ways in playout servers. For almost a decade, a friend and client, Del Parks, has preached to me that we need to stop looking at servers as different from computer platforms. Though I have always agreed with Del in principal, we have reached the cusp of a time when it is imminently possible to add more functionality to servers, rendering them as the complete playout channel rather than just a source to playout channel. There is no technological reason servers cannot add graphics, perform image manipulations and integrate live inputs. Several companies deliver systems often thought of as integrated content management boxes, but is it just as practical to look at them as highly optioned video servers. At NAB this year, there were several developments along that continuum.

Approaching the Holy Grail

In the end, servers should be considered both content management and playout systems, because both functions are central to the systems into which servers are built. As we approach the time when moving recoding mechanisms, including both tape and optical disk, disappear from common use, it may be beneficial to use networked storage for all recording. Instead of video recorders for each ISO in a studio shoot, at a cost of tens of thousands of dollars per device, we can now use ports on a large server implementation at a fraction of the cost.

In the balance, the ability to manage the life cycle of the content is facilitated. The total workflow, from production to post and on to air, can be done with different appliances attached to a central library recording and media asset management system. As we approach that Holy Grail, we are on the right path. BE

John Luff is a broadcast technology consultant.

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

Tetra VIO — Analog Way

Universal device functions as a scan converter, scaler, standard converter with TBC, audio embedder/de-embedder, switcher and interface; can convert any high-res up to 2K; with HDCP compatibility, accepts formats from computer to video and HDTV in analog or digital; connectors include BNC, HD15, DVI, mini DIN4 and RCA; supports I/O types up to 2048 x 1080 RGB and 1600 x 1200 at 60Hz in analog RGB and DVI; features four analog audio stereo in and one out, as well as one digital S/PDIF audio I/O.

212-269-1902; www.analogway.com

WASP3D 2009 — WASP3D

Updated real-time, 3D graphics solution features new WASPi Mimosa and Drone Designer 2009; WASPi Mimosa allows users to present content on a touch-screen panel and offers various telestration tools, touch-based actions, and menu and other tools for building interactive scenes; Drone Designer module features new effects, including refraction, reflection, real-time shadows, bump map, x-ray and more; UBT feature enables virtually zero coding for creating basic data entry UI.

+91 120 4308 888; www.wasp3d.com

QR-EX3 Gold Mount — Anton/Bauer

On-camera mount allows Sony's PMW-EX3 to work with the Dionic 90 or Hytron 50 batteries, offering up to 6.5 and 3.5 hours of run time, respectively; comes standard with PowerTap connector, which provides for the powering of an on-camera light, wireless receiver or other 12V accessory.

800-422-3473; www.antonbauer.com

Code Fury/Hypnotica — Artbeats

Royalty-free CG background collections offer more than 50 background displays; available as HD or SD formats and as individual clips or complete collections; Code Fury features 29 clips resembling optical illusions in motion; Hypnotica includes 25 clips of brightly colored, swirling geometric shapes.

800-444-9392; www.artbeats.com

Light Weight Support — Chrosziel

DSLR camera support system provides easy access to all sides of the camera, monitor and external microphone I/Os, memory card and battery case, which can be opened without dismounting the camera; enables users to adapt the optical axis of the DSLR camera to the video standard.

818-972-2839; www.chrosziel.com

DaletPlus v3.0 — Dalet

Updated media asset management system features transparent support for SD/HD formats, CG production directly in Dalet Media Cutter timeline, desktop previews of video and graphics from any workstation, automated playout of graphics as secondary events and video ingest solution based on IT-based servers; third-party technology support includes SeaChange video servers and Data Direct Networks shared storage.

212-269-6700; www.dalet.com

DVI-7510a Coax Extender — DVIGear

Coax extender supports HDMI v1.3 data rates up to 10.2Gb/s at distances up to 330ft (100m) with no loss of audio or video quality; uses auto-adaptive technology to adjust for varying cable lengths; supports 1080p displays and up to 1440p; consists of DVI-7511a, a transmitter that accepts HDMI input signal and converts it to four coax signals, and DVI-7512a, which accepts these four signals and converts them back to an HDMI output signal without conversion artifacts.

888-463-9927; www.dvigear.com

Exstreamer-100/110 — Barix

IP audio decoders built around audio-over-IP distribution; receive audio from a central location and decode it for playback at branch locations; support aacPlus v2; Streaming Client firmware option enables playback of locally held, encrypted content from a USB stick; 110 adds backlit 2 x 16-character LCD to display stream metadata or file information and introduces a built-in relay.

866-815-0866; www.barix.com

RFX-GL series — RF Central

Family of digital fixed links offers the use of different boards, allowing the units to accept analog video, E3, EI (4x), ASI or SDI inputs with the option of mixing signals together and sending all signals over a single link; available in 2GHz, 7GHz, 13GHz, 18GHz and 23GHz links; capable of high capacity up to 155Mb/s; configurable with either internal RF modules or RF outdoor units.

717-249-4900; www.rfcentral.com

ClipWrap 1.1 — Divergent Media

Mac application batch converts M2T files into QuickTime files by placing video data within a QuickTime container, leaving the original content intact; transcodes M2T files from native HDV into ProRes, Apple Intermediate, DVCProHD or DNxHD formats; adds downsampling to DV; doesn't require Final Cut Pro on the rewrap machine.

888-632-0904
www.divergentmedia.com

CS-7/ML-7 — Eyeheight

Control software includes a visual alarm on the display screen that notifies the operator if an attached device is being controlled from another computer; automatic network scan enables the identification of all connected products; single-display interface allows simultaneous status checking and multiproduct control; CS-7 single-license allows a chosen module to be controlled, while the ML-7 allows five or more modules to be controlled from a single GUI.

623-328-5800; www.eyeheight.com

Feedbuilder_News — BUG.tv

Graphics automation system increases the delivery speed of motion graphics, bumpers and teasers with embedded audio for news production; integrates MOS requests from news automation systems, art department graphic production and news production switchers into one seamless workflow; works with iNews, ENPS, Norcom and others to simplify taking MOS single- or multichannel graphics requests and sending them to the art department.

866-387-4679; www.bug.tv

16GFC SFP+ — Gennum

Integrated circuit solution enables development of SFP+ modules using the same form factor and pin out as previous 8GFC solutions; designed to offer a low-cost, low-power approach that can ease the migration to 16GFC data rates; consists of a clock and data recovery (CDR) IC with integrated limiting amplifier; a CDR with integrated equalizer/laser driver IC and a transimpedance amplifier.

905-632-2999; www.gennum.com

HVD6100 — NTT Electronics

Professional 4:2:2 integrated receiver decoder supports HDTV/SDTV, AVC/H.264, and MPEG-2 and 4:2:2/4:2:0 chroma; equipped with DVB-S2/DVB-DSNG/DVB-S demodulator that supports QPSK/8PSK and 16APSK/32APSK in DVB-S2, and CCM and VCM; provides HDTV to SDTV downconversion, 1080i or 720p to 576i or 480i; audio I/Os and formats include SDI embedded, AES-3id and analog; includes built-in Ethernet interface for IP communications.

201-556-1770; www.nel-world.com

MediorNet — Riedel Communications

Network system combines signal transport, routing and signal processing, and conversion into one integrated real-time network; each MediorNet mainframe provides a router for 32 x 32 720p/1080i signals, 184 x 184 SD-SDI signals, 27,000 x 27,000 AES signals or any combination of these; its open network topology supports ring, star, daisy-chain or any combinations; offers Link Cards with and without integrated CWDM multiplexing to network MediorNet mainframes with a bandwidth of up to 153Gb/s on a single fiber link.

818-241-4696; www.riedel.net

StereoBrain Processor (SB-1) Inition

HD video processor allows live viewing from a stereoscopic camera pair or other 3D video source on any of the current breed of 3D televisions; enables live 3D viewing and manipulation in post production for any 3D pair of HD-SDI sources; outputs pair of images via a single DVI/HDMI signal in interlaced or side-by-side configuration; can output overlayed left/right on a standard 2D HD monitor.

+44 20 7613 5004; www.inition.co.uk

MiniBlox 4206 — ISIS Group

Reclocking video distribution amplifier operates with all SDI standards from 270Mb to 3GHz; features automatic input cable equalization; provides six reclocked outputs; powered by an individual in-line power supply; rack-mountable up to five units in a 1RU frame or 14 in a 2RU frame.

888-622-4747; www.isis-group.com

MagicSoft Playout — MagicSoft

Playout software can use SD (including PAL at 720 x 576 and NTSC at 720 x 480), HDV and full HD materials in the same playlist; works with Blackmagic Design's DeckLink or Intensity cards; supports 8-bit, 16-bit, mono and stereo audio as well as sampling rates from 8000Hz to 48,000Hz; integrates with third-party nonlinear editing software, including Premiere, Final Cut Pro and Avid; verifies clips in client application before being accepted for playout.

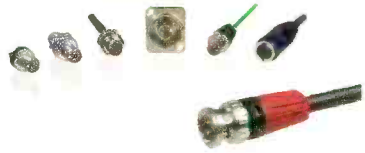
702-275-6353; www.magicsoft.tv

kleer colour — Gekko Technology

Adjustable, focusable, single-source, multicolor light engine uses a single-array, high-power LED that can be tuned under software control to produce millions of different color temperatures; can emulate a high-quality tungsten reference source and be switched to produce 2900K, 3200K, 4300K, 5600K and 6500K, in addition to a range of color gels.

+44 1926 863 366
www.gekkotechnology.com

rearTWIST BNC — Neutrik



BNC connectors show return loss values up to 4.5GHz and jitter-free transmission, even with uncompressed HD 1080p signals; feature a machined body with a 75Ω design for HDTV/DVD requirements; rear boot color-coding options are available with the BST-BNC.

732-901-9488; www.neutrik.com

CRUCIS — ERI

VHF panel antenna can be configured for LPTV, Class A and TV translator applications as well as Band III digital services such as DMB, DAB and DVB; constructed of brass and copper with stainless steel reflectors and brackets; available in an array of configurations for omnidirectional and directional applications.

812-925-6000; www.eriinc.com

Ditty Bag — Petrol

Lightweight carrier comes equipped with internal removable divider and tool pouch; features multiple loops and pockets of different sizes, cold-molded laminate bottom, auxiliary strap with hook, padded neoprene shoulder strap, removable handle, nylon rain cover and external pocket; constructed of heavy-duty black and blue Cordura.

845-268-0100; www.petrolbags.com

FSB 8 — Sachtler

75mm fluid head supports a 20lb max payload; designed for lightweight DV-CAM and HDV camcorders; features a 10-step counterbalance and five grades of horizontal and vertical drag; provides high precision and fast counterbalance; reduces minimum payload for a head; compatible with SOOM tripod system and FSB CELL power supply.

845-268-0100; www.sachtler.us

DELTA-stat — DELTACAST

Real-time, on-air 3D graphics system consists of a DELTACAST board and a custom GUI to automate the appearance of timers, stats and animations during live sports coverage; manages all graphics to overlay during the game; provides internal or external keying; operable in HD or SD; integrates user-provided graphics chart for customized system.

702-275-6353; www.deltacast.tv

EXII 0.45X Super Fisheye — 16x9

New design allows lens to fit a wider variety of cameras without vignetting; mounting options include threaded 62mm, 72mm, 77mm and 82mm as well as multiple bayonet mounts; adds a full .45X magnification; features 23mm length and 115mm front diameter.

866-800-1699; www.16x9inc.com

FxFactory v2.0.6 — Noise Industries

Updated post-production software works with After Effects CS3/4, Final Cut Studio and Final Cut Express application; features thumbnail previews, block dissolve to reveal variable-sized blocks in the destination image, banding-free gradient generator, working color space with select plug-ins and added support for hardware-accelerated anti-aliasing in plug-ins running inside Final Cut Pro, Motion and Express; allows plug-ins to perform high-precision rendering on systems with low available video memory.

415-401-7382
www.noiseindustries.com

OpenMedia v3.6 — Annova Systems

Updated newsroom system adds story bin feature to enable users to systematically link together all scripts, assets and resources relative to a specific story; system then trails these assets across the workflow to ensure consistent tracking of allocated resources and produced outputs; can automatically forward information to a third-party enterprise resource planning or data warehouse system; facilitates real-time reporting of engaged costs and budget allocations.

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

Mediator 4 — Pharos

Updated broadcast workflow management platform features compliance workflow, Web browser-based user interface, advanced search tools, management metrics, reports and dashboards; manages the preparation and transcoding of content for multiformat VOD, mobile and podcasting services alongside traditional playout.

+44 118 950 2323; www.pharos.tv

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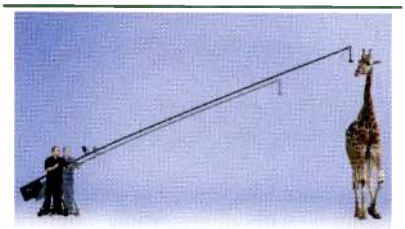
7th Heaven — **Polecam**



HD/SD camera jib arm spans up to 26ft from its pivot; retains quick setup and dismantling capabilities as well as internal cable ducts to allow wiring to be routed inside the rig; compatible with all standard Polecam accessories, including heads, HD/SD cameras, CCUs and recorders; existing five-section Polecams can be retrofitted with new high-rigidity 26ft boom plus two new counterweights and a replacement strain relief strap.

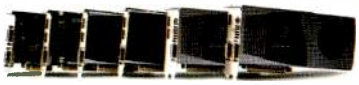
323-633-7033; www.polecamusa.com

Cougar 3GEN — **QuStream**

Video router offered in 32 x 32 or 16 x 16 configurations; supports all SMPTE standard data rates from 143Mb/s to 3Gb/s with auto-equalization on all inputs, as well as a 10/100 Ethernet control; features auto-rate sensing, reclocking and front-loaded, hot-swappable active circuit elements; provides two independent reference inputs, each capable of accepting analog black burst in NTSC or PAL formats as well as HD trilevel sync; can be equipped with single or dual internal power supplies and internal single or dual system controllers as options.

800-328-1008; www.qustream.com

Quadro FX 5800 — NVIDIA



Professional graphics solution features 240 CUDA parallel processing cores, a 128-bit precision graphics pipeline, 64-bit floating point precision, 4GB GPU memory and bandwidth of up to 102GB/s, advanced color compression, fast 3-D texture transfer, frame sync and full-scene antialiasing.

408-486-2000; www.nvidia.com

AG-HMC40 — Panasonic

Camcorder features full HD 3MOS imagers, high-res 10.6-megapixel still photo capture, 12X optical zoom and solid-state AVCHD recording on widely-available SD cards; uses MPEG-4 AVC/H.264 high-profile encoding; records in all four professional AVCCCAM recording modes, including the high-quality PH mode, the HA mode (approx. 17Mb/s), the HG mode (approx. 13Mb/s) and the extended recording HE mode (approx. 6Mb/s); supports 1080/59.94i (in all modes) and 1080/29.97p, 1080/23.98p native, 720/59.94p, 720/29.97p and 720/23.98p native (in PH mode only); using one 32GB SDHC memory card, users can record three hours of full resolution 1920x1080 video and audio in PH mode, four hours at HA mode and 5.3 hours at HG mode.

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

LevelTrack Audio AGC — Ensemble Designs

Adds a user-configurable audio level management system to Avenue signal processing modules; automatically monitors the levels in up to eight audio channels; based on the history in each channel, gradual changes are applied to prevent the audio level from dropping below or exceeding user programmable thresholds; this automatic level control can be applied on an individual channel or stereo pair basis.

530-478-1830; www.ensembledesigns.com

Duende Expanded/Studio Pack — Solid State Logic

DAW plug-in collection comprises the Channel Strip, Stereo Bus Compressor, Drumstrip, X-EQ, X-Comp and Vocalstrip; available in three new packages: Mini Expanded includes Duende Mini, Channel Strip, Bus Compressor and 16- to 32-channel upgrade; Mini Studio Pack includes Duende Mini, Channel Strip, Bus Compressor, 16- to 32-channel upgrade, Drumstrip, Vocalstrip, X-EQ and X-Comp; PCIe Studio Pack includes Duende PCIe, Channel Strip, Bus Compressor, Drumstrip, Vocalstrip, X-EQ and X-Comp.

+44 1865 842300; www.solid-state-logic.com

Boris Continuum Complete 6 AE — Boris FX

Updated graphics system features new filters, including extruded text, extruded spine, type-on text, layer deformer, smooth tone, DV fixer and pixel fixer; supports After Effects' camera and lighting system, the import of After Effects mask paths into BCC 6 AE, saving and loading of XML-based animated presets, and motion-tracking data import and export in an industry-standard format; includes a single-click custom preset navigation tool.

888-772-6747; www.borisfx.com

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A test pattern for DTV

Sarnoff's new test pattern is a DTV Swiss Army knife.

BY ANTHONY R. GARGANO

Making its original debut in 1939, it seems only fitting that the legendary tried and true Indian Head test pattern (See Figure 1), originally developed by RCA, is now being replaced by a test pattern developed by Sarnoff. Originally founded as RCA Laboratories, it was the advanced research and development center for TV pioneer RCA. It was subsequently renamed the David Sarnoff Research Center (DSRC), and, with the acquisition by GE in 1986 and the subsequent breakup of RCA, DSRC became a separate entity called the Sarnoff Labs.

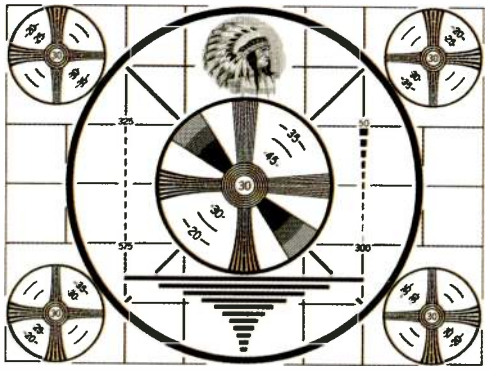

Figure 1. Original RCA Indian Head test pattern

But, let's go back to the present and the era of digital television. Along with the advancements in technology is the inherent complexity associated with those advancements. If you think about it, examples abound all around you. Digital television is not an exception to this rule. From the original capture of content and throughout the various stages of processing and ultimately transmission of that content, the opportunity to introduce errors into the bit stream that represents the original content is manifold. The simplicity of analog video and transmission is a bygone, much like bandstand music emanating from a public park on a Sunday afternoon.

As an aid to recognizing and solving the problems that can be introduced by the complexities of digital video, Sarnoff has developed an extremely comprehensive DTV test pattern called the Visualizer. (See Figure 2.)

An apt name, the Visualizer can reveal potential problems that may have been introduced by the various workflow processes to which the content was subjected. My own personal pet peeve, lip sync problems, can not only be identified, but also the offset from video can be precisely measured simply by viewing which of the "sprocket holes" in the lower portion of the test pattern is white. The solution is simple but effective.

Figure 2. Sarnoff Visualizer DTV test pattern

Notice the offset color bars in the test pattern? The ramps in the green and magenta bars allow you to easily check 4:2:2 and 4:2:0 chroma sampling phase. Does the colorimetry of the content not seem quite right? The color spaces of HD standard Rec. 709 and SD standard Rec. 601 are different. If content conversions between HD and SD are not appropriately matrixed, the end result of the process is a color matrix mismatch, and it is instantly identifiable using the DTV test pattern. Are there strange motion artifacts in the content? A common cause is field dominance errors, which are also easily identifiable with the Visualizer.

Those mentioned above are just a few of the more commonly identified problems that this new test pattern can help you quickly spot. In addition, it can help you discover compression artifacts, linearity and gamma, and dropped frames, along with another dozen potential DTV problems.

Before retiring my familiar Indian friend, the engineer who developed the Visualizer conducted a demo for me, and I was impresed. He referred to it as his DTV Swiss Army knife. Victorinox, the originator and manufacturer of the Swiss Army knife, achieved one of its highest accolades when, in recognition of its unique design, New York's Museum of Modern Art (MOMA) added a Swiss Army knife to its collection. The Visualizer may not make it to the MOMA, but it may find a welcome home in TV stations and facilities. **BE**

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

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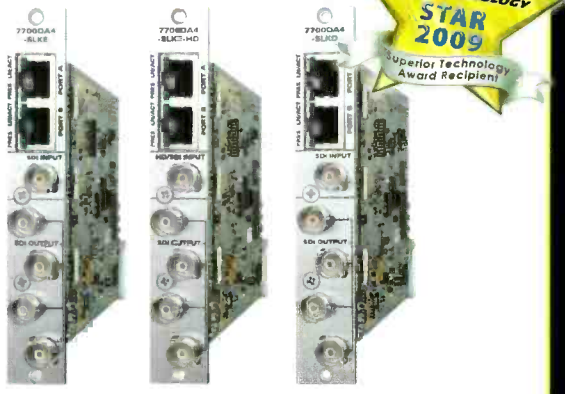

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