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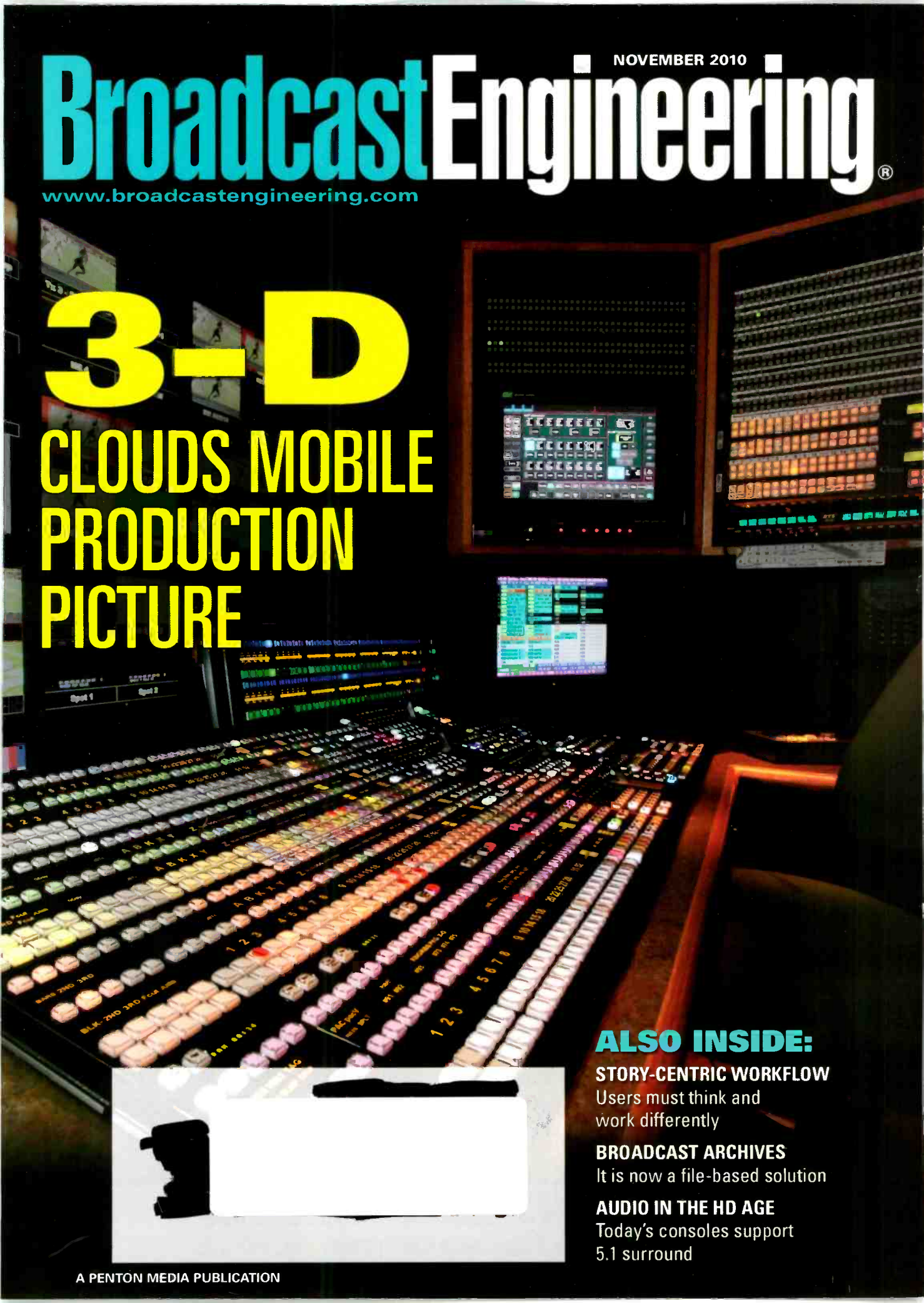

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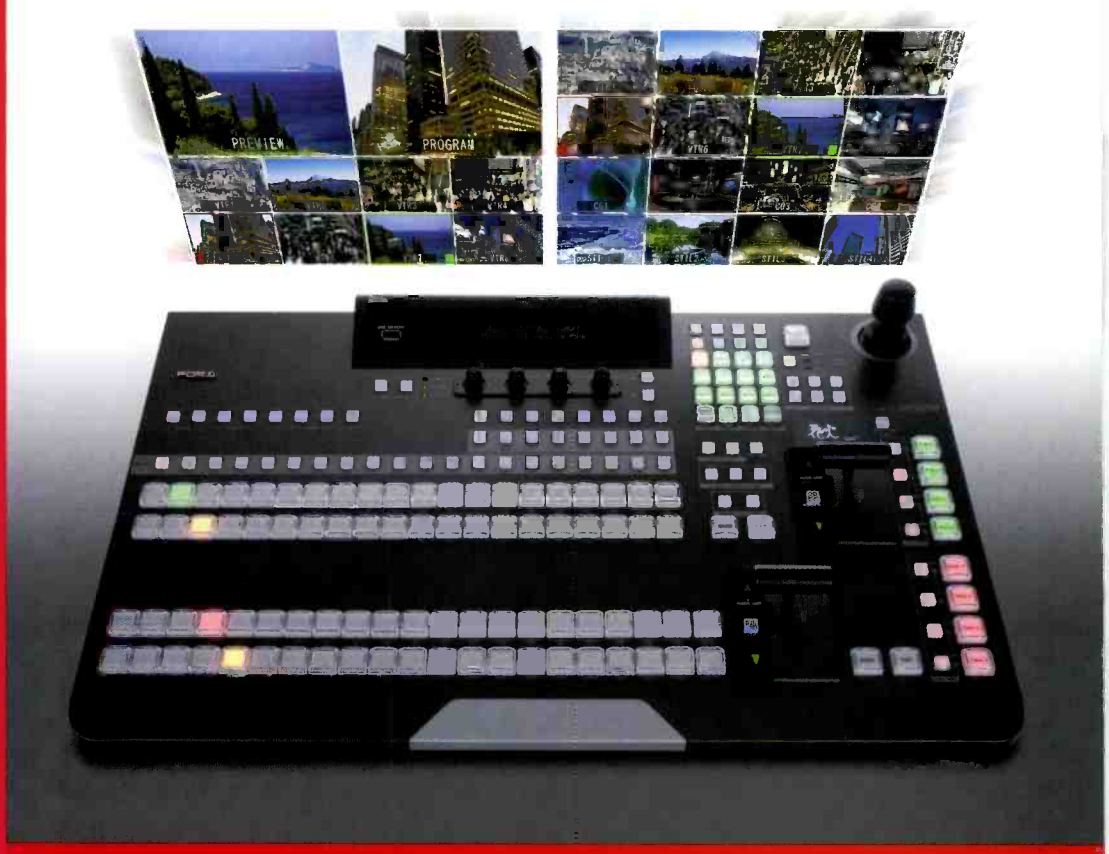

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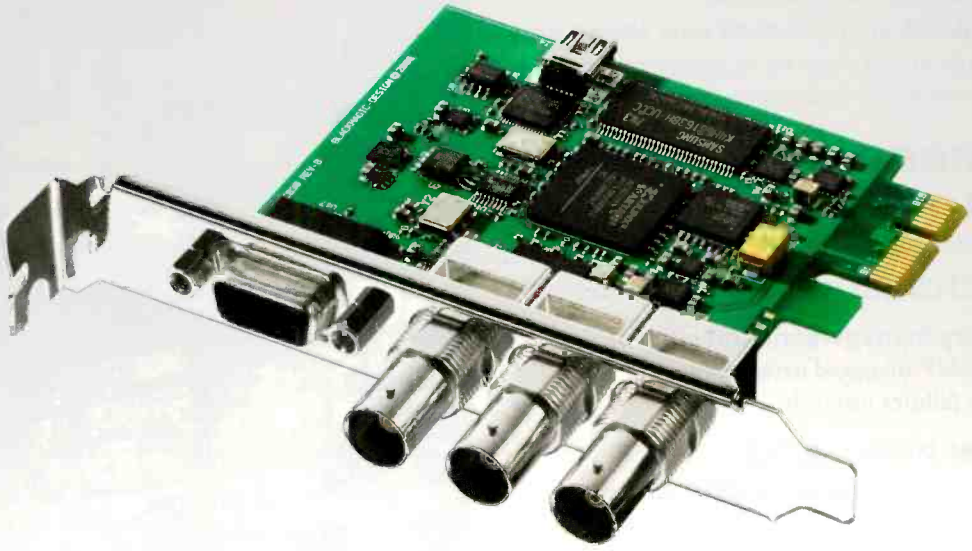
ON THE COVER:
Shooting in 3-D requires a larger production crew, making it more expensive. Shown here is Grass Valley's Kayenne Video Production Center switcher onboard a Game Creek Video production truck.

Blackmagicdesign



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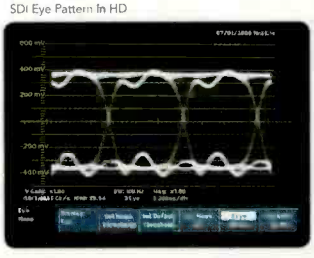
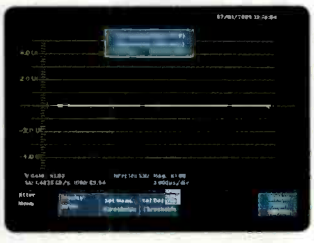
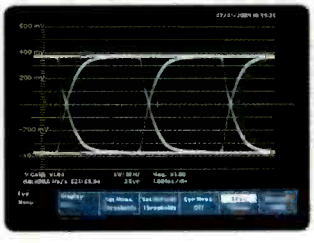
SDI Eye Pattern In HD



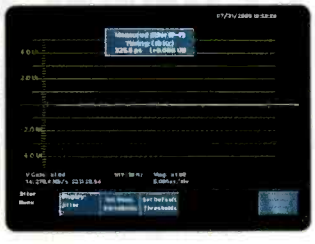
SDI Jitter Performance in HD



SDI Eye Pattern In SD



SDI Jitter Performance in SD



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DEPARTMENTS

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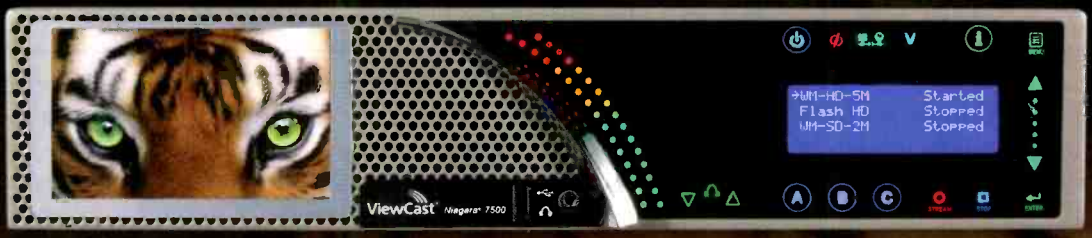

It's easy to be enticed by the alluring good looks of the Niagara® 7500 – the newest HD streaming solution from ViewCast. On the outside, its sleek, innovative design and responsive touch-control interface will excite you. Its brilliant high-resolution HD display will dazzle you. But on the inside, it's a beast.

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The best of times, the worst of times for 3-D

If one were to judge the importance of 3-D stereoscopic equipment by the exhibits and hoopla at either NAB or IBC this year, the conclusion might be, "Wow!" Virtually every exhibitor with video production and distribution products claimed to be in the 3-D space with solutions. If you privately asked these same vendors what they thought about 3-D, however, quite a different perspective is often found. It's one thing to portray a company as highly involved in 3-D while at a show; it's quite another to actually bet its future on the technology.

No doubt 3-D movies continue to be hot-ticket items. According to Screen Digest, 80 percent of the $749 million in box office receipts for "Avatar" came from the 3-D version. About 50 percent of the revenues from both Disney's "Up" and Warner's "Clash of the Titans" were sourced to 3-D theaters. U.S. broadcasters Discovery, ESPN and DIRECTV have launched 3-D TV channels, and both Virgin and BSkyB launched 3-D broadcasts in the UK in late September. Add to that the stereoscopic tsunami from all of the 3-D TV sets being released, and one might conclude that 3-D is here and now.

Maybe.

In response to my question about the importance of 3-D TV technology, at Grass Valley's IBC press conference, the company's senior vice president, Jeff Rosica, stated the obvious, "We don't make televisions." He continued by reinforcing the point that Grass Valley would continue to support customers who needed 3-D solutions but characterized much of today's 3-D production work as still "experimental." He's right: We don't yet have a complete set of 3-D standards.

As confirmation of his viewpoint, Rosica's comments were echoed by every IBC vendor to whom I asked the same question. The bottom line for the production equipment vendors is that they will provide 3-D solutions as requested by their customers, but these vendors aren't betting their company's future on 3-D products — at least not yet.

Broadcasters and content producers also can take with a grain of salt the shouts from the consumer electronics industry about the huge success of 3-D TV sales. A report from DisplaySearch says that only 5 percent of TVs sold this year have 3-D capability. Yes, it's early in the product development and sales cycle, but with all the CES hoopla, I expected a more rapid adoption rate. Certainly there are plenty of 3-D sets available.

One problem is that 3-D content is scarce. You only need about 6in of shelf space to stock all the 3-D movie titles now available. Screen Digest says that while about 25 3-D movies may become available over the next year, only a half dozen are now available in the United States. In fact, the official Blu-ray website lists only four 3-D titles.

Despite all of these challenges, I'm a big fan of 3-D TV. Oh sure, I know you have to wear those funny-looking, dark glasses, and you're locked into a fixed viewing position. But after a long day at the office, I can think of nothing better than sitting in my darkened home theater, cold beverage on hand, a 3-D title on the big screen, wearing those weird glasses and — snoozing.

With today's required 3-D eyewear, no one knows if I'm watching TV or just taking a nap. BE

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

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Mobile TV

Readers had much to say regarding an Oct. 25 article about mobile TV, "Mobile DTV: A technology in search of a business model."

Dear editor:

$130,000 to ensure that viewers keep watching? Sounds like a cost of doing business! If a klystron went out, you'd replace it and not sweat the business model.

Doug Ferguson

Dear editor:

Broadcasters: Stop [messing] around and just have this be a successful free-to-air service. Nobody is going to pay for premium service. Dumb in-car systems won't have the ability to enter any subscription IDs.

Joseph Fiore

Dear editor:

The business model is to have your salespeople go out to the world and sell it. Include it in a current buy if you have to, but sell it. Present the case for why people will accept advertising with the service and collect the check.

If everyone is so enamored with it, then build the subscriber base necessary and then sell against it. Unless you can't. Only a dunce thinks it's the technology or that people will love it for free. Maybe the salespeople are too stuck in their ways to switch hats and think like an advertiser. If you owned your own company and you wanted to sell your product, would you spend money on mobile television?

Jbvick

Video routers Q&A

Broadcast Engineering's Sept. 21 webcast "Video routers" generated a slew of questions from attendees. Here are some selected questions and answers from the presenter, John Luff. To view the on-demand version of the webcast, visit *http://broadcastengineering.com/webcast*.

Q: What are the routing considerations to handle 3-D in the studio? Is this a bandwidth issue or dual paths?

A: Excellent question! At this time stereoscopic 3-D production is done primarily in two formats. The most easy to understand, and the closest to the origination, is discrete left- and right-eye signals, most commonly both 1920 x 1080i30/50 on SMPTE 292 infrastructure. This requires routing two signals with a single selection, which can be done with a macro or salvo command. In the future, 3G-SDI (1080p60) signals will become common.

The other format often used is to time domain multiplex the two signals on one HD signal, with side-by-side or over-under combinations. This allows a single wire to carry both channels, and it fits perfectly in any SMPTE 292-capable router. Obviously, this reduces the resolution when sent to the home, but it works in common infrastructure.

Q: Why do most router control interfaces still use RS-232/485 and not Ethernet?

A: A high percentage of new routing systems use IP connections for all control. There remain many legacy products that use other communications methods, but I would expect that they will disappear in coming years.

Q: What is the direction of the industry in dealing with consumer digital transmission formats such as HDMI and the new VESA standard, DisplayPort? What about digital rights management?

A: The output from routing will eventually have to accommodate many of the interfaces you mention. Today, specialized hardware interfaces convert SDI (HD or SD) signals to display input standards. However, in the sense that multiviewers are routers or extensions of routing, they often have HDMI or other display outputs natively.

Q: Could you discuss the tie line configuration to get more inputs /outputs with two smaller routers?

A: Using small routers connected with tie lines, managed in software, often works and can reduce cost, but it needs to be well-planned. For instance, in the extreme, a pair of 10 x 10 routers connected by five tie lines in both directions uses 50 percent of the capacity for the tie lines, but will not "block," i.e. all signals can be available to all outputs. But the net effect is that of a single 10 x 10 router. The key is to decide if nonblocking is a requirement or whether the resources can be managed on a probable-use basis like public switched telephone networks, where on average everyone can make calls because not everyone will make a call at the same time. **BE**

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Audio in the HD age

Stereo still reigns, but audio consoles can ease the transition to 5.1 surround.

BY STEVE ZARETSKY

Audio in the age of HD production has ushered in a host of challenges for broadcasters, production houses and educational facilities. Adding to these challenges, stations and production houses have become more reliant on novice engineers or nontechnical staff to meet increasingly complex programming demands. Audio product manufacturers have responded to these challenges with the release of digital audio consoles and stand-alone units for broadcast production that offer increasingly agile features to help support more intricate mix requirements.

Implementing 5.1 often mandates a major equipment upgrade by facilities, as the complexity of a mix situation involving simple stereo and 5.1 surround is best accomplished in a digital production workflow.

The ups and downs of 5.1

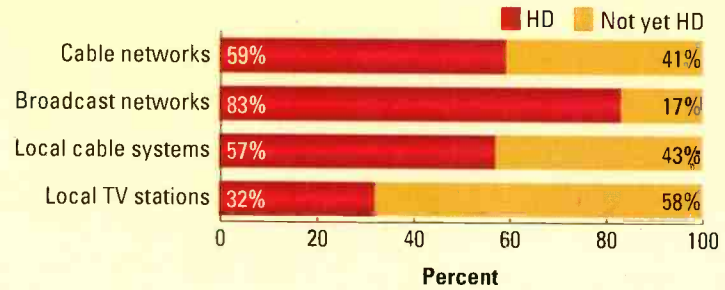
Implementing 5.1 often mandates a major equipment upgrade by facilities, as the complexity of a mix situation involving simple stereo and 5.1 surround is best accomplished in a digital production workflow. While the industry is romancing HD video quality with a hint of 3-D on the horizon, the stark realities and challenges of audio still lie with stereo mixes versus 5.1 surround mixes, both on the production side and the viewer side. Where the major broadcast facility, production house and feature studio have the resources and staffing to accomplish 5.1 audio, many local affiliates and smaller production facilities may only have the means for stereo. As a result, the segment of their viewership that is equipped for 5.1, such as home theater enthusiasts, will have to put up with being jarred from the fast-paced action and lively crowd noises of a sports program when the enveloping surround field collapses into a locally produced commercial in stereo.

Fortunately, manufacturers of digital consoles and stand-alone units offer 5.1 upmix products to help this situation along. The stereo-to-5.1 upmix algorithm essentially extrapolates information from an existing stereo mix to populate the front center speaker, the left and right surround speakers, and the subwoofer. For the local content producer working in stereo, this means all productions can match the surround capabilities of the network feeds, keeping the audio field consistent. This can also add new life into legacy productions or movie catalogs. Hitting a button on a digital console is far

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

HD adoption by key broadcast and cable media type

While 83 percent of broadcast networks deliver in HD, only 32 percent of local TV stations do.



Source: Extreme Reach HD Trends Report

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easier than contracting to remix a production. The good news is many of the available upmix products deliver believable results.

Despite the growing consumer interest in surround sound, most industry estimates place the market penetration of home theater systems in the mid-30 percent range, indicating that the majority of viewers are still only capable of hearing that fantastic surround track in simple stereo. This can be seen in that the much-desired, latest-generation flat-screen TVs still offer integrated stereo speakers. This market dichotomy ensures that stereo will reign supreme for quite a while. To this end, the digital audio console or stand-alone unit manufacturer that provides this 5.1 upmix algorithm must also deliver a phase-accurate stereo (and/or mono) downmix from an existing discrete 5.1 mix.

Some digital consoles offer automated 5.1 surround upmixing for facilities without experienced audio engineers.

The perplexities of panel discussions

Getting a handle on the delivery of simultaneous 5.1 and stereo feeds to viewers is a major component of successfully integrating surround in the broadcast workflow, but not the only one. Surround sound for panel discussions also presents new challenges. As with analog audio, having a panel with two or three members presents one level of difficulty, while adding more members, as with debates, raises the complexity level exponentially. For the engineer, the problem is dealing with how to make sure the right mic is on, and at the right level, in time for any particular speaker — all while maintaining consistent ambient noise levels for a clean listening experience. In the world of analog, this was accomplished through a combination of level gates, mind-bending concentration, quick reflexes and perhaps several cups of strong coffee.

With a digital console, engineers can use a DSP-based gating function on all mics to turn a channel on and off as before, but they still face the challenge of maintaining consistent background noise. When a gate is introduced to the signal flow, the action of turning the active mic on and off changes the ambient level balance in the stereo and surround fields, creating a "pumping" artifact that is unpleasant and distracting. Many engineers avoid this problem by setting an average fader level and manually upcutting a particular fader to present a consistent ambient field. This, of course, requires agility and some guesswork as to who might be speaking next. This might be manageable with a small number of participants speaking mostly in turn, but if there is a large number of participants, and they're arguing, it is a nightmare!

Getting a handle on the delivery of simultaneous 5.1 and stereo feeds to viewers is a major component of successfully integrating surround in the broadcast workflow, but not the only one.

What digital technology can offer is algorithm development to automate this process. This function can be found in some stand-alone units, or better yet, as a feature that is built into the mixing console. Engineers can now set optimum levels for multiple mics, and the algorithm takes over the task of riding the levels while maintaining a smooth ambient background. Engineers are released from the shackles of keeping their hands locked on the talent mic faders and are free to react to the director barking out instructions or to focus on the overall sound quality of a production, which was often not possible in the past.

It's an automated world

Station automation is a growing requirement in today's broadcast industry. Automation provides a variety of benefits, even enabling stations to maintain a high quality of production during nonpeak programming hours, with limited staffing. The challenges listed previously, and their all-important solutions, are highly valued when operating within an automated environment.

With these advancements in digital console technology, a station's automation system can trigger a setup that would recall all the necessary parameters for a perfect stereo to 5.1 upmix, along with "hands-off" mic leveling, to provide a clean, tight sound field for viewers during the wee hours of the morning.

As the broadcast industry continues to recast its technology mission to accommodate 3-D and beyond, audio manufacturers are helping this change by providing innovative solutions to aid all levels of the industry. BE

Steve Zaretsky is vice president broadcast sales for Solid State Logic.

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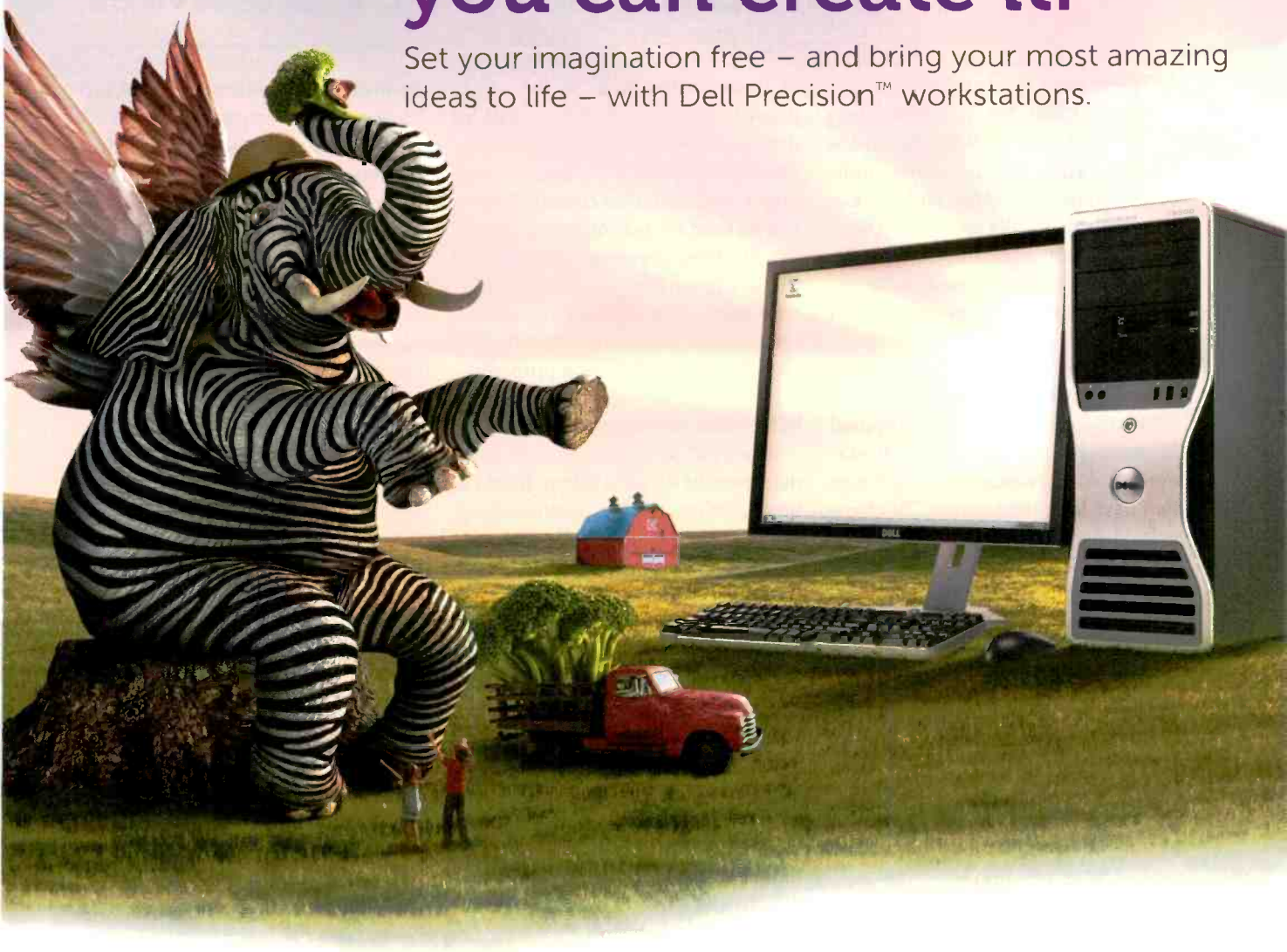

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White-space rules

The FCC approved deployment of white-space devices.

BY HARRY C. MARTIN

The FCC has ruled on 17 petitions for reconsideration of the TV white-space rules. This action allows unlicensed Wi-Fi networks and devices to operate on locally vacant TV channels. Companies such as Google, Microsoft and Dell told the FCC to expect hot spots and campus networks to emerge as a result of the rulings.

Interference prevention

White-space devices are supposed to avoid interference with TV stations and the wireless microphones that have long used vacant TV channels. The original plan called for each device to use both geolocation — ascertaining its own position using GPS and consulting a database to find locally vacant channels — and engage in spectrum sensing on the ground. The new decision confirms the geolocation requirement, with many critical details still to be announced. But the FCC has pulled back on sensing. When it tested spectrum-sensing technologies several months ago, none of them worked well. So the agency dropped the sensing requirement for devices that use geolocation. Sensing-only devices are still allowed, but only under rigid technical constraints that will be hard for manufacturers to satisfy. Database checking will usually be the sole feature for avoiding interference, so the FCC promised a rigorous certification procedure to ensure devices handle this function properly.

Wireless microphones

The FCC struggled to accommodate users of wireless microphones in broadcasting, theater, moviemaking, sporting events, and public gathering places like churches and auditoriums. It will reserve two TV channels in each geographic area for wireless microphones, which will accommodate 12 to 16 microphone voice channels. Microphone operators who may need more devices for an event can request to have specific events entered into the white-space database, which should automatically keep white-space devices away. Requests to protect unlicensed microphones must show that the channels free of white-space devices cannot do the job.

No protection for STAs

To assure the required protection of TV broadcast signals, white-space devices will consult a database to determine which TV channels can be safely used at the device's location. The devices may have to change channels as necessary from time to time. Since the selection of vacant channels will be a dynamic process, the FCC wants to make sure that only channels actually in use by TV stations are marked as off-limits. The new rules provide that the white-space database need only to recognize granted or pending license applications for both full- and low-power TV stations. STAs are not mentioned and will not receive protection. Operation pursuant to an STA is commission-authorized broadcast operation that should be protected from white-space devices to the same degree as licensed operation.

Retransmission protection

TV translators, LPTV stations, cable systems and other multichannel video programming distributors are still not fully protected. If a white-space device goes into operation near one of these facilities, it could block the facility's ability to pick up the TV signal it is retransmitting.

Under the 2008 white-space rules, all facilities that retransmit a TV signal using over-the-air receive sites within 50mi from the received station's transmitter site (but not within the station's protected contour) could register in the white-space database and obtain protection. In the commission's newly adopted rules, receive sites located more than 50mi from the edge of the received station's protected service contour may submit waiver requests seeking registration of their sites, but protection is not automatic.

Implementation

The effective date of the new rules will not occur any earlier than 30 days after the new rules have been published in the Federal Register. But it is likely that the FCC will not invite new registrations (or registration waiver requests) until practical questions related to the white-space database have been resolved. For example, who will manage the database, how will registrations be submitted, and how will the database be implemented? BE

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

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

Dateline

- Noncommercial TV stations in Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont must file their biennial ownership reports by Dec. 1.
- By Dec. 1, TV and Class A TV stations in the following locations must place their EEO public file reports in their files and post them on their websites: Alabama, Colorado, Connecticut, Georgia, Maine, Massachusetts, Minnesota, Montana, New Hampshire, North Dakota, Rhode Island, South Dakota and Vermont.
- Dec. 1 is the deadline for TV stations in Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont to electronically file their broadcast EEO midterm reports (Form 397) with the FCC.

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Video compression technology

The quest for encoding efficiency continues.

BY ALDO CUGNINI

The MPEG-2 and MPEG-4 standards are now at a relatively mature stage. At the same time, new implementations of MPEG-4 are still on the rise, especially using H.264/AVC. Both ATSC and DVB-T support this more efficient compression standard (with newer receiving devices, such as mobile displays), and newer codecs are emerging in a growing number of video applications. While MPEG-2 and AVC are now ubiquitous in broadcast, cable and satellite distribution, other codecs have found an equally widespread home for the distribution of video over the Internet. Because we are seeing more applications that cross the various media, it is useful to understand the makeup of these various codecs.

Most compression systems have similarities

All compression systems function by removing redundancy from the coded information, and the highest amount of compression is almost always achieved by lossy coding, i.e., the decoded information, while presenting a faithful version of the original information does not produce an identical set of data. Essentially, most video codecs today function by reducing the information content of video in three ways: spatially, temporally and logically.

All compression systems function by removing redundancy from the coded information, and the highest amount of compression is almost always achieved by lossy coding.

Spatial video content (in the horizontal/vertical image dimensions) is compressed by means of mathematical transforms and quantization. The former remaps the video pixels into arrays that separate out detail information; the latter reduces the number of bits required for each transformed pixel. Temporal video content (in the time dimension) is compressed by means of residuals and motion estimation, and in some codecs, by quantization as well. Residuals reduce information by coding differences between frames of video, and motion estimation provides data reduction by accounting for the movement of pixel "blocks" (and groups of blocks, i.e., macroblocks) over time. Logical content (i.e., strings of codewords representing spatial and temporal content) is further compressed by using various forms of entropy coding and/or arithmetic coding, which remove information by efficiently coding the strings in terms of their statistical likelihood of occurrence.

Each MPEG standard is actually a collection of different tools and operating parameters, grouped into levels and profiles. The level typically defines the horsepower needed for decoding the bit stream, as defined in macroblocks per second (or per frame) and the overall video bit rate. Profiles are used to group the different tools used during encoding. For example, MPEG-2 Main Profile @ Main Level is sufficient to encode SD digital TV broadcasts, while MPEG-2 Main Profile @ High Level is needed to encode HD video.

FRAME GRAB

A look at tomorrow's technology

HD receivable U.S. TV households top 50 percent

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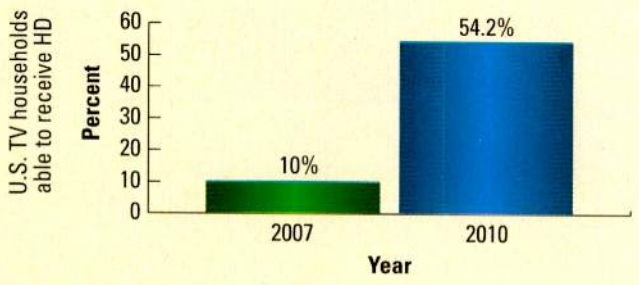

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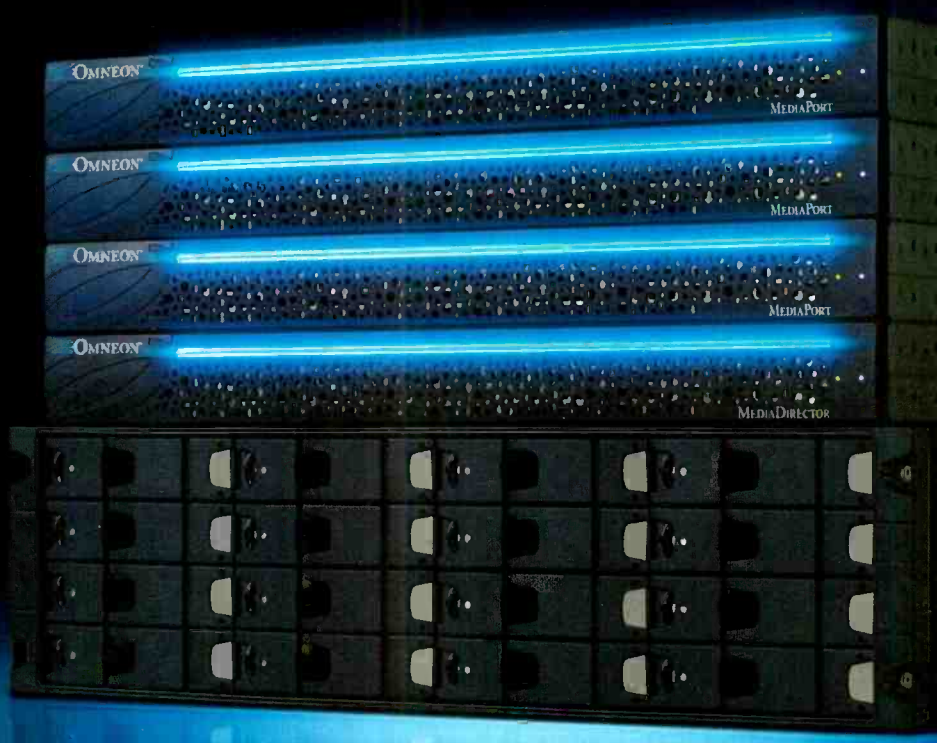

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A huge amount of content on the Internet, however, does not use MPEG-2 or AVC coding. YouTube, for instance, almost exclusively uses Flash for video compression. Flash does not use one unique codec, but rather defines a format for FLV files. These files, in turn, encapsulate content usually encoded with either the On2 VP6 or Sorenson Spark video compression algorithms. VP6, now owned by Google (which also owns YouTube), uses several standard compression techniques: a DCT block transform for spatial redundancy, motion compensation, a loop filter and entropy coding. (The loop filter is used to lower the appearance of block-edge artifacts.) While all of these are present in AVC compression, the loop filtering used in VP6 operates in what can be called a "predictive" manner. Instead of filtering blocks over an entire reconstructed frame, the VP6 codec only filters the edges of blocks that have been constructed by means of motion vectors that cross a block boundary. VP6 also uses different types of reference frames, motion estimation and entropy coding, compared with MPEG.

According to various sources, Sorensen Spark (more specifically the SVQ3 codec "Sorenson Video 3") appears to be a tweaked version of H.264/AVC and has similarities to an earlier codec, H.263. While VP6 and Spark are essentially incompatible with non-Flash decoders, the most recent releases of Flash Player do support H.264/AVC video and HE-AAC audio.

VP6 and Spark (as well as AVC) are defined by various patents, with differing licensing terms for encoding, distribution and decoding. HTML5 (video) is another codec that has been defined for Internet use. It attempts to simplify (or remove) licensing fees. (The use of HTML5 has recently come to light regarding various video players, with the announcement that Apple would support it, and not Flash video, in its products.) Supporters of HTML5 want a codec that does not require per-unit or per-distributor licensing, that is compatible with the "open source" development model, that is of sufficient quality, and that does not present a patent risk for large companies.

Nonetheless, while HTML5 developers formerly recommended support for playback of video compressed in the Theora format, there is currently no specific video codec defined for it. In May, the WebM Project was launched to push for the use of VP8, a descendant of VP6, as the codec for HTML5. The project features contributions from more than 40 supporters, including Mozilla, Opera, Google, and various software and hardware vendors. Perhaps not coincidentally, in August, the licensor of H.264, MPEG LA, announced that it will not charge royalties for H.264-encoded Internet video that is free to viewers.

Current codecs are also being improved by means of new and emerging extensions, which have applications for storage and content management.

New versions of codecs

Current codecs are also being improved by means of new and emerging extensions, which have applications for storage and content management. A number of extensions to H.264/AVC support high-fidelity professional applications; scalability and multiview video have also been defined. MPEG collectively refers to the "High" profiles as the "fidelity range extensions" (FRExt), which include the High 10 profile (10 bits per sample), and the High 4:2:2, and High 4:4:4 profiles.

AVC has generally been viewed as providing a doubling of coding efficiency over MPEG-2, but the quest for more efficiency goes on. The ISO/IEC and ITU-T standardization committees have now embarked on the specification of a new video encoding standard that targets improved encoding efficiency for HD video sources. Again, the goal is to cut the bit rate in half relative to existing codecs, e.g., AVC. This new specification is being referred to as the High-Efficiency Video Coding (HEVC) standard, and the target applications are broadcast, digital cinema, low-delay interactive communication, mobile entertainment, storage and streaming. Depending on the proposed technology, a final standard could be developed by July 2012.

Standards for multiview video coding based on MPEG-2 and H.264/AVC currently exist, but support is generally limited to a single stereo view that requires glasses to view the 3-D content. MPEG is now planning to standardize a new format for 3-D that supplements stereo video with depth/disparity information and could be used more effectively with glasses-free displays. BE

Aldo Cugnini is a consultant in the digital television industry.

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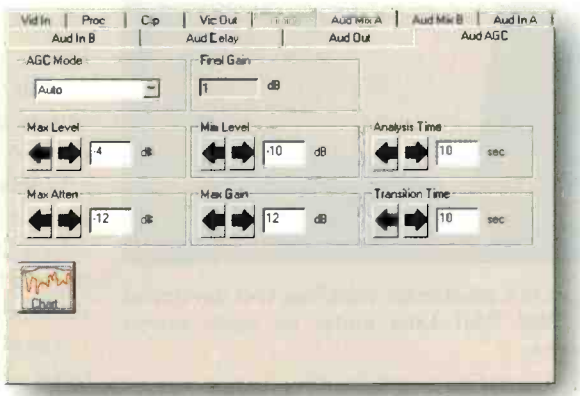

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Open source programs

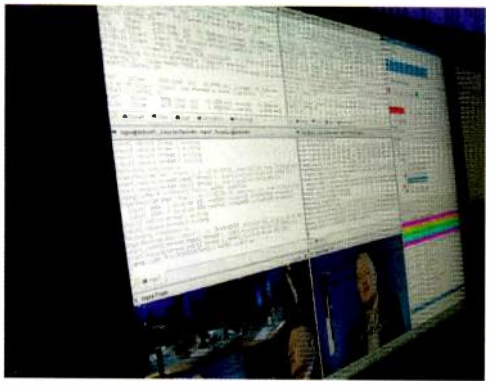
Download these free software solutions for professional media applications.

BY BRAD GILMER

Some of the most well-known open source programs are the Linux operating system and the Firefox Web browser. You can find open source software for an amazing array of professional media applications. Many of these applications run behind the scenes, but they are critical to professional media applications.

What is open source?

To understand open source, think back to the origins of the Internet. The Internet was developed through funding from the U.S. Department of Defense with major contributions by the academic community. One of the first uses of the Internet was collaborative development in an academic setting. Not surprisingly, much of this collaboration was centered on software development. Interested developers worked together on software projects that were maintained by a few core programmers. Contributors worked for free, and the resulting software and source code was distributed free of charge. Any developer could fix bugs or add functionality, and the changes that were accepted by the coordinators appeared in subsequent releases. Developers contributing their time wanted to be sure that the resulting software would remain free. This led to the creation of the General Public License (GPL), one of the first open source licenses.



Ingex is a production workflow tool developed by BBC R&D Labs under an open source license.

Just what is open source? Fortunately, the Open Source Initiative (*www.opensource.org*) has defined open source. As stated by the Initiative, "Open source doesn't just mean access to the source code." Below is an excerpt from the complete definition, which can be found at *www.opensource.org/osd.html*. Note that the explanations of the terms are mine:

- *Free redistribution.* The license allows for free redistribution, meaning that the software may be freely distributed by people other than the original creators of the software. For example, anyone can burn CDs and distribute Linux. You can even charge money for this service, even though someone can go directly to *www.linux.org* and download the code for free.
- *Source code.* The distribution must include the source code. This allows others to see what is going on in a program, and it enables easy modification of the original program.
- *Derived works.* An open source license allows you to modify the software to make new software without having to pay anyone. This is a clear reflection of the collaborative spirit of the academic community where it is common for future researchers to build on previous work.
- *Integrity of the author's source code.* A software developer cannot keep you from adding new code to his work, but he can require that you identify what is original and what was added.
- *No discrimination against persons or groups.* Open source is an open party, and everyone is invited!
- *No discrimination against fields of endeavor.* Basically, open source software can be used everywhere. You cannot restrict how people may use the software once it is contributed.

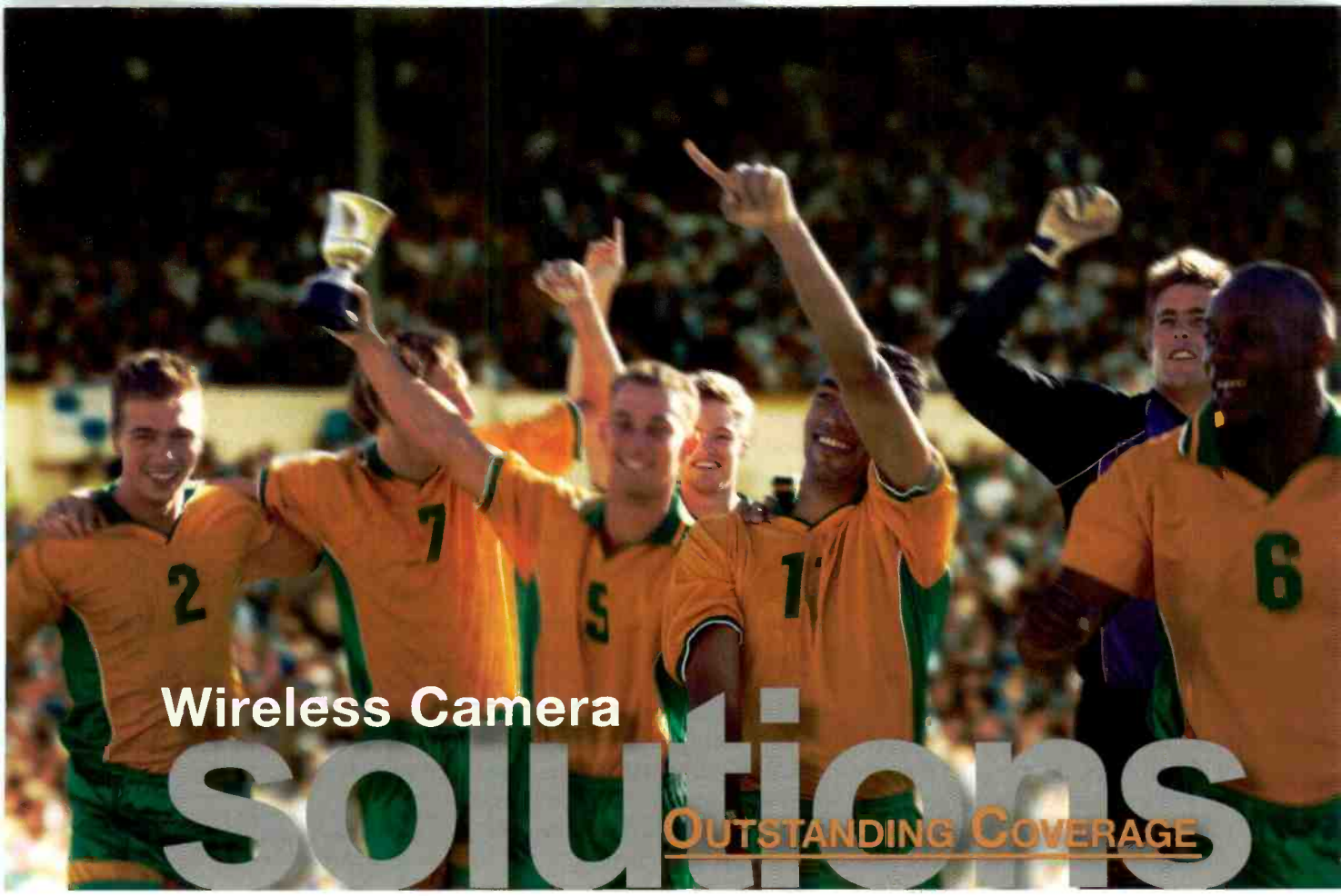
Much of the Web functions on open source software, and it was a factor in the explosive growth of the Internet. Examples include the TCP/IP protocol stack, the Domain Name System and the Apache Web server. Two other major open source software projects still dominant today are the Linux operating system developed by Linus Torvalds and Mozilla's Firefox Web browser, which can trace its beginnings to the Netscape browser.

Much of the Web functions on open source software, and it was a factor in the explosive growth of the Internet.

Open source for pro media

While it is true that open source has been a mainstream IT effort, there have been some significant contributions in the open source community specifically targeted at the professional media market. Many of these contributions are targeted at other developers, not at end users. However, these contributions have been significant:

- *Ingex* (ingex.sourceforge.net). Ingex was developed by a team led by Phil Tudor at the BBC R&D Labs. It started out as a logging application in



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a studio environment and has grown into a major production workflow tool. In a nutshell, it allows a user to capture multiple camera feeds in real time, add annotation and director's cut information, and send this information directly to editing workstations.

Tudor described the core of Ingex this way: "The heart of the system is the recorder, which is a direct-to-disk recorder consisting of a high-end multicore PC, multiple SDI/HD-SDI capture cards and the software. Under the control of a user interface in a production gallery, recorders are used to capture the studio feeds at full quality, encode them in real time to the required production formats and store the results in standard file formats such as MXF or QuickTime. With advances in processing power, the software is able to simultaneously capture and encode four channels on each recorder, and store the results in the required full-resolution and offline formats for editing. Each unit is typically built with several terabytes of local storage to allow self-contained operation for several days of recording."

The system is specifically tailored for the multicamera studio environment. Not only does it capture video, audio and logging data, but it also captures metadata related to cuts between cameras made during the live production session. These decisions can be fed to the post-production editor, who can use this information to see what the director was thinking at the time of the shoot. Furthermore, the system creates low-resolution proxies, which can be viewed over a network or on a mobile device.

- *Advanced Authoring Format (AAF) Software Developer's Kit (SDK)* (amwa.tv). Created by the Advanced Media Workflow Association, the AAF SDK provides an API that can be used to import and export digital video, audio and associated metadata between applications. The SDK includes example source code and utilities for creating, using and examining AAF files. The SDK also reads and writes MXF files. It is used in several commercial products as the AAF/MXF import/export engine.
- *MAJ API* (majapi.sourceforge.net). MAJ API gives access to functionality contained in the AAF SDK for people who program in Java.
- *mxflib* (freeMXF.org). mxflib is a multiplatform C++ library for reading and writing MXF files. It was developed by Matt Beard and allows programmers to read, write and manipulate MXF files.
- *Dirac video compression* (diracvideo.org). Almost all video compression algorithms are proprietary and require implementers to pay licensing fees. Dirac is one of the few truly open source professional video codecs.

How to download it

You can get open source software any number of ways. The most obvious is to download it directly from the authors. For example, you can download Linux from *www.linux.org*. Similarly, you can download the Firefox browser from Mozilla at *www.mozilla.org*. But the granddaddy of all open source developer sites is SourceForge (*www.sourceforge.net*), and in fact, all of the professional media open source projects listed in this article are hosted at SourceForge. BE

Brad Gilmer is President of Gilmer & Associates and executive director of the Advanced Media Workflow Association.

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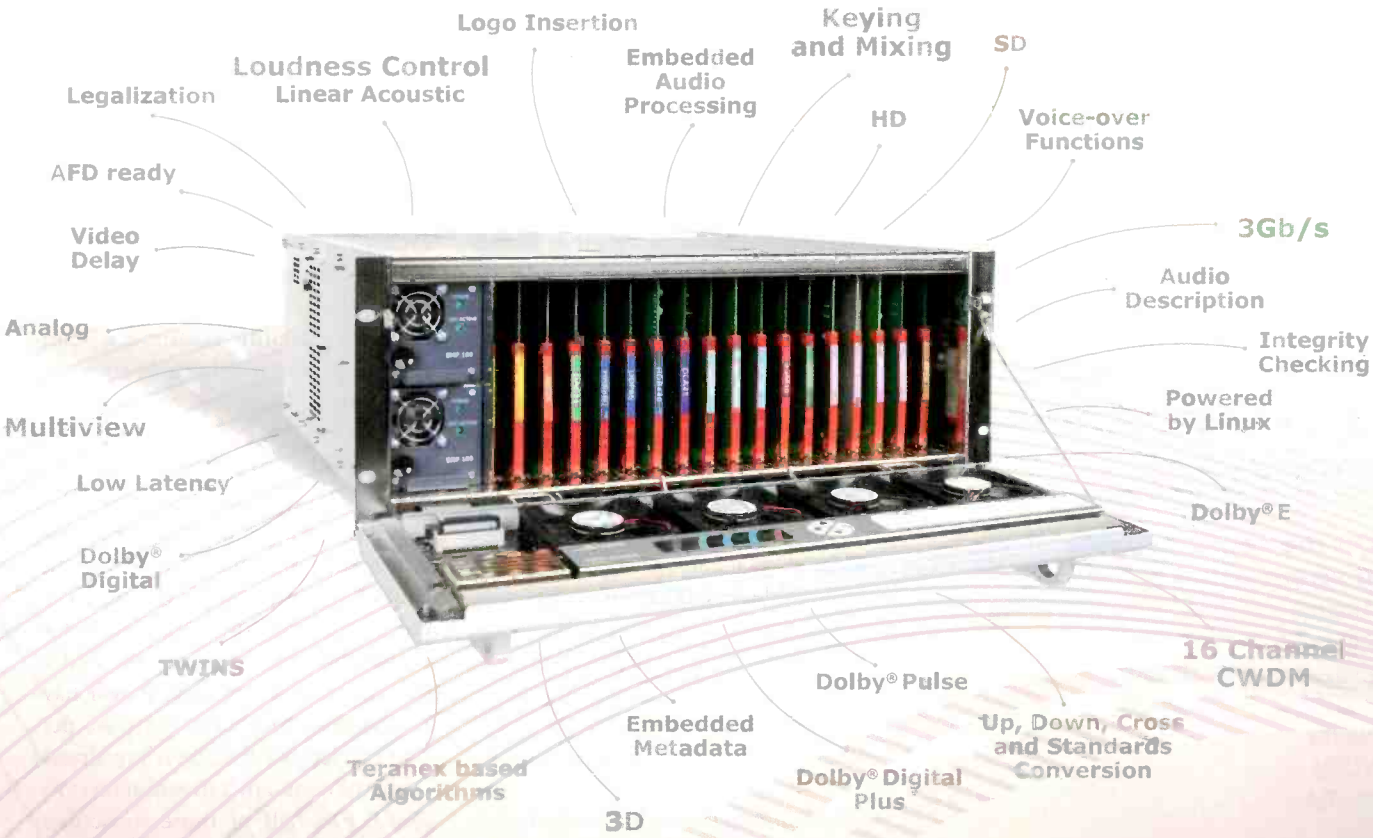

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Over-the-top video

As consumers look for new ways to access media, OTT is growing dramatically.

BY SUSAN ANDERSON

Over-the-top (OTT) video — the delivery of video via the Internet from a source other than the network service provider — has arrived. Several factors are fueling the development of OTT video initiatives. The first is that viewers are demanding more customized access to their content. Consumers want their content anywhere, on any device, at anytime and at their convenience.

Some OTT service providers and set makers

On the consumer side
Content delivery networks
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Apple TV
Hulu
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Netflix
VUDU
YouTube

Internet TV manufacturers
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Samsung
Sony
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Consumer devices
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Boxee
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Logitech
Microsoft Xbox 360
Roku
Sony PS3

A key second component of OTT's fast rise is an array of both streaming content providers and new receivers. These free or inexpensive components have combined to create a disruptive marketplace for cablecasters while meeting consumer needs. In-Stat principal analyst Keith Nissen says the industry is struggling with how to maintain revenue as consumers shift to on-demand viewing. Broadcast TV ad revenue is declining, the pay-TV market no longer has much new subscriber growth, and consumers are not, or cannot, continue to pay for 200 TV channels when they watch just a handful of channels.

A new playing field

The industry most affected by OTT technology is cable. Is there a threat to basic cable services from OTT?

Consider these recent statistics:

- 21.4 billion online videos are viewed each month.
- 82 percent (158 million) of the U.S. Internet audience watches online videos.
- 500 minutes (more than eight hours) of online video is watched per month per average viewer.

As video content becomes more diverse and younger viewers take command of remote controls, pay-TV operators will need to adapt to these younger viewers' demands and expectations. In addition, the FCC is going to promote a replacement to the failed CableCARD, so viewers may have new options in how they access content.

With the OTT model, consumers would rely on a broadband connection for the delivery of content. That content could consist of OTA broadcast signals; cable network programming like Disney, Turner and others; and VOD signals.

This content would be accessed via devices from some new players, including Apple TV, Boxee, Google TV, Hulu and VUDU. All of these new devices make content easier than ever to find and the viewing process, perhaps, more customer friendly. A J.D. Power and Associates survey released in October reports that consumers are more upset than ever with the high cost of pay-TV bills. In addition, cable viewers are more likely to feel ripped off than IPTV or satellite customers. Consumers prefer an à la carte solution. OTT can provide that option.

Some OTT providers

The growing demand for OTT video is driving a litany of new players to enter the market space. In the United States, Netflix is dominant. In the first quarter of 2010, Netflix had 14 million subscribers. By the end of the year, Nissen predicts it will have 17 million subscribers. Sixty-six percent of Netflix subscribers are already using the company's streaming service. More than half of those subscribers are streaming movies or TV episodes to their homes through devices such as Roku set-top boxes, Xbox 360 game boxes and Blu-ray players.

Also going over-the-top is DISH Network, which offers more than 180 international channels in more than 28 languages. The network announced early this year a multiyear partnership with NeuLion, an end-to-end IPTV service provider of live and on-demand international, sports and variety programming delivered via broadband. Under the agreement, certain DISH Network international channels will be distributed, using NeuLion's IPTV service, to consumers without access to satellite TV.

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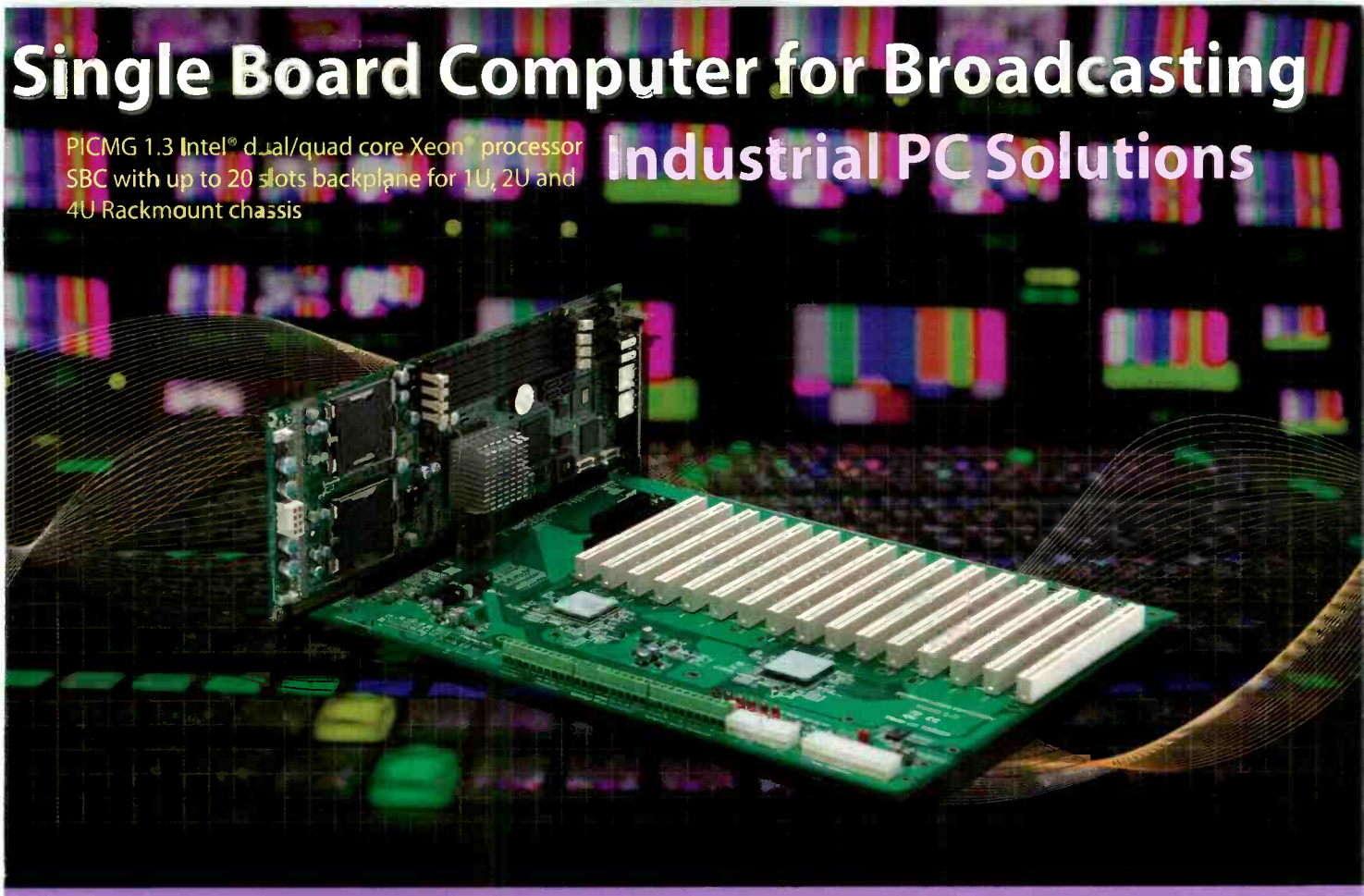

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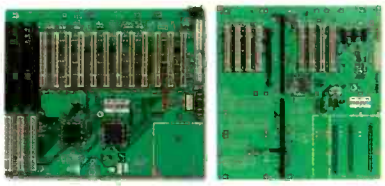

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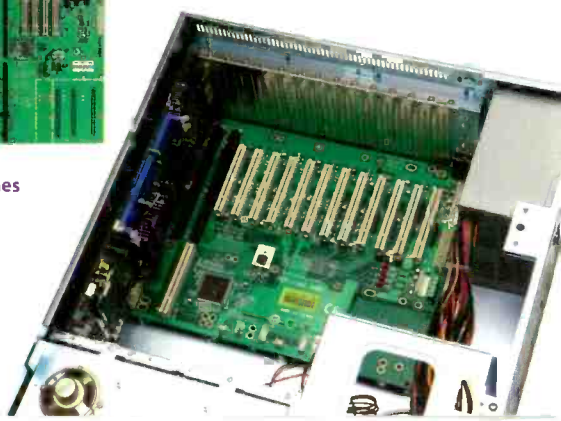

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Next year, look for Wal-Mart and Best Buy to promote their own online video services. Wal-Mart purchased VUDU, an on-demand video service that sells and rents movies and TV shows over the Internet. And, Best Buy and Blockbuster have teamed with online movie service Roxio CinemaNow.

The most talked about streaming provider, Hulu, launched Hulu Plus this year. This ad-supported premium subscription service costs $9.99 per month. It works across a variety of platforms, such as PCs, the iPhone, iPad, Playstation 3 and Samsung Blu-ray players. The service boasts thousands of subscribers. And, in only six days after being released, the Hulu application for the iPhone and iPad was the most downloaded service in Apple's App Store. In July, the U.K.'s *Financial Times* reported that Hulu had been working on plans for an international launch of Hulu Plus, with the UK and Japan as target markets.

Another player, called ivi, is less familiar. The online video service expects to charge customers $4.99 per month for a package of shows from all major American networks, plus some superstations most Americans haven't seen since the early 1990s. The startup claims it offers more content than Hulu by providing online access to every network and syndicated show seen on New York and Seattle TV screens.

In only six days after being released, the Hulu application for the iPhone and iPad was the most downloaded service in Apple's App Store.

Broadcast Engineering readers may recall another company's attempt to deliver OTA programming via the Internet. In 1999, a company called iCraveTV initially delivered 17 channels of programming from both Canadian and Buffalo, NY, TV stations. It took maybe a week for the lawsuits to begin. Within weeks, iCraveTV bit the dust. Both Hulu and ivi will likely find that without some form of payments to the content owners, the legal challenges will be endless.

Delivery

There are many ways to get packetized data to consumers, and, for the most part, these will be transparent

to them. Adaptive streaming, caching and torrent technology are delivery methods, and Nissen expects that all will be used. After all, consumers don't care how the content gets to the TV.

Expect to see MPEG-4 AVC and other advanced encoding technologies to be used to reduce bandwidth needs. Nissen also doesn't think carriers will go to measured pricing, but he does believe that content producers ultimately will partner with pay-TV service providers to deliver both pay-TV and OTT video to consumers using hybrid set-top boxes. This allows content producers to market OTT content directly to consumers while delivering it over a secure, managed pay-TV access network. This will appeal to pay-TV operators because they are also content producers, they will get paid to carry the on-demand content, and they want to remain the gatekeeper for all paid digital entertainment. As a result, consumers will be paying for a combination of pay-TV services and paid OTT video services. The shift in spending to paid OTT video services could permit content producers to eliminate low viewership pay-TV channels from pay-TV packages. Under this model, consumer spending won't decline, but the value of pay-TV services would rise. This would lower the dissatisfaction that consumers currently have with pay-TV services.

The cable industry still feeds television programming to 62 million homes.

A contrarian viewpoint was noted in a recent article from TechCrunch. The article quoted writer and entrepreneur Paul Kedrosky, "Many people are coming to the correct conclusion that in the age of Hulu, Boxee, BitTorrent, etc., that cable TV is an overpriced relic of another entertainment age."

Maybe so, but if you have any cable stock, keep it. The cable industry still feeds television programming to 62 million homes. And, the industry has almost 42 million broadband customers. BE

Susan Anderson is managing editor of Broadcast Engineering.

Broadcast archives need new technology

A warehouse of shelving no longer meets the needs of file-based operations.

BY DAVID AUSTERBERRY

Until recently, the provision of a content archive was given little thought by engineers and management. Any videotape that was likely to be needed in the future was sent off in a van to a warehouse, to be stored until it was needed. The warehouse required climate control, security and maybe a small dubbing facility to run off copies of tapes when recalled.

The software to manage the archive was little different from that in a public library: bar code readers, a database of tape IDs and shelf positions, and a check-in/check-out facility.

Migration away from videotape is changing the broadcast archive. Now that videotape is reaching the end of its life as a storage technology, the archive becomes a repository for files, rather than the physical asset that a videotape represents.

Storing files raises a whole number of new issues. It now takes serious technology planning if the archive is to last as long as tape (typically 25 to 30 years) or even longer. Data storage typically has a short life, less than five years for a disk drive.

By the time videotape starts to deteriorate, whoever sent it to the archive may well have retired; it will be someone else's problem. Files must be constantly migrated to the latest storage technology, so a technology solution to preserve the archive must be put in place today, not in 25 years' time.

Other issues to consider include network bandwidth from production to the archive, storage architecture, disaster recovery planning and the operating cost of the archive.

IT archives

I was watching a documentary about the "Domesday Book," a record of title in England during the 11th century. One thousand years later we can still read the books, written in ink on sheepskin parchment. There are much older written documents, such as Egyptian tablets or the Dead Sea Scrolls, but how much of our recent video material will last that long?

Archiving was once a real estate issue, as with these Digital Betacam tapes at itfc's archive in London. With files, it became a technology issue.

Many of the IT developments in data archiving are designed to maintain documents for regulatory compliance, which in most cases is less than 10 years. Broadcasters regularly air series from 40 years ago, or even older, so commodity IT systems are not necessarily going to meet the needs of long life. Broadcasters' requirements are more akin to the collections sector: museums, archives and libraries.

Programs can have value for reruns, and some have a more intangible value as historical records. The value of a news archive is the depth it can add to stories, again intangible as an asset. The balance of the value as an asset versus the cost of maintaining an archive is perhaps the biggest problem in designing an archive, in proving the ROI.

What is an archive?

An archive can be many things. For a production company, it could be somewhere to store the files from the temporary storage used for acquisition now that many camcorders use SSDs and flash storage. For a news department, the archive represents news history and will need to be maintained for decades; a sports department will have similar requirements. For a transmission department, the archive is a low-cost repository for programs for the duration of the rights window. For a program commissioner, the archive stores the program as an asset well into the future, as long as it can generate revenue.

All these archives have different requirements, both technical and cost. It is a matter of judgement as to the value of an asset, as is the long-term cost of running an archive for decades. Deciding what to keep and what to delete is not an exact science.

Which codec?

This is not a simple choice for HD and higher resolutions; although, for SD, MPEG-2, I-frame at 50Mb/s is popular.

The decision rests on several factors. First, has the file been ingested from videotape, or is it an original file? Is 8-bit resolution sufficient or does it need to be stored at 10 or more bits of resolution? Should it be encoded

in a standard such as MPEG (-2 or -4) or JPEG 2000, or should it use something more edit-friendly such as Avid DNxHD (SMPTE VC-3) or Apple ProRes? If you need more than 8 bits of resolution, that narrows the choice, excluding MPEG-2 for example. For many codecs, there is a choice of long GOP or I-frame only.

AVC-I is emerging as a choice for HD; it supports 10-bit coding and can be edited without the need to decode GOPs.

Codec choice is a compromise. More efficient codecs use less storage space for a given quality but may need more powerful workstations for editing. As computer performance increases, the latter becomes less of an issue. The decision made today may not be the optimum choice next year.

A major goal is to minimize the number of transcodes from acquisition to delivery, which best maintains video quality. That may dictate a proprietary format for the archive. For most broadcast applications, audio can be left uncompressed.

Another factor is the video and audio wrapper or container. MXF is the obvious choice here, but which operational pattern? OP1a makes sense for most applications, but AAF may be best if an entire project is to be stored with the intention of later extensive repurposing. Many production systems maintain metadata in a separate database. For a long-term archive, self-describing files are an advantage.

The optimum codec will depend on the application — news, recent drama, videotape transfers, and HD or SD — so most broadcasters' archives will contain a mix of codecs.

Technology

Current technology is still based on electromagnetism, whether disk or tape. The magnetic
a long life, although
systems suffer from obso
formats of tape drives ar
trollers have a short life o
or five years, so long-term
needs ongoing migration of
the latest storage formats.

Optical systems have faile
provide the storage density of
although, they, like solid-state st
age, have applications in productio
However, in 10 or 20 years time, a new
technology could supplant or replace
magnetic storage.

There is one technology that is low-risk but expensive: 35mm film separation negatives. The images are stored as red, green and blue silver negatives. These do not fade like the dyes used in color negatives, and they can potentially last centuries in the correct storage conditions. Also, they do not rely on computer technology, which

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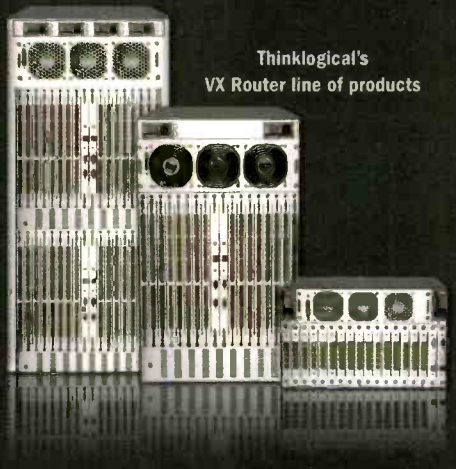

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is notorious for its rapid obsolescence. Who can even start to envisage what the computer of 20 years time will be like, let alone in a century from now?

Disk or tape

This is a long-running argument, with proponents on either side. Many broadcasters have adopted a mix as the most cost-effective system for their needs. Clouding the issue is outsourced storage — the cloud. The economics are changing quickly, but cloud storage does require a high-bandwidth connection for large media file transfers.

Many cloud systems sell the advantages of storage on demand and ramp up and down to meet your needs, but broadcasters generally have storage needs that go one way — up. Surplus capacity is not an issue.

Just as confidential records are stored inside mountains, outsourcing storage is becoming more popular. However, many broadcasters have concerns about security, retrieval times and catastrophic failure, which has happened. Outsourcing to a data center has advantages: They are experts at running storage systems. But if the goal is to archive programs for decades, you may want to consider whether the outsourcing company will be around in 25 or 50 years; IT companies come and go apace. Another route is to keep the storage in-house but outsource the management.

LTO advances

Data tape is the chosen archive format for many broadcasters. The latest generation of LTO, LTO-5, introduces a feature that lends it to broadcast archive applications: support for the Long Term File System (LTFS). This is an IBM development for a low-cost, self-describing tape file system.

An LTFS volume comprises two partitions, one for data and one for an index. The index is an XML data structure that describes all data files, directory information and associated metadata for files recorded on the LTFS volume. This means that a tape can be mounted and read just like a disk drive without the need to first transfer the data to online disk storage.

LTFS, when added to other LTO features such as WORM and encryption, is improving its suitability for archiving video every time there is a new release.

WORM was introduced in LTO-3 for regulatory compliance applications, but it also has advantages for video libraries. A write-once tape cannot be overwritten or altered. Content integrity is becoming more of a requirement for file-based operations. Was the file you are reading the same as the file written years ago? The combination of WORM with a content

integrity check as described in SMPTE 429 will provide the confirmation that a file has not been tampered with or inadvertently altered.

LTO-5 tapes can store 1.5TB of data, which is 1.5 hours of uncompressed 1080i/50 or more than 50 hours of 50Mb/s content. The future road map takes densities up to 12.8TB for LTO-8, which is planned for release in 2016.

Threats to an archive

The big problem with data archives is that failure can cause the loss of assets. Content originated on videotape can always be re-ingested, albeit at a cost, but file-based content will require precautions to protect the assets.

Being mechanical, disks and data tape can suffer catastrophic failure, but various techniques can mitigate this, including RAID for disks and duplicate copies for tape.

Disasters can cause great damage to a data center, and the only way around this is either to mirror to a geographically remote data center or to store duplicate data tapes in a remote library. As with all archive design, choices are compromises between availability and the total cost of ownership.

Human error is an inevitable factor in archiving. This could be an archivist accidentally erasing a file or an IT system engineer performing incorrect procedures. Again, file repositories present a higher risk than videotape; the loss of a single tape does not compromise the whole library.

Data arrays are subject to the usual IT threats such as computer viruses and software corruption, but there are well-known procedures for guarding against these threats. One of the advantages of outsourcing the archive is that storage specialists are well-versed in these procedures.

Summary

Now that many productions are recorded directly to files rather than videotapes, consideration must be given to the long-term storage of the assets. Videotapes were simply dispatched to a warehouse. Occasionally a tape might go missing or deteriorate beyond the point where it could be played, but bar a catastrophe at the warehouse, the risk of losing everything was remote.

A central file archive is subject to far more risk and can fall prey to technological obsolescence long before videotape. If broadcasters expect to realize the value of their program assets in 25 or 50 years time, serious thought must be given to the design and operation of the file archive.

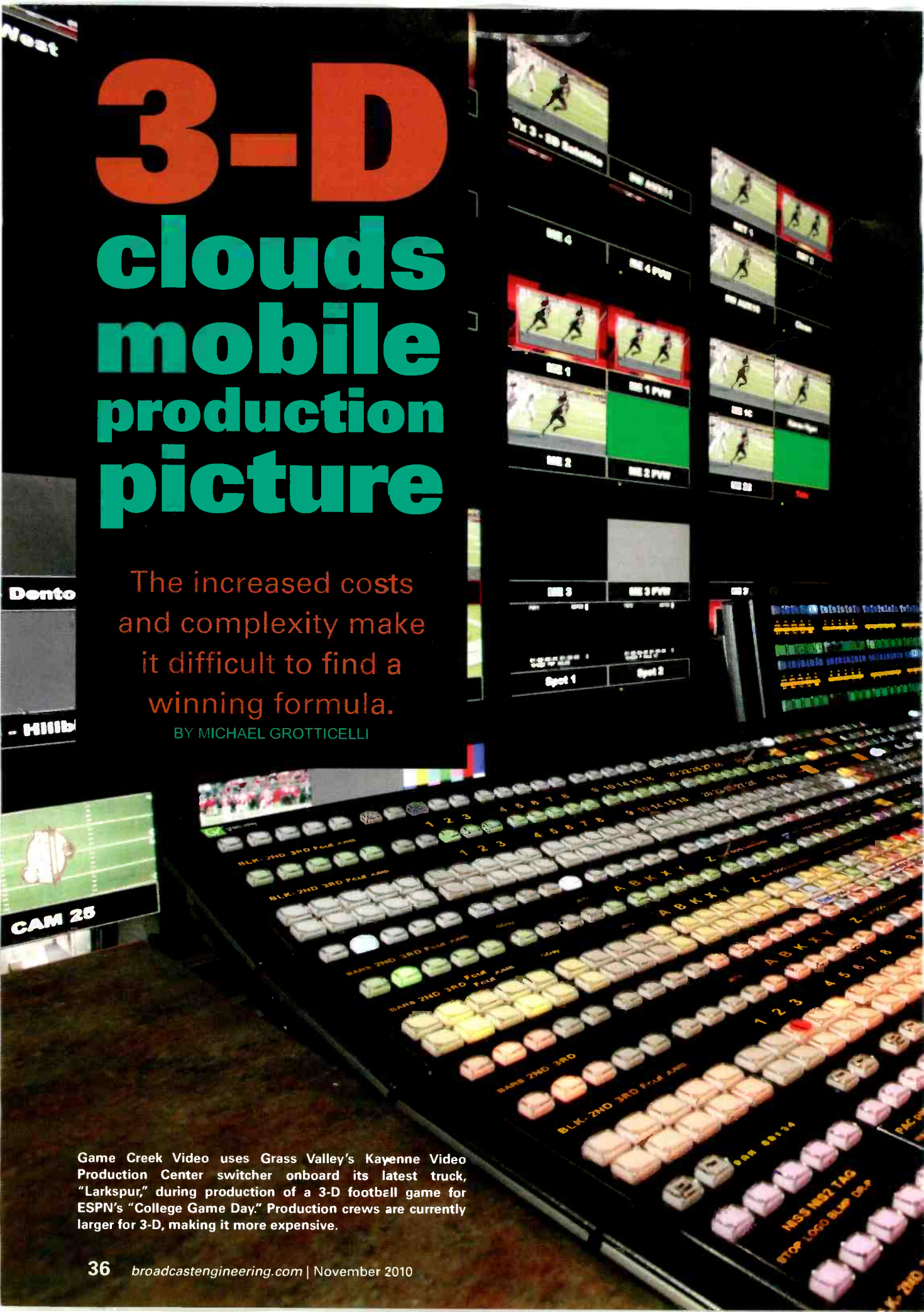
As ever, there are choices and compromises. Cloud or in-house? Which codec and which wrapper? Finally, which storage medium? Without a crystal ball, only your best judgment today will ensure future generations can view the best of today's TV. Files do have the great advantage in that, abstracted from the storage medium, they can be migrated without the generation losses of videotape. Will your library last as long as the "Domesday Book?" BE

David Austerberry is editor of Broadcast Engineering World *magazine.*

3-D clouds mobile production picture

The increased costs and complexity make it difficult to find a winning formula.

BY MICHAEL GROTTICELLI



Game Creek Video uses Grass Valley's Kayenne Video Production Center switcher onboard its latest truck, "Larkspur," during production of a 3-D football game for ESPN's "College Game Day." Production crews are currently larger for 3-D, making it more expensive.

With all of the talk about 3-D television these days, you'd think virtually every project was being produced and broadcast this way, but most digital production is done in HD — and some still in SD. That's because the economics for 3-D have yet to be figured out in a way that generates real profit, for the production company or the client.

Indeed, while many have been captivated by the emergence of 3-D television and its potential, owners of the mobile production companies that create such live broadcasts (and pretaped shows) have privately complained about the need for yet another, more complex way to produce programming. The technology differentiates sports and entertainment broadcasts and adds a certain amount of sizzle, but the added costs cannot be easily passed on to the client and, perhaps more telling, there's not a lot of interest from the general production community.

With few consumers able to watch the production at this early stage of the technology's development, they ask: Why expend the time and effort to retrain crews, buy duplicates of many production systems and add the required extra staff?

That does not mean they have been complacent. There have been about a dozen HD-capable mobile units completed this year in the United States alone, complete with new or refurbished 3Gb/s infrastructures that can handle the highest quality signals (1080p60). This increased bandwidth makes these rigs suitable for all types of projects, including 3-D production. They include new routers, monitor walls, production switchers, servers, graphics systems, signal processors and cameras, and the setup costs roughly $7 million to $10 million per truck.

Discussing the cost of building such trucks, one executive said that it was about two-and-a-half to three times more expensive than a typical 2-D HD truck. For starters, a 3-D camera setup costs between three and three-and-a-half times that of a 2-D setup, requiring two cameras, two lenses, a 3-D rig and image processor. Then there's also double the number of record and replay channels required on the video servers. (Therefore, a six-channel server provides four channels for 3-D.)

ESPN's World Cup coverage used Sony HD cameras mounted on side-by-side rigs above the field to provide the best wide-angle views in 3-D. The consensus is that side-by-side rigs work best from higher positions.

What we're learning

The advent of 3-D production has brought a multitude of new issues that have to be, or have already been, solved to some extent. There are framing issues, added crew and equipment, and a need for a clear understanding of what works in 3-D and what doesn't.

The type of camera rig used, whether it be a beam splitter ("mirror rigs") or side-by-side version, is also an issue that is being worked out on a project-by-project basis. Most agree that side-by-side rigs work better for higher camera positions, while mirror rigs are better suited at lower levels and closer to the field. They are even being carried onto the field in handheld rigs.

Then there's the issue of how to use these special camera rigs most effectively. Correctly framing shots appears to be another critical factor in successful (pain-free) HD 3-D viewing. Vince Pace, a pioneer of 3-D production techniques, often talks about "letting the scene breathe," meaning camera operators should stay on a subject longer without constant refocusing or fast pans. Holding a shot for 30 or 60 seconds (instead of today's 15- to 20-second cutaways) might re-educate directors to pursue a strategy of "less is more."

Steve Schklair, founder of 3Ality Digital, another company at the forefront of live 3-D broadcast, says the patience required for a production with less cutting and fewer camera positions might bring the industry back to the days of extended wide shots and staying locked to a single subject for extended periods. This has meant using six cameras instead of 20 or more. (The last NFL Super Bowl used about 45 cameras). It's often more pleasing to the viewer to understand what's going on by finding a point of interest on their own instead of having a director dictate, in quick succession, how the action is processed.

The people most intimately involved with 3-D production are beginning to understand these limitations. During this year's MLB All-Star Game, some hard lessons were learned. To control the distant parallax parameters, the stereographer decided to converge on the pitcher. The crew wanted the shortstop to appear to come off the screen, but he couldn't because he was attached to the screen by virtue of the field plane. The result was often jarring, and some in the truck described the scene as painful to watch.

In these early days of 3-D production, 3-D camera operators have not been given ideal shooting positions.

Technology is becoming available that can dynamically adjust the Z-plane depth of titles and lower-third graphics. This keeps them from becoming a distraction to the scene or getting blocked and thus not easily viewable. This can be done during live broadcasts in real time, whereby, as the action changes within a scene, the titles or logo move to a different part of the screen automatically.

Digital nirvana: one production, one crew

The other challenge for production companies is trying to figure out how to produce a 3-D show with the same truck — and possibly crew — as the

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traditional 2-D HD production. Simulcasting, which has been successfully worked out for SD/HD productions, helps defray some of the added cost. This is critical in getting clients interested in producing 3-D.

At the World Cup, Canon HJ22ex7.6B lenses were mounted on Sony HDC-1500 HD cameras inside Element Technica 3-D rigs. Beam-splitter rigs are common at most live 3-D sports productions because they can get closer to the field.

Some promising techniques include placing a second "shadow" rig on top of the 2-D camera. This innovative rig allows the camera operator to think about 2-D widescreen framing while shooting 3-D images simultaneously. The camera becomes harder to maneuver, but it gives the operator two joysticks, one for 2-D and the other to control dual lenses mounted on top of a box-style HD lens. The rig has been demonstrated at various industry events — and used during the recent U.S. Open tennis tournament in New York — and employs two HD box cameras and 16-bit encoders inside dual HD lenses mounted side-by-side for wider and atop-stadium (overhead) shots. (Beam splitter rigs are used for tighter shots and to get closer to the action.) It also employs a "frame-link" software and hardware system. There are two tally lights for talent if necessary.

The real benefit is that it allows a single person to shoot for both shows and saves seats in a venue. HD cameras still get the most desirable positions within a venue. At a time when everyone is looking for the right business model, this issue can't be overstated because venue owners are often hesitant to "lose" prime seats to camera positions. (A hockey game produced and televised in 3-D by Madison Square Garden Network, in New York City, in March reportedly "lost" about 700 seats to 3-D camera positions.) Of course, this was also an issue during the early days of HD production, but not to the same extent, as 3-D camera rigs are larger and must get closer to the field to be most effective.

Onboard the truck, one idea is to have a second production switcher (on the back row) to handle the 2-D show, using left- or right-eye-only camera sources. However, this adds

cost to the client, and 3-D production is expensive compared with a traditional HD project.

The world is watching

Mobile production companies making the migration from an established video format to the latest technology — 3-D TV this time — have always struggled with the initially high incremental cost differential of deploying the technology and how to get clients to pay more for their services.

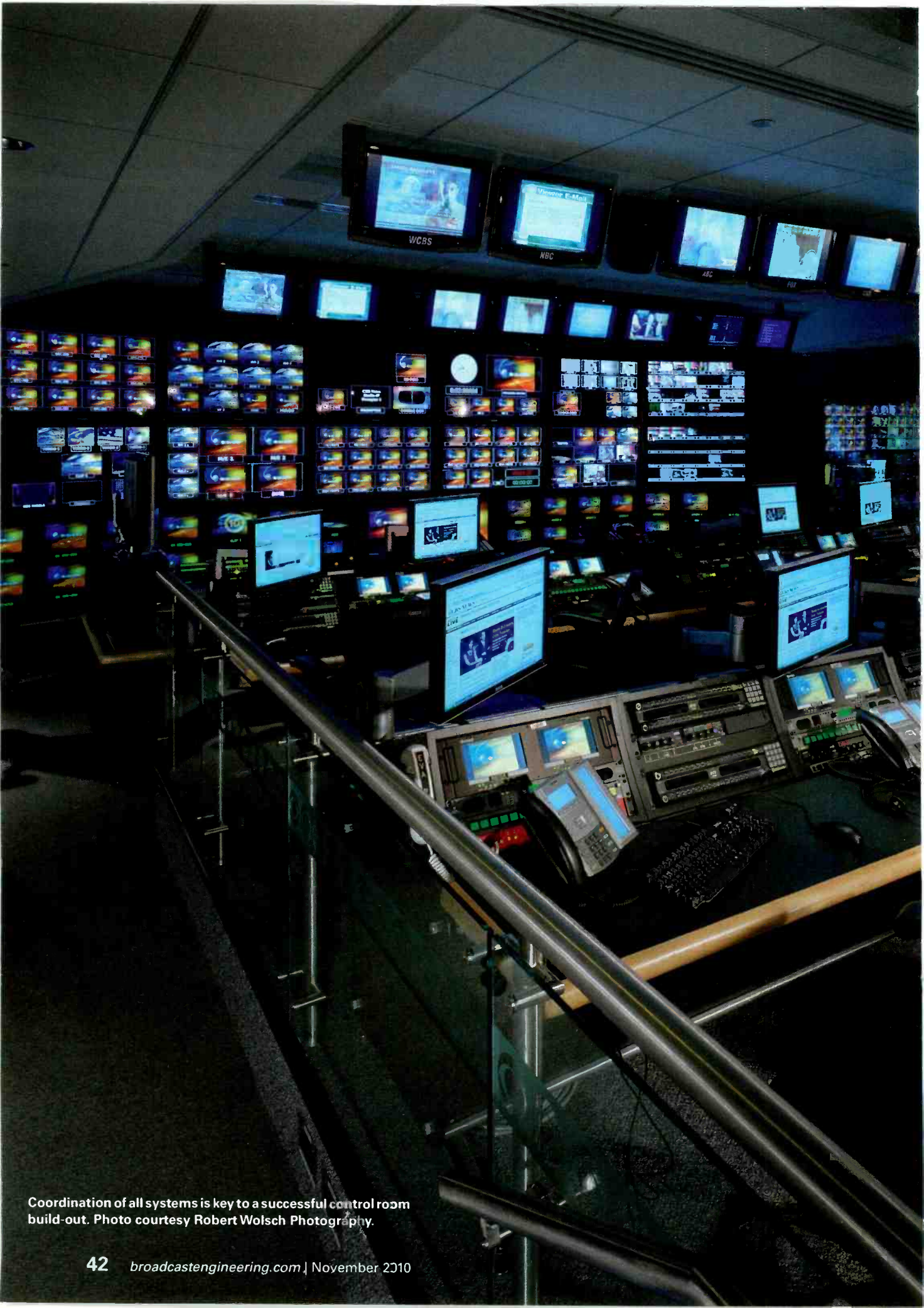
With 3-D, however, there is the added cost and a big learning curve. Many production companies are learning from each other's experiences. Although the industry is competitive, it's not uncommon to see rival crews discussing techniques and the most efficient way of doing things.

When the industry went from SD to HD, it necessitated the addition of, perhaps, one more person to the truck. With 3-D, there's a need for one person per rig, a stereographer and a processing engineer. So you could add up to 10 people to the standard crew necessary to produce a 2-D HD event. If a company does a 2-D/3-D simulcast, it needs a second production switcher and TD. That brings a whole new set of challenges. Clearly, there's a big difference between 2-D and 3-D in terms of acquisition and making it all fit into an overall production.

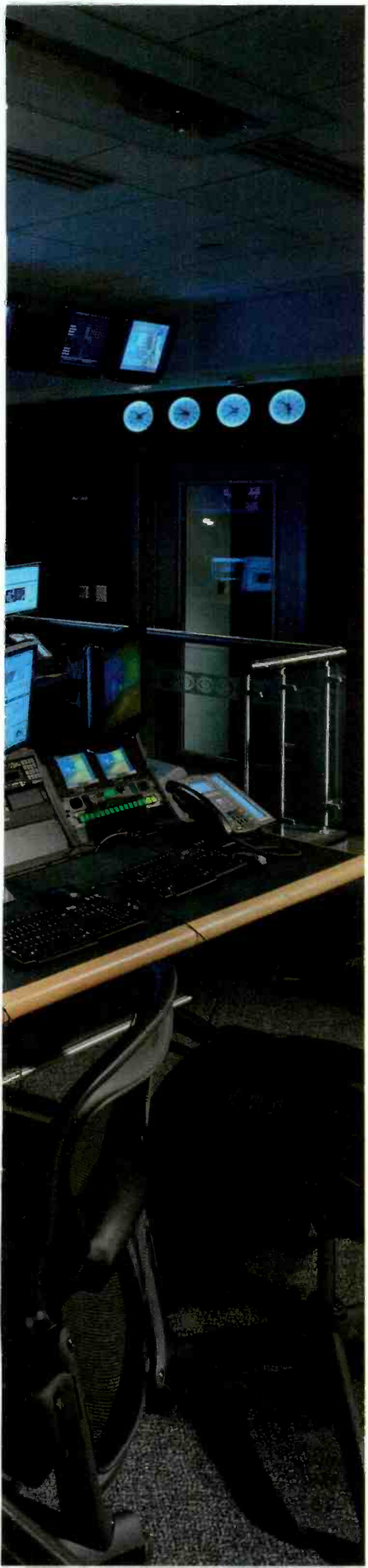
For now, the industry is intent on keeping this new generation of trucks working and is waiting to see what happens with the general acceptance of 3-D. Everyone agrees that 3-D production is still in the development stage, and every production thus far has been underwritten by consumer electronics manufacturers trying to prime the programming pump and sell consumer 3-D TV sets. Yet with each new project, we get a better understanding of the pitfalls and successful practices that make a live broadcast work.

Of course, the more productions accomplished in 3-D, the better understood it will be, leading to financial and technical rewards for everyone involved. Production companies are getting a lot of bids for 3-D work, but whether those actually happen remains to be seen. BE

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



Coordination of all systems is key to a successful control room build-out. Photo courtesy Robert Wolsch Photography.



Calculating THE COST OF building BROADCAST facilities

BY JOHN P. GERING, AIA, AND KEITH HANADEL

This has been a big year for the broadcast industry. The conversion to digital broadcast was accomplished, but not without its rough spots for a number of stations. HD broadcast has become the norm. And while 3-D, the big topic at every booth at NAB for the last few years, has now been broadcast on a limited basis, the horizon for the large-scale adoption of the format remains unclear. The reallocation of the broadcast spectrum has not been finalized, and the broadcast industry remains active in defending its needs and voicing its concerns over this planned long-term change in the use of the airwaves.

The industry has also needed to adjust to reflect the realities of the current media marketplace. While the broadcast industry is still the leader in supporting the needs of advertisers, the expanding media options available to advertisers have put pressure on the broadcast industry. Broadcasters have embraced new media with moves as varied as Web producers joining the assignment desk, the encouragement of viewer participation in newsgathering operations and advances in delivery of video on websites. All of this is supported by an expanded new media technical infrastructure. To increase efficiency, broadcasters have sought to embrace this new delivery system and meet the needs of their viewers and advertisers.

The future

The reality is this has been another year where broadcasters have had to react to the near constant level of change in their industry driven by advances in technology and changes in the marketplace. They have thoughtfully adapted to remain competitive. The changes required in the past have been primarily technical. Now as the marketplace changes, and the need to be more productive and efficient within existing real estate and facilities increases, the need to adapt for new uses is affecting broadcasters everywhere. This, combined with the fact that many broadcast facilities were built in the 1960s and 1970s — at a time when the interior space standards were much less efficient than current requirements — means that interior renovations of existing working facilities will continue to be required by many broadcasters.

Interior renovations of existing working facilities will continue to be required by many broadcasters.

Sustainability

One additional pressure for rethinking existing infrastructure is sustainability. Broadcasters, along with many other organizations, are realizing that

the ultimate benefits of a sustainable workplace are not only tax incentives and energy efficiencies, but also a more productive workforce. A sustainable approach to design and construction has become the norm; companies expect a sustainable approach regardless of the decision to seek formal LEED certification. While the current green ratings are not refined enough for the realities of broadcast facility energy needs, architectural and engineering firms are being directed to take an aggressive, proactive approach to identifying and implementing design and material decisions that are sustainably driven. These choices can alleviate some of the increased financial burden and add perceived, quantifiable value to the broadcast workplace. For major renovations or new facilities, the current construction environment already includes green costs that are not optional. There are significant government-mandated energy and material requirements in place. Introducing green design measures into a project at the earliest phase and continuing the effort with an integrated team throughout the life of the project are far more cost-effective than tacking on individual green additions late in the design process.

A sustainable approach to design and construction provides tax incentives, energy efficiencies and a more productive workforce. For example, most of today's broadcast facilities feature LCD instead of CRT monitors. Photo courtesy David Churchill.

Construction cost outlook

As widely reported, construction costs have dropped from previous years. Despite the fact that the market has shown early signs of recovery, costs have fallen about 10 percent to 15 percent overall from 2009 to 2010. (See Table 1.) Although some leveling off is expected, construction costs may actually decrease 10 percent before costs begin increasing as the market stabilizes and begins to recover over the next year. Barring any further economic problems, prices should continue to level off in 2010 and 2011. As the market continues to stabilize, and if project work starts picking up, prices are expected to start increasing. Now is an excellent time to build or renovate a broadcast facility. For some guidelines regarding what type of space a broadcast room requires and the estimated cost, see Table 2 on page 46.

There has been a dramatic expansion in the number of locations around the country that regard themselves, or intend to be, media production centers. These aren't just located in Los Angeles, Vancouver, New York or Florida anymore. Now Louisiana, Michigan, New Mexico, Massachusetts and Connecticut offer incentives for capital and tax relief. The tax initiatives in these states and others suggest that significantly more spending will flow into these areas. Major production firms will likely be the first to capitalize on this.

Construction cost ground rules

Construction costs include all hard construction. As a test, imagine raising the building and turning it upside

Facility type	Year 2009 renovation construction cost per GSF ranges	Year 2010 renovation construction cost per GSF ranges
News-oriented production and broadcast facility (small studio)	$280-$325	$250-$300
News-oriented production and broadcast facility (large studio)	$300-$350	$280-$325
Sports-oriented production and broadcast facility (small studio)	$400-$450	$380-$425
Sports-oriented production and broadcast facility (large studio)	$350-$400	$325-$375
Master control/network release facility	$350-$400	$325-$375
Video and audio production facility (no live out)	$250-$300	$225-$275

Table 1. Shown here are New York City tristate area broadcast and media facility renovation construction costs per gross square foot (GSF) by facility type. Construction costs are based upon union construction, which typically results in higher-quality, on-time construction and therefore, may be more expensive.

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down. Whatever doesn't fall out (or at least rattle around badly) is part of the hard construction cost. For a broadcast and media production building, construction costs also include:

- walls and isolated wall assemblies;
- doors and acoustic doors;
- acoustic isolation and treatment systems;

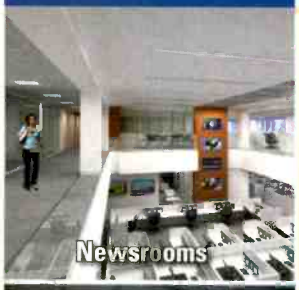
Type of space	What are their spaces typically like?	Type of space needed	Interior construction cost per square foot		
			Basic	Enhanced	High end
 Newsrooms	• Windowed offices • Open plan • Electronic library and condensed filing • 30 percent technology • 70 percent office • Secure entry • 24/7 operations	• Class A • Perimeter core for maximum open space interior offices • High floor-to-floor height • Maximum load capacity • 24/7 operation • Accommodate raised floor	$250 ±	$275 ±	$300 ±
 Control rooms	• Increased electric • Increased HVAC • Specific electrical requirements • 24/7 operation requiring supplemental air • Raised floor	• Increased structure • Accommodate raised floor • Adequate power	$325 ±	$350 ±	$375 ±
 Studios	• Windowless environment • Gymnasium-type space • High floor-to-floor height	• Large, open warehouse-type space • Level floor slabs • Column-free space • 20ft-30ft clearance height	$250 ±	$300 ±	$350-$500 ±

Table 2. Broadcast facility construction guidelines according to type of space

- ceilings and isolated ceiling assemblies;
- mechanical systems and redundancy requirements;
- electrical power and distribution systems, including service side transformers; backup generators; UPS, PDU and ATS systems; and grounding systems;
- plumbing systems;
- fire protection systems, including sprinklers and sprinkler booster pumps; pre-action systems; and clean agent systems;
- architectural lighting;
- broadcast lighting, including grids; trusses; transformers; and DMX cabling and circuiting (but not dimmer panels or racks);
- passenger and freight elevators;
- long-span construction to create studios and other double-height spaces;
- raised and accessible floor systems;
- pathways, conduits, cable trays and termination panels for broadcast, IT and telecom systems. The actual cabling, racks, rack gear, servers, local interface devices, control surfaces and computers are *not* included;
- passenger and freight elevators;
- building management and automation systems;
- basic building commissioning; and
- food service equipment.

Construction costs also include landscaping and site work such as parking; utilities up to 5ft outside the building line; general contractor's overhead and profit or construction manager's fee and general conditions. It is customary and prudent to include a design contingency in the construction cost. For more information, see the "Rules of thumb" sidebar to the right.

Major purchased items not included in the construction costs are:

- general furniture;
- broadcast, IT, telecom or computer cabling;
- telephone system, paging or security systems;
- desktop office computers;
- broadcast technical equipment, including racks; rack gear; servers; local

Rules of thumb for general office/nontechnical interior construction (price per square foot)

- Electrical $14-$20
- Light fixtures $6-$9
- HVAC $14-$20
- Carpentry (ceilings) $9-$13
- Carpentry (partitions) $9-$14
- Carpet $5-$7
- Millwork (basic) $6-$10
- Data cabling $5-$7 or $850 per seat
- Security $2-$3
- Sprinkler $5-$7

interface devices or control surfaces; consoles; and computers;
- broadcast lighting systems, including dimmer panels or racks and lighting instruments;
- audiovisual equipment;
- moveable or bench-top testing and repair equipment;
- ENG or microwave communication equipment;
- set construction or installation;
- antennas, antenna design and surveys, or satellite dish equipment;
- signage;
- artwork; and
- expanded or extended commissioning.

Construction cost measures are based on gross square feet — that is, the total built area. Net or usable area is only a portion of what you are building.

What do you get for interior spaces at $75-$100 per square foot?

- Carpet (material cost $20/square yard)
- VCT flooring, vinyl base, ceramic tiles
- No or minimal millwork (plastic laminate finish)
- Basic drywall construction
- Standard 2ft x 4ft acoustical ceilings
- Standard hollow metal doors and frames
- Minimal lighting (2ft x 2ft, 2ft x 4ft or high-hats)
- Minimal architectural finishes
- Standard paint finished (maximum four to six colors)
- Basic wall covering
- No exposed ductwork
- No exposed structural elements
- No interconnecting stairs
- No slab openings
- Standard pantry appliances

Soft costs

The total project costs include the sum of all of the costs necessary for an owner or client to build a project. These additional construction costs are referred to as "soft costs." The predictable range of soft costs includes:
- A/E design service fees and consultant fees;
- project manager's fees;
- set design fees;
- broadcast technical design or integration fees;
- furniture, fixtures and equipment;
- construction manager's fees (if used);
- construction change orders and owner's contingency;
- legal fees; and
- permits and filing fees.

The unpredictable range of project soft costs include land costs, financing costs, moving costs and relocation and/or business interruption costs associated with renovations. Together, these could far exceed the cost of construction. These costs are not under the control of the consultants or construction professionals, hence their lack of predictability. Generally, new construction, excluding land and financing, is ≈70 percent to 80 percent of project costs. Renovation construction cost is ≈ 65 percent to 75 percent of project cost.

Conclusion

The most influential construction cost driver in 2010 has been increased competitiveness due to

market pressures in local markets. Generally, construction costs can be expected to continue to decrease over early 2009 levels by 5 percent to 10 percent on the East and West Coasts and 15 percent to 20 percent most everywhere else. For those broadcasters considering a renovation or new build out, the current difficult and uncertain business environment has created an ideal time to implement any contemplated construction plans.

Likely market influences that will affect broadcast operations are trends related to converging media, consolidating technology, the emergence of 3-D TV and the continued growth of interactivity/social media. Budgets for broadcast operations are likely to continue to shrink, thus increasing the demand for flexibility in real estate models. BE

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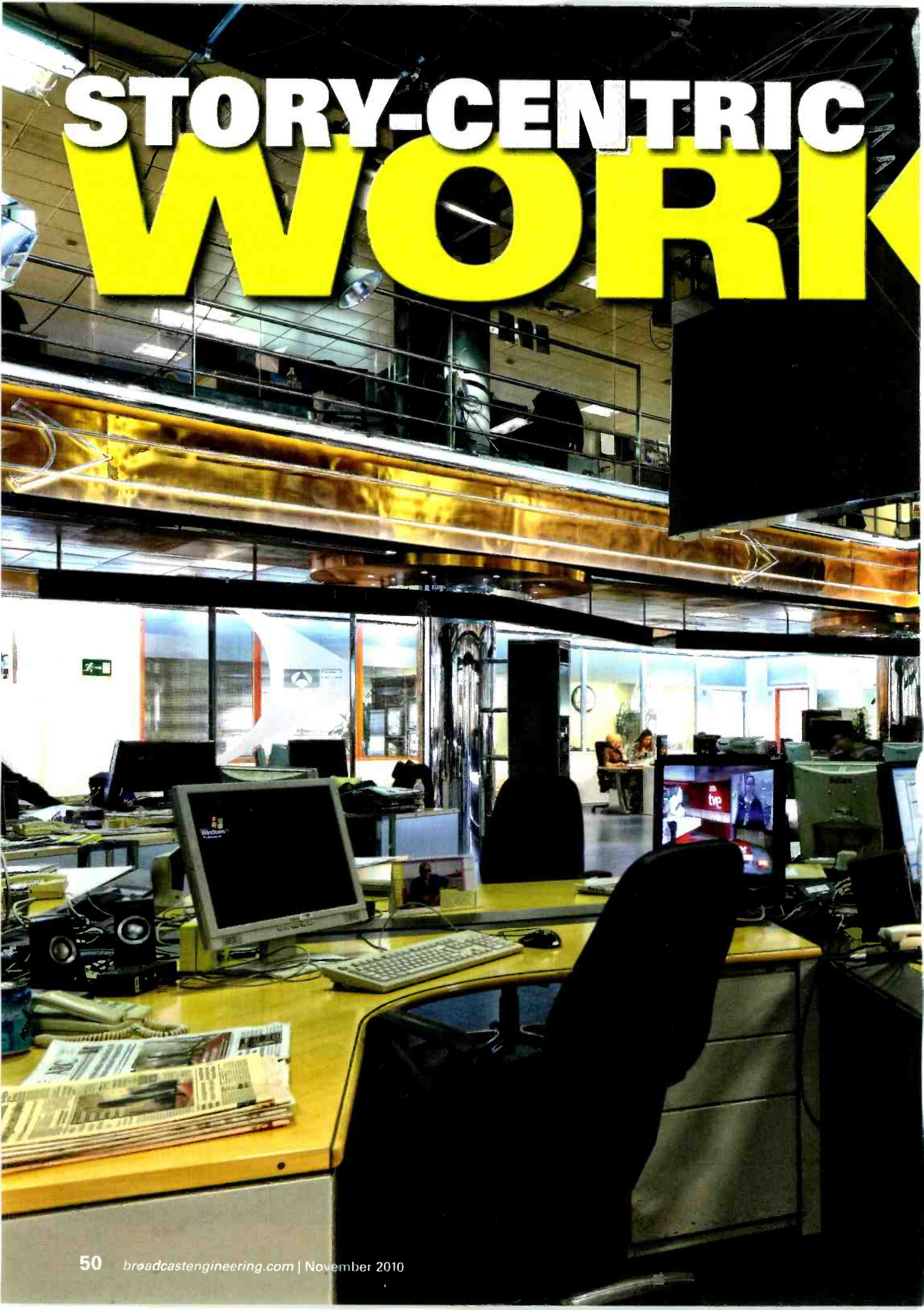
- High-end architectural finishes
- Specialized paint finishes
- Custom wall covering
- Exposed ductwork (round, oval)
- Exposed structural elements
- Interconnecting staircase
- Slab penetrations
- Ornamental metal
- Architectural glass
- Exotic materials (stone, marble, granite, ebony, mahogany, etc.)

John P. Gering is AIA, managing partner, broadcast design, and Keith Hanadel is principal, broadcast design director, for HLW International. Supporting research was provided by Irwin Schneider, PE, managing director, and Ray Arnold, managing director, of VVA.

STORY-CENTRIC WORK



KFLOW

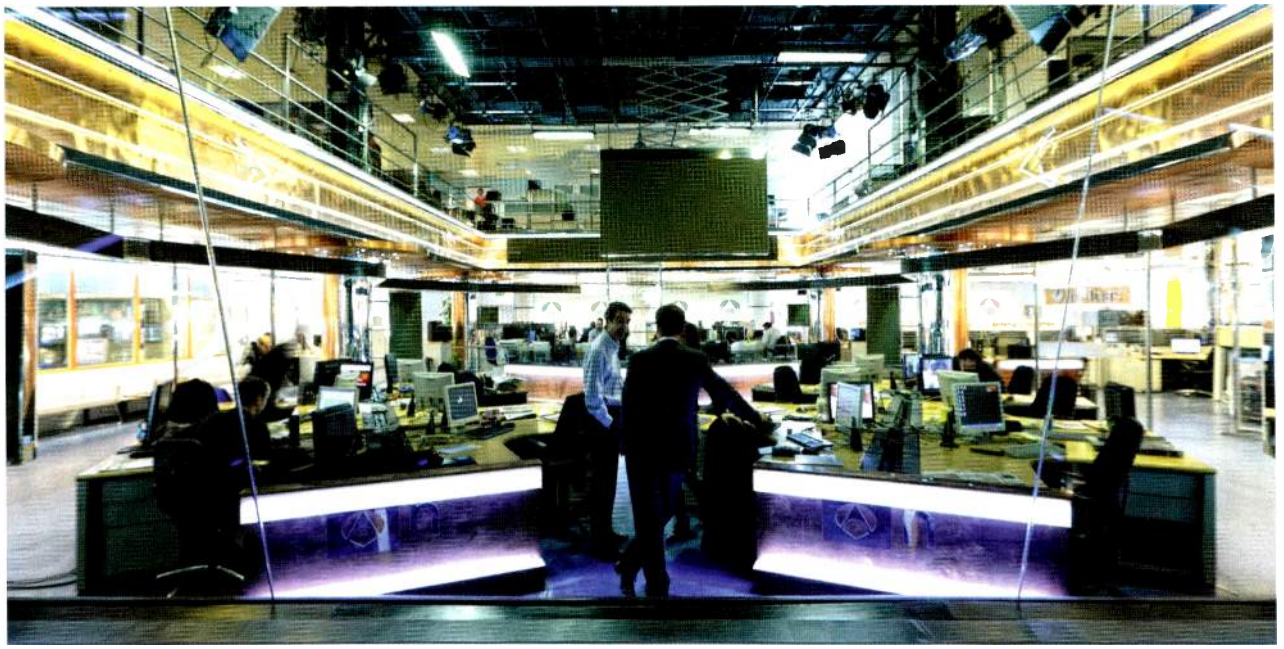
The change in method is philosophical as well as technological.

BY RAOUL COSPEN

Anyone who has spent time in a television newsroom as airtime approaches will tell you that the word "busy" doesn't really begin to describe it. The film "Broadcast News," made in 1987, accurately captured the panic caused by late material as journalists and production staff battled to get it on the air ahead of the competition, despite all the obstacles put in their way by human frailty and unhelpful technology. It was amusing on the big screen, but it was — and still is — a lot less funny when you have to live it.

It has been almost 25 years since that film was made, but many of today's television journalists will readily recognize the world it portrays. The truth is that in many of today's broadcast newsrooms, working practices have still not quite caught up with the opportunities offered by new technology nor with the new requirements imposed by evolving business models for broadcasters.

Antena 3 in Madrid, Spain, chose Dalet Enterprise Edition for its newsroom production system. The software includes a broad range of production tools and MAM functions.



Moving creative tools from dedicated hardware to the desktop helped make the story-centric workflow possible.

A new way of working, in both technology and workflow terms, is not only possible, but profoundly necessary. It's called story-centric workflow.

To understand why this is so different, let's look back at how TV news has traditionally been put together. In the past, the work of creating news items and getting them on the air had to be divided up. There were a number of reasons for this, such as time pressure. Breaking an item down into separate small elements, each of which could be done quickly, meant (in theory) that the whole process would take less time to complete.

Also, people had different functions. For example, journalists wrote words but didn't edit video. That was the job of a craft editor using complicated and dedicated tools that required special training (and usually membership of a specialist trade union). Production and playout were separate functions requiring quite different teams of people with individual skill sets.

All the distinct elements of a given story — moving pictures, stills, graphics, subtitles, voice-overs, prompter text and so on — were created and stored in different places, using different systems that had little or no connection with each other, making any kind of repurposing difficult or impossible.

The old way

All of this was labor-intensive, inflexible and error-prone. At the heart of the operation were a series of separate "containers," tapes with video or audio, scripts with words, and above all lists. The lists consisted of assignments, stories, scripts, video packages, graphical elements and audio clips. Playout was achieved by coordinating the lists and the simultaneous operation of all of the separate systems in what was a complicated process involving highly skilled specialist operators.

Late changes were possible but usually extremely difficult to achieve. Inserting a new story into an existing running order involved updating multiple lists simultaneously and then managing their coordinated playout, and it all had to be done with split-second accuracy.

When the program was over, all of the elements went back into their separate piles. To reuse a story, broadcasters had to access all the separate stores (if they were available) and reassemble the story as it had been transmitted. Then there was the matter of searching, which was even more difficult.

While enormous changes have taken place in the tools and techniques available to broadcast journalists, it's surprising how many of the old ways persist. It is much harder to change working habits than it is to update technology, and the innovations of the last decade or so have created their own issues and introduced new complexity, without necessarily changing the mind-set — or, crucially, the underlying workflows — of the people who manage and staff newsrooms. Change delivers enormous benefit to today's news organizations, but they must work to adapt and make the most of it.

Here are the most important evolutionary factors in broadcast news production, each with its advantages and challenges.

The new way: a story-centric approach

The story-centric approach to newsroom workflow exploits all of the innovations, evolutions and philosophies discussed to realize both efficiency and business benefits. The

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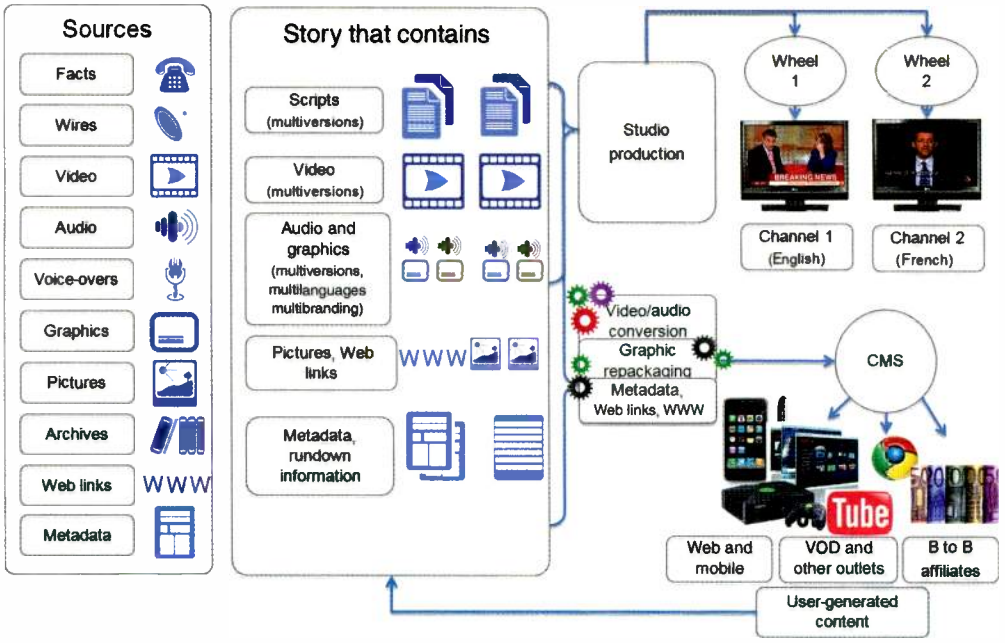

Figure 1. The story-centric newsroom draws on many sources to build a story.

story becomes the basic unit around which management and creativity are organized. (See Figure 1.) It is a virtual container that brings together all of the elements necessary to create, identify, modify and deliver a unit of news that can be delivered through many different channels. In other words, a story-centric workflow is not rundown driven but content- driven.

A story's life cycle is one of evolution over time. It may begin with little more than an idea, an item in a news diary, an assignment given to a camera crew or a placeholder in a draft running order. As time goes on, and as the editorial elements around it develop and change, the story will include a variety of elements: video clips, audio voice-overs, subtitles, graphics and references to sources such as wire stories, webpages, contacts files or news agency feeds, all of which may be useful at some point in the future. Crucially, the story may also include a number of different output formats or templates into which the content elements can be fitted manually or automatically.

This collection of material and references can be managed and treated like a reservoir from which a number of different versions can be derived to suit differing audiences or to reflect developments in the story as time goes on. Rather than managing each element separately, as in the past, the story-centric approach allows all of the elements in the story to be assembled and managed together as one unit.

These delivery channels illustrate another aspect of the story-centric workflow: automated processes to convert content from one delivery format to another, e.g. from a broadcast script to Web content, from one language to another, or into a templated format for an individual customer.

Another automated mechanism that is particularly adapted to 24-hour news channels is the concept of the wheel, a carousel of preproduced stories that are played out continuously, with the ability to update individual stories as news events develop.

In the story-centric process, each content item becomes a focus for the creative efforts of different people who can collaborate concurrently rather than wait for the previous step to be completed before they can begin their work. The story can be managed as a single entity from initial planning all the way through to long-term archiving. As the story evolves over time and is ultimately archived, all of its component parts and previous versions are kept together.

The story-centric process is not just a more efficient way of working in the newsroom, it enables news organizations to cope with a number

of new demands placed upon them by developing technologies and consumer trends.

The proliferation of sources

Today's broadcast journalists have a colossal quantity of source material available to them. From an internal point of view, newsrooms can often afford to deploy more crews because the equipment they use has fallen in price, and the links back to the studio are generally easier. Crew productivity is greater, and that means journalists have more material to assess, to shotlist and, ultimately, to edit and incorporate in stories and packages.

The same is true for news agency material, whether in video or text form; there is a lot more of it to monitor and read. The Internet has delivered a whole new world of source material and research capabilities, and then there is the proliferating availability of user-generated content (UGC), with members of the public capable of capturing breaking news on mobile phones and sending material directly into any news organization that is set up to accept it. There is also a growing trend to use social networks such as Facebook and Twitter to both contribute and access developing stories.

All of this gives journalists more choice and the potential to cover stories more accurately and more deeply. But it places an enormous demand on the systems involved. There is more content to store, a greater necessity for material to be accurately indexed and tagged so that it can be retrieved and processed quickly, and the need to track source and rights information.

From linear playout to multichannel delivery

Broadcast newsrooms must produce a lot more than just radio and television bulletins these days. Low-cost and powerful technology in the hands of consumers — such as STBs, PCs and mobile telephones — has created an enormous number of new delivery opportunities for electronic media organizations: red button interactive services, VOD, mobile TV and location-based content delivery. This provides important and potentially lucrative new revenue opportunities for broadcasters. However, it also creates the necessity to make into a reality the often-expressed aspiration to "produce once, publish many times."

This means, firstly, the integrated flow of content from system to system and process to process, with true interoperability based on compatible implementation of common standards. It also means the ability to automate processes such as standards conversion based on a set of rules and furthermore an architecture that not only allows an integrated infrastructure to be created in the first place, but also copes with changes and adjustments down the line as business and production requirements evolve and software versions change.

The result of all this in terms of the broadcaster is a flexible workflow design, not just a great story for playout on a single channel, and the possibility to repurpose content and rebrand it to exploit the maximum possible number of different outlets to potentially generate new revenue.

From dedicated hardware to desktop applications

Many, if not most, of the creative tools that are used to process media content are now available as desktop applications. They run on standard platforms such as PCs or Macs and connect using standard IT networks. This has revolutionized the journalistic process in newsrooms that have embraced the appropriate technology. These programs allow media content such as video, graphics and audio to

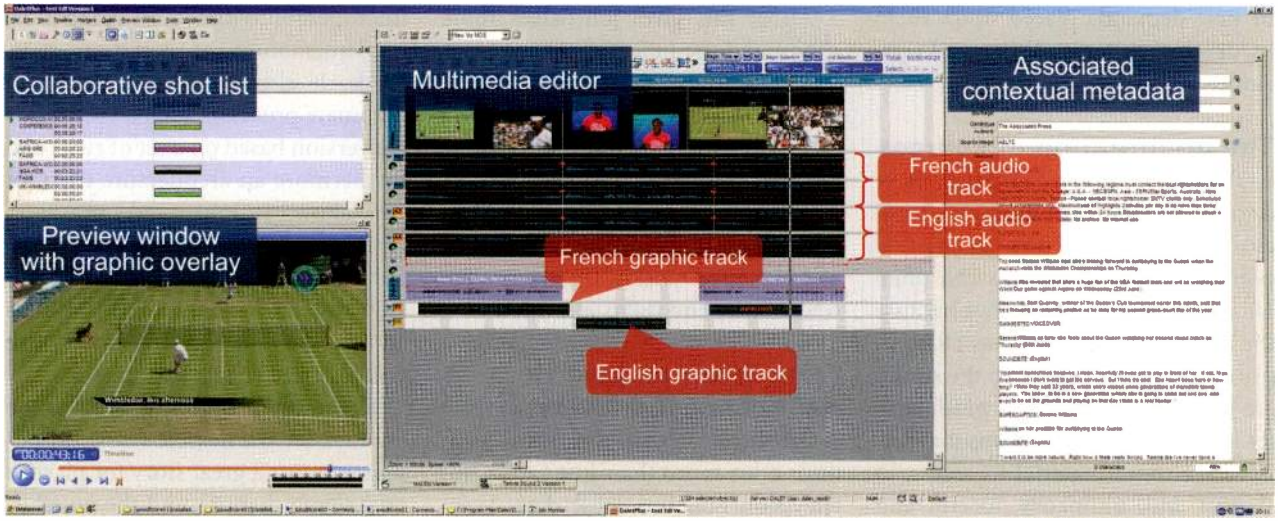

Figure 2. A story can be delivered in different languages from a single timeline.

be created and edited along with the words for commentary and voice-over in a fully integrated way that was never possible before. This obviously places a demand on journalists to become trained in new skills. It also completely changes the workflow from a largely linear procedure in which material was passed from hand to hand and from process to process to one in which people with multiple skills collaborate simultaneously on the same material.

From analog media to file-based digital assets

Underlying all of the above is the transition from analog to digital, from tape to disk, from linear communications to data networks. This is perhaps the most significant change of all and one that affects every aspect of work in the newsroom. Above all, it changes the basic mind-set created by many years of container-based work, where media was stored on tapes or cassettes, where the tape was indexed by writing its contents on the label, where the person who held the tape "owned" the story, where playout was engineered by complex manipulation of the containers, and where archiving was done on a shelf.

A digital, nonlinear, online environment conveys huge advantages, but these are hard to achieve without careful consideration of all the implications and requirements. It is much more than simply replacing VTRs with servers. It requires the simultaneous deployment of a number of overlapping and interdependent elements that are as much philosophies as they are systems and technologies.

What it takes

Deploying a story-centric approach in a broadcast newsroom requires both a variety of enabling technologies and the implementation of change in newsroom organization.

Media asset management

There are two questions that any media asset management (MAM) system must answer: What does it have? Where is it? Of course, that is just the beginning. Other business-critical information that needs to be tracked might include where it came from, how much it cost to acquire or buy, who now owns it, how many times it has already being used, and much more. The reality is that media assets must be managed from the earliest planning stages, which may have important resource implications, all the way through acquisition, indexing, storage, retrieval, processing, packaging, delivery, repurposing and archiving. In other words, they must be managed through the entire life cycle. Knowing all of this is the key to efficient operation, and it is essential for effective content monetization and therefore to the business viability of media-centric organizations.

Therefore, a MAM system is an essential element of the story-centric workflow. Moreover, it must be integrated with the creative process at every step because new metadata is constantly being generated and must be available to anybody who is involved in production or delivery. The days are long past when an archive system was quite literally a morgue, where tapes went on to a shelf following broadcast and, for the most part, gathered dust thereafter. The MAM system must be the foundation for the whole process because it is important to constantly keep tabs on content since one never knows when it might come in useful in the future.

Collaborative creativity tools

The importance of the desktop environment for such processes as video and audio editing cannot be overstated. It ensures that all of the creative processes central to broadcast and especially to news production are capable of being carried out concurrently by production staff on a common stock of content.

The user interface, therefore, must cater to an extremely flexible approach. A story can carry multiple alternate audio and graphics tracks that can be selectively played out or

delivered according to the demands of a particular channel. (See Figure 2.) These become part of the overall metadata attached to the story.

Automated workflows

The complexity of the modern digital media delivery landscape is such that sophisticated rules-based automation capabilities are absolutely essential so that material can be intelligently reformatted and repackaged for multiple channels, multiple audiences, multiple devices and, of course, in the interests of generating multiple revenue streams. The time is long past when a news organization could afford to support separate newsrooms for television, radio and the Web. There must be an uninterrupted flow of material through all of the processes required to produce output in any desired format — a kind of content factory approach that operates like a production line.

The question of integration

Story-centric is not only about technology; story-centric is technology and a new, more flexible workflow that allows more efficient ways of organizing the newsroom.

Above all, it requires integrating systems and processes that used to be separate and compartmentalized. The environment must closely integrate the newsroom computer system (NRCS); MAM; production tools such as video editing, audio processing and graphic creation; archiving; automation; and tools to create and manage workflows appropriate to all of the above. All of this should be largely invisible to the journalists and production staff who simply want to create accurate, timely news content. Exactly how these capabilities are delivered to them is of little interest. They care about what technology enables them to do.

The story-centric workflow requires integration of the newsroom computer system, the MAM system, production tools, automation, archiving and the tools to manage it all.

The problem facing broadcasters is that few manufacturers offer all of the above in a single integrated package, and integrating tools and systems provided by separate manufacturers can be dauntingly difficult.

But the benefits are so clear that the question has to be asked whether broadcasters can afford not to go for a story-centric approach. And broadcasters aren't the only ones. Enterprises in many industries are increasingly using digital media to deliver messages and sell products, and they have just as much need of an integrated creation, management and delivery system as the broadcasters themselves.

Either way, a well-implemented story-centric newsroom will take the quality of the journalism to a new level and is likely to cause fewer sleepless nights for the people working in it. **BE**

Raoul Cospen is director of marketing for Dalet.

Christie MicroTiles

"The Colbert Report" receives a colorful video wall makeover.

BY JIM FENHAGEN

With the patriotic red, white and blue set of Comedy Central's "The Colbert Report" due for a design update earlier this year, Jack Morton PDG reached out to Dale Cihi of integrator Videofilm Systems to give Christie MicroTiles a high-profile role in the redesign.

As a designer, I'm always looking for ways to make things look as innovative and new as possible. New products, if they're to be considered, need to have a real "wow factor" and grab the viewer's attention. With these display tiles, we could not only provide a look that was unique, but one that worked wonderfully with our design concept. The set would be able to feature dynamic content that included full video and even allow Colbert to have something new to comment on.

Christie MicroTiles displays were used for the redesign of "The Colbert Report" set. The displays use DLP and LED technology and are energy efficient.

The displays' technology combines DLP and LED illumination in modular 16in-by-12in displays that can be stacked or aligned to create video walls of various shapes and sizes. The tiles met a number of criteria for the new set: real-time color correction, off-access viewing, exceptional brightness, and color-matched graphics and video without any pixelation. We found that the MicroTiles helped to visually amplify the set while maintaining its signature look and not being too distracting to the viewers. The technology was intended to be seen but not always watched, serving as virtual scenery whose screens become part of the set architecture.

"The Colbert Report" marked the first installation of the displays since its launch in November 2009. Cihi first saw a product demo of the displays at InfoComm 2009 and, knowing that we were looking to integrate strips of video in the show's new set, we decided to try the technology.

The redesigned set features 41 display tiles. Thirteen are arranged as three horizontal displays — in 1 x 4, 1 x 5 and 1 x 4 configurations — under Colbert's desk. Twenty-eight comprise four angled 1 x 7 vertical columns along the set's backdrop. The displays present HD video and graphics, such as bold stars and stripes, created exclusively for the show.

Installation of the modular systems was quick and easy, and we were especially pleased that the columns, a design feature from the previous set, didn't have to be redesigned to accommodate the tiles. The product's flexibility and narrow profile (10.24in deep) enable it to fit in even the most space-constrained studios, and it fit seamlessly into the set's existing space.

The displays achieve 115 percent NTSC broadcast standard and PAL color gamut, giving Colbert's over-the-top Americana extra visual punch.

The displays are an all-in-one technology that worked perfectly for our project. Not only was the product well-designed and easily implemented right out of the box, the tiles met the goal of building green into equipment whenever possible. The display tiles consume less energy than other systems and operate longer with a lower cost of ownership in a near "set-it-and-forget-it" installation.

Embracing a new product often requires extensive support from the manufacturer to get past any glitches and hiccups. "The Colbert Report" was the first time the tiles were going to appear on-air, and the installation went smoothly and without incident.

Set design is a competitive business, and staying on top means finding creative and renewable ways to use the technology you have. Christie MicroTiles adapt easily for entertainment spaces so the client can repurpose them later on, restacking them and integrating them with different set pieces to create a totally new design. "The Colbert Report" may be unwavering in its commitment to the red, white and blue, but the show is always looking for innovative ways to brandish its satirical flag. **BE**

Jim Fenhagen is senior vice president of design at Jack Morton PDG.

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TRAINING DOESN'T COST, IT PAYS!

Facility management and control

An SNMP-managed network can detect failures instantly.

BY JOHN LUFF

There are many reasons to consider using products that can be monitored and controlled with software suites. Among the most obvious is the level of complexity in modern facilities and the need to add an abstraction layer that makes the complexity less overwhelming for operators. Think for a moment about how many products are in large plants today. For instance, in Turner's Atlanta Network Transmission Center (Turner NetOps) there are more than 4750 modules in 350 rack frames managed by a single network. Imagine for a moment how difficult it would be to chase configuration and fault issues in a system that large without software tools to make it possible to abstract the complexity to a single screen.

Using a software product to manage such an installation is off scale for most installations. But the second reason to consider software suites is the amount of time available to do the job manually. We are often concerned about mean time between failures (MTBF). That is a measure of how often each piece of equipment might fail based on statistical data about component and module reliability. It is an important measure, but even more important is mean time to repair (MTTR). The MTBF might show that a DA is unlikely to fail in your lifetime, but if it does fail, it is much more important to be able to find the fault quickly and cure the problem, perhaps by swapping a spare module into the slot.

The MTTR is affected by many things. Let's say each module has a loud annunciator that will notify you of a failure, assuming the circuit that runs the noise maker does not itself fail at the same time. The MTTR would be determined by how long it announces failure before you finally hear it, the time to go to the rack room and find it, back to the shop to find the spare, and finally back to the rack room to install it in the slot. It's simple, quick and effective. The failure may only last a couple of minutes if you are fleet of foot.

Contrast this with a facility that has a monitoring and control system. As soon as the fault occurs, both the failed module and the next device in the signal path report a problem (absence of picture, or audio perhaps). Immediately, you know the location of the failed module, and a call to maintenance can dispatch a technician with the right module to the exact location, saving precious minutes. In a large facility, the monitoring system might trigger a switch to a redundant path as soon as the failure is sensed, meaning that there is essentially no impact on-air. Still, the failed module is identified and replaced, restoring the backup in minutes.

Feeds from the Chilean mine rescue arrive at Eurovision's Washington, D.C., network operations center, a major hub of the worldwide fiber and satellite network. On custom software, duty technicians have a live view of all feeds passing through any node in the Americas. They can also plan short notice news feeds 24 hours a day.

But let's say the failure happens in a large facility like NetOps. With 300 or so racks, you might not hear the failure unless you walk down every row of racks, which might take several extra minutes. In large operations, the rack room might be separated by some distance from the QC position or MCR. Additional precious time is lost before someone figures out the failure was perhaps not in an encoder but in a device that feeds the encoder before a technician is dispatched to roam the rack room.

This is a rather simplistic view of complex monitoring and control products. Many more features are often built-in.

Simple Network Monitoring Protocol

An important consideration is the ability to use Simple Network Monitoring Protocol (SNMP) to talk to devices from many manufacturers. SNMP uses standardized interfaces, called management information bases (MIBs), which are provided by the device manufacturer.

An SNMP-managed network consists of three key components. First is the network management system (NMS), which is the software running on a network computer. It speaks to network nodes in managed devices through software in the managed device called the agent. Communication can be unidirectional, setting parameters from the management system or getting status on request from managed devices. Or it can be bidirectional, with managed devices reporting parameters on their own to the management system, as in failures. Though developed for computer hardware, SNMP works perfectly well with many pieces of video-specific hardware. A video server system might report the status of the disk array, including failures, and perhaps power supply voltages and fan status, as well as the status of the MPEG I/O ports. A video switcher or router might also show the status of power and cooling, reporting internal temperatures, but also might identify the absence of reference or excessive bit errors on inputs.

Finally, several video hardware manufacturers have developed systems with tight links to the display of errors.

All of the data gathered via either SNMP-compliant or proprietary software must be displayed in a way that facilitates efficient and succinct presentation to the operator. Most monitoring systems are therefore highly graphical at the operator level. The majority of facility monitoring and control systems allow mapping devices to a bitmap view of the facility floor plan. When a failure happens, there is no mistaking exactly where in the rack room the technician should go. It is valuable to note that a good monitoring system can extend far beyond a local facility.

For example, Eurovision operates NOCs in many cities around the world where programming can be handed off inbound or outbound to its complex transmission network. All of the interfaces and the virtual circuits across its terrestrial and satellite network can be managed from Geneva at the Eurovision Control Center, as well as from operation centers in the United States and Asia. This allows fault chasing as well as complete setup of the operational status without any staff present at the hardware location, perhaps halfway around the world. The interface is highly graphical to allow operators to see the status of each interface in real time as the network is reconfigured throughout the day. Systems like this are normally configured to send alarms to e-mail accounts or pagers, so failures are not missed for long.

Finally, several video hardware manufacturers have developed systems with tight links to the display of errors. This can allow real-time monitoring to start at the macro level, showing the status of entire nodes in a centralized broadcasting model, but "zoom in" to the micro level when a fault has been detected. One manufacturer calls this lean back, i.e. the macro level in the quiescent state, and lean forward when working on a problem that requires full attention. Using tightly integrated products in a real-time environment like broadcasting is always valuable. **BE**

John Luff is a broadcast technology consultant.

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Compix — NewsScroll 4.0

Software allows users to add multiple crawls, logos and more with a single channel; enables simultaneous display of two independent crawls, which can be updated manually or automatically from RSS feeds; supports two static or animated logos, a real-time, customizable clock, a data box that can be updated through text, Web and XML files, an interchangeable ratings logo and an instant text-update field for last-minute additions; includes a cut mode that enables users to insert full- or partial-screen graphics behind other crawls, logos and text elements; includes new GPI and auto-start functions.

949-585-0055; www.compix.tv

Noise Industries — FxFactory Pro 2.5

Visual effects platform features new filter and transition plug-ins including local contrast, vibrance, genie filter, accordion, origami, genie transition and page turn; new user interface in slideshow generator gives users increased flexibility in selecting and reordering image files and control to produce slideshows in Final Cut Pro, Motion and After Affects, as well as includes four new transition effects applied automatically between slides; available free to current FxFactory Pro 2 users.

415-401-7382
www.noiseindustries.com

OConnor — 2065

Fluid head for digital cameras features stepless, ultra-smooth pan and tilt fluid drag and sinusoidal counterbalance system that provides accurate balance at any point in the tilt range; equipped with dual scales, one on each side, and four handle rosettes for operation from either side of the head, as well as front or back handle mounting; one-touch platform release lever enables one finger or hand action to undo the safety catch and open the lever; weighs 22.9lbs and has a payload of zero to 71lbs.

818-847-8666; www.ocon.com

Orad — Maestro Suite 6

Updated enterprise graphics solution features extensive control of graphics' behavior, redesigned plug-ins, a new user interface for its modules and sync, a standalone tool that allows the movement of content from different databases as well as the import/export of content to files; supports multiple tracks that can be triggered by different events; can directly play pages created with Morpho 3D; enables the creation of scripts and macros.

201-332-3900; www.orad.tv

Radiall — R2CT

Connection kit provides a waterproof, sealed connection for fiber-to-the-antenna, remote radio head equipment and outdoor applications where a protected interface is needed; designed for optical systems using SFP transceivers and duplex LC-terminated fiber-optic cable; kit can be assembled over existing cables and can be reused, allowing cables and transceivers to be changed in the field including front-panel swapping of transceivers; sealing levels are IP65, with IP67 optionally available, with a durability of 100 mating cycles minimum and a temperature range of -40 degrees to 85 degrees Celsius; uses a receptacle attached to the equipment panel and a plug assembly over the cable.

480-682-9400; www.radiall.com

Softel — Dashboard

Solution designed to manage the configuration and monitoring of an entire subtitle transcoding and transmission operation; provides a central, unifying point from which to administer multichannel, multilanguage subtitling and captioning; allows operators to administer multiple Swift TX units and configure subtitle processors, monitor subtitle streams and oversee a subtitle archive system that allows broadcasters to manage their subtitle assets throughout their lifecycle; aggregates subtitle monitoring information from across the broadcast infrastructure and presents it clearly, diagnosing and highlighting any issues within the chain.

203-354-4602; www.softelgroup.com

SSL — C100 HDS V3

Upgraded broadcast console introduces support for new low-cost I/O and expanded remote GPIO options; extends remote-control capability with Pro-Bel protocol compatibility and full implementation of Ross OverDrive and Sony ELC production automation systems; features a Dialog Automix option, which transparently manages the riding of faders in a live, multimicrophone production, eliminates missed upcuts and maintains a smooth, balanced level of background ambience; adds automatic stereo to surround 5.1 upmix option; production tools include program output delay, enhanced snapshot editing, expanded free control assignments, fader to zero decibels and new maintenance tools.

213-249-9229
www.solid-state-logic.com

TV One — LM-1750HD

High-performance, multiformat 17in LCD monitor features inputs for SDI (SD or HD) with an active output, HDMI, analog RGBHV, YUV or YPbPr component video and two-times composite video, with a YC input available that can be used in lieu of one of the composite inputs; supports and automatically detects NTSC and PAL TV standards; provides five stereo inputs and dual internal speakers driven by a 3W amp for stereo audio monitoring; front-panel tally LEDs can be activated externally via the DB9 connector; a sync-delay mode allows viewing of the vertical and horizontal sync and vertical blanking intervals, and a blue-only mode facilitates accurate monitor setup when viewing color bars; includes standard VESA mount on the rear panel and a rack-mount kit that can tilt up and down.

800-721-4044; www.tvone.com

Universal Electronics — Dolphin

Advanced interface control enables 3-D navigation by incorporating Freespace motion-detection technology by Hillcrest Labs; adds a new dimension to traditional up/down/left/right controls by translating all hand movements into on-screen cursor movements; provides subscribers ability to navigate multiple screens and functions of IP-based applications by manipulating the on-screen cursor with routine hand and wrist movements; includes intelligence that will enable future versions to recognize user patterns for further personalization and interactivity.

714-820-1000; www.uei.com

Autoscript — LED14TFT-BLW

TFT LED system offers instant warm-up to full brightness and comes with a wide-angle hood; includes Eco+Plus+ feature that saves power when no active video is present and low-consumption mode for use with camera utility power outlets; features built-in, dimmable tally light with opto sensor input and repeat output, illuminated control panel and optional HD-SDI input.

203-926-2400; www.autoscript.tv

Front Porch Digital — SAMMA Solo

Semi-automated videotape-to-digital migration system watches over the entire operation automatically, monitoring the process and implementing specified quality standards frame by frame; converts videotape in real time to as many as four simultaneous digital files, including MXF-wrapped JPEG 2000, MPEG-2, QuickTime, H.264 (MPEG-4), Flash, MPEG-1, AVC, Windows Media and Real Media.

303-440-7930; www.fpdigital.com

Lectrosonics — Mute

Belt-mount active switch is powered by any five-pin Lectrosonics transmitter; works with most two- and three-wire lavaliere microphones; uses an optically coupled switch to silence the audio signal without any clicks and pops, even when located in a strong RF field; features weather-resistant toggle switch as well as cable with weather-resistant vinyl boots at each end; included wiring kit provides a five-pin connector, strain relief parts and an additional water-resistant vinyl boot to protect the lavaliere microphone connector from moisture.

800-821-1121
www.lectrosonics.com

MultiDyne — HaLFCuBE

Portable fiber-optic field transport system allows for up to 40 channels over one fiber-optic cable; can be configured with DVI, RGB and HDMI and run on batteries or 110/220VAC power; features an HD monitor and signal generator on either end of the product so users can test the circuit even if the camera isn't present.

516-671-7278; www.multidyne.com

Vaddio — ControlVIEW XHD

Automated robotic PTZ camera controller with HD, RGBHV and SD video switching, video transitions and camera preset trigger functionality; can control up to six PTZ cameras (or other video sources) and assign up to 72 total preset positions; 6 x 1 switcher accepts analog, SD, HD and RGBHV on all inputs and up/downscales these signals to dual program outputs at an SD, HD or RGBHV resolution.

800-572-2011; www.vaddio.com

Canon — REALiS WUX4000

Installation LCOS (liquid crystal on silicon) projector delivers 1920 x 1200 widescreen images with an aspect ratio of 16:10 and brightness level of 4000 lumens; employs AISYS-enhanced LCOS optical engine that offers crisp, seamless images with intricate detail, high brightness, high contrast and accurate color; features include access to three new high-resolution interchangeable Canon projection lenses as well as motorized lens shift for installation flexibility.

516-328-5000; www.usa.canon.com

Harmonic — Rhozet Carbon Coder 3.16/Carbon Server 3.16

Transcoding application/server updates include multiple audio program support for H.264 exporter/importer and Smooth Streaming exporter; CEA-708 caption support for Omneon exporter/importer (MXF and MOV) and H.264 exporter/importer; a video filter that allows for the insertion of V-Chip XDS information into the Carbon pipeline in the caption/708 payload; an optional audio filter that allows Dolby E encoding for any Carbon Coder exporter supporting an uncompressed or PCM audio format; and a new time code processing filter that can correct, clean up or synchronize the time code payload with time sources other than the source file.

800-788-1330; www.harmonicinc.com

AJA Video Systems — KUMO CP

Optional 1RU networkable control panel for KUMO line of compact SDI routers gives users access to destination- and/or Web browser-based control of KUMO routers; supports the selection of 16 sources to 16 destinations on each of up to four routers; connects to a single router automatically without computer/browser connection; enables users to assign the router select buttons to up to any four routers on the network via the Web browser interface; features removable button lens caps for the customization of source and destination names; provides panel lock, destination lock and router delegation buttons.

530-274-2048; www.aja.com

Tightrope Media Systems — ZEPLAY 8440HD/8440SD

Eight-channel server with four inputs and outputs active at all times is available in SD and HD versions; HD system includes support for resolutions up to 1080i and all international frame rates; features 160 total hours of HD recording time (40 hours per channel), independent control of every output channel, a built-in multiviewer, frame-blended slow motion and a dedicated replay controller; includes redundant power as well as RAID protection for both video and system drives.

866-866-4118; www.tms.com

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Reference displays

LCD technology has come of age.

BY ANTHONY R. GARGANO

A long time ago, in a galaxy far, far away, broadcast and production facilities displayed video imagery on the best monitors money could buy. Manufacturers were in a constant battle of product one-upmanship, and reference monitor prices ratcheted skyward. But that was years ago in what seems like another world. That world was transformed when the axis of decision making rotated from the technical corps to the accountants.

I can recall experiencing this firsthand during a meeting in New York with a newly appointed TV network senior vice president for engineering and operations. You could have coated his eyeglasses with the total of his technical knowledge and not impede his vision, but he could really make that nickel buffalo cry for mercy. I knew my display business was in trouble when he said the network didn't need hundreds of monitors worth thousands of dollars each when a several-hundred-dollar TV set could do the same thing. He highlighted the polar extremes of using $10,000 display monitors versus $200 TV sets with monitoring inputs. As it turned out, he was at the forefront of an industry move to cost containment and expense reduction that led to lower-cost professional monitors, among other products.

LCD replaces CRT

The key enabler to driving down monitor costs was the replacement of CRTs with LCD display technology. Not only having smaller size, lighter weight, lower power requirements and simpler control circuitry, with LCD panels appearing in everything from cell phones to laptop PCs, the economies of scale afforded to the panel manufacturing process yields an incredibly low cost per square inch of viewing area.

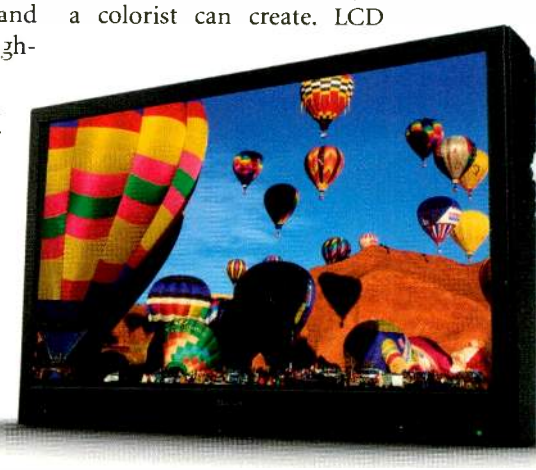
Today, we live in a world of digital theaters, HD broadcast television, high dynamic range image processing, 2K and 4K video, digital intermediates in the film world, and video capture cameras surpassing the dynamic range of film cameras. This world demands the ultimate in color accuracy and quality proofing measurement devices. Until now, that need could only be met by special colorimetry, beam alignment and control circuitry built around high-quality, ultra-fine pitch CRTs.

CRT has long commanded center stage for critical viewing of such things as detail assessment and color reference evaluation. The key advantage of CRT over flat-panel displays has been dynamic range or simply the ratio of peak white luminance versus black-level luminance that the device can display. CRTs have always delivered richer black level detail — until now. Another advantage that CRTs once enjoyed over flat-panel displays was wider color gamut, but this advantage disappeared with the introduction of LED backlight technology.

Recently, Dolby announced a new state-of-the-art in LCD technology. The company now makes a flat-panel reference display that exceeds CRT displays in several key areas of performance and specifications. Using a unique and patented dual modulation scheme, the PRM-4200 panel is backlit by 1500 LEDs, each containing an RGB triad for a total of 4500 individually controllable elements. In a process called local dimming, each element of each RGB triad is independently controlled and modulated on a frame-by-frame basis synchronously with the LCD panel. This technique not only yields black levels heretofore unachievable in an LCD but also enables the display of a wide color gamut. Going well beyond Rec 709 color gamut, Dolby claims this is the first flat-panel display to show 100 percent of the full color gamut of DCI P3.

Conclusion

We have now reached a level of performance with LCD technology where the range of colors that can be displayed is almost beyond what a colorist can create. LCD display technology has truly come of age. It can now be used for checking color accuracy, grading content, approving program material or assessing creative imagery. Such technology may represent the ultimate in a visual quality control tool. But this level of performance doesn't come cheaply. Dolby's new reference monitor has an MSRP of $54,950 — so it's not very likely to be an item for your media room budget. But, say boss, can I borrow this for the weekend? BE



New flat-panel LCD displays can check color accuracy, grade content and approve program material.

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

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

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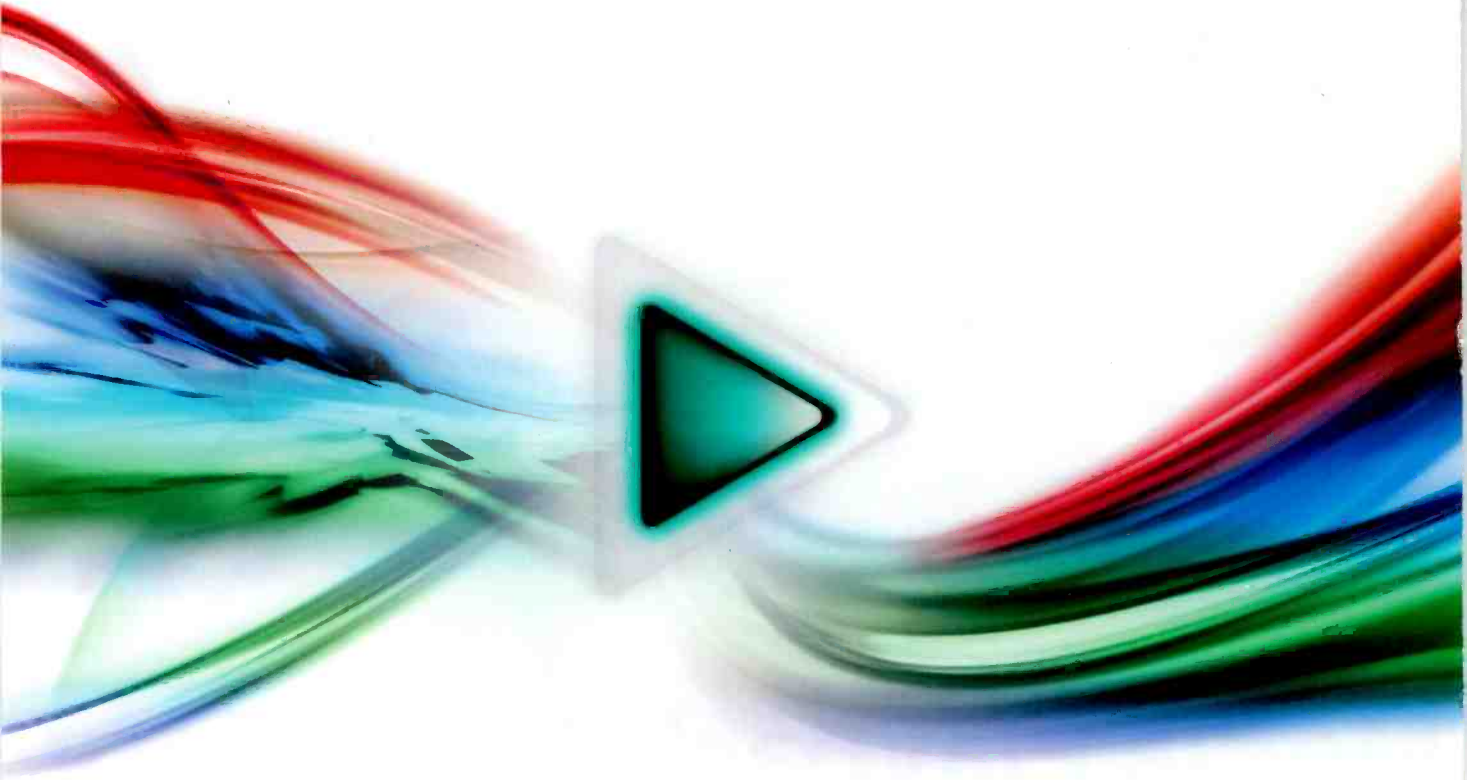

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