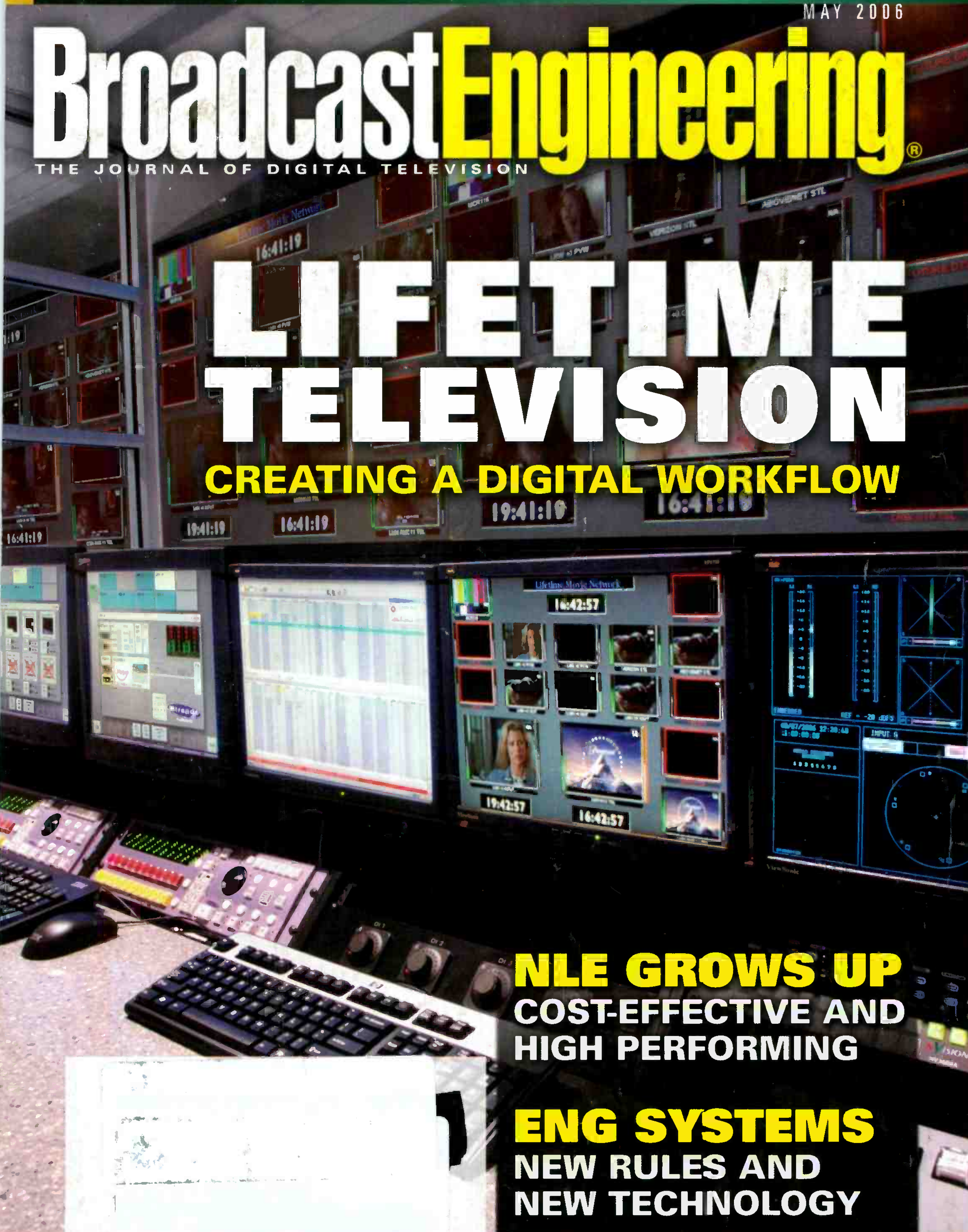
www.broadcastengineering.com

MAY 2006

# BroadcastEngineering®

THE JOURNAL OF DIGITAL TELEVISION



## LIFETIME TELEVISION

### CREATING A DIGITAL WORKFLOW

### NLE GROWS UP

COST-EFFECTIVE AND HIGH PERFORMING

### ENG SYSTEMS

NEW RULES AND NEW TECHNOLOGY

A Prism Business Media Publication

# THIS IS NOT AN AUDIO CONSOLE

Audio Control

D-9

## IT'S A DIGITAL CONTROL SURFACE

THE D-9 interfaces to WHEATSTONE's router-based BRIDGE MIXING SYSTEM—a digital network that lets multiple control surfaces share common audio resources, accessing signals and sending mixes throughout your facility.

Production

OTHER SURFACES can share common audio resources

Studio 2

I/O CONNECTIONS can be at point-of-use and accessed by any control surface

DEDICATED DSPs and controls, redundant automatic failover CPUs, mix engines and power supplies are all integral to the system. Components interconnect via CAT5 or fiberoptic cables for single-wire system integration.

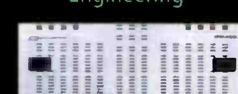
A traditional intuitive surface layout gets your operators up and running FAST—even in full 5.1 surround mode.

*TRUE RELIABLE mixing power; ease and clarity of operation—take ADVANTAGE of the WHEATSTONE BRIDGE Network System!*

CENTRAL FRAME can control a 1024 x 1024 mixing based router

Engineering

Engineering



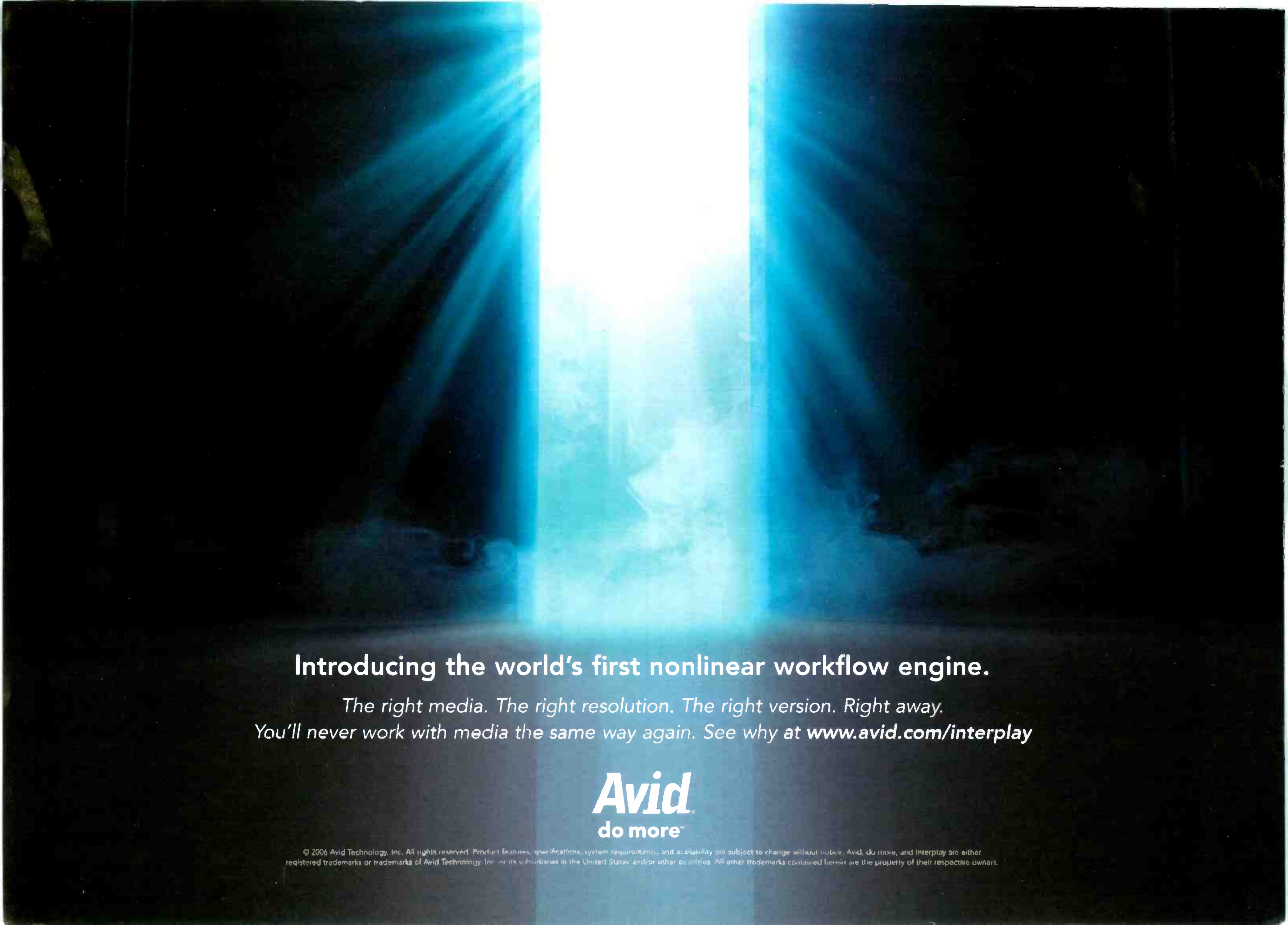
Talk to your STATION ROUTER bi-directionally for smooth integration

Wheatstone

sales@wheatstone.com / tel 252-638-7000 / www.wheatstone.com


LEITCH
HARRIS


INTERPLAY™


Introducing the world's first nonlinear workflow engine.
The right media. The right resolution. The right version. Right away.
You'll never work with media the same way again. See why at www.avid.com/interplay
Avid
do more

MAY • VOLUME 48 • NUMBER 5



BroadcastEngineering
THE JOURNAL OF DIGITAL TELEVISION

# CONTENTS

## FEATURES


**58 New technologies changing NLEs**
*By L.T. Martin*
The difference between manufacturers' edit systems can be found in the core technologies.

**68 Choosing a storage management system for broadcast**
*By Brian Campanotti*
How to use automatic archiving technology to repurpose content

**82 HDTV optics and the many roads to HD newsgathering**
*By Larry Thorpe and Gordon Tubbs*
The steps toward incorporating upconverted widescreen SDTV field acquisition into an HDTV news broadcast





**ON THE COVER:**

Lifetime's technical operations center includes a master control pod that is used for playback and monitoring of Lifetime Movie Network and Lifetime Real Women. Photo by Andy Washnik, CORPRICOM.



## BEYOND THE HEADLINES


Download
**16 ITV shrouded in the mist**

FCC Update
**22 White-space proposal has new life**


## DIGITAL HANDBOOK


Transition to Digital
**26 Digitizing audio**

Computers & Networks
**34 Fibre Channel and its use with Ethernet**

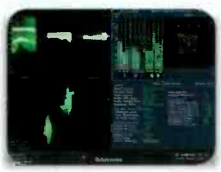
Production Clips
**40 HD ENG: Is it ready?**


(continued on page 8)

## Give everybody the power to See and Solve. Close the case of video compliance.

Tektronix video solutions with exclusive See and Solve™ features help everybody in your operation solve problems faster and easier. Video compliance doesn't need to be complicated. Provide understandable information, not just data, and more members of your team can visualize and troubleshoot the source of problems. Editors, operators, technicians, and engineers can all use Tektronix tools to identify and address potential problems with gamut, audio, MPEG compression, and more with simplicity. You need to see it for yourself.

**Give people the power of real information, not abstract data.**
**www.tektronix.com/seeandsolve**



**Tektronix®**
Enabling Innovation

MAY • VOLUME 48 • NUMBER 5

www.broadcastengineering.com

BroadcastEngineering

THE JOURNAL OF DIGITAL TELEVISION

# CONTENTS

## Systems Design & Integration

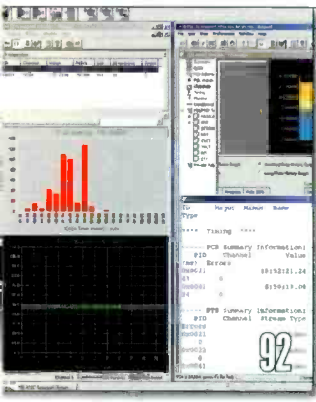

Systems Design Showcase

44 Broadcast and IT converge at Lifetime

Transmission & Distribution

54 Emergency preparedness






## New Products & Reviews


Applied Technology

92 JDSU's multicast IPTV analysis system

94 Tektronix's surround-sound monitoring solution

Technology in Transition

98 Master control automation

New Products

102 Quantel's Newsbox HD and more...



## Departments


10 Editorial

12 Reader Feedback

109 Classifieds

113 Advertisers Index

114 EOM



### Freezeframe

An MPEG-2 transport stream is always ____ bytes long.

Readers submitting winning entries will be entered into a drawing for *Broadcast Engineering* T-shirts. Enter by e-mail. Title your entry "Freezeframe-May" in the subject field and send it to: editor@prismb2b.com. Correct answers received by July 1, 2006, are eligible to win.

The answer can be found in John Watkinson's book, "The MPEG Handbook," available from Focal Press and your local bookstore.

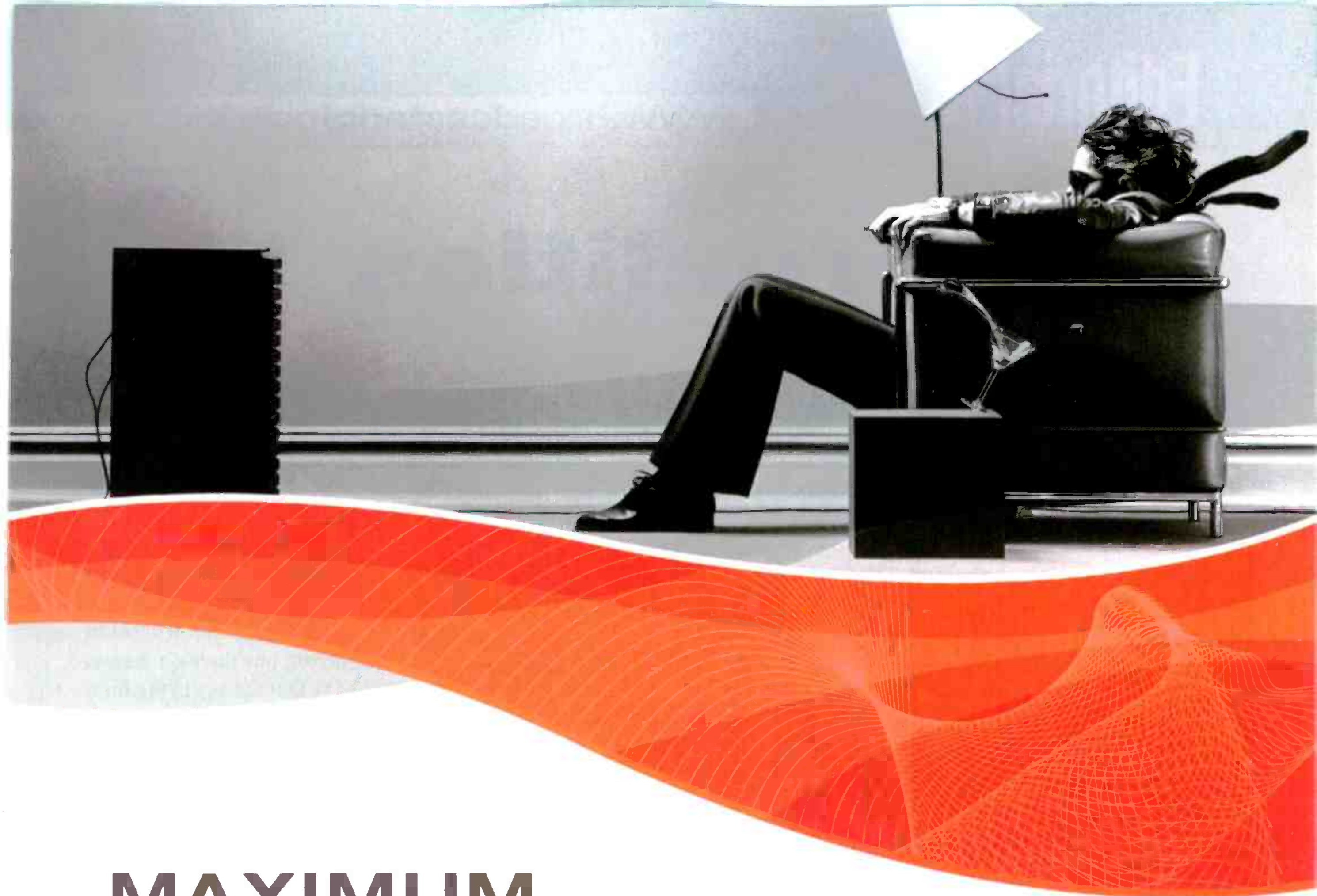
### January Freezeframe

Q. Define the acronyms as they apply to DTV technology: DCT, DMD, GOP, HANC, JPEG, MPEG, SDTI, TCM, VITS, VLC

A. **DCT**: Discreet Cosine Transform; **DMD**: Digital Micromirror Device; **GP**: Group of Picture; **HANC**: Horizontal Ancillary Data Space; **JPEG**: Joint Photographic Experts Group; **MPEG**: Moving Picture Experts Group; **SDTI**: Serial Data Transport Interface; **TCM**: Time Compression Multiplexing; **VITS**: Vertical Interval Test Signal; **VLC**: Variable Length Coding

### Winners:

Rich Lohmueller, Neal Bilbe, Tim Costley, Jeff Ebner, Paul Claxton, Al Van Dinteren, Bud Alger



# MAXIMUM PERFORMANCE BROADCAST PRODUCTS

**For over 30 years, Maxell's innovative technologies have provided broadcast professionals with the highest levels of quality, stability and reliability.** That's why we're one of the leading blank media brands for television commercial duplication and playback-to-air, as well as acquisition, editing, post-production and archiving. Moreover, all of our products are backed by Maxell's superior customer service and unsurpassed product warranties. So when you choose Maxell, you've chosen maximum performance products from the maximum performance brand.




maxell
www.maxellpromedia.com

# The realities of NAB

By the time you read this, you're either still recovering from NAB or — maybe better — you didn't go at all. Trust me, it's not the end of the world if you didn't attend. Of course, I don't mean that. We all love the NAB convention, right? There are some things you just have to love about this show.

First, there's the food. The food in Las Vegas is good and cheap — or not — depending on your proximity to the action. You can get a Krispy Kreme doughnut just inside the convention hall front doors for a mere $2.50. Sure, you get the same doughnut everywhere else for less than a dollar, but what's an extra buck and a half with the whole upper level of the South Hall to explore?


Second, there's the coffee. Caffeine may keep a convention running. However, it doesn't make convention attendees smart. Folks stand in a line 100 deep outside the Starbucks next to the LVCC cafeteria for their caffeine hit. If they would simply walk 15ft to the cafeteria, they would find the same Starbucks coffee without the 30-minute wait. Of course, then they'd have to settle for a standard Starbucks brew and forgo their grande toffee nut latte with two shots of espresso — but hold the whipped cream and use soymilk because they're on a diet — drink. I know; it's a tough decision. But I'm sure not going to wait for the person in front of me to decide if he wants regular or reduced-fat coffeecake with his 2000-calorie Venti Java Chip Mocha Frappuccino either.

Third, there's the transportation. Las Vegas cabs are driven by locals. For the most part, they tend to be native-born Americans — most with a lifetime of Las Vegas experience. I'm not saying that it's bad to have a foreign-born cab driver, but there's a certain comforting factor in knowing that the guy in the front seat knows his home turf. Although reaching that all-knowing cabby requires a stand-in-line dedication similar to the one at Starbucks.

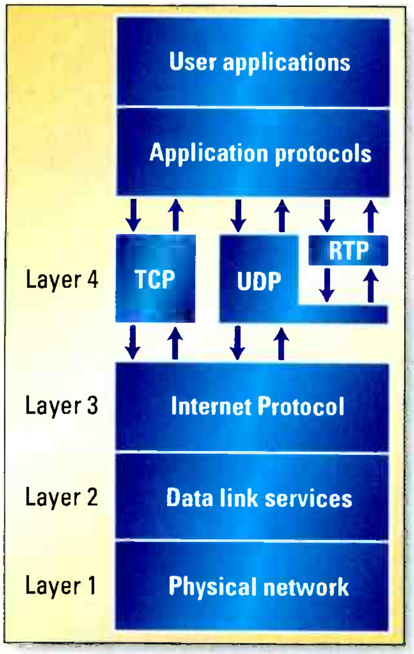
Fourth, there's the press. It's tough to get the press to show up for anything. So, exhibitors like Panasonic, Sony, Omneon, Avid and a few others spend tens of thousands of dollars to hold press events. They ply reporters with plenty of food and, most importantly, drink. This usually works. But what about smaller companies with budgets less giving than the big boys?

Well, now the NAB arranges for companies to come to the press. For a standard arm-and-a-leg price, NAB provides a room, coordinates a schedule and holds back-to-back press conferences. Each company gets 50 minutes to make its pitch. Then, it's "Next!," and another company steps up to parade in the dog and pony show. The press sits, and the world revolves around us. Cool! I wish they'd thought of this when I started out more than two decades ago.

The only downside is, for the most part, press conferences end on Monday. That leaves three days of trudging through crowded North and Central halls and navigating the numbered chaos of the South halls. Oh well, there's always the $2.50 Krispy Kreme sugar fix and a Starbucks caffeine boost to keep us going. Hint to newbies: Get the doughnut first so you don't fall asleep waiting in the long line for coffee. BE

Brad Dick
editorial director

Send comments to: • editor@prismb2b.com • www.broadcastengineering.com




**This simplified network layer model illustrates the separation of networking functions from the applications they serve.**

## Networking tutorial

*Brad Gilmer:*

I really enjoy your networking tutorial articles, and I hope that you will continue the series. In Part II in February 2006, you often use the term Internet gateway. This would refer to a router, wouldn't it?

Michel Dupagne
Associate Professor
School of Communication
University of Miami

*Brad Gilmer responds:*

I am glad you enjoy the tutorials. Networking seems to be a hot topic in our field these days.

Regarding your question, yes, this would definitely be a router, but with the default route set to a WAN interface that typically is connected to an Internet Service Provider. The IP address of this device is what you would normally enter as your default gateway in the network configuration on your computer.

## E-zines

I like the idea of e-zines. They save resources and are more timely than most print publications. Unfortunately, everyone seems to format their e-zines the same as their paper magazine — tall and narrow. There are a few computers that have portrait-formatted monitors, but the vast majority of computer screens are landscape-oriented. When viewing vertically-formatted screens, it is necessary to scroll up, down and sideways. It really ruins the ability to quickly scan through the magazine.

Dan Stoe
Chief Engineer
KVAL-TV
Eugene, OR

## Taking ownership

My maternal grandfather, Parker S. Gates, built his radio equipment manufacturing company on providing high-quality goods and service. Not only did he sell the products on the road, he would then return to the shop in Quincy, IL, and help build them. My grandfather considered himself to be both the president and the janitor of his company. He swept the floors every night before he left and personally installed equipment for customers. He knew all the customers and employees by name. (Do you think Bill Gates ever answers a tech support call or Jack Walsh changes one of his light bulbs? I don't think so!)

My grandfather had no fear in putting his name on his products because he believed in them. Today, it's hard to find a CEO who will even put a telephone number to the company's corporate headquarters on their products.

When my grandfather sold his company in 1956, he stayed on as president of Harris' broadcast division and as a member of its board of directors. He stayed for one reason: His long-term customers were committed to him, and he was committed to them. I challenge you to find that quality in a current-day CEO.

*Broadcast Engineering* ran an article about why founders and owners put or don't put their names on their companies. Hopefully, the example of my grandfather will show you that a man who believes in his products and the people he hires has no qualms putting his name on a product. Wouldn't it be nice if more CEOs today had this integrity?

William F. Gerdes IV

## ATSC meeting attendance

*Editor:*

I read the article "'Way-out-of-the-box thinking' may be critical to success of broadcasters" in the March 7, 2006, HD Technology Update e-newsletter. I am appalled at how difficult it is to get the U.S. broadcast community to attend ATSC meetings and vote to make MPEG-4 a part of ATSC.

This lack of interest may hinder the transmission of 60 frames progressive at 1080 x 1920, which would allow local broadcasters to charge more for the advertising at this transmission standard because it's so much clearer and more precise in image rendition.

Broadcast TV management would make so much more money for ad airtime if MPEG-4 and similar codecs were mandated to be part of ATSC. But broadcasters do not assign time for their people to vote in these standards. It makes no sense.

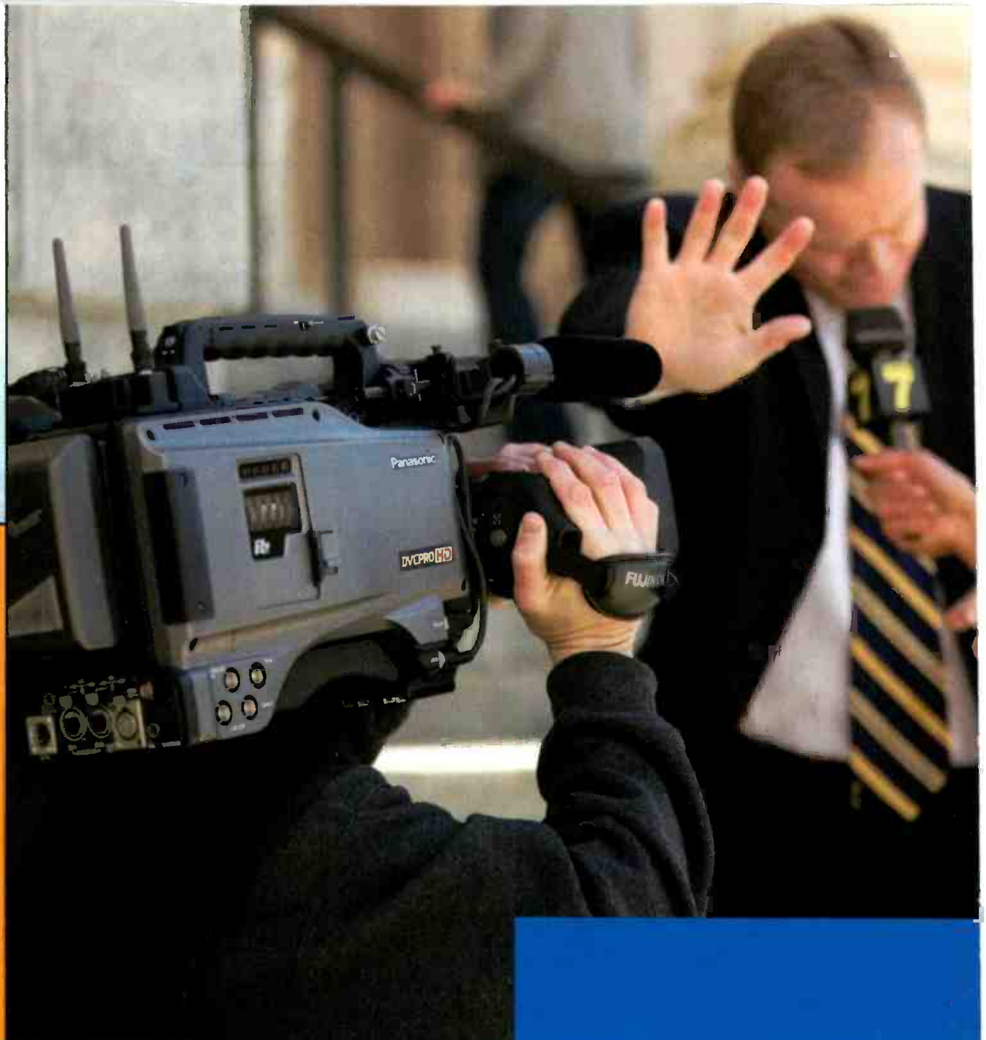
Paul Thurston

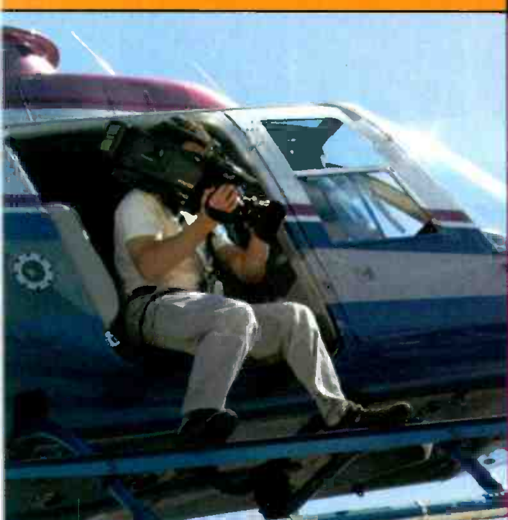
*Brad Dick responds:*

You're right, but then, how many technical managers don't even attend the annual NAB convention? **BE**

**Test Your Knowledge!**
See the Freezeframe question of the month on page 8 and enter to win a *Broadcast Engineering* T-shirt.
Send answers to editor@prismb2b.com

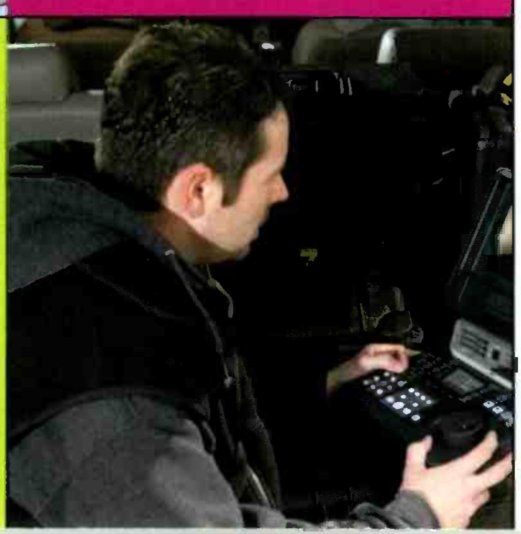
**Go to extremes** - Ever captured the Iditarod in the frozen Alaskan tundra? P2 has. When rain, wind and humidity played havoc with tape-based cameras during the Gulf Coast hurricanes, P2 performed flawlessly. P2 products offer you the greatest reliability, whatever the weather conditions.



**Shake things up** - When breaking news hits, don't let it knock you for a loop. P2 withstands shock up to 1,500 G and vibration up to 15 G – ensuring you'll get the shot no matter how bumpy the ride.

**Speed editing** - The portable AJ-HPM100 records/plays DVCPRO HD, DVCPRO50, DVCPRO and Mini-DV. For nonlinear editing with a laptop, P2 cards plug directly into the PCMCIA card slot; no digitizing. With data transfer at up to 640 Mbps, you'll be producing at the speed of IT.



# ITV shrouded in the mist

BY CRAIG BIRKMAIER

The world of digital media seemed to materialize before our eyes in 1994. Personal computers were moving from the office into the home. Microsoft bet heavily on the home entertainment PC as a game machine that could also run its Office software. Apple was floundering, thanks to management missteps, including the pronouncement that the Mac was not a game machine. AOL, having passed the million-member milestone, was telling the world, "You have mail." And the cable industry proclaimed that the future was interactive TV (ITV), delivered via their full-service networks (FSNs).

This was the year a new genre of interactive games — delivered via CD-ROM — burst onto the stage, with the release of "Myst" by Cyan Worlds. "Myst" and its sequel "Riven" sold more than 12 million copies, placing them among the top-selling games in the history of personal computing. Consumers were becoming comfortable with the idea of sitting at a computer to interact and play. The entire Internet phenomenon was just beginning to emerge from a primitive digital world.

**After a decade of hype, interactive TV is still shrouded in the mist. Games like "Myst" and the Internet turned the home entertainment PC into a venue for interactivity.**

More than a decade later, the world of ITV is still shrouded in primordial mist. The mass media pundits tell us that TV is a lean-back, passive experience. Then again, the mass media would like to keep it that way. (It would also like to return to the good old days before remote controls, hundreds of channels and TiVo.)

The PC is where you go when you want to lean forward and interact. But now, the PC pundits want to turn their boring beige boxes into home media centers, connected to that big-screen HD-capable display in the family room.

Could it be, after all these years, that the pundits of convergence, this author included, may finally see the mist lifting as the distinctions between the world of video and PC are rendered meaningless?

## Control freaks

I still remember that bright sunny day in December 1994 when Time Warner invited us media pundits to a suburb of Orlando for the unveiling of the first FSN. The air was filled with unreality, but this was just a prototype, a multi-billion dollar test bed to develop the future of whatever you want to call that appliance in the family room. The operations center was filled with exotic gear: the first deployed ATM switch to route bits to individual homes via a hybrid fiber/coax network; Silicon Graphics (SGI) servers to store the on-demand programming and support the interactive games and commerce that the FSN would offer to subscribers; and the set-top box, an SGI computer that reportedly cost about $3,000.

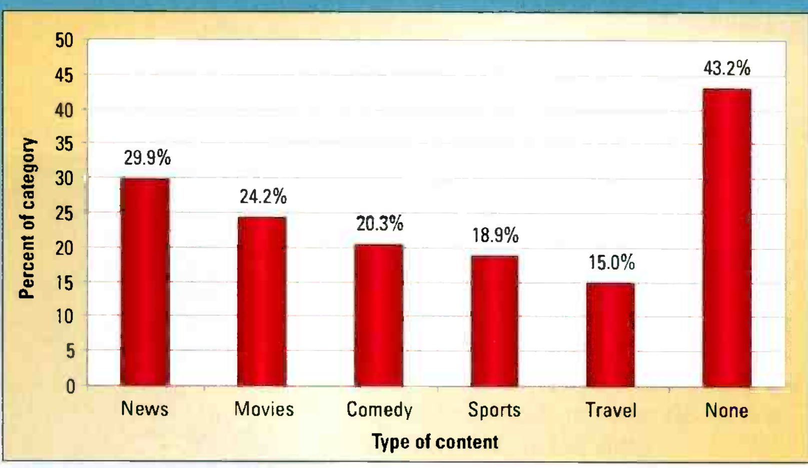
Several years later, I spoke with a colleague who worked at Time Warner until the FSN project crashed in 1997. He talked about dumpster diving, as much of this gear was unceremoniously disposed of when the project was written off.

What went wrong? From a purely technical perspective, the FSN was launched well ahead of its time. From a technical perspective, the FSN was

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

**Preferred content for mobile phone viewing**

29.9 percent of consumers want to view news content




Source: TDG Opinions www.tdgresearch.com

heralded as a success, as it provided a wealth of information about real world implementation issues, not to mention information about consumer behavior and the potential demand for services. From a more global business perspective, however, the FSN simply was not ready.

The entire concept was based on


**Apple's Front Row user interface for Mac OS X, and the remote that ships with many models, allows users to access their digital media files at TV-like viewing distances.**

the notion that consumers would be comfortable living within the walled garden of the FSN. Also, Time Warner hoped that the third-party businesses providing products and services would be willing to develop these products using proprietary technologies and tools, while giving Time Warner a cut of each transaction.

In more simplistic terms, the Internet and the World Wide Web happened. Instead of cable control freaks becoming the tollbooths of the information highway, companies such as AOL and Microsoft tried to turn the Internet into a toll road. It is ironic that years later, when it looked like the Internet was winning the war, Time Warner and AOL merged. But the culture clash that followed provides an informative case study about how easy it can be to stifle innovation when powerful business interests seek to maintain the status quo and when they choose to maintain control at any cost.

In April, this column examined the world of content management and the extreme measures that the content conglomerates and their co-conspirators in Washington, D.C., are taking to use the transition to digital as a means to extend their control over consumers. These measures place a handful of special interests in the world of content creation and distribution in the position of dictating the design of virtually any product that may touch a digital entertainment bit. And the politicians seem only too happy to enforce these requirements based on the premise that every citizen would be little more than a common thief if technical innovation were not regulated to control piracy.

## Enabling interactivity

Fortunately, consumers may hold the real content management keys that will determine the future of digital media, whether it is enabled via the TV in the family room, the PC in the den, the mini theater system in the car or the Swiss Army knife of the digital age — the ubiquitous cell phone. We still have the power to "just say no."

The FCC mandates regarding digital television receivers serve as a prime example of consumer power. Despite requirements that new digital sets have integrated ATSC receivers, most consumers are electing to purchase HD-capable monitors rather than integrated receivers.

While the cable industry continues to try to keep subscribers from wandering outside of its walled garden, it is enabling consumers to do just that through the tremendous success the industry has had deploying broadband cable modems. The e-commerce that the cable industry sought to control is blooming on the Internet, where vendors have total control over their e-commerce sites, using widely deployed standards that have emerged for Web authoring.

And now, the stage is set for new forms of interactivity on that big-screen display in the family room. One of the key enabling factors is the long-delayed demise of CRT displays and a legacy compression scheme

known as interlace. Virtually all of the new display technologies use progressive scanning techniques.

Even more important, the computer industry and the TV industry are converging around the same affordable display technology: LCD panels. Panel displays in the 20in to 30in range can be used for up close personal interaction applications or viewed at a distance, filling the shoes of the ubiquitous 25in to 27in CRTs they are replacing. With large progressive displays, it is relatively easy to support interactive applications using the same tools available for computer and Web applications.

And the computer industry is beginning to address dual-use functionality in current and next-generation operating systems. The current version of Apple's Mac OS X includes a user interface called Front Row (see "Web links"), and several of Apple's new computers ship with a remote control, allowing users to navigate and play digital media files at TV-like viewing distances.

OS X includes a feature called widgets that allows users to create small information windows that are continuously updated via RSS feeds from the Internet. Widgets can place weather maps, sports scores, stock quotes and other information around a screen that is primarily being used to view a video program. Microsoft's next-generation OS — Vista — will include many of these same features and full support for the HD-DVD format that it is developing with Toshiba and others.

All this is not to say that more traditional forms of TV interaction have failed completely. NDS, a technology subsidiary of News Corporation, and OpenTV both have a wide range of interactive TV deployments around the world. (See "Web links.") And the BBC has been a leader in developing interactive TV applications. NDS supplies interactive software features to BSkyB in Great Britain and DirecTV in the Untied States.

DirecTV recently reported that almost two thirds of the subscribers to its NCAA Mega March Madness package with interactive receivers took advantage of the on-demand interactive features during the first week of the tournament. Among the interactive features, half of subscribers used the Game Mix channel, which offered as many as three live contests on the screen at one time; one-third pulled up on-screen scores; and more than one-third accessed the tournament bracket feature to make and follow their picks.

Perhaps the most successful technology that has consumers interacting with their TVs is the now ubiquitous standard-definition DVD. The menu systems for DVD, including the visual scene guides, make navigation of disk content much easier than fast-forward and rewind buttons. And titles that include a wide range of additional interactive features have proven to be quite popular.

But DVD interactivity generally stops at the boundaries of those disks. Attempts to develop Web-linked applications have generally failed because of the inability of set-top players to connect to the Internet and the limitations imposed by the interlaced TV receivers to which most are connected.

This limitation is being addressed by both of the proposed next-generation standards for high-definition DVDs. The Blu-ray contingent is promoting an interactive software layer based on the Java-interpreted language BD-J. This spec allows the development of sophisticated interactive applications that can take advantage of online connections.

First-generation Blu-ray players will only permit Ethernet connections to the Internet because the content management moguls are concerned about allowing protected bits to travel across the wireless Wi-Fi data links now used in many homes.

> **Perhaps the most successful technology that has consumers interacting with their TVs is the now ubiquitous standard-definition DVD.**

The HD-DVD camp is promoting an interactive software layer based on the XML mark-up language used extensively on the Internet. Microsoft has been involved in the development of this language and will provide full support for it in Vista.

There have been many reports that the differences in the interactive layers may be as big a hurdle to harmonize the formats as the physical differences in the way the disks and players work. And all of this is being influenced by the Content Protection Racketeers (for more on this group, read last month's column), who are trying to limit the ability of consumers to share the content of these discs across the devices that may be attached to an in-home network.

Bottom line: The prospects for interactive TV appear to be linked intrinsically with the medium that has brought interactivity to the masses — the Internet. **BE**

*Craig Birkmaier is a technology consultant at Pcube Labs, and he hosts and moderates the OpenDTV forum.*

SEND Send questions and comments to: craig_birkmaier@prismb2b.com

## Web links

Apple Front Row user interface
*www.apple.com/imac/frontrow.html*

Interactive TV showcases:

- BBCi
  *www.bbc.co.uk/digital/tv/index.shtml*
- Value@TV
  *www.nds.com/applications_showcase/applications_showcase.html*
- OpenTV
  *www.opentv.com/solutions/showcase.html*

# ENCODING CAN MEAN THE DIFFERENCE BETWEEN WORKFLOW & WORK SLOW

## SPEED MATTERS

You don't have an eon to carve your niche.
If you can't get high-quality video content to market quickly, you'll be left behind.

Does it take you hours – or days – to encode a few minutes of video? Inlet's Fathom™ encoder leverages the power of hardware to deliver real-time encoding – in both SD and HD. Worried about quality? Don't. Our Semaphore™ Quality Control software helps you analyze every frame, and alerts you to any detail that doesn't meet your standards. So you produce the quality content your audience expects, in a fraction of the time. With Inlet's workflow efficiencies you can deliver more content more quickly, for commercial opportunities like VOD, IPTV and mobile video – and you can do it now.

Make your deadlines, wow your clients, win more projects.
You have the talent, we have the tools.

NEW!

*Fathom Pro for SD*
Only $9,999.00

Learn more.
Call: 919-256-8145
www.inlethd.com

INLET HIGH-DEFINITION

The Channel to Digital Media

# White-space proposal has new life

BY HARRY C. MARTIN

The U.S. Senate introduced two bills that would require the commission to adopt rules to authorize the unlicensed use of television spectrum for wireless broadband services.

### Terms of the proposals

Both proposals require the commission to complete the long-pending television white-space proceeding within 180 days. This proceeding sought comments on a proposal to permit fixed and mobile uses of the TV band for wireless services. In discrete geographic areas, many channels in the TV band are not being used. The commission asked whether it should allow unlicensed devices to operate in these white spaces. That would make efficient use of the spectrum and promote broadband deployment, without interference.

The Senate bills would require the completion of this rulemaking and adoption of technical rules and certification processes for unlicensed devices to "facilitate the robust and efficient use" of the TV band. One bill would require television broadcasters to provide field measurements in order to file a complaint alleging interference.

The Senate Commerce Committee held a hearing on the bills on March 14. Many of the senators warned broadcasters against raising false claims of interference in an attempt to derail the legislation.

The Senate hearing was merely a formality, and the two bills will most likely be reconciled and attached to a larger bill in late April. While there is not yet a companion bill in the House of Representatives, a bill might be introduced if the Senate bills emerge.

### Opposition to legislation

Several groups have already begun attacking the legislation, including the wireless microphone users who also use the TV band, the consumer electronic companies who fear the unlicensed devices will interfere with the digital set-top boxes and the Association of Maximum Service Television. These parties have many concerns about the proposal.

First, proponents of white-space use have not developed devices that can sense whether a television station is using a particular spectrum. The proposal depends on the presumed availability of such devices, so the fact that none exist raises valid questions as to whether it makes sense to adopt rules based on non-existent technology.

Also, no one has a solution for the problem of the unidentified receiver. Even if there existed a device that could sense whether a TV channel is available and then could react accordingly, such a device would not be able to determine the proximity of the unlicensed device to a television receiver or other device already operating in the TV band. Without knowing its proximity to the receiver, the unlicensed device could not determine whether it would cause interference to the reception on a particular TV channel.

Because the device will not have the same reception capabilities as a television receiver, many people are concerned that the unlicensed device will transmit on a channel it has incorrectly determined to not be in use. As of this date, there are no acceptable devices to operate in other bands.

And because the devices would be unlicensed, it would be impossible to track down and order the users to cease using the devices if they interfere with licensed operations.

Finally, many broadcasters are concerned about the impact of the unlicensed devices on the DTV transition. Because the unlicensed devices would be digital and the final broadcast transition to DTV is still three years away, the unlicensed use of the spectrum could adversely affect the digital operations of television stations as they commence full-power service on their channels. **BE**

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

SEND Send questions and comments to:
harry_martin@prismb2b.com

## Dateline

June 1 is the deadline for television, Class A, LPTV and TV translator stations in the following states to file their 2006 renewal applications: Arizona, Idaho, Nevada, New Mexico, Utah and Wyoming. Television, Class A and LPTV stations that originate programs in those states also must file EEO Program Reports (Form 396) along with their renewal applications.

June 1 also is the deadline for biennial ownership reports (Forms 323 and 323-E) for television broadcast stations in Arizona, the District of Columbia, Idaho, Maryland, Nevada, New Mexico, Utah, Virginia, West Virginia and Wyoming.

July 1 is the deadline by which all television stations must complete construction and begin operations with their full replication or maximization DTV facilities or face loss of interference protection beyond the signal contour in operation as of that date.


Canon
HDV
20x
Canon

# 3CCD: 1440 x 1080 EACH. HD-SDI OUT: SMPTE 292M. SMPTE TIME CODE IN/OUT. 20x HD VIDEO LENS. AND BUILT-IN GENLOCK.

# FOR UNDER $9,000?*

## THE CANON XL H1 HD CAMCORDER.

Whether you're a broadcast ENG producer, documentary, feature or commercial videographer, your HD camcorder has arrived. Here are just a few of its unparalleled litany of features. The Canon XL H1 is built around a 3CCD system with separate native 16:9 CCD's. Each 1/3" CCD has 1440 x 1080 pixels, resulting in high resolution, accurate color reproduction and a wide dynamic range with virtually no color noise. For pristine image quality, the XL H1 features uncompressed digital HD-SDI output (SMPTE 292M). And multi-camera shoots are no problem, thanks to SMPTE time code input and output and Genlock synchronization. The features and innovations continue as you also get Total Image Control which includes 3 color matrixes, 2 cine gammas, and adjustable: knee, black stretch, setup level, master pedestal, horizontal detail, coring, sharpness, 2 noise reductions, color gain, hue, and master color setup adjustments. Since each adjustment is individual, you can create your own custom look and store it on an SD memory card. The XL H1 delivers 1080i HD resolution, along with three different frame rates of 60i, 30 Frame and 24 Frame – so no matter what your production, the XL H1 has you covered. There's also the optional 60i / 50i Video Mode Option, which means that you can record in both NTSC and PAL. You can even take photos with the XL H1 either in video or camera color space. And in keeping with Canon's Open Architecture approach, optional CONSOLE Image Control & Storage software delivers unprecedented flexibility and versatility. Proving, of course, that the XL H1 is truly high definition's highest expression. You'll find so much more about this amazing, affordable HD camcorder at www.canondv.com.

*XL H1*



Canon

*image*ANYWARE

# Digitizing audio

BY MICHAEL ROBIN

The world around us is analog. Our perception mechanism is also analog. Standard audio transducers, such as the microphone and the loudspeaker, are analog devices. Sound perception of humans occupies about 20 octaves, extending from 20Hz to 20kHz.

In an analog system, the infinite number of discrete electrical signal amplitudes that the microphone produces (the information) is amplified to a suitable level for further processing, such as mixing, recording, transmission and reproduction. The signal processing is essentially a transmission medium that carries the original signal from the source (the sound captured by the microphone) to the destination (the listener).

The medium inherently introduces undesirable electrical signal impairments (linear distortions, nonlinear distortions and noise), which have a direct effect on the reproduced audio quality. These impairments are additive, and the overall performance of a complete analog chain depends on the individual performance and number of discrete components assembled in a typical operational configuration (the medium). This puts a limit to the number of stages that an analog audio signal can pass through before it becomes too impaired to be acceptable.

Many analog signal handling difficulties can be eliminated if the analog signal is digitized prior to modulation and transmission. In a digital audio system, the original analog information is converted to a digital representation. The analog-to-digital conversion consists of two processes: sampling and quantizing. The resulting digital information is in binary form. Essentially, the digital electrical signal has two well-defined states: zero and one.

Undesirable medium-generated impairments affect the digital electrical signal in a manner similar to the one affecting the analog signal. They have, however, no effect on the information as long as the receiver can distinctly recognize the two levels. The result is that the message distortion is restricted to the analog-to-digital (A/D) and digital-to-analog (D/A) tandem process, thereby improving the transparency. The transparency is maintained as long as the SNR is within some medium-related values beyond which the cliff effect occurs, and the transmission shuts off.

### The sampling process

Sampling is the first step towards digitizing audio signals. It consists of measuring the analog audio waveform amplitude at periodic intervals, represented by T in the formula that follows. The main concern is to represent the original analog values with adequate precision. The measurement accuracy depends on the sampling frequency. As stipulated by Nyquist, the sampling frequency has to be at least twice, preferably higher, the maximum audio frequency.

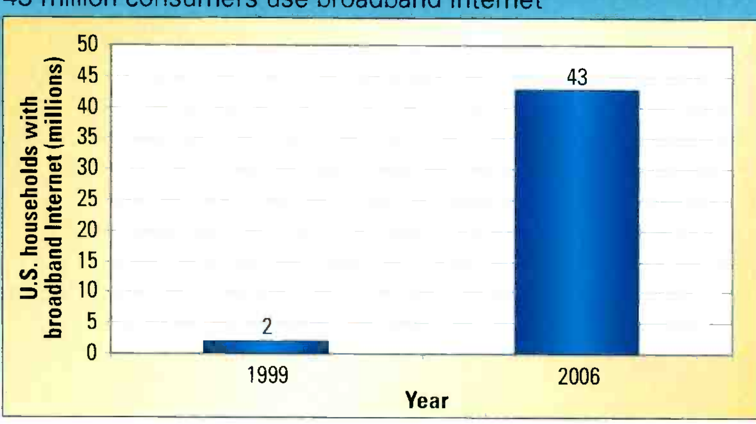
The sampling process requires multiplying the analog audio signal with a stream of repetitive pulses. This results in a pulse amplitude modulation (PAM) process. Figure 1 on page 28 represents this process in the time domain, and Figure 2 on page 28 represents it in the frequency domain. In this idealized case, the sampling frequency ($F_s$=1/T) is considerably higher than the sampled frequency, and the sampling pulse duration is close to zero. Early digital audio, as used for telephone communications, assumed a 30Hz to 3.4kHz audio bandwidth and used a sampling frequency of 8kHz.

For historical reasons, CD recordings use a sampling frequency of 44.1kHz. Sampling 20kHz bandwidth analog audio signals at 44.1kHz requires a 20kHz low-pass filter between the analog input and the A/D converter. Well-designed filters avoid interference between the baseband audio and

**FRAME GRAB** A look at tomorrow's technology

**U.S. broadband Internet access**

43 million consumers use broadband Internet




Source: CEA www.ce.org

# Largely covered by water

the sampled PAM spectrum, preventing aliasing. Even so, many purists claim that a 20kHz low-pass filter gives rise to overshoot, ringing and related audio distortions, which, to some, are unacceptable. For this and other reasons, studio operations are carried out at a 48kHz sampling rate.

Using both sampling frequencies in a studio environment requires sample-rate converters. In a digital television studio, the audio sampling frequencies also must be coherent (derived from the same master clock) with the video sampling frequencies.

## The quantizing process

The samples are further processed by assigning them a binary number approximating their sampled value. This process is called quantizing. Quantizing divides up the sampled voltage range into $2^n - 1$ quantizing intervals, where n is the number of bits per sample (sampling resolution). For example, an 8-bit system can identify $2^8 = 256$ discrete sampled signal values (255 quantizing intervals). This is the case of a signal with an amplitude occupying the whole quantizing range.

Low-amplitude audio signals would be quantized with considerably fewer discrete levels, resulting in significant quantizing errors. These quantizing errors are correlated with the signal and are perceived as distortion. With higher-level signals, the quantizing errors are uncorrelated with the signal and are perceived as random noise. The quantizing errors can be reduced by increasing the number of bits per sample as well as the sampling frequency (oversampling). Early digital audio equipment (e.g., CD technology) used 16 bits (65,535 quantizing intervals). Current high-quality studio equipment uses 20 bits (1,048,575 quantizing intervals) or 24 bits (16,777,215 quantizing intervals) per sample.

## Overall performance

The formula expressing the SNR of a digital audio system is:

$$SNR\ (dB) = 6.02n + 1.76 + 10\log_{10}(F_S/2F_{MAX})$$

where n is the number of bits per sample, $F_S$ the sampling frequency in Hz, and $F_{MAX}$ the maximum (low-pass filtered) baseband frequency in Hz. It is evident that higher values of n and $F_S$ ensure a better SNR. For example, if n = 24, $F_S$ = 48kHz and $F_{MAX}$ = 20kHz, the SNR is 151.24dB. A 6dB SNR improvement is obtained for every additional bit at a given $F_S$. Oversampling improves the A/D and D/A performance by reducing the quantizing errors and aliasing component amplitudes. At a given n, four-times oversampling increases the SNR by 6dB. By comparison, a typical analog audio console would not exceed an SNR of 60dB. An analog audio tape recorder would have difficulties even reaching an SNR of 60dB.

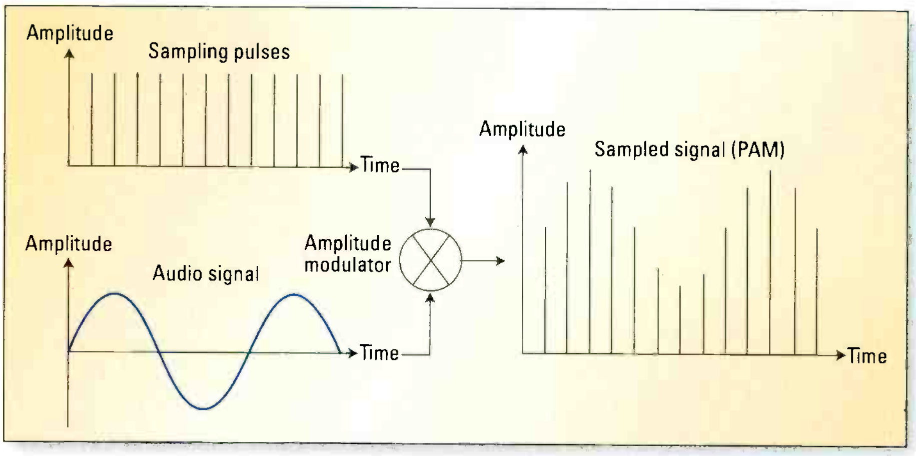



**Figure 1. The sampling process results in a pulse amplitude modulation.**

## Carrying digital audio signals

Figure 3 on page 30 shows a simplified block diagram of a stereophonic digital audio system consisting of an ADC, a DAC and a transport medium. In this basic diagram, the digital audio is in its bit-parallel native format. Assuming a 24-bit accuracy, each of the two signals would be transported by 24 pairs of wires (one pair per bit), plus an additional pair for the clock signal. This calls for a heavy cable and connector. Early equipment worked in this manner, which is suitable for simple operational environments but not for a large installation.

For large installations, the digital signals are distributed using the AES/EBU bit-serial digital audio signal distribution format. This is a self-clocking single-cable format, which is now universally used. The resulting

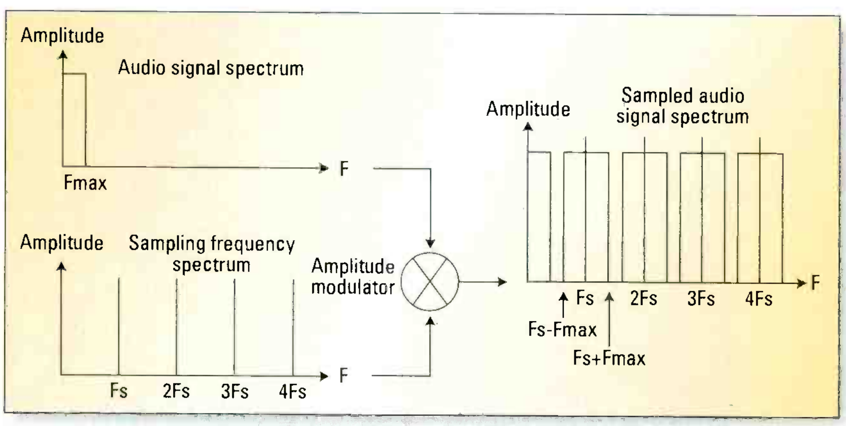



**Figure 2. Modulation spectrum**

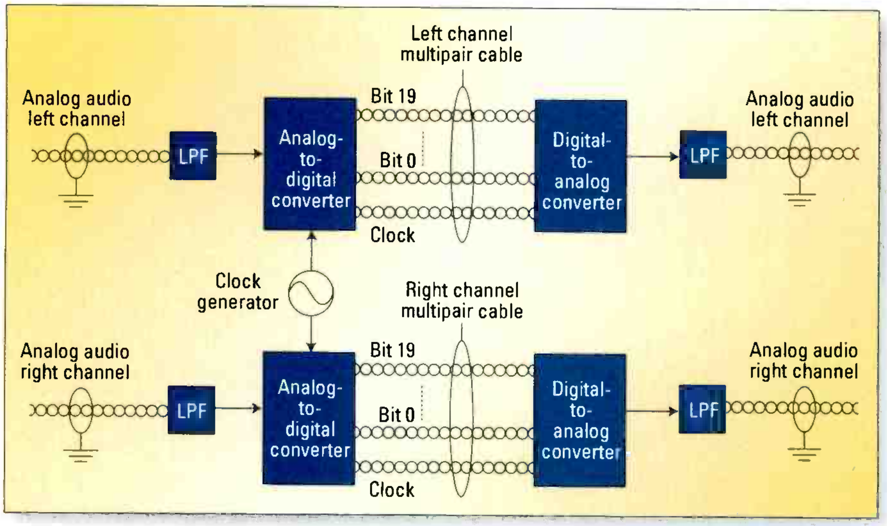


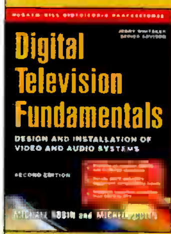

**Figure 3. Conceptual block diagram of bit-parallel digital audio signal distribution**

bit rate for a dual-channel (left and right) AES/EBU signal is 6.144Mb/s.

While distributing this signal in a studio environment is feasible, distribution and transmission in a restricted bandwidth requires compression. Digital audio signals can be efficiently compressed by using MPEG methods. The MPEG-2 compression system exploits certain human auditory system (HAS) characteristics to remove redundant data and considerably reduce the bit rate. This is an added advantage of digital audio. **BE**

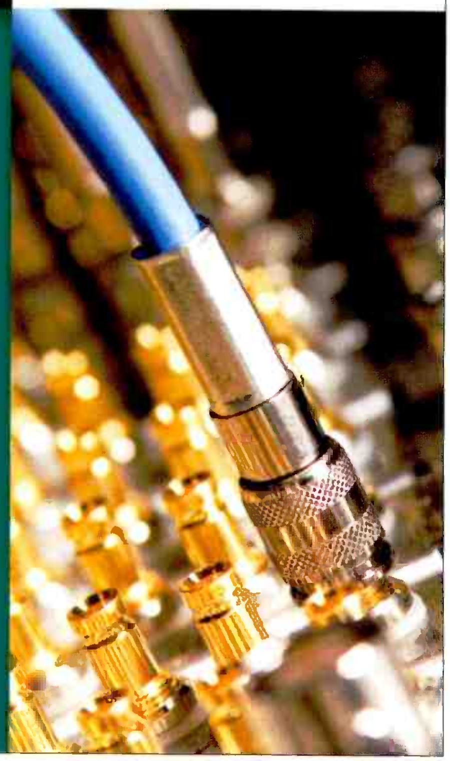
*Michael Robin, a fellow of the SMPTE and former engineer with the Canadian Broadcasting's engineering headquarters, is an independent broadcast consultant located in Montreal. He is co-author of "Digital Television Fundamentals," published by McGraw-Hill and translated into Chinese and Japanese.*

SEND Send questions and comments to: michael_robin@prismb2b.com

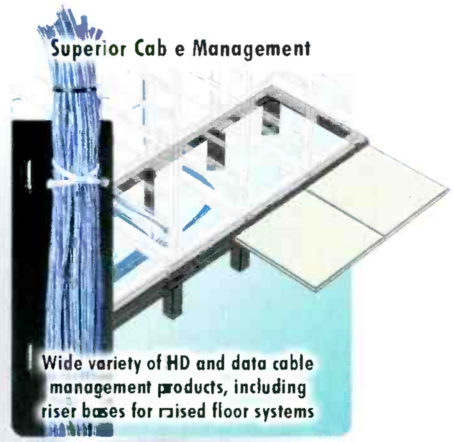



The second edition of Michael Robin's book may be ordered directly from the publisher by calling 800-262-4729. The book is available from several booksellers.





# The New Broadcast Standard.





**VRK Series**
**Broadcast Rack Systems**
Fully welded cabinets support 2,500 lbs. of equipment and cable

SEISMIC CERTIFIED

c UL US
LISTED

Essential Code Compliancy
NO EXTRA CHARGE

**For 27 years,** integrators have consistently called on Middle Atlantic Products for professional racking solutions. With racks and accessories engineered to save time and ensure reliable installations, we provide a complete line of products for an effective integrated system. Our commitment to excellence extends beyond our innovative products to providing service and support that exceed your expectations.

**Call us at 800-266-7225 to plan your next broadcast installation**

**Middle Atlantic Products, Inc.**

INTEGRATED


SOLUTIONS

**Request our *NEW* 2006 Broadcast Brochure**

800-266-7225 | middleatlantic.com
info@middleatlantic.com

# Fibre Channel

## and its use with Ethernet

BY BRAD GILMER

This month we are going to look at how Fibre Channel and Ethernet can be used together in the broadcast facility. Sometimes this discussion is cast as Fibre Channel vs. Ethernet, as if there were a competition between the two technologies. In reality, as both technologies have matured, the industry has adopted both in the areas where they make the most sense.

Ethernet is wildly popular. There are millions, if not billions, of devices in the world that use Ethernet, and because of this, the technology is quite inexpensive. Fibre Channel is not as widely deployed, but it has received a lot of attention in the area of storage networking — and for good reason. Fibre Channel is very fast, and it has been optimized to move large amounts of data, something that broadcasters can take advantage of.

### Fibre Channel features

Fibre Channel started out as a way to move data between CPUs and storage systems without the overhead associated with Ethernet, and without the cable distance and device limitations associated with HIPPI and SCSI.

One of the keys to moving large files on a network is to move the data in large blocks. While the individual packet payload size is 2048 bytes, Fibre Channel permits the implementer to string a large number of payload packets together into a sequence (as large as 4GB) for delivery. Fibre Channel recognizes sequences at the hardware level, which means that large sequences can be delivered to a device without requiring a lot of processing power to read and interpret header information on the packets.

One other key feature of Fibre Channel is that because of the design of its lower levels, applications are assured that bandwidth is available when it is needed. This is not always the case with Ethernet networks, and it is one of the keys to the low overhead and high transfer capabilities of Fibre Channel.

For many years, storage devices were an integral part of the server itself. Servers were connected to disk drives using SCSI interfaces. But there were problems. Cables could not be longer than 8ft in practical implementations. And the total number of devices connected to the SCSI buss was limited to six once the controller was put in place. Fibre Channel resolves these problems while allowing manufacturers to continue to use SCSI software commands. It replaces the limited SCSI physical layer with a new architecture. Manufacturers treat it as a powerful cable extender.

There are three main classes of service available with Fibre Channel. Class 1 is a dedicated connection for point-to-point operations. Class 2 provides a connectionless operation that requires a confirmation being sent back from the receiving node. Class 3 is a connectionless service that requires no confirmation; this is the class typically used for storage subsystems.

### Fibre Channel frame structure

Data is sent across the Fibre Channel fabric as payload contained in frames. The 2K payload is surrounded by a header and footer, which help direct the frame through the network and correct errors that may have occurred in transmission. (See Figure 1.)

After the start of frame, there is a frame header. The header contains information about where the frame came from, where it is going and other information, which helps the frame to be correctly organized at the receiving end. Then comes the payload — the data to be transferred across the network. After the payload, there is a 4-byte CRC error check and finally a 4-byte end-of-frame marker.

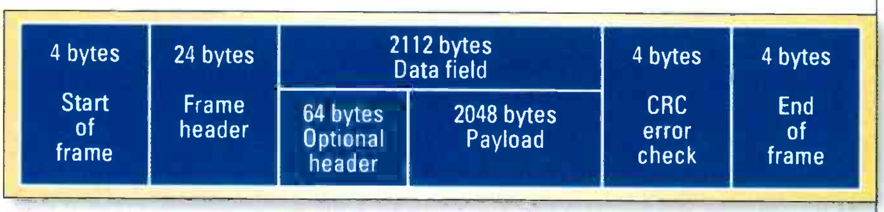



**Figure 1. Fibre Channel frame structure**

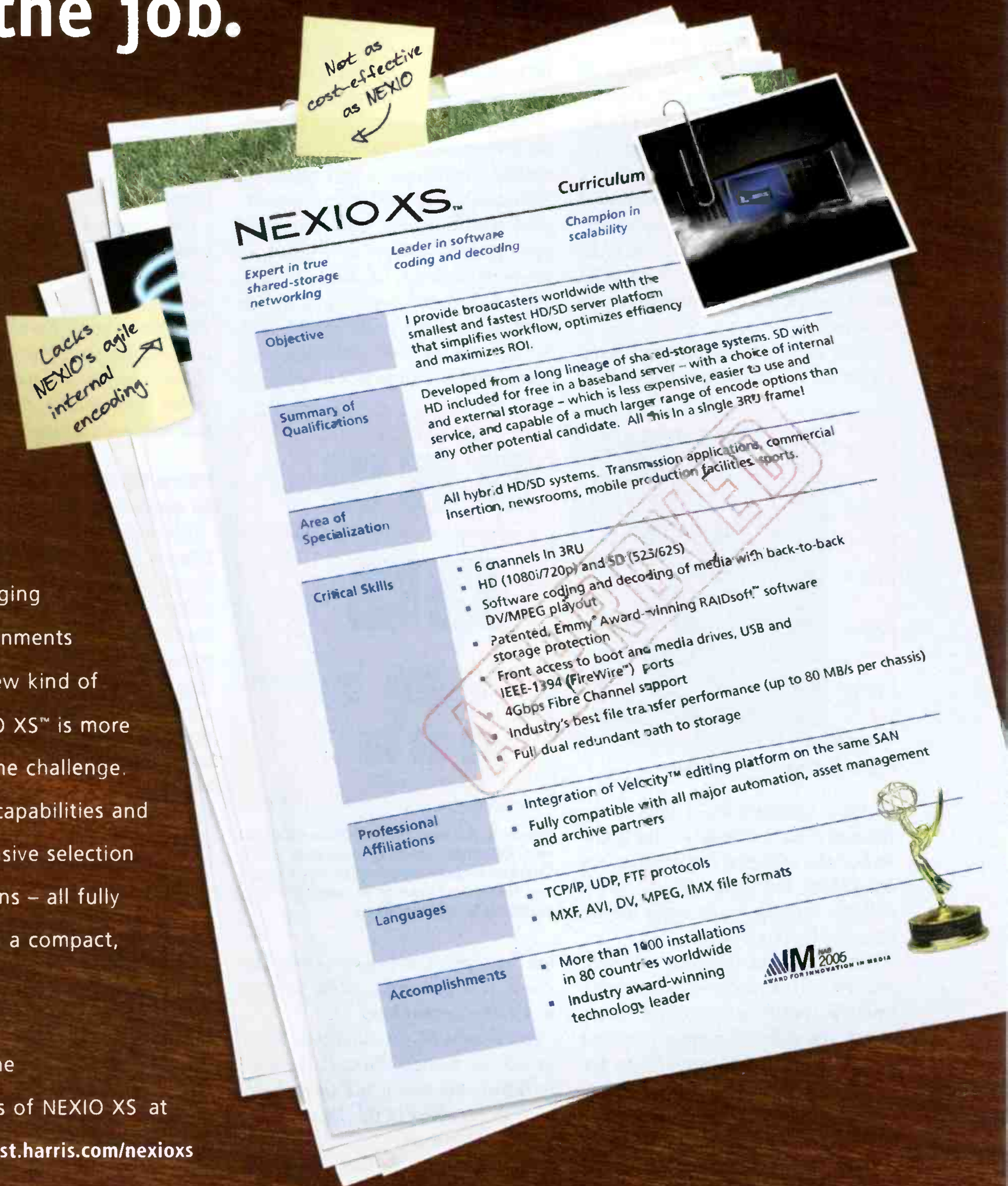
### What is Fibre Channel?

Fibre Channel is a two-way (duplex) communication channel that can be used to interconnect a wide variety of computers and storage subsystems. Each computer or storage subsystem is a node that has both a transmitter and receiver (these are combined in a device called a transceiver). Data is transmitted and received across a Fibre Channel link, which can be a copper wire (up to 25m), a short-wave optical fiber (up to 500m) or a long-wave optical fiber (up to 10km).

### Fibre Channel layer structure

Fibre Channel is designed in a layered structure. These layers are defined as FC-0 through FC-4, and

# The right server for the job.




Today's changing media environments demand a new kind of server. NEXIO XS™ is more than up to the challenge. Exceptional capabilities and a comprehensive selection of applications – all fully integrated in a compact, 3RU frame.

Check out the qualifications of NEXIO XS at **www.broadcast.harris.com/nexioxs**

USA East +1 800 231 9673 | USA West +1 888 843 7004 | Canada +1 800 387 0233 | Latin America +1 305 512 0045

Leitch is a brand of Harris Corporation.

LEITCH

HARRIS® *assuredcommunications*™

Broadcast • Microwave • RF • Government Systems

*www.harris.com*

much like the ISO layer model, they specify different functional components of the overall Fibre Channel technology. (See Figure 2.)

FC-0 defines the physical link used to connect the components. This includes physical measurements of connectors and fibers along with electrical parameters.

FC-1 defines the way data is encoded and decoded (commonly called the transmission protocol). This includes not only how the data is encoded and decoded but also how errors are handled.

FC-2, the signaling protocol layer, serves as the transport mechanism of Fibre Channel. FC-2 defines the framing rules for the data being transferred, the different mechanisms for controlling the three service classes and the means of managing the sequence of a data transfer.

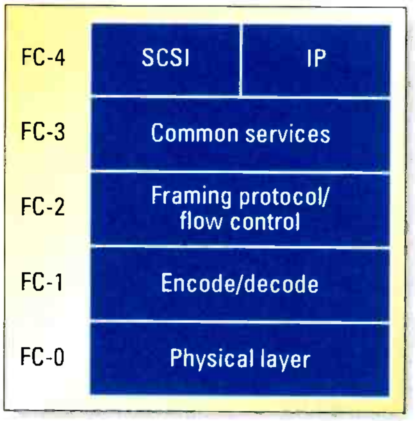



**Figure 2. Fibre layer structure**

The FC-3 level provides advanced features. This includes combining multiple ports to aggregate bandwidth, the ability for more than one port on a device to respond to the same address and multicasting.

FC-4 defines the application interfaces that can be used over Fibre Channel. While a number of interfaces are listed, the predominant ones are SCSI and IP.

## Topologies

Fibre Channel fabric can be configured in a number of different ways depending on the requirements and performance required across the network. Point-to-point is the simplest and least expensive topology to implement. It is also quite self-explanatory. In an equipment pair, the Fibre Channel gigabit linking modules (GLMs) are connected back-to-back. No hubs or other control devices are needed. Costs are low, the installation is simple, the bandwidth on the network is well-defined, and control and interoperability issues are limited, so resolving technical issues is a breeze.

The next step in topology is the Fibre Channel arbitrated loop (FC-AL). FC-AL has several advantages. In small configurations, it is simple, and for that reason, it is easy to troubleshoot. It is also expandable, with up to 126 devices per loop.

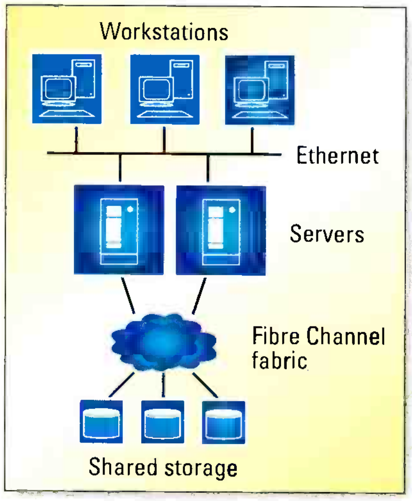



**Figure 3. An example of Fibre Channel and Ethernet working together. Fibre Channel is used for connectivity to storage devices. Ethernet is used for connectivity to workstations.**

Single-loop FC-AL does have some problems, though. First, it is prone to failure. Because it is a single loop, a break anywhere in this loop crashes the entire network.

Second, in a single-loop configuration, Fibre Channel does not support simultaneous communications. This can seriously limit bandwidth on the network.

Broadcasters will find that most vendors employ a dual loop configuration. The dual-loop FC-AL eliminates the single loop failure mechanism. If one of the loops fails, the other assumes the load. A dual loop FC-AL also allows simultaneous communications between devices, greatly increasing the bandwidth available. While the cost of dual loop topology may be greater, for most applications, the security and performance increases are worth the increased costs.

The third common topology is switched fabric, which works by connecting full-bandwidth pipes between two devices that wish to communicate. This allows many devices to communicate at the same time, it increases the effective bandwidth available for each device dramatically, and it provides fault tolerance in large networks.

## Fibre Channel and Ethernet in application

It is quite common to employ both Fibre Channel and Ethernet in a broadcast application. In the bottom of Figure 3, Fibre Channel is used to connect multiple processors to shared storage devices. At the top of the illustration, Ethernet is used to create a LAN, which is used to connect a number of workstations and servers together. This allows the processors to benefit from the fast, block-oriented technology of Fibre Channel when accessing storage, and it allows the workstations to take advantage of the ubiquitous nature of Ethernet.

## Conclusion

Fibre Channel is one of the best ways to move large amounts of data between servers and storage devices. Its ability to put together a large number of packets into a single sequence for delivery is one of its key strengths. Ethernet is fast, widely deployed and well supported on the desktop. By combining these two, broadcasters can make the most of both technologies. BE

*Brad Gilmer is president of Gilmer & Associates, executive director of the AAF Association and executive director of the Video Services Forum.*

SEND Send questions and comments to: brad_gilmer@prismb2b.com

## More HD programming.
## More dramatic imagery.
## More reasons to choose Canon.

| FIELD (Sports, Entertainment Special Events) | STUDIO (Drama, Sitcom, News, TV Game Shows) | PORTABLE (News, Documentary Sports, Reality TV) |
|---|---|---|
|  |  |  |
| DIGI SUPER100xs | DIGI SUPER 22xs<br>EXCLUSIVE! COMPACT LENS | NEW! ENG/HD<br>HJ17ex7.6B SERIES |
| DIGI SUPER86TELExs | DIGI SUPER25xs | HJ17ex7.7B SERIES |
| DIGI SUPER86xs | DIGI SUPER23xs | HJ11ex4.7B SERIES |
| DIGI SUPER75xs | | HJ21ex7.5B SERIES |
| DIGI SUPER60xs | | HJ22ex7.6B SERIES |
| **SD** | | HJ40x14B IASD-V |
| DIGI SUPER62 | | HJ40x10B IASD-V |
| DIGI SUPER62TELE | | |

**HDxs**

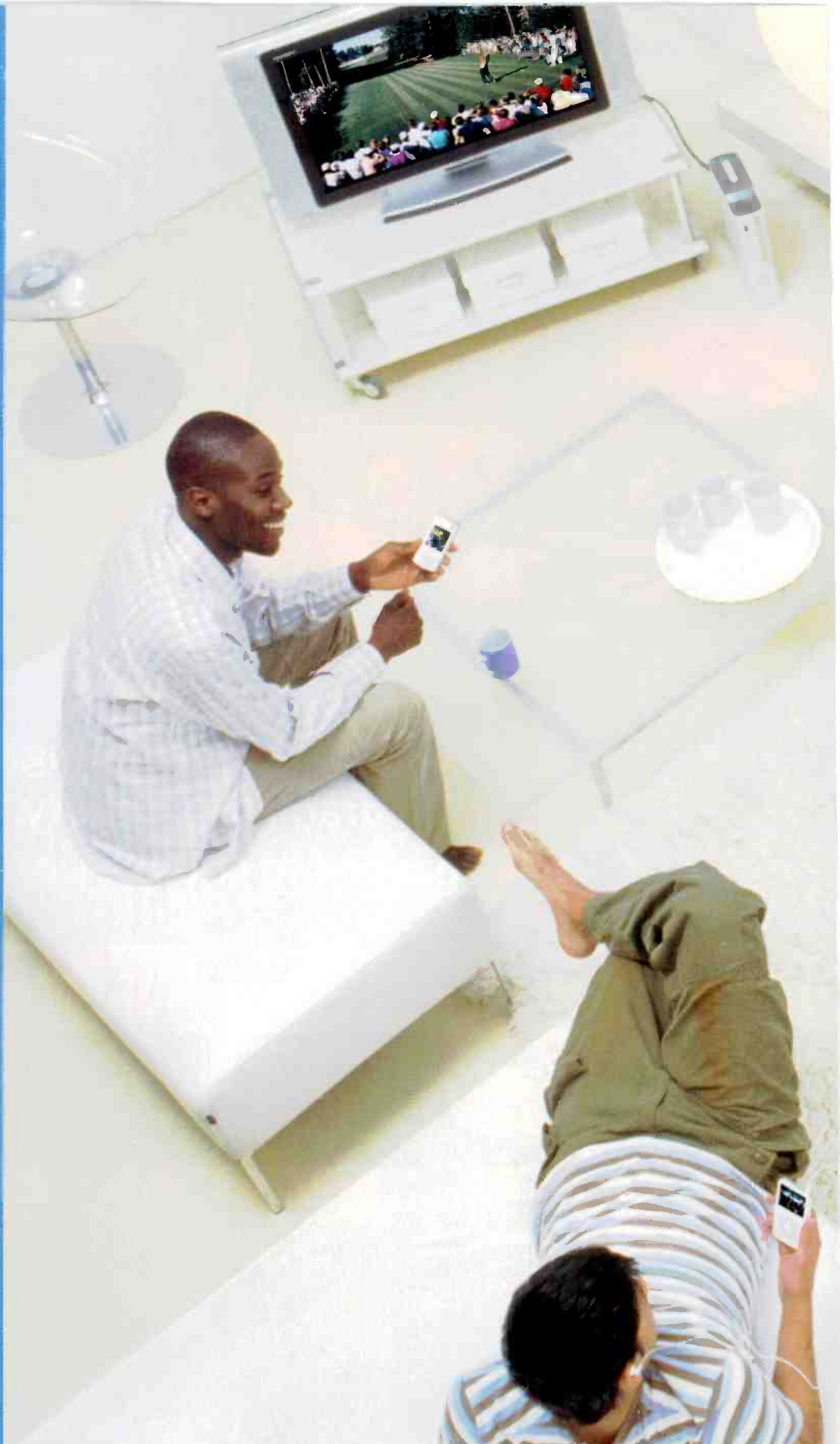
*Maximize Your Camera's Performance.*

***Find out more at canonbroadcast.com***

*1-800-321-HDTV (Canada: 905-795-2012)*

**Canon**

*imageANYWARE*



HD, IPTV, mobile TV – the broadcast digital media world is rapidly evolving with new formats and new ways of creating, packaging and delivering "content everywhere."

Increasing consumer choice means new opportunities for broadcasters and content owners to put their pictures to work and generate extra revenue.

The challenge is to make evolving technology work for you profitably and in harmony with your existing plant.

# HD ENG:
## Is it ready?

BY GEORGE MAIER

If you've noticed that the topic of HD ENG and local production has been popping up frequently in conversations around you, you're not alone. Interest in HD at the local level has been increasing steadily since NAB2005. The factors that seem to be driving it include:

- reasonably priced HD field cameras
- improved recording media with a range of new storage devices
- portable HD editing tools
- microwave ENG systems that support higher digital rates
- the increasing number of HDTV sets in homes
- the need for ratings differentiators in highly competitive markets.

The actual implementation of HD for ENG has been slow up to now but should pick up this year as television networks and major groups begin standardization on equipment. Some stations that have already made the leap to live HD ENG coverage include WRAL-TV in Raleigh, NC; KUSA-TV in Denver; and WLS-TV in Chicago.

### In the field

WRAL began broadcasting news from an HD-equipped studio in 2000. Since then, the station has put more than two dozen DVCPRO HD camcorders in the field. And in November 2005, live HD ENG coverage expanded to include shots from the station's helicopter.

The station uses a handheld camera but plans to upgrade to a gyro-stabilized gimbal mount later this year. The HD-SDI from the camera drives a JVC HD encoder that feeds ASI to a Nucomm ChannelMaster COFDM ENG transmitter.

KUSA's HD ENG operation began in the spring of 2004 with a Sony HDC-950 in a Cineflex HiDEF gyro-stabilized turret system in its helicopter. The microwave system includes an NTT Electronics HD encoder that puts out ASI to a Microwave Radio Communications (MRC) STRATA COFDM transmitter.

WLS is installing HD in a helicopter. It is using a TANDBERG Television encoder feeding ASI into a Nucomm ChannelMaster transmitter with MRC CodeRunner 4 receivers on the ground.

### Cameras

Over the last few years, the price of HD field cameras has steadily dropped, and the flexibility has increased. Compatibility between cameras is another issue, however, as various manufacturers have adopted different recording formats. For the most part, all HD cameras provide an HD-SDI, component or composite output that can be connected to an HD encoder in an ENG or SNG vehicle.

Also, as camera manufacturers move toward tapeless recording, the storage media has taken on a life of its own. Many cameras are still available with tape transports, but the options now include hard drive, Flash RAM and laser discs. The connection between the camera and recording device may be USB 2.0, IEEE 1394 (also called i.LINK by Sony), 100BASE-T or Gigabit Ethernet. Each method has its own set of unique attributes.

### Microwave systems

The current crop of digital ENG microwave systems includes a variety of interfaces that support 270Mb/s SDI in on-board encoders or ASI streams from external encoders. Until recently, the only way to support HD was via ASI from an external encoder running at rates up to 20Mb/s.

The data rate limitations have been imposed by the inherent capability of DVB-T COFDM, which tops out at just over 30Mb/s. In reality, COFDM must be operated in the more robust regions of the standard to survive in a hostile metro area environment, which drops the practical limit back down to the 20Mb/s area.

While it is possible to get good-quality HD in a 20Mb/s stream, most agree that rates of 30Mb/s to 50Mb/s are needed. To support these higher data rates, MRC and Nucomm have incorporated single-carrier modulation options in their ENG systems.

At the 2006 Super Bowl, ABC used Grass Valley LDK 6000 HD cameras equipped with Link Research LinkHD COFDM transmitters, as supplied by Aerial Video Systems.

Nucomm chose the ATSC 8VSB technique and can vary the VSB rate. MRC uses a variable rate QAM modulator, similar to what has been used in classical digital radios for decades. Either way, the result is higher throughput from the field, but with a sacrifice in multipath resistance, making it applicable only when conditions are favorable.

Nucomm's view of a single carrier is that it is a temporary but necessary

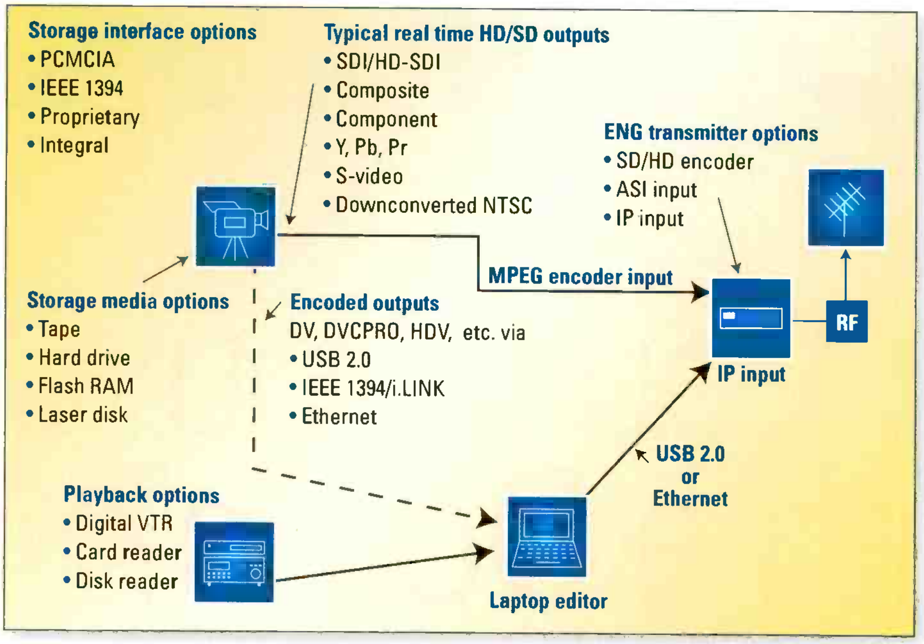



**Figure 1. HD ENG camera, recorder and microwave interface options**

step until MPEG-4 develops to the point of becoming affordable. The company is betting that the superior processing power of MPEG-4 will drop the HD contribution rate down to the point that COFDM will be the only format needed.

MRC appears to be taking the approach that broadcasters will always want higher bit rates, even with improved encoding techniques. The new MRX4000 ENG decoder and demodulator includes DVB-T COFDM and single carrier QAM, as well as the capability of supporting high-speed video file transfers via IP using USB, IEEE 1394 or Ethernet protocols.

### HD encoders

One of the more expensive items in an HD ENG system has been the MPEG encoder, however the prices are dropping and so are the barriers to entry.

The first DENG vans that hit the road in 1999 used expensive, rack-mounted MPEG-2 encoders to generate an ASI to be sent via COFDM microwave to the studio. Over time, MPEG-2 encoders have shrunk in size and cost to the point that most COFDM transmitters include the encoders as an integrated option.

As the early HD ENG systems get under way, the same scenario appears to be playing out with encoders. As proof of the size reduction, both Link Research and Global Microwave Systems introduced camera-mounted COFDM transmitters with built-in HD encoders at NAB2005. At NAB2006, Nucomm added an SD/HD model, and the companies all showed diversity receivers. Expect this generation of HD encoders to proliferate. But will they be needed?

With reference to Figure 1, video is captured by the HD ENG camera (shown on the left) and may be transmitted live through the microwave or recorded for later transmission. For live transmission, the HD-SDI is fed to an MPEG encoder in the ENG transmitter. A recorded scene can be downloaded to a laptop from the camera storage media via IEEE 1394, USB 2.0 or Ethernet, and a fully edited or cuts-only version can be sent via IP file transfer back to the studio. Transmission may be slower or faster than real-time transmission depending on the situation.

**One of the more expensive items in planning an HD ENG system has been the MPEG encoder; however, the prices are dropping.**

The paradigm shift that appears to be on the minds of many engineers and news producers is being able to connect the camera's integral encoder directly to the microwave for live shots. The data rate required depends on the camera encoding format, which ranges from 25Mb/s for HDV to 145Mb/s for Ikegami Editcam HD, with stops in-between for Sony XDCAM-HD, Panasonic DVCPRO HD and a host of SD formats. As the camera manufacturers turn to MPEG-4, these rates will drop also.

Strong evidence to support the camera-encoder trend can be seen in the products that Miranda and Computer Modules have introduced. These products provide a bridge between HDV with IEEE 1394 and ASI. Both products can take an HDV feed in IEEE 1394 protocol and produce an ASI output at a fraction of the cost of an HD encoder. If these prove to be successful, we should expect to see other versions or perhaps multiformat versions available soon.

### Proceed with caution

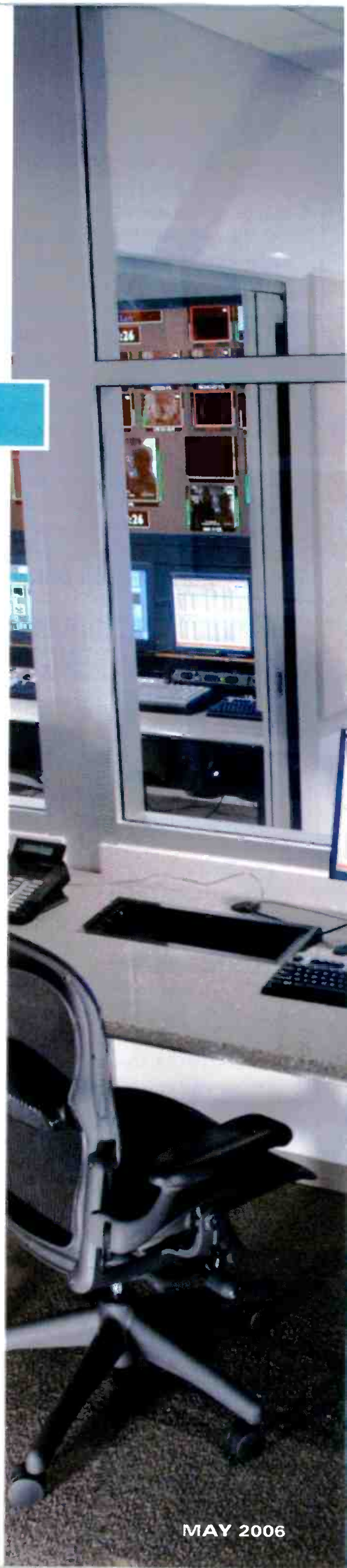
There's no doubt that HD is working its way into news and that most of the hardware and software is ready to go. Still, it would be wise to look carefully at developing equipment trends and talk to someone who has been there before. Fortunately, the list is growing. BE

*George Maier is the founder of Orion Broadcast Solutions, a broadcast consulting firm.*

SYSTEMS DESIGN SHOWCASE

# BROADCAST & IT converge at Lifetime

BY PETE SGRO AND DON JARVIS



Lifetime's new, 50,000sq-ft technical operations center in New York is the culmination of many years of intensive planning and evaluation. In 1988, four years after Lifetime's launch, the network built a studio production facility in a lease arrangement at Kaufman Astoria Studios with the help of systems integrator Ascent Media Systems & Technology Services.

The expiration of its long-term lease at Kaufman Studios offered Lifetime the perfect opportunity to assess the current and future needs of its core operations, as well as create a facility to support the multichannel network's continued growth.


The facility's on-air supervisor area offers sightlines into each master control room pod from a central location. Photos by Andy Washnik, CORPRICOM.

## Infrastructure

The main requirement of the network operations and engineering management team was a hardened building infrastructure, including mission-critical mechanical and electrical systems capable of providing continuous and reliable services. The new site features 14ft ceilings, supports floor loads of 200lbs per sq ft and provides vast electric power, complete with multiple emergency generator farms.

The building is also home to domestic and international telecommunications providers, enabling the team to implement diverse, redundant terrestrial connectivity to the Ascent Media Network Services uplink facilities in Tappan, NY, and Glenbrook, CT. It also supports the network's mission critical TOC infrastructure, which includes:

- independent and redundant AC systems;
- an automation control system designed for monitoring and emergency load shedding;
- primary and backup UPS systems, emergency generator capacity; and
- connectivity to the network's remote disaster recovery facility.

## Teamwork design

With its infrastructure set, the next step was facility design, with an emphasis on migrating Lifetime's videotape-based workflow to digital files. Ascent Media headed an engineering design team that included Lifetime's engineering department and the network's newly formed digital media task force (a team comprised of broadcast and IT engineering experts). From the outset, plans were in place for a digital asset management system central to the architecture, as well as a data center relocation, which would naturally blend the previously diverse cultures of broadcast and IT.

There were two big design challenges. The first involved the digital media applications and infrastructure supporting the production systems, vendor development partnerships and interoperability. The second concerned change-management issues surrounding entirely new workflows.

The selection of a media asset management partner was also critical to the design process. Following a comprehensive review process, Venaca's S3 production system was selected to serve as the core digital media application.

In this QC and ingest suite (one of four), real-time ingest of long-form programs is performed using an Optibase encoding system under Venaca S3 control.

The task force's mission was clear: Work with Ascent and Venaca to build a system that would support and enable efficient, highly reliable media workflows from product delivery through handoff to on-air systems. The team developed a master project plan that included organization and resource planning, as well as the design of overall architecture and integration between systems.

The formation of the team enabled Lifetime to proactively and effectively mesh the divergent approaches to systems engineering that exist between broadcast and IT implementation. For example, when evaluating NLE systems for the new facility, broadcast engineers learned the merits of full requirements gathering and a product gap analysis as organized by the IT project manager. Similarly, during the design phase of the facility's network infrastructure, IT engineers gained an appreciation for the unique and often pragmatically simple needs of an environment that cannot tolerate downtime.

**The team enabled Lifetime to ... effectively mesh the divergent approaches to systems engineering that exist between broadcast and IT.**

Working together, the converged team had a better grasp of the broader business, with the positive result of an in-house knowledge base that allows for the integration and support of workflows across the enterprise. Management teams from each of these areas continue to collaborate and determine ownership of facility systems, troubleshooting responsibilities and first response procedures.

During the design phase, careful attention was also paid to the media switching architecture, VLAN administration and security. The media switching architecture features five Cisco Catalyst 6513 switches with two PIX 535 firewalls for a secure on-air

# WHAT KIND OF SIGNAL DO YOUR LABELS SEND?

**RhinoPRO™ 5000 keeps your facility as professional as you are.** Connections are everything. But marking them clearly and securely reflects a commitment to excellence you can share. Advanced RhinoPRO 5000 won't challenge your people. Instead, it will speed their efforts in studios, control rooms, OB vans – anywhere you need to identify and organize assets.

**Easy operation keeps your operation moving.** RhinoPRO 5000's full-featured command set includes one-touch "hot keys" and memory storage for instant labeling of cable ends, patch panels and stand-alone equipment. With back-lit display and impact-resistant rubber bumper, RhinoPRO 5000 is just as useful behind equipment racks.

**RhinoPRO labels leave a lasting impression.** Our easy-to-load, all-in-one cartridges hold easy-peel labels that resist heat, UV, moisture and smearing. Think of RhinoPRO 5000 as the latest labeling technology – to identify the fast-changing technology you provide and maintain.

Get **RhinoPRO 5000** and get your labeling up to speed.
Visit **www.rhinolabeling.com** for details.

*Available at Comprehensive, Gepco International and MilesTek*

A1969_02


5000

## Features:

1. RhinoPRO labels stick and stay stuck
2. Back-lit display for low-light environments
3. One-touch Hot Keys for cable/wire wraps, patch panels, terminal blocks, fixed length and vertical labels, eliminate guesswork and complicated menus
4. Separate save and recall keys for quick access to label memory
5. Durable rubber bumper for added protection

RHINO™
PROFESSIONAL LABELING TOOLS
HOW DO YOU SIGN YOUR WORK?™

environment.

This HD-ready facility uses complex digital media systems and applications that enable a virtually tapeless delivery-to-air workflow for Lifetime's networks and brand extensions, including Lifetimetv.com. The facility contains:

- four QC and ingest suites where incoming program materials are encoded into the production system;
- 12 nonlinear post-production suites designed for creative collaboration;
- a graphics and digital media services bureau;
- an audio production suite;
- a four-pod master control complex;
- a transmission control room; and
- a central technical area dedicated to broadcast and IT equipment.

Ascent and Lifetime designed a core routing system with simplicity as the primary goal. After many years of using multiple layers and sub-routers, the network's new facility uses HD, SDI-embedded audio and time code as the base signals.

The team selected two routers from NVISION, one for post production and one for on-air operations. The post router is prewired for a 512 x 512 matrix. The first 256 I/O frame is for SD signals and the second is reserved for HD signals with a 196 x 196 section active on the first day. The 256 x 256 on-air router is entirely super-wide bandwidth. This allows any cross point to be either SD or HD with virtual layering as part of the configuration. All primary master control switchers are fed from the router for ultimate flexibility, and all uplink STL and TSL signals are incorporated to make them available at the push of a button.

The post-production aisle in the facility's central technical area is home to Avid's Symphony Nitris and 64TB of Unity ISIS storage.

## Post production

The digital media infrastructure and applications at the core of the post-production facility handles full-length movies and programs as high-resolution digital files. The heart of this environment is the S3 production system, which contains a comprehensive set of tools that manage media ingest, storage, search, retrieval, annotation and transcoding of digital assets.

Venaca and Optibase partnered to provide a complete encoding solution that serves as the heart of the facility's each QC and ingest suite. Real-time ingest of long-form programs is performed using the Optibase encoding system under S3 control. Master and proxy streams are encoded simultaneously, and the system uses Vela's CineView decoding module to provide decode-while-encode playback of all digital assets.

IMX 50Mb serves as the high-resolution master file format. During ingest, metadata is created and stored in S3, along with simultaneous generation of time-code accurate proxy viewing copies. Venaca developed a custom button logger for the network's quality control workflow to enable real-time annotations. Annotations can be sorted as category strata and note everything from discrete technical issues to segment start and end time codes.

Venaca and Optibase partnered to provide a complete encoding solution that serves as the heart of the facility's four QC and ingest suites. Promo and long-form format producers browse the low bit rate MPEG-2 proxies generated during quality control ingest. The producers have access to the QC annotations and have the ability to add metadata using the standard annotation tool. To aid producers in session preparation, Lifetime's IT applications group developed a custom XML edit decision list tool that is integrated with the logger.

One of the key pieces of development tackled by Venaca was the licensing of Avid's workgroup APIs to build integrated media, data and command exchanges with Unity ISIS. The blade-based storage system uses a distributed

## Design team

**Lifetime**

Gwynne McConkey, sr vp of operations, information systems and technology
Pete Sgro, vp and gm of operations and engineering
Don Jarvis, director of broadcast engineering
Carl Charleson, director of digital media applications
Marc Glenn, director of post-production engineering
Padraic Boyle, sr IT network engineer
Michael Simpkin, sr IT network engineer
Dave Dellafave, IT business analyst

**Ascent Media**

Howard Dixon, sr project manager
Brian Luscombe, design engineer
Eddie Ly Son, design engineer
Dave Liptak, design engineer
Jim McGovern, test and commissioning
Ed Buchanan, project administration
Kelly Damstrom, purchasing
Kenny Brueck, project leader and installation supervisor

Small Business

Dell 19" 1907 Flat Panel Display, add $399

**FINALLY, A RANGE OF TOTAL SOLUTIONS FOR YOUR LIMITLESS IDEAS.**

Now you can bring your most complex design ideas to life with help from Dell and Adobe® Dell Precision™ workstations are high-performing systems. Many are powered by the next generation of 64 bit capable Intel® processors and customizable with advanced graphics, RAID hard drive support, and dual-monitor capability. Dell has partnered with Adobe to deliver a powerful Adobe OpenHD certified HDV solution, featuring the comprehensive post-production tools of Adobe Production Studio. Together, they give you access to the exceptional quality and resolution of HD at an affordable price. These systems offer optimal performance and the added peace of mind of compatibility between all hardware and software components. So just like your creativity, the sky's the limit. That's the direct path to growth. That's pure Dell.

**Adobe Production Studio Standard**
Software, documentation or packaging may vary from retail version.

## Dell™ recommends Windows® XP Professional

### DELL PRECISION™ 670 WORKSTATION

**$4079** Adobe OpenHD Certified Solution

Lease as low as **$108**/mo., (48 pmts*)
E-VALUE Code: **07725-S40516m**

**Scalable, Dual Processor Capable Workstation**

- Intel® Xeon® Processor (3.60GHz, 2MB L2 Cache, 800MHz FSB)
- Genuine Windows® XP Professional
- 4GB Dual-Channel* DDR2 SDRAM
- 500GB* (7200 RPM) SATA Hard Drive and 160GB* (7200 RPM) SATA Hard Drive
- 256MB PCIe x16 NVIDIA Quadro FX3450 Graphics Card
- 16x DVD+/-RW* Drive
- 3-Yr Economy Service Plan (Next Business Day On-Site Service* Hardware Warranty Support)
- Monitor Not Included

**Recommended Upgrade:**

- 3-Yr Business Essential Service Plan (24x7 Same-Day On-Site Service* advanced Hardware Warranty Support), add $408

### *NEW* DELL PRECISION™ M65 MOBILE WORKSTATION

**$1849**

Lease as low as **$49**/mo., (48 pmts*)
E-VALUE Code: **07725-S40518m**

**Ultimate Performance Mobile Workstation**

- Intel Core Duo Processor T2300 (1.66GHz, 2MB Cache, 667MHz FSB); Intel PRO/Wireless 802.11a/g Dual-band Mini-Card
- Genuine Windows® XP Professional
- 15.4" WXGA Active Matrix Display
- 512MB DDR2 SDRAM; 60GB* (5400 RPM) Hard Drive
- NVIDIA Quadro FX 350M 512MB Turbocache (OpenGL graphics)
- 24x CD-ROM Drive
- 3-Yr On-Site Economy Service Plan (Next Business Day On-Site Service* Hardware Warranty Support)

**Recommended Upgrade:**

- 3-Yr Business Standard Service Plan (On-Site Service* CompleteCare™ Accidental Damage Service* advanced Hardware Warranty Support), add $278

Dell™ recommends Adobe® software with Dell Precision™ Workstations.

**Adobe® Production Studio Standard**
Adobe offers the essential post-production toolset.

- Package includes: Adobe After Effects® 7.0 Standard, Adobe Premiere® Pro 2.0 and Adobe Photoshop® CS2, Adobe Dynamic Link and Adobe Bridge.

**Special offer only with purchase of select Dell Precision™ Workstations***
Only **$799** **Great Value!**

**Adobe® Production Studio Premium**
Adobe offers a complete post-production solution.

- Package includes: Adobe After Effects® 7.0 Professional, Adobe Premiere® Pro 2.0, Adobe Photoshop® CS2, Adobe Audition® 2.0, Adobe Encore® DVD 2.0 and Adobe Illustrator® CS2 software, Adobe Dynamic Link and Adobe Bridge. **Call for Dell Pricing.**

Adobe OpenHD
dell.com/SMB/OpenHD

PURE DELL

call **800.247.2270**

**Call: M-F 7a-8p Sat 8a-5p, CT** ***Pricing/Availability:** Pricing, specifications, availability, and terms of offer may change without notice Taxes, fees, shipping, handling and any applicable restocking charges extra, vary and are not subject to discount Offers may be combined with other select offers or discounts U S Dell Small Business new purchases only LIMIT 5 DISCOUNTED OR PROMOTIONAL ITEMS PER CUSTOMER In case of customers leasing under these promotions, please note that items leased will be subject to applicable end-of-lease options or requirements Dell cannot be responsible for pricing or other errors, and reserves the right to cancel orders arising from such errors. **Adobe Video Collection 2.5 Standard Offer:** Offer valid only with purchase of Dell Precision™ 380, 470, 670, M20 or M70 system Offer excludes N-series systems **Limited Warranty:** For a copy of our Guarantees or Limited Warranties, write Dell USA L P Attn Warranties, One Dell Way, Round Rock, Texas 78682 For more information, visit http //www dell.com/warranty **Dual-Channel Memory:** Dual-channel memory requires 2 each of the same capacity memory DIMMs **On-Site Service:** Service may be provided by third-party Technician will be dispatched, if necessary, following phone-based troubleshooting Subject to parts availability, geographical restrictions and terms of service contract Service timing dependent upon time of day call placed to Dell **Leasing:** Monthly payment based on 48-month Fair Market Value ("FMV") QuickLease and does not include taxes, fees, shipping and handling charges Your monthly payment may vary, depending on your creditworthiness QuickLease arranged by Dell Financial Services L P ("DFS"), an independent entity, to qualified Small Business customers Minimum transaction size of $500 required At the end of the FMV QuickLease, you can purchase the equipment for the then FMV, renew the lease or return the equipment to DFS Please contact your DFS representative for further details All terms subject to credit approval and availability, and are subject to change without notice **CompleteCare Accidental Damage Service:** CompleteCare service excludes theft, loss, and damage due to fire, flood or other acts of nature, or intentional damage CompleteCare not available in all states. Customer may be required to return unit to Dell For complete details, visit www dell com/servicecontracts **Hard Drive:** For hard drives, GB means 1 billion bytes, actual capacity varies with preloaded material and operating environment and will be less **DVD+/-RW:** Discs burned with this drive may not be compatible with some existing drives and players, using DVD+R media provides maximum compatibility


Two 3.8m TVRO antennas monitor Lifetime's satellite downlinks.

intelligence architecture.

Venaca used the ingest and playback data handling module to create a plug-in that works with Unity TransferManager to perform drag-and-drop ingest transfers directly into an Avid media bin. At the same time, it checks the associated metadata into the Unity MediaManager. The facility also features the new Avid Symphony Nitris HD/SD nonlinear editing solution.

## On-air playback

Lifetime's master control complex is enclosed by an aluminum and glass storefront and includes four master control pods and a transmission control center. The center of the complex features an on-air supervisor post with sight lines into each of the pods from a central location. The initial pod configuration includes:

- a room for the network's East and West Coast playout;
- a room for Lifetime Movie Network and Lifetime Real Women playout (single feeds);
- a live events and training room; and
- a future HD control room.

The flexibility of the facility's master control design and Miranda's Kaleido-K2 system allows the control and monitoring of the channels to be combined or switched between pods.

Harris supplied a ADC-100 automation system for the new facility, controlling a variety of hardware devices, including the Miranda Presmaster 2 and Imagestore Intuition branding device and Omneon's Spectrum media servers. Harris also controls the movement of air-resolution files to the facility's dual partitioned ADIC Scalar 10K archive. One partition is dedicated to high-resolution production media and is managed by Venaca. The on-air partition is managed by MassTech's MassStore system.

Each Lifetime network is designed to run two playlist streams simultaneously. The first is a plus-three stream, which provides a three-hour advance screening that is monitored before going into a three-hour buffer. The second is a plus-zero, or real-time, stream. The advance stream serves as the primary playout and provides the network ultimate flexibility and quality control. If a problem occurs, the facility's master control staff has a three-hour window to correct it on the plus-zero stream and switch to it at time of air.

The automation architecture is designed for redundancy, with six device servers deployed. At any given time, there are four device servers available to get playlist elements to air. In the unlikely event that all four servers fail, each network will still have the ability to get a simple playlist to air using the Omneon PlayTool in its MediaControl suite connected to a single video decoder port.

The remaining two device servers provide main and backup functions for Harris ingest stations. With all content being delivered via files to master control, it is essential that the ingest stations remain online. A backup device server for this area will minimize downtime due to hardware failures.

Adjacent to master control is the ingest and gatekeeping suite. Here, technicians perform quality control on digital long- and short-form files, which are delivered to an Omneon catch server at 12Mb/s through Venaca's transcoding process. Venaca has successfully integrated with Harris' H-Class Media Ingest module to transfer house XML metadata to the automation database during this process. A


This master control pod is used for playback and monitoring of Lifetime Movie Network and Lifetime Real Women.

copy of this air-resolution file is pushed via a Gigabit Ethernet connection to a disaster recovery site, where a remote air client runs an unattended, 24/7 automation playlist.

The MassStore system interfaces with the Harris automation system, dual Omneon media SANs and ADIC Scalar 10K robotic archive in Lifetime's multichannel environment. It monitors all content ingested or flipped to the dual SANs. Then the Harris ADC video archive control protocol (VACP) command directs the archiving of content. It archives broadcast-resolution content from the source SAN to the MassStore system or restores from MassStore to the SANs.

ADIC's Scalar Distributed Library Controller (SDLC) provides a fully redundant and robot controller for the Scalar 10K. Lifetime installed a dual-aisle configuration with 10 LT-20 drives and 1884 slots. Five drives are dedicated to high-resolution media under Venaca control, and five drives are dedicated to on-air under MassTech control. Venaca controls to the SDLC are executed via IP using the DAS protocol. Control for the MassTech environment is sent over Fibre Channel to ADIC's server. Miranda's iControl, the facility's monitoring and control-over-IP system, alerts operators and engineers when any signal falls out of defined specifications or hardware failures are detected.

The digital media technology at the core of the new facility enables streamlined production and distribution across multiple platforms. The same media files help create new products in formats appropriate from HD to wireless resolutions, giving the network tremendous flexibility at much lower cost. It also enables a robust disaster recovery and business continuity system through the distribution of master video files over the wide area network. BE

The digital media technology at the core of the new facility enables streamlined production and distribution across multiple platforms.

*Pete Sgro is vice president and general manager of operations and engineering, and Don Jarvis is director of broadcast engineering for Lifetime Networks.*

*Photography by Andy Washnik, CORPRICOM.*

## Technology at work

- ADIC
  - Scalar Distributed Library Controller
  - Scalar 10K archive
- Avid
  - Unity ISIS
  - Symphony Nitris NLE
- Barco projection displays
- Cisco
  - broadcast LAN
  - Catalyst 6513 switches
  - PIX 535 firewalls
- EMC post-production SAN
- Forecast consoles
- Harris
  - ADC-100 automation system
  - H-Class media ingest
- MassTech MassStore archive management system
- Miranda
  - iControl SNMP monitoring
  - Imagestore Intuition channel branding
  - Kaleido-K2 display processing
  - Presmaster 2 MC switcher terminal gear
- NVISION SD and super-high-bandwidth routers
- Omneon
  - MediaControl software suite
  - Spectrum media servers
- Optibase encoders
- Vela CineView PCI decoders
- Venaca S3 MAM

# Euphonix - Audio Mixing for Broadcast

## OB Sports

**Client:** **Mobile Television Group**
**Console:** **System 5-BP**
**Notes:** One of six System 5 consoles in Mobile Television Group's new HDX Trucks. Euphonix StudioHub Router integrates with the truck's Jupiter and Pesa audio/video router systems.

## On-Air News

**Client:** **KVUE Local News**
**Console:** **Max Air**
**Notes:** 96 channels of high quality audio controlled from a compact and easy-to-use surface. Max Air is packed with features to make the job of mixing news less stressful and much simpler resulting in a better show.

## Production

**Client:** **KLRU 'Austin City Limits'**
**Console:** **System 5-BP**
**Notes:** Their System 5 has 132 channels, 48 mix busses, 12 aux busses, and 41 physical faders. Although the show is currently broadcast in stereo it is mixed in 5.1 surround for archiving.

**Whatever the application Euphonix has the experience to meet your needs including fully integrating the console's audio router with most router control systems that utilize the ES-Switch protocol.**

euphonix.com


220 Portage Avenue • Palo Alto, CA 94306 • Ph: (650) 855-0400 • Fax: (650) 855-0410

Euphonix
digital emotion

# Emergency preparedness

BY DON MARKLEY

This year's hurricane season is expected to bring more named storms than average. Prognosticators also predict that this higher-than-average occurrence will continue for the next several years as part of a normal cyclical weather pattern.

That means that stations along the coasts can anticipate even greater hurricane damage than last year. Add that to the tornado damage that has already occurred in the Midwest and South this year, and it is apparent that the normal power lines need to be augmented. Big winds can bring cross-country power lines and local distribution wires down. Therefore, television stations in these severe weather areas should plan to generate their own electricity for extended periods.

## Standby power plants

Standby systems are a well-developed technology with highly competitive pricing and good reliability. The first step in developing a station standby power system is determining the capability of the system.

The transfer switch can be placed at the primary disconnect panel for the entire building. In the best possible system, a UPS is installed downstream of the primary disconnect. This ensures there is no momentary power interruption when the power fails. The UPS keeps the station running without glitches while the generator set starts, comes up to speed and goes online. Unfortunately, this type of system is probably the most expensive. The only real work involved is determining the maximum load, which can be decided by the power company through its demand metering.

To save money and still obtain a highly usable system, the station should make a list of its energy requirements. It's not necessary to have the outside lights, interior lighting, air conditioning or other auxiliary systems on the UPS. Those systems can easily tolerate a momentary break in power without any damage. And keeping them off the UPS can greatly reduce the required UPS size.

It usually doesn't make a great deal of sense to cut loads off with regards to the generator. The loads that can be eliminated are usually quite small in comparison to the main loads from the transmitter itself. Any savings are usually offset by the cost of rewiring the transmitter building, enabling loads to be left off the standby power system.

After a major storm, an intact tower can help to make a broadcast station available for emergency communications.

To put together a standby power plant, it is highly recommended that a station hire an engineer who is experienced in such system designs. Often, a preferred manufacturer will recommend an engineer. It can be assumed that the engineer will not pad the system size for a bigger commission — the industry is far too competitive for this type of action.

When meeting with the engineer, be sure to involve your electrical contractor. The options of what to include in both the UPS system and the standby power coverage will almost always be affected by the necessary wiring. Major rewiring of the entire facility will probably be quite expensive when compared with simply installing everything at the primary power disconnect.

## Fuel choice

Your next big decision is what type

**FRAME GRAB** A look at the consumer side of DTV

**Digital satellite set-top box market to grow**

79 million consumers will own a digital satellite set-top box by 2009


Source: In-Stat www.in-stat.com

of fuel to use. The fumes from spilled gasoline in an enclosed space are highly explosive. Natural and liquid natural gas are awkward for the average operator to handle when performing minor service. Good, old-fashioned diesel fuel is normally the fuel of choice.

The fuel must be treated with readily available additives when it is stored for extended periods. This helps to avoid the buildup of some nasty organisms.

In addition, the fuel can be filtered by a service to ensure cleanliness. In this case, the fuel is pumped out of the station's tank, through some serious filters and placed back into storage.

Any tank vents or access points must be above the highest water point. It doesn't hurt to have the whole tank elevated, though burial does provide an excellent amount of protection.

This is an area where the design engineer can also be of help. You can't simply dig a hole and throw in the old war surplus fuel tank that you found behind the transmitter building. The tank, along with its installation, must fully comply with EPA regulations or you will be required to dig it up and replace it.

The availability of fuel can be a concern. Diesel fuel is the easiest to obtain — in normal situations. In emergency conditions, having fuel delivered to the transmitter site may be difficult, if not impossible.

For one thing, a lot of people will be clamoring for fuel. Operating a broadcast station is certainly well within the criteria of public interest and justifies getting fuel. However, as some Gulf Coast stations learned during Hurricane Katrina, the officials who approve the fuel distribution are busy during these emergencies. To avoid waiting for fuel, contact the emergency preparedness officials in your area now. Discuss how much fuel the station would need on a weekly basis and how often you would need deliveries to be made. This sets up a determined schedule with a fuel source while cool heads are prevailing. It also eliminates having to track down officials for authorization at a time when they might be too busy to fulfill your requests.

**Proper integration of backup generators in broadcast operations can keep stations on the air, even under adverse conditions.**

### Emergency communications

Hopefully, the station will still have a tower that is erect after a big storm hits. In addition, the station will have electric power available in the transmitter building. That combination makes the station an asset, highly available for emergency communications.

Remember after Hurricane Katrina when the city officials could only communicate via one working network line in a hotel room? Normal telephone systems and cellular telephone systems didn't work after towers came down and the power went out. Along the Gulf Coast, one of the main communications abilities was the use of amateur radio. Hams were the main source of information into and out of the area until the army came in and set up some equipment. Even then, ordinary citizens depended on amateur radio to communicate to their families and friends that they were safe and what their evacuation plans were.

Get the station involved. Helping people communicate provides the news bureau with good material, is great for public relations and is simply part of being a good citizen.

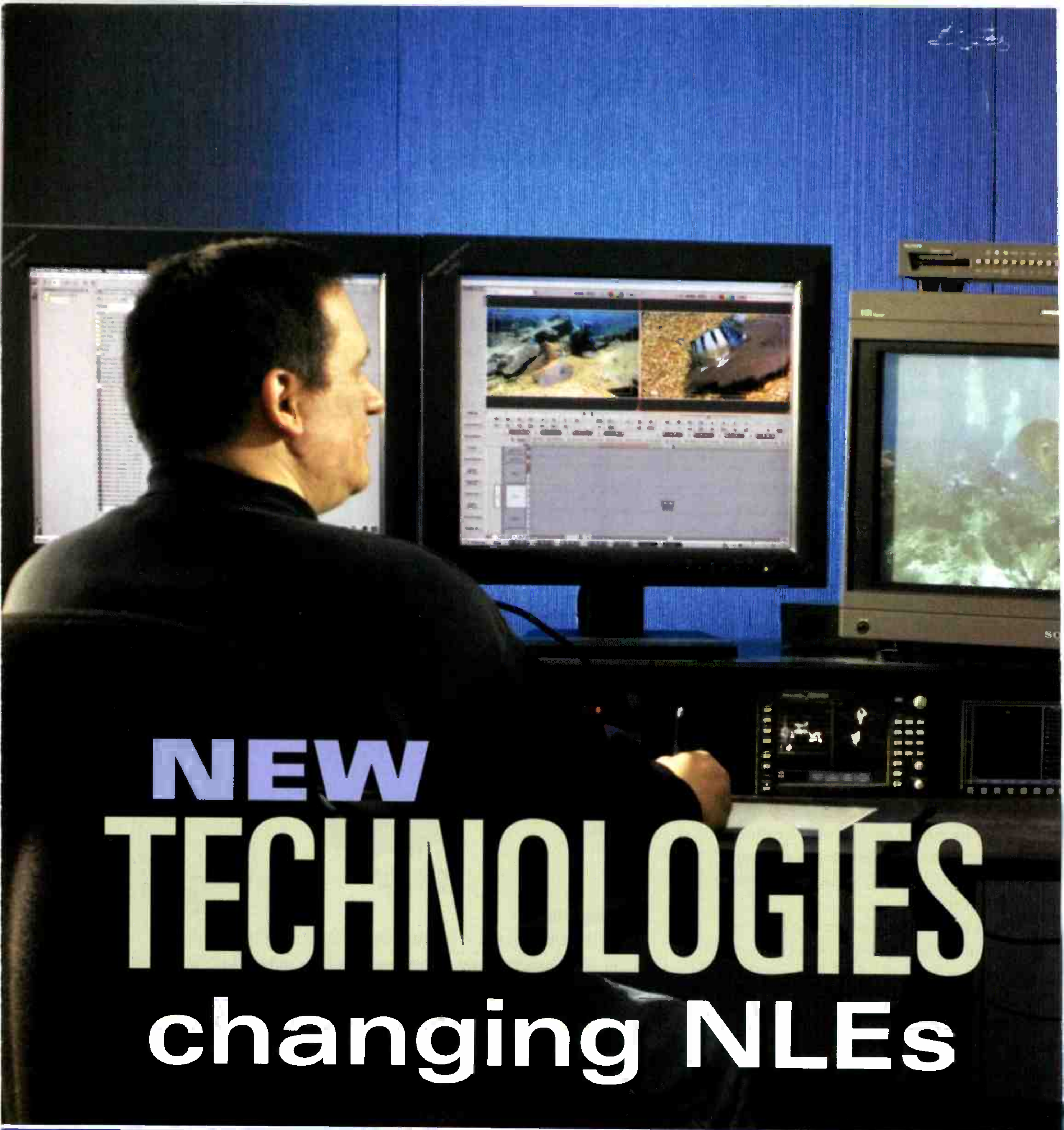
Usually, the amateur community works tightly with the emergency management folks. But, in New Orleans and along the Gulf Coast, much of the amateur work involved operators using field day equipment in their homes or in other dry locations. Some work was simply done by operators sitting in their cars using their mobile equipment.

Television stations can certainly assist in such work with little or no effort. For example, find a spot on the tower at a reasonable elevation where the emergency communications folks can put an antenna or two. If on the lower part of the tower, the effect on wind loading will not be significant. The insurance liabilities can usually be totally eliminated by a simple call to the insurance company.

When TV stations help with emergency communications, the benefits to the public are obvious. As an added benefit, your actions might even help you get your hands on that diesel fuel when you need it. **BE**

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

Send questions and comments to:
don_markley@prismb2b.com



# NEW TECHNOLOGIES changing NLEs

BY L. T. MARTIN

Ever since the CMX 600 system introduced disk-based editing at the 1971 NAB convention in Chicago, digital nonlinear editing has become a mature technology capable of cutting everything from DV to 2K resolutions. But even though the past year has seen significant brand name consolidation in the post-production game, the difference between manufacturer's edit systems can be found in the core technologies hidden under the hood. For most of us, NAB is our first opportunity to look at the latest crop of editing products — and there have been a lot. In June, we'll review the new editing products introduced at NAB2006. For this article, however, the focus is on the new technologies that differentiate NLEs.

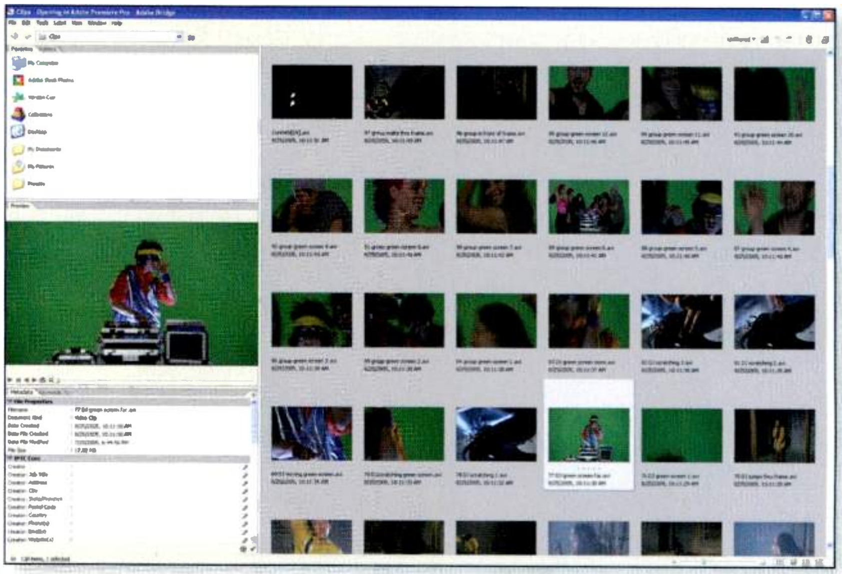

Robert O'Geen, a supervisor at KQED-TV in San Francisco, edits "Ocean Adventures" using an Avid HD Nitris system. Photo by Doug Schwartz.

## Adobe Production Studio 1.0

Adobe released its Production Studio 1.0 collection of software components last January as part of the Creative Suite family. The premium version of Production Studio provides plenty of new capabilities for content creation in the new versions of:

- Adobe After Effects 7.0 for motion graphics and visual effects;
- Adobe Premiere Pro 2.0 for real-time editing from DV to HD; and
- Adobe Photoshop CS2, which increases the capabilities of the industry standard for image editing.

However, sharing images between these packages has been challenging in the past because of the need for intermediate rendering when moving images from one application to the other. But now the Adobe engineers have come up with a new technology called Dynamic Like. It lets an editor drag-and-drop images from one software package to the other, enabling these three modules to work together seamlessly. For example, the layers for a green screen shot can be created in Photoshop CS2, composited in After Effects 7.0 and then dropped into the bin of Premiere Pro 2.0 to be edited into the timeline.



Adobe's Premiere Pro 2.0 enables users to capture and edit any format from DV to uncompressed HD and output to tape, DVD and the Web.

## CineForm Visually Perfect

Adobe Premier Pro 2.0 can directly edit HDV in its native format. But for some applications, either on lower-powered workstations or when intensive compositing will be involved, editors may find it useful to transcode those 4:2:0 long GOP files into the 4:2:2 format of CineForm's Visually Perfect post-production codec.

The codec incorporates a compressed AVI file format called CFHD. It employs a full-frame temporal wavelet transform that eliminates block artifacts risked by a DCT compression. Still, 1920 x 1080 source material with an uncompressed YUV bandwidth of about 125MB/s can be compressed to between 12MB/s and 20MB/s after compression, while preserving visual quality indistinguishable from the source.

CineForm's intermediate software is also being used with Wafian's HR-1 disk system for direct-to-disk recording of high-definition material from the HD-SDI output of Canon's new XL H1 HD camcorder. Although the camcorder is capable of producing an HDV signal for recording, when output through its HD-SDI connection, the signal bypasses internal HDV compression. It is then delivered as a traditional 1920 x 1080 YUV 4:2:2 60i signal that can be accessed directly for nonlinear editing by using CineForm's Prospect HD plug-in on Adobe Premiere Pro 2.0 editing software.

## Apple Final Cut Pro

Apple was one of the first to support native editing of both DVCPRO HD and HDV in its Final Cut Pro (FCP) software, part of the Final Cut Studio software suite. All of the editing done on Apple's Power Mac platforms (now with Intel chips onboard) is based on the open specification of QuickTime, and the project data inside FPC uses XML as an interchange format. That is why it has always been easy to get material in and out of the FCP editing flow.

But delivering a high-definition project cut in a desktop edit system to clients has always been a challenge. So it is notable that Final Cut Studio

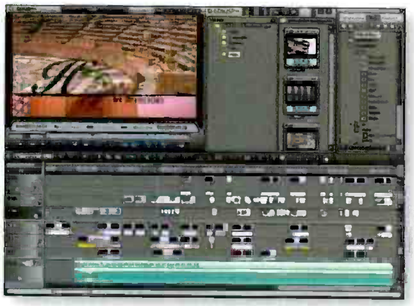
Apple's Final Cut Pro acquires HDV media via FireWire and keeps it in the original format, transferring it into the system without any generation loss.

enables the creation of a high-definition DVD for distribution by taking the output of an HD project edited on FCP directly into Apple's DVD Studio Pro 4 disk authoring software.

Internally, Apple has implemented the HD-DVD specification intended to be used with a blue-violet laser in commercial DVD distribution and made it work with a red laser disk recorder to put high-definition programming onto a standard DVD disk. Of course, the disk must be burned and played back through an Apple G5 computer. But at least for today's desktop editors, this has freed up HD disk distribution from the Blu-ray/HD-DVD format blue laser format war.

### Canopus EDIUS Pro 3.6

Now a part of Grass Valley, Canopus is energetically developing its EDIUS Pro 3.6 editing software based on the power of its codecs. The HQ codec is used as an intermediary for HDV editing to make the process less CPU-intensive. This frees up the CPU's power for effects creation, which means that, in a typical dual Xeon 3.4 system with a RAID drive, the HQ codec's intraframe compression can provide four tracks of variable bit rate HD content.



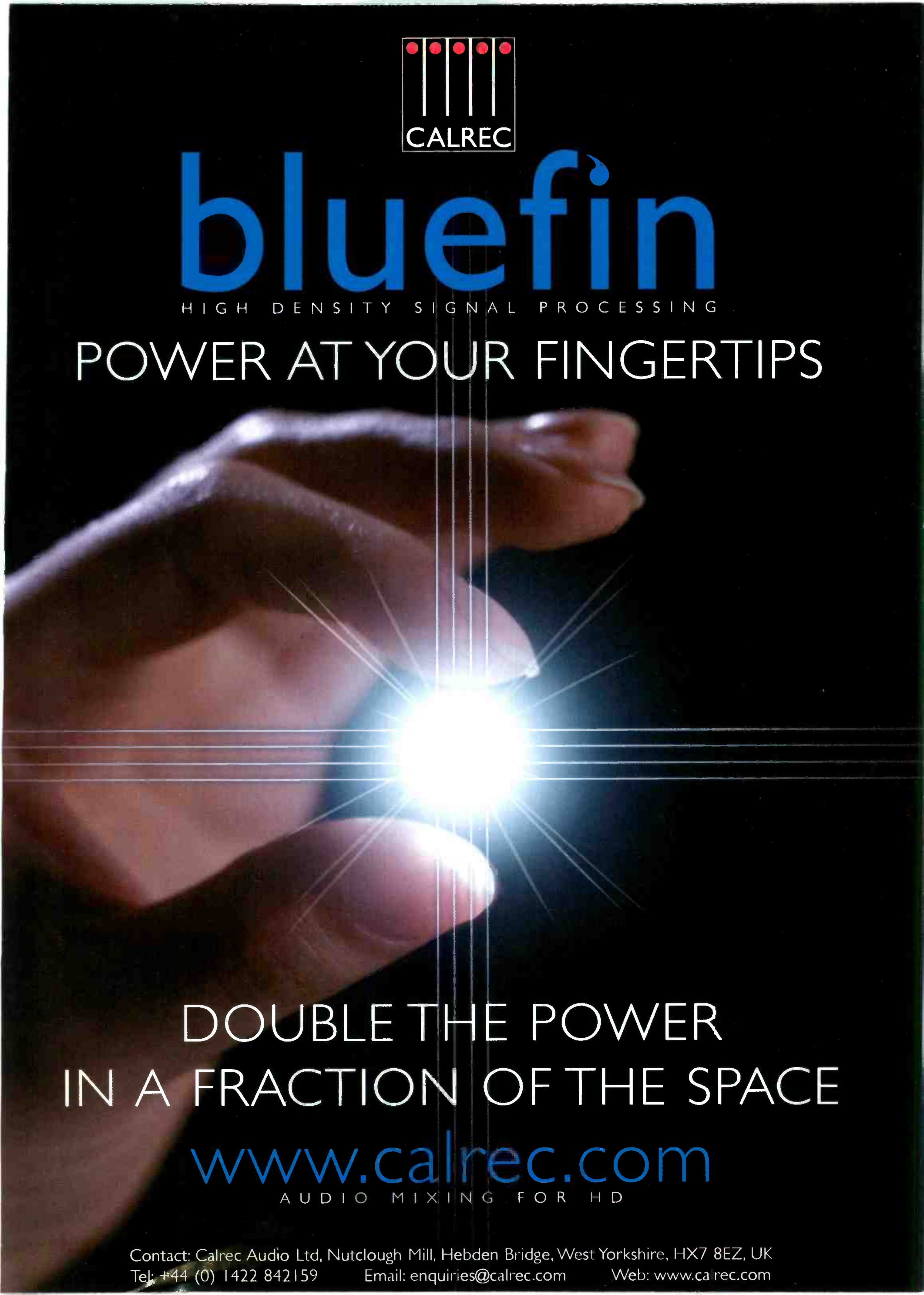
**Canopus EDIUS Pro 3.6 provides a seamless real-time workflow, supporting all video acquisition formats.**

Included in the system is Speed Encoder for HDV, which splits the long GOP encoding into two separate processes on dual-core platforms. Unlike the typical multitasking that processes the MPEG transport stream linearly, Speed Encoder splits the encoding tasks into two streams and processes them simultaneously.

Canopus systems can now interface with the new Grass Valley 35GB REV PRO storage disk, which is an extension of the Iomega REV format. Because these disks are used as removable storage for the Grass Valley Infinity camcorder, they can feed two streams of 55Mb/s MPEG-2 or DV material directly into an EDIUS nonlinear edit system. Once edited, the EDIUS can output the rendered HDV file and play it onto a Grass Valley Turbo iDDR.

### Discreet Smoke

Moving into the high end of hardware-based NLEs, the Discreet systems that are now marketed under the


CALREC
bluefin
HIGH DENSITY SIGNAL PROCESSING
POWER AT YOUR FINGERTIPS
DOUBLE THE POWER
IN A FRACTION OF THE SPACE
www.calrec.com
AUDIO MIXING FOR HD
Contact: Calrec Audio Ltd, Nutclough Mill, Hebden Bridge, West Yorkshire, HX7 8EZ, UK
Tel: +44 (0) 1422 842159 Email: enquiries@calrec.com Web: www.calrec.com

Autodesk brand emphasize working with completely uncompressed 4:4:4 RGB material. Because it is built on the Irix-based SGI platforms, the Smoke edit system runs on multi-CPU technology within a 64-bit architecture.

Although it does include a 4:4:4 proxy workflow, Smoke doesn't offer a compressed video option. One reason the Discreet systems can handle this throughput is because of their proprietary Stone storage file system, which is based on an algorithm that is essentially frame-size agnostic. This ensures that the data access patterns are optimally aligned to the storage system and hardware architecture.

The systems work seamlessly with SD, HD or 2K images. That can be essential when working with a combination of standard files (such as DPX) and standard file systems (such as XFS) in a digital intermediate workflow.

### Quantel eQ and iQ4

Pushing hardware to the limit are the resolution-coexistent eQ and new iQ4 systems from Quantel. Proprietary scaling technology allows them to perform real-time pan-and-scan from 4K digital intermediates.

For effects, the systems employ the Eiger Media Engine as the media processing heart, and this is at the functional heart of the new Pablo color-correction system. The engine is built with field-programmable gate array technology, enabling new hardware features to be added to Pablo with simple software upgrades. Eiger uses 64-bit per pixel inputs, giving Pablo full 16-bit accuracy for each image component, while internally the Media Engine works to at least 32-bit precision. A second engine is used together with sophisticated resource scheduling. It enables integrated concurrent processing, a technology Quantel calls TimeMagic. TimeMagic allows the operator to work with full interactivity in the foreground, while the second engine renders in the background.

**Quantel iQ delivers real-time 4K playback — more than 1GB/s — without proxies or patches. It can pan-and-scan HD and SD versions in real time from a 4K master.**

### DVS CLIPSTER

When shooting 2K and higher digital cinema productions, sometimes it's necessary to have an edit system that can handle files of that size on

the set. The portable (well, at least transportable) system being seen on Hollywood sound stages is CLIPSTER from DVS. It creates real-time transitions in 2K to let the DP and digital imaging technician review sequences on location in uncompressed RGB 4:4:4. Inside the system are levels of proprietary I/O boards that use field-programmable gate arrays. The newest software supports workflows for digital dailies, using various compressed formats such as JPEG2000, WM-9 and QuickTime, depending on where they will be screened.

CLIPSTER accesses its data files from the Pronto2K and ProntoHD disk recorders, which provide instant access and capture of uncompressed 2K, HD and SD to combine the advantages of a disk-based recording system with a workstation. It can even play out 4K files in real time, but it edits them in a lower resolution by using 2K files as proxies.

**DVS CLIPSTER works with multiple resolutions in real time.**

### Avid Interplay

Avid recently announced a system called Interplay that is intended to define a whole new category in media production technology. It is designed to give everyone on a production team access to shared data within powerful security and revision control. This open system can accommodate more than 100 different media and non-media file types and can link to production tools from virtually any other company.

The core technology of Interplay is a client/server engine that works with any member of the Avid Unity MediaNetwork family of shared-storage systems. Its components include a PC server that acts as its central nervous system connecting to the media assets. Its user software client provides revision control and management capabilities to desktop and laptop systems on the network.

Interplay allows customers to work natively on any resolution, use a background network service to transcode to different resolutions and create as many resolutions and formats of a clip as necessary. Its archive software module lets editors work with low-resolution proxies of archived files either directly from the editing interface or automatically through the system's access tool. **BE**

*L.T. Martin is a post-production consultant.*

*The information in this article was received prior to NAB2006.*

# CHOOSING A STORAGE MANAGEMENT SYSTEM FOR BROADCAST

BY BRIAN CAMPANOTTI

The accelerating adoption of digital, file-based infrastructures continues in the broadcast world, forcing the need for more storage capacity and effective storage management. Digital storage silos — independently serving post-production, on-air playout, graphics and newsroom systems — are becoming a common solution to fit these unique workflows, despite the obvious disadvantages. Effective unification of these distinct digital silos is necessary if a facility's storage and content management capabilities are to facilitate next-generation, file-based collaborative workflows.

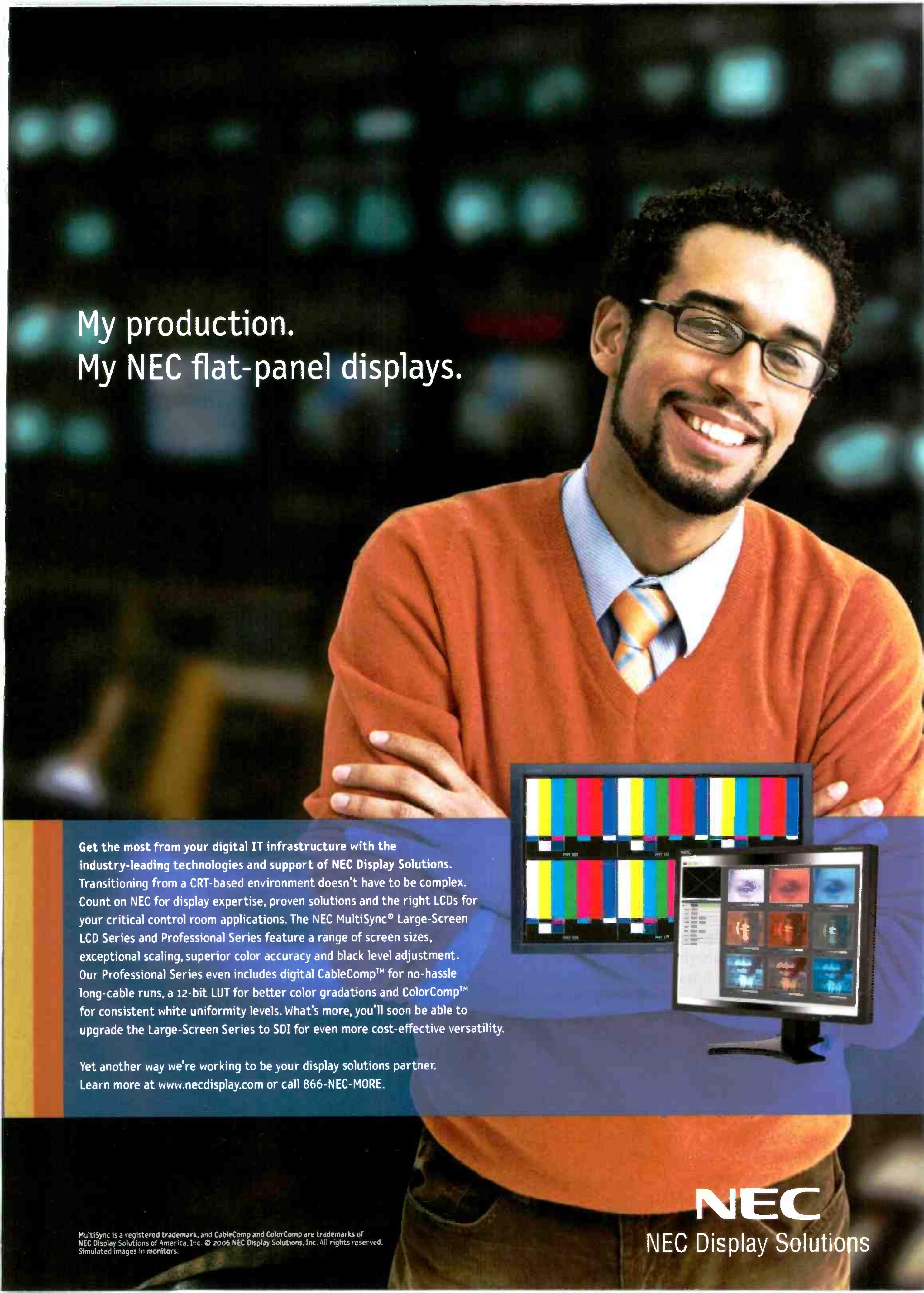
To put this into context, consider a traditional network file server. It would be unacceptable for the IT department to mandate that all word processing documents be stored on one server, spreadsheets on another, GIF images on a third and so on. But in a broadcast environment, this is pervasive and considered an acceptable practice. It is time to look at server storage differently.

## The file-based environment

A file-based broadcast model is comprised of three necessary layers (as shown in Figure 1 on page 70):

- *digital broadcast devices*, including video servers and newsroom and editing systems;
- *physical storage infrastructure*, including a storage management system, high-speed networks and a mix of disk storage arrays, data tape or optical libraries; and
- *control systems*, which are the user-facing applications, such as broadcast automation, media asset management (MAM) or less expensive content

**Photo: Rainbow Media's VOOM HD Networks employs the Front Porch Digital DIVArchive for file management. Photo by Fred Towne.**



My production.
My NEC flat-panel displays.
Get the most from your digital IT infrastructure with the industry-leading technologies and support of NEC Display Solutions. Transitioning from a CRT-based environment doesn't have to be complex. Count on NEC for display expertise, proven solutions and the right LCDs for your critical control room applications. The NEC MultiSync® Large-Screen LCD Series and Professional Series feature a range of screen sizes, exceptional scaling, superior color accuracy and black level adjustment. Our Professional Series even includes digital CableComp™ for no-hassle long-cable runs, a 12-bit LUT for better color gradations and ColorComp™ for consistent white uniformity levels. What's more, you'll soon be able to upgrade the Large-Screen Series to SDI for even more cost-effective versatility.
Yet another way we're working to be your display solutions partner. Learn more at www.necdisplay.com or call 866-NEC-MORE.
MultiSync is a registered trademark, and CableComp and ColorComp are trademarks of NEC Display Solutions of America, Inc. © 2006 NEC Display Solutions, Inc. All rights reserved. Simulated images in monitors.
NEC
NEC Display Solutions

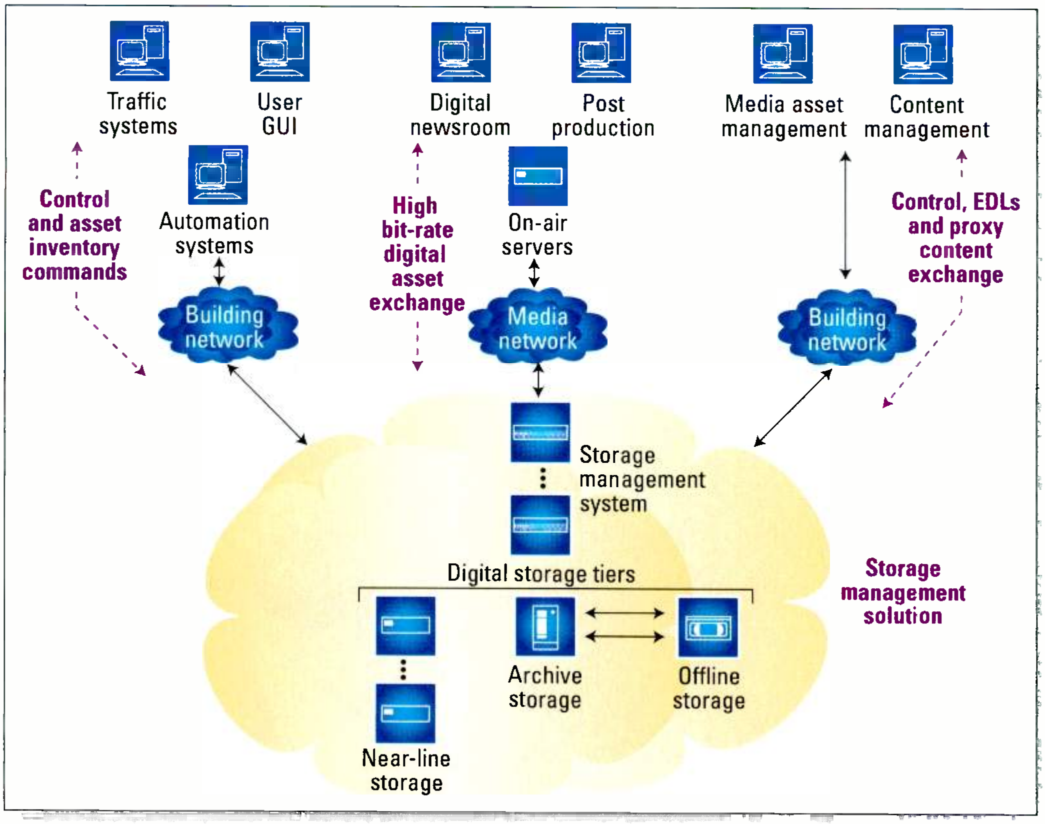



**Figure 1. Overview of a file-based facility**

management solutions that help users to facilitate content identification, use, reuse and collaboration.

These layers work in tandem to facilitate the end-to-end, file-based digital content workflow. At the heart of this concept is the handling and management infrastructure or, simply, the storage management system. These systems can include direct connectivity to various broadcast devices and provide intelligent physical storage management and abstraction. Advanced solutions can also facilitate digital content repurposing via time-code-based partial restore, high- and low-bit-rate content transcoding for tapeless interoperability between systems, as well as automatic site-to-site content distribution and replication for disaster recovery.

Most broadcast storage infrastructures feature four distinct tiers: online, near-line, archive and offline. The major benefit of this tiered storage model is that storage cost decreases significantly as content migrates from online to near-line, from nearline to archive and, finally, from archive to offline storage. (See Figure 2.) Each tier of storage also provides certain workflow advantages and disadvantages, which must also be taken into careful consideration during the planning stage.

The storage management system is ultimately responsible for the effective management of these storage tiers. There are currently two types of storage management systems often confused. They are hierarchical storage management (HSM) and media storage management (MSM) systems. Both share similar names but offer fundamentally different functionality because of their origins.

## HSM migration

HSM systems were developed to address storage infrastructure management in traditional IT environments. HSM systems generally manage the migration of any type of file to and from different storage tiers using file-based rules or migration policies. (See Figure 3 on page 76.)

Once the administrator defines these policies, the HSM software manages migration between storage

| Storage tier | Description | Cost and access |
|---|---|---|
| Online | A spinning disk connected directly to broadcast devices (video servers, editing platforms, newsroom systems, etc) | Storage cost: $$$$$<br>Access speed: immediate |
| Near-line | A less expensive spinning disk controlled by the storage management system. Requires a copy operation to online disk for content access | Storage cost: $$$<br>Access speed: very fast |
| Archive | A large and expandable robotic tape or optical storage device controlled by the storage management system | Storage cost: $$<br>Access speed: fast |
| Offline | Media from the robotic storage library can be ejected and stored on shelves (or off-site) while still tracked by the storage management system | Storage cost: $<br>Access speed: slow |

**Figure 2. In this storage tier summary, the tiers below the dotted line are managed by the storage management system.**

# SPEEDBALANCE

| Video 20 SB | Video 18 SB | Video 15 SB | DV 12 SB | DV 8/100 SB | DV 8 SB | DV 6 SB |
|---|---|---|---|---|---|---|
| Payload 7–25 kg | Payload 2–18 kg | Payload 1–16 kg | Payload 1–14 kg | Payload 1–12 kg | Payload 1–12 kg | Payload 1–9 kg |


+ Ideal for every Camera
+ Touch & Go® Camera Plate
+ Self-Illuminated Touch Bubble NEW!
+ Counterbalance within Seconds
+ Finer Counterbalance Graduation NEW!

= The new Fluid Head Generation

## SPEEDBALANCE

www.sachtler.com

**sachtler – New York Office**
709, Executive Blvd.
Valley Cottage, NY 10989
USA
Phone (+1) 845 268 2113
Fax (+1) 845 268 9324
Email sales@sachtlerusa.com

**sachtler – Burbank Office**
2701 N. Ontario St.
Burbank, CA 91505
USA
Phone (+1) 818 845 4446
Fax (+1) 818 845 4572
Email sales@sachtlerusa.com

**sachtler – Headquarters**
Erfurter Straße 16
85386 Eching
Germany
Phone (+49) 89 321 58 200
Fax (+49) 89 321 58 227
Email contact@sachtler.de

**sachtler**®
*set your ideas in motion!*

tiers automatically with little or no interaction. These HSM migration policies can specify the movement of a file between storage tiers when it has not been accessed for a certain period of time, has a specific file extension or meets other general parameters.

Watermarking is another migration policy typical to HSM systems. With it, the free capacity on near-line storage is monitored. When it reaches a certain threshold, seldom-used files are transparently moved to archive storage, freeing space on the near-line tier. These HSM policies typically mirror simple business practices where files become less relevant as they age.

The HSM software typically runs on the same single server that hosts the network shared drive, which it monitors for files that should be migrated to different tiers based on configured policies. For example, an HSM application can run on a network server monitoring a shared drive (near-line tier) and migrate content to a data tape library (archive tier) as additional space is required on the network drive or a particular file has not been accessed for several months.

### HSM disadvantages

The monolithic nature of the HSM environment guarantees significant downtime for upgrades and greater susceptibility to catastrophic software and server failure. Also, these systems

**HSM policies typically mirror simple business practices where files become less relevant as they age.**

are intended for cost-effective management of large volumes of data and don't fit dynamic content workflows common in broadcast applications. HSM systems simply move files to less expensive tiers as the configured migration policies are satisfied.

In order to perform content migration, HSM systems use stub files to trick applications into thinking the original file is still present on a particular tier of storage. This stub file is typically a small fragment of the original file, containing pointer information to where the actual file has been moved to in the less expensive storage tiers. If the HSM system migrates files to these other tiers of storage without leaving a stub file behind, applications would simply believe the file no longer existed and have no way of retrieving it.

When the HSM system receives an access attempt on a stub file, it will

ask the requesting application to wait while it retrieves the remainder of the file from other storage tiers. The operating system on the client computer considers the entire contents of the HSM system to be online, unaware that the bulk of the files may reside on other storage tiers.

This fundamental HSM mechanism can be problematic in a broadcast environment. Leaving stub files on online storage (video servers, newsroom systems, etc) is simply not possible. If a broadcast automation system believed a particular commercial existed on a video server because it found a stub file in its online storage, on-air disaster would likely follow. Automatic file migration or movement to other storage tiers can also cause unexpected results when, for example, the next commercial to play on-air is migrated by the HSM policy engine because it has not been accessed recently.

For these reasons, typical HSM systems do not directly interface to online storage. They instead rely on introducing yet another layer of control to copy or move content from online to near-line storage where the HSM system can then take over the simple migration process. Not only does the additional control layer add complexity to the overall solution, but it mandates that its provider develop many proprietary broadcast device interfaces to support the necessary workflow. Because this development is not typically the primary focus of the provider, it can also limit the customer to a non-ideal and somewhat convoluted workflow.

Unfortunately, these are not the only potential pitfalls in selecting an HSM solution. A side effect of the storage abstraction provided by the use of stub files is that control systems have limited visibility into where files are actually stored at any point in time. Also, HSM systems typically provide limited mechanisms for request prioritization. The combination of these factors eliminate the potential for deterministic system behavior, which is an absolute necessity in broadcast applications.

> **Another significant limitation is that HSM systems deal with files independently because of their IT-centric approach.**

Another significant limitation is that HSM systems deal with files independently because of their IT-centric approach. They are not capable of grouping related component files together to form compound objects.

The ability to group content is a requirement when dealing with a media asset, which might consist of a header file, several audio files, a VBI file, a digital video file and more. These independent files need to be treated as one single element as they flow through the storage infrastructure.

Imagine a situation where a movie is required for playout to air. Its audio and VBI files are in near-line storage, but its video and header files sit on different pieces of media in the archive library. This can present a potentially disastrous situation.

Although rarely supported, offline storage can present additional issues because of the randomness of files contained on each piece of archive media. Administrators would be constantly shuffling archive media in and out of the library as users requested access to their files.

Considering these significant issues, HSM systems are condemned to provide limited value and leave us far from the goal of having a truly unified broadcast and media storage

infrastructure. Thankfully, there is an alternative.

## MSM basics

HSM and MSM systems are similar in that they can migrate files from one storage tier to another. But this is where the similarity ends.

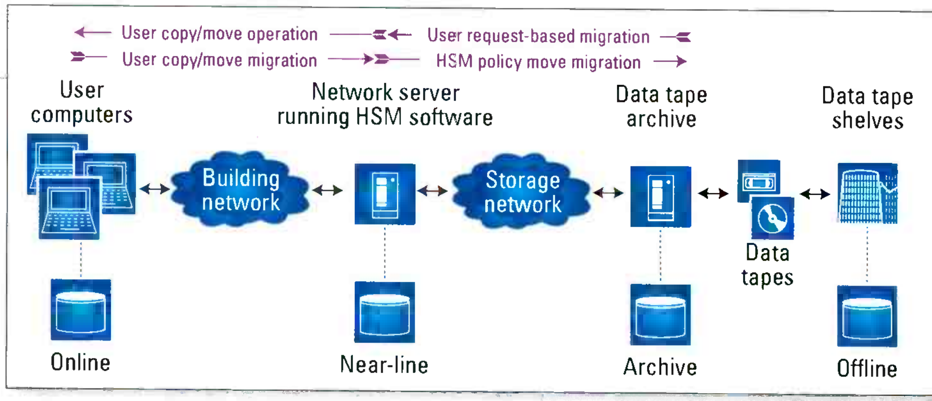



**Figure 3. Overview of a hierarchical storage management HSM system**

MSM systems, sometimes referred to as archive management systems, are becoming less focused on media archiving and more focused on active, file-based digital workflows, distribution, content exchange and collaboration. The term archive management no longer does these advanced systems justice.

Fundamentally, MSM solutions interface directly into broadcast devices (online storage), manage all tiers of storage and provide a unified and intelligent view of the storage infrastructure to various broadcast control devices. MSM systems rely on copy rather than move operations (no stub files) to migrate content into the storage infrastructure from the online tier. These systems are less focused on expensive storage tier capacity maximization and more focused on the complex collaborative and accessibility requirements of a broadcast facility.

## MSM variations

To confuse the issue further, within this class of MSM solutions, features and capabilities vary widely. In general, MSM systems are server-based software solutions that reside between the so-called media network — which connects various broadcast devices — and the storage network — which connects the near-line and archive storage tiers. (See Figure 4 on page 78.)

MSM systems take responsibility for the broadcast asset directly from online storage through near-line, archive, offline and back. This eliminates the need to have an additional


## Multiple Receiver Card Cage

| Description | Model Number | Frequency |
|---|---|---|
| Card Cage | OCC-1 | - |
| Power Supply | PS-OCC-1 | - |
| L-Band Receiver | OCCR-103000-1 | 10–3000 MHz |
| L-Band Transmitter | OCCT-103000-1 | 10–3000 MHz |
| C-Band Receiver | OCCR-3442-1 | 3.4–4.2 GHz |
| Broadband Receiver | OCCR-95012750-1 | 0.95–12.75 GHz |

The MITEQ Fiber Optic Card Cages are capable of supporting up to ten individual receiver modules at all of the covered frequency bands. The card cage features hot swappable connection and summary alarm contacts for each module. The card cage can be ordered with up to ten receiver modules at any available frequency or any combination of L-Band transmitters or receivers.

## One Third Rack Unit Fiber Optic Transmitter and Receiver

### Fiber Optic Link Models

| Model Number | Frequency |
|---|---|
| OL-103000-1 | 10–3000 MHz |
| OL-3442-1 | 3.4–4.2 GHz |
| OL-95012750-1 | 0.95–12.75 GHz |

### Fiber Optic Transmitter Models

| Model Number | Frequency |
|---|---|
| ORT-103000-1 | 10–3000 MHz |
| ORT-3442-1 | 3.4–4.2 GHz |
| ORT-95012750-1 | 0.95–12.75 GHz |

### Fiber Optic Receiver Models

| Model Number | Frequency |
|---|---|
| ORM-103000-1 | 10–3000 MHz |
| ORM-3442-1 | 3.4–4.2 GHz |
| ORM-95012750-1 | 0.95–12.75 GHz |

For additional information please contact Chris Alfenito at (631) 439-9108 or calfenito@miteq.com

NQA 9001:2000 REGISTERED COMPANY ANSI-RAB QMS ACCREDITED

3 YEAR WARRANTY

CE

MITEQ

100 Davids Drive, Hauppauge, NY 11788
**(631) 436-7400 FAX: (631) 436-7431**
www.miteq.com

proprietary control layer act as an intermediary between online and near-line storage to facilitate storage management.

Some MSM solutions can provide a truly unified asset storage infrastructure. They can span a mix of broadcast devices, including on-air video servers, post-production editing platforms and digital newsroom systems.

In addition to the obvious cost and workflow benefits of this single storage infrastructure, advanced MSM systems can also offer in-path content transcoding, allowing tapeless interoperability between these distinct silos. Add time-code-based partial file restoration to this mix, and the true benefits of a collaborative, file-based broadcast workflow become obvious.

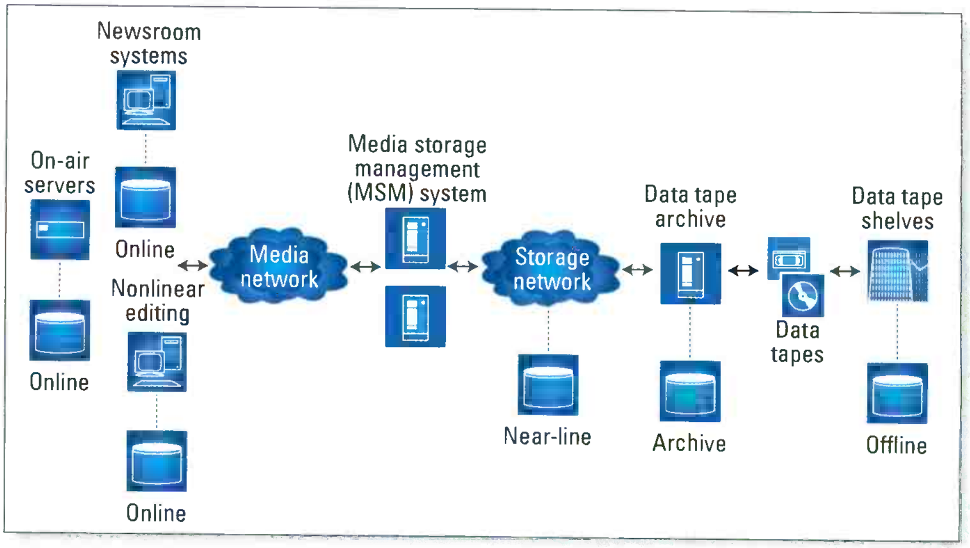



Figure 4. Overview of a media storage management (MSM) system

## MSM migration

Advanced migration, or content lifecycle policies, provided by MSM solutions fit better into broadcast environments than the harsh rules defined in HSM applications. Not only can decisions be made based on media-centric parameters, but these MSM applications also provide robust programmatic interfaces (APIs)

for control and management by higher level business systems, such as traffic, inventory systems and automation.

For example, with a single command, traffic can directly instruct an advanced MSM system to copy a newly ingested, high-revenue movie into the archive library, make two copies of it for protection and generate a frame-accurate Windows Media proxy copy for Web access. An editor can then access the proxy generated by the MSM system from his or her desktop using the MAM interface and select the shots to be used in creating movie promos.

This shot list can be sent to the MSM system via the same API to partially restore the segments based on mark-in and mark-out time code values defined in the edit decision list (EDL). The MSM system then extracts the matching segments from the original high-bit-rate movie, transcodes them as necessary and digitally delivers them to the editing system for creation of the promos. Once the promos have been completed, the same workflow (and API) brings this newly created content from the editing platform through the MSM system and to the on-air video servers for playout to air.

Broadcast control systems can provide intelligent contextual management of content as it migrates through the MSM system. By monitoring relevant broadcast-centric factors, such as rights management information, operator needs, on-air playlist demands and intangible content relevance, migration can be driven by complex decisions rather than simple machine logic.

Prioritization is a key feature of MSM systems. For resource assignments, it factors in the importance of content and how quickly it is required. This intelligent migration management and inherent support for request prioritization allows effective use of offline storage, providing near limitless and inexpensive storage expansion, as well as support for off-site content replication.

Because MSM systems are focused on direct interface to broadcast devices, they can handle either single-file assets or compound objects comprised of a few or even hundreds of component element files. As these assets migrate throughout the storage infrastructure, they are handled as a group, ensuring the complete asset is available as required.

**Broadcast control systems can provide intelligent contextual management of content as it migrates through the MSM system.**

MSM solutions provide all of the necessary broadcast-centric functionality, with the added benefit of easy, low-cost expansion as the broadcast operation evolves. With a distributed architecture, advanced MSM systems offer incremental scalability through the addition of movement engines, or actors. These actors are used to provide additional system bandwidth and redundancy at any point without necessitating downtime. This redundancy and scalability simply is not possible with HSM systems — as well as some less-advanced MSM systems — because of their monolithic architecture.

### What this means

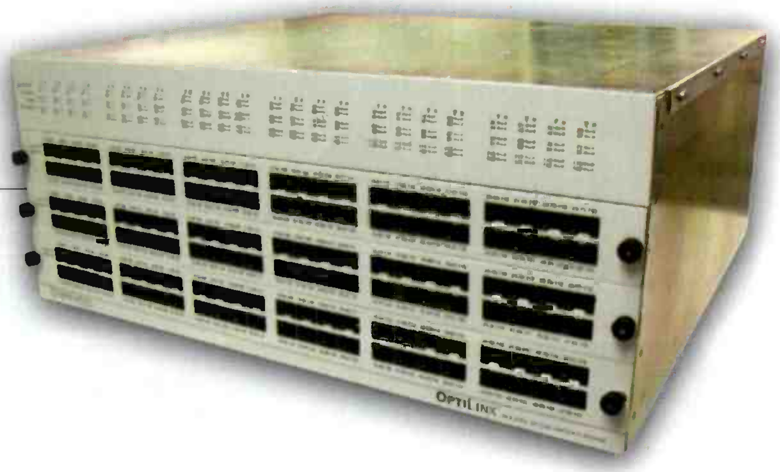
This is by no means an exhaustive list of the factors that should play part in this complex decision-making process. It is important to partner with a solution provider who not only fully understands the business, but who focuses exclusively on the complex, file-based storage management needs of global broadcasters.

Effective unification of the distinct digital storage silos is necessary if a facility is to benefit from next-generation, file-based collaborative workflows. Implementation of an advanced MSM system, built specifically to meet a broadcaster's needs, gives users the power and flexibility to get the most out of their assets and achieve a unified media storage infrastructure. BE

*Brian Campanotti is chief technology officer for Front Porch Digital and has been involved with the development of MSM systems for nearly 10 years.*

# It's time to switch.

LinxView™
Remote Management Suite



# OptiLinx™ OLX-3000
## Optical Switching Made Easy

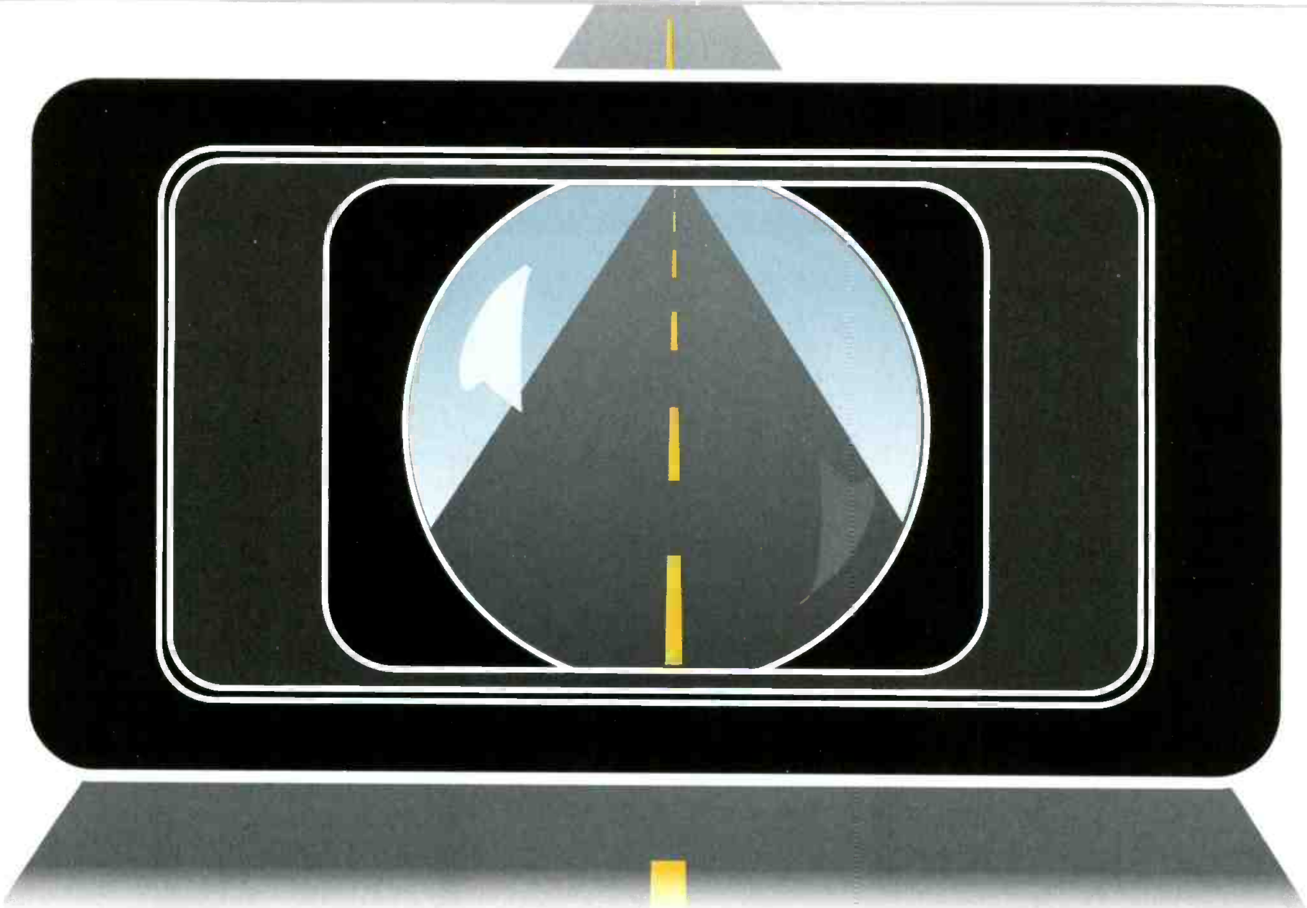
Opticomm's OptiLinx™ OLX-3000 is a versatile, multi-purpose, fiber optic switch that provides high-speed switching between ports. The OLX Series is capable of switching signals up to 4.25 Gb/s per each of its 144 ports (612 Gb/s per mainframe), all in a compact 4RU chassis, using swappable SFP modules.

The OLX-3000 is ideal for applications involving broadcast media conversion, multicasting one signal to many displays, or switching any video, audio or data input to any display output. Opticomm's LinxView™ software and Command Line Interface enable you to remotely perform these functions at the touch of a button.

**Visit us at InfoComm | June 7-9 | Orlando, FL | Booth 1300**

opticomm
travel by light™

800.867.8426 | www.opticomm.com



# HDTV optics

## and the many roads to HD newsgathering

BY LARRY THORPE AND GORDON TUBBS

Across the country, broadcasters are examining possibilities in migrating to HDTV newsgathering as part of the larger DTV transition. At this juncture, broadcasters appear separated into two broad philosophical camps: those wanting near-term total transition to HD and those wanting a more paced transition.

The first group wants to convert news studio and allied infrastructure to full HDTV production as well as outfit all in-field news crews with HDTV equipment. In many cases, this simultaneously encompasses a switch to a tapeless nonlinear IT-based system.

The second philosophy involves conversion of the news studio to full HDTV production, but with in-field news crews shooting widescreen digital component SDTV that will be subsequently upconverted to the chosen HDTV format. A second downstream transition to HD news acquisition is generally anticipated.

### Upconverting SDTV newsgathering material

The singular challenge to the second approach is integrating the upconverted widescreen SD material from the field with the pristine and sharp programming of the HDTV news studio. A first important premise is understanding that the upconversion process cannot add picture sharpness to an original SDTV image. The best that this process can do is to:

- eliminate the visibility of the line carrier structure of the SDTV signal, which does clean up the image, especially when viewed at close range; and
- reformat the 16:9 SDTV video signal to the 16:9 HDTV video signal so that the two can be seamlessly integrated within HD switchers, editing systems, etc.

What should be sought is the best visual fit between the upconverted SD imagery from the news crews and that originated in the studio by the HD cameras. That visual match encompasses all of the numerous dimensions of an image, including picture sharpness, contrast, tonal reproduction and color reproduction. With careful planning (and some operational training), the match can be quite excellent — except in the realm of picture sharpness.

The in-field SDTV video capture must be the best possible. There are a number of key things you must do:

- Use the best lens — and it should be an HDTV lens.
- Use 4:2:2 digital SDTV recording in the field-acquisition system.
- Use the optimum camera setup that expedites good-quality upconversions (especially on the setting of detail enhancement systems in the camera).
- Learn the rules of image framing for acceptable upconversion.
- Use a high-quality upconversion system.

Let's take a closer look at each of these in turn:

- *The lens.* Picture sharpness on large HDTV screens will be more readily evaluated in the picture extremities as well as picture center. It is important that the lens used on the SDTV camcorder have as even a modulation transfer function (MTF) distribution from picture center to corners as possible.

The 16:9 SDTV camera should use an HDTV lens. The HDTV lens will enhance the MTF of the SDTV video. The flatness of this MTF across the image plane will also be improved. It will optimize a number of additional picture parameters, including the optical contrast ratio. Picture sharpness and contrast are intimately related [1]. The HDTV lens will ensure that the SDTV camera is delivering all that it is capable of originating.

- *Digital 4:2:2 recording.* The SDTV camcorder should be full-bandwidth 4:2:2. Fortunately, there are a wide variety of such digital ENG camcorders to choose from, both tape-based and tapeless. All of that original color detail will be needed to ensure that upconverted video is as rich in detail as possible.
- *Camera setup.* Use of minimum detail enhancement is important. The established instinct from the NTSC era is to use a significant amount of enhancement in order to overcome the resolution limitations of that analog system. However, SDTV is a component-based digital system and is inherently sharper. Upconversion processing works optimally when there are no overshoots on transitions and when aliasing (particularly vertical aliasing) is minimized.
- *Rules of image framing.* This is the most critical issue. The reproduction of image sharpness is highly dependent upon picture content, and the lens is the great dictator on this. There is no intuitive prediction of the optimization of upconversions. There are too many variables involved. Testing is the only way to develop a feel for the boundaries.
- *Upconversion system.* Over the past five years, a tremendous amount of development has gone into digital upconversion processing, and sophisticated techniques have evolved. Testing is the best way to zero in on the system that works best for the type of imagery anticipated.

## Picture sharpness revisited

In the second article in this series [2], we looked at the topic of picture sharpness. The visual perception of sharpness on a television screen viewed from a distance (six or seven times picture height being typical for SDTV) is proportional to the square of the area under the MTF curve [3]. This refers to the lens MTF multiplied by the camera MTF.

What this translates to in real terms is that the lower spatial frequencies make the greatest contribution to the edge sharpness perceived by our eye-brain system. The higher spatial frequencies then augment this by contributing important textural information that adds to the reality of the portrayed image. Texture is generally low-amplitude, high-frequency detail relating to human facial portrayal (eyebrows, skin texture, etc.), clothing textures (wool, silk, etc.), nature (grass, leaves on trees, shrubs, etc.) and materials (wood, bricks, stucco, etc.).

Essential picture sharpness and the associated image texture can be mapped onto the HDTV lens MTF characteristic. (See Figure 1.)

A good SDTV camera and 4:2:2 digital recorder can create a high-quality image at normal viewing conditions (six or seven picture heights from

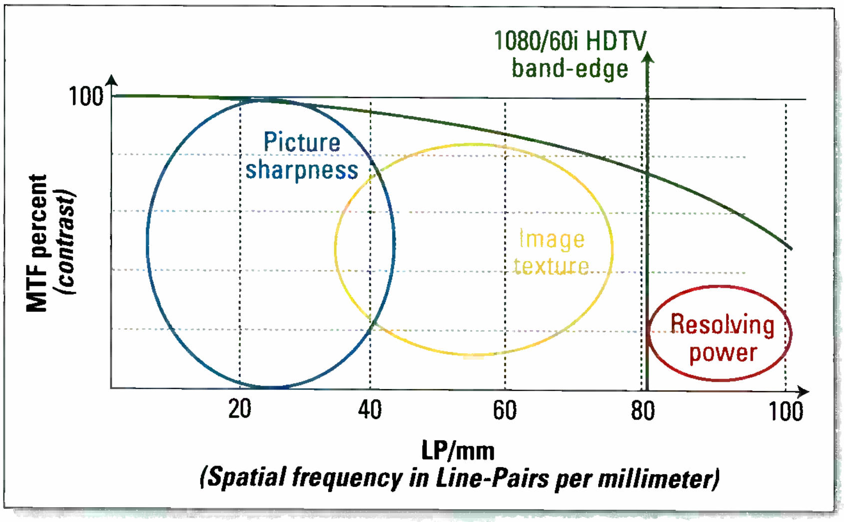



**Figure 1. A typical MTF curve (measured at picture center) of a contemporary 2/3in HDTV lens and the approximate regions of spatial frequencies**

# UTAH-400

## It Just Keeps Getting Better ...and Better


**The UTAH-400 High-Density Digital Routing Switcher, already the world's most advanced switcher, now offers even more:**

**Automatic crosspoint redundancy in all matrix sizes**
The UTAH-400 allows you to protect your critical signal paths against interruption with *AUTOMATIC* internal redundancy.

**Three Frame Sizes -- 64x64, 144x144, and 288x288**
You can use the UTAH-400 for any digital router application from the smallest utility router to the largest central matrix.

**In any size, all UTAH-400 systems offer the same set of world-class features -- and the industry's lowest prices:**

- Full time Input / Output Signal Monitoring
- Reduced Power Consumption and Rack Space Requirements
- SD/HD Compatibility
- Fiber Optic I/O Option

TEN YEAR WARRANTY

UTAH SCIENTIFIC

New Directions in Digital Switching

4750 Wiley Post Way, Suite 150, Salt Lake City, UT 84116 USA
Ph: 801.575.8801 • Fax: 801.537.3099 • Email: sales@utahscientific.com

the SDTV display). Contemporary SDTV 2/3in CCD imagers that are super-sampled horizontally (in the vicinity of 1000-elements), in combination with a high-performing lens and 4:2:2 10-bit digital recorders, will do justice to edge sharpness. But, the reproduced picture will still lack fine textural detail.

Texture plays an important role in contributing to the perception of sharpness. The detail in hair is an obvious one. The fine detail in facial skin is a more subtle manifestation — discernible in an HD image but much less so (or not at all) in an SDTV image. The textures in clothing are superbly reproduced in an HD image, but are usually significantly attenuated or may be eliminated entirely in an SD image.

If a scene is imaged by a lens, then the essential edge sharpness will be optically resolved over the spatial frequency range of 0LP/mm to approximately 40LP/mm. The textural detail in the face and the clothing, however, will be primarily resolved over the spatial frequency range of 35LP/mm to 75LP/mm [4]. Let us put a technical perspective on this.

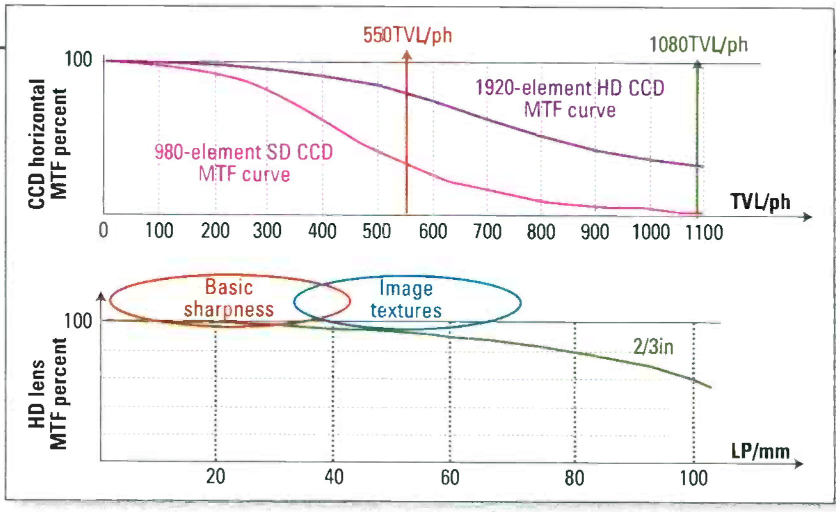
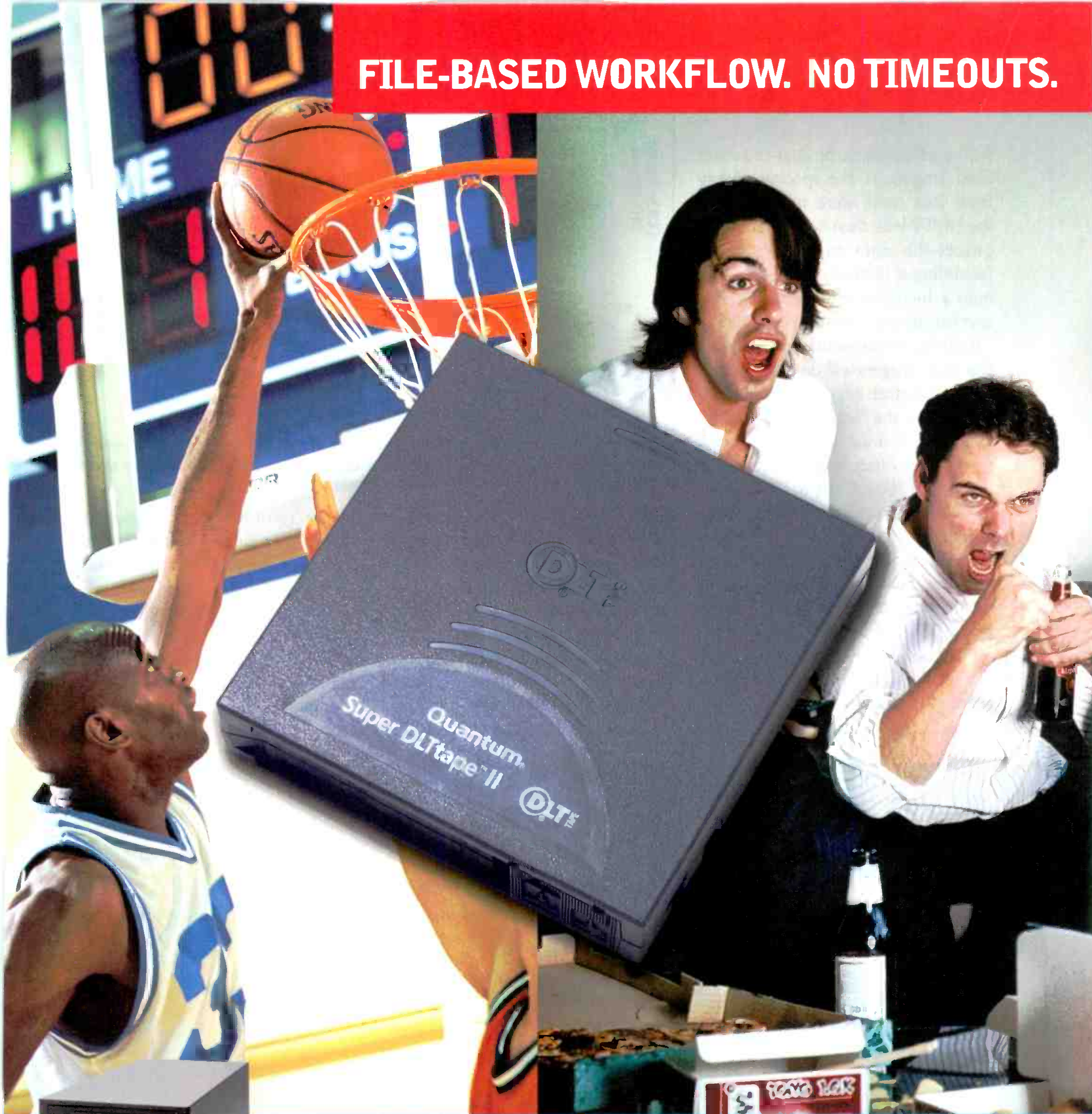



**Figure 2. An HDTV lens that is projecting a medium close-up image onto a 2/3in SDTV CCD (with a Nyquist frequency of 550TVL/ph) and onto a 2/3in HDTV CCD (with a Nyquist frequency of 1080TVL/ph)**

Figure 2 shows an HD lens MTF (at picture center) whose optical response (in LP/mm) has been scaled to coincide with the spatial resolution of an SDTV CCD imager and an HDTV CCD imager (1920 horizontal samples) that are shown in TVL/ph. The MTF curves shown are typical of the two different 2/3in imagers. It is assumed here that the lens has been set


FILE-BASED WORKFLOW. NO TIMEOUTS.
HOME
Quantum
Super DLTtape II
DLT

for a medium close-up shot (medium focal length). If the spectral energy from that scene were mapped onto the HDTV lens, then it would, in turn, project this onto an HDTV imager (assuming a 1920-element CCD) and onto a high-performance SDTV imager (assuming a 980-element CCD).

It can be readily noted from Figure 2 that both imagers will do justice to the essential picture edge-sharpness. Both will resolve the higher textural information (and, if the SDTV camera employs spatial offset, it can do quite well here), even though the MTF curve of the SDTV camera is considerably lower over that region. The HDTV image will, therefore, be perceptually sharper.

The real problem, however, lies in the digital filters that define the separate SDTV and HDTV production standards. Figure 3 shows the Rec 601 digital filter of 5.75MHz for the SDTV acquisition system and the SMPTE 274M digital filter of 30MHz for the HDTV acquisition system superimposed upon the respective imager MTF curves. Now the comparative image capture capability of the two video systems becomes starkly apparent.

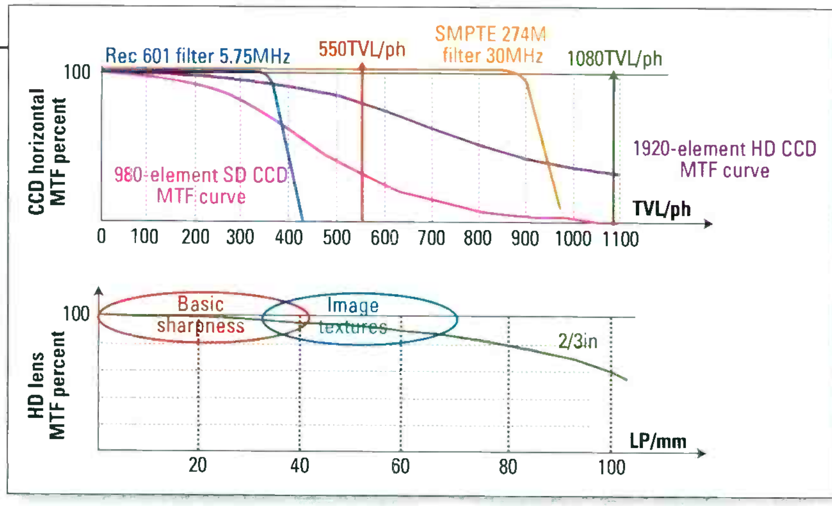



**Figure 3. The effect of the SDTV 5.75MHz band-limiting filter in removing textural detail from the same medium close-up image**

The region containing the fine detail texture information that was captured by the CCD is completely eliminated in the recorded SDTV video (conforming to the 601 standard). Thus, from a viewpoint of reproducing a truly sharp image, there is an inherent failure in the SDTV system.

Long ago, the zoom lens was developed to become the supreme arbiter in forming imagery that could meet the quite limited spatial resolution

You expect more from your channel branding.

# WE KNOW.


HD X SD With optional VxScaler HD/SD conversion module


# VertigoXG

Channel branding has never been more critical to your broadcast ratings. You need a flexible, powerful branding engine that delivers everything your GM demands: automated promos and snipes, headline crawls, weather and stock tickers, EAS, Amber Alerts, sponsor logos, school closings... But your current channel branding engine isn't up to the task. Take the VertigoXG challenge and change what you expect from a branding engine.

| Key Features | Your System | Vertigo XG | Vertigo XG |
|---|---|---|---|
| Video Formats | ☐ | ✓ | SDI or HD/SDI inputs with A/B switching in a single or dual channel configuration |
| Format Conversion | ☐ | ✓ | HD/SD cross conversion with VxScaler module |
| Audio | ☐ | ✓ | AES - 16 embedded and 8 discrete stereo channels |
| Graphics Layers | ☐ | ✓ | Unlimited layers for multiple animations, tickers, crawls, and DVEs |
| Clip & Graphic Formats | ☐ | ✓ | Support for MOV+alpha, AVI+alpha, WMV, MPEG, DV, DivX, plus over 150 image file formats |
| Video Bypass | ☐ | ✓ | Auto-detect bypass on hardware, power, or software failure |
| Station Integration | ☐ | ✓ | Integration with MOS newsrooms, station automation, and traffic with full as-run logging |
| Data Support | ☐ | ✓ | Drag & Drop data linking from databases, spreadsheets, web & live data feeds |
| Reliability | ☐ | ✓ | Up to 1 TB internal RAID with redundant power, networking & fans |
| Future | ☐ | ✓ | SD-HD field upgradeable |

VERTIGO (X) MEDIA

we know graphics

info@vertigoxmedia.com www.vertigoxmedia.com Tel: 1.514.397.0955 capabilities of the approximately 4MHz analog NTSC system. Figure 4 illustrates the lowering of the scene spatial frequency by increasing the focal length of the lens until the band of spatial frequencies corresponding to low-level textural content is moved within the 5.75MHz passband of the SDTV acquisition system.

In the real world, the dictates of framing a scene may not allow the luxury of considerations of image detail. While it is important that the camera operator become sensitive to framing for optimized upconversion, there will still be many instances where compromise is necessary (dictates of required picture content). In Figure 5, a situation is given where the imperatives of picture framing only allow a portion of the textural spatial frequencies to fall within the system's electronic passband. But even that curtailed information is important, and the use of an HDTV lens will aid considerably in ensuring the highest level of that detail being applied to the CCD imagers and the in-camera or external video recording system.

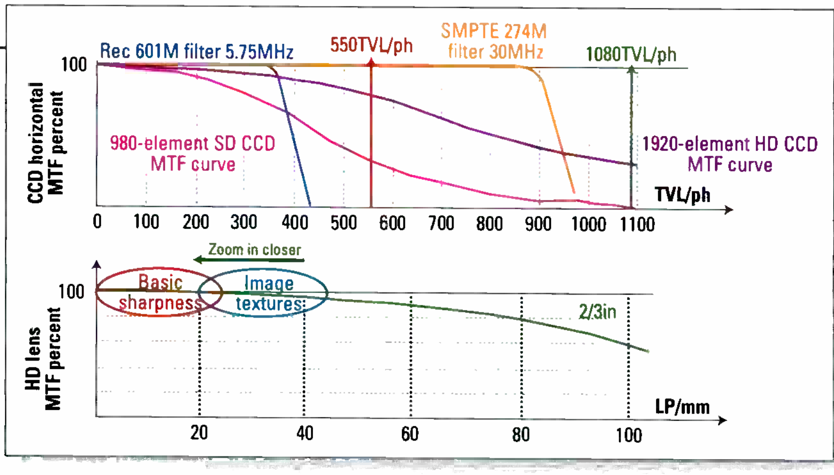



Figure 4. Comparing this with Figure 3 illustrates the lowering of the spatial frequency content of a given scene by adjusting the lens for a tighter shot.

## Summary

Widescreen SDTV field acquisition that is upconverted and incorporated into an HDTV news broadcast system is an important migration track from the existing analog NTSC world to the all-DTV future. It recognizes significant realities that confront many broadcasters. Reconciliation of the two levels of imagery — from out in the field and from in the studio — can never be complete, but it can, with proper attention, be made acceptable. The degree of acceptability achieved will call for iterative experimentation on the part of the news photographers and close collaboration with the technical and production staff at the station. There is no substitute for this testing in identifying the image-framing guidelines that work best for a given choice of SD camcorder, HD format, upconverter and news editing/post-production system. The use of an HDTV lens and minimum digital image enhancement in the camera is strongly recommended to ensure the best possible image sharpness in anticipation of the critical upconversion process. BE

*Larry Thorpe is the national marketing executive and Gordon Tubbs is the assistant director of the Canon Broadcast & Communications Division.*

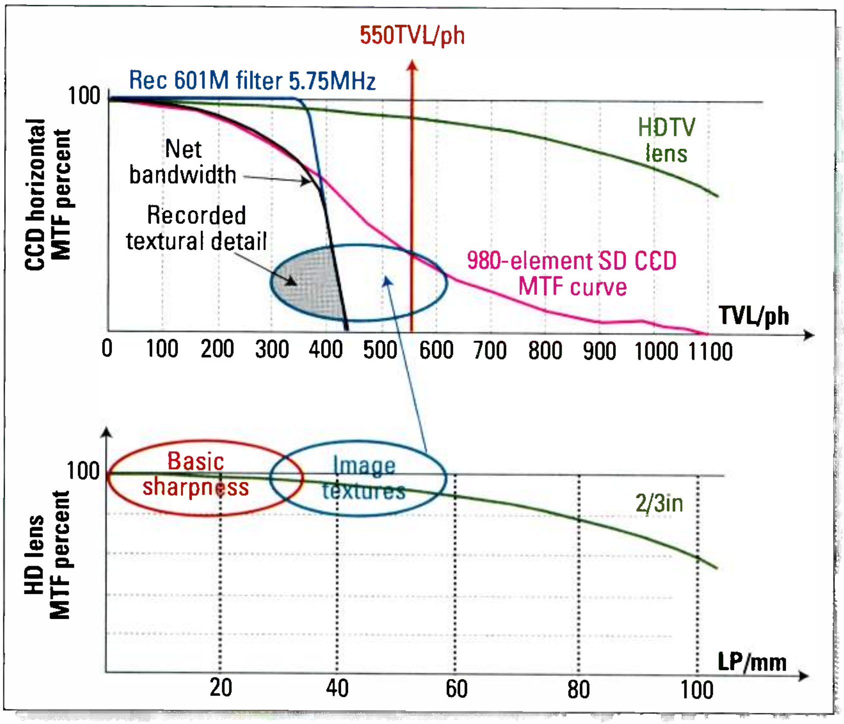



Figure 5. A lens setting that allows some of the high-frequency textural detail (shown shaded) to be captured by the SDTV camcorder, in which case the critical role of the higher MTF of the HD lens is apparent

# References

[1] Larry Thorpe and Gordon Tubbs, "Management of MTF," *Broadcast Engineering*, March 2005.

[2] Larry Thorpe and Gordon Tubbs, "HDTV lenses, MTF and picture sharpness," *Broadcast Engineering*, January 2005.

[3] Otto H. Schade, Sr., "Image quality: A comparison of photographic and television systems," reproduced in the *SMPTE Journal*, June 1987.

[4] Larry Thorpe, J. Hosoya. K. Ito, "A new HD cine zoom lens for digital motion pictures," *SMPTE Journal*, October/November 2005.

NEW PRODUCTS & REVIEWS

# JDSU's multicast IPTV analysis system

BY SUDEEP BOSE

Because many broadcasters today promote multicasting as an added value to their IP services, it is important for them to have efficient solutions to prevent the pitfalls associated with increased network demand. Viewers expect 24/7 service 365 days a year.

If a triple-play service already contains voice, video and data, what else is there? In addition to ensuring the quality of the video, a provider must also guarantee that the Internet Group Management Protocol (IGMP) — the signaling protocol used to deliver multicast services — is performing optimally. A variety of issues must be addressed, including IGMP and channel change request latency. It is important for customer satisfaction that minimal delay is experienced when viewers change the channel. Typically, providers must be at or close to the customer's premise to accurately measure these parameters.

Photo 1. An illustration of what the customer sees. In this example, the picture's I-frames are missing.

Traditional IP transport test equipment often cannot effectively shed light on the health of the underlying video transport layer. Those parameters include error conditions such as loss of audio, lip-sync errors, absence of an entire program or its components (audio or video), or the loss of a subscriber's EPG. For these reasons, an effective test platform must be able to dig deeper into the video transport to identify problems.

## New solution

To address this need, JDSU's Test and Measurement group recently added multicast IP video services analysis to its IP and digital video test platform, DTS. This functionality is comprehensive, accurate and easy-to-use for IP video deployment and multicast testing platforms. It identifies trouble spots for any IPTV platform. Operators can proactively check for problems and issues without waiting for the customer to call in with a complaint. The goal of DTS is to improve operational efficiency and maintain a high quality of service within the network.

Here is a typical test example: A video service delivered over an IP network is experiencing problems in the quality of the video presentation. Throughout of the presentation, parts of the audio and video are out of sync, the audio is completely absent or blocks of the picture are missing.

A test of the IP transport platform confirms that the IP transport performance, including IP packet jitter, packet loss and other key parameters, is within acceptable values. Yet, the problems still persist.

By testing the IP transport first, the operator has obtained a first level of confidence monitoring. Now, it's time to analyze the MPEG-2 transport stream.

## Measuring MPEG

There are several types of problems that could cause errors. (See Photo 1.) The causes include:

- inaccuracy in the program clock's reference-time values;
- jitter in the MPEG-2 PCR arrivals;
- discontinuity of the MPEG program elements;
- inaccuracy of the various packer identifier information for the program elements at the MPEG level;
- loss of frames or MPEG packets resulting in continuity counter errors.

Such problems, even those that exist when the IP transport is performing at acceptable levels, can be caused by IP errors.

Using the DTS-330 test platform or DTS-200 for in the field testing, the operator can perform a real-time investigation of a wide selection of important MPEG parameters. (See Figure 1.) This includes presence of all audio and video content, PCR accuracy and jitter, continuity counter measurements and packet loss. The test system can also view the accompanying MPEG metadata that is needed by the set-top box.

In addition, the multicast analysis feature allows an engineer to perform the complete suite of in-depth protocol tests at or close to the customer premise by remote control, if needed. This simulates the viewer's experience, as the test has to order each channel individually as done via an set-top box's channel change request.

An engineer can leverage the DTS to quickly and easily join and leave multicast service groups, just like a set-top box does. This provides an effective method to troubleshoot video service issues.

With DTS, service providers can perform in-service, non-disruptive

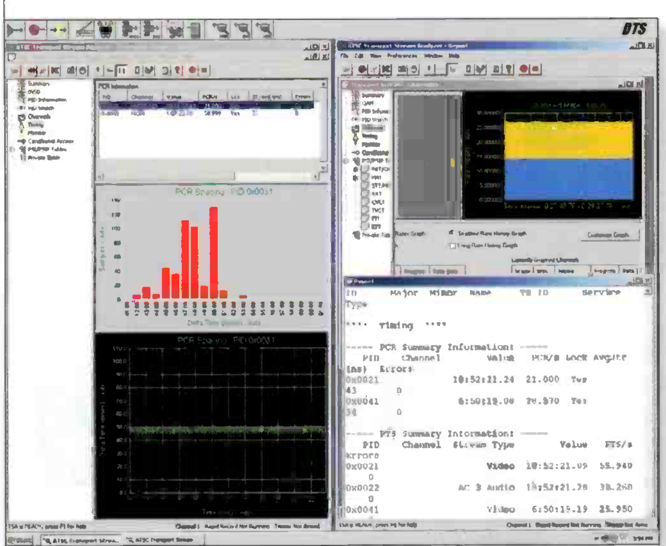


**Figure 1. Using the JDSU DTS, an operator can monitor and measure video timing, stream composition and content bandwidth utilization, among a variety of other parameters.**

tests by sharing the same quality-of-experience as the viewer, providing the same perspective as if the engineer were located in the customer's home.

These new functions and capabilities, along with the DTS' existing remote troubleshooting versatility, allow the network operator to perform in-depth troubleshooting and service assurance checks of a subscriber's quality of experience without ever leaving the central office. (See Figure 2.) The DTS-330 and DTS-200 can be remotely located from the central office, yet still permit technicians to perform the full array of in-depth video transport analysis. BE

---

*Sudeep Bose is product marketing manager for the cable networks business unit of JDSU's Test and Measurement DTS product line.*

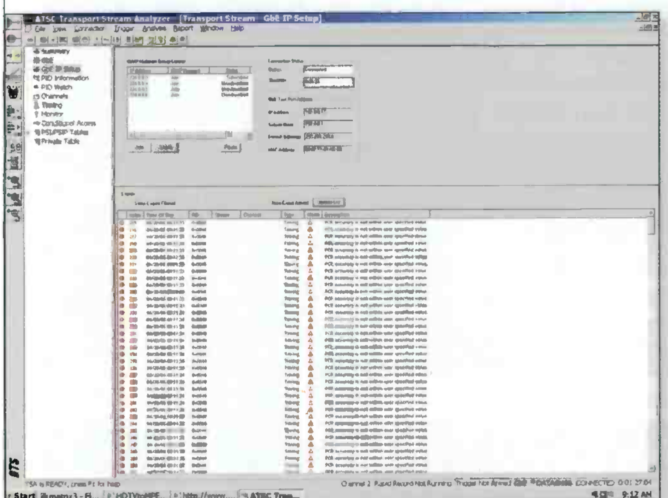


**Figure 2. DTS' easy-to-use GUI allows an engineer to remotely analyze the quality of experience of the customer by viewing various programs just like a user does via channel changing.**

# Tektronix's surround-sound monitoring solution

BY MIKE WAIDSON

A picture may say a thousand words, but without audio to accompany the picture, the impact of the material is subdued. Viewers strive for higher audio quality within their home theater systems. This technology evolution creates the need for multichannel audio monitoring solutions. In particular, audio and video professionals need monitoring displays that help them visualize the auditory image that viewers will experience.

Traditionally, audio professionals have used level meters, Lissajous (phase) displays or correlation meters to monitor the audio channels. These methods work well for monitoring stereo signals but are difficult for operators to quickly gain an understanding of surround-sound systems. Monitoring multiple channels requires a new display. Ideally, it would give the operator or engineer, at a glance, an interpretation of how the mix will sound to the end customer.

## Surround-sound setup

A 5.1 multichannel audio system locates the speakers as shown in Figure 1. The left (L) and right (R) channels drive the speaker pair in front of the listener and carry most of the music in the program. The center (C) channel primarily carries dialog, as producers usually want listeners to perceive this in the center of the video field.

The left surround (Ls) and right surround (Rs) channels drive the left and right speaker pair placed to the side or behind the listener. They typically handle the sound effects and ambient noises that create the aural illusion of a particular environment.

The Low Frequency Effect (LFE) channel delivers low-frequency non-localized special effects and creates the dramatic effects within the material (e.g., explosions). The LFE channel drives a high-power speaker (a subwoofer) that has a restricted frequency below 150Hz. The subwoofer is typically positioned in front of the listener. Although the speaker device is called a subwoofer, in a surround-sound system, it is often referred to as the LFE channel because it will have different responses depending on the size of the speaker system being used by the viewer.

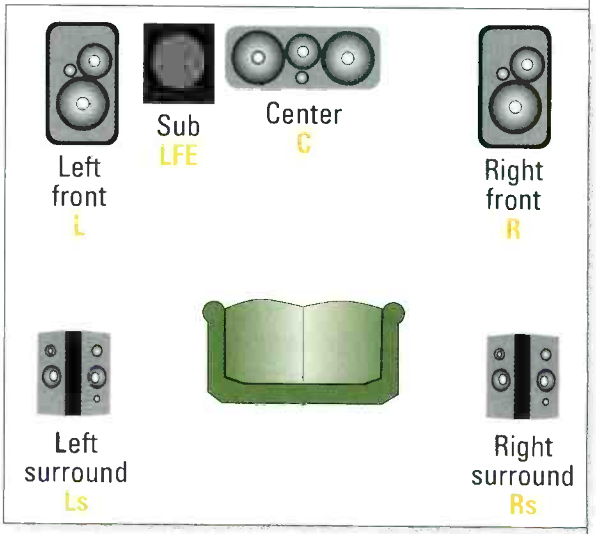



**Figure 1. Typical multichannel 5.1 surround-sound speaker placement**

## Displaying surround sound

Germany-based RTW developed the surround-sound display available in the Tektronix WFM700, WFM6100 and WFM7000 series waveform monitors as well as in the WVR6100 and WVR7100 series

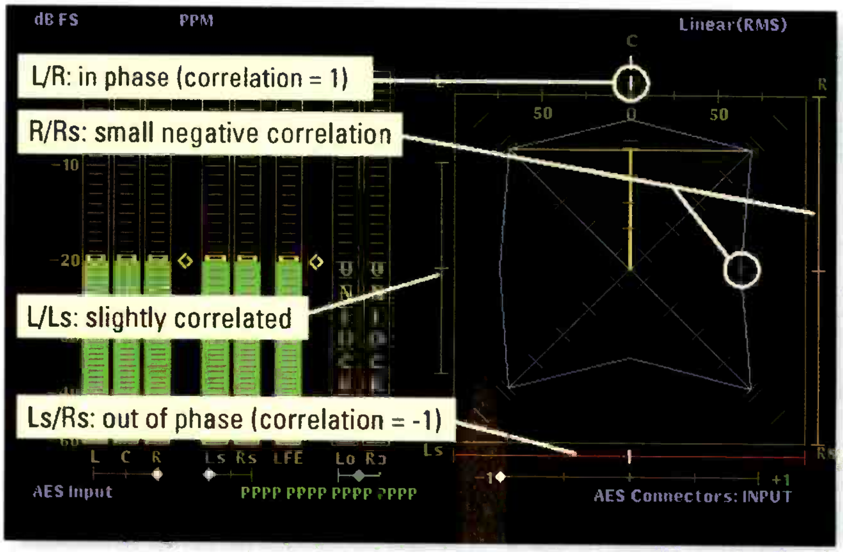



**Figure 2. Surround-sound display with the left surround (Ls) and right surround (Rs) out of phase, as shown on the Tektronix WFM700 waveform monitor**

waveform rasterizers. The display is configured to be similar to the speaker setup in viewers' home theater systems. Figure 2 shows how the waveform monitors display information. The L, R, Ls and Rs form the corners of the display, and audio signal amplitude is displayed diagonally from the center level of -65dBFS to 0dBFS at the outer corners of the display.

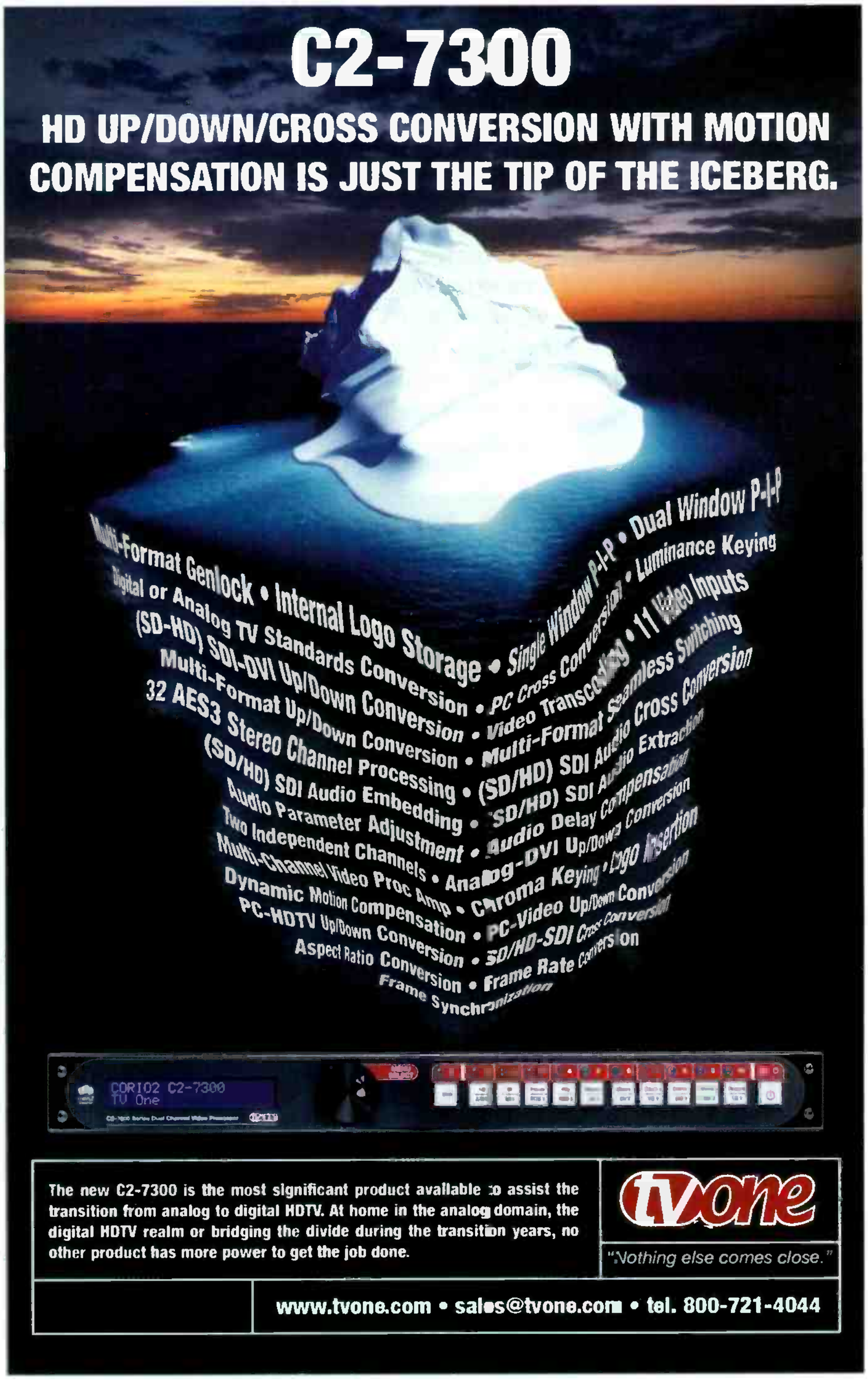
The response of the audio level can either be based on the linear root mean square amplitude of the signal or on the use of an A-weighting filter, which adjusts audio amplitude relative to the frequency response of the human auditory system. The test level is also noted by a mark at -18dBFS or -20dBFS level to aid in the setup of audio levels through the system. Cyan lines connect between each of the audio levels (L, R, Ls and Rs) and provide a total volume indicator. This indicates the balance level between the channels.

A bending of the cyan line that connects the amplitudes of the channels indicates the correlation between channels. Figure 2 shows the display within the WFM700 waveform monitor. The WFM700 audio module offers the ability to monitor the digital audio signal in either embedded or external AES/EBU digital inputs. A straight line connecting the audio level indicators of two adjacent channels indicates these channels have uncorrelated signals (i.e., a correlation value of 0.0).

Applying a lineup tone to all channels produces an octagon shape within the display. (See Figure 3 on page 96.) As the correlation between the two signals increases toward +1.0, the line connecting the audio level indicators bends outwards away from the center and toward the phantom sound source. As the signals move toward an out-of-phase condition (i.e., correlation approaches -1.0), the line bends inwards, toward the center, indicating the destructive interference and reduction in total sound volume associated with the out-of-phase signals.

The center channel has a special role within the surround-sound system and is denoted by a yellow vertical line positioned between the left and right audio channels. The display forms a center volume indicator by connecting lines drawn from the center channel to each of the left and right channels.

Phantom source indicators positioned around the perimeter of the display offer additional help in visualizing sound localization and correlation between channels. Four PSIs placed on each side of the display indicate the nature of potential phantom sound sources formed by L/R, L/Ls, Ls/Rs and R/Rs adjacent channel pairs. Additionally, a fifth Phantom Source Indicator (PSI) located above



the L/R PSI indicates potential phantom sound sources formed by L/C and C/R.

## Monitoring audio signals

Within digital audio there are a number of phenomena an audio engineer needs to monitor to ensure the audio signal quality and prevent distortions. Tektronix waveform monitors incorporate audio monitoring options that allow video and audio to be monitored simultaneously. The WVR7100 and WVR6100 offer a variety options for monitoring digital, analog and decoding of Dolby data streams. This gives the user the ability to monitor the audio signals at all the different layers within the facility.

In the digital domain, a clip can occur when a number of consecutive audio samples are at full scale. This could lead to distortion of the audio signal when it is reproduced in the analog domain.

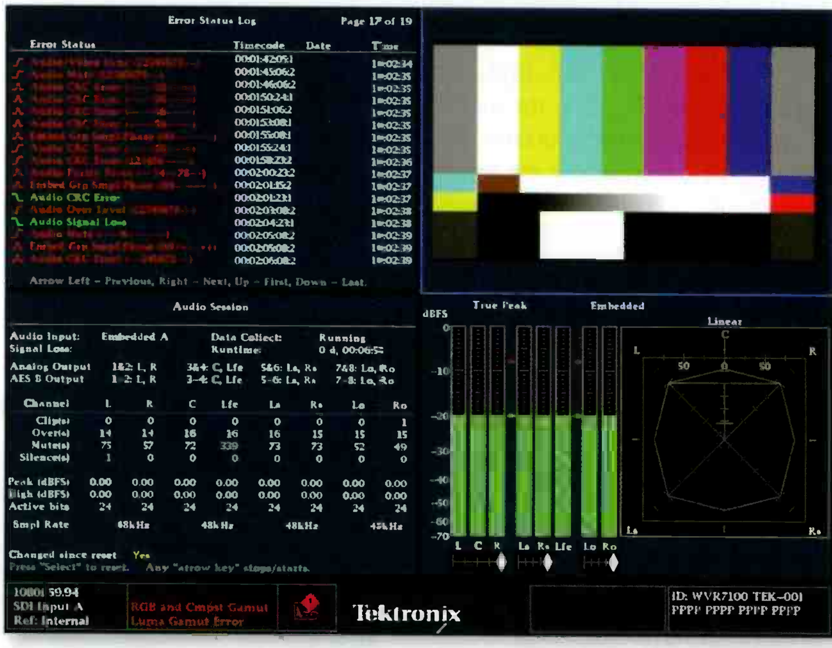



Figure 3. An error log and audio session display from a Tektronix WVR7100

A mute can sometimes occur if an audio packet is determined to be either non-audio data or if it contains an error. The number of consecutive samples before the alarm is triggered is user configurable.

The audio engineer can also set

up his own selectable conditions for when the audio exceeds a certain level for a period of time an over condition occurs. The operator can also set up a level where below which he considers the audio level to be silent. When these conditions occur, the audio monitor then warns the operator of the specific condition within the audio display and provides a summary and log of the events. Figure 3 shows the error log display from the WVR7100 instrument with the various audio error events related to time code. An audio session display provides a summary of these errors within the material.

Unlike analog audio, in digital audio, it is important for the equipment to be synchronized to the same clock, either a 48kHz Word Clock or an AES/EBU digital audio reference signal (DARS). This digital audio reference must be supplied to all digital audio equipment in order for synchronous operation of the audio within the facility. Then, when signals are switched, they all have a fixed relationship to the DARS, and the equipment does not require a finite period to lock to the new signal.

There should also be a fixed relationship between video and digital audio signals to ensure complete synchronization of the facility. Within audio monitoring equipment, it is useful to apply the DARS to allow measurements related to the reference. The equipment should also measure the relationship between the audio signal and video signal and flag an alarm if there is an error.

## Conclusion

Traditional audio monitoring tools can be used to monitor multichannel audio signals and provide simple audio session summaries of errors present within the material related to time code. However, a traditional Lissajous display is not sufficient to quickly interpret the interaction of multiple audio channels.

The surround-sound display provides a quick interpretation of the interaction of multiple audio channels. It offers an indication of the total loudness of the program, correlation between channels and indication of the dominant sound within the material.

This display can help audio engineers and operators more easily visualize the interaction of audio channels within a surround-sound environment. Understanding audio measurement techniques can help all engineers and operators more carefully monitor the audio signal. BE

*Mike Waidson is a video applications engineer for Tektronix.*

# Master control automation

BY JOHN LUFF

Despite the changing face of today's automation systems, there are two primary reasons why master control automation exists: to achieve a consistent on-air look and to save costs.

### Complexity

The complex master control operations of many broadcast channels, including cable and other services, may be approaching the point where a single human cannot consistently achieve the on-air look. Snipes, voice-overs, complex graphics attached to real-time push of data and screen geometry changes are only a small part of the complexity that makes manual automation difficult. As master control moves to multiple streams in most applications, DTV and other multi-program service providers, it will be a physical impossibility for an operator to push the buttons without automation assistance.

### Saving costs

As complexity goes up, the need to add people is clear, but the revenue is not always there to justify the labor cost. In major markets, with the value of commercials high and the potential for loss of revenue an unacceptable risk, automation may be mandated to decrease liability mistakes. In such a case, the problem only moves upstream to the traffic department.

The traffic department has the most complex job. Not only does the department's log need to be accurate, but the log must also contain the commands needed to achieve all of the richness and complexity the station sells and delivers as its product.

When they're well done and thoughtfully implemented, automation systems have the potential to lower labor costs. Many stations find that although they may choose to have an operator present during prime revenue hours, they can operate in the wee hours of the night unattended. Others have found that automation allows largely unattended operation full-time. If implemented as part of a centralized operations strategy, the benefits may accrue more quickly.

If the labor cost is stabilized by automation, but the revenue can grow, then the sweet spot has been reached.

A total of 2.5TB of central storage is used for KOKI-TV and KFTO-TV in Tulsa, OK, and KVOS-TV in Bellingham, WA.

Balancing this, of course, is the cost of the operators in master control. If the wages are low, the cost of automation hardware, software and support may add up to an insufficient total to justify reducing labor dramatically. This equation is sensitive to the needs of each station. There are no pat answers.

If the labor cost is stabilized by automation, but the revenue can grow, then the sweet spot has been reached. The station retains valued employees who deliver the product to customers, and the quality of the output can rise.

### Integration

Over the last several decades, automation has become more effective, adaptable and comprehensive. Ties between automation and traffic have always been part of the process of automating, except in the case where logs were manually typed into the automation system, a practice not generally done today. But modern automation systems are tied closely to other software systems, such as asset management, archive management and playout servers. The degree of integration between these systems is approaching a point where it is hard to tell where one stops and another begins.

One major vendor is developing a platform strategy that holds the promise of tying programming, traffic, automation, asset management and archive management together on one common platform. In such a case, low-level calls between applications make it difficult to separate each component from the holistic effect that is promised.

There is, of course, a downside. Complex software systems are difficult to thoroughly model and inherently more difficult to troubleshoot. When things go wrong, they can go horribly wrong. But when things work out, the promise is elegant and highly desirable.

Other automation companies tightly integrate their products with traffic systems. One supplier has major investments from a number of broadcast group owners who hope to achieve the same level of integrated operation.

Some systems have been recompiled for new operating systems so many times that it is hard to call a new release anything other than a maintenance patch.

Times have changed. Stations are no longer interested in finding best-of-breed solutions and attempting to manage the implementation themselves. Increasingly, system integrators are tapped to take program responsibility, and contracts often require multiple vendors to deliver a holistic system in close association with each other.

This TOC provides operations for KOKI-TV and KFTO-TV in Tulsa, OK, KVOS-TV in Bellingham, WA, and KFTY-TV in Santa Rosa, CA. NexGen software is stored on the video players, as well as all control and ingest stations.

### A change in dynamics

Important dynamics are slowly changing the automation business. Software that was written only a decade ago for the dominant operating systems is now hardly supportable. Some systems have been recompiled for new operating systems so many times that it is hard to call a new release anything other than a maintenance patch. Operating systems and the underlying computer hardware are so far removed from those available a few years ago that a complete rewrite is often the only practical strategy.

In addition, where RS-422 was the dominant mode of communication between automation devices and software systems a few years ago, TCP/IP communication is rapidly becoming dominant. SMPTE is in the process of defining the interface between devices and controllers, an effort that has been on its plate in one form or another for more than two decades.

The devices being controlled have changed too. Master control switchers have become branding engines, absorbing multiple functions. MPEG splicing and compressed bitstream processing are now practical ways to automate. One automation vendor is introducing a complete software and hardware solution this year. It includes clip playback, branding and automation in one box. Controlling this variety is now a difficult task for the software engineer and the system planner.

**If the complexity requires constant tweaking, we will have achieved the opposite of progress.**

Clarity monitors and Evertz VIP-12s monitor player and recorder signals. All future NexGen rollout features are tested, verified and approved in this CCTV development lab for KOKI-TV and KFTO-TV in Tulsa, OK, KVOS-TV in Bellingham, WA, and KFTY-TV in Santa Rosa, CA.

## Closing comments

To the degree that software systems and computers supply complex and feature-rich results to program stream providers, broadcasters will have achieved a lofty goal. Let's hope the result is understandable by mere humans and supportable far into the future. If the complexity requires constant tweaking, we will have achieved the opposite of progress. BE

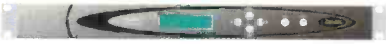
*John Luff is the senior vice president of business development for AZCAR.*

SEND Send questions and comments to: john_luff@prismb2b.com

## NEWS SYSTEM

**Quantel Newsbox HD:** A complete, self-contained news system; available in both "HD now" and "HD upgradable" configurations; can ingest material, view rushes, choose shots, edit stories, review finished pieces and play them out to air; progressive user interface and toolset are similar to all Quantel sQ systems; works with all HD acquisition formats.

**703-448-3199; *www.quantel.com***



## HDTV VIDEO AND AUDIO MONITORING

**Zandar Technologies Predator HD8:** HDTV video and audio monitoring multiviewer system; features Zandar's new Z-Configurator user software and ZdH Zandar dual-head display facility; comes in a compact 1RU system; has eight auto-sensing inputs, allowing both HDTV 720p and 1080i formats and legacy SDI (270Mb/s) signals to be used together, bridging the migration to HDTV signal formats.

**321-939-0457; *www.zandar.com***

## TRANSMISSION SERVER SYSTEM

**Harris Leitch NEXIO XS:** Modular transmission server system offers SD and HD support; has integrated software codecs with an extensive range of compression formats and back-to-back DV/MPEG playout; houses system in a 3RU frame; connects to the NEXIO SAN; is available with a choice of external or internal storage.

**513-459-3400**
***www.harrisbroadcast.com***

## AUDIO/VIDEO SYNC

**Pro-Bel VALID8:** Video and audio line-up and identification system allows audio/video sync problems to be quickly and accurately diagnosed and rectified; works with any HD or SD standard; can be compressed, recorded, replayed and standards-converted with the VALID8 signal and then measured for video/audio delay.

**925-735-9269, *www.pro-bel.com***

## STORAGE SYSTEM

**Omneon MediaGrid:** Storage system combines grid storage and grid computing through the use of multiple intelligent interconnected, yet independent, storage servers; provides centralized shared storage that is scalable in capacity, bandwidth and media processing power; components of the system communicate over standard Ethernet and generate massive aggregate bandwidth that is available to external storage clients; each component has a media processing engine.

**408-585-5109; *www.omneon.com***

## MPEG-4 ENCODER

**Grass Valley ViBE:** Features H.264/MPEG-4 AVC main/High Profile Level 4 compression including FRext; has CBR and VBR encoding; includes MPEG-1 layer 2, Dolby Digital 2.0 or 5.1 (AC-3) and AAC audio compression; features up to 12 stereo audio channels; has advanced preprocessing and noise reduction; offers IP over Gigabit Ethernet output; supports management via embedded Web server, SNMP or Grass Valley XMS 3500 eXtensible Management System command and control, including redundancy management; fits in a 1RU chassis; is currently implemented in a DSP-based architecture.

**503-526-8200**
***www.grassvalley.com***

## VIDEO PRODUCTION SYSTEM

**SSL MediaWAN Gravity:** Broadcast production system uses software running on standard high-performance PCs and servers; encoders import video from a variety of sources, including HD; features a preview and job allocation interface and editing software; an asset management database and user interface are also provided.

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

## AUDIO METERS

**DK-Technologies MSD600M and PT0660:** Version 5 of the audio meters includes a graphic loudness display that shows the corresponding time code; time code can be coupled to the signal; display the instant SPL as a bar graph for each audio channel and show the instant SPL as a graphic curve; loudness is measured in mono, stereo and 5.1 surround.

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

## DIGITAL VIDEO ROUTER

**NVISION NV8288:** Designed for use in video production trucks and other applications where space is limited; built for HD, supports all standard SD data rates; is ASI-compliant; can be configured for systems ranging in size from 12 x 12 to 288 x 576; all modules, including power supplies and cooling fans, are front-serviceable and hot-swappable; runs at data rates up to 1.5Gb/s; engineered to be 3Gb/s-capable for future signal formats such as 1080p HD.

**530-265-1000; *www.nvision.tv***

## MONITORING SYSTEM

**Snell & Wilcox Hyperion:** Content monitoring system uses intuitive algorithms that mimic human intelligence to evaluate the quality and makeup of the video, audio and metadata content within the signal; automatically provides an "educated opinion" as to whether each element of the program meets satisfactory viewing-quality standards.

**212-481-2416**
***www.snellwilcox.com***

## CAMERA

**Panasonic AJ-HDX900:** Multiformat DVCPRO HD camcorder can record 100Mb/s HD images in any of 11 video formats, encompassing 60Hz and 50Hz production; features the DVCPRO HD codec and a multiformat recording system; includes a native 16:9, 2/3in HD, 1-million pixel 3-CCD system; is equipped with 14-bit A/D DSP circuits; offers 4:2:2 color sampling and independent frame compression.

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

## GRAPHICS SYSTEM

**Chyron Lyric PRO:** Graphics system is driven by Chyron's interFuse technology; features Interactive Messages, persistent objects, multiple timelines per message, continuous graphics renderer, hierarchical animation and live particle effects; compose and playout modes provide greater control over the creation of graphics; 3-D primitive library provided for building 3-D scenes; is available as an option for Chyron's HyperX and LEX graphics platforms.

**631-845-2000; *www.chyron.com***

## CAMERA LENSES

**Fujinon HS16x4.6ERM, XS13x3.3RM and XS17x5RM:** 1/2in HD lenses engineered for HD cameras using Sony's XDCAM HD professional disc technology, including PDW-510 XDCAM for DVCAM recording and PDW-530 XDCAM HD for MPEG IMX and DVCAM recording.

**973-633-5600**
***www.fujinonbroadcast.com***

## DIGITAL AUDIO MIXING SYSTEM

**Studer Vista 5:** A compact digital live broadcast and production console; fits into any OB van and can be easily moved to new locations; uses a DSP core; the table-mounted mixer shares the same operating principles and Vistronics screens as the Vista 6, 7 and 8; features a 32-fader desk with 20 channel strips optimized for input channel operation and 12 additional versatile strips for operating input and output channels; offers access to 52 outputs from the Vistronics screen and 240 channels from the desk.

**866-406-2349; *www.studer.ch***

## MASTER CONTROL SWITCHER

**Pro-Bel Masterpiece:** Offers HD and SD switching, advanced audio processing, and flexible keying and DVE options; upgrades include the addition of an HD DVE and the option to install Dolby E decoders and logo storage; now features four keyers and has the ability to handle audio mixing.

**925-735-9269; *www.pro-bel.com***

## AUDIO ROUTER

**PESA Cheetah:** Audio router starts with a base unit of 64 x 64 in 1RU or 128 x 128 in 2RU and is expandable to 2048 x 2048 in 36RU; offers a small form factor and a distributed architecture that is fully compatible with Dolby E; supports synchronous and asynchronous signals and sample rates up to 96kHz.

**631-912-1301; *www.pesa.com***

## NLE SOFTWARE UPDATE

**Grass Valley EDIUS Pro Version 4.0:** Offers real-time, multi-track, mixed-format HD and SD editing, compositing, chroma keying, titling and timeline output capabilities; supports all video acquisition formats; new features include multicam support, nested sequence editing, improved trimming tools and keyframe support for color correction; multicam supports up to eight cameras in real-time monitor preview; provides support for Windows Media; includes EDIUS Speed Encoder for HDV for fast output; new parameter-based keyframe support offers frame-by-frame color correction.

**503-526-8200**
***www.grassvalley.com***

## MULTICHANNEL MONITORING SYSTEM

**Genelec 8030.LSE PowerPak:** Five Genelec 8030A two-way, bi-amplified active monitors, one Genelec 7060A LSE series active subwoofer, and a Genelec Acousti/Tape frequency/wavelength measuring tape; setup guide is included for accurate speaker placement, wiring and fine-tuning.

**508-652-0900**
***www.genelecusa.com***

## PROMPTERS

**Autocue Master Series:** Offers four prompters, ranging in size from 12in to 20in; come in both top- and bottom-mount configurations; 15in (MSP15), 17in (MSP17) and 20in (MSP20) units are designed for studio use on fluid head tripods and pedestals; all prompters use Ultrabright screen technology.

**704-377-1496**
***www.autocue.com***

## PRODUCTION/ PLAYOUT SERVER

**EVS XT[2]:** Designed for compatibility with Sony's HDC-3300, a 3x HD super-slow motion camera system that can output normal speed signals simultaneously for live feeds through separate digital signal processing; this can be captured by the server for instant replays, clipping, highlight package assembly and complete network access; enables all three phases of the HDC-3300 to be captured at full, native HD resolution with instant, tapeless, super-slow motion replays; supports all the current applications of EVS' XT server applications.

**973-575-7811;** ***www.evs.tv***

## HDTV UPCONVERTER

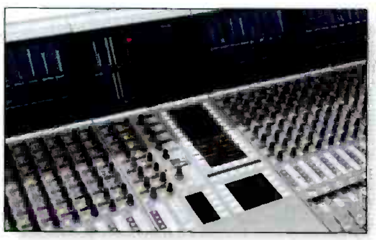
**Snell & Wilcox Quasar:** A motion-compensated broadcast upconverter; produces clear and sharp HD outputs from a variety of SD inputs; combines three Snell & Wilcox technologies in a single compact 1RU package, including Ph.C motion estimation, premium HD upconversion and Prefix compression pre-processing for noise reduction and dropout filtering; upconverts interlaced SD 525 and 625 material to 720p and 1080i HDTV formats; converts captions, graphics, logos and branding; features an aspect-ratio converter with a series of fixed presets for common conversions.

**212-481-2416**
***www.snellwilcox.com***


## VIDEO PROCESSOR/ CROSSCONVERTER

**Miranda Imaging XVP-811i:** A univeral HD/SD video processor and cross-converter that processes incoming satellite feeds in broadcast facilities, as well as incoming lines for mobile production trucks; dual inputs can be used to switch between an SD and HD source; an upstream router can be used to select sources, and the second input can be used to connect a backup source that will be automatically selected when the main source fails.

**561-400-3320;** ***www.miranda.com***



## INTERFACE CONTROL SURFACE

**Euphonix System 5-B:** Control surface for the DAW features modules that are operationally compatible with previous versions; have higher resolution displays at the top of each module and touch-sensitive knobs that include color-coded LED rings at the base; fader scale gives finer resolution around 0dB; includes faster embedded microprocessors for quicker response and boot times.

**650-855-0400**
***www.euphonix.com***

## BRANDING SYSTEM

**Chyron Channel Box:** An HD/SD switchable, turnkey branding system featuring 3-D design and controllable playout; branding applications include tickers, crawls, snypes, promos and end credits; creates events easily with the Creation GUI; is brought to air either manually or using automation.

**631-845-2000;** ***www.chyron.com***

## SUPERVISORY MONITORING SYSTEM

**Digital Transaction Group (DTG) Virtual Metadata Display Technology:** Monitoring technology for DTG's Xe Automation system that allows information about content, schedules, alerts and other metadata to be incorporated in multi-image displays; in a multichannel environment, one operator is able to monitor more channels efficiently; monitors multiple video streams or channels and displays dynamic information and text in each; can be integrated with the Miranda K2.

**512-837-3737;** ***www.dtgtv.com***

## IT WORKFLOW

**Harris NewsNet:** A digital newsgathering application for broadcasters and content originators; encompasses the full digital news workflow by providing shared access to content hosted on NEXIO servers; leverages industry standards, such as the media object server (MOS) communication protocol; spans the full range of news applications from ingest, editing, management, monitoring, rundown and playout.

**800-442-7747**
***www.harrisbroadcast.com***

## SWITCHER

**Broadcast Pix Slate 100:** Combines a video production switcher and a computer workstation for live production facilities; retains the control panel layout of traditional switchers, with comprehensive preview capability, offers nonstop on-air operation; produces 10-bit-quality video, including digital SDI and analog YUV, S and composite; operation is controlled with a mouse or from a touch screen; mixes up to six live inputs with up to two clips and five channels of graphics from its included workstation.

**781-221-2144**
***www.broadcastpix.com***

## MONITORING SYSTEM

**Volicon Observer 3.0:** A broadcast monitoring and logging system with closed-caption display, export view for scheduled archiving, support for Front Porch Digital's archiving systems and support for import of as-run logs from Harris and Sundance; offers applications to replace tape for logging, competitive news analysis, ad verification and company reporting; allows users to record, store, search and retrieve media in real time from multiple broadcast sources.

**781-221-7400; *www.volicon.com***

## VIDEO ARCHIVING

**DiskStream Capsa:** A file-based archiving solution for video content; tailored to the needs of small-market broadcasters and specialty channels; improves access to archived media content; combines archive media management functionality with cost-effective mass-market storage and server technologies; automatically archives video content and other files on near-line SATA storage or offline data DVDs; media files are submitted to archive through a network file copy.

**519-579-8166**
***www.diskstream.com***

## TRIAX-TO-FIBER CAMERA INTERFACE

**Telecast Fiber Systems Cobra-D:** Interface features digital transmission of the bidirectional RF signals; is compatible with most triaxial cameras from Sony, Grass Valley and Ikegami; supports all two-way communications between camera and base station; digitizes the wideband RF camera signals, locking in high signal quality at the origin.

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

## FUEL CELL REFILL STATION

**Jadoo Power Systems FillOne:** A single-port refill station designed for mobile and independent users; weighs 3lbs; is capable of operating with a 12VDC input; can be directly powered by a fuel cell power unit.

**916-608-9044**
***www.jadoopower.com***

## NEWSROOM SYSTEM

**Autocue QSmart:** An addition to the QSeries platform; designed for small-market broadcasters; a software bundle that provides an optimized version of the QSeries database, 10 user licenses, script archive, wire server, QTV prompting software and optional integrated device control for a character generator.

**704-377-1496; *www.autocue.com***

## DTV STREAM MONITOR

**Triveni Digital StreamScope:** A remote monitoring system with RM-40 units placed throughout the broadcast operation to validate critical transformations of DTV streams as they move through the equipment chain or from one site to another for distribution; offers real-time monitoring and analysis of MPEG-2 and MPEG-4 transport streams; can be monitored from any SNMP agent in the network.

**609-716-3500**
***www.trivenidigital.com***

## DISPLAY PROCESSOR

**Avitech MCC-8004:** Multi-image display processors that support a large variety of routing switcher, production switcher and tally management systems; can customize a monitoring solution to fit system-wide operational needs; has a built-in digital/clock or graphical element; includes optional built-in time code extraction for clocks.

**425-885-3863**
***http://avitechvideo.com***

## CONNECTORS

**Gepco G37:** Twelve-channel DT12 connectors feature a new hard anodized aluminum backshell that locks in place with two set screws into a series of castellations; the set screws and castellation prevent accidental loosening of the connector shell, therefore extending the operating life; the male connector shell is constructed from stainless steel to prevent damage and keyway wear.

**847-795-9555; *www.gepco.com***

## VIDEO ENCODING

**Kula Media Group KulaByte:** Video encoding process for broadcasters performing IPTV, live video streaming, HD media encoding and ENG backhaul applications; works with an industry-standard codec to stream high-quality images over a fixed-bandwidth network without dropped frames; enables high-performance, live video streaming with MPEG-2-, MPEG-4-, Windows Media 9-, H.264- or Flash-based encoders and players.

**512-853-9436; *www.kulabyte.com***

## AUDIO MONITORING SYSTEM

**Wohler Technologies Audio Metadata Analysis System:** A metadata monitor, analyzer and alarm system that offers a clear indication of metadata parameters and allows unattended checking of programs though logging; contains 30 parameters for each program carried.

**510-870-0810; *www.wohler.com***

## HARD-DISK STORAGE

**Hitachi Mediapac:** Solid-state cartridges for the company's Z-DR1 dockable digital recorder; available in 8Gb and 16Gb; aluminum-encased hard disks with 40GB to 120GB capacities; offers up to nine hours of recording time; an optional accessory incorporates hardware encryption for secure content transportation from the camera to the intended destination.

**516-921-7200**
***www.hitachikokusai.us***

## LIP SYNC ANALYZER

**Pixel Instruments LipTracker:** A non-invasive lip sync measurement tool; compares selected sounds in the audio stream with the mouth shapes that create them in the video stream; displays the current lip sync error and a moving average, as well as the history display with past errors; automatically restarts the error analysis after a scene change.

**408-871-1975**
***www.pixelinstruments.tv***

## HD CAMCORDERS

**Sony XDCAM HD PDW-F330 and PDW-F350:** Part of the XDCAM HD Series and Professional Disc system; both offer 24p recording in SD or HD, interval recording and slow shutter; the same Professional Disc media used in the SD version of the XDCAM system is also compatible with the new HD version; users can record up to two hours of HD content.

***800-686-7669***
***www.sony.com/professional***

## SYNC AND TEST GENERATOR

**Trilogy Mentor XL**: Sync and test generator is designed around a new processing engine that generates all synchronization and test signals needed; offers a full genlock and master SPG with multiple timing planes; for HD, a four output tri-level sync option is available; operates in 525, 625 and HD modes simultaneously; has audio options for analog, AES and AES/SD embedded tones and silence.

**305-495-8636**

***www.trilogycomms.com***

## TERRESTRIAL DIGITAL TV SIGNAL GENERATOR

**ShibaSoku DS303B**: Signal generator converts and transmits signals from analog to digital in a broad range of formats; can select a variety of output settings, including 8-VSB, DVB-C and ISDB-T; can be equipped with optional modules to support MPEG-2-TS signal generation; offers a suite of modulation and broadcast standard support.

**303-278-1111**

***www.shibasoku.com***

## VIDEO SERVER

**Leightronix NEXUS**: Multichannel server includes WebNEXUS, a Web interface for creating and managing digital video slides via the Internet; log into NEXUS using any standard Web browser; creates and broadcast time-sensitive and emergency messages; integrates with other video playback devices such as DVDs and VCRs.

**800-243-5589**

***www.leightronix.com***

A Prism Business Media Publication

**BroadcastEngineering®**

www.broadcastengineering.com

**Editorial Director:** Brad Dick, bdick@prismb2b.com
**Editor, World Edition:** David Austerberry, editor@broadcastengineeringworld.com
**Managing Editor:** Susan Anderson, sanderson@prismb2b.com
**Assoc. Editor/Webmstr:** Chevonn Payton, cpayton@prismb2b.com
**Assoc. Editor:** Angela Snell, asnell@prismb2b.com
**Assoc. Editor:** Spring Suptic, ssuptic@prismb2b.com
**Sr. Art Director:** Michael J. Knust, mknust@prismb2b.com
**Art Director:** Robin Metheny, rmetheny@prismb2b.com
**Technical Consultants:** Computers & Networking – Brad Gilmer
Antennas/Radiation – John H. Battison
Digital Video – Michael Robin
Transmission Facilities – Donald L. Markley
Legal – Harry C. Martin
New Technology – John Luff
Industry Watcher – Paul McGoldrick
New Media – Craig Birkmaier

**Sr. VP:** Peter L. May, pmay@prismb2b.com
**Group Publisher:** Jonathan Chalon, jchalon@prismb2b.com
**Marketing Dir.:** Kirby Asplund, kasplund@prismb2b.com
**Online Sales & Marketing Dir.:** Samantha Kahn, skahn@prismb2b.com
**Vice President of Production:** Lisa Parks, lparks@prismb2b.com
**Production Manager:** Kathy Daniels, kadaniels@prismb2b.com
**Classified Ad Coord.:** Sarah Goulding, sgoulding@prismb2b.com
**Dir., Audience Marketing:** Barbara Kummer, bkummer@prismb2b.com
**Group Show Director/LDI:** Sharon Morabito, smorabito@prismb2b.com

**PRISM** BUSINESS MEDIA™
**Prism Business Media Inc.**
**President/CEO:** John French, jfrench@prismb2b.com
**COO/CFO:** Andrea Persily, apersily@prismb2b.com

**MEMBER ORGANIZATIONS**
Sustaining Member of:
- Society of Broadcast Engineers

Member, American Business Media; Member, BPA International,
The Missouri Association of Publications

**SUBSCRIPTION RATES:** Free and controlled circulation to qualified subscribers. Non-qualified persons may subscribe at the following rates (Prices subject to change): USA and Canada, 1 year, $70.00, 2 years, $135.00, 3 years, $200.00, Outside USA and Canada, 1 year, $85.00, 2 years, $165.00, 3 years, 245.00 surface mail (1 year, 155.00, 2 years, $295.00, 3 years, $440.00 airmail delivery). For subscriber services or to order single copies, write to Broadcast Engineering, 2104 Harvell Circle, Bellevue, NE 68005 USA; call 866-505-7173 (USA) or 402-505-7173 (outside USA); or visit www.broadcastengineering.com.

**ARCHIVES AND MICROFORM:** This magazine is available for research and retrieval of selected archived articles from leading electronic databases and online search services, including Factiva, LexisNexis and Proquest. For microform availability, contact National Archive Publishing Company at 800-521-0600 or 734-761-4700, or search the Serials in Microform listings at napubco.com.

**REPRINTS:** Contact FosteReprints to purchase quality custom reprints or e-prints of articles appearing in this publication at 866-436-8366 (219-879-8366 outside the U.S. and Canada). Instant reprints and permissions may be purchased directly from our Web site; look for the RSiCopyright tag appended to the end of each article.

**PHOTOCOPIES:** Authorization to photocopy articles for internal corporate, personal, or instructional use may be obtained from the Copyright Clearance Center (CCC) at 978-750-8400. Obtain further information at copyright.com.

**PRIVACY POLICY:** Your privacy is a priority to us. For a detailed policy statement about privacy and information dissemination practices related to Prism Business Media products, please visit our Web site at www.prismb2b.com.

**CORPORATE OFFICE:** Prism Business Media, 9800 Metcalf, Overland Park, Kansas 66212 • 913-341-1300 • prismb2b.com



## STANDARDS CONVERTER

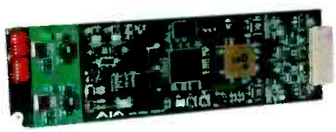
**TV One PX-720:** Converter automatically detects PAL, SECAM and NTSC; motion compensation is also provided; features an integral time base corrector with full synchronization that allows the unit to be genlocked to a composite video source; uses digital conversion and digital comb filtering in the decoding process; internal 10-bit accurate A/D and D/A conversion circuitry is employed for 8-bit resolution.

**859-282-7303; *www.tvone.com***

## STANDALONE ENCODERS

**Axon Digital Design DDP14 and DDP84:** Feature Dolby Digital Plus and are part of the Synapse broadcast system; incorporate the Dolby Cat No 561 OEM module to provide real-time multichannel encoding in Dolby Digital Plus and Dolby Digital technology; have five discrete AES/EBU inputs (10 audio channels) and four discrete bitstream outputs.

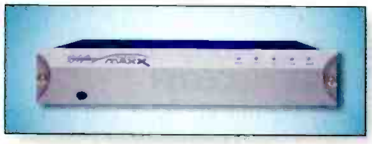
**+31 13 511 6666; *www.axon.tv***



## CONVERTER

**AJA Video RD10MD:** Dual-channel converter downconverts HD to SD at 10-bit, broadcast-quality; features three re-clocked input loop HD/SD SDI outputs (two on channel 1 and one on channel 2), with two downconverted outputs on each channel that can be independently configured as SDI or composite analog; supports all HD formats and 24p/psf with 3:2 pulldown.

**530-274-2048; *www.aja.com***



## BROADCAST SERVER

**360 Systems Image Server MAXX:** Server's new standard equipment includes faster FTP transfers with other servers, NLEs and network-attached storage, embedded audio, a remote workstation interface software, and an ability to perform MPEG-2 transfers in different forms; has a high level of compatibility for file-based workflows; includes composite video and SDI ports and AES/EBU digital audio as well as balanced +4 analog audio on XLR connectors.

**818-735-8221**
***www.360systems.com***

## OPTICAL DISEMBEDDER

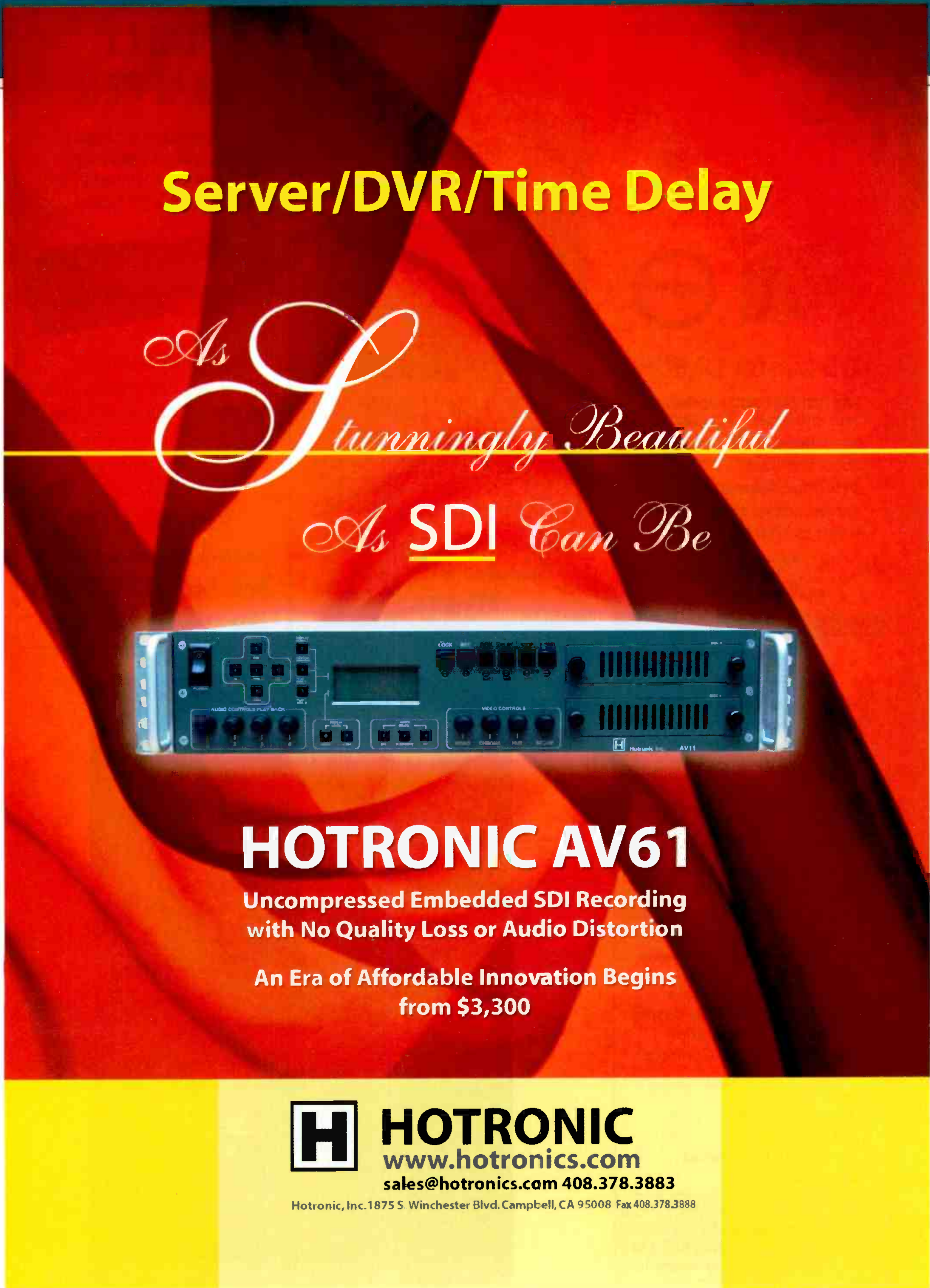
**Ensemble Designs BrightEye 74:** An eight-channel audio disembedder for 1.5Gb/s HD video signals or 270Mb/s SD signals; accepts either an HD or SD optical signal; includes an eight-channel audio mixer with channel swap and shuffle capability to rearrange and remix audio channels; provides precise control over audio level, with up to 12dB of gain to compensate for low-level sources.

**530-478-1830**
***www.ensembledesigns.com***

## PORTABLE DVR

**Fast Forward Video NDT 200:** Portable, handheld DVR features a standard removable 2.5in hard-disk drive and a large display panel and touchpad; all functions can be controlled via the touch pad, soft buttons and LCD panel on top of the unit or from an external PC or VTR controller; video clips can be recorded in QuickTime format for playback on a PC or Mac or as FFV secure video files.

**949-852-8404; *www.ffv.com***


Server/DVR/Time Delay
As Stunningly Beautiful
As SDI Can Be
HOTRONIC AV61
Uncompressed Embedded SDI Recording
with No Quality Loss or Audio Distortion
An Era of Affordable Innovation Begins
from $3,300
HOTRONIC
www.hotronics.com
sales@hotronics.com 408.378.3883
Hotronic, Inc. 1875 S. Winchester Blvd. Campbell, CA 95008 Fax 408.378.3888

### TELEVISION CHIEF ENGINEER

WRSP-TV/DT, Fox affiliate, Springfield-Decatur-Champaign, Illinois has an opportunity for an experienced Chief Engineer who knows television and is appreciative of a first class television facility.

WRSP-TV/DT and its satellite transmitter, WCCU-TV/DT in Champaign/Urbana, Illinois, have been fully rebuilt. Both analog and full power digital transmission facilities are on-air and fully licensed. Towers are up to standard.

Facilities feature all new digital 601 video systems with AES audio equipment. Full 601/AES Grass Valley routing and Master Control. All new IT infrastructure has been installed with Dell equipment & servers. Studio has generator capabilities with full UPS for Master Control equipment. No ENG operation.

Responsibilities include: All aspects of transmitter maintenance; studio equipment maintenance and operation. IT supervision. Working knowledge of FCC Regulations and responsibility to assure compliance. Professional knowledge of television engineering including operating and capital budgeting is required.

Virtually new, first class television station, looking for someone to step up and care for it long term. If interested in moving up to such a facility and meet the qualifications please forward a cover letter and resume to:

Anna Rufty, SVP/Human Resources
Bahakel Communications, Ltd.
P. O. Box 32488, Charlotte, N. C. 28232
E-mail address: HR@bahakel.com

Equal Opportunity Employer

### BROADCAST MAINTENANCE ENGINEER

Will maintain, troubleshoot and repair (to component level in some circumstances) all systems found in a television broadcast facility. This opening will require the monitoring of nightly newscasts and coordinating any live remote elements in these shows. Shift will be Wednesday thru Sunday, 3pm until the conclusion of the 11pm newscast. Rotating holiday schedule. SBE Certified Broadcast Technologist (CBT) preferred but may be waived for 2 years experience in a television broadcast engineering role. Knowledge of component level repair of equipment is preferred. A basic knowledge of computers and computer networking is a plus. Please send resumes to:

Todd Tobin - Chief Engineer
WBRE-TV
62 South Franklin Street
Wilkes-Barre, PA 18701
EOE

### Manager of Engineering - Winnipeg

Reporting to the Director of Operations, the Manager of Engineering is responsible for APTN's technical, production, distribution, and transmission facilities in Winnipeg, the North, and across the country.

**Key responsibilities:**

- Management of studio, master control, uplink, and production infrastructure in the Winnipeg Production Centre, 8 remote news bureaus, 3 Northern Uplink sites and APTN's network of 96 Low Power Rebroadcast Transmitters in Northern Canada.
- Planning, coordinating and directing broadcast engineering activities relating to the design, installation, integration, upgrading, and maintenance and monitoring of all network broadcast systems.
- Designing and modifying existing systems, equipment and facilities.
- Helping to plan, prepare and execute network technical operating plans including migration to HDTV and adoption of new and emerging technologies.

**Requirements:**

- A post secondary education in Broadcast Engineering or Electronics Engineering is required, however a degree is preferable. 6 years of demonstrated experience in the broadcast engineering field including television system design and equipment maintenance. At least 3 of those years should be in a management role
- A true and comprehensive understanding of the mission and mandate of Aboriginal Peoples Television Network is important

**Remuneration:** DOQ/DOE. This is a national search, therefore, a relocation allowance will be provided if necessary.

Please reply quoting competition number and forward your resume in confidence by
3 p.m. (central), June 30, 2006 to:
Debbie Isaak, Manager of HR Administration & Recruitment
Aboriginal Peoples Television Network
Fax: 204-947-9307 E-Mail: disaak@aptn.ca (No phone calls please)

***COMPETITION NUMBER 05/06 - 29***

### TELEVISION BROADCAST TELEVISION SYSTEMS ENGINEER

Rainbow Network Communications is seeking an experienced professional for their state of the art Broadcast Technology Center in Bethpage, Long Island. Individual must possess a minimum of 4 to 5 years experience in broadcast systems maintenance & willing to work nights, weekends & holidays. Responsibilities include support & troubleshooting live On-Air Master Control suites & post production equipment. Must possess a strong working knowledge of analog/digital SD & HD systems. This includes video switchers, routers, DVE's, DDR's, automation equipment & editing systems. Experience with GVG 7000, M2100, Profile XP, Accom Axial and Harris Automation is a plus. Must be able to work well under pressure situations with minimal supervision, understand schematics diagnosing On-Air problems. Background should include a hands-on understanding of computer networking, Windows O.S. as well as hardware/software installations and configurations. Experience with AutoCad and Visio drafting programs preferred. We offer a competitive salary and an excellent benefits package. For consideration, forward your resume, cover letter and salary requirements to: **hdnjobs@cablevision.com**

EOE M/F/D/V & A Drug Free Workplace

### ENG MAINTENANCE SPECIALIST

KPHO, the Meredith owned CBS affiliate has an opening for an ENG Maintenance Specialist. The successful candidate will be involved in the maintenance of news and editing equipment, broadcast servers, live trucks, satellite, broadcast IT, and microwave systems, high power UHF and VHF TV transmitters and support equipment, and television studio equipment. Training in Electronics on a college or technical school level is required. Military training experience will also be considered. FCC First Class License or SBE Certification preferred. Must have a minimum of 5 years broadcast maintenance experience – TV maintenance experience preferred. Must be familiar with FCC rules and have a demonstrated knowledge of various broadcast systems. Qualified candidates should submit a resume to: CBS 5 Human Resources, 4016 N Black Canyon Hwy, Phoenix, Az. 85017, CBS5JOBS@KPHO.com or fax to 602-650-5510.

Meredith Corporation/KPHO-TV is an Equal Opportunity Employer.

## Help Wanted

### DIRECTOR OF ENGINEERING

KPHO-TV is heading from good to great and we're looking for the best to join our winning team. The successful candidate will have superior Engineering, people and communication skills. A minimum of 5 years in engineering management is preferred. Experience at a major news operation is highly desirable. Thorough understanding of FCC rules and regulations is required. Operating and capital budget skills are also required. Possession of an FCC General Radiotelephone License or equivalent certification in broadcast engineering desirable. Send a letter and resume to: Steven D. Hammel, VP & GM, KPHO-TV, 4016 N Black Canyon Hwy, Phoenix, Az. 85017. KPHO-TV, Meredith Corporation is an Equal Opportunity Employer.



## Help Wanted

### CHIEF ENGINEER

WTXL ABC-27 in Tallahassee FL is looking a chief engineer: If you have experience with: UHF transmitters, Studio and ENG equipment, and can troubleshoot to component level we want to talk to you. We are in the process of building a new facility and need a hands-on engineer. The successful candidate will be a team player with ability to interact with management and staff at all levels in the local and corporate environment. FCC General Class License and SBE Certification is a plus. Equal Opportunity Employer, women and minorities are encouraged to apply. Please send resumes to WTXL-TV / Personnel, 1600-2 Red Barber Plaza, Tallahassee, FL 32310 or e-mail personnel@wtxl.tv or fax 850-576-1202. No Phone Calls.

### CHIEF ENGINEER

Educational Communications Center (ECC), Kansas State University (KSU), Manhattan, KS. Application review begins May 1, 2006. Position description at www.ksu.edu/ecc, or call Paula (785) 532-3104. KSU is an equal opportunity employer. Ad paid for by KSU,



## Help Wanted

### BUSINESS DEVELOPMENT MANAGER

AZCAR, a major media system integration and consulting firm, seeks highly motivated individual to run Business Development. Experience in system engineering and sales management important. Staff of about 10. Marketing and advertising responsibilities along with personal involvement in major accounts. Salary, commission, override and bonus plans. Relocation allowance. Excellent benefits. Commitment to growth, client service, and solid team work important. Communications skills and public speaking must be strong suits. Modest travel required. Position filled before NAB. Send expression of interest, resume and references to BDVP@AZCAR.com

## Certification



## For Sale

# Ad Index

*Broadcast Engineering* is not responsible for errors in the Advertisers Index.

| | Page # | Advertiser Hotline | Website Address |
|---|---|---|---|
| ADC Telecommunications Inc. | 75 | 1-800-366-3891 | adc.com/broadcast |
| AJA Video | 91 | 530-274-2048 | aja.com |
| Avid Technology | 4-5 | 800-949-AVID | avid.com/interplay |
| Azden Corp. | 57 | 516-328-7500 | azdencorp.com |
| Blackmagic Design | 19 | | blackmagic-design.com |
| Broadcast Microwave Services | 96 | 800-669-9667 | bms-inc.com |
| C4 Sports | 99 | | c4-sports.com |
| Calrec Audio Ltd. | 63 | +44(0) 1422 842159 | calrec.com |
| Canare Cable Inc. | 62 | 818-365-2446 | canare.com |
| Canon USA | 24-25 | | canondv.com |
| Canon USA Broadcast Lens | 37 | 1-800-321-HDTV | canonbroadcast.com |
| Clear-Com Communication Systems | 65 | 510-496-6600 | clearcom.com |
| Dell Computer | 49 | 800-247-2270 | dell.com/smb/openhd |
| Dolby Labs Inc. | 17 | | dolby.com/tvaudio |
| DYMO Corporation | 47 | | rhinolabeling.com |
| Ensemble Designs | 61 | 1-530-478-1830 | ensembledesigns.com |
| ERI Electronics Research Inc. | 86 | 877-ERI-LINE | eriinc.com |
| ESE | 97 | 310-322-2136 | ese-web.com |
| Euphonix | 53 | 650-855-0400 | euphonix.com |
| Evertz Microsystems Ltd. | IBC | 905-335-3700 | evertz.com |
| Fiberplex | 76 | 301-604-0100 | lightviper.com |
| Fischer Connectors | 56 | 800-551-0121 | fischerconnectors.com |
| Fox Electronics | 52 | 800-604-0301 | foxelectronics.net |
| Front Porch Digital | 43 | 936-520-6042 | fpdigital.com |
| GEPCO | 72 | 1-800-966-0069 | gepco.com |
| Global Microwave Systems | 42 | 888-880-9339 | gmsinc.com |
| Harris Broadcast | 3 | 800-4-HARRIS | harris.com |
| HME | 100 | 866-352-8569 | pro850.com |
| Inlet Technologies | 21 | 919-256-8145 | inlethd.com |
| Iconix Video | 41 | 800-783-1080 | iconixvideo.com |
| JDSU (Acterna) | 23 | 1-800-428-4424 | jdsu.com/bce-qt-1100 |
| Kino Flo Inc. | 88 | 818-767-6528 | kinoflo.com |
| Lawo | 83 | +1-416-292-0078 | lawo.de/nova73hd.en |
| Leitch Inc. | BC | 1-800-231-9673 | broadcast.harris.com/platinum |
| Leitch Inc. | 35 | 1-800-231-9673 | broadcast.harris.com/nexioxs |
| Leitch Inc. | 79 | 1-800-231-9673 | inscriber.com |
| Marshall Electronics Inc. | 78 | 800-800-6608 | lcdracks.com |
| Maxell Corp. of America | 9 | 800-533-2836 | maxellpromedia.com |
| Middle Atlantic Products Inc. | 31 | 800-266-7225 | middleatlantic.com |
| Miller Camera Support | 93 | 973-857-8300 | millersprinter.com |
| Miranda Technologies Inc. | 11 | 514-333-1772 | miranda.com |
| MITEQ | 77 | 631-436-7400 | miteq.com |
| Modulation Sciences Inc. | 73 | 800-826-2603 | modsci.com |
| NEC Display Solutions Inc. | 69 | 866-NEC-MORE | necdisplay.com |
| Network Electronics | 101 | 800-420-5909 | network-electronics.com |
| NVision Inc. | 30 | 1-800-719-1900 | nvision.tv |
| Omnibus Systems | 18 | 704-319-2231 | omnibus.tv |
| Opticomm Corp. | 81 | 800-867-8426 | opticomm.com |
| Panasonic Broadcast | 14-15 | 1-800-528-8601 | panasonic.com/broadcast |
| Pro-Bel | 66 | | pro-bel.com |
| Quantel Ltd | 51 | | quantel.com |
| Quantum Corporation | 87 | | quantum.com/tape4 tapelessworld |
| Radyne Corporation | 55 | 602-437-9620 | radn.com |
| Riedel Communications | 74 | +1-818-563-4100 | riedel.net |
| Rohde & Schwarz | 67 | 1-888-837-8772 | test-rsa.com/tvtrans/be |
| Sachtler Corp. of America | 71 | 1-845-268-2113 | sachtler.com |
| Scientific Atlanta Inc. | 64 | | scientificatlanta.com/compete |
| SCTE CABLE-TEC Expo | 105 | | scte.org |
| Sennheiser Electronic GmbH | 27, 29 | | sennheiser.com |
| Snell & Wilcox Ltd. | 38-39 | | snellwilcox.com |
| Sony Electronics Inc. | 32-33 | | sony.com/hdselect1 |
| Streambox | 80 | 206-956-0544 | streambox.com |
| Tektronix Inc. | 7 | | tektronix.com/seeandsolve |
| TVOne Multimedia Sales | 95 | 800-721-4044 | tvone.com |
| Utah Scientific | 85 | 801-575-8801 | utahscientific.com |
| VertigoXmedia | 89 | 1-514-397-0955 | vertigoxmedia.com |
| Wheatstone Corporation | IFC | 252-638-7000 | wheatstone.com |
| 360 Systems | 13 | 818-735-8223 | 360systems.com |

# Sales Offices

## US/CANADA

### WEST
*George Watts III*
(360) 546-0379; Fax: (360) 546-0388
georgeww3@aol.com

### EAST
*Josh Gordon*
(718) 802-0488; Fax: (718) 522-4751
jgordon5@bellatlantic.net

### MIDWEST
*Emily Kalmus*
(312) 840-8492; Fax: (913) 514-6131
ekalmus@prismb2b.com

## INTERNATIONAL

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

### Israel
*Asa Talbar*
Talbar Media
+972-3-5629565; Fax: +972-3-5629567
talbar@inter.net.il

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

## CLASSIFIED ADVERTISING
*Susan Schaefer*
(484) 478-0154
Fax: (484) 478-0179
sschaefer@prismb2b.com

## REPRINTS
*FosteReprints*
(866) 436-8366;
International inquiries,(219) 879-8366

## LIST RENTAL SERVICES
*Marie Briganti, Walter Karl*
(845) 620-0700
(845) 620-1885
marie.briganti@walterkarl.infousa.com

**Customer Service: 913-967-1707 or 800-441-0294**

May 2006, Vol. 48, No. 5 (ISSN 0007-1994) is published monthly and mailed free to qualified persons by Prism Business Media, 9800 Metcalf Ave., Overland Park, KS 66212-2216. Periodicals postage paid at Shawnee Mission, KS, and additional mailing offices. Canadian Post Publications Mail Agreement No. 40597023. Canada return address: DHL Global Mail, 7496 Bath Road, Unit 2, Mississauga, ON L4T 1L2. POSTMASTER: Send address changes to Broadcast Engineering, P.O. Box 2100, Skokie, IL 60076-7800 USA. CORRESPONDENCE: Editorial and Advertising: 9800 Metcalf, Overland Park, KS 66212-2216 Phone: 913-341-1300; Edit. fax: 913-967-1905. Advert. fax: 913-967-1904. 

# Audio for video

BY PAUL MCGOLDRICK

I always seem to be harping about video, but what's happening in the world of audio? Are we, in fact, making any progress for the future of what we hear in our homes and in theaters?

Way back in the early 1960s, stereo audio recording was in its infancy, and the equipment all still used tubes. The setup at the Abbey Road recording studios of EMI, for example, looked like something pulled together from a World War II surplus. The fact that reasonable-quality recordings were made has always astounded me. At the BBC, every audio recording had to be optimized for the particular reel of tape that we loaded; the bias setting was different every time!

**Dolby Surround in 1982 completely changed the movie experience ... just in time for "Star Wars" and "Close Encounters of the Third Kind."**

## Noise-reduction systems

In 1965, Dolby Laboratories came onto the audio front. Based on patents that could have easily been dismissed by the BBC at the time — over prior art — the first single-channel A-type noise-reduction system, the A-301, was launched in 1966. It battled for a place in the audio recording studios of the world, and traction finally came with multitrack recording, which wouldn't have been possible without such a system. A 16-channel A-type system, the M-series, hit studios in 1972.

Meanwhile, Henry Kloss, the legendary proprietor of KLH, badgered Dolby into developing a noise-reduction system for consumer equipment. The result was the simplified Dolby B-type noise-reduction system. The corporation decided to keep control of the manufacturing and leasing of the recording coders, while licensing the decoder technology to the OEM vendors. The tiny licensing dollars per unit of sold product quickly encouraged widespread adoption.

B-type also rescued the Philips Compact Cassette standard from its dictation standard to make it a worldwide audiotape playback standard. The first players were made by Nakamichi — with various vendors' names glued to the outside — in 1970.

(Back in 1961, Signetics Semiconductor developed a decoder IC that made implementation of the standard even easier. Incorporating the IC also led to a fast blessing of a new product by Dolby Licensing. Philips later bought Signetics.)

The remainder of Dolby's audio improvements came about because of the then lousy mono audio quality of the Academy standard used in movie theaters. Dolby Stereo in 1976 and Dolby Surround in 1982 completely changed the movie experience — the former being just in time for "Star Wars" and "Close Encounters of the Third Kind."

Digital standards started popping up in 1984 with AC-1, which was adopted by DBS the following year. AC-2 came out in 1989 and quickly became the standard for exchanging studio-grade recordings and mixes — both domestically and internationally — using ISDN. AC-3 was the final consumer delivery standard in 1992. It came to be known as Dolby Digital rather than a complex list of words and acronyms consumers would not understand.

5.1 Dolby Digital is in just about every audio delivery we can get, whether it be recorded media, satellite delivery, terrestrial broadcasts in SD and HD formats, video games and, of course, in the movie theater. Eventually, when the film medium goes away — as it must — the electronic projector's audio will also be Dolby Digital on present-day expectations.

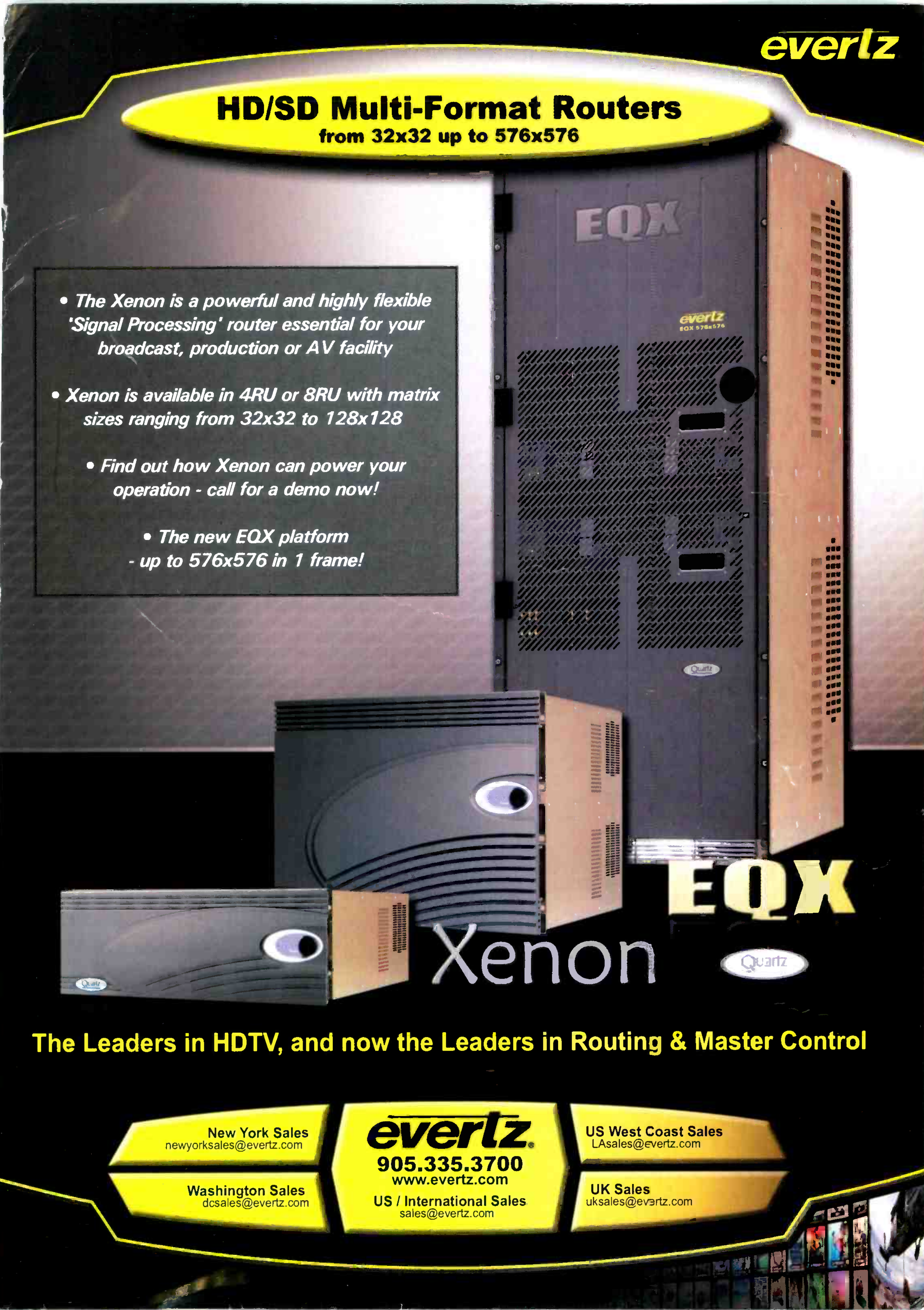
## 7.1 and beyond

But where does it go from here? More and more sources are pushing for 7.1 systems, even for your gaming experience, but those just involve hanging a couple of extra speakers around the room. We have pseudo headphone systems, but there does not seem to be any radical developments in the works.

It has been 14 long years since Dolby Digital emerged. Prior to that, developments came fast; developments are still coming fast in the video world. How can a medium that needs so many bits for effective resolution be so slow to change? BE

*Paul McGoldrick is a consultant based on the West Coast.*

SEND Send questions and comments to: paul_mcgoldrick@prismb2b.com


everlz
HD/SD Multi-Format Routers
from 32x32 up to 576x576
• The Xenon is a powerful and highly flexible 'Signal Processing' router essential for your broadcast, production or AV facility
• Xenon is available in 4RU or 8RU with matrix sizes ranging from 32x32 to 128x128
• Find out how Xenon can power your operation - call for a demo now!
• The new EQX platform - up to 576x576 in 1 frame!
EQX
EQX
Xenon
Quartz
The Leaders in HDTV, and now the Leaders in Routing & Master Control
New York Sales
newyorksales@evertz.com
Washington Sales
dcsales@evertz.com
evertz
905.335.3700
www.evertz.com
US / International Sales
sales@evertz.com
US West Coast Sales
LAsales@evertz.com
UK Sales
uksales@evertz.com