AUGUST 2008

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FOX Business Network

An HD technological challenge

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ASSET MANAGEMENT
Tag, track and inventory video content

FCC FINE-TUNES ITS PSIP RULES
Compliance is not an option

COMPUTER ARCHITECTURES
Protecting video networks from attack

A PENTON MEDIA PUBLICATION

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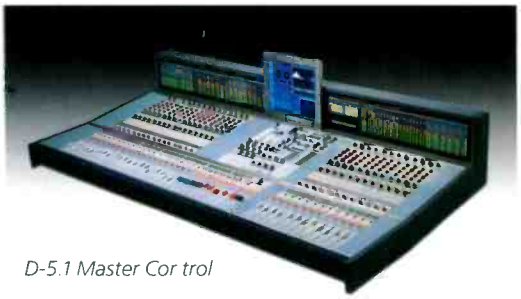

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- The Broadcast Production Standard
- Eight HD Lenses To Choose From
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- A Range Of Affordable HD Lenses
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The Lens Creates the Image

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

Canon

imageANYWARE

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When you're responsible for the transition to HD news at one of the country's largest TV station groups, you need to ensure seamless integration of SD and HD material. That's why Sinclair's Marc Nadeau put Kahuna™ at the heart of his HD transition strategy.

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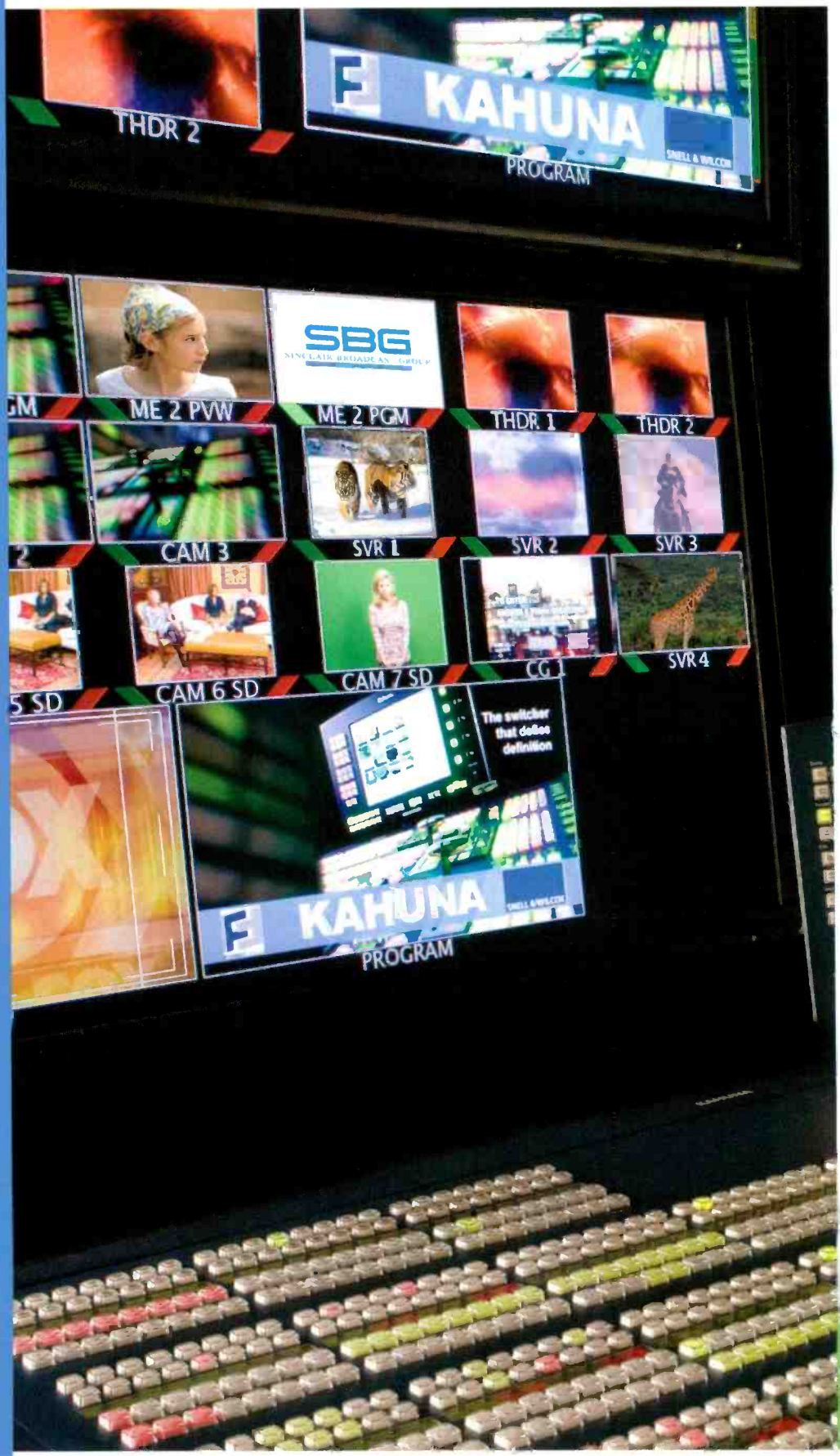
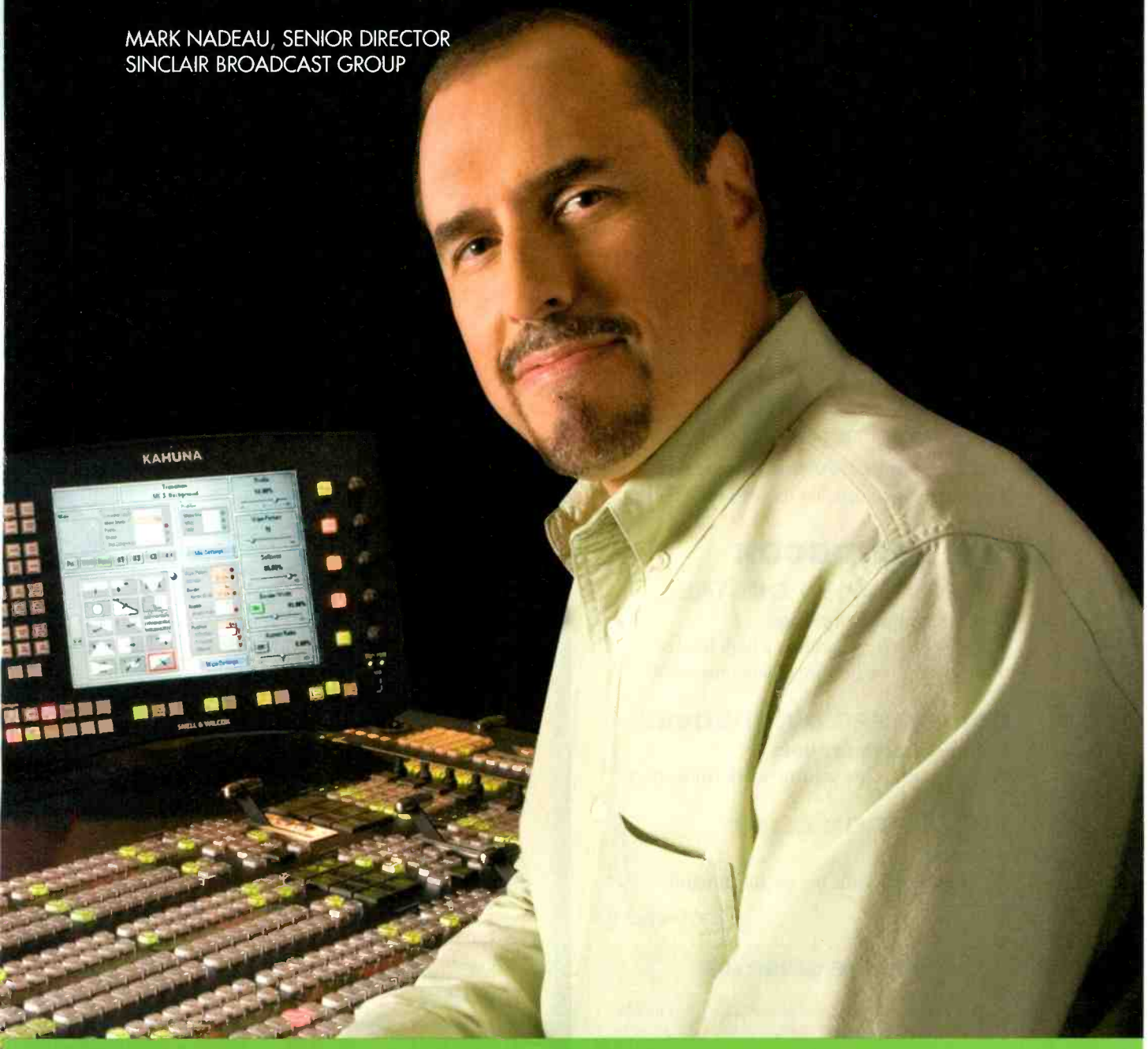


To find out why Sinclair chose Kahuna, visit snellwilcox.com/sinclair

KAHUNA™

"THIS SWITCHER IS LOADED...IT'S AMAZING."

MARK NADEAU, SENIOR DIRECTOR
SINCLAIR BROADCAST GROUP



SINCLAIR BROADCAST GROUP STANDARDIZES ON KAHUNA FOR MOVE TO HD NEWS PRODUCTION

Putting Pictures to Work

SNELL & WILCOX

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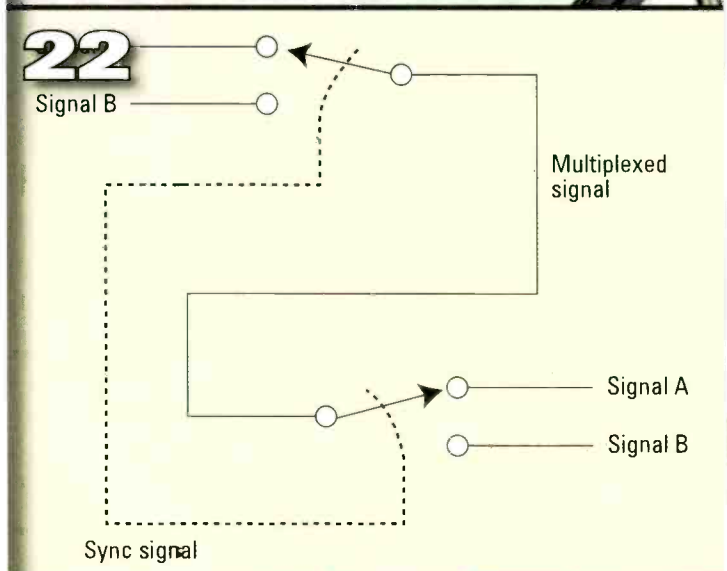
AUGUST'S FREEZEFRAME QUESTION

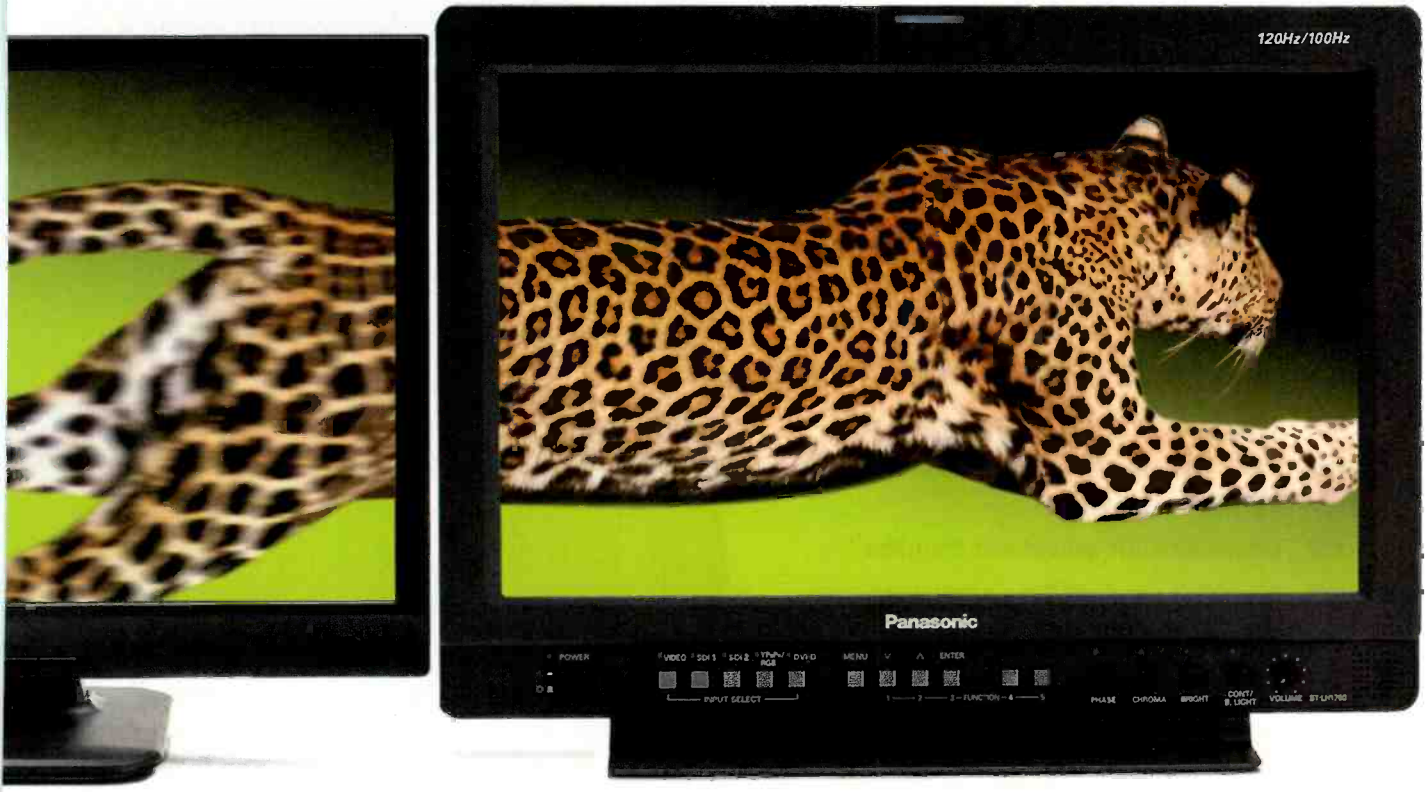
Satellite uplink operators need to be aware of proper operating bands. Insert the missing frequencies for satellite up/downlink operation in the list below.

Satellite frequency bands of operation:
C-band 3.4GHz to ___GHz
Ku-band ___GHz to 18GHz
Ka-band ___GHz to ___GHz
L-band ___GHz to ___GHz

Question taken from Jonathan Higgins' book, "Satellite Newsgathering," available from Focal Press.



see the demo.



... be ready to buy.

Because when you see for yourself how much better the BT-LH1760 handles motion compared with a standard 60 Hz professional LCD monitor, you're going to want one. It's the only 17" pro display to incorporate a 120 Hz double-speed drive* with proprietary In-Plane Switching (IPS) technology for superior motion handling. And you'll swear you're looking at a CRT when you view the LH1760's blacker blacks and truer colors. Lightweight yet production tough for field use, the LH1760 is the only AC/DC monitor in its class to feature waveform monitoring, a vectorscope and time code display. With built-in embedded audio and the ability to drive powered speakers from the headphone jack, you've got a full-featured, pro LCD monitor with the best motion display at a price you can afford.

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Built production tough with a die-cast aluminum frame, the BT-LH1760 is perfect for the field or studio.

when it counts

Panasonic
ideas for life

*120 Hz double-speed capability optimized for 60i/60p video content.
Simulated images shown on monitor screens.

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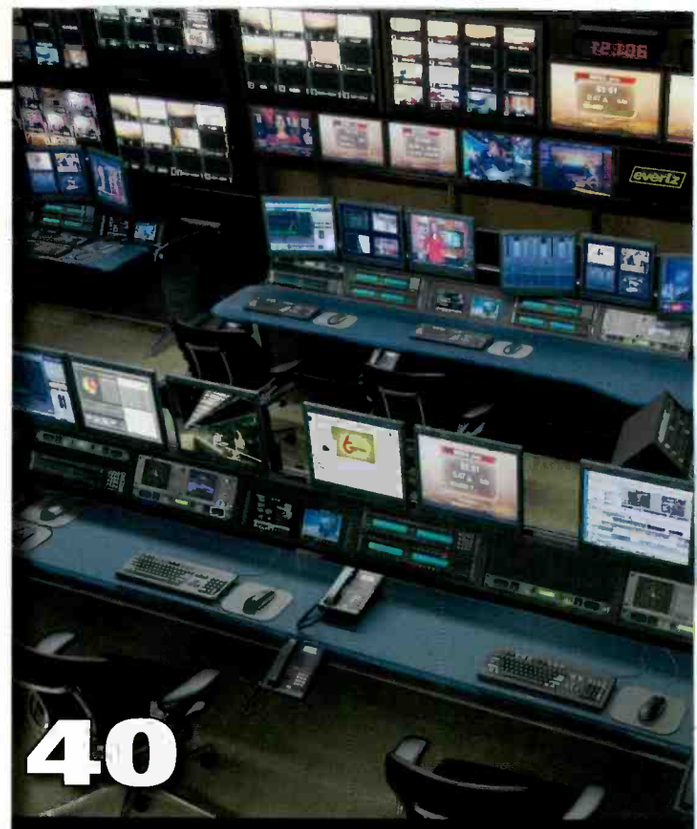
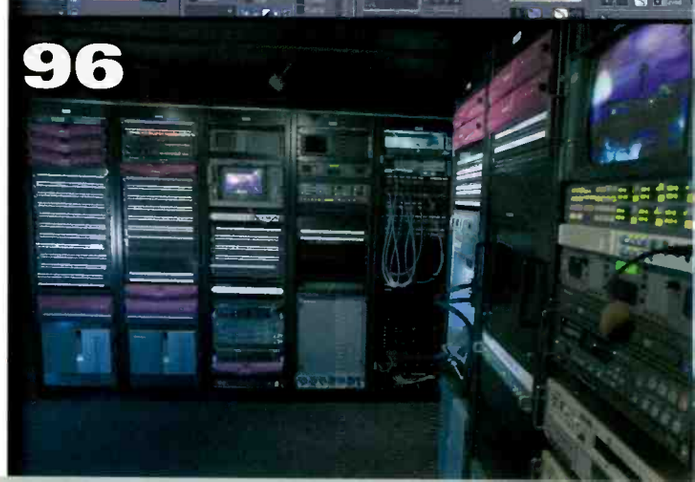
THE FREEZEFRAME ANSWER

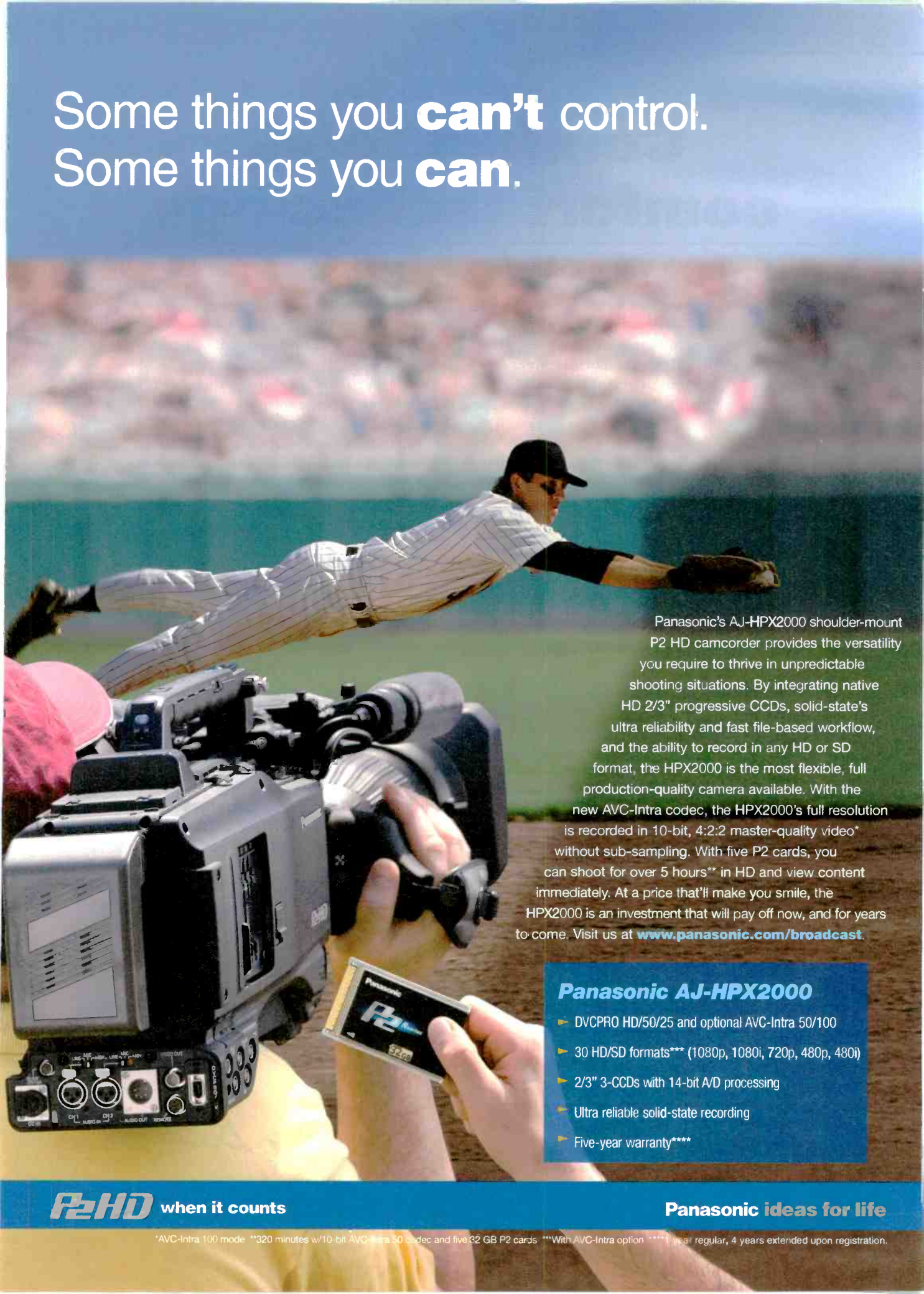
C-band 3.4GHz to 7GHz
Ku-band 10GHz to 18GHz
Ka-band 18GHz to 40GHz
L-band 1.0GHz to 2.0GHz



ON THE COVER:
One of FOX Business Network's three control rooms features Sony MVS-8000 HD switchers and Evertz MVP multiview software and VIP displays.



Some things you **can't** control.
Some things you **can**.



Panasonic's AJ-HPX2000 shoulder-mount P2 HD camcorder provides the versatility you require to thrive in unpredictable shooting situations. By integrating native HD 2/3" progressive CCDs, solid-state's ultra reliability and fast file-based workflow, and the ability to record in any HD or SD format, the HPX2000 is the most flexible, full production-quality camera available. With the new AVC-Intra codec, the HPX2000's full resolution is recorded in 10-bit, 4:2:2 master-quality video* without sub-sampling. With five P2 cards, you can shoot for over 5 hours** in HD and view content immediately. At a price that'll make you smile, the HPX2000 is an investment that will pay off now, and for years to come. Visit us at **www.panasonic.com/broadcast**.

Panasonic AJ-HPX2000

- DVCPRO HD/50/25 and optional AVC-Intra 50/100
- 30 HD/SD formats*** (1080p, 1080i, 720p, 480p, 480i)
- 2/3" 3-CCDs with 14-bit A/D processing
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P2HD when it counts

Panasonic ideas for life

*AVC-Intra 100 mode **320 minutes w/10-bit AVC-Intra 50 codec and five 32 GB P2 cards ***With AVC-Intra option ****1 year regular, 4 years extended upon registration.

Comfort food, comfort technology

What's your favorite comfort food? For a Midwesterner, it might be chicken fried steak and mashed potatoes. For a Bostonian, comfort food might be clam chowder. In San Francisco, comfort food could include an Italian specialty from North Beach or chocolate from Ghirardelli Square. The common element in each of these examples is that the dish provides something that the diner finds familiar, pleasing, easy to access and meets an emotional need.

Now, replace the word "food" with "technology." What would you define as comfort technology?

For many, it might include their cell phone, their computer or perhaps their television. These devices provide communication, entertainment and even security. They meet our needs. They can be battery-powered, so they are portable. However, in times of severe weather, only the television can provide real-time visual broadcast weather information, but DTV is not yet portable.

This spring's severe weather with tornados and flooding affected much of the nation, especially the Midwest. There were also fires along the West Coast. The East Coast had heat emergencies. And no one can forget the hurricane devastation to New Orleans and our Southern seaboard in 2005. In all of these cases, viewers had the opportunity to receive life-saving severe weather information from portable TV sets.

I own two battery-powered TVs, and they work quite well. One is cell phone sized, so I sometimes take it to the pool so I can follow a baseball game or newscast. But I've also used them for weather information. Unfortunately, by this time next year, those analog TV sets will be worthless in receiving severe weather information because they can't receive DTV signals.

Digital TV is still a relatively young technology and laden with an appetite for power. So, while analog chip designers have, over the years, refined their products for maximum efficiency, digital TV is so new that portable applications have yet to be similarly perfected. That, plus the demand for HD being the market driver, has placed portable applications on chip designers' back burner. Therefore, there are few DTV receivers available.

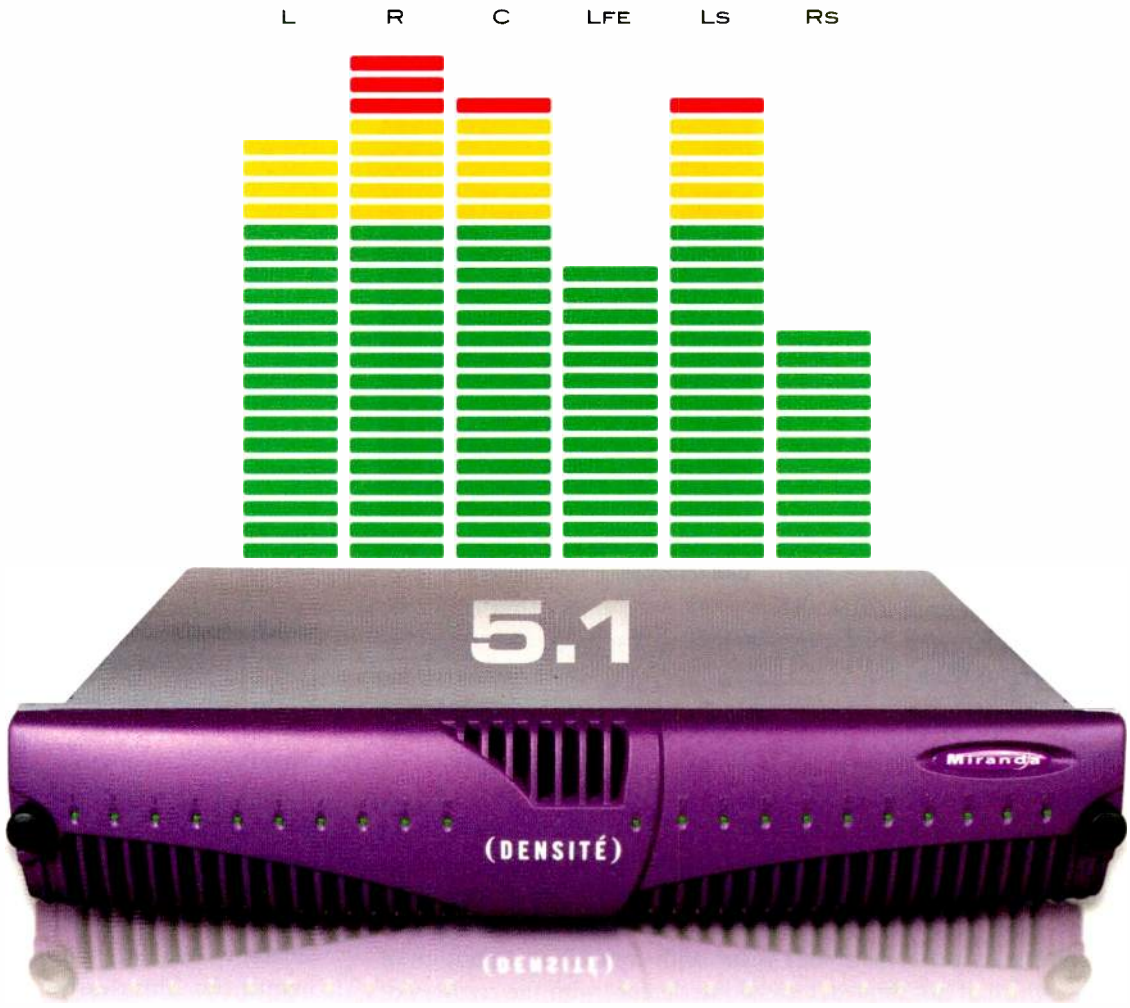
Maybe broadcasters should make the point to the FCC that DTV is the only true broadcast service. It covers everyone and all areas. Best of all, it's free. When it comes to distributing information to mass audiences, broadcasters do it best. A cell phone-delivered severe weather service can't compare. In addition, what about hearing-impaired viewers? What will they do for weather and emergency information?

Viewers could build their own inverter power supplies. If you add enough 12V batteries and an inverter, about any AC device could be powered. But even that solution comes with its own set of obvious problems.

One might try moving a 57in HDTV plasma display from the living room to the basement while a tornado is bearing down. And don't forget to power the STB or dish LNA. All things considered, such a DIY portable solution sounds a bit unrealistic.

We'll get portable DTV sets; it will just take some time for a variety of options to become available. Meanwhile, keep that portable radio handy. I know that in an emergency, sound without pictures may not be comforting, but for now that may be your only choice. BE

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



Rethink 5.1 audio for HD

Audio for HD is full of new challenges. With Miranda, it's now possible to overcome all of them using our feature-packed DAP module. Upmixing stereo to 5.1 with Linear Acoustic UpMAX™ technology, encoding/decoding Dolby™ E/AC-3, downmixing, audio to video delay, even loudness measurement and control, all in one module. It's time to rethink what's possible.

Miranda

Rethink what's possible

www.miranda.com/dap

Transition from monochrome to NTSC transmission

Dear editor:

I just read the interview with Tim Carroll of Linear Acoustic in the July 8 edition of the "HD Technology" e-newsletter. He made the closing comment about how after 13 years of having the ATSC standard, he is amazed that the industry is down to a few months before analog cutoff and is still dealing with so many loudness-related issues. I wonder, from a historical point of view, did we have this magnitude of issues when television went from black and white to color? If not, why? Somehow it seems the transition was easier — much easier — as long as you forget about the CBS color system versus RCA.

Tim Carroll, Linear Acoustic president and founder

Gary Brefini
SBE member

John Luff responds:

The transition from monochrome to NTSC transmission was almost trivial, but the production issues were enormous. First, you can start at recording. A quad recorder that only handled monochrome needed just a rudimentary time base error corrector, while color required nanosecond accuracy. For many years, there were issues with controlling saturation of the picture, which, if not limited, created interference with the recovery of the sound subcarrier.

Similarly, production professionals had to figure out how to make a picture that was pleasing in color but also looked acceptable on legacy sets that didn't filter out the color subcarrier living smack in the middle of the video passband. DAs and other devices that clamped the video on the back porch (between sync and start of active video) had to contend with burst, which many could not. Sync generators were replaced to get genlock accuracy needed for color. Plenty of primary engineering had to be done, often as problems came up. Ask anyone who edited quad tape about color framing and editing.

Size matters

Dear editor:

Does size matter for HD transmissions? You bet it does. The satellite industry uses nonionized radiation. Although not radioactive, at higher levels it could still cook soft skin such as the cornea of the eyes.

Although fully licensed by the FCC, 2.4m C-band antennas are often incapable of providing high-grade, high-order modulation HD transmissions without using higher power levels than published by the FCC.

Link budgets and hazard studies have consistently yielded poor performance results for these antennas, and yet 2.4m platforms are being assembled as you read this. These antennas lack the gain needed and interfere with adjacent satellites while exposing everyone around them to high-level radiation.

Coupled with two 750W phase combined amplifiers, a comparison between a 2.4m and a 4.5m antenna yielded the following results: The 2.4m yielded acceptable results for a DVB-S, QPSK, 18Mb/s carrier at 130W. The Eb/No and BER were usable. For DVB-S, QPSK, 40Mb/s and 60Mb/s carriers, the antennas yielded unacceptable results.

The FCC published the maximum feedhorn flange power density allowed as -50.90dBW/Hz. With a 2.4m antenna, the total EIRP needed for the 60Mb/s carrier (for acceptable Eb/No, BER, EVM and MER) is 72dBW. The 2.4m dish gain is 41.8dBi, which leaves 30.2dBW or 1047W needed from the amps. At that power level, the feedhorn flange power density is -45.80dBW/Hz, higher than what the FCC requires.

Such a level produces a wider radiation pattern around the antenna, up to 30m in diameter. In turn, this creates a wider beam to space, which would most likely interfere with adjacent satellites using similar frequencies. This clearly is not a good outcome.

The 4.5m antenna (with 48dBi of gain) would need 251W to achieve acceptable Eb/No, BER, EVM and MER at the receive sites. The power density would then equal -52.0dBW/Hz, a lower, safer value than what the FCC requires.

An opposing argument would be that the 2.4m antenna is mounted on the top of the SNG vehicle, and, therefore, all the radiation is focused toward the satellite. This argument is valid under very low-power outputs; higher power levels are magnified by the antenna, therefore creating a wider electromagnetic field around the dish, the vehicle and passersby.

Eddie Maalouf
Gil Hanna

Test Your Knowledge!

See the Freezeframe question of the month on page 6.

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Technology promises the perfect fit* for your business.

*You just need to change what you do.

Don't let technology manage your business.
Investing in new technologies should help you get more business or increase profits without creating a technical nightmare–Or changing your business model.

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Being there

Will NBC's Olympics coverage change the way we watch the games?

BY CRAIG BIRKMAIER

In 1932, David Sarnoff, then the president of RCA, wrote an article titled "Where Television Stands Today" for the April issue of *Modern Mechanics and Inventions*. The founder of the NBC television network predicted that a new world of cultural and educational opportunities would be opened to the home. And he took the opportunity to describe the potential of this new medium:

"But even more appealing to the individual is the hope that television may, at least in a measure, enable man to keep pace with his thoughts. The human being has been created with a mind that can encompass the whole world within the fraction of a second. Yet his physical senses lag woefully behind. With his feet he can walk only a limited distance. With his hands he can touch only what is within reach. His eyes can see at a limited range and his ears are useful at a short distance only.

"When television has fulfilled its ultimate destiny, a man's sense of physical limitation will be swept away, and his boundaries of sight and hearing will be the limits of the earth itself."

While Sarnoff was correct in his assertion that television would bring the world into our living rooms, the medium he helped to create did little to deliver on the promise that TV would sweep away man's boundaries of sight and hearing. TV has delivered a highly filtered view of the world — through the eyes of television production teams who attempt to capture an event or story and present it in a coherent manner that informs and/or entertains.

Our physical limitations have not been swept away. We still cannot direct the camera to see what we want, as we could do with our eyes if actually there. We have learned that the television medium is a powerful tool to convey the thoughts of those who control what we see. To date, it has not delivered on Sarnoff's promise to help us form our own thoughts.

There will be more hours of coverage in Beijing than the combined total of every previous Summer Olympics televised in the United States.

One world, one dream

In the era of television broadcasting, the Olympics have always been one of the premiere events shown on the TV screen in the family room. During the two plus weeks of Summer Olympics coverage, the U.S. TV network with the rights to the games dominates the TV scene.

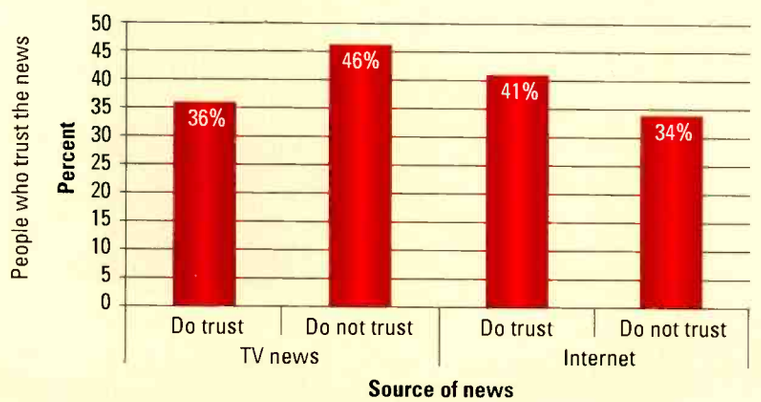
Perhaps this reality influenced the decision of the Olympics organizers in China to create the catchphrase "One World One Dream" for the 2008 Summer Games. But this phrase seems dated and inappropriate, given the realities of how NBC is providing coverage of these games.

During the Golden Age of TV broadcasting in the United States, families would gather around the electronic hearth and watch what amounted to an up close and personal news report of the games, with limited live event coverage. The gargantuan task of covering multiple venues — there are 28 sports in the 2008 edition of the games, with events spread out over 17 days — creates literally thousands of hours of content. Much like the

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

Forty-six percent of Americans do not trust TV news

Compared with the Internet, viewers have less trust in TV news.



Source: Harris Interactive *www.harrisinteractive.com*

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Dolby® Media Meter is powerful new software that accurately measures program loudness just as viewers subjectively experience it. Well suited to the needs of both broadcast and post-production facilities, it's an ideal tool for program-creation and quality-control applications, and perfect for optimizing broadcast, packaged media, VOD, and game media.

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If you're looking for a software application for loudness measurement, Dolby Media Meter is the cost-effective choice at $795 (MSRP).

Dolby Media Meter Features

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- ITU-R BS.1770-1 algorithm
- Loudness measurement and logging

MAC/WINDOWS

- Stand-alone application for file-based measurement
- Digidesign® RTAS plug-in for real-time measurement
- Digidesign AudioSuite plug-in for file-based measurement

MAC OS®

- Minnetonka AudioTools™ AWE plug-in for file-based measurement

Find more information on Dolby Media Meter at dolby.com/dmm.

shooting ratios for a documentary, this mountain of content was once distilled into about 200 hours of broadcasts. As a much younger viewer, this approach certainly provided a one-world view of the games.

As a middle-aged TV professional, I had the opportunity to help put together the broadcast facilities for the 1984 Olympics in Los Angeles, while working for the Grass Valley Group. The International Broadcast Operations Center of any Olympic games is anything but a one-world operation. In reality, there are dozens of countries creating their own worldly view of the games, focused on the athletes from their nation and their performances.

For decades, TV coverage of the Olympics has focused on filtering through this massive quantity of content to give the folks back home a peek at what is going on. During the 1996 Summer Olympics in Atlanta, I had the opportunity to attend the Olympic archery events. The contrast between watching the distilled version of the games on TV and attending a live event was stark. Unlike live coverage of most U.S. college and professional sporting events, where TV coverage is often better than being there, the traditional edited down TV version of the Olympics is far less satisfying and engaging. For the few sports that earned live coverage, the experience could be exciting. For the rest, newspaper reports were often more timely.

But this is a new millennium, and digital distribution technologies are changing the traditional face of the television medium. This is the first Olympics where the potential exists to view almost all of the events in a manner that approaches being there.

The Olympics on demand

General Sarnoff would be proud and amazed to see how far the medium of television has progressed, although he might not recognize some of the new forms it has taken — the 500 channel universe of multichannel subscription TV (cable and DBS) and the demand-based world of video delivered via the Internet.

In what some are calling the most ambitious single media project in history, Sarnoff's NBC network is flooding the airwaves and cyberspace with a whopping 3600 hours of coverage from Aug. 8 to 24. The vast majority of these hours of Olympics coverage are being delivered via live streaming video on *NBCOlympics.com*. Of the total hours of event coverage, 1400 hours are airing on NBC

Web links

- The official Web site of the Beijing 2008 Olympic Games; *http://en.beijing2008.cn*
- NBC Olympics Web site; *www.nbcolympics.com*
- NBC: Olympics a new-media 'research lab;' *www.cnn.com/2008/TECH/07/07/nbcolympics.ap/index.html*

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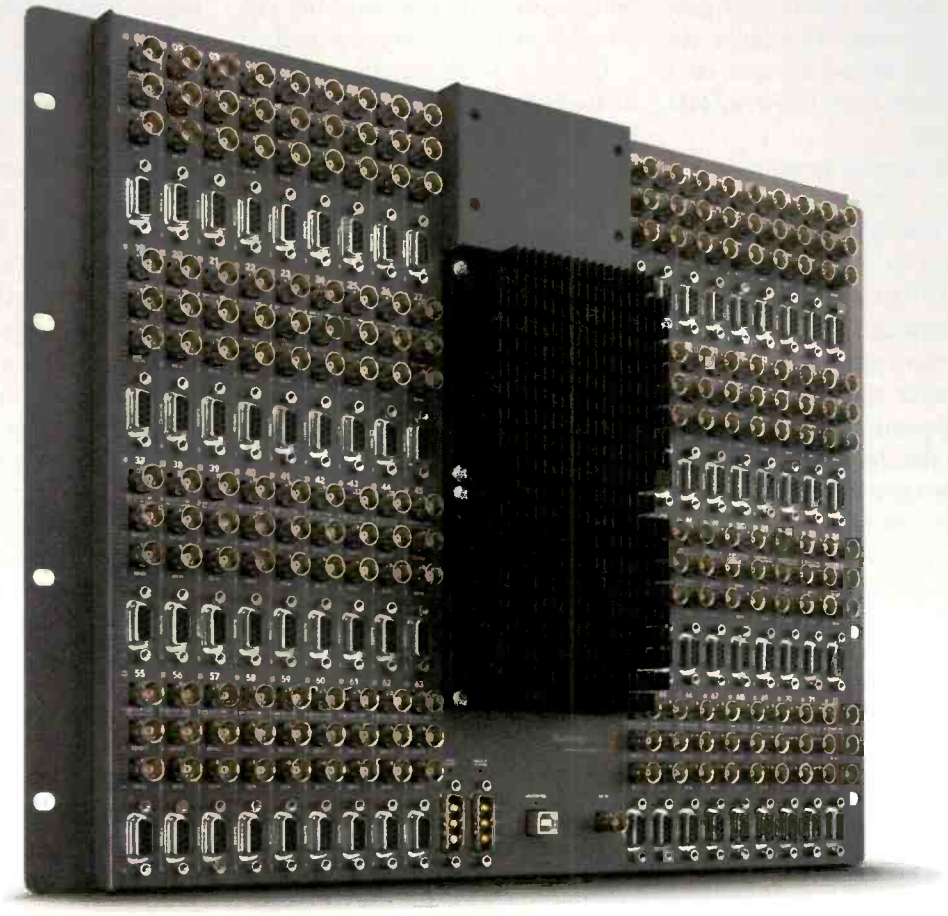

Introducing the world's largest affordable SD, HD and 3 Gb/s SDI router!

Eliminate complicated manual video patching forever! Broadcast Videohub is a powerful broadcast grade routing switcher featuring a massive 72 inputs, 144 outputs, 72 deck control ports, auto switching SD, HD, and 3 Gb/s SDI, in a compact rack mount chassis only a few inches thick.

Industrial Strength Routing Switcher

With 72 inputs and 144 outputs, Broadcast Videohub has enough SDI connections for 72 edit systems or decks. With twice as many SDI outputs, each user can have a completely independent SDI output for monitoring. This means you can monitor direct from any equipment in your building without effecting routing! 72 deck control ports are also included for a complete routing solution.

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Broadcast Videohub handles mixed SD, HD and 3 Gb/s SDI connections all on the same router at the same time. Broadcast Videohub detects when an input changes, and automatically sets all the outputs connected, to match the changed input. SDI re-clocking and output SDI slew rates will also change automatically.

World's Highest Quality

With exciting new 3 Gb/s SDI connections built in, Broadcast Videohub allows twice the SDI data rate than normal HD-SDI. Use 3 Gb/s SDI for high resolution real time 2048 x 1556 feature film editing. 3 Gb/s SDI has full compatibility with SD, HD and 2K in 4:4:4 or 4:2:2 all with a single BNC cable.

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Broadcast Videohub uses software control panels that run on Windows™ and Mac OS X™ for "routing control" right from your editing system desktop! Broadcast Videohub connects to any computer via USB and is then shared over your local network. Router labels can be changed from any computer and are fully unicode compatible for foreign language support.

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and sister stations CNBC, Oxygen, MSNBC, USA and Telemundo (in Spanish), plus high-definition coverage on USA HD and Universal HD cable channels.

There will be more hours of coverage in Beijing than the combined total of every previous Summer Olympics televised in the United States. Coverage of 28 sports and 302 events will be virtually 24/7. To deal with the inevitable overlapping conflicts, the 12- to 15-hour time difference between Beijing and most of the United States, and the desire to relive and/or share the experience with others, much of the 2200 hours of live Internet streaming coverage will also be available later as VOD.

NBC has also entered into an agreement with DirecTV to make selected event coverage available after the live NBC coverage as VOD, and there will be Olympics coverage targeting video-enabled mobile phones as well.

Giving U.S. viewers the ability to virtually be there is only part of the story. The entire project is something akin to a huge research project or test lab for what TV may become in the next decade. CNN released a report on NBC's Olympic efforts. According to Alan Wurtzel, NBC's research chief, "Besides giving advertisers a clearer picture of how much consumers are paying attention to the games, NBC hopes its research provides a comprehensive picture of how people are supplementing TV viewership with tools such as video streaming, video on demand and mobile phones." The CNN report provides additional details of the various measurement techniques that will be used to track what NBC calls a Total Audience Measurement Index (TAMI), which takes into account TV, online, video on demand and mobile phone usage. (For more, see "Web links" on page 16.)

A network's well-being

During the Golden Age of TV broadcasting in the United States, the network with the rights to the Olympics enjoyed a major promotional advantage over broadcast competitors. The timing of the Summer Olympics was perfectly suited for promotion of the network's fall prime-time schedule. That network usually did not make a profit on its Olympic coverage, but the ratings bump was worth the investment.

In due time, we will learn if the expanded coverage of the 2008 Olympics will turn into a rating bonanza for NBC. Earlier this year, NBC Universal took a big step toward undoing one of the television industry's oldest traditions by announcing that it would move to a year-round schedule of staggered program introductions. This move is in part an attempt to provide fresh content throughout the year to help slow the erosion of viewers to cable networks that offer fresh content on a more or less continuous basis. For NBC, there will be fewer new shows to promote during the Olympics.

What NBC may learn from this massive research project is that a new generation of viewers is seeking more from the world of digital media than the programming formulas that worked so well when there were only a handful of TV channels. Today, the broadcast networks are in competition with hundreds of channels of linear TV, VOD, DVDs, video games and the virtual world of the Internet. NBC may learn far more than its founder could possibly have imagined about the power of being there. BE

Craig Birkmaier is a technology consultant at Pcube Labs.

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FCC fine-tunes DTV transition rules

The commission clarifies its rules on PSIP.

BY HARRY C. MARTIN

With the major DTV rulemaking proceedings out of the way, the commission has been working on resolving remaining DTV transition issues as they occur. Here is a summary of some recent developments.

Maximization and channel change procedures

In May, the FCC lifted the freeze, in place since 2004, on maximization applications and DTV channel change requests, and simultaneously opened a window for such submissions on June 20.

All applications and petitions filed during this window will be reviewed to determine preliminarily if there were timely filed conflicting proposals. If a proposal is not subject to such conflicts, it will be granted promptly so as to permit effectuation of the changes in advance of the Feb. 17, 2009, transition deadline.

In situations where a conflict is identified, the commission will grant all of the conflicting proposals, with the condition that the parties resolve their conflicts within 30 days. If the parties cannot resolve the conflicts, then the commission will dismiss all of the conflicting authorizations and require the parties to re-file. Re-filed applications will be processed on a first-come, first-serve basis. The FCC warned parties that they cannot rely on these submissions in seeking extension of the Feb. 17, 2009, transition deadline.

Consumer education rule relaxed

The commission also issued an order on clarification of its consumer education rules. Announcements made to the public over television stations relating to the early termination of analog facilities, or the extension of time to construct post-transition facilities, may be combined into a single spot, rather than aired as separate spots.

PSIP clarification

In the same order, the commission clarified that licensees do not have to immediately update their Event Information Table (EIT), required under Program System and Information Protocol (PSIP) standards, when circumstances change the program lineup. The FCC encourages licensees to update their EITs as quickly as possible, but such updates do not have to occur in real time.

To review, PSIP is data transmitted along with the station's DTV signal, which provides DTV receivers with information about the station and what is being broadcast. PSIP data provides a method for DTV receivers to identify a DTV station and to determine how a receiver can tune to it. It tells the receiver whether multiple program streams are being broadcast and, if so, how to find them.

The FCC's PSIP standards, including the new protocol for EITs, are incorporated into Section 73.682(d) of the agency's rules. Detailed ATSC PSIP information, as modified effective May 29, is available publicly at the sites referenced in Section 73.8000 of the FCC's rules.

Class A freeze over

The FCC's freeze on the filing of Class A TV station displacement and minor-change applications, which has been in place for several years, ended Aug. 4. Beginning then, such applications are accepted on a first-come, first-serve basis.

DTV Activity Form 388 now available

The commission created a Form 388 (DTV Quarterly Activity Station Report) in Common Debian Build System (CDBS) and has ordered reporting broadcasters to file through CDBS starting with the second quarter of 2008 and forward. BE

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

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

Dateline

- Oct. 1 is the deadline for TV stations in the following states and territories to file their biennial ownership reports: Alaska, Florida, Hawaii, Oregon, the Pacific Islands, Puerto Rico, the Virgin Islands and Washington.
- Oct. 1 is the deadline for TV stations and Class A TV stations in the following states and territories to place their 2008 EEO public file reports in their public files and post them on their Web sites: Alaska, Florida, Hawaii, Iowa, Missouri, Oregon, the Pacific Islands, Puerto Rico, the Virgin Islands and Washington. LPTV stations originating programming in these locations, which are not required to have public files, must post these reports on their Web sites and keep them in their station records.

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Understanding muxing

Today's systems can achieve a high level of sophistication by grouping data into packets.

BY ALDO CUGNINI

Multiplexing is a technique for carrying multiple channels of information within a common signal. Although usually thought of as a digital process, the method was actually pioneered many years ago as a way of carrying multiple analog signals simultaneously.

Analog multiplexing

In its simplest form, an analog multiplexer (or mux) is a switch that alternates between input signals at a high rate. (See Figure 1.) The multiplexing system used throughout the world to carry FM stereo signals is based on this idea. There are several requirements for faithful separation of the original signals.

First, the switch must operate at a high rate. Even in a pure analog system, the switch creates a sampled signal, so our old friend Nyquist applies. The switching must happen at a rate at least twice that of the highest frequency component present in either of the signals.

At the receiving (or demultiplexer) end, a complementary switch is used to separate out the original signals. (In the case where analog signals are sampled, a low-pass filter is also needed to remove the switching components, i.e., the repeat spectra.)

The second requirement is that the bandwidth of the channel carrying the multiplexed signal must be sufficient to carry the multiplex. In principle, the number of carried signals is limited only by these requirements. Of course, the synchronizing signal must also be carried or must be resynthesized at the receiving end.

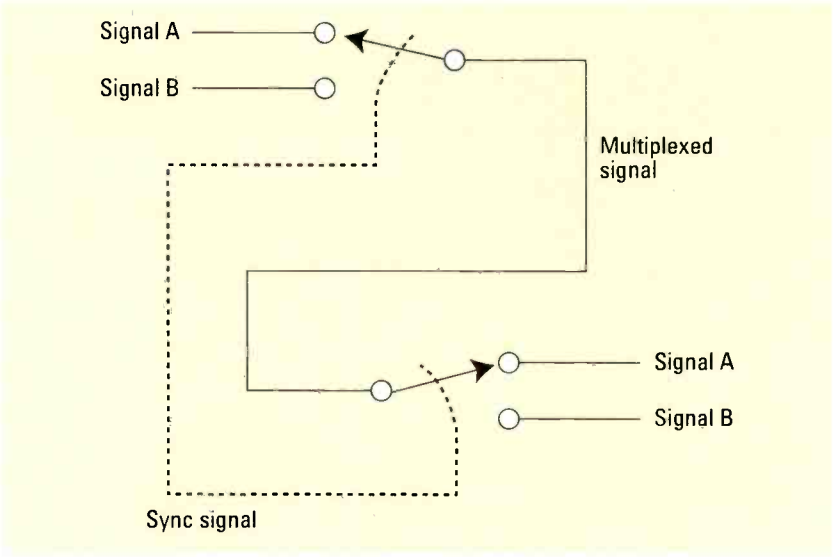

Figure 1. In its simplest form, a multiplexer is just a switch.

Because the input signals are switched in time, the above scheme is known as time-division multiplexing (TDM). However, analog signals can also be modulated onto carriers, with the carriers placed at different frequencies. Such a scheme is called frequency-division multiplexing (FDM).

One well-known example of FDM is the method used to encode color information (chroma) in the NTSC and PAL video formats. In fact, the entire RF spectrum can be thought of as one huge FDM system. A different case of FDM is the diplexer, where multiple RF signals (or DC and RF signals)

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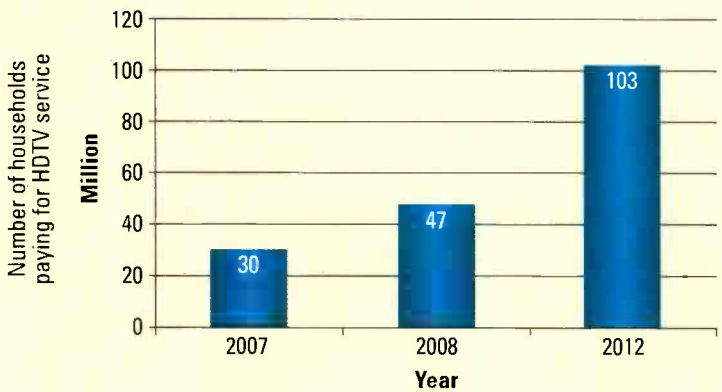

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are combined in a single cable, often transmitting in opposite directions.

Digital technology

One inherent problem with analog multiplexing is the crosstalk between signals that develops from the use of practical systems or channels. For this reason, as well as that of efficiency and flexibility, most of the multiplexing systems we use today are digital.

First conceived in the 1930s, pulse code modulation (PCM) samples an analog signal and creates a digital representation of the signal. The first practical widespread use of this was in the United States' public switched telephone network in the 1960s. Designed for the 3.3kHz bandwidth of voice circuits, an 8kHz sample rate with 8-bit quantization gives a data rate of 64kb/s (known as the DS0 signaling rate). Twenty-four DS0s multiplexed together constitute a DS1 signal, also known as T1 when carried over copper wire. This multiplexing, however, is done after the individual signals are all digital. Hence, there is zero crosstalk in a properly functioning system.

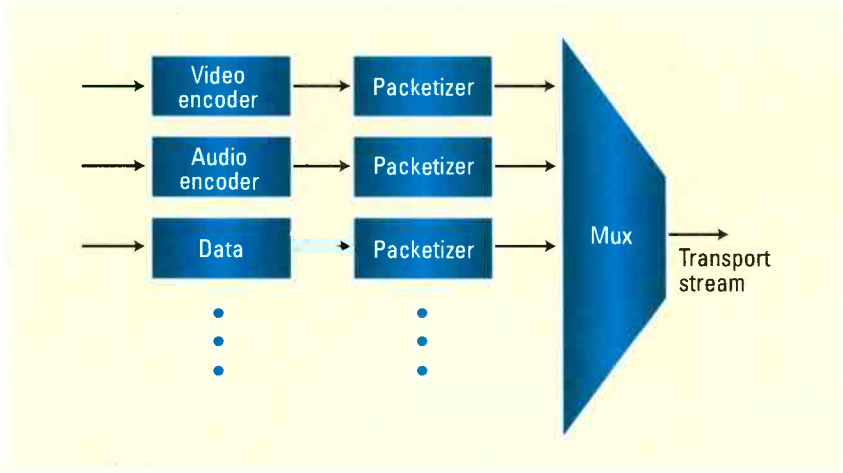

Figure 2. Transport streams are formed by a multiplexer.

The SDI and HD-SDI digital video interfaces are also capable of multiplexing embedded audio, closed captions, time code and other data. The signal can carry up to eight 24-bit embedded stereo audio pairs, at 48kHz sampling, which is directly compatible with the AES3 digital audio interface.

Modern multiplex systems carry much more than the pure signals (data essence) themselves. By grouping data into packets, multiplexers can achieve a high level of sophistication by adding information such as headers, sync fields, timing and metadata (which is data about the data).

The MPEG transport stream used for DTV transmission is an example of such a multiplex, where video, audio and ancillary data are all combined into one transmission channel. (See Figure 2.) With the approach of mobile DTV broadcasting, additional services can also be multiplexed at the physical layer so that the mobile service has its own unique RF reception characteristics.

Simple multiplexing can accommodate the situation where the input sources have fixed data rates. However, when the data rates vary, a more sophisticated scheme must be used to ensure efficient use of the communications channel. Statistical multiplexing provides this efficiency by continuously varying the individual input data rates so that a total target rate is achieved.

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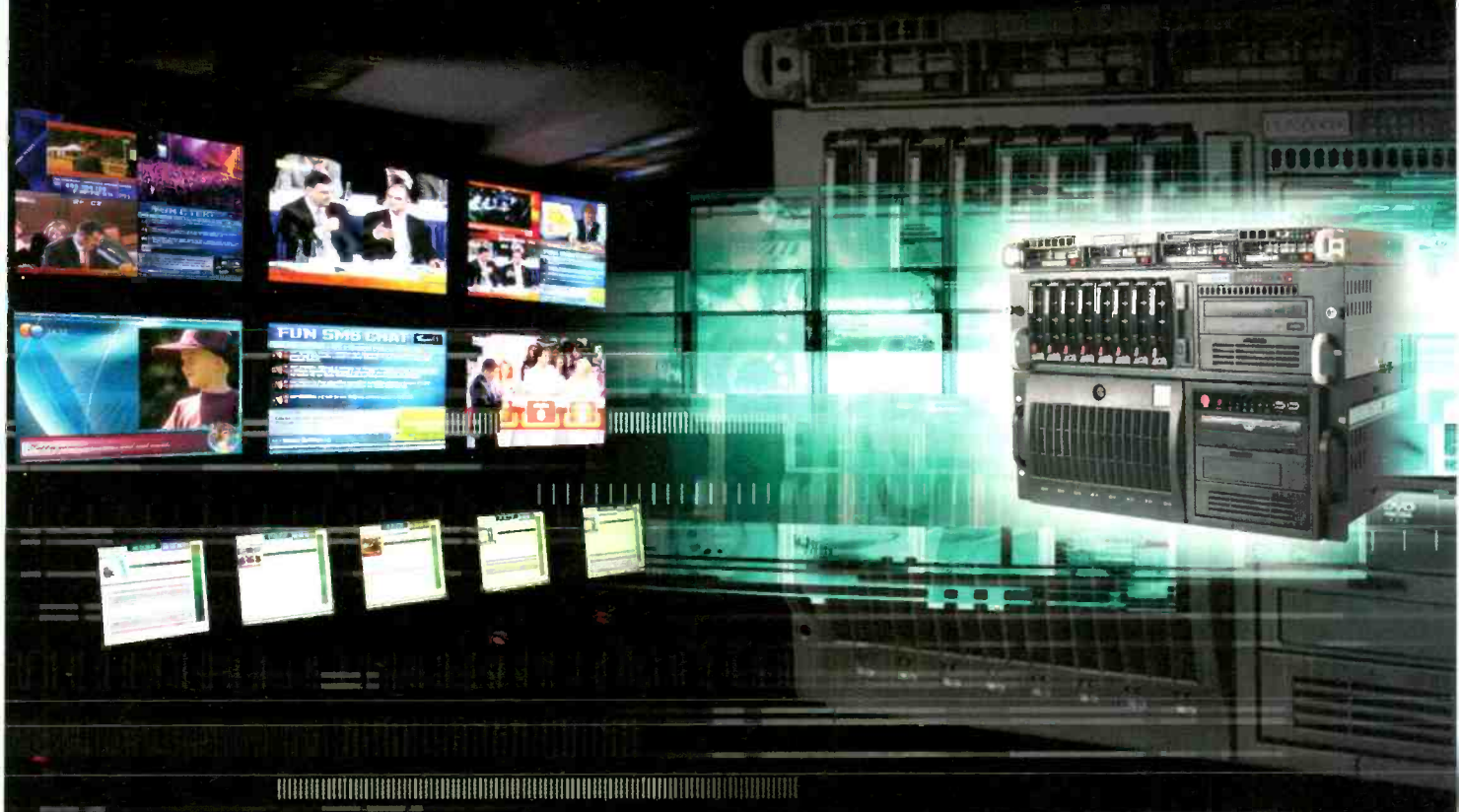

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Transport streams vs. program streams

MPEG-2 can carry programs in one of two container formats: transport streams and program streams. The difference is essentially that of error resilience and program multiplicity. Transport streams can carry more than one program, each with its own time base, and are designed to allow for recovery from channel errors. Program streams can carry a single program and are designed for lossless transmission channels. The former is therefore well suited to RF transmission, and the latter is usually used in fixed media, such as DVDs.

A packet is the basic unit of data in a transport stream and consists of sync, a packet ID (PID), various flags and related data, an optional adaptation field that carries additional stream information, and the payload. PIDs allow decoders to select from various programs and provide the means for transmitting major and minor channels in a DTV multiprogram service.

Each program also has a program map table (PMT) that lists all of the PIDs associated with the program. This allows decoders to quickly parse the stream and decode only the elements needed to deliver one (or more) particular program at a time.

In ATSC and DVB, the packets also contain Reed-Solomon error correction, which is in addition to the trellis coding in the channel modulation.

Another important TS element is the program clock reference (PCR), which is used to synchronize the decoder and the display to that of the original encoder. The PCR can be thought of as a snapshot of the master clock used to generate the original stream. Through the use of PCRs and presentation time stamps (PTS), it is possible to ensure correct playback, even if the encoding and decoding are done at different points in time. A properly designed decoder can also use these to assure correct audio/video synchronization.

Other forms of multiplexing

Orthogonal frequency-division multiplexing (OFDM) is a multicarrier modulation scheme used in many applications, including broadcasting, DSL and Wi-Fi communications. With OFDM, a large number of closely spaced orthogonal subcarriers transport data from multiple parallel data streams or channels. Here, there are multiple levels of multiplexing. The modulation system itself uses multiplexing even if there is only one program.

Code division multiple access (CDMA), another form of FDM, uses spread-spectrum signaling for some cell phone services and for GPS. A private code synchronizes the transmitter and receiver by frequency hopping among numerous narrowband RF channels. With trillions of possible frequency-sequencing codes, CDMA communications are both secure and robust.

Not to be overlooked is the network router, a special form of multiplexer/demultiplexer that steers IP packets on a LAN, usually over Ethernet. This kind of multiplexer, however, usually has little interaction with any of the information within the packets, other than possibly reassigning IP addresses.

Lower complexity

Thankfully, most of the complexity of muxing is handled by equipment designers. For practical use, the majority of installations allow a set-and-forget attitude — that is, until systems are upgraded. Then, it's back to the user manual to find the elusive setting that will get one more program into the mux. For the greatest flexibility, have a good stream analyzer that will show you the constituent elements of your mux! BE

Aldo Cugnini is a consultant in the digital television industry.

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Computer architectures

Take steps to secure your network from attack.

BY BRAD GILMER

Frequently, I have talked in this column about separating the broadcast core computer networks from business networks and the Internet. In the real world, things are not so clear-cut; there are many different network segments, all needing differing levels of connectivity and security.

Your facility probably consists of a number of networks, including a:

- secure network for broadcast operations (automation, etc.);
- traffic network for the traffic department;
- production network for post production, graphics and so on;
- news system network;
- business network (billing, sales, traffic, employee e-mail, etc.);
- demilitarized zone (DMZ) for Web hosting and streaming;
- virtual private network (VPN) for connecting remote studios and facilities;
- VPN for remote access from employees' homes, etc.;
- wireless network for in-house employees;
- wireless network for visitors; and
- an Internet network.

Let's assume that you have analyzed your facility and come up with the list above. The next step is to think about the connectivity required between the networks and the level of security for these networks. You might create a table similar to Table 1. (See page 30.) While you may disagree with the classifications in Table 1, the point is that different networks require a variety of security and access, and that the architectures behind these networks are determined by the clients' requirements for access to data across the network.

There are a couple of interesting things to point out in this table. Note that the traffic network and the VPN for remote access by employees both have demanding networking requirements. Clients require a high degree of connectivity to other networks. They need broad access to office applications, but they also have a high need for security.

These are challenging scenarios where security should be of considerable concern. The VPN requirement for security is clearly understood. But it may be less obvious that high security is required in the traffic department. Clients in these systems typically touch not only the business networks and the Internet, but also the highly sensitive broadcast network. Special care should be taken to ensure that the security of the broadcast network is not invalidated by problems with traffic clients. The same may be said of news systems because they demand a lot of connectivity to the outside world, but the information from these systems must also get to the broadcast core.

Figure 1 shows a high-level architecture that could be used to connect the various networks described in

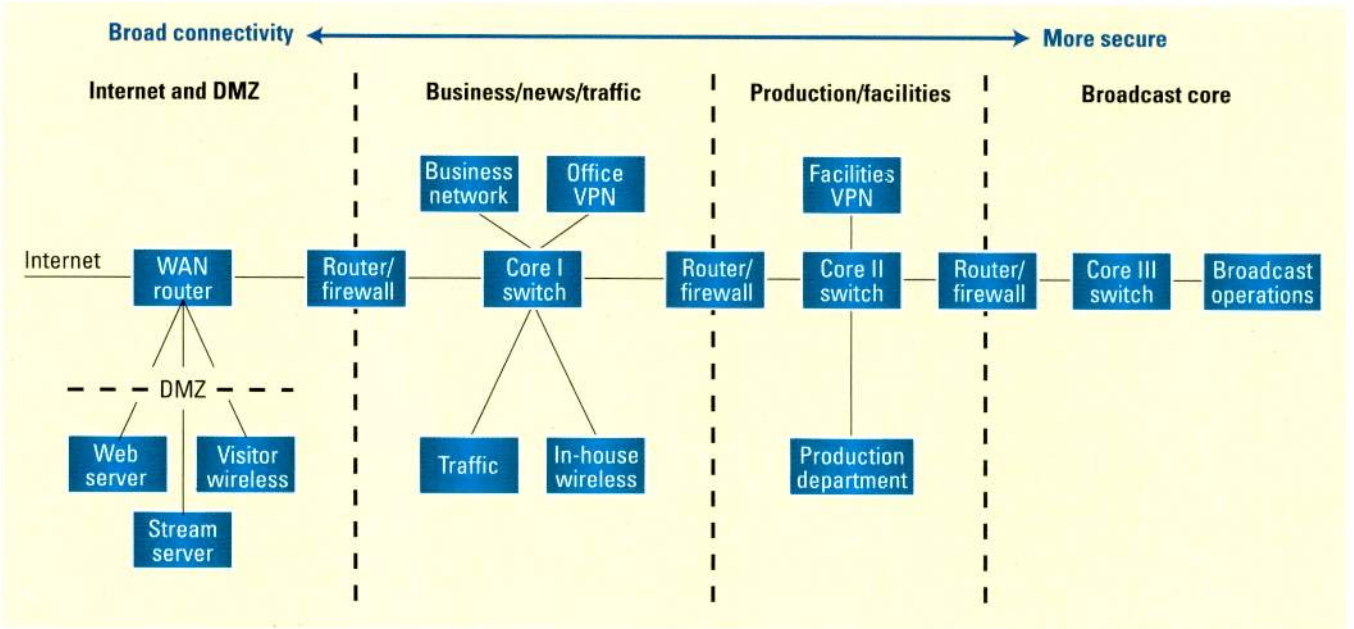

Figure 1. This diagram shows the high-level architectural design of a typical broadcast facility. Note that this architecture takes advantage of several different layers of security, while providing a high degree of connectivity within related departments.

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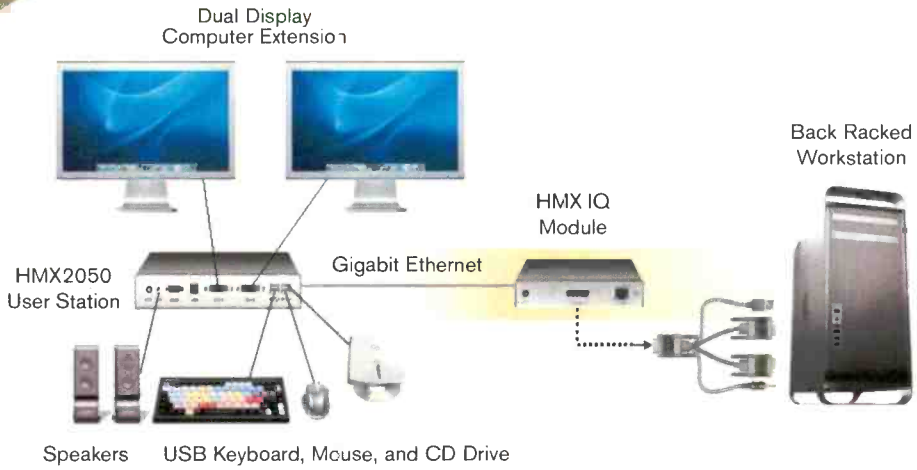

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Production	Medium	High	Medium
News	High	Medium	High
Business	High	Medium	High
DMZ	High	Low	None
VPN for facilities	Low	Very high	High
VPN for remote access	High	Very high	High
Wireless in-house	High	High	High
Wireless visitors	Low	Low	Low
Internet	Low	Low	Low

Table 1. When analyzing the architecture of your broadcast facility, a table such as this one helps you think about the architecture, security and access required by the clients on the networks.

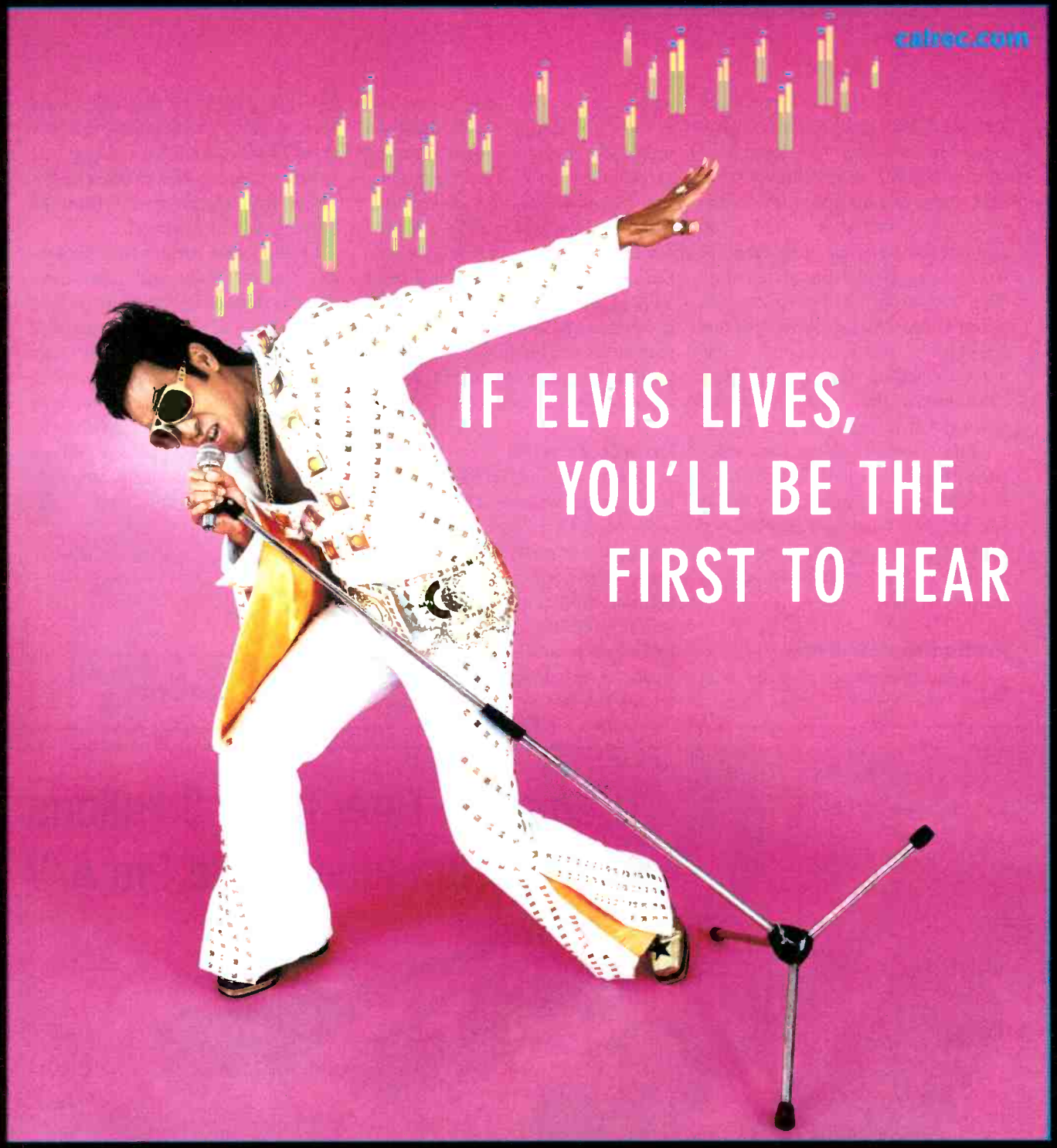
Table 1. The figure includes different network zones, or areas of security and access, such as Internet and DMZ, business/news/traffic, production/facilities, and broadcast core.

The networks on the left of the diagram have broad connectivity. The networks on the right are more secure.

Starting at the left of the diagram is the wide area network (WAN) router. This device connects the facility to the Internet. It also allows us to establish a DMZ for publicly accessible equipment such as Web servers, streaming servers and visitor wireless connections. Note that this is a simplified diagram. There are firewall components in the WAN router, but they are not shown here. There are also security components in the Web and streaming servers. Security is present, but it is not as tight as it is further into the network. The router/firewall connected to local area network (LAN) side of the WAN router isolates the main facility from the Internet and from people using visitor wireless services.

Business/news/traffic network

In the business/news/traffic network zone, I have grouped networks



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with similar levels of connectivity and need for Internet access. Also, generally speaking, these areas have similar security requirements. That said, there is a lot going on in this system that isn't shown. The news and traffic systems both require connections to the broadcast core. This is done by configuring access control lists (ACLs) in the router/firewalls of the system. Also, the news or traffic system may have components that connect to the networks at various places.

Think carefully about how these connections are made. You can use as simple or complex an approach as you like, but increasing connectivity without increasing the complexity/security of the network can lead to security issues.

Production/facilities

Production/facilities are the next layer of the network. As the diagram shows, this zone is more secure, and as with the last network, the clients on these networks are grouped by similar access and security needs. The production network has to be secure; however, people in post facilities still need access to other areas of the facility and the broadcast core. In some facilities, a VPN is used to connect two or more production facilities on a semi-permanent basis. This allows users in two facilities to exchange content as they work together on a project.

Broadcast core

Finally, the innermost network is the broadcast core. This core network is protected by a series of firewalls and routers that severely restrict access. Once again, ACLs and other security mechanisms play a critical role in protecting this network. It is important to protect the core facility from the malicious actions of people on the Internet or within your facility. That said, in all the time I have been working in the industry, I have never heard of someone hacking into an automation system or other on-air system from the Internet or from the business side of a network.

On the other hand, I have personally tracked down and fixed three failed computer systems that crashed in such a way as to render the network unusable for everyone. In all cases, these were hardware failures, and in all cases (fortunately), the broadcast core was insulated from the failure by routers, which prevented the garbage transmitted by these failed computers from reaching critical systems. BE

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

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TV mics

Choose the right mic for the job at hand.

BY BENNETT LILES

Despite the wondrous range of new gizmos and gadgets currently available to bend, shape, twist and color sound signals, there is still nothing that can substitute for the right microphone in the right position for the job at hand. The variables among microphone characteristics are substantial, however, general guidelines provide a solid start to any task using microphones for the more frequent television production formats.

Dynamic and condenser mics

It's important to choose the proper mic type and polar pattern. Dynamic microphones work on electromagnetic induction and are comparatively simple in design. For TV production purposes, their primary advantages are that they are tough (you can actually drive nails with some of them, though it won't help the cosmetics), and they don't require phantom power to operate. That's generally why these end up in ENG vans and road kits.

The dynamics share this space with electret condenser microphones, which require either an internal battery or phantom power from a mixer to operate a tiny preamplifier inside the microphone case. They generally provide better frequency response and higher output than dynamics.

The manufacturers of some field recorders recommend using condenser mics to provide a better signal-to-noise ratio from the recorders' microphone preamps. Condenser mic design has come a long way, but for pick-up of loud sound sources like musical instrument amplifiers, a dynamic mic is less likely to produce SPL overload and distortion because it doesn't have an internal preamplifier.

However, many of the newer condenser microphones have a switch on the case that can attenuate the signal by 10dB or 20dB for loud source pickup. Wireless mic body pack transmitters have a similar attenuation switch inside the case, and this is typically used when the transmitter is empolyed with an electric guitar or similar instrument with a higher output than the microphone.

Pattern and frequency

The second basic consideration is the pattern. Any new microphone should come with a polar pattern printout showing the directionality at various frequencies and the effect of pattern-changing switches. This should always be accompanied by a frequency response graph.

There is nothing that can substitute for the right microphone in the right position for the job at hand.

Due to basic audio frequency physics, microphones are less directional as the frequency goes toward bass. Low-frequency sounds penetrate, while higher audio frequencies bounce off solid objects like walls. Did you ever notice that you can hear the bass and kick drum from a live band while standing in the parking lot, but when you walk in the dance hall door, suddenly there are drum cymbals? In real-world use, microphones represent a typical case in which you don't get something for nothing. There is always a trade-off, and this is the essence of experience in microphone selection.

Omnidirectional microphones are less sensitive to breath popping and sound coloration when used for close-up handheld vocal applications, such as a reporter doing a standup in a high-noise environment.

Cardioid microphones pick up less background ambient sound, but require thicker (and more obtrusive) pop filters. Also, they tend to have a proximity effect that emphasizes bass when held close to the mouth. Singers often use this effect to their advantage.

Shotgun or hypercardioid microphones provide a tighter pattern but emphasize the proximity effect. For this reason, these types are used in situations where the microphone can't be placed close to the sound source.

Hypercardioid podium microphones can help prevent PA system howling by providing more gain before feedback, and this is a typical case in which the correct microphone choice should come before twisting any EQ knobs on the mixer. One hallmark of inexperienced sound operators is that they tend to think that EQ knobs only turn to the right.

Levels and power

Microphone lines carry weak, tiny signals that are vulnerable to inductive noise and hum from motors, lighting dimmer packs and ground loops. Balanced lines help reject induced noise. However, the best defense against background AC hum and other sound system trash is to kick up the signal level at the earliest possible point with a preamp.

A good battery-operated preamp can sometimes be placed inside a podium and supply the phantom power necessary for condenser mics. Most include a limiter, and gain can be adjusted, usually in 5db to 10dB

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steps. Many of the newer digital snakes also have preamps built into the snake head, and these may be remotely operated. Any time a mic signal is being split for separate house, broadcast or stage monitor feeds, the splitter should include a direct path for mixer-supplied phantom power and a transformer isolated path with a switchable ground lifter. Every sound kit needs to have one because it can also be used to isolate powered speakers and other sound gear that may get its power from an AC source incompatible with that running the main mixer. Phantom power levels typically run from 12V to 48V, and the higher the original sound levels, the higher the voltage on the phantom power that may need to be used. Podium microphones for normal speech can usually get by on 12V phantom power.

Coincident pair

Among the more frequently used techniques of mic placement for stereo recording is the coincident pair using two cardioid pattern microphones angled at about 90 degrees with the capsules placed as closely together as possible without touching. This works particularly well for recording sources that are spread out over a wide area, such as symphony orchestras, studio audiences and crowds at sports events. (See Figure 1.)

The coincident pair best guarantees monaural compatibility, while a spaced pair enhances the spatial effect of channel separation. In the case of the orchestra, the mics are typically hung about 20ft above and behind the head of the conductor. A number of coincident pairs may be needed on tall stands to capture the stadium or gymnasium crowd at a football or basketball game.

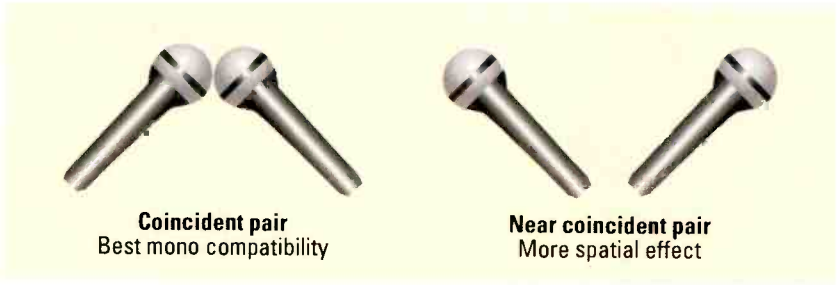

Figure 1. Stereo mics

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It is important not to put the signal from the ambient mics through the same compressor that is used for the announcer or sideline reporter microphones. Instead, group the mic signals for compression, because the variations in their close-mic levels will cause the compressor to pump the crowd sound, and this can be distracting to listeners. (See Figure 2.)

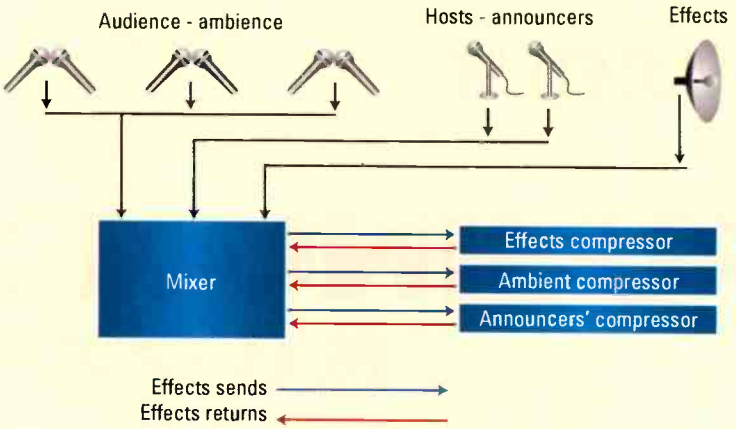

Figure 2. Mic compression

Parabolic mics used on football games can also have a noticeable effect on the crowd ambience because they are normally heavy on upper middle frequencies due to the size of the parabolic bowl. Parabolic mic faders should be treated like an airplane throttle — smoothly up and smoothly down.

Panel talk with lapel mics

The electret condenser lapel mics used on talk shows can be either omnidirectional or cardoid, but once again there is a trade-off. With half a dozen guests on the set, cardioids sound less reverberant but usually require pop filters.

Omni lapel mics don't pop as easily, but tend to pick up the other guests nearby. In a free-form discussion format, noise gates are no panacea because they can be triggered by guests on either side of the one talking, depending on which way the speaker's head is turned.

The best results are reached by anticipating the flow of conversation and keeping each guest's mic slightly below normal operating level until they begin to respond to the host. Multitrack recording can clean it up perfectly. However, in most production situations, the time required for post mixing is a luxury and, of course, not an option on live shows.

Once the characteristics of the microphones are familiar, audio for TV production formats isn't especially difficult to learn, but there's no substitute for on-the-job experience. BE

Bennett Liles is a writer and TV production engineer in the Atlanta area.

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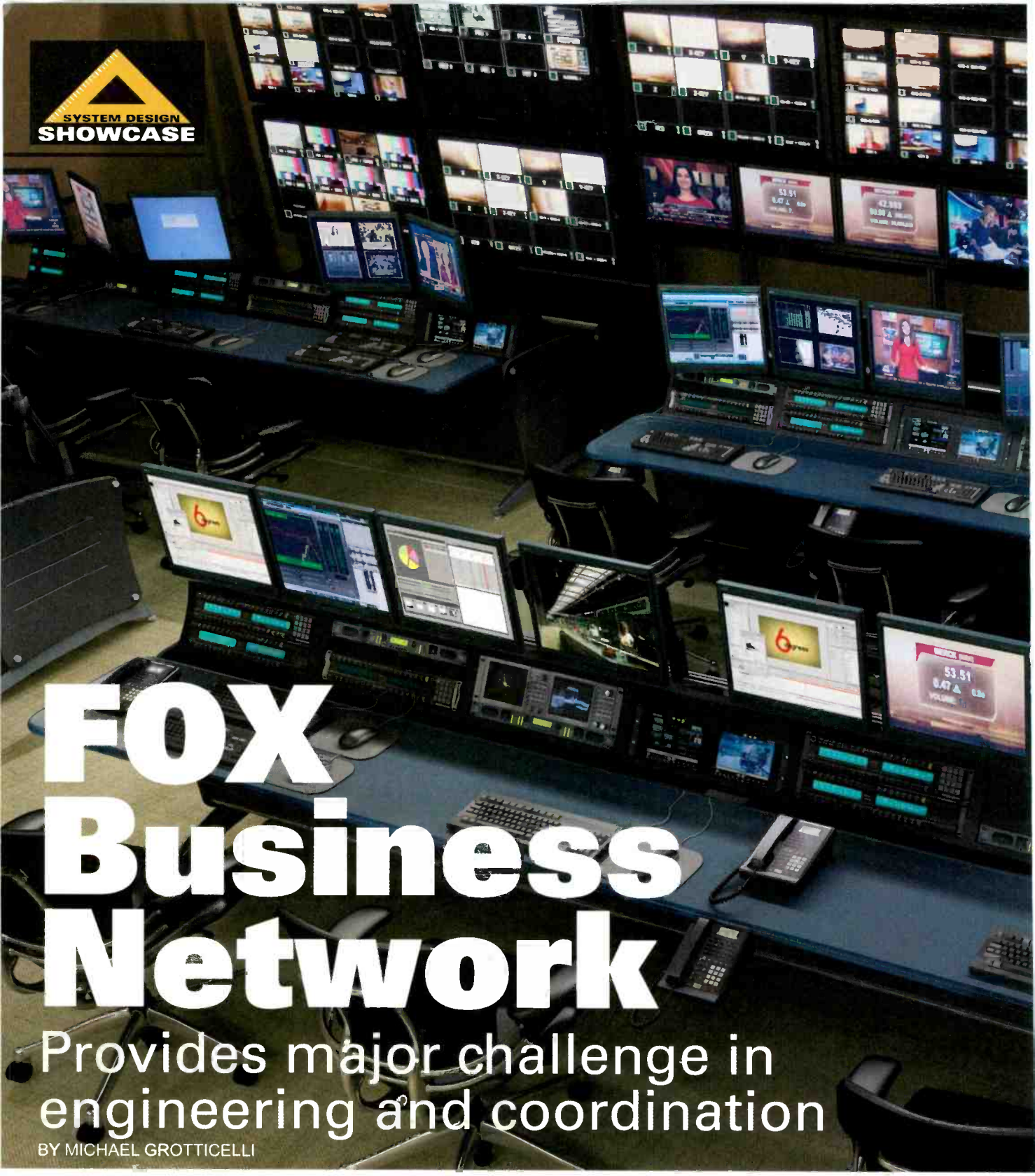


FOX Business Network

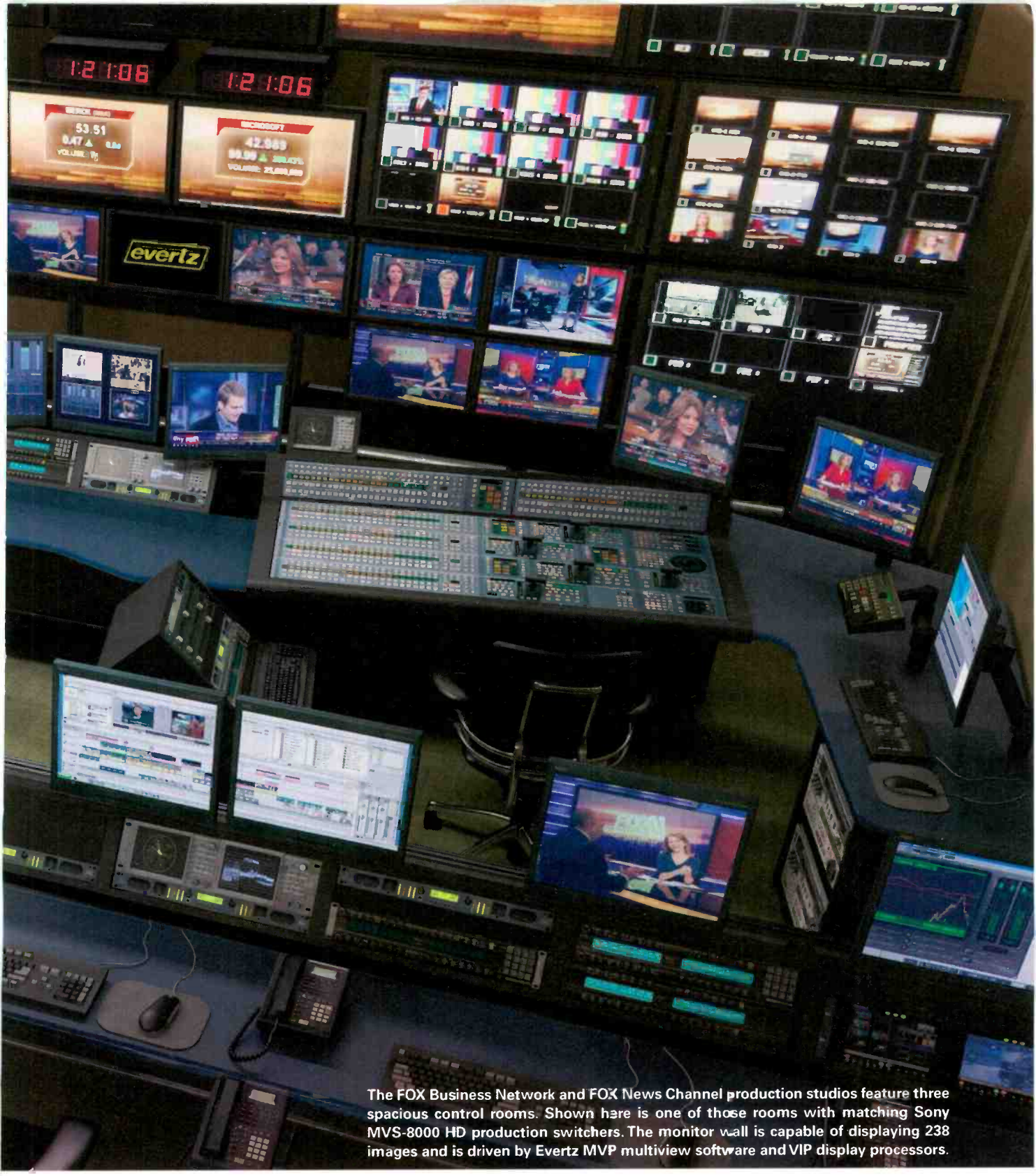
Provides major challenge in engineering and coordination

BY MICHAEL GROTTICELLI

In the realm of major facility builds, none was as challenging or as complex as the launch of the new FOX Business Network. Working within the confines of an existing space inside FOX News's main headquarters in New York City, three system integrators, hundreds of technicians and millions of dollars in equipment took the project from initial design discussion in April 2007 to on-air in a mere six months.

When you see the all-HD facility — with its multiple control rooms, production studios, and hybrid Fiber/Coax infrastructure — the feat is nothing short of amazing.

FOX engineers, led by directors of engineering Doug Butler and Peter Blangiforti, acted as prime integrator and coordinated various activities of all integrators involved. The outside systems integrators on the job included (in order of involvement)



The FOX Business Network and FOX News Channel production studios feature three spacious control rooms. Shown here is one of those rooms with matching Sony MVS-8000 HD production switchers. The monitor wall is capable of displaying 238 images and is driven by Evertz MVP multiview software and VIP display processors.

Ascent Media Systems & Technology Services, National TeleConsultants (NTC), IBM and Beck Associates. All spent numerous hours and lots of manpower to convert a former parking garage and retail space into an advanced HD production plant. Ascent's team, led by Rich Bisignano, senior vice president/general manager systems integration U.S., were on-site in July with a mandate to get the new FOX Business Network operational for an Oct. 15, 2007, launch.

NTC was brought in to design and build out the broadcast IT infrastructure, HD graphics facility and end-to-end tapeless system, including the ingest and playout servers, HD editing, ingest control, associated monitoring and storage integration systems. Beck Associates designed and installed the editing environment for FOX's creative services. This included moving the entire promo, new media and

online department to another floor. This environment features a large-capacity shared storage network and multiple Final Cut Pro and Avid Media Composer rooms that are responsible for both long-format and short news pieces. For master control playout, they use Omneon servers and Harris automation.

The new FOX Business Network's main studio features colorful LED light panels and robotic pedestals, as well as a jib arm with Ikegami HD-327 cameras.

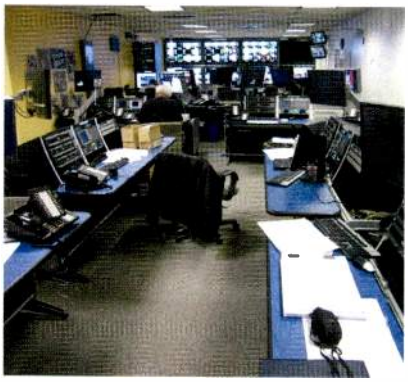
Having built the facility that supports the FOX News Channel at the same building in 1996, Ascent was familiar with the complexity of working in the 45-story skyscraper at 1211 Avenue of the Americas in NYC. A total of 40 Ascent people soon began working on the site.

Major engineering feat

Ascent's Bisignano said the project was so complex that to make it work, he had to institute the same skills and methodologies that are used on major civil construction projects. During the build, he arranged collaborative workshops in order to improve communication and identify FOX's needs upfront. These sessions are part of Ascent's "Collaborative Working" model, which helps foster productive communications between all of the various parties involved and eliminates project waste. And on a project like FOX Business News, wasting time was one luxury the teams did not have. Ascent's software integration team also provided ongoing support to FOX operations for the myriad of automation and graphics-automated events that take place virtually each minute at FOX Business News.

Multiple Thomson Grass Valley Trinix routers — including 1024 x 1024 I/O, 512 x 512 and 256 x 256 I/O configurations — manage the vast signal distribution system design. It includes 6000 cables representing more than 100mi of fiber and 100mi of copper to carry the SD and HD signals. There's another existing 512 x 512 router for SD signals alone. Much of the core routing system was prebuilt in Ascent's main headquarters in Northvale, NJ. In addition, each control room has its own Evertz EQX router to drive its monitor wall.

This infrastructure also supports the FOX News Channel, which



The main ingest area accommodates more than 125 feeds that come in daily and are converted in real time to a widescreen aspect ratio in both SD and HD by 10 operators.

recently went to HD broadcasting as well. Both Ascent and NTC are participating in this facility upgrade (in the same building) as well.

Throughout the building, and especially for the FOX Business Network, a massive amount of Evertz conversion and distribution products, as well as its multi-image monitor wall software, have been installed. Everything is fully HD-capable, including synchronization and timing systems, signal conversion modules, three MVP multimonitor display software systems, digital rack mount displays, 130 VIP multidisplay systems, analog/digital DAs, cross- and downconverters, 200 3RU frames, audio embedders and de-embedders, and three EQX routers (216 x 288 I/O and larger) to display signals to an operator's workstation at the touch of a button.

HD production workflow

All HD production is captured in 16:9. The on-air screen includes a ticker at the bottom, with the right side wider than the left to accommodate business information on companies. Standard-definition audiences see the ticker at the bottom.

The facility now includes three identical HD control rooms, capable of displaying 238 images on each monitor wall. The displays are Tamuz monitors driven by Evertz MVP multiview software and VIP display processors. The rooms also feature one of the largest digital intercom systems in the country, made by RTS.

These spacious control rooms, with matching Sony MVS-8000 HD production switchers, support FBN and FNC production studios located on the street level. All three feature robotic pedestals with Ikegami HK-327 HD cameras. Because there are so many sources coming into the studio, there's a separate 1 M/E Sony switcher in each control room to allow a set TD to switch sources as

A fully networked Calrec Hydra audio spider system in the audio mixing room allows FOX to multiplex signals and combine a large amount of sources (wireless mics, audio recorders, etc.). The system also enables any of the facility's studios to access any audio console in the building.

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The master control area has been designed as a series of four pods, with each pod capable of controlling three HD streams. Currently, one pod is dedicated to FOX Business Network, serving as the main and back-up channels for HD and a third for SD feeds. The FOX News Channel has recently moved into this new master control area. The system is the beginning of the roadmap for the transition to HD of all FOX News shows going forward.

There's also a main ingest area, called Acquisition, where more than 125 feeds come in daily and are converted to 16:9, in both SD and HD by 10 operators. This is done in real time, so that they can be used on-air quickly.

Specially configured broadcast service panels, with audio and video connections, have been installed at strategic locations throughout the building (even the roof) and hang on the walls of the studio. They include optical-to-electrical converters for all video signals, which are required due to the long distance between the studios and the equipment centers.

An audio spider system, the Calrec Hydra, has been installed, which allows FOX to multiplex the audio signals in order to combine a large amount of sources (wireless mics, audio recorders, etc.) with ease and flexibility. The system also allows any studios' audio to be mapped to any control rooms' audio console.

Among the 10 initial edit suites for the tapeless system (now called the Digital Newsroom Systems), DV 50 compressed files are enclosed in MXF wrappers and stored on a SAN, which is accessible to all FCP edit rooms for staff collaboration. QuickTime is used as well. Of the 10 edit suites, six are intended for short-form content, and four are for long-form content. The long-form systems have their own Omneon server for edit-in-place functionality, with ingest coordinated by a media manager workstation.

File-based challenges

Moving FOX from a tape-based model (it continues to use JVC's D-9 format VTRs) to a file-based infrastructure was no easy task. This was the challenge for NTC's engineers, who worked together with IBM to deploy IT technology that could handle 16:9 SD format files, which are up-converted for HD playback. The system will eventually migrate to either DV 100 or AVC-I file format for native HD playback. Panasonic P2 cameras are currently being deployed for field acquisition.

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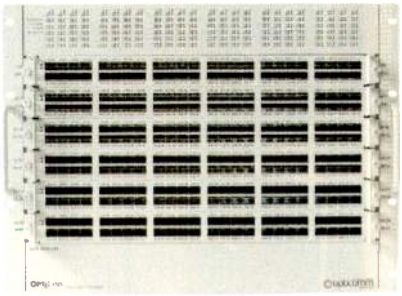

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newsroom system's tapeless environment and signal-processing infrastructure, FOX decided on an IT-centric infrastructure that brings together best-of-breed solutions for acquisition, playout and automation, editing, archiving and media asset management. This includes an Ardendo asset management system, Apple's FCP for editing, Omneon servers for ingest and playout, Pebble Beach for playout automation, and IBM, which integrated the software systems and provided the robotic storage and servers.

The NTC team designed a completely redundant broadcast local area network (LAN) system, broken up into four major sections: one for the core infrastructure; one for the graphics environment; one for the digital newsroom system; and another for master control and playout. Tom Michales, who headed up the NTC team at FOX, said data throughput and security necessitated that the network be divided into several VLANs.

The NTC design supports the numerous broadcast and production systems with a dedicated LAN to accommodate the large video files. Operating in parallel with the tapeless environment on the broadcast LAN, and a smaller edit system SAN for long-form content with an Omneon server and Final Cut Pro editing systems, NTC also installed a LAN for the HD graphics network. This is running all Vizrt HD graphics systems, VDS Financial Graphics software (for the automated generation of ticker graphics) and render farms. Foundry Networks Ethernet switches were used throughout the broadcast LAN to manage the heavy amount of traffic.

Flexible IT storage environment

Also deployed are several IBM

Multiple IBM servers were deployed to handle 16:9 SD format files, which are automatically upconverted for HD playback. IBM engineers also installed the software and robotic storage systems.

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storage systems, IBM servers, Fibre Channel switches, and an IBM LTO-based tape archive system for long-term storage. There's also a substantial cache system whereby inbound feeds are recorded on Omneon servers. From there, the data files are transferred to online storage. Simultaneously, proxy files are made of the full-res material to allow Mac and PC users to view content from their desktops. Files can then be transferred to playout servers and finally sent off to the tape libraries for archiving, where they can be retrieved as needed.

NTC's Michales says this is one of the largest LAN systems in the broadcast industry, boasting a 10GB/s backbone, GigE connectivity to all devices, Fibre Channel connectivity and a control LAN with more than 2000 nodes. It's been set up to ensure total system reliability and flexibility, with a high level of resiliency and fault tolerance. It doesn't get any more sophisticated than this.

The biggest challenge for Ascent, NTC, IBM and the FOX engineers on this project was dealing with different aspect ratios and having to convert them to a common format. The system that Ascent and NTC put in place handles all signals and automatically converts them, so FOX engineers never have to worry about a piece of material's signal type.

Summary

In discussing the project with everyone involved (all of whom have worked on big jobs before), they all agree that the most unusual aspect of this job was the insane timeline. That, coupled with the fact that they were working with limited physical space (under the street level of the building) and that they had to build the facility within an operating core of the 24/7 FOX News Channel without affecting what it was doing or taking it off-air.

Many people still can't believe what they accomplished. For example, toward the end of the project, the Ascent team installed $1 million worth of equipment per day for about two weeks. The experience was positive and exhausting.

The FOX Business Network had to be on the air on Oct. 15, and the project was mostly finished by Oct. 3. Looking at the file-based production environment in place and the ease at which a massive amount of HD content is created and displayed on-air every day, now the FOX News Channel wants the same thing for its staff. BE

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

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SYSTEM DESIGN
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Design team

FOX News/Business
Warren Vandeveer, sr. VP of eng. and operations

Studios, control rooms, core infrastructure
Doug Butler, dir. of eng.; Mike Young, project mgr.; Greg Ahlquest, dir. of digital media production; John Collins, Mike Liebman, Steve Blot and Warren Langrock, engineers

Graphics
Peter Blangiforti, dir. of eng.; Scott Buchholz, proj. mgr.; John Fenton, eng.

IBM Global Services Team
Bill Baer, CTO; Fabio Schiattarella, proj. mgr.; Mike Outlaw, Brad Christus and Mike Baba, engineers

Ascent Media Services
Rich Bisignano, sr. VP/gen. mgr., systems integration U.S.; Jack Dawson, sr. VP, facilities planning; Steve Vitale, Steve Sabin: sr. proj. mgrs.; Laura Gross, dir., solutions architect group; Marilyn Pierce, dir. of IT and tech. group; Ken Brueck, lead installation supervisor; John Ciulla, sr. proj. eng.; Scott Whitcomb, broadcast LAN lead eng.

National TeleConsultants

Project management
Tom Michales, program mgr. and proj. mgr. of tapeless and long-form edit; Steven Mendel, proj. mgr. for graphics; Gary Katz, installation supervisor

Graphics
Rich Hill and William Hooper

Tapeless and long-form systems
Jim Schoedler, Bob Blanks, Don Markus, Keith DeBelius and Pete Nehl

Beck Associates
Paul Kast, dir. of eng., Northeast; Joe DiFrisco, sr. proj. mgr.

Technology at work

Apple Final Cut Pro
Ardendo asset management system
Avid Media Composer
Calrec Hydra audio spider system
Evertz
- Conversion and distribution
- MVP multiview software
- VIP display processors

Foundry Networks Ethernet switches
Harris automation
IBM
- Storage systems and servers
- Fibre Channel switches
- LTO-based tape archive system

Ikegami HK-327 HD cameras
Omneon servers
Pebble Beach playout and automation
RTS digital intercom
Sony MVS-8000 HD production switchers
Tamuz monitors
Thomson Grass Valley Trinix routers
VDS Financial Graphics
Vizrt HD graphics systems

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ESSENTIAL GUIDE to automation

Crawford Communications' tapeless server and playout system, ENCOMPASS.

Broadcast automation has come a long way from being a simple playlist running a sequence of videotape cassettes in a cart machine. Early systems were primarily used to just handle spot breaks. The idea of having an automation system that could run both programming and breaks was only dreamed of.

Originally, broadcast automation was a control system, interfacing via mix of serial, parallel and GPI triggers to the video playback equipment. Basically, the automation system was the controller, and other (external) devices provided the content.

The introduction of the video server represented a significant advancement in what an automation system could do for the broadcaster. It now presents possibilities for broadcast playout operations that would have been impossible in the days of tape. Today's automation systems offer a breadth of features that can meet the demands of multichannel, multiformat delivery.

Also, the old divisions between the back office (program management, traffic and sales) and master control are blurring. The power of the computer has significantly changed the traditional operations of running a transmission center.

As computer processing power has increased, it is even possible to find video and audio processing taking place in the same chassis as the core control system. These "station-in-a-box" systems have transformed the economics of launching new channels and building disaster recovery (DR) and backup facilities.

An automation solution must serve many purposes. For management, it must reduce personnel, lower overhead costs, and decrease the number of make-goods. For traffic, the automation system manages the airing of spots and provides an as-run log for reconciliation and billing. For program management, it should deliver slicker presentation and branding — all without errors. This is a tall order, but today's systems can deliver.

Automation in broadcast operations

Automation bridges the gap between the business and engineering operations of a station, combining a web of software applications and IT-based hardware (See Figure 1.) Upstream is program management and traffic. Program management plans the daily program schedule, acquires programs, and manages the rights. Traffic, along with sales, fills the breaks

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IT Automation for New Media Platforms

The broadcast world is always moving on. Where once there were proprietary 'black box' equipment and formats, there are now open standards and file-based workflows. Where once there were complex, difficult-to-maintain chains of playout hardware from multiple vendors, there is now a powerful, unified software alternative that outstrips the conventional solutions in power and versatility of features, ease of use and adaptability to rapidly-evolving delivery platforms.

The new era of file-based automation and playout ushered in and led by OmniBus with the ground-breaking iTX coincides with the diversification of delivery platforms: where just a few years ago, linear broadcasting to fixed schedules was the norm, now media organisations have not only the conventional channels, but IPTV, VOD, and mobile TV to contend with.

To survive and prosper in this multi-platform world requires fresh thinking, and the technology to match.

OmniBus iTX makes the conventional broadcast automation, master control and playout chain obsolete. Combining and exceeding all the functions of a conventional chain in a single, integrated suite of software applications, iTX is flexible, open and feature-rich, and offers a significantly more configurable and responsive end-to-end solution for multiple operating environments and scenarios. With market-beating support for SD and HD, and exceptional ability to integrate with 3rd party systems, iTX delivers the most powerful solution available while significantly reducing the investment required to meet the challenge of operating high-quality channels in broadcast, IPTV, mobile TV, disaster recovery, and business continuity applications.

For the transition to HD, iTX offers the most effective way to get new HD channels up and running: not only is there a significant reduction in the investment required compared with a set up using conventional hardware, iTX also simplifies many of the technical issues facing designers of new HD installations, including dealing with 5.1 surround sound, the up-conversion of existing content, and producing hybrid schedules of HD and SD. As a single, integrated suite of powerful software encompassing all the functionality required to automate and play out new channels, iTX can help broadcasters get new HD channels to air very rapidly.

For mobile and IPTV applications, iTX offers the advantage of feature-rich versatility combined with the ability to quickly create high-quality crafted services for the new platforms. An iTX transmission stream can include video and audio transitions, logo insertions, voice-overs, and two-dimensional DVE moves for squeeze-and-tease effects. The entire content management, production and transmission process for multiple channels can be managed from a few standard PC desktops. In the competitive arena of new media, a quick launch combined with a high-quality, crafted channel brand can be crucial for grabbing audience share.

Whatever the delivery platform, security is equally important, and while every broadcaster wants to be protected against disaster, the economics of providing an alternative facility have until now been an obstacle to all but the largest. But with iTX BCP, business continuity can be ensured more readily and cost-effectively than ever before. Configured to provide continuity in the event of failure in any part of the broadcast playout operation, caused by power failure, interruption of database/framework services, loss of network access, or evacuation of the broadcast facility, iTX BCP's capabilities range from straightforward standby content provision in the event of sudden gaps in the schedule, through auto failover, to complete fully-redundant mirroring and remote operation.

Advanced automation, flexible and feature-rich production tools, rapid installation and the ability to integrate seamlessly with a wide range of operating environments are the key requirements for success in today's dynamic market. For this file-based, multi-platform broadcasting world, the powerful end-to-end solution provided by OmniBus iTX offers breakthrough advantages to users around the world.

– Ian Fletcher, CTO , OmniBus Systems


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require an in and out time code to select the correct part of a file to play. An event may require other parameters as well — for example, switcher transition or secondary events details.

There also is a special type of event: a live event. This commands the switcher to select an incoming line, which could be a network feed, the news studio feed, or a backhaul feed from a sporting event. Some live events have a predetermined end time, when the schedule starts again under automation control. Others may need the operator to restart the schedule.

Indeterminate finish times mean that the following event start times must ripple back in time. Generally, the operator must intervene by shortening or deleting events to get the playlist back on schedule. Many events may run at fixed times that cannot be changed — commercial breaks, for example.

The device trigger can be as simple as a switch closure or GPI. This is commonly used to turn logos and bugs on and off. However, most devices are connected via LAN, which could be an RS-422 or Ethernet connection. The data passed over this link includes everything needed for the device to perform its task. Typical information might include tape ID, file name and time codes.

Some devices require time to load a file and cue to the correct location. For instance, video servers must precharge decoders so they can play precisely on cue. The automation system will "preroll" such a source some seconds before the event, so it is waiting for the cue to play the event. A VTR might take five seconds to run up to speed, but most sources today require less than a second of latency to play on cue.

Secondary events

In addition to the primary event, many secondary events sometimes must occur in parallel. These could be lower-thirds, voice-overs, logos or any number of graphic elements. These secondary events are often program promos, coming-ups, branding logos and clip titles to promote the channel or station and upcoming programming. The primary events in a schedule are the programs and ads.

The interstitials (elements between programs or ads) often require multiple layers of live or stored video all keyed over a live or static background. These foreground layers are classified as secondary events and may include voice-overs, snipes, squeezebacks, branding and partial screen clips or tickers.

Aspect ratio and crossconversion

While many engineers may wish it weren't so, we will forever live in a world of mixed aspect ratio programs. This means schedules will contain programs and commercials with a mix of 4:3 and 16:9 material. One solution is to use an in-line aspect ratio converter to provide a single aspect ratio for transmission. Another solution, in which the broadcaster can retain control over his displayed images, is to rely on Active Format Description (AFD). This metadata lets the broadcaster control how a cable receiver/converter formats 16:9 images for legacy 4:3 receivers. Having the automation system ensure the proper delivery of the AFD is key to making this a seamless process. A similar process can be used when transmitting mixed SD and HD material. The automation system can control any needed up/downconversion as appropriate.

Because broadcasters will inevitably need to handle many formats with different resolutions (SD and HD; 4:3 or 16:9; and different codecs including DV, HDCAM, IMX or SDI), solutions need to be flexible. While these conversion tasks can be done at ingest, a modern IT-based automation system can render the images on the fly at transmission. This greatly simplifies a workflow because the program files can be left in their native format.

Business continuity and disaster recovery

Many larger networks and station groups require comprehensive DR facilities to ensure business continuity. Extreme weather or other events such as earthquakes, floods or even terrorist threats represent a significant business risk to broadcasters. While backup power supplies can be built, what if the broadcast center is severely damaged? Is there another place to continue operations? Reviewing all the possible scenarios that might take a station off the air has led many broadcasters to consider building DR facilities.

Previously, the cost to duplicate an on-air playback center has been prohibitive when set against a totally unknown scenario. Some solutions implemented have relied on minimal equipment located at a transmitter site or other location; however, such solutions come with their own set of issues.

Fortunately, new low-cost automation systems make DR a feasible business proposition. By connecting the broadcast center to a geographically remote location via fiber, a broadcaster can have content and schedules mirrored to the remote site. The switch to this backup site can be almost instantaneous and provide as much or as little of the current operations desired. All this can be handled in a cost-effective, small-footprint solution.

Centralcasting

As groups began buying stations, they quickly looked to consolidate their workflows to one central site. This design is often called centralcasting. The goal is to operate multiple sites, when possible, from a single control point.

Variations on the model have led some satellite stations to insert local advertising that has been created and ingested locally. Similarly, local news is usually handled as a local insert. This allows most other operations to be centralized. Such a solution avoids

with ads. This combination results in a complete schedule of events or tasks for the automation system to perform.

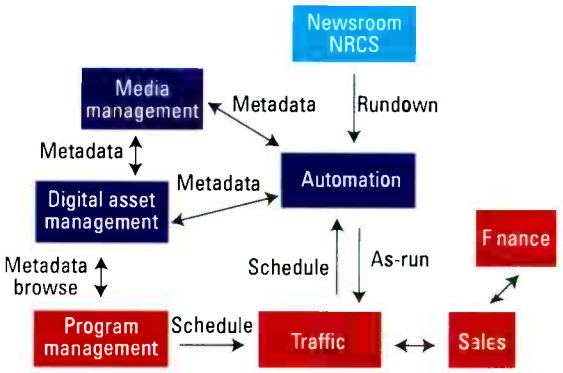

Figure 1. Automation is linked to many other systems in a TV station.

On the engineering side, automation, coupled with media management, controls the ingest of material for upcoming schedules and routes content to the correct on-air servers, even prepping it for transmission.

Workflow

Automation manages three types of content: programs, ads and interstitials. Content can arrive at a station via satellite, telco circuit or tape. The first stage is to ingest the content, QC the technical quality, and check the metadata. This latter is vital because the IDs and time codes must match the playback schedule.

Once a schedule arrives at master control (typically 24 hours ahead), the operator can check for missing content and make adjustments. As a channel plays to air, the operator constantly monitors for problems and perhaps switches out live feeds as required (See Figure 2.).

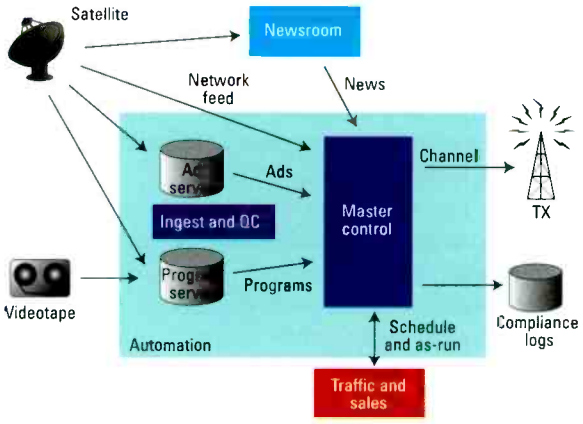

Figure 2. Automation manages content from ingest to air.

The automation system also creates a log of all events. This record is called an "as-run log" and is later reconciled with the schedule for ads billing. The as-run log has reduced the blame operators place on technology.

Challenges

Major broadcast platforms now run tens or even hundreds of channels. Legacy automation systems could rarely be scaled to more than a few channels. Modern automation products now make extensive use of IT infrastructures to build scalable, reliable systems at a lower cost than traditional video systems. And these systems can efficiently operate as many channels as desired.

Broadcasters and multichannel system operators have become more agile in the new world of multiplatform distribution, which now includes IPTV, Web and mobile. They may want to add new channels or a new graphics application to a channel, but they also want to make the changes quickly. Automation solutions must now be designed to provide flexible configuration and ease of installation.

Broadcasting has become more complex. So as the analog switch-off approaches, stations need to exploit the advantages of digital operation with flexible use of their multiplex. During off-peak viewing times, a station can swap from HD to four SD subchannels. Many broadcasters expect to multicast by providing regional or language variations of programs, or to add programming for the Web or mobile distribution, and they need to do all of this without increasing staff.

Automation 101

The basic operation of an automation system sounds simple: Play out a series of events/content according to a schedule. The reality is much more complex.

The automation system processes a schedule of events and compares that schedule with reference time code, which gives time of day. When the scheduled time for an event is reached, that event is taken to air. The complexity arises in that the system must run in real time and guarantee that each event goes to air with frame accuracy. The system must cue the correct material for each event while controlling several devices simultaneously.

Each event line in a schedule contains the information necessary to play that event. Basic information may include:

- Program/ad title
- Start time
- Duration
- Source device
- Program/ad file name or ID
- In and out time code

A program title allows the operator to identify the event, a start time indicates the time to trigger the event, and a duration field indicates the time until the end of the event. The source device name specifies the device (server, graphics, tape, live) for that event. The device name is used to route control to the appropriate device and also to direct the master control switcher to select that source. A file name or ID is used to load the video clip, CG page, etc. Many clips

duplication of staff, not only in on-air operations, but also in areas such as traffic and promotions.

Broadcast automation can provide the control system necessary to manage a geographically disparate operation. This allows the satellite servers to be scheduled remotely for the local breaks so a lights-out operation can be run outside of the newscasts. A wide variety of remote monitoring equipment is available that allows the network control operators to view off-air broadcasts from transmitters hundreds of miles away.

Integral or external video server

Early automation systems simply replaced the VTR or tape robot with a video server. While this worked, it failed to optimize the workflow and still represented a control device managing storage devices. Another solution, powered by today's PC platforms, provides an automation system complete with integral storage. Such systems are now becoming mainstream. These "channel-in-a-box" products are now beginning to replace separate server solutions for a variety of reasons (See Figure 3.).

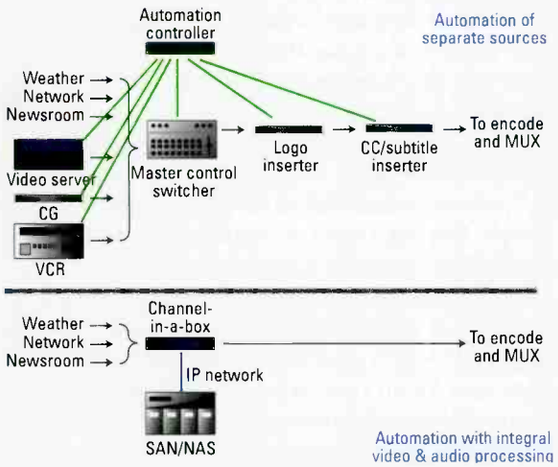

Figure 3. Automation once controlled third-party equipment. Channel-in-a-box systems now provide an alternate solution.

High-revenue channels and call-letter stations are often conservative in their choice of automation systems. Some of these operators may rely on a separate video server as a dependable route. Other operators recognize the ongoing benefits of IT and see newer solutions that rely on power PC technology as attractive.

While a hybrid system using integral servers may appear to be a single point of failure, that's not necessarily the case. A less expensive channel-in-a-box solution may actually allow a station to purchase an n+1 or even mirrored redundant system, which provides complete backup — perhaps at a lower cost than a stand-alone solution.

Multicasting and subchannels

With the analog switch-off fast approaching in the United States, stations are looking to optimize spectrum by multicasting. Call-letter stations can multicast by using the HD channel spectrum for a multiplex of SD secondary or subchannels during off-peak hours.

In DVB-T territories, initial digital services were multicast SD channels. As consumer pressure increases for HD services, some countries are reconfiguring multiplexes to carry HD services alongside the existing digital SD services. Automation enables stations to manage this potentially complex splitting and combining of channels with relative ease.

It's important when choosing an automation solution to be sure that it can accommodate both SD and HD signals simultaneously. Confirm that the solution can handle the many control configurations needed by multiplexers and encoders.

Promo automation

Channel branding is critical to standing out in a multichannel world. As broadcasters launch new channels or add subchannels, cross-channel promotion is becoming essential to keep the viewer's attention. Unfortunately, the creation of timely promos can tie up costly post-production resources and staff.

A smart automation system can actually create time-critical promos on the fly. Through the use of data-driven graphics templates, the automation system can pull together titles, times, temperatures, stocks, etc., and merge it with the template to create a promo graphic. It's no longer necessary to have a person do this hours, or even days, ahead of broadcast. The result is a huge benefit in terms of branding, promotion and cost-effectiveness.

The bottom line

Today's automation systems provide a wide range of features and functions and can handle the requirements of broadcasters ranging from a major network to a basic movie channel. The technology has evolved from a control system for VTRs to a complete platform that encompasses file storage and graphics processing. In real terms, costs have fallen as the manufacturers move to IT platforms for much of the signal processing, and automation feature sets continue to evolve based on the demands of new markets of IPTV, Web and mobile television.

When buying an automation system, there are many questions to consider. Does it need to handle live events? Does it integrate with media management? Should it be a channel-in-a-box or separate server design? How much graphics automation is needed? How much backup is needed? How easy is it to expand, both in terms of storage and control?

Broadcast automation systems allow broadcasters to add channels, to deliver to new markets, and to improve their on-air look — and can do so without increasing staff. Perhaps best of all, automation equipment cost is falling as more IT solutions become available. For the broadcaster, this is a win-win situation.

– David Austerberry

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Seamless ad insertion

Target ads to a specific audience with DPI.

BY YANIV BEN-SHUSHAN

Over the past several years, digital program insertion (DPI) has enabled seamless commercial ad insertion into an MPEG stream. Service providers realize the business potential that lies in this technology, as well as the quick return on investment, and are expanding and investing in more digital splicing channels.

To date, the technology for regional ad insertion has mainly been based on MPEG-2 codecs — a mature technology that is widely available. However, digital video solution providers are developing products that will enable digital ad insertion not only on SD MPEG-2 services, but also on HD and advanced video codec (MPEG-4 AVC or H.264) services.

The transition to the new codec — in conjunction with the introduction of IP networking technology for video delivery — has provided an opportunity for enhanced and updated ad insertion solutions, resulting in further advancements in this space.

Breaking it down

The overall ad insertion system consists of many components that must interact according to certain expectations. (See Figure 1.) The typical system components are traffic and billing, automation, digital compression, a video server, and a digital splicer.

Many years ago, companies produced general-purpose splicers that functioned without decompressing the MPEG-2 signal. Interestingly, they performed splicing in multiple-program transport streams (MPTS), as well as in single-program transport streams (SPTS). When it became clear this technology functioned well, broadcasters' interest in it grew rapidly. They realized that if the splicing triggers were carried in digital form, new and expanded capabilities would also become possible.

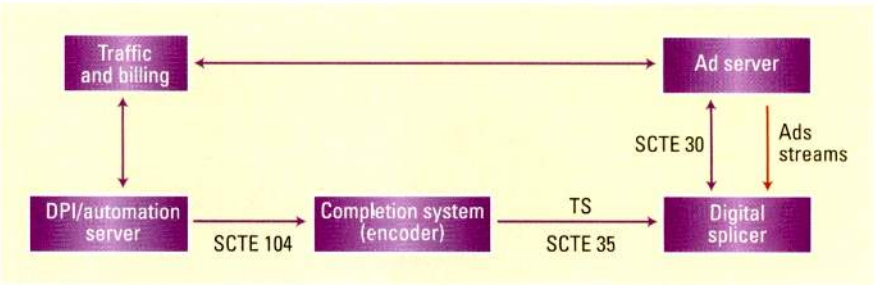

Figure 1. DPI architecture

A set of standard communication protocols between the automation system and the compression system, the compression system and the digital splicer, and the ad server and the digital splicer were established. The protocols make sure that all the components can easily be integrated and work together, no matter which vendor's equipment is being used.

Drafting of the standards began several years ago, focusing initially on the splicer/server portion of the system and permitting continued use of the existing contact closure mechanisms. The standards for the in-band signaling between the compression system and the splicer/server were devised shortly thereafter.

The Society of Cable Telecommunications Engineers (SCTE) created the following standardization protocols:

- SCTE 35 defines the cue messages that are embedded in the transport stream (TS). It also defines the upcoming splice points and other timing information.
- SCTE 30 defines the communications between a splicer and the ad server in response to the messages defined in SCTE 35.
- SCTE 104 defines the communications between an automation system and the compression system that will insert SCTE 35 private sections into the outgoing transport stream.

FRAME GRAB

A look at the consumer side of DTV

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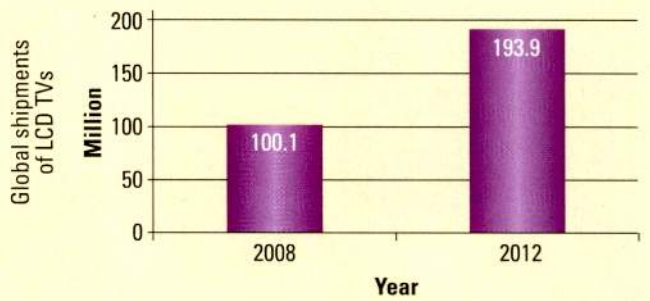

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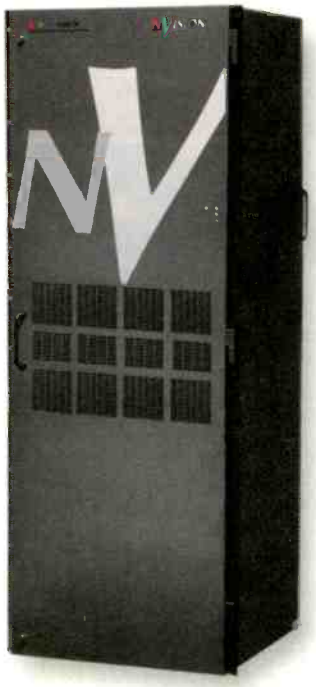

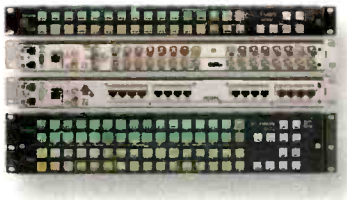

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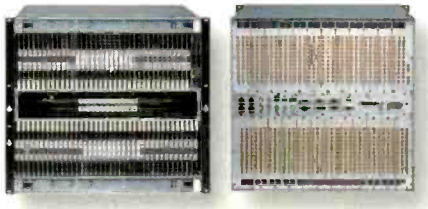

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Integration

Now let's try to understand how the system works and how all the parts come together. The signal flow begins with the compression system that receives live content and compresses it in an MPEG stream. The automation server triggers the compression system to place SCTE 35 messages in the TS. The positions of advertising avails are signaled by SCTE 104 from the automation server to the compression system.

The digital splicer extracts the SCTE 35 message from the TS and then passes the splice request to the ad server over a SCTE 30 message. The ad server receives the schedules from the traffic and billing system. The schedule contains the information that specifies the channel and which ad to insert at which time. The ad server follows these instructions when the splicer requests an ad. The splicer inserts material from the server in place of the incoming transport stream in response to SCTE 35 commands embedded in the TS.

Customer expectations of a fully digital ad insertion system's performance are fairly high. Moving from a traditional ad insertion architecture, using baseband, to a fully digital system introduces the need for a more seamless splice because of the improved video quality. It is worth noting that the delivery of clean switches is the responsibility of the splicer involved, rather than the encoder or server.

Targeted ad insertion

The existing MPEG-2 ad insertion technology was designed and developed using rate shaping (requantization or re-encoding) as its starting point. Rate shaping is widely used by service providers who want to groom a set of channels into a fixed bandwidth pipe. It is therefore no surprise that the majority of ad insertion deployments to date have been within the cable industry, as its hybrid fiber-coaxial (HFC) architecture requires delivering video in fixed bandwidth pipes known as quadrature amplitude modulations (QAMs).

The fact that more cable networks are segmented is one of the biggest advantages with respect to digital ad insertion, or to be more specific, regional ad insertion. In fact, the first motivation for segmenting the cable network was to offer on-demand services, but soon after that, operators discovered that they could use this architecture for ad zones. A large cable operator has the ability to insert different ads in various geographical locations on the same program.

This network topology enables pay-TV operators to insert the right ad to the right target channel at the right time to gain the maximum impact, which enables them to charge a premium for the ad insertion service. However, this kind of service needs to be cost-effective in order to be successful. The ad servers need more capacity, more streaming throughput and the right pricing structure. The same goes for the digital splicers, which require a dense architecture and more throughputs. This is the first step toward targeted ad insertion.

While DPI technology was rapidly adopted by the North American cable market, the international market is moving toward this technology at a much slower pace. The main reason is the number of channels the MSOs are allowed to splice into, which is increasing and will soon make it worthwhile for those operators to invest in a DPI solution. However, longer term, the industry is likely to transition to a fully unicast IP-based environment that will incorporate targeted ad insertion. BE

Yaniv Ben-Shushan is product marketing manager for Harmonic.

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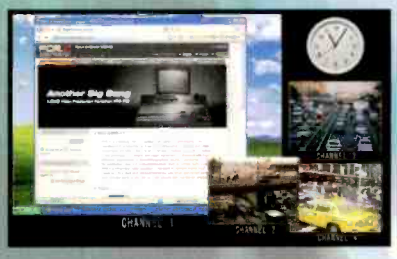

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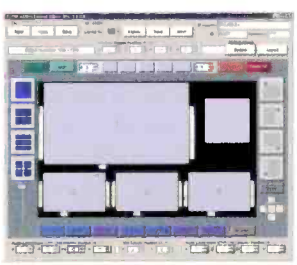

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Monitor and control

Media and broadcast monitoring enters the digital age.

BY JOHN HOOKER

The ability to monitor and archive as-aired content has long been an important function for broadcasters, but it has taken on even more urgent and critical dimensions in today's increasingly digital world. Facing growing competitive pressure to convert to fully digital operations and provide high-definition offerings to their ever-more discriminating viewers, broadcasters have moved quality of service (QoS) and quality of experience (QoE) to the top of the priority list. Proactively monitoring and viewing what goes on the air, exactly as the audience sees it, is the only sure-fire way to determine whether a broadcast is meeting a station's high-quality standards — and to take quick corrective action if a video or audio fault does occur.

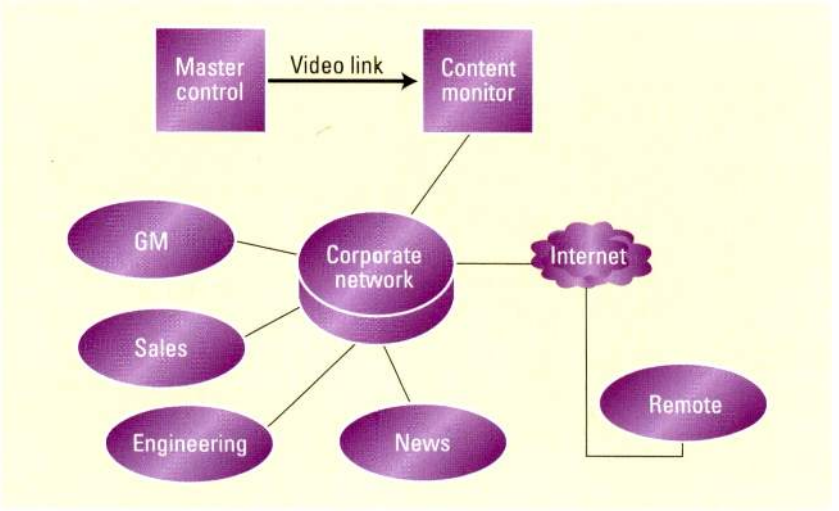

Figure 1. Content monitoring in a broadcast environment

One system, many applications

In addition to quality assurance, a dedicated system for content logging and monitoring can be indispensable to many different functions within the broadcast organization. (See Figure 1.) By providing an archive of aired content over a specified time period, the system enables a station to validate compliance with federal regulations, such as closed captioning, or back up its agreements with performance rights organizations such as ASCAP and BMI.

Also, stations can validate to their advertisers that commercials ran as contracted and use the archived video to respond to viewer inquiries. The ability to retrieve and export selected video clips enables broadcasters to repurpose content for a wide range of uses, such as posting to a Web site, and even turn the content into a revenue generator by making it available for sale.

Finally, content monitoring plays an important role in competitive analysis by allowing broadcasters to make side-by-side comparisons of their own programming with that of their competition.

Beyond videotape: the digital revolution

As compelling as these benefits are to a broadcasting operation, they are difficult, if not impossible, to achieve using the traditional means of recording and archiving. Until recently, broadcasters have relied on cumbersome manual processes and videotape to capture aired video. These systems not only lack spontaneity but are fraught with inefficiencies.

Videotape-based monitoring systems are becoming extinct like most other analog- and tape-based processes.

The delays inherent in a tape-based system make it untenable for fault detection and quality assurance. In this setup, error resolution is typically a reactive process initiated by customer complaint calls. After spending time viewing videotapes to locate the fault, the operator must manually dub off the tapes in question and circulate them to the engineers, who can finally start working to resolve the issue — perhaps hours after the original complaint came in. It doesn't take a rocket scientist to see that this is not an optimal strategy for maintaining QoS.

The good news for broadcasting operations is that videotape-based monitoring systems are becoming extinct like most other analog- and tape-based processes in the broadcasting environment. Digital, file-based video monitoring and logging solutions are turning best practices on their head and making fault detection a proactive exercise in which errors are found, identified and corrected before they turn into customer complaints.

This new breed of logging and monitoring system harnesses a broadcaster's standard computing environment to deliver a new degree of immediacy and efficiency to the tasks

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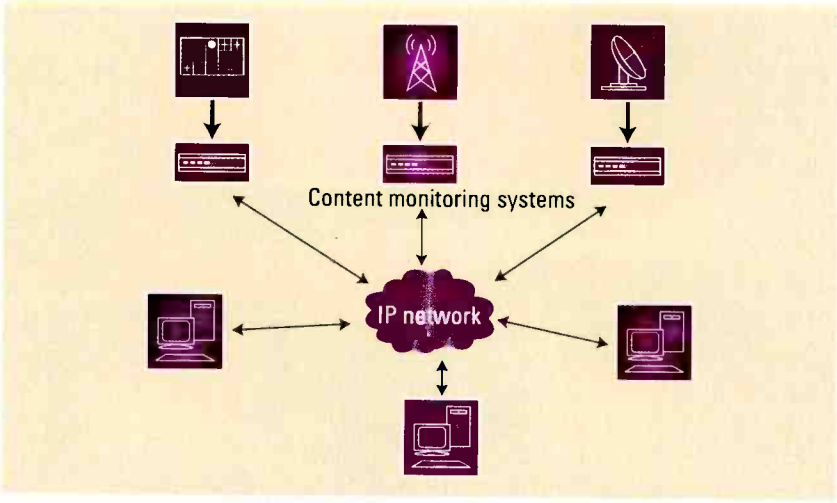

Figure 2. Advanced streaming technologies make it possible for logging and monitoring systems to pull video from a variety of sources and transport the clips for viewing over computer networks, using familiar Web browsers.

of locating, sharing and saving video. By using high-density storage strategies such as RAID, the digital systems occupy a tiny fraction of the footprint left by yesterday's huge cabinets of videotapes. Advanced streaming technologies make it possible for the system to pull in video from a variety of sources and then transport the clips for viewing over computer networks using familiar Web browsers. (See Figure 2.)

Monitoring essentials

In order to deliver on its full range of potential for quality assurance, compliance and validation for advertisers and other customers, a digital content monitoring and archiving system must offer some important baseline functionality. The key building blocks for an ideal video monitoring and logging solution include:

• *Effective video compression.* The system provides efficient video compression so the content can be delivered through a typical IP network and viewed over a standard platform, the PC, without a significant loss in video quality. Furthermore, it supports an industry-wide compression format, such as Windows Media 9, which is more efficient than earlier compression standards like MPEG-2. The

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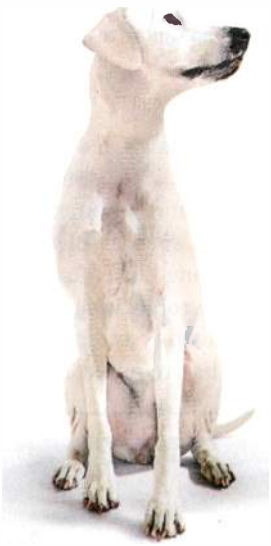

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system must allow the broadcaster to choose from several levels of compression based on available network bandwidth and requirements for video quality on the monitor screen.

- *Modular scalability.* The system needs to expand easily to monitor many channels as the station or cable provider expands its offerings.
- *Multichannel display.* The system displays multiple video streams simultaneously on a single screen to enable side-by-side comparisons and other types of video analysis. (See Figure 3.)
- *Support of standard, intuitive user interfaces.* In order to run in an existing IP network, the system comes bundled with its own Web server and offers easy, ubiquitous access from any Web browser, anywhere. Likewise, the interface enables broadcast engineers to work with the video using the commands they're used to, such as fast-forward, rewind, stop, pause and play. Also, the system displays EPG information exactly as it would appear in its native format, with easy-to-use checkboxes for selecting specific programs or channels to record. (See Figure 4.)
- *Robust searching capabilities.* An effective monitoring system includes a searchable database, with closed captions acting as keywords on which operators can search for and retrieve video clips.
- *Comprehensive fault detection and alerts.* Based on thresholds established by the broadcaster, the system will continuously scan multiple channels and automatically detect common transmission faults, such as black screen, low or missing audio levels, missing closed captions and even macroblocking errors. (Macroblocking has been particularly troublesome for broadcasters and cable operators alike because it traditionally has required hu-

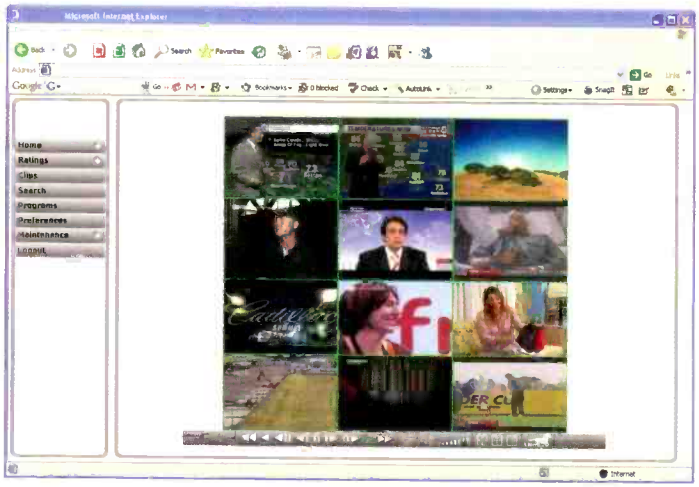


Figure 3. A monitoring system should have the capability to show multiple video streams simultaneously.

Figure 4. Monitoring systems should display EPG information as it would appear in its native format.

man intervention to spot the on-screen anomalies.) Once a fault is detected, the system automatically triggers an e-mail alert notifying the operator and providing a link to the video clip demonstrating the problem. Another option is to interface with the station's network management system to issue alerts based on SNMP traps.

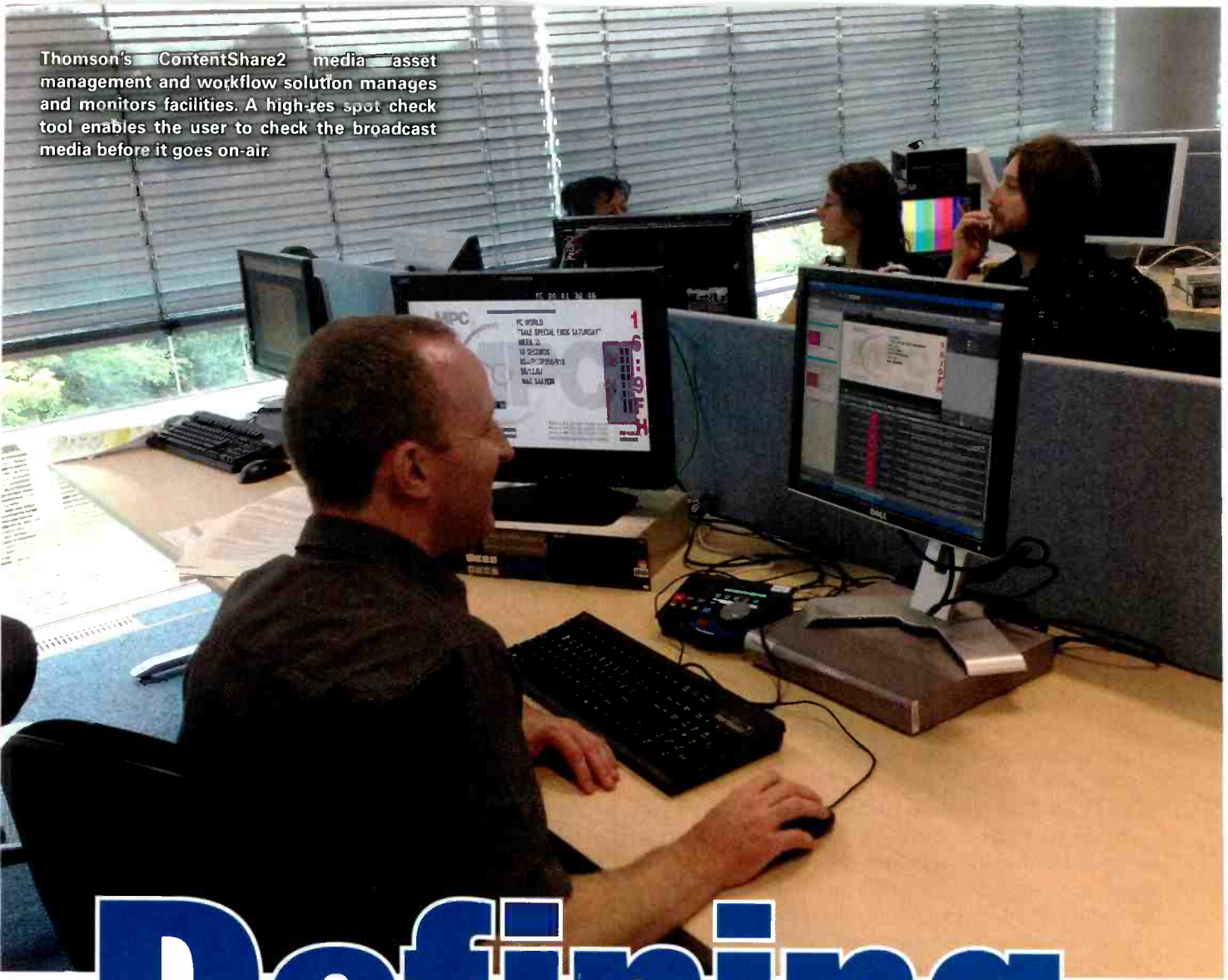
- *Multiple scanning and recording options.* The system provides variable scanning based on the broadcaster's specific requirements (e.g. fast scanning for a large channel lineup or slow scanning after a problem is detected in order to focus on a particular sub-lineup and narrow the search for troubleshooting). In addition, the system provides the option of selectively recording specific channels or even specific programs based on date and time as displayed by a downloaded EPG.
- *Easy data import.* The monitoring system enables easy import of external data to support video access and analysis, such as downloading of Nielson ratings information for side-by-side competitive analysis of multiple news broadcasts or importing of a station's own as-run logs for quick identification of video segments as they have actually aired.

Conclusion

Although the rush to convert to digital operations is placing unprecedented stress on many broadcasters, the emergence of new digital and file-based technologies is helping to ease the burden and create new efficiencies and opportunities to increase QoS.

Digital content monitoring and logging systems provide a win-win situation for broadcasters and viewers alike. For broadcasters, these solutions deliver powerful capabilities for proactively tracking and correcting video faults, maintaining compliance, performing competitive analysis and providing accountability to advertisers. Perhaps the biggest winners are the viewers themselves, who will ultimately benefit from television and cable reception that meets their expectations for dazzling and error-free HD viewing. BE

John Hooker is product marketing manager at Volicon.



Thomson's ContentShare2 media asset management and workflow solution manages and monitors facilities. A high-res spot check tool enables the user to check the broadcast media before it goes on-air.

Defining asset management

BY ERIC DUFOSSÉ

While technologies have advanced dramatically since the TV business started 60 years ago, the fundamental workflows have not significantly changed. The transition from film to tape and eventually to file-based delivery over a shared storage network has made life easier, but it hasn't altered the basic operations used to create and distribute content. Business applications (billing and traffic) are still disconnected from content playout. And, the different operators' roles in a TV station have remained primarily the same, even though the required skills have evolved. The result is that many stations have rigid, inefficient and expensive workflows, despite new technology. These factors can greatly affect operating expenses (OPEX).

Fortunately, new IT commodity products, standards and technologies can be leveraged with asset management to provide flexible, efficient and affordable solutions. When IT is combined with asset management, content is produced faster, with higher quality, fewer errors and at lower cost. Let's look at some of the issues involved with implementing a digital asset management workflow.

The business issues

While asset management applies to most businesses, broadcasters face a unique limitation. They must sell commercial time, or spots, but there is a limited availability (24 hours) in each day to place those spots.

Consider the difference between a TV station's advertising slots and cans of paint for sale in a hardware store. Once a commercial time slot passes, that opportunity for revenue is gone. Yesterday's 10:16 a.m.

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commercial slot cannot be recovered. Yet, even if a can of paint doesn't sell on Tuesday, it's still available to sell on Wednesday. For broadcasters, time is everything.

In addition, spots often depend on the content itself. Some commercials may not be appropriate for children's programming. Or, sporting events may run long or short. What happens to scheduled or unscheduled spots? These factors make it difficult for MCR engineers to schedule commercials.

Finally, competition from the Internet, satellite, IPTV and portable/mobile video places tremendous pressure on stations to effectively manage both avails and content to maximize income. Unfortunately, if a station is locked into a tape-based workflow and old business practices, it becomes virtually impossible to maximize revenue or take advantage of new opportunities.

However, if a TV station can dynamically sell and manage advertising and content in response to short-term or changing events (i.e. weather or sporting events), new options are created.

For example, if it rains, there's an increased prospect of selling new advertising to basement repair and roofing companies. When the local football team wins, restaurant, fan and sports memorabilia stores may suddenly want to advertise.

If a football game goes into overtime, new ad slots open, but can they be filled at the last minute? It is seldom possible to take advantage of these last-minute opportunities with a tape-based or rigid workflow. The solution? TV stations must implement an effective digital asset management system that can support such time-sensitive events and new content streams.

Create more content

The development of new content is one area where TV stations have an advantage over all the competition. Broadcasters generate tons of content every day. That content can be sold once, or with proper management, it can be sold many times over many channels.

This is where asset management can really shine. A DAM system manages the essence, the video/audio and the descriptive metadata. For those of you older than 40, think of metadata as an electronic version of the library card catalog. If you are younger, consider metadata as tags, like those used to describe Web or blog content.

Once the essence is tagged with metadata, either at ingest or through the editing process, the content can be stored, tracked, repackaged, transcoded and distributed in many ways. One benefit of a modern asset management system is that many of the steps previously done manually can now be done automatically. Let's examine some of the important steps involved with implementing a media asset management (MAM) system.

One benefit of a modern asset management system is that many of the steps previously done manually can now be done automatically.

Decision-making

Managing content, whether it's programs or commercials, across multiple channels is challenging, especially if it requires significant human intervention. These factors create a complex business environment and increase OPEX. The challenge is to improve workflow with the help of a systemwide infrastructure and workflow. The new workflow must effectively integrate the business system with the playout technology.

An example of an asset management system with a tightly integrated workflow is illustrated in Figure 1 on page 73.

HP & OmniBus Systems partner to deliver IT broadcasting solution

Getting there is the easy part.

Virtually everyone agrees that moving to a file-based infrastructure can be beneficial to a media distribution company's success, but physically (and technically) getting there is the hard part. The related time, effort and costs associated with such a major move can be daunting.

Nevertheless, due to an increasingly competitive environment, this migration has become extremely popular, as the roughly 64,000 broadcast channels worldwide grapple with the challenges of making the move to high-definition operations. What's become clear is the need for IT-centric, industry-standard hardware from companies like Hewlett-Packard (HP) and industry-specific software from a variety of vendors to enable broadcasters and media companies to make the transition faster and much more cost-effectively.

Making the transition allows them to take advantage of new advances in information technology, which come at a much faster rate than traditional video equipment can offer. This allows them to both lower their investment costs and improve reliability.

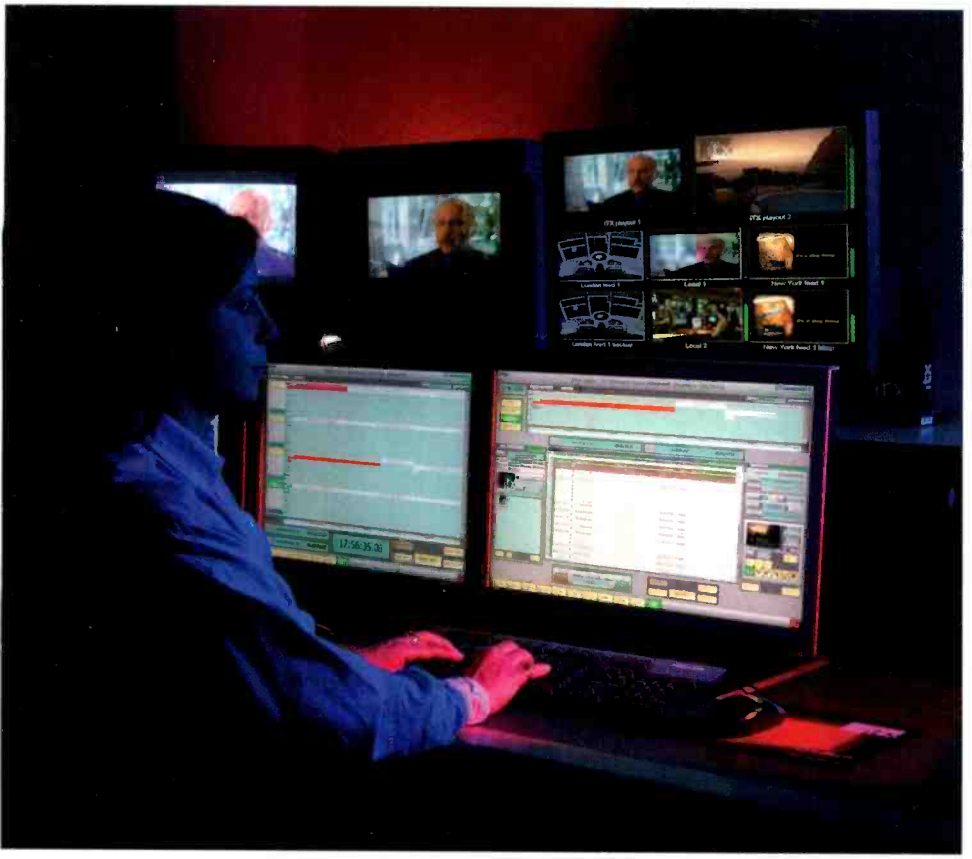
Another advantage inherent in the transition is the simplicity of the architecture. With HP technology and task-specific software, all of the functionality necessary to perform a variety of functions that traditionally were accomplished with individual, proprietary systems is now delivered in a single, integrated package. One such strategic partner that HP is working closely with is OmniBus Systems and its software-based suite of broadcast and production tools called iTX.

Using this tightly integrated, IT-centric, software-based approach, equipment installation and system operation are virtually foolproof. The result is that projects are faster to deploy, and the cost of ownership for customers is about 30 percent lower. In addition, power consumption is about 40 percent less.

"With the iTX platform, OmniBus has reduced the complexity of the system architecture while simultaneously increasing the feature set and functionality of what can be done," said Stephen McKenna, vice president of Media & Entertainment at HP. "That's the type of innovation that HP understands and respects. We're pleased to be working with OmniBus to offer broadcasters a robust solution that's both affordable and easily implemented into a variety of distribution environments."

The result is that projects are faster to deploy, and the cost of ownership for customers is about 30 percent lower.

Over the last two years, HP and OmniBus have partnered to deploy solutions at a number of the world's leading broadcasters. Working closely together, they've designed and implemented projects both large and small for a range of new services; from mobile and internet TV to multi-channel HD operations providing direct-to-home satellite services. The key driver is that it's now possible to use standard IT equipment to replace functionality that previously involved the integration of technology from a number of different vendors running



on proprietary platforms and different operating systems.

"Our largest iTX deployment to date has been an 80-channel HD system that serves the entire U.S.," said Ian Fletcher, chief technology officer at OmniBus. "This was based on standard HP ProLiant DL145 and DL365 and blade servers (with Serial Attached SCSI, PCI-Express-based storage and remote management capability). It was implemented cost-effectively due to the use of the off-the-shelf HP hardware."

The unique system design includes two separate redundant streams that ensure 24/7 reliability. Due to the success of the initial system, the content delivery operation has been increased to 120 iTX-based channels. It's all running on HP servers and includes new capacity for more, yet-to-be-launched channels.

Previously, file-based multichannel system integration has often involved spending countless hours trying to make several disparate pieces fit together and work seamlessly. With the iTX system running on HP hardware, much of the implementation guesswork has been eliminated because HP and OmniBus Systems have pre-tested the two technologies to ensure that they work reliably every time.

With the iTX system running on HP hardware, much of the implementation guesswork has been eliminated.

"We're now able to get these new channels up and running in an unprecedented amount of time," said Mike Oldham, chief executive officer at OmniBus. "What used to take months to deploy now takes weeks or even days. By moving to an open, IT solution, we've changed the whole dynamic of the industry and how it operates. With HP and Omnibus, you're taking about a certified solution that has been pre-configured and tested, so no matter how complex the installation, system implementation usually goes really fast."

This powerful combination of the HP server technology and the iTX platform allows broadcasters and a variety of new media companies to launch advanced services such as new HD channels, that are customized in different ways to suit individual needs. Among the key benefits for all are faster and more reliable performance of tasks such as file ingest, signal routing, server control, channel branding, logo and commercial insertion, and trafficking. The iTX system also facilitates error-free commercial insertion into live HD streams and real-time SD and HD encoding of content.

"We're always looking to partner with companies that solve problems large and small for customers; that's where we find the most success," said HP's McKenna. "OmniBus is a good example of that, so we've formed a good symbiotic relationship. Broadcasters now have opportunities to create new channels at lower costs than ever before. That market is now open to new players that bring innovation and price competition to consumers. That's been our driving strategy at HP and it's resonating with everyone we work with."

As today's video production and broadcast industries continue to move to file-based infrastructures, what better company to work with than one like HP that really understands ones and zeros? While more businesses take on the role of content distributors, HP technology is targeting the full spectrum of media applications — from the large screen to handheld devices — and is helping these new companies to reliably and cost-effectively create content once and distribute to many platforms simultaneously. For broadcasters and distribution facilities working with HP, getting there is the easy part.

For more information on HP's ProLiant servers for content distribution, visit www.hp.com/media/entertainment.

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Note that the uppermost part of the system is the business application. This is the heart of every TV station and where decisions regarding content and commercials are made. The rules regarding programs, channels and commercials are all handled by the traffic and marketing departments. The illustrated system confines much of the previously manual and disparate processes into a tightly integrated workflow. Once content is ingested into the system, it can be transcoded, moved, logged and played out based on workflow templates. By integrating the business decisions with content, metadata and controlled playout, OPEX can be reduced while maintaining a high-quality output.

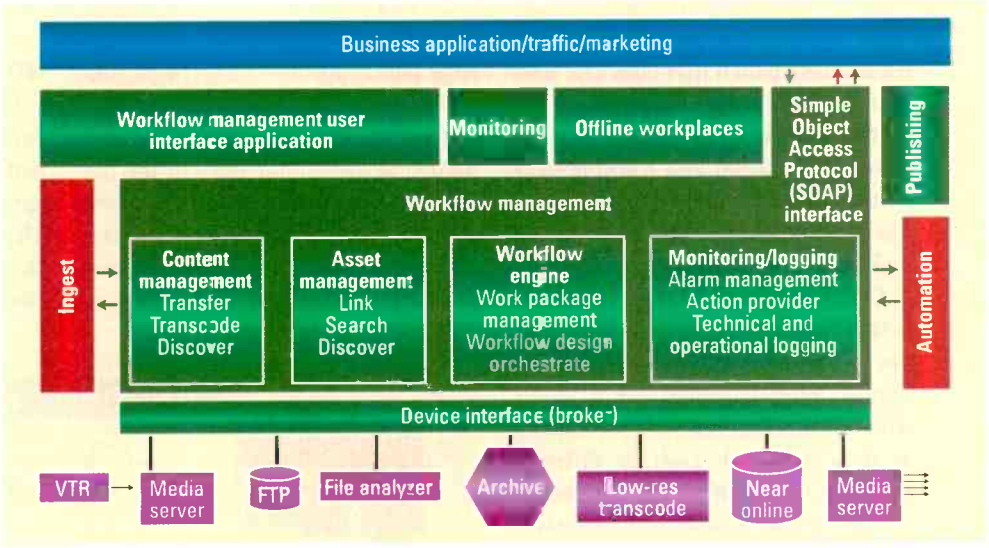

Figure 1. An effective asset management system will tightly integrate both the business and technical processes of the TV station. Templates are developed to direct workflow from ingest to output. This reduces human errors and recurring tasks.

Any required manual intervention is supported by low-resolution browse proxies, which are available throughout the facility's network. Operators can add metadata, such as program IDs, broadcast dates and other business or production information. Content can be edited, graphics added and entire programs created along with descriptive metadata. This metadata remains with the content, no matter

the ultimate path it may take. The asset manager's software resides above the entire workflow, providing detailed status information and tracking back to the business side so management has a complete picture of processes and technical operations.

One key benefit of such a process is that content aggregation no longer has to occur prior to playout. Instead, output channels can be built on the fly with content automatically assembled as it is delivered, even to different channels. Technically, it is possible to actually assemble programs all the way out to the neighborhood or home level (with an addressable set-top box). Such benefits could never be accomplished with manual workflows.

Workflow templates

The first step in implementing asset management is to develop a flexible workflow that supports the station's goals. This requires the technical, production and business departments to analyze the facility's current workflows. (See Figure 2.) It is important to carefully examine current processes and look for repetitive patterns or steps. Many stations are still moving content like it's videotape, except now it's a file.

Begin the process by considering asset management as many pieces of a large puzzle. Identify all the steps content takes while passing through the system. Also, carefully define what is needed at the output stage of the finished product before making decisions about the internal steps. Making a hard decision to perform a down-resolution at step three could prevent getting an HD image out of the system later.

Once you've defined desired flows, patterns will become apparent. These patterns are then modeled into a set of templates called workflow templates. The asset management system will store these in a workflow library. They contain information about the content

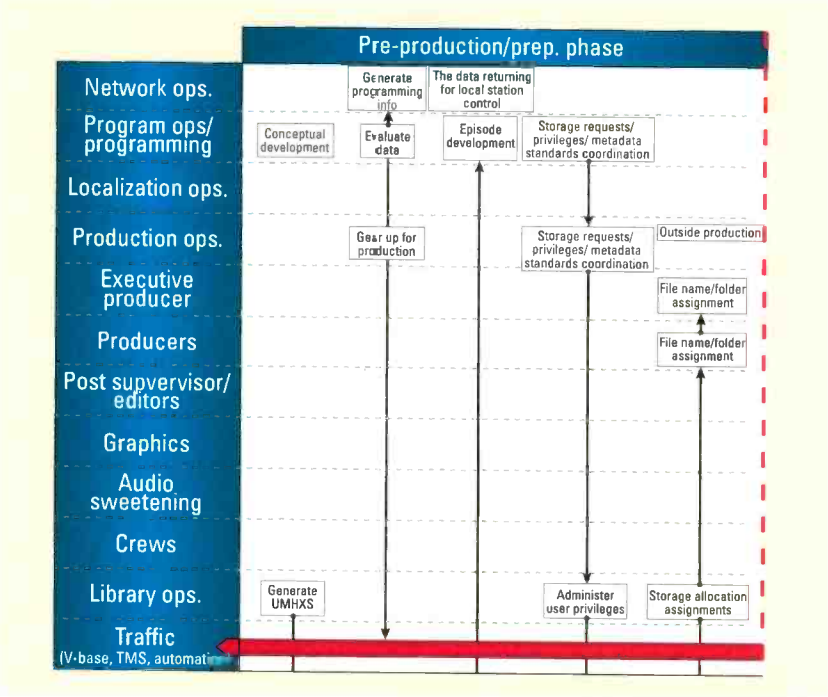

Figure 2. Each department has workflows that impact other areas. It's important to minimize any repetitive steps and obtain agreement from all players on how content should move within the facility.

path through the facility, execution rules, default parameters and conditions. These templates become the blueprint for every workflow needed.

Each step inside a workflow template is often referred to as a task. A task can be either manual or automatic. Manual tasks are given to an operator for execution, while an automatic task is directly executed by the underlying DAM infrastructure. Tasks assigned to an operator appear on workstations, along with a description of the work to be completed. The workstation provides the operator with all the tools necessary to complete the task. Business and technical rules are implemented here. For example, metadata fields can be made mandatory. Leaving a field blank will prevent the operator from sending the project to the next step.

It is important to maintain consistent metadata terms, so you'll need a facility-wide metadata dictionary. This will prevent errors like one editor calling a story an "automobile accident" and another from calling the same story a "car wreck." A SMPTE committee is developing a metadata dictionary, and the current version is available at *www.smpte-ra.org/mdd.*

Completing the DAM puzzle

Another benefit of examining the workflow and current practices is identifying wasteful redundancies. This is the time to streamline work practices, eliminating duplicate steps — and duplicate copies of content, which can reduce storage requirements.

Because workflow discovery involves multiple departments, expect conflicts. Resolving disagreements in how work moves through a facility will improve efficiency and accountability. Although departments may initially disagree about what constitutes the best workflow, consensus among all players is important.

Buying DAM software and simply laying it over a facility as homebrew automation can be done, but that solution misses out on the full potential asset management has to offer. Success typically requires the combination of good technology and an experienced systems integrator or an in-house IT/engineering team that can implement the right software to support the desired workflows. Combining the management of digital assets with an organization's business operations is the key to creating an efficient profit engine. However, this engine can only be enabled by leveraging an open and robust architecture that is tightly interfaced with an organization's specific workflows, legacy systems and third-party applications. BE

Eric DuFossé is chief marketing officer for Networks and Integration Solutions, Thomson.

The challenges

An examination of video storage platforms

BY ARUN TANEJA

The largest Fortune 1000 companies have grown their storage infrastructures to hundreds of terabytes, with the largest companies having multiple petabytes. In less than a year, Web 2.0 Internet start-ups and other companies storing rich media content have consumed more storage than the larger companies have accumulated over their lifetimes.

Social networking, application hosting, auctions, photo sharing and video distribution all consume more storage than older transactional type applications. The difference is that many Web 2.0 applications tend to be participatory and collaborative applications, where the users are the ones generating much of the content. The change from provider-generated content to user-generated content makes predicting storage growth far more challenging than in the past.

In addition to consuming vast amounts of storage, these new applications often have different I/O profiles compared to transactional applications, which tend to be primarily small-block, random I/O-oriented. Web 2.0 applications tend to store larger, more variable digital content. Access patterns can also vary between read-intensive (video distribution) to almost exclusively write-intensive (remotely hosted backup) and anything in between. The storage architectures that support high-performance transactional applications are not always a good fit for new video applications.

As for scalability, it's not that traditional monolithic arrays can't scale up to petabyte-plus configurations; it's the efficiency and cost (capital and operational) required to reach these levels. Not everything scales gracefully when 10-to-20-year-old storage architectures strain to accommodate the scalability requirements of these new applications. And, management paradigms that worked fine with tens of terabytes don't always scale well when managing multiple petabytes or more.

Video storage requirements

Like storage in general, there is no one-size-fits-all device that meets the requirements of every video application. However, video applications do share five common storage requirements: cost, performance, operational simplicity, modular growth and reliability. Let's look more closely at each.

Cost

Due to the large amounts of storage required by video, the cost per terabyte needs to be far lower than price points of traditional SAN and NAS storage devices used with transactional data applications. While everyone wants cheaper storage, many video applications would not be financially feasible without inexpensive storage. For most video applications, the cost of storage must be in the range of $1000 to $2000 per terabyte, with prices declining at 30 percent to 40 percent per year.

Although within the video storage market the term inexpensive is still relative, professional applications such as

# of storing video

news and post-production editing, VOD, and TV station on-air playout may be able to afford more expensive storage than social networking and video-surveillance applications.

Just as the purchase cost can jeopardize the market viability of a video application, so too can excessive operational management costs. For instance, the cost to manage a terabyte of storage is often overlooked in calculating cost of ownership.

The four-year total cost of ownership of a video server can often be four to five times the initial purchase cost. It doesn't matter if the storage is being managed by video engineers or a station's IT department; it still needs to be as simple as possible to manage — or costs go up. While new storage technologies can simplify and automate the configuration and ongoing operation, the cost of ongoing management should be included in cost projections.

Performance

Video production and playout applications place different demands on storage than do other tasks. Traditional data-center applications consist of many random, small-block reads and writes. Video applications typically consist of large-block, sequential streaming I/O, with unique I/O profiles. For example, many video capture applications are 99 percent writes, while video sharing applications are 99 percent reads. Just because a server can support a large bank doesn't mean that same server can handle video well.

Storage has traditionally been optimized to meet the needs of transaction processing. Caching was used to help optimize the server's performance. However, video requires large block, sequential reads and writes, which can quickly overwhelm a cache, rendering traditional storage architecture ineffective for use with video.

Video applications benefit from architectures that distribute data across multiple disks and servers to increase the degree of parallelism, i.e., bandwidth. This approach not only provides a more cost-effective implementation, but also it allows video-optimized storage to meet the performance and throughput requirements that might not be available from more traditional storage architectures.

Operational simplicity

Historically, video storage was supplied as part of a media solution.

The needed storage was embedded with the applications, such as editing or master control playout. Because these applications typically live outside the domain of IT management, stations often required additional support from their vendors. Due to the sheer volume of data, companies cannot afford the operational overhead of complex management paradigms.

Also, because video engineers, who were often less familiar with IT, were in charge of maintenance, the on-site management of the storage had to be far simpler than other facility storage. This has forced some stations to begin consolidating management of storage technology within their IT departments.

Modular growth

Video consumes large amounts of storage. And, the pace of growth is not always predictable. This is especially true of applications with user-generated content. Even traditional video applications like editing and graphics can experience unexpected growth due to expansion in the number of data sources, the move to HD or a desire to store content in multiple formats to support multiple playout channels.

This has forced some stations to begin consolidating management of storage technology within their IT departments.

One approach is to purchase a large monolithic storage array up-front, which will accommodate both planned and unplanned growth. The problem with this strategy is that monolithic arrays typically cost significantly more than the identical capacity in a modular array. In addition, this approach puts the acquisition cost up-front when the ROI or viability of the business plan may be unproven.

Modular storage provides a pay-as-you-grow storage model. In addition, modular arrays, with clustered or grid architectures, offer several advantages as a video storage platform when compared with traditional dual-controller modular arrays.

With traditional dual-controller arrays, additional capacity can be added up to a point. However, when bandwidth or controller processing power reaches its limit, the only solution is a forklift upgrade, or another modular array must be added. This requires each additional array to be managed as a separate entity.

Modular storage arrays with clustered architectures allow capacity, bandwidth and processing power to be scaled in modular units. Storage

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Presented by Bennett Liles
August 12, 2008 – 2:00 pm EST

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COMING IN SEPT.

Audio & video sampling and rate conversion

Presented by Aldo Cugnini
Sept. 23, 2008 – 2:00 pm EST

Today's production and television facilities must often convert audio and video signals multiple times before they reach a viewer's home. How well does your facility handle this task? Just what makes a high-quality signal conversion device? What should you look for when considering new A/D and D/A equipment? This noted consulting engineer and writer will help you better understand the conversion process and show you what to look for when purchasing the technology.

virtualization software eliminates the operational complexity of having to manage multiple independent arrays by creating a single virtual array that leverages the combined resources of the cluster to provide more linear performance and scalability. The array's virtualization software takes care of automatically distributing the data and processing across new modules as they are added. Clustered storage architectures provide pay-as-you-grow scalability while providing the simplicity of managing a single entity.

Reliability

Broadcasters require 100 percent up time, which demands protection from failure while allowing upgrades without disruption. In addition to hardware redundancy, RAID-type data protection is also a requirement. However, many video storage implementations are moving away from traditional RAID protection to other protection schemes that provide faster rebuild times in the event of a disk failure. Keep in mind that as capacities grow, the chance of a disk failure increases with the number of disks. This means the system must be able to rebuild quickly without impacting performance over long periods of time.

Video intelligence

Today's servers are highly intelligent devices with built-in diagnostics, volume management, snapshot, point-in-time copy and remote replication. In addition, some servers provide video-specific functions that optimize video storage and retrieval.

Other servers can automatically move frequently accessed data blocks and files to the outside of disks to improve disk seek times and performance. A server can even provide transcoding. This allows content to be converted to different output formats, helping create new revenue possibilities via new channels.

Direct attached storage

Some applications still store their data on inexpensive direct attached storage (DAS). This solution represents one of the most basic storage deployment options, where disk drives are either embedded in or directly attached to a single server. To access the content, workstations must be networked into the server. DAS storage still represents a large percentage of the video storage market, especially in price-sensitive applications like video editing.

This approach works well for applications requiring only small amounts of data. However, for most video tasks, DAS-based storage solutions can quickly become multiple islands of storage that are hard to scale and complex to manage. In addition, the initial cost savings of DAS can quickly be consumed by the operational costs or business impact that result from these limitations.

Traditional SAN and NAS

Traditional Fibre Channel SAN or NAS storage devices also can be used to store video data. If a company has a relatively small amount of content and a large investment in existing SAN or NAS technology, then these storage devices may provide a cost-effective approach for storage without having to retrain operational staff.

However, if the objective is to store large amounts of media-rich content with high-throughput requirements, then traditional SAN and NAS storage devices will not be cost-competitive compared to newer clustered storage architectures. In addition, traditional separated storage devices will likely run into performance, scalability and manageability limitations that will further exacerbate costs.

Clustered IP storage

IP-based clustered storage represents a cost-effective alternative that meets the unique requirements of video. Based on commodity servers and disk drives, clustered storage systems have many of the cost advantages of DAS. However, clustered storage can aggregate multiple storage nodes into a single logical system. Using this modular approach, performance,

capacity and bandwidth can be scaled incrementally as needed while preserving the simplicity and manageability of administering a single virtual storage device.

IP-connected storage provides the bandwidth and performance required by media-rich applications without the additional cost overhead and operational complexity of deploying Fibre Channel SANs. Storage applications may use iSCSI (block-level), NAS (file-level) and object-level interfaces for the storage and retrieval of video content. Each of these interfaces has its advantages and disadvantages, and depending on the application, one may be more appropriate than another.

Overall, clustered storage architectures are well-suited for the demanding requirements of video applications. However, even within this approach solution, there is no one-size-fits-all solution. Most clustered IP storage solutions can meet the needs of generic video applications. So, while many broadcast-specific company names may come to mind, there is actually a variety of less-well-known vendors providing excellent video storage solutions.

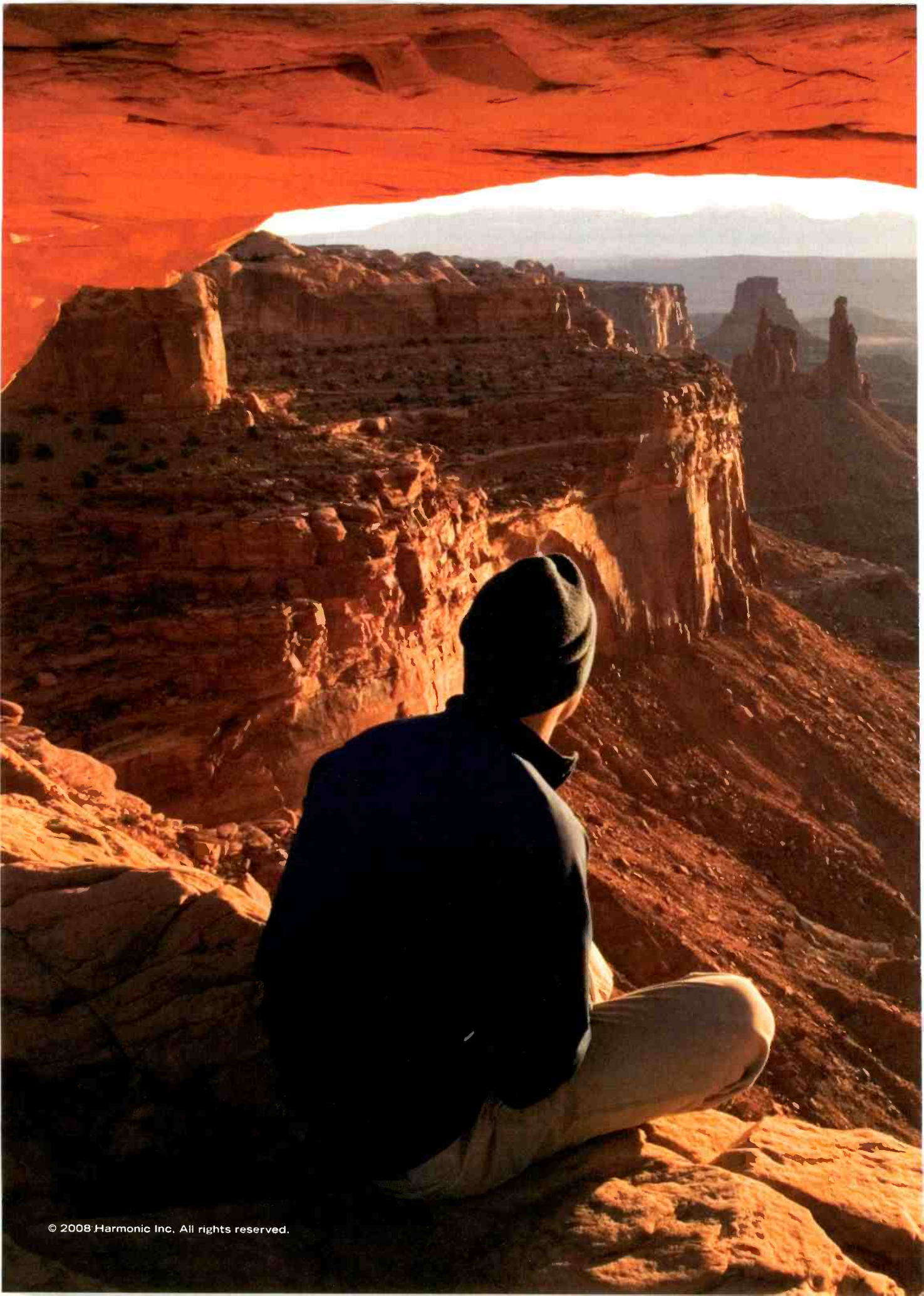
Storage as a service

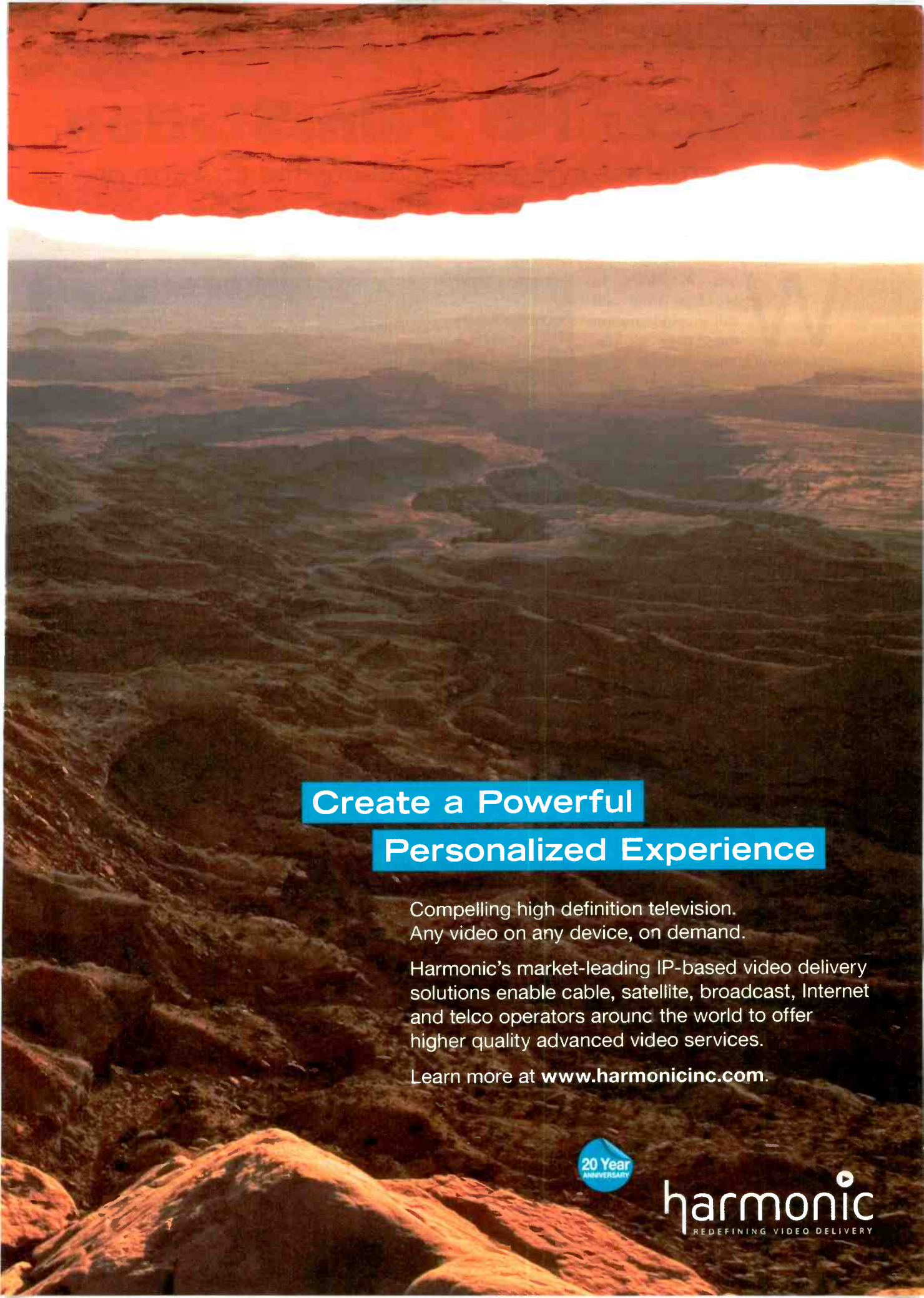
One option for companies looking to store video or other multimedia data is the storage-as-a-service (SaaS) delivery model. Vendors that deliver SaaS provide a simple Web-service-based API to store and retrieve multimedia objects in their hosted storage. Costs to store data fall between $1500 to $2500 per terabyte per year, with additional costs each time data is transferred in or out. While these rates may initially sound expensive, after factoring in the fully loaded costs to house, cool and manage in-house storage, SaaS storage services may be a financially viable alternative, depending on the data access requirements.

In addition, this option may be a useful and cost-effective disaster recovery/backup solution. Here the station faces only the storage and access costs, while not having to maintain a separate site, equipment and maintenance. This solution also solves the problem of keeping backup content well geographically separated from your on-air operations.

IP-based clustered storage is worthy of consideration as it provides an attractive solution to the handling of video and other media-rich content. Because of the sheer volume of video data being generated, traditional DAS, SAN and NAS solutions may no longer be the best economical choice. IP-based clustered storage is well poised to garner the lion's share of the video storage market. BE

Arun Taneja is the founder and consulting analyst with Taneja Group research and consulting firm.

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Twister HD PaintStation

VDS' graphics system streamlines the creation of daily news graphics and getting them to air.

BY DAVID-RAY WORTHINGTON

When it comes to broadcast paint and still graphic creation tools, there are certainly several choices available. Most of these applications feature a large selection of image composition tools and are relatively easy to work with. However, most of the real issues facing today's broadcasters tend to be workflow-related. Content acquisition and supporting file formats from a wide variety of sources, processing this content into daily graphics and then distributing to playout devices has become a challenge for many broadcasters. HD, of course, introduces a whole new set of issues. Higher resolution means more detail. This makes previewing graphics in context with programming more important than ever.

Twister HD PaintStation provides SD/HD frame grab and output, along with the ability to key and preview live graphics (real-time paint) over incoming video. This also includes the ability to grab video from canvas directly to layers.

Workflow

Six years ago, New York-based VDS acquired the Liberty Paint product line along with the respective development group from Chyron. The goal was to develop the Twister HD PaintStation, a simple-to-use, SD/HD graphics creation and distribution system with strong content creation tools. It was designed from the ground up to streamline the process of creating daily news graphics and getting them to air.

All effects are accomplished by selecting a layer, and then selecting and applying an effect.

The system is loaded with workflow tools such as the ability to drag and drop content from any local or remote source to layers. It also supports direct file and metadata exchange with current and legacy broadcast systems. This ability to integrate and file share with so many different industry platforms solves many common and non-typical workflow issues.

From a workflow perspective, artists simply access their graphic content material through the system's browser. From here, graphic content can be dragged and dropped from virtually any source or location directly into the layer stack. The graphics system automatically generates thumbnails of most image formats, making it easy to view source material before selecting. In addition, file information and supported metadata is also displayed. Because the browser supports Windows Network Neighborhood, as well as Quantel, Chyron and Aprisa FTP protocols, the system can be configured to browse and access content from wherever there is local or remote connectivity.

Once content is recalled into the layer stack, individual layers can be created or modified using the paint and image processing tools, all accessed through the tab-based tool system. Masking and cutting out images is easily accomplished using the mask tools section. Plug-ins are accessed and applied through the plug-ins tab, and so on. In fact, all effects are accomplished by selecting a layer, and then selecting and applying an effect. Layers can be individually or group

selected in the stack with a cursor, or interactively on the canvas as objects.

The system features quick keys that allow fast access to more commonly used features like move, pan, paint, cut, fill, transform, shapes, text and grouping. Many of the advanced effects such as text, shapes, paste effects and shadows are dynamically applied and can be changed or adjusted at any time without having to recreate. All of the effects have previewing modes to allow for adjustments before committing the effect to the layer. All layers have their own undo libraries, making it easy to step back to certain states on an individual layer basis.

Once the final graphic has been completed, it can be saved as a template-type layer file for daily updating and use, or composited to a single layer and distributed to a playout system such as a character generator or still-store. A wide variety of file formats and database systems are supported, making the transfer of images and metadata from the system to industry storage and playback devices simple and straightforward.

It can operate in any resolution and comes with real-time paint I/O, supporting all SD and HD formats. This includes the ability to grab on-the-fly to layers and real-time view of canvas on an SD or HD monitor. A linear keyer allows continuous live viewing of graphics keyed over video stream. This is particularly vital for previewing HD material to ensure ramped transparencies and other blended elements are smooth and clean. Selection between SD and HD working modes is almost instantaneous.

The system can operate in any resolution and comes with real-time paint I/O.

The system is also compatible with Photoshop. Photoshop files can be opened in Twister and turned into templates that can be easily updated daily and distributed.

Summary

The Twister HD PaintStation is a product that improves the workflow of daily news graphics production. Its easy to use, rich feature set allows it to be used as a complete graphics design system, or as a front-end solution to update and distribute daily templated graphics. Full SD/HD compatibility and real-time previewing make the system a great addition to any broadcast environment. BE

David-Ray Worthington is the director of marketing and product development for VDS.

OmniTek's XR

The waveform monitor addresses the impact of digital cinema on post production.

BY MIKE HODSON

The advent of digital cinema has significantly impacted those involved in post production of images for theatre presentation. The specifications put together by SMPTE and the Digital Cinema Initiatives group introduced several novel features such as JPEG2000 image compression and the use of new high-resolution 2K and 4K video formats.

They have also specified use of the CIE XYZ color space for encoding of master source material. This color space was created in 1931 following studies of the perception of color by the human eye. Its defining characteristic is its ability to represent every color to which the human eye can respond as a unique combination of three positive parameters that doesn't depend on the devices used to produce the light.

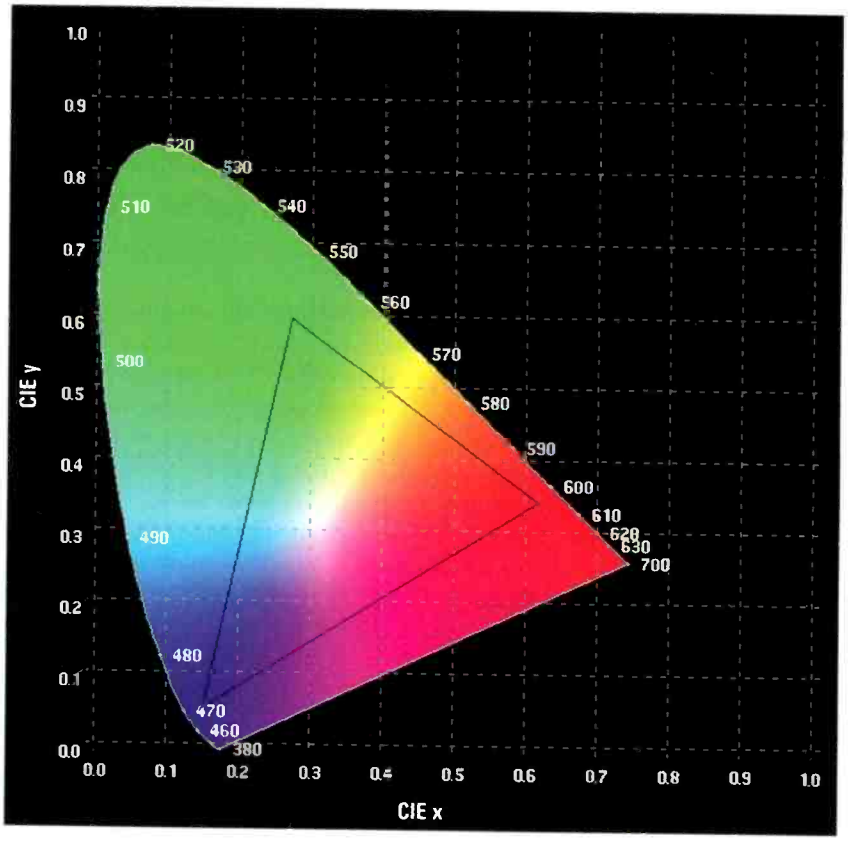
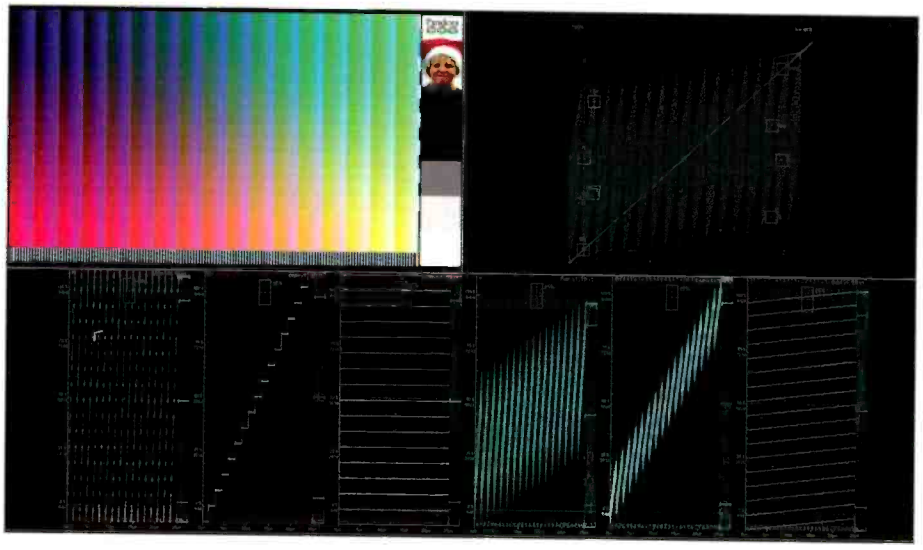


Figure 1. XYZ chromaticity diagram, overlaid with triangle showing RGB gamut

The issue at hand

The problem for post production is that the RGB color space typically used in broadcast is limited in the range of colors it can represent as a result of the way the responses of the red, green and blue cones of the human eye overlap. Blue-green colors are a particular problem. A monochromatic light source of approximately 500nm should only produce a response in blue and green, but any color produced by mixing monochromatic green and blue light sources will also stimulate red cones. It is therefore impossible to represent this color in the RGB color space.

The scope of the RGB color space is readily illustrated on the CIE chromaticity diagram, as shown in Figure 1. The outer curved boundary of the colored region represents the eye's response to monochromatic light in the visible part of the spectrum, while the



OmniTek's XR display shows waveforms in RGB and XYZ color spaces, as well as an XYZ vector display and high-resolution video proxy.

inner region represents its response to mixtures of those colors. The vertices of the triangle represent the colors produced by red, blue and green photo devices, while the triangle encloses all the different colors that can be created using these devices.

Conversion of image material encoded using XYZ color space into RGB color space uses a matrix that maps XYZ values into RGB values. Only positive RGB values have any meaning for an RGB display, so any negative values that result from the conversion are replaced by zero. Colors that fall within the gamut of the RGB triangle have positive values in RGB color space and so translate directly. Conversion of colors that fall outside the RGB color space, however, result in negative values for either R, G or B. The result of this is to substitute the original color by one on the edge of the RGB triangle.

The effect of this color conversion on the resulting images is crucial to colorists working in the broadcast industry not just for aesthetic reasons, but also for the range of fringing and other artifacts that can result. Reducing the color saturation of the image helps by pulling each color in toward the white point at the center of the chromaticity diagram. However, doing this in a controlled manner requires detailed information about the location and extent of the problem areas in the video images. This in turn requires test and measurement equipment that can both handle the video formats used by digital cinema and provide information about color gamut in both XYZ color space and RGB color space on a pixel-by-pixel basis.

The solution

The OmniTek XR waveform monitor and image analyzer provides such support. It can take either the source or the output from the colorist's color grading equipment and, in real time, display waveforms and histograms, not just of the XYZ source but also of the equivalent RGB or YUV video.

Of particular value to the XYZ conversion problem is the color gamut display. This may be set up to display equivalent RGB values as bar graphs, with values that exceed acceptable thresholds shown in a contrasting color. It also keeps a count of the number of pixels for which the conversion produces values outside the required range and measures of these effects as a percentage of the overall area.

The XR system also has the ability to highlight the pixels affected as part of a live display either on a monitor or the built-in video proxy, thereby giving the colorist an easy way of seeing the scope of the problem that needs to be dealt with. **BE**

Mike Hodson is president of OmniTek.

Neutrik's OpticalCon

The IP65-rated rugged connection offers heavy-duty retention.

BY MARK BOYADJIAN

In live broadcast settings, military spec connectors and cables were once the only options for heavy traffic areas. While these products offered supreme ruggedness, they were extremely cost-prohibitive.

What the industry lacked was a heavy-duty cable with the ruggedness and stability of the military spec cables, but designed specifically for broadcast applications and environments.

Introducing OpticalCon

Featuring an IP65-rated connection, all-metal housing and heavy-duty cable retention, Neutrik's OpticalCon connection system is protected from dust and dirt through automatic sealing covers and gaskets. Its standard, easy-to-clean lucent connector (LC) fiber-optic connectors are equipped with a push-pull locking mechanism and include colored labeling plates to identify fiber mode.

In addition, the company offers a hybrid cable — fiber optic and copper — providing users with a signal that can be transmitted by fiber optics, while the four copper contacts can be used for power, logic systems, to test whether the connector was mated or unmated, and for a number of control functions, such as a camera.

Expanding your options

A significant advantage of using the chassis connector is its compatibility both front and back with an LC duplex patch cable. Connected to the front of the chassis connector, it can be used for lower impact applications that don't necessarily need a ruggadized connection.

It is also ideal for applications where the user doesn't want to be limited by the fragility of a standard LC, straight tip (ST) or subscriber connector (SC) cable. The user can also employ a chassis connector that fits into a standard D series cutout. The back of the chassis connector accepts a standard LC duplex connection, while the front accepts OpticalCon or a standard LC duplex patch cable. Because of its compatibility with conventional LC connectors, users can either apply a cost-effective LC connector as a permanent connection or the OpticalCon cable connector for mobile applications.

It's offered in a multimode hybrid version, where four 18-gauge copper wires are added to the duplex fibers. A single-mode version is available as signal mode angled physical contact (APC), which minimizes back reflection of the light signal. When working with high output devices in single-mode fibers, back reflection can occur. To minimize this, Neutrik finishes the end of the fiber by grinding it to an 8-degree angle. This minimizes the effect of this reflection of light back into the fiber.

There is also a SMPTE version. Although it is not intermatable with a SMPTE camera connector, the cable and grounding features are SMPTE-compatible.

Maximum protection

The system offers protection for the fiber optic built into the cable. With the cable in the unmated position, it has two silicon shutters that are backed with metal and a soft silicon seal. It is mechanically actuated and operates automatically. As a user plugs in the connector, the shutters lift up, exposing the fiber optics so that signal transmission can occur. When disconnecting it, the shutters close, protecting the fiber optics from dirt and contamination. This feature is on the receptacle side as well as the cable side. It offers complete protection in the unmated condition.

Available in lengths from 0.5m to 2000m, the system comes with a variety of package options, including an air spool, which is a heavy-duty Velcro tie to a nylon case, and three different spool options based on the length of cable chosen.

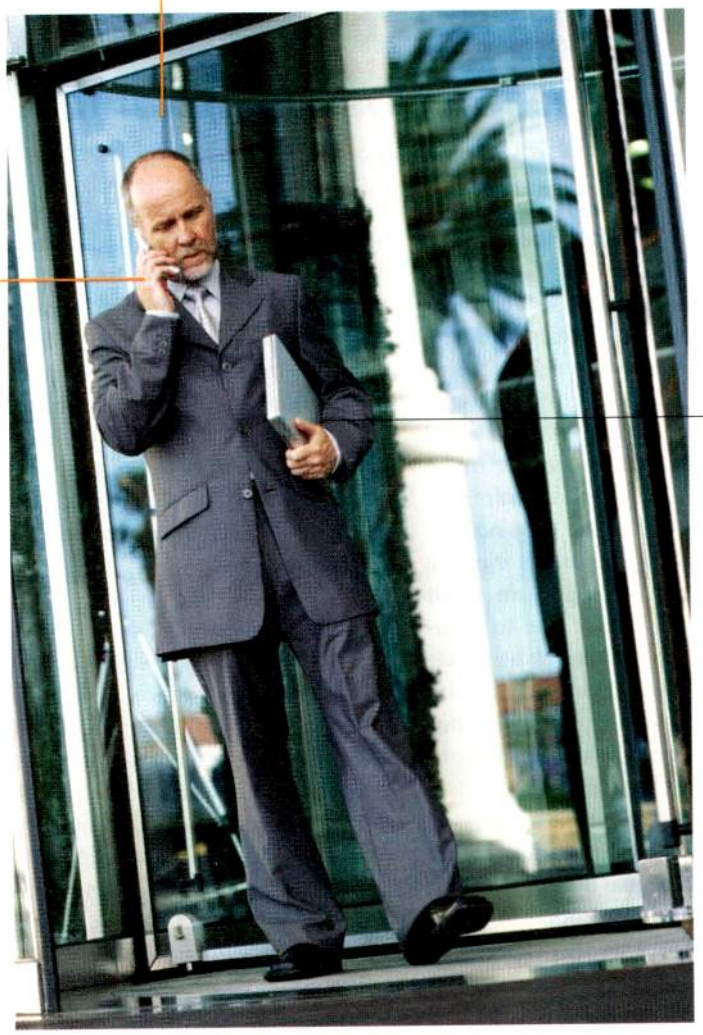
Combat high-traffic areas

OpticalCon is ideal for high-impact applications, such as extreme outdoor venues and conditions where foot traffic is a major concern. Able to withstand constant dragging and dropping during setup, it increases the reliability and maximizes the uptime for fiber-optic connection systems, while also maintaining its effectiveness in harsh conditions. BE

To achieve a dust and water-resistant IP65 connection, Neutrik has employed additional seals and gaskets on the chassis connector and cable ends of the OpticalCon.

Mark Boyadjian is marketing facilitator for Neutrik USA.

Common Short Codes



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EEG's iCap

Modernize workflow with IP-based closed captioning.

BY PHILIP MCLAUGHLIN

In 2007, EEG introduced iCap, an IP-based, closed-captioning software system that runs on the company's HD480 hardware encoder. The system solves numerous shortcomings associated with previous modem-based real-time captioning models. These problems include poor audio quality resulting in lower captioning accuracy, inflexibility in large system configurations, difficulty in monitoring and troubleshooting, and significant security vulnerabilities. In addition to addressing these limitations of previous-generation systems, it also offers a host of new features for broadcasters and the captioning agencies they work with.

Intuitive GUI

iCap uses an intuitive GUI to address the common administrative requirements of captioners, such as connection to multiple encoder nets and handoffs between live captioners. For broadcasters, this results in uninterrupted data and less lost time spent on troubleshooting.

The system delivers securely encrypted, high-quality streaming audio over an IP link, which translates to improved captioning services for viewers. It also eliminates the need for external audio couplers, which deliver much lower quality audio and consume an additional telephone line. Also no longer necessary are captioners viewing satellite downlinks, which can result in high caption latency due to compression delays. If broadcasters have multiple encoders, they won't need a separate phone line for each one. They simply connect each phone encoder to a local Ethernet that shares an outside Internet connection.

The block diagram shown in Figure 1 illustrates the signal flow of the iCap system. The caption encoders from the broadcast plant and the captioners, from their work site, both connect to a centrally located server that provides identity authentication and a secure encryption key for data transfer. The authenticated IP connection carries program audio and live caption monitoring to the captioner. Then it carries caption data back to the encoder. Customized routing for multi-encoder jobs, backup encoders and other configurations can be setup through a password-protected interactive Web page on the server.

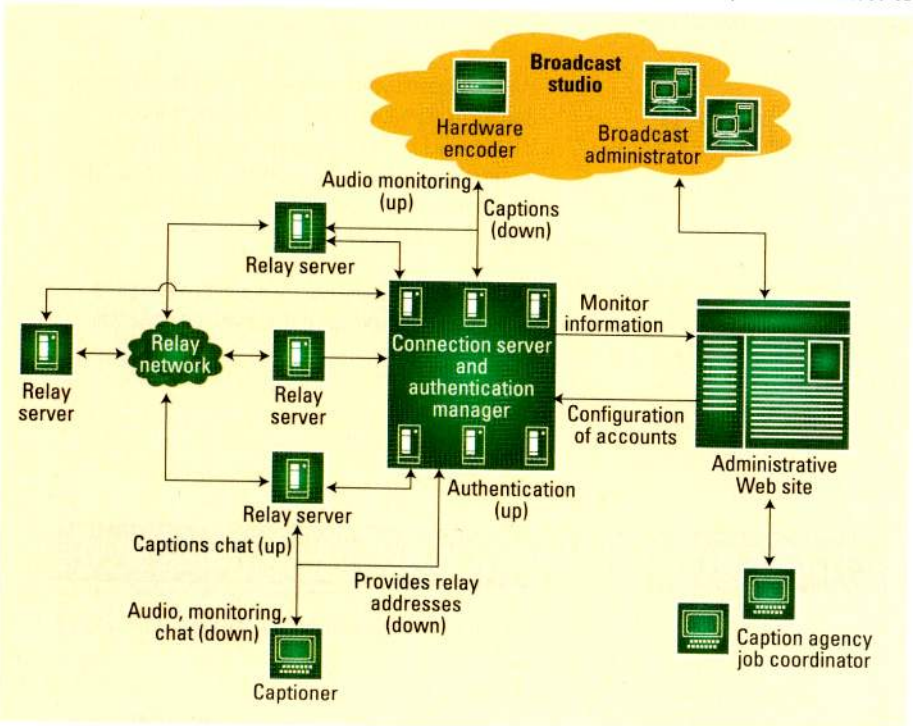

Figure 1. Shown here is the signal flow of iCap.

Superior audio

Improved audio performance is a key feature of the new system. The combination of software and HD480 hardware transports audio sampled at a rate of 16kHz, compressed with a highly efficient codec specifically designed for voice applications. The resulting sound quality is a significant improvement over telephone-quality audio, which is band-limited to about 3.3kHz.

The audio data is transported over a dynamically optimized IP stream, which results in point-to-point latencies as low as 150ms compared with the 500ms typical of many streaming applications, and the three to four seconds of latency that is common on a digitally compressed satellite downlink.

iCap dynamically reaches the lowest possible latency for a given network connection by maintaining strict real-time transport, meaning it does not fall behind over time by attempting to retransmit lost packets. Instead, the system uses a special audio algorithm to conceal lost packets, while the exact latency is independently optimized at each client based on packet loss history. Each user's software automatically detects the minimum amount of buffering necessary to preserve acceptable audio quality on the current network connection. The latency adjusts accordingly, though it will not attempt to exceed the limit for easy-to-read,

real-time captioning, which is approximately one-half of a second.

Increased security

In the dial-up model, anyone can dial into a closed-caption encoder simply by knowing the phone number and a few commands. This leaves it vulnerable to on-air hacking, a public security breach that has happened in the past. iCap eliminates this vulnerability, using advanced cryptographic algorithms that require authentications and password-protected user log-ins, all of which are protected on the server via 256-bit SSL encryption. Streaming program audio is also encrypted, with a separate key, removing the risk of unauthorized eavesdropping and/or recording.

The system is designed to minimize the risks broadcasters face in connecting their on-air equipment to the outside Internet. It doesn't require broadcasters (or captioners) to leave their computers or networks open to unknown/nontrusted remote connections. Broadcasters only need to allow the hardware encoder to dial out of the building to the fixed iCap server address and then accept data back from the same server, on the same port it dialed out of. No unsolicited data, or data from other sources, is accepted. This type of setup is safe against almost all types of unauthorized use and is easily configurable on most commercial firewall products.

Conclusion

Designed with digital/HD plants in mind, iCap improves communications, security and administrative issues at practically every level. These features help improve the viewer experience and make life markedly easier for broadcasters without an increase in costs. BE

Philip McLaughlin is president of EEG.

Optoma's BigVizion

WCMH-TV enhances its news set with a DLP monitor.

BY MICHAEL P. HILL

WCMH-TV, the NBC affiliate in Columbus, OH, was looking for a high-tech way to showcase large-format video and graphics on its new set. The station wanted a sharper image than what most rear-projection screens generate. The solution was Optoma Technology's BigVizion DLP monitor.

The unit, which measures 100in (and is also available in 80in and 90in models), offers clear pictures that work well in the broadcast TV environment. Originally developed for home theater and corporate installations, this is the first time the monitor was installed in a live TV studio. The monitor is ideal for such uses not only because of its large scale, but also because it's specifically designed for wall surface installation.

The compact modular steel frame, mirror and projector assembly gave the set's desiger — FX Group — the freedom to spec the frame and wall coverings around the unit from within its existing materials library. It includes a customizable bezel designed to match designer's requirements.

Despite its large size, the monitor requires a minimal footprint. The housing behind the unit is only 30in deep, which makes it possible to integrate a large monitor in smaller studios. Because the unit lacks the casing found on a traditional DLP monitor, the area behind the monitor must be kept dark for optimal results. It also offers various antireflective, high-contrast optical display options, so FX's lighting designers can prevent the studio's bright lighting from creating a glare on the image.

Crisp HD images

The large scale of the monitor creates an eye-catching showcase behind the anchor desk, allowing WCMH to display live feeds, video playback or motion graphics in native HD resolution. The unit's crisp images are created by combining DLP technology and a bright lamp that is rated at 4000 hours of use.

FX Group installed an Optoma BigVizion DLP monitor behind WCMH-TV's anchor desk, creating an eye-catching visual display.

Using a proprietary light engine, all input signals are displayed in 1080p, with pixel-matching technology for 1:1 scan conversion. Video can be input via HDMI, BNC RGBHV, YPbPr, S-video, VGA, HDSMI or composite video, each with its own individual picture adjustment memory. The unit also offers ISFccc custom day and night modes and is compatible with 480i, 480p, 576i, 576p, 720i, 720p, 1080i and 1080p at a maximum resolution of 1920 x 1080.

This is made possible with an optical short-throw lens that projects the image using a P-VIP 180W lamp and a 100in, first-surface glass with 1in aluminum honeycomb backing. Image quality is controlled by advanced scaling with 1080i to 1080p deinterlacing, as well as a professional grade external scaler, a feature that was added specifically for broadcasters.

Flexibility

Large-format screens are a great way to add flexibility to sets and aren't limited to just anchor areas. Because stations can output practically any image on the screens, it's possible to create instant branding changes for different newscasts or franchise segments such as health news, consumer reporting and special reports. For generic uses, subtle animation loops give newscasts an active feel and add visual interest.

FX has also placed large-format monitors in standup areas and weather centers. The image is visible by both viewers and talent, allowing anchors and reporters to interact with the material displayed on the monitor, such as pointing out locations on a map. BE

Michael P. Hill is founder of NewscastStudio, a Web site covering creative services for television news.

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New rack designs provide increased utility.

BY JOHN LUFF

It would be easy to assume that the least important technology in a broadcast facility is the piece that only serves to keep equipment from falling to the floor — the ubiquitous equipment rack. It is metal, does not (normally) move and must match a well-defined standard. Henry Ford would have painted them any color as long as it was black, and indeed most racks are black or grey.

Chief engineers often have a strong preference for one brand or another, and additions to an older facility must match. For that reason, over the years, manufacturers have created extremely stable product lines with the same appearance and function. But in this age, as technology transitions significantly, there are consequential changes in the way we mount, ventilate, wire and power equipment.

Trinity Broadcast Network's production and broadcast facility in Tustin, CA, features Stantron Broadcast E-Racks.

Standard rack dimensions

The 19in rack is standardized (EIA-310-D, IEC 60297 and DIN 41494 SC48D) across many uses. From home theater to power plants to broadcast, everyone worldwide has adopted a common standard. The Electronic Industries Association has specified the dimensions for the front-mounting surface of racks. The standard is available for purchase on the Web, but here are the most critical dimensions, some of which are quite familiar:

- The panel mounting flange is 19in exactly.
- The holes repeat in a regular pattern (0.625in, 0.625in, 0.500in) every 1.75in, commonly called one rack unit (abbreviated RU).
- The left-right spacing between holes is specified as 18.312in, or 465mm.
- The clear space between the mounting rails is specified as 17.72in, or 450mm.

For the most part, these dimensions are all one needs to know to build a rack. How cable access is provided, rack depth, construction, structural integrity and other matters are left to the manufacturer. Usually there is space outside the mounting area for power and signal cabling, as well as air movement. Wire access is often planned both top and bottom. The screw holes are not specified, but 10/24, 10/32, 12/24 and clip-style holes are common, and their spacing is always the same. Things we often take for granted, like rear or intermediate rails, power strips, cable lacing bars, wireways and structural rack attachments are left entirely to the creativity of the manufacturer — at least almost.

Specifications

Other specs that affect the design and installation of racks include earthquake protection, grounding, structural weight loading, etc. Some of these are specified in local ordinances. For example, in California and other earthquake-prone areas, rack bases must be attached to the structure to prevent entire rows of racks from tipping over when the building structure moves beneath them. The details of this can be quite complicated, and often a structural engineer with appropriate expertise is needed to review plans before an installation can proceed.

Modern technology has made miniaturized equipment attractive and practical. There is, however, a pervasive downside of this trend. Equipment mounting — particularly deep computing servers, power density and wire count — has changed the function of equipment racks. It is not unusual to have as much as 12kW of power draw in a single equipment rack full of servers. This presents engineering challenges for both power distribution and cooling.

Effective strategies include building a plenum for removing heat, but even then the density of the equipment and the high temperatures that can result lead to the conclusion that high-density racks, which worked for video facilities with loads of cable but manageable heat loads, may no longer be acceptable design practice. IT server racks sometimes include intermediate narrow racks between populated racks, which contain fans to help evacuate the heat. By building a hot side, cold side approach (enclosing the rear of the racks and forcing cool air in from the front and out the back into a low pressure return duct area) and keeping the front of the racks at cooler than normal temperatures, it is possible to considerably drop the temperature inside the racks.

This can help to solve other issues as well. With systems routinely requiring as much IT gear as baseband video equipment, it is common to deal with large bundles of fiber and Cat 5/6 cable. Handling these cable types is quite different than bulk quantities of video and audio cable. Technicians must be trained in proper installation techniques, with controlled bend radius and less use of tight cable ties

required. Often it is best to separate the fiber and data cable in distinct cable paths to make handling effective. With intermediate racks designed to handle cooling, it is sometimes possible to create more useful wireways for all cable types.

Of course, with high-bandwidth video systems, like the newer systems capable of 3GHz (SMPTE 424M-2006), it is critical to manage cable with similar effective control over bend radius and anything that might deform the cable and create return loss issues. Some routing switchers today are capable of handling more than 1700 cables in a single 32RU frame, and almost 2400 in two adjacent racks in a 1152 x 1152 matrix, so cable management is a huge and growing concern. Deep racks can help make space for cable, and intermediate racks mitigate cable density and heat loading problems.

Recent improvements

Beyond the engineering of effective equipment room rack layouts, the rack itself has become a source of innovation in the last decade. Racks that hang on walls and pivot for service are handy for studio systems, or perhaps for wireless microphones. In tight spaces, there are racks with bases that can be pulled away from walls and even rotated. These specialized racks come with limitations, like restricted use in earthquake zones and lower weight loading capacity, but offer utility not available in the past.

Finally, there was a time when broadcasters had a choice of consoles made from slope-fronted racks or custom-designed furniture, which usually cost an order of magnitude more. In a move that comes full circle, some custom control room furniture suppliers now offer standard designs, which provide great utility at a more modest cost by leveraging standardized partial assemblies. The availability of custom features at a more modest cost is certainly attractive, and in a complementary move, some rack manufacturers now offer more appealing and functional metal products to compete with fully custom furniture. The biggest advantage of both of these approaches is that they offer attractive and operationally functional products that are designed to handle the mounting of computers and peripherals, as well as cable management and heat load issues, in an effective manner. BE

John Luff is a broadcast technology consultant.

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

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RMR-X6-II — RF Central

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717-249-4900; *www.rfcentral.com*

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CC-1 — Nucomm

Camera control unit works with the CamPac 2 HD/SD COFDM camera-back transmitter; expands the features of the CamPac 2 through a software-based data interface that allows the CP2/CC-1 to work with other manufacturer's control panels and command protocols; allows operators to work within a seamless environment between wired and wireless cameras; available in two radio options: licensed 450MHz or unlicensed spread spectrum 900MHz.

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858-679-8990
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Eldorado — Scopus Video Networks

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Back to the future

Broadcasters are preparing for the analog transition!

BY ANTHONY R. GARGANO

"What's a 'broadcast guy' doing at a cable show?" Spending several days at the Society of Cable Television Engineers (SCTE) annual expo in Philadelphia gave me the opportunity to ask a lot of questions but the above question was the most common one asked of me. Clearly, there has been a symbiotic relationship between the two industries from day one.

The birth of CATV

The first cable television system is usually recognized as the system built in Astoria, OR, in 1949 by appliance dealer Ed Parsons. Ed wanted to sell television sets but found that a bit challenging because Astoria didn't receive any signals. That's hard to imagine in this era of hundreds upon hundreds of channels to select from over cable, satellite and telco fiber. Back then, off-air was the only option, and there were less than 100 television stations in the United States.

Ed, armed with an FM receiver to tune TV audio, explored the surrounding countryside to find a place where he could receive a signal. When he did, he strung some cable from that spot to his newly sold receivers, thereby giving birth to CATV.

Analog dilemma

The parallels between broadcast and cable have undergone radical change over the years, but some of today's major ones include:

- We compete for advertising dollars.
- We share common technologies.
- We compete for content.
- We are both transitioning to digital.

For the broadcaster, the transition is mandatory. For the cable operator, it is a matter of survival; it's all about bandwidth reclamation. The cable industry's precious commodity is bandwidth. A 6MHz analog channel can accommodate as many as nine QAM modulated SD digital channels and two or three (depending on QoS levels) HD channels. To compete with satellite providers' 100-plus HD channel offering, and telcos' FTTH and higher high-speed data services, cable needs bandwidth. But therein lies the analog dilemma. One of cable's big advantages is delivering analog signals to the myriad of analog receivers out there, which flies directly in the face of reclaiming analog bandwidth for digital services.

The first part of cable's analog dilemma is the broadcast industry's DTV transition. Despite cable's transition to digital channels and services delivered to digital set-top boxes, there are a significant number of analog-delivered television channels. The average cable home has three-and-a-half television receivers but on average, only slightly more than one digital set-top box. While a small number of those receivers rely on off-air, the majority of sets that are not connected to a digital set-top box are connected directly to cable and view strictly analog-delivered channels.

To prevent nondigital tier subscribers' televisions from going dark in February, cable headends will have to convert those off-air, digital-only DTV signals back to analog! So, the broadcaster — after taking painstaking care and spending millions of dollars to deliver pristine digital signals — will find the majority of cable viewers still viewing an analog signal.

Then there's the nightmare scenario: SD content upconverted to HD by the broadcaster and transmitted digitally only to be received at a cable headend where it is downsampled to 4:3, converted to analog and then sent through several miles of cable trunk and distribution amplifiers before appearing on the subscriber's receiver. Any resemblance to original content is purely coincidental!

Recent statistics released by the NTIA indicate that consumers have applied for DTV converter box coupons in record numbers. The coupons, which expire 90 days after being issued, however, have also been expiring in record numbers.

According to the NTIA, 58 percent of all issued coupons expire unused. With factors such as this added to continuing consumer confusion, the cable industry expects that a large number of analog viewers will be driven to hook up to cable's analog spigots as February looms closer.

The second part of cable's analog dilemma goes back to the bandwidth issue. To efficiently maximize all available bandwidth, ideally cable doesn't want to dedicate any of its bandwidth to analog signals.

Enter the digital-to-analog (DTA) converter. Cable equipment manufacturers have started demonstrating prototypes of tiny, inexpensive DTA converters that accept a stream of digital channels from the cable plant and convert them to analog for tuning and display on a subscriber's receiver. Deployment of such devices would enable a cable operator to fully convert the entire plant and distribution system to its highest form of bandwidth monetization — digital-only streams.

The broadcaster can only hope that cable gets it right. Whether at the headend or in the subscribers' home via a DTA device, conversions not only need to address program content quality but also a host of issues ranging from closed captioning to content advisories. Welcome to the analog transition. BE

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

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