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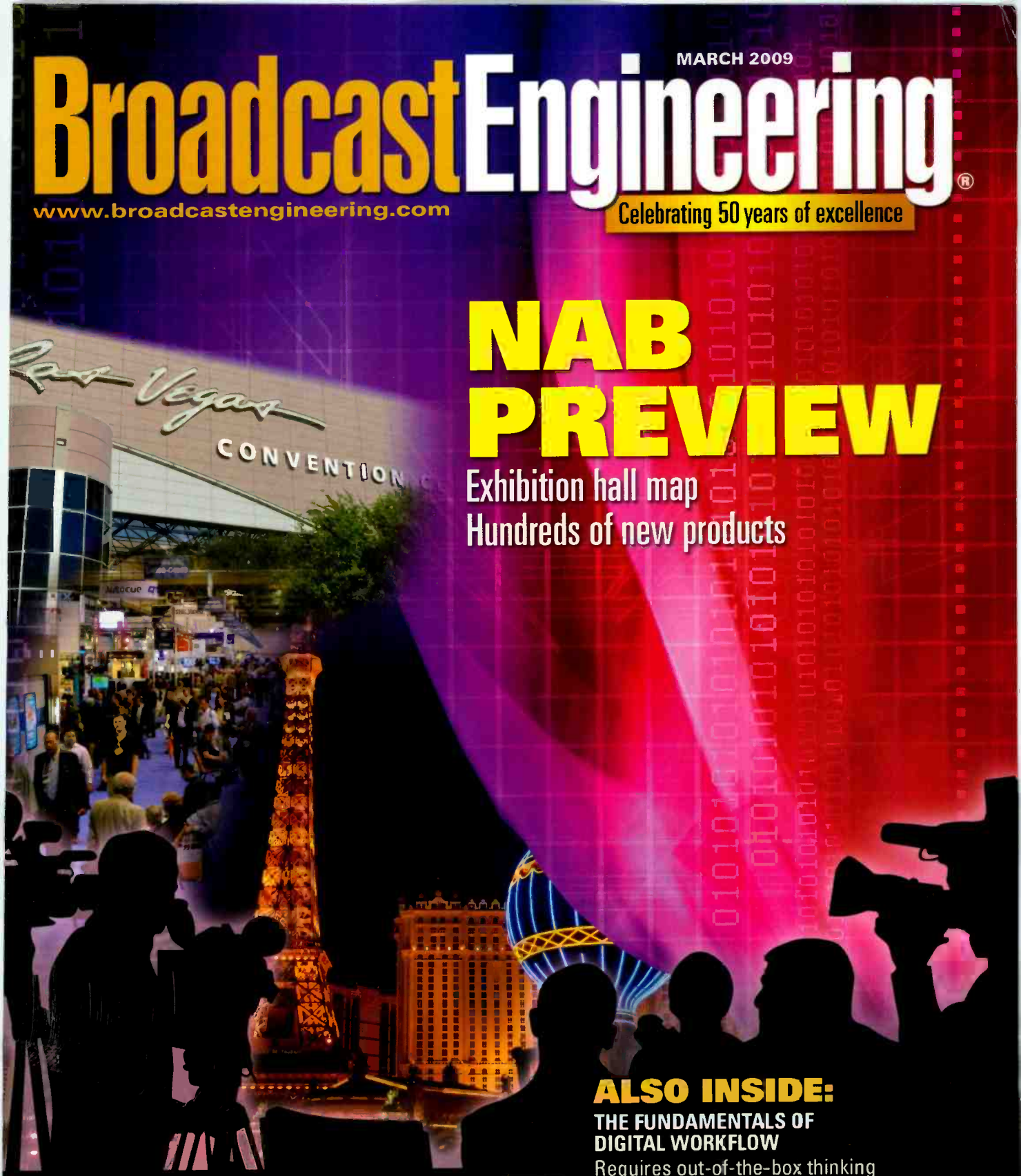

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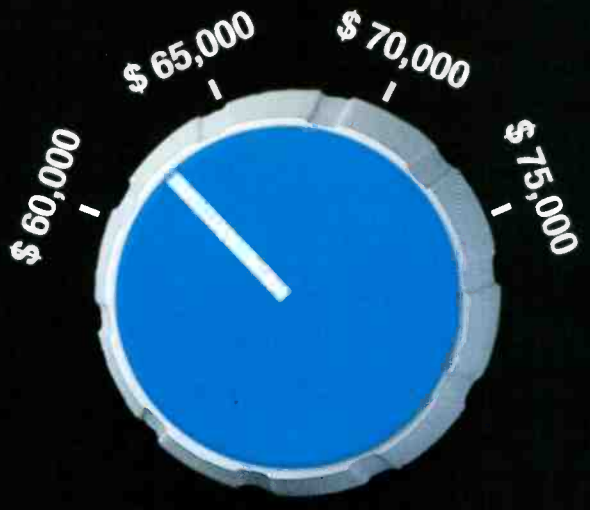

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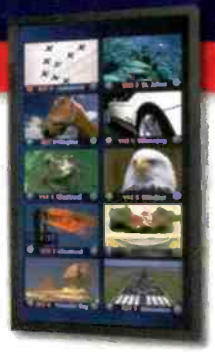

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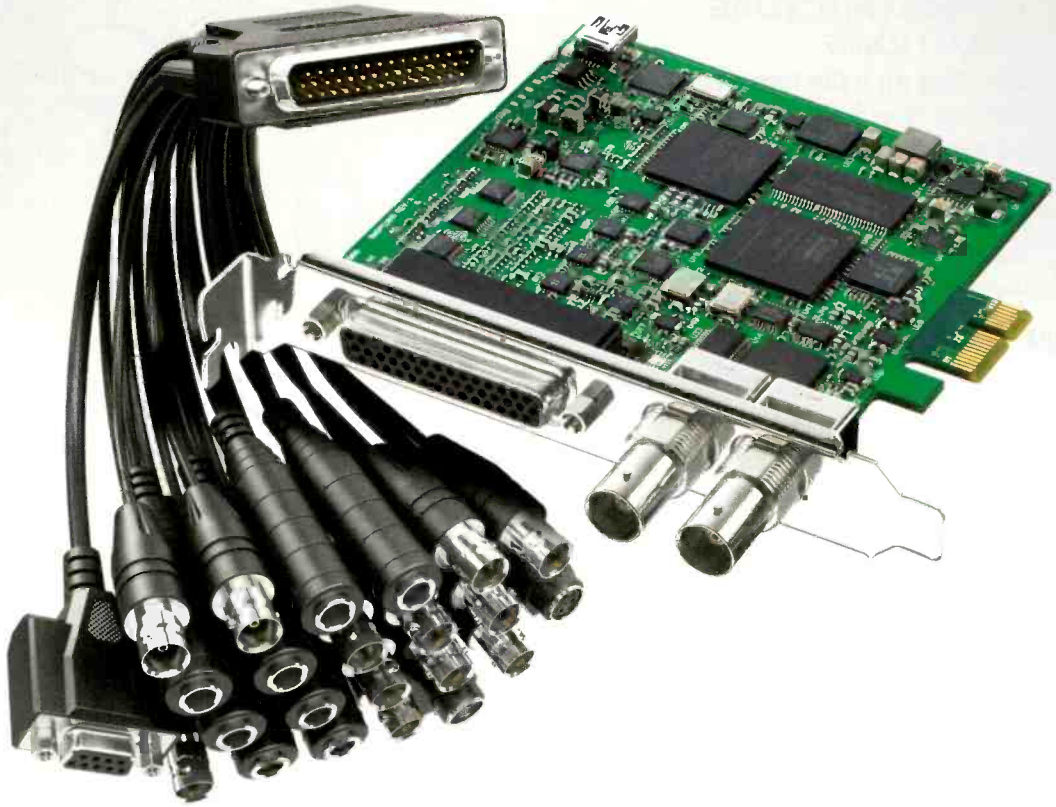

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DEPARTMENTS

MARCH FREEZEFRAME QUESTION

How good is your understanding of basic digital networks? Answer the following questions:

1) A _____ is used to interconnect two LANs while separating network segments.

2) A _____ is an improved network technology that resolves the issue of providing direct data connections and maximizes the use of a LAN's bandwidth.

3) The _____ command is used to verify that a network connection exists between computers.

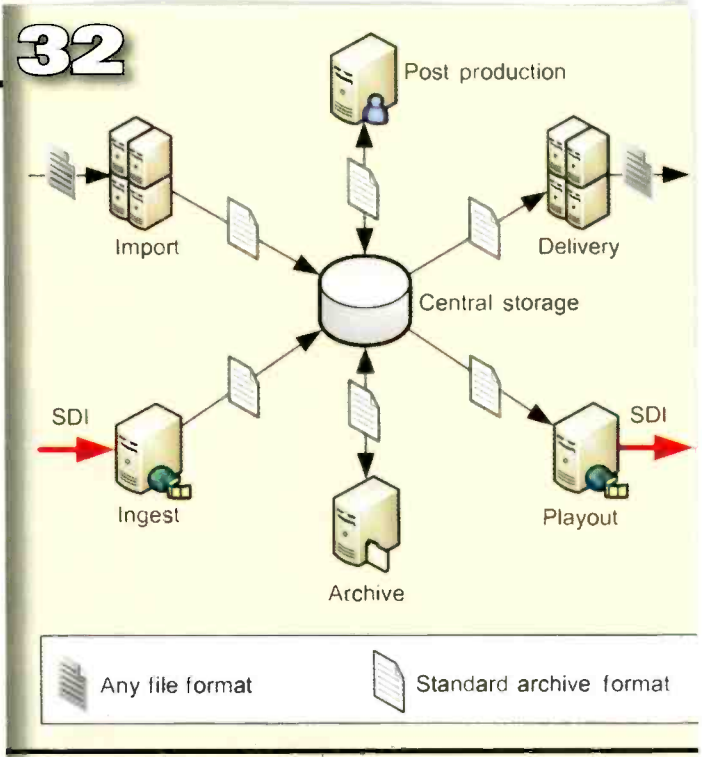
4) A _____ uses layer 3 addressing to make routing decisions regarding forwarding data packets.

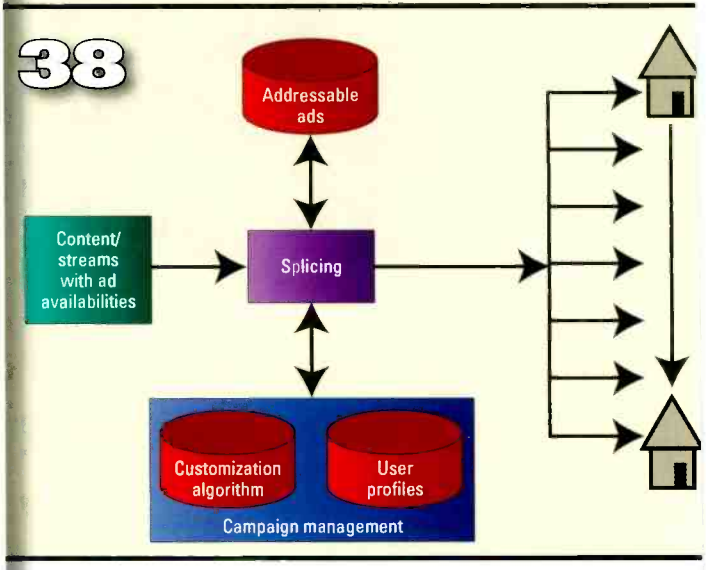
5) A network address is also called the _____ .

6) The two transport protocols within the TCP/IP transport layer are _____ and _____.

MARCH FREEZEFRAME ANSWER

1) Bridge
2) Layer 2 switch
3) Ping
4) Router
5) Logical
6) TCP and UDP





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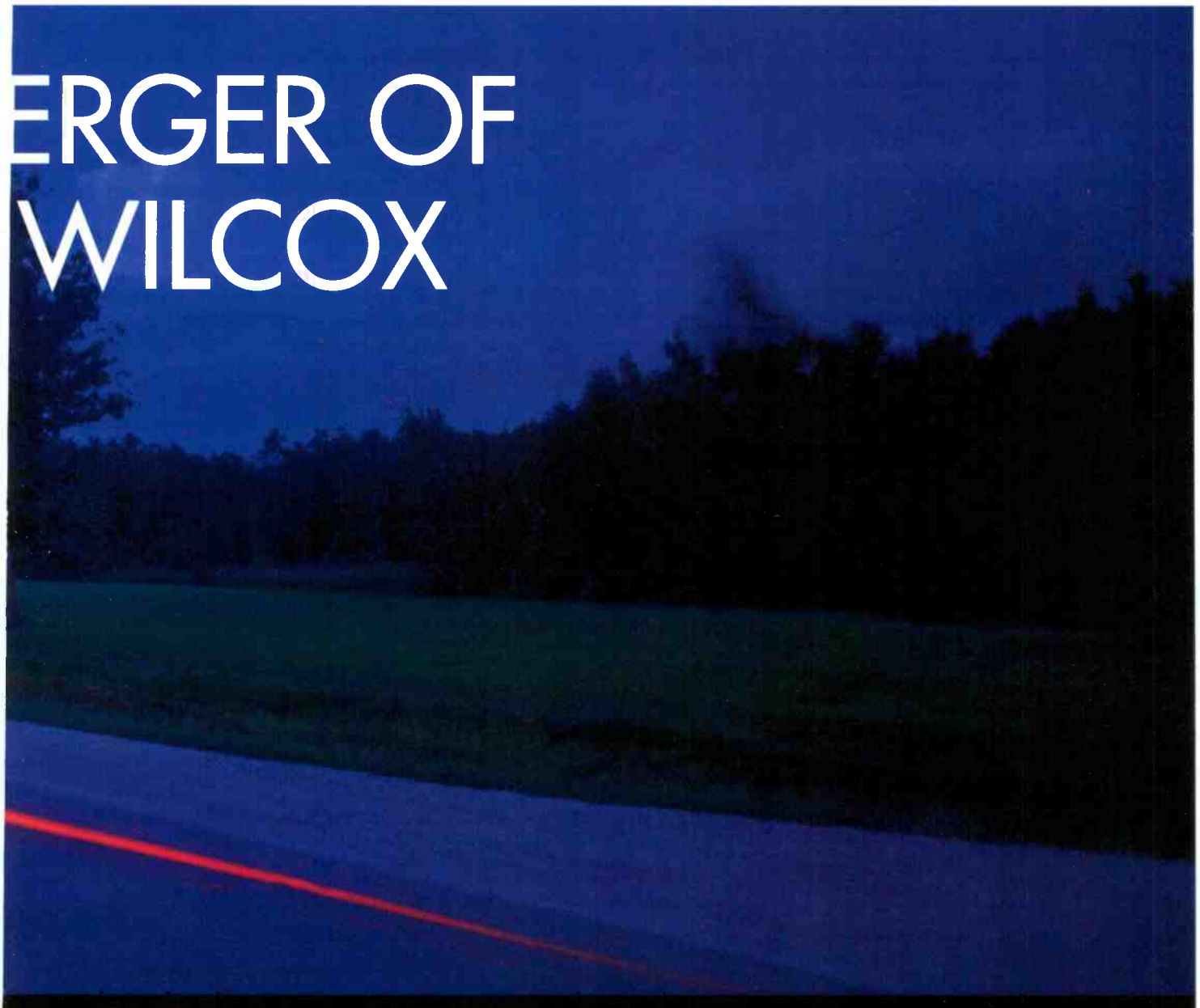

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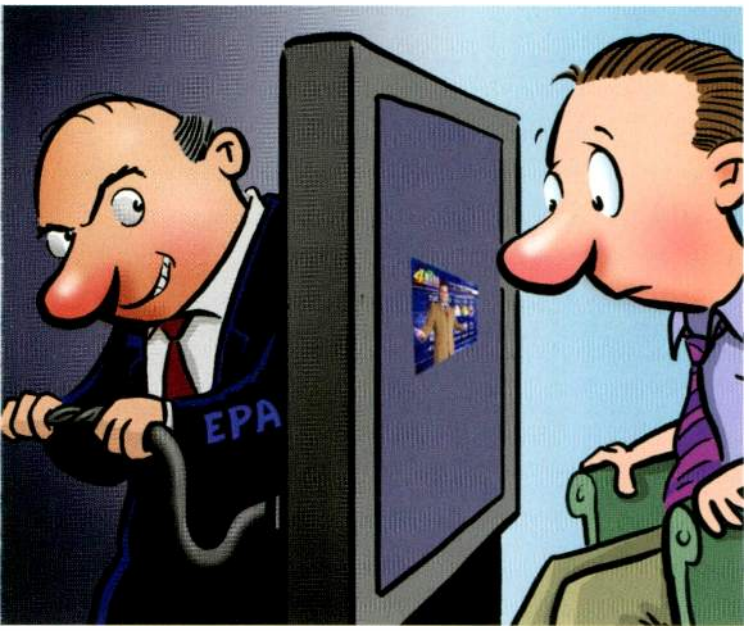
Energy Star this!

Four years ago, I purchased a new home, which came equipped with Energy Star-compliant appliances. From day one, the dishwasher refused to fully dry the dishes. I put up with that idiosyncrasy until a week ago, when I finally decided to see what the heck was wrong.

At first, I suspected the drying element in the bottom of the washer wasn't working. So, a few minutes of running the dishwasher and then a touch of the finger ... Ouch! That's hot! Okay, the heating element is working.

A second check was incoming water temperature. Dishwashers need at least 120-degree water if the dishes are going to be clean and dry. My digital thermometer said that the incoming water temperature was 129-degrees, so the water temperature was okay.

While hating to admit I was unable to solve the problem, clearly it was time to contact the manufacturer. I posed my



question to the General Electric (GE) Web site, and within 24 hours I received an answer. The company representative said that in order for the dishwasher to meet EPA Energy Star requirements, the designers were forced to reduce the size (and hence, heat output) of the heating element. In addition, the engineers had to shorten the dry cycle time.

The nice lady at GE said that if I'd just be sure the incoming water temperature was at least 120 degrees and that I used a "proper wetting agent," the dishes should be "almost dry" when the wash cycle is completed. The result is that while my dishwasher is fully Energy Star-compliant, it doesn't dry the dishes!

I was reminded of my situation while reading an article about the difficulties TV manufacturers are having meeting the new, and even more restrictive, Energy Star 3 requirements. The article claimed that none of today's 37in TVs meet the new Energy Star 3 power-on standard. However, seven out of 10 50in plasma TV sets do meet the power consumption standard. If you're looking for justification to buy a larger TV set, that should be all the excuse you need.

However, the EPA wasn't satisfied with just requiring lower power consumption when a TV is turned on. The agency also is demanding that TV sets consume less than 1W when they are off! Set makers claim that meeting this portion of the Energy Star 3 requirements will be extremely difficult because of the requirement to support instant-on HDMI interface capability.

Could the EPA impose even stricter limitations on electronics? Yes. Your next television set might contain a "feature" that allows the power company to downgrade your set's display quality to "almost HD" to save power. Perhaps the set will shut down heavy CPU image processing or reduce the contrast ratio, which lowers LCD back lighting power requirements.

The bottom line is that government-mandated power limitations, while they may seem worthy, can also limit features and performance and result in a higher-cost product. They are an unwelcome intrusion into one's home.

I can deal with my wet dishes. The solution just requires a towel and time. But when it comes to my home electronics, I'd like to tell EPA where they can stick that Energy Star. BE

Brad Dick
EDITORIAL DIRECTOR
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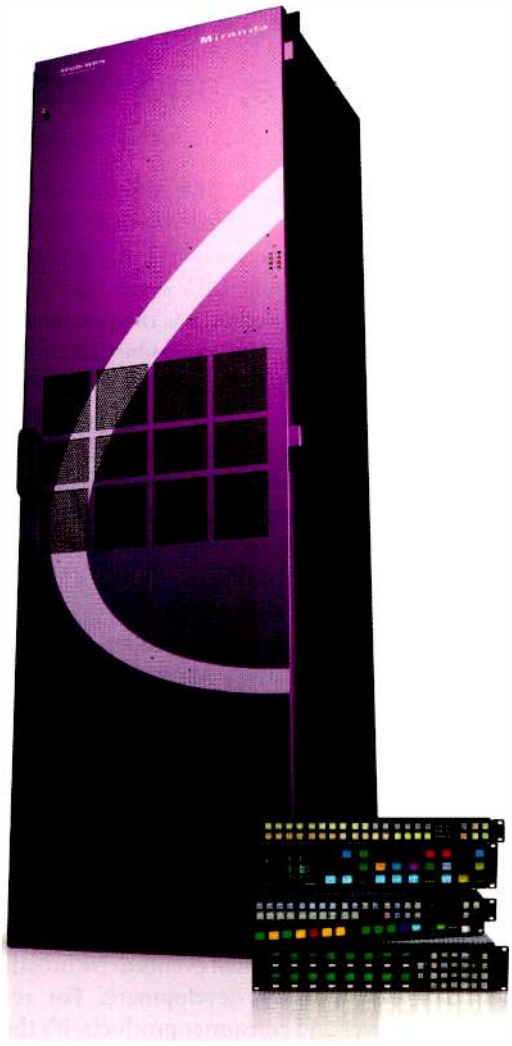

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Mobile DTV

Where are we, and what's next?

BY JAY C. ADRICK

The development of ATSC-compatible in-band mobile DTV began more than three years ago with two companies (Samsung and LG Electronics/Zenith) leading the way — each with a different approach. Each company took on transmission partners, and over-the-air demonstrations began in the spring of 2007. The broadcast industry's interest in mobile DTV ignited rapidly and culminated with the formation of the Open Mobile Video Coalition (OMVC), representing more than 20 major broadcast groups.

At the same time, the ATSC moved the standardization of a compatible ATSC mobile DTV system into high gear. When a request for proposals was issued by the ATSC, many companies responded, and various tests were conducted to evaluate systems. This activity concluded with a recommendation to the ATSC's Technology and Standards Group subcommittee on mobile DTV, S-4, to develop a system based on the physical layer of the LG/Zenith/Harris MPH technology.

The road to ATSC Mobile DTV

The ATSC S-4 activity began in May 2007. By August 2008, the four working groups within S-4 had defined the pieces necessary to put together a working mobile DTV system that met the required criteria as defined by the industry. By late November 2008, the ATSC S-4 mobile DTV system was elevated to ATSC Candidate Standard status and assigned the A153 designation. To many, this might sound like a long development process until you compare it with the more than 10 years of activity that led up to the ATSC DTV standard. The ATSC TSG S-4 Working Group, under the leadership of Mark Aitken and the four subgroups, maintained a constant stream of working sessions via telephone conference calls, e-mail and in-person meetings to move the technology forward and get to the Candidate Standard status in just under 18 months.

Two key annual events drive broadcast industry development. For receiver and consumer products, it's the Consumer Electronics Show in early January. For broadcast equipment, it's the NAB convention in April. In order to show working prototype ATSC Mobile DTV receivers at CES 2009, both receive and transmission technology had to be "reduced to practice" (demonstrate its workability) by mid-November 2008. There was no time to wait for the outcome of balloting with the ATSC TSG if successful demonstrations were to be conducted at CES in January.

LG/Zenith and Harris, along with several partner companies, began product development just after NAB2008. Specifications for the receiver chip sets and the transmission equipment were based on the committee work that was conducted in TSG S-4 with the hope that no major changes would take place. The receive technology is the most sensitive to change as it is reduced to a single ASIC chip. Most of the transmission technology is implemented on software-defined platforms, thus allowing most changes to be made in software code rather than hardware. By mid-October 2008, a plan was in place for a mobile DTV demo that included nine television program streams, two audio-only streams, a data service and a complete electronic program guide service. The mobile DTV service was to be broadcast by two Las Vegas UHF DTV stations.

CES 2009 marked the formal introduction of ATSC Mobile DTV.

Receiver chip sets were ready by late October and were integrated into prototype receiving devices. By mid-November, all of the transmission equipment was ready for testing. The CES demonstration system was staged at the Harris facility in Mason, OH. Receiver engineers with prototype receivers and engineers from our ESG partner, Roundbox, converged

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

Baby boomers make up largest group of Internet users

Close to 75 percent of baby boomers use the Internet.

	2008	2009	2010	2011	2012	2013
Baby boomer Internet users (millions)	56.7	57.4	58.0	58.5	58.9	59.3
Percent of baby boomer population	73.5%	74.7%	75.8%	76.8%	77.8%	78.7%
Percent of total Internet users	29.4%	28.8%	28.3%	27.7%	27.3%	26.8%

Note: Born between 1946 and 1964

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on the facility to fine-tune and conduct system integration tests for the first implementation of the ATSC A153 Mobile DTV system.

CES 2009 marked the formal introduction of ATSC Mobile DTV. The OMVC conducted a press event and announced that more than 60 U.S. DTV stations committed to launch mobile DTV during 2009. There were a number of prototype receivers shown by LG, Kenwood, Delphi, Visteon and others.

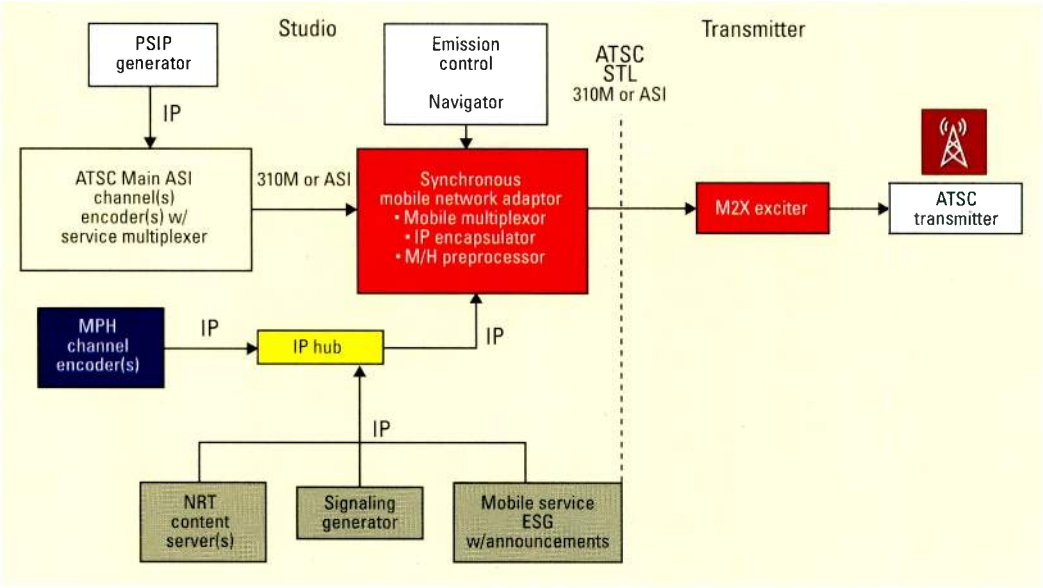

Figure 1. System architecture with full ATSC M/H

What's next?

So, what's next on the road to mobile DTV? The ATSC, with support from the OMVC, is planning several tests for systems to gain more real-world knowledge of system performance. Distributed transmission technology for mobile DTV has yet to be tested outside of the laboratory. Many believe that distributed transmission systems will enable broadcasters to provide seamless mobile DTV coverage throughout their area of dominant influence. The purpose of the Candidate Standard period is to allow such testing and to verify that the proposed standard performs as anticipated. It is also a time when interested manufacturers can develop prototype products based on the standards documentation, while verifying that the documentation is both correct and sufficient to support product development.

In addition to the testing of the system, ATSC TSG S4 has several system enhancements to consider, such as defining the methodology for a back channel, audience measurement and digital rights management. Those items and others being considered in TSG S13 covering data services will keep the ATSC team members busy with mobile DTV for some time to come.

Issues to resolve

A successful commercial launch of ATSC Mobile DTV will require resolutions to several issues. First, broadcasters need to develop and select business models that will attract consumers while also becoming economically viable. Is this service free-to-air, subscription-based, pay-per-view or a combination of those? Will broadcasters in a market develop a unified service offering? If service is based on subscription, will it travel from market to market? What is the mix of content offered — local, national or both?

Second is the need for broadcasters to build relationships with the partners. If the mobile DTV service is based on subscription or pay-per-view, what type of partner is needed to manage this activity? It could be a wireless carrier, a local cable operator or a service management provider. There are several major wireless carriers that already have wireless video services, while others are partnering with broadcasters.

Offering service on a platform with a return channel, such as a mobile phone, enables enhanced interactive services, audience measurement and a much wider consumer base. ATSC Mobile DTV was designed to reach both one- and two-way devices. While the largest platform opportunity is the mobile phone, broadcasters must not overlook personal computers, in-car reception, portable media players and navigation devices as viable reception options.

A third issue is identical to that of DTV in the early days. It is the chicken-and-egg problem of signals on the air versus receiver availability. Most receiver manufacturers and sales channels will want the assurances of broadcasters that service will be available before they commit to ordering, building and stocking receivers. While the OMVC announcement of stations committed to launch in 2009 is a start, much more will be needed to make the market interesting to manufacturers.

The next few months, beginning with NAB2009 in April, will be an interesting time in the development of broadcaster-based mobile DTV. There will be many parallel activities at both the ATSC and within the broadcast community as the ATSC Mobile DTV system moves toward full standard status and commercial deployment. BE

Jay C. Adrick is vice president, broadcast technology, for Harris, Broadcast Communications.

Captions going digital

In addition to providing closed captions in digital, stations must still offer them in analog.

BY HARRY C. MARTIN

The FCC has imposed a number of new closed-captioning obligations on TV licensees and other video programming distributors, and the commission is soliciting comments on even more changes to the closed-captioning rules as TV makes its transition to all-digital.

In November, the commission released a declaratory ruling, order and notice of proposed rulemaking (DRONPRM) in which it announced rule changes and proposals, but the effective dates of the changes and the deadlines for comments and reply comments did not appear in the Federal Register until mid-January.

Dateline

- April 1 is the deadline for TV stations in the following states to file their biennial ownership reports: Delaware, Indiana, Kentucky, Pennsylvania and Tennessee.
- April 1 is the deadline for TV stations and Class A stations in the following states and territories to place their 2009 EEO public file reports in their public files and post them on their Web sites: Delaware, Indiana, Kentucky, Pennsylvania, Tennessee and Texas. LPTV stations originating programming in these states, which are not required to have public files, must post these reports on their Web sites and keep them in their station records.
- Also on April 1, all TV stations (but not Class A stations) in Indiana, Kentucky and Tennessee, regardless of the number of persons employed at the station, must electronically file an EEO midterm report using FCC Form 397.

Rules effective in February

In the new rules section of the DRONPRM, the FCC has made it clear that there is no exemption for DTV programming just because it is digital. Likewise, the transition to all-digital broadcasting in June does not relieve stations of the obligation to continue captioning programming in a manner that can be decoded by analog TV sets. Finally, the transition does not create the opportunity for stations to claim the self-implementing exemption for channels with less than $3 million in revenue or the new network exemption just because of a change from primarily analog to all-digital operation. All captioning obligations remain in place and apply to DTV operations.

All captioning obligations remain in place and apply to DTV operations.

Requirements temporarily suspended

The new contact information requirements and complaint process were adopted, but they are not yet in effect. Those items require review and approval by the Office of Management and Budget (OMB) and were subject to comment through March 16. Also under review are the newly-adopted FCC complaint process and the new rules requiring that stations both provide and keep updated contact information for complaints and inquiries. These requirements will be effective 30 days after OMB approval.

Proposed rulemaking

The subject matter at issue in the proposed rulemaking portion of the DRONPRM is how Section 79.1(d)(12) of the commission's rules should apply to DTV broadcasting. That section provides that no video programming provider will have to pay to caption "any channel of video programming producing annual gross revenues of less than $3,000,000 during the previous calendar year." But it is not clear how that exemption would or should be applied to multichannel DTV broadcasting. For example, should each digital stream be deemed a separate and independent channel for these purposes, or should the term channel be deemed to mean the entire 6MHz of spectrum used by the licensee?

Also, the commission has questioned whether $3 million is an appropriate threshold and whether a single threshold, as opposed to some sliding scale, might be a better fit. Notwithstanding the exemption, all video providers will still be required to pass through any captioning that has already been included by program producers.

Comments on the FCC's rulemaking proposals were due in February. BE

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

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

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Managing lip sync

Solving this problem requires knowledge on how analog video becomes digital.

BY ALDO CUGNINI

This is not the first time that the subject of A/V sync, or lip sync, has been covered in this column, nor will it be the last. While some industry organizations continue to study the issue, and a handful of products exist that either measure or control A/V sync, progress is slow in combating the problem. This month, we'll look at some of the lesser-understood technical factors contributing to the problem.

To recap the issue, correct A/V sync is necessary for program delivery so that the presentation retains a natural appearance. Studies have shown that a mismatch is detectable when the sound leads the video by more than 45ms or lags the video by more than 125ms. Various recommendations exist that put tighter bounds on acceptable performance. The ATSC, for example, recommends that the sound program should never lead the video program by more than 15ms and should never lag the video program by more than 45ms (±15). But state-of-the art systems and products are not yet at the point where this recommendation is always met.

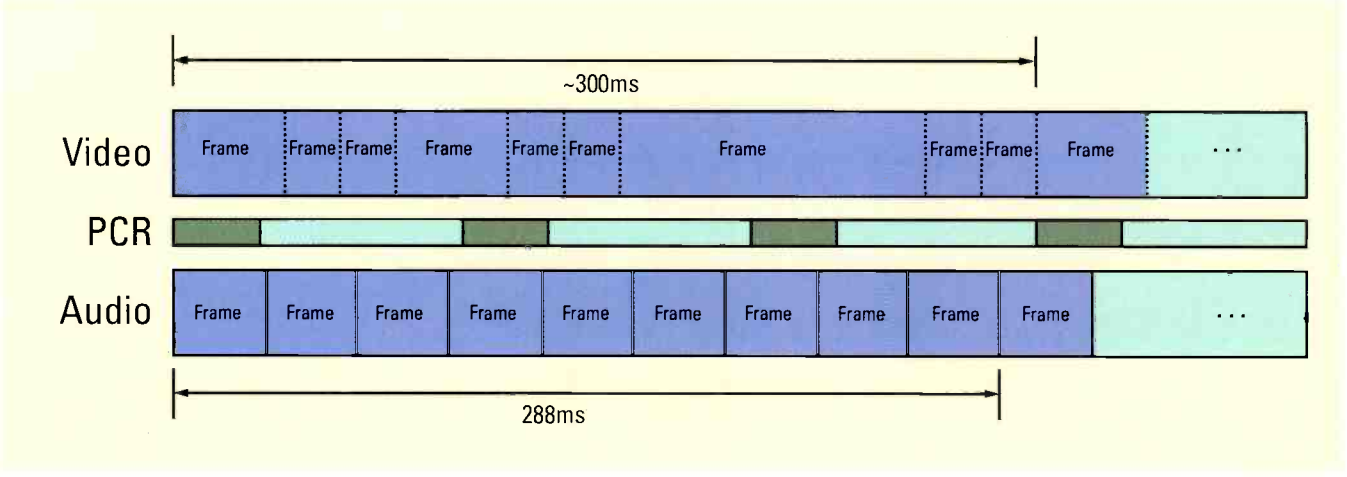


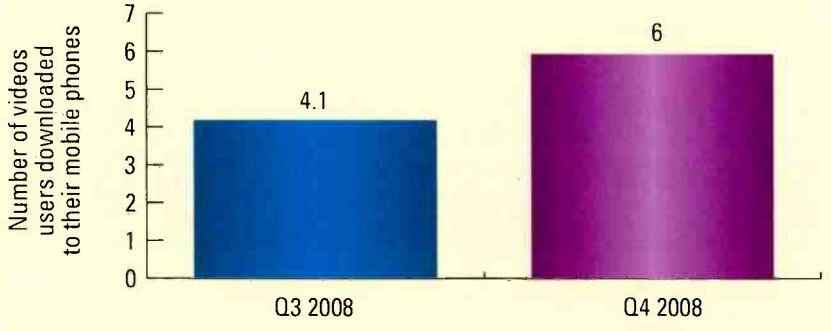
Figure 1. Video and audio streams have different frame-size characteristics.

FRAME GRAB

A look at tomorrow's technology

Mobile video downloads increasing

In Q4 2008, the average user downloaded six videos.



Source: QuickPlay Media

www.quickplay.com

Compression complicates the problem

Audio and video will be differentially delayed when passing through different equipment (or improperly designed equipment). These differences in routing audio and video signals can create an A/V sync problem, especially when the delays change over time.

In addition to the problem of independent signal paths and processing, compression adds another variable to A/V sync mismatch. Not only are video and audio signals compressed using different algorithms, but more importantly, the differential delay between the compression paths is not constant in parts of the system. This is illustrated in Figure 1, together with

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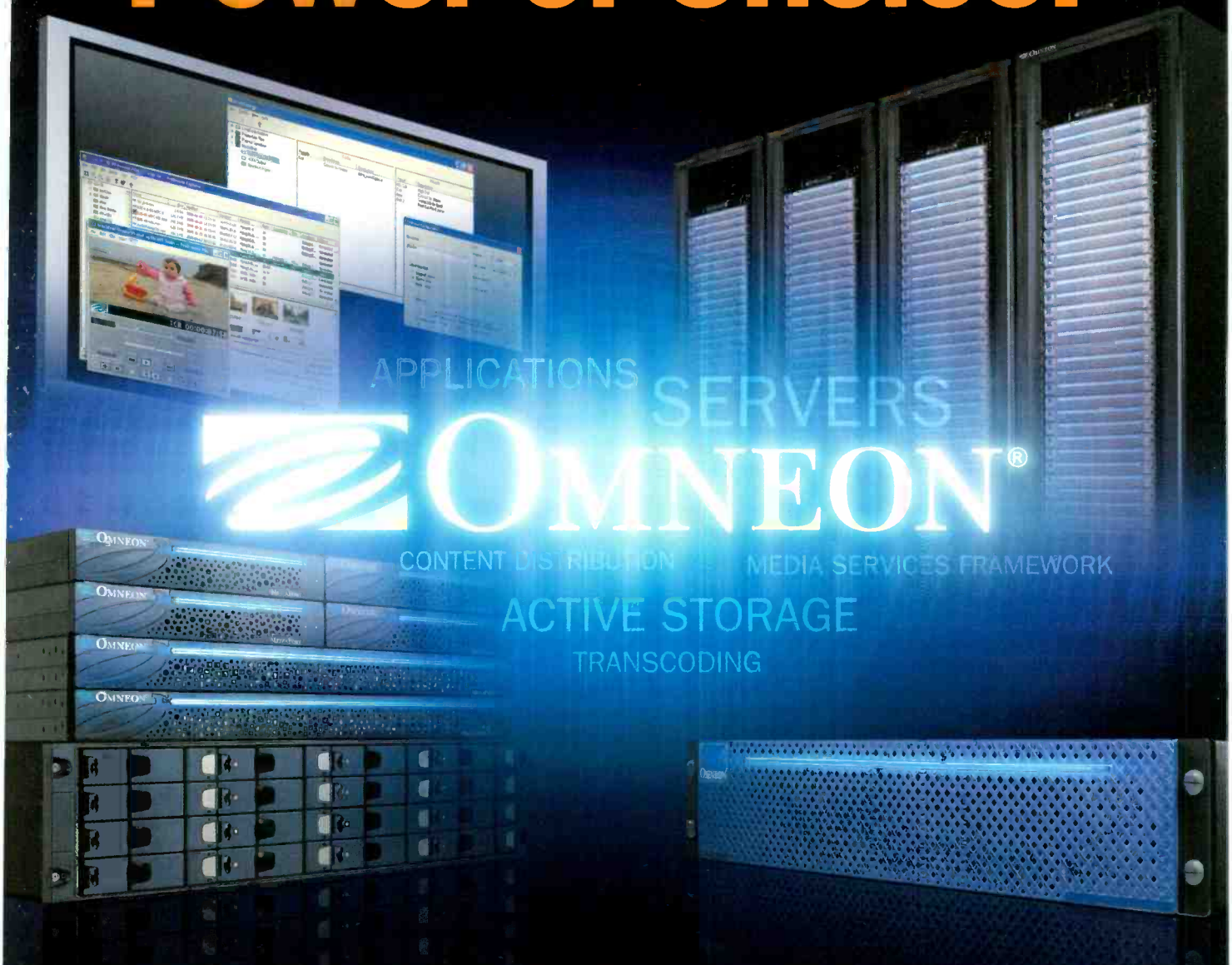

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the program clock reference (PCR) synchronizing element.

MPEG video compression, like most compression systems, uses different types of frames, resulting in different amounts of data for each frame in the coded bit stream. While the overall bit rate for such a system is constant (when using constant bit rate encoding), the number of coded bits per second varies around a target rate and is smoothed by a buffer.

However, the compressed audio does have a constant number of bits per second in most transmission systems. This means that the video and audio frames never exactly line up, and therefore must rely on a time stamping mechanism in order to reproduce the correct A/V sync. MPEG provides a PCR to accomplish this, which is a sample of the master clock that is used in the compression system. By generating the video and audio clocks from this master clock, and then transmitting the PCR at frequent intervals, the decoder can correctly resynthesize the clocks necessary to maintain synchronization.

The video and audio streams each contain a recurring presentation time stamp (PTS) that indicates when each video and audio "presentation unit" should be presented to the decoder. With a fixed decoding time for each process, this then establishes the correct presentation time of video and audio to the viewer/listener.

However, there exists the possibility that receivers (decoders) do not process these time stamps correctly, depending on how the video decoder buffer is managed. As we saw previously, the bit stream data rate varies from frame to frame. This requires a buffer in order to properly decode the video, and an appropriate algorithm to manage the buffer. In MPEG, this is known as the video buffer verifier (VBV), a model that is used in the encoder to ensure that there is never an overflow or underflow condition.

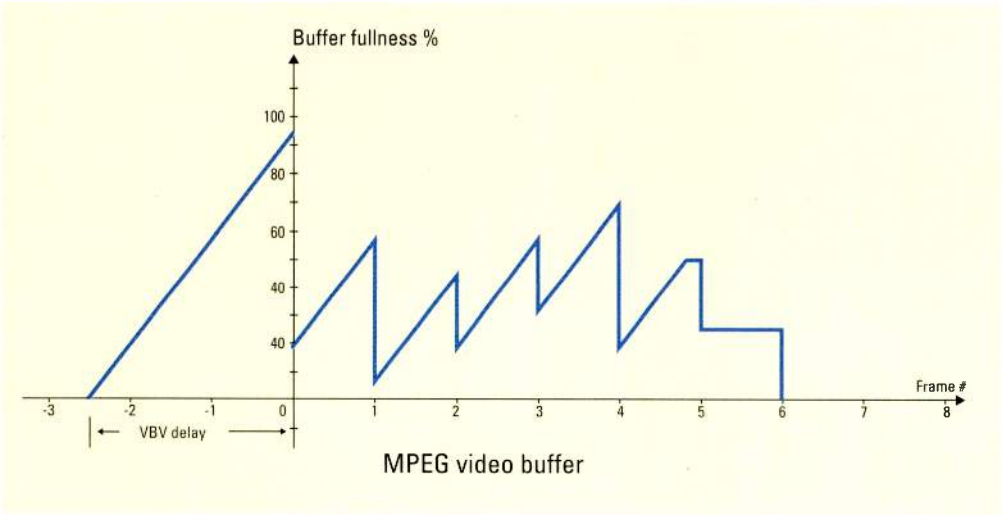

Figure 2. The video buffer allows the decoder to process variable-sized frames.

This is shown in Figure 2 for a fictitious seven-frame stream, with the fullness of the decoding video buffer as a function of time. Bits enter the buffer and then are removed (decoded) starting at frame #0 in the graph. From that point forward, bits must be removed at the correct frame rate to ensure proper video display. (The model assumes that all bits from each frame are removed instantaneously. This is valid for the sake of buffer management, given actual hardware architectures and the fact that any practical delay is inconsequential to the action of the buffer.) If the buffer should overflow or underflow, the video would either freeze or jump ahead, causing a noticeable disruption.

The parameter VBV delay specifies the duration of time that the first byte of coded video data remains in the video buffer (to the left of zero in this example), to start the filling process. While this parameter can be specified in the bit stream, most decoders ignore it, and regenerate the buffer timing from the PCR and PTS data — and herein comes the potential for problems.

Decoders vary in how often they recheck the PCR and PTS elements for synchronization, which can cause a problem if data is corrupted or missing. For instance, a simple decoder could be constructed that fills the buffer to some arbitrary point, and then proceeds to decode pictures without referring back to the PTS on an ongoing basis. Assuming all other data is correctly received, and the decoding frame rate is correct, the decoder could run indefinitely and appear to produce correct pictures and sound. But if there was an error in the timing algorithm, or if some data is lost in transmission, the playback timing could be sufficiently in error so as to produce an A/V sync error that persists indefinitely.

Any viewer encountering lip sync issues will almost certainly blame it on the program provider and not on the product.

The problem with any such product is that there is no formal requirement

that the decoding should work properly 100 percent of the time, other than that of product quality control. (And receiver manufacturers are loath to accept imposed requirements, as well.) In reality, any viewer encountering lip sync issues will almost certainly blame it on the program provider and not on the product. Any activity aimed at improving the situation would have to be from a cross-industry collaboration between broadcasters and consumer electronics manufacturers.

Few solutions at this time

In an earlier column, we took a look at some of the technologies that measure or control A/V sync at the broadcast plant. Part of the problem with their effectiveness is that the simplest test equipment requires the interruption of normal programming. Automatic online measurement and compensation could alternately provide a precise and self-correcting system. Technical committees are continuing to work on the problem, but the work is difficult.

IEC is working on standards relating to assessment, measurements and methods for A/V synchronization, but the results may not provide specifics for the broadcaster. The HDMI v1.3 and IEEE-1394 standards have features that help consumer equipment, but not in systems already installed.

CEA is working on a recommended practice, to be known as CEB-20, for DTV receiver implementers and developers, that relates to DTV receiver/decoder processing affecting a/v sync. Expected completion is mid-2009, after which ATSC will continue its own efforts.

More visibility needed

Unfortunately, A/V sync is the kind of problem that everyone knows about, but not all broadcasters and program distributors are willing or able to spend sufficient time or money in its solution, perhaps in part due to the difficulty of determining the actual effect on revenue. Perhaps therein lies an opportunity for manufacturers to develop solutions that are inexpensive and straightforward to implement. BE

Aldo Cugnini is a consultant in the digital television industry.

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Networking video

Understand these five issues related to moving video over packetized networks.

BY BRAD GILMER

When moving professional video over networks, consider these defining characteristics: large amounts of data; sensitivity to errors and loss; sensitivity to delay; the efficiency multicast issue; and maintenance personnel mind-set.

Large amounts of data

One of the defining issues concerning the use of networking technology for professional video is that it involves moving huge amounts of data. How much data? (See Table 1.)

Of course, these are uncompressed rates; modern compression techniques can dramatically reduce the required bandwidth. But even at 100:1 compression, a two-hour movie at 525/29 represents a file size of about 2.4GB. If you transfer this file over a single 100Base-T network that has a policy to use only 70 percent of network capacity, it will take more than 30 seconds to transfer one file. And this one transfer takes up virtually all of the available space on the network for that entire time.

There are ways to reduce the impact of video on the network, but they all amount to the same thing — an increase in network capacity. Gigabit Ethernet (GigE) is becoming ubiquitous, so the transfer that took more than 30 seconds on your old 100Base-T network will only take three seconds on a GigE network; and 10GigE is on the horizon. Also, it is possible to bond multiple Ethernet connections into a single virtual connection. This allows you to combine several GigE connections together, which is not practical for workstation connections, but it is a reasonable option for connections between backbone switches or between a switch and a large server.

Sensitivity to errors and loss

Professional video users are sensitive to errors and loss during file transfer. If you use conventional FTP to move video files and the transfer fails somewhere in the middle, you will have to start over. Some FTP clients can resume a file transfer at the point where the transfer failed. But if you are moving files larger than 2GB, or if you move large files on a regular basis, investigate special software packages and protocols that will accelerate these transfers far beyond what conventional FTP can deliver.

TV standard	MB per frame	MB/s	Size of 30-second file
525/29	1.126MB	33.75MB/s	1.0GB
720p60	3.093MB	105.58MB/s	5.6GB
1080p60	6.187MB	371.22MB/s	22.3GB

Table 1. Data rates and file sizes for typical TV standards

One of the defining issues concerning the use of networking technology for professional video is that it involves moving huge amounts of data.

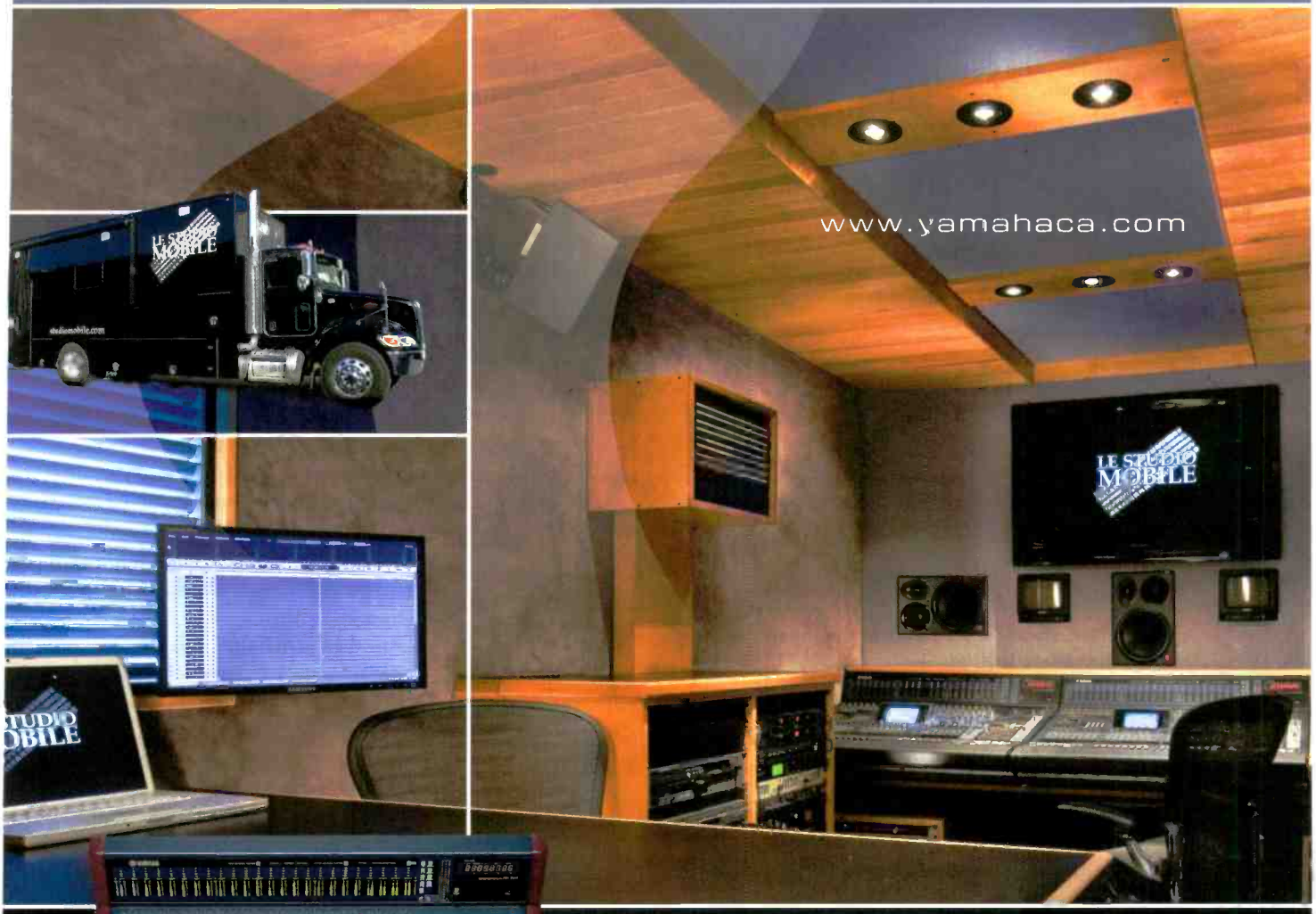
Broadcasters are sensitive to problems during the file transfer, but go ballistic when errors are incurred during live transmission. There are several reasons for this.

First, assuming that the transmission is going out on the air, errors are visible to end viewers, and there is no opportunity to fix the problem in post. Second, depending on where the error hits and on the technology in the encoder/decoder chain, loss of a single packet can produce a series of errors that could last for more than one second. Things do not look any better when considering that IP networks were designed to lose packets when the going gets rough.

You can do things to help with live transmission of professional video over IP. Generally, these fall into two categories. First, try to prevent errors before they occur. Second, protect against errors after the fact.

To do the first, ensure that the internal plant is configured properly so networks that move video prioritize that traffic above other services. Or build separate networks dedicated to only moving video traffic. When working with wide area networks (WANs), make sure quality of service (QoS) agreements are in place so video arrives intact.

To protect against errors after the fact, add forward error correction (FEC), which allows users (up to a limit) to reconstruct missing information using extra bits sent as part of the transmission. Of course, nothing



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is free, and FEC will deduct from the total bandwidth available for video transmission. Furthermore, typically, the more FEC introduced in a circuit, the longer the latency — the time between when video enters one end of the link and when it exits the transmission system at the far end. In live interview situations, large amounts of latency are unacceptable.

Sensitivity to delay

In some cases, such as a live interview, delay can be a bad thing. Fortunately, most on-air talent and home viewers are used to dealing with satellite delay. As long as broadcasters stay within the limits of what someone would normally encounter in this environment, it's okay.

But long-distance IP networks have another interesting characteristic that could prove extremely disturbing. Unless a large IP network has been engineered to control this problem, the delay can change from one moment to the next depending on which route packets take from a sender to a receiver. If the route is constantly changing over the network, a problem known as route flap, the delay experienced over the network will constantly change. Proper engineering of the network will help avoid this situation, but note that human beings hate nonconstant delay when trying to communicate.

Efficiency

As you may know, standard Ethernet frames are a little more than 1500 bytes long (1538 to be exact). The Ethernet payload is 1500 bytes, with the rest taken up by Ethernet headers. Typically, video over Ethernet uses UDP over IP. UDP/IP headers consume 28 bytes of the 1500-byte Ethernet payload. So typical video transport, ignoring collisions, other network traffic and a host of other factors is around 96 percent efficient. (See Figure 1.)

While this may appear to be a small amount of overhead, when you are sending hundreds of thousands or millions of packets, decreasing the overhead seems like a good idea. And of course, engineers cannot resist making things better. Many years ago, the idea of Ethernet jumbo frames was introduced. The idea was simple — to allow Ethernet payload sizes to be increased for large payload types, which would make networks more efficient.

```
Percent efficiency = Video payload/Total Ethernet packet size
Percent efficiency = (IP payload - IP header - UDP header)/
Total Ethernet packet size
Percent efficiency = (1500-28)/1538
Percent efficiency = 95.7 percent
```

Figure 1. Illustrates how to calculate the theoretical efficiency of video transport over Ethernet using UDP/IP

Bill Fink, the author of nuttcp — a networking test tool — has calculated that the throughput of GigE with jumbo frames set to 9000 bytes instead of 1500 bytes is about 99 percent efficient. On the surface, using jumbo frames seems like a great idea, especially for video applications moving a huge amount of data.

There is no denying the math. Jumbo frame networks are more efficient. The problem is that they may not be supported by the switches and routers in your network. And while most equipment supports jumbo frames, it only takes one switch somewhere in the network to disrupt the jumbo frame transmission. If you decide to use jumbo frames, test the network before relying on it.

Other issues to consider

There are several other issues related to moving video over networks that bear special attention. One issue is that when streaming video, everyone watching the video requires a separate connection back to the originating server. To tackle this, people have built content delivery networks (CDNs), which deploy many servers throughout the world, capable of replicating streams in the network themselves. This reduces the overall load on the originating server. CDNs coupled with multicast technology allow the delivery of a large number of streams in a role similar to over-the-air broadcasting.

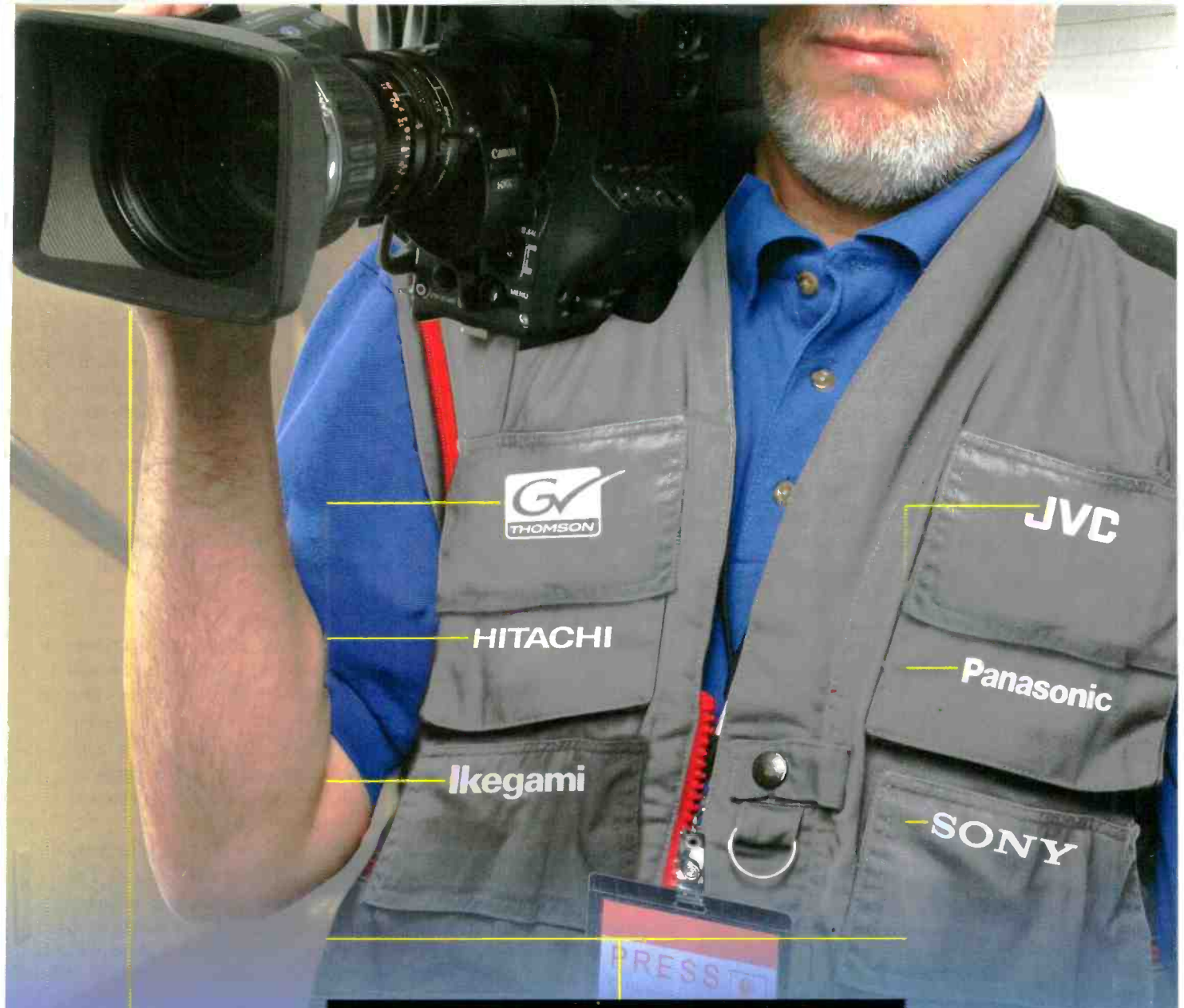
Another issue that relates to the transmission of video over networks is the mind-set of the people who maintain the networks. For people who deal with packetized networks, minor service interruptions are the norm as they go about their maintenance tasks. But video users are extremely sensitive to outages, so it takes a partnership between the maintenance people and those using the networks to keep interruptions to a minimum.

Having an understanding of the issues and potential solutions concerning networked video will help you do a better job as a broadcast engineer.

Moving video over IP networks is done successfully every day. But having an understanding of the issues and potential solutions concerning networked video will help you do a better job as a broadcast engineer. BE

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

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



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What's in your bag?

With these tools in your run-bag, you'll always get the shot.

BY KEVIN JOHNSON

"A cameraman without a camera is just a man." Stephen Press, a freelance cameraman from New Zealand, displays this signature on all of his posts on the b-roll.net forum (*http://b-roll.net/forum*). His quote makes a good point. No matter how much we may try to avoid it, professionals and craftsmen are defined by the tools they carry.

Much like paramedics, who have to be ready for any emergency, TV news photographers need to be prepared for just about anything.

The varied and random situations faced by the average TV cameraman require us to be ready for anything. At the bare minimum, a television photographer needs a camera. Many will argue that the list of essentials should also include a microphone, tripod, lights and a run-bag. While heavy tools and gear may be left behind in the truck, the run-bag goes everywhere the shooter goes and is filled with small quick-fixers and supplies — elements that can make or break a video shoot. Neatly organized or haphazard, fully equipped or sparsely loaded, the run-bag can reveal a photographer's true character.

What is your favorite "indispensible" tool in your run-bag? I posed the question to the members of b-roll.net, a Web site forum for television photographers. My unscientific survey yielded a number of trusted accompaniments, from precise electronic testers to granola bar snacks.

Andy Grossman, a photographer with WVEC-TV in Norfolk, VA, compared photographers to paramedics responding to an emergency. Much like paramedics, TV news photographers need to be prepared for just about anything. Having the right tools in a run-bag can guarantee you'll be ready.

The following list is a compilation of important support gear we all should have on hand.

Multipurpose tool

Often referred to by the brand names Leatherman or Gerber, these indispensible devices combine a Swiss-Army knife collection of tools along with a pair of pliers and wire cutters. Almost any field repair, from retuning a wireless to tweaking your tripod, can be accomplished with the blades, files and screwdrivers found in the multitool. Sometimes this is the only apparatus that can keep your shoot rolling.

Be warned that even though these multitools should never leave your run-bag, they will not make it through airport security. A quick stash in your checked luggage is recommended.

Gaffer's tape

Never mind all of the duct-tape jokes. It's gaffer's tape that can be used for just about anything. The cloth tape sticks to almost everything but doesn't leave any residue. I've used gaffer's tape to keep power cords on the floor, lavalier mics on guests and collars down on jackets.

One of my favorite uses is to cover highlights on shiny metal objects. The black tape covers the sharp reflected light but disappears into the shot. To avoid carrying a full roll of gaffer's tape, many shooters pull a small section of tape off and wrap it around a pen or marker.

Reflector

A foldable circular reflector can be a lifesaver for interviews in harsh sunlight situations. Most reflectors have a white side and a shiny gold or silver side. Positioned just right, the soft reflected sunlight fills in shadows on your subject's face.

The wider the radius of the reflector, the more intense the reflected light, but a small 24in reflector gives just enough light. This smaller size allows it to be held with one hand by a multitasking photographer.

Warming cards

The act of setting color balance on a camera by shooting a white piece of paper is a time-honored

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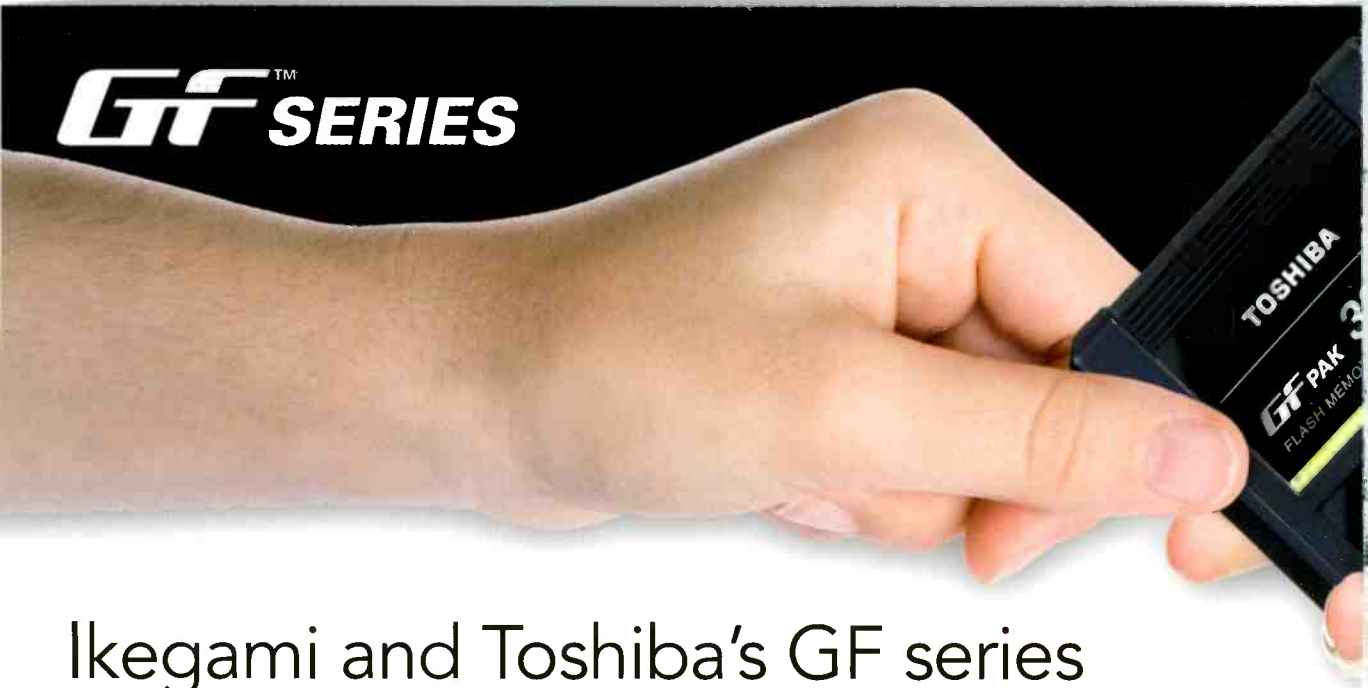

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Ikegami and Toshiba have teamed up to deliver unprecedented levels of workflow innovation in the new GF series tapeless HD ENG system. From digital capture to fast, efficient non-linear editing, to instant IT networking, this revolutionary system features an open-codec HD/SD architecture, proxy video and meta data convenience. System components include the GFCAM™ HDS-V10 tapeless camcorder, the GFSTATION™ GFS-V10 Central Video Management/Player/Recorder studio deck (and a field version for added production versatility), and GFPAK™ high-capacity Flash media to record more than two hours of HD video.

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- Manufactured by Toshiba

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tradition. Many shooters use light blue-colored warming cards to cheat the color balance. The camera's sensor over-corrects for the blue and gives your image a warmer, yellow-orange tone.

New camera models come with color monitors and the ability to manually adjust the color temperature, but the warming card can still be helpful in balancing multiple cameras to the same look.

Rain gear

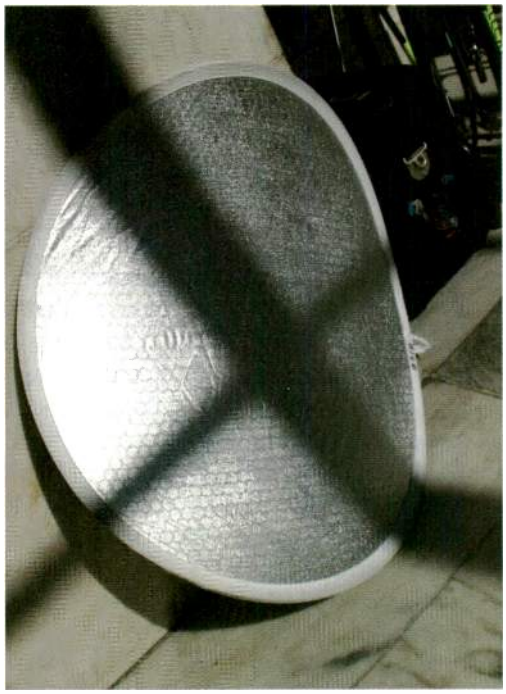
The blue nylon camera cover is an icon of the television photographer. These covers help protect the camera from minor bumps and scrapes, but more important is the quick access to a rain cover in the side pocket. A more substantial rain cover should be within quick reach in your bag for a longer stay in bad elements.

Lens cloth/chamois

The absorbent cloth keeps lenses clean and stops rain drops from ruining your shot. One method is to purchase a large sheet of chamois, and cut it into small portable pieces. Hiding these cloths in various locations means they're always within reach.

Adapters/cables

The right audio and video adapter can save a live shot or tape feed. It may be the only thing that helps you get media in or out of your camera. The alphabet soup of cable acronyms isn't always interchangeable — a BNC video cable to an RCA jack or an XLR to a phono jack. A BNC barrel and an XLR gender changer can help make cables work for you instead of against you.



A foldable circular reflector can be a lifesaver for interviews in harsh sunlight situations.

Gaffer's tape can be used for just about everything, such as keeping power cords on the floor and lavalier mics on guests. Don't leave home without it.

At the same time, don't forget about the simple solutions. In treacherous rain and storms, a simple 10-cent plastic bag can do wonders to help protect a camera worth thousands. Stash a few garbage bags for the camera along with smaller plastic bags and rubber bands to guard your wireless.

The digital nature of today's cameras demands a spare firewire or USB cable. Bring as many variations as you can carry. Murphy's Law guarantees that the adapter or cable you need is just the one you failed to pack.

Mini camera

A camera may seem like a strange example of support gear, but small, affordable cameras are perfect for cramped or dangerous situations. The tiny cameras may go where your high-dollar primary camera can't or won't — underwater or at high altitude, on a police dashboard or hanging off of a motorcycle. The little camera won't out-perform your main camera, but the unique angle will be worth the lesser image quality.

Summary

Early in my career, a reporter friend taunted me with the phrase, "A poor carpenter blames his tools." In the run-and-gun world of TV news, there is no excuse for not being prepared. The story happens whether you're rolling or not. What tools you carry in a run-bag often determines how your story turns out. Always run with the most useful gear you can. BE

Kevin Johnson is the founder of b-roll.net, an online industry resource for television photographers. He has been in the video field for 16 years, and currently shoots for Cox Television News Bureau in Washington, D.C.

Deciding on a file format

Optimize workflow by selecting a file format for archiving and content exchange.

BY PETER THOMAS

As TV broadcasters migrate to file-based workflows, selecting the right file format is becoming important. A file format should support all core processes in television without the need for time-consuming transformations, have a minimum number of transcodings outside of core processes and have a credible future.

Core processes include file import and signal ingest, post production, playout and delivery, and archiving. (See Figure 1 on page 34.) File import typically requires transcoding to the house format. File-based delivery, such as file exchange or distribution via Web, IPTV, VOD or mobile, usually involves at least a transcoding step for delivery format creation.

A standard archive format optimizes those core processes. The selection of such a format is a holistic approach that should not to be dominated by one department or group but be considered as a cross-enterprise business decision.

Archiving

File formats have two facets — the encoding format and the wrapper format. For use in archiving, an encoding format must:

- have a standard encoding scheme;
- be widely supported in the industry;
- be compatible with the products used for in-house core processes; and
- be supported by transcoders.

For SD, popular encoding formats are D10 and DV-DIF. For HD, no common denominator has yet emerged. Organizations may have to use different encoding formats for different business processes, but should strive to avoid transcoding wherever possible in order to avoid generation losses and latencies.

The wrapper format must:

- be open and well-documented;
- be widely supported in the industry;
- support partial restore;
- support play while record;
- have little overhead compared the payload;
- include well-documented mappi for the selected encoding formats; a
- support embedded techni metadata.

Suitable wrapper formats fc TV archiving are MXF OP1a an QuickTime.

File exchange

For file exchange with external partners, the file format has to meet the specifications as agreed upon in the respective service contract. The wrapper format should also allow embedding descriptive metadata, as you may want to embed subsets of the available metadata as contractually required. Hence, external file delivery typically includes transcoding to the required file format and embedding of metadata.

For file exchanges within your organization, try to avoid any encoding format changes, as they are time-consuming and introduce generation losses. Wrapper changes are less critical.

Selecting the right wrapper format

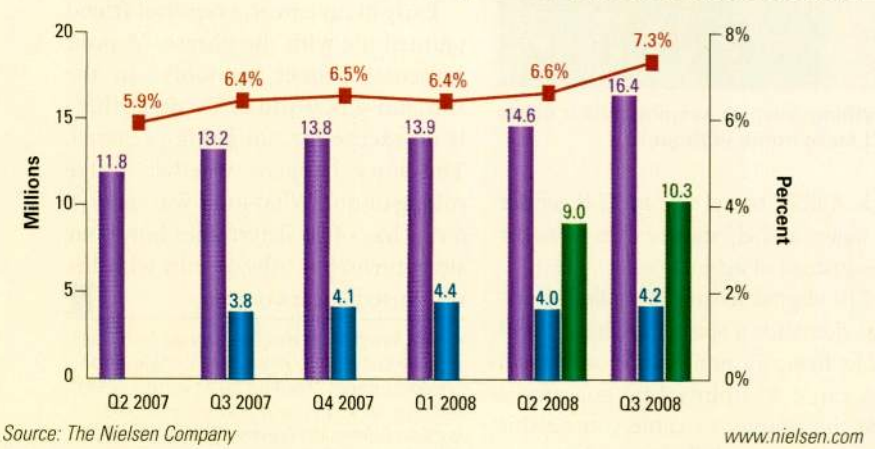
Until recently, the obvious choice for the wrapper format was MXF OP1a. There are MXF-enabled products available to support all core processes, and sufficient interoperability

FRAME GRAB

A look at the consumer side of DTV

Mobile video growth in the United States

In Q3 2008, 10.3 million people consumed video on their phone.



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between those products has been achieved. Some products use MXF OP Atom, but the rewrap can be performed easily during file transfer.

However, one product has successfully entered the market that changes this picture — Apple Final Cut Pro (FCP). FCP does not natively support MXF. Instead, it uses QuickTime — a wrapper format developed by Apple and widely accepted in the IT industry. That means that MXF-wrapped material has to either be rewrapped before being delivered to FCP, or a separate QuickTime reference file has to be created. Content created on FCP requires rewrap from QuickTime to MXF before it can be used in an MXF environment.

Hence, facilities that are using FCP as the predominant editing platform may want to consider QuickTime as house wrapper archiving format. A prerequisite is that QuickTime can be used across ingest, production, playout and archiving, thus avoiding rewrapping entirely. If this is not possible, MXF continues to be the best choice.

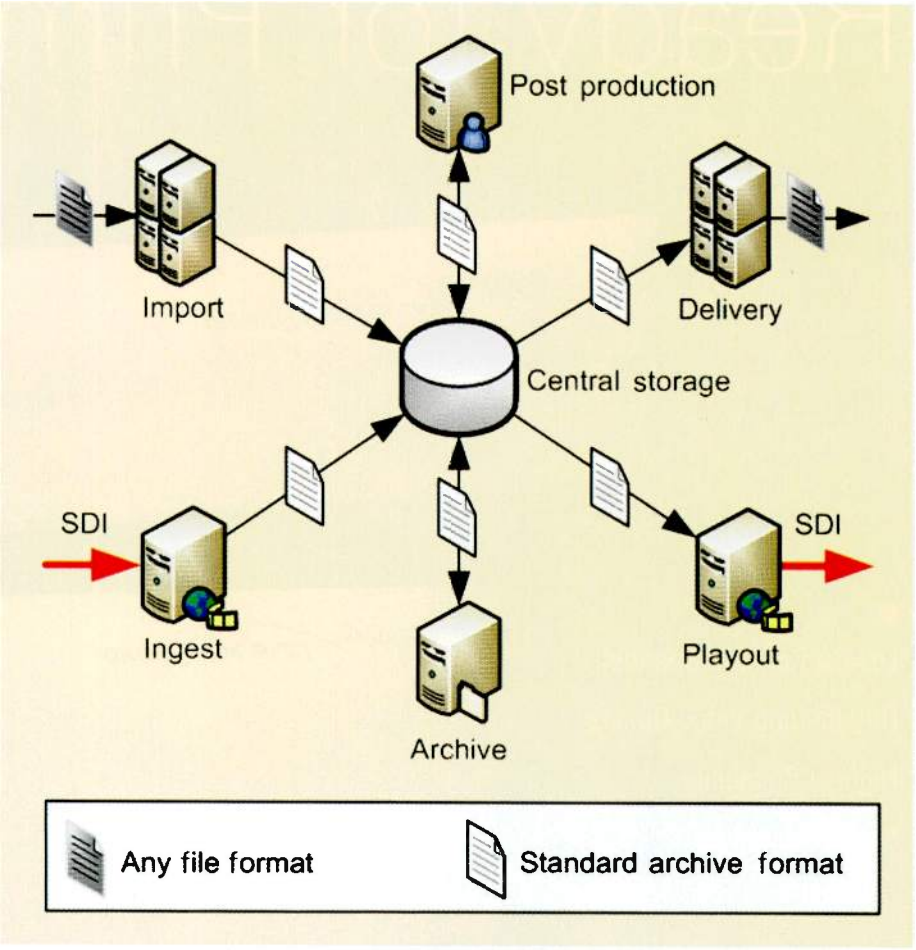


Figure 1. Core processes in a TV facility

Embedded metadata

The fact that wrapper formats allow embedding of metadata can be an enabler for certain file-based workflows. However, there are caveats with descriptive metadata. Specifically, there is a lack of recommendations that allow tying down the full metadata semantics. SMPTE's metadata dictionary helps to define the semantics of attributes. However, a fully specified standard reference data model and a specification about how to map that model to the file embedded metadata are required to tie the attributes to specific entities in such a model.

If such a data model was available, an organization could map its own data model to this reference model, thus ensuring that the semantics of the embedded metadata is clearly articulated. If an organization maps its proprietary data model to the embedded metadata, the result is just as proprietary; no other organization has knowledge of the semantics and hence cannot reliably interpret the data when receiving the file. Embedded descriptive metadata only is useful for file exchange between two systems or two organizations if the semantics is unambiguously agreed upon.

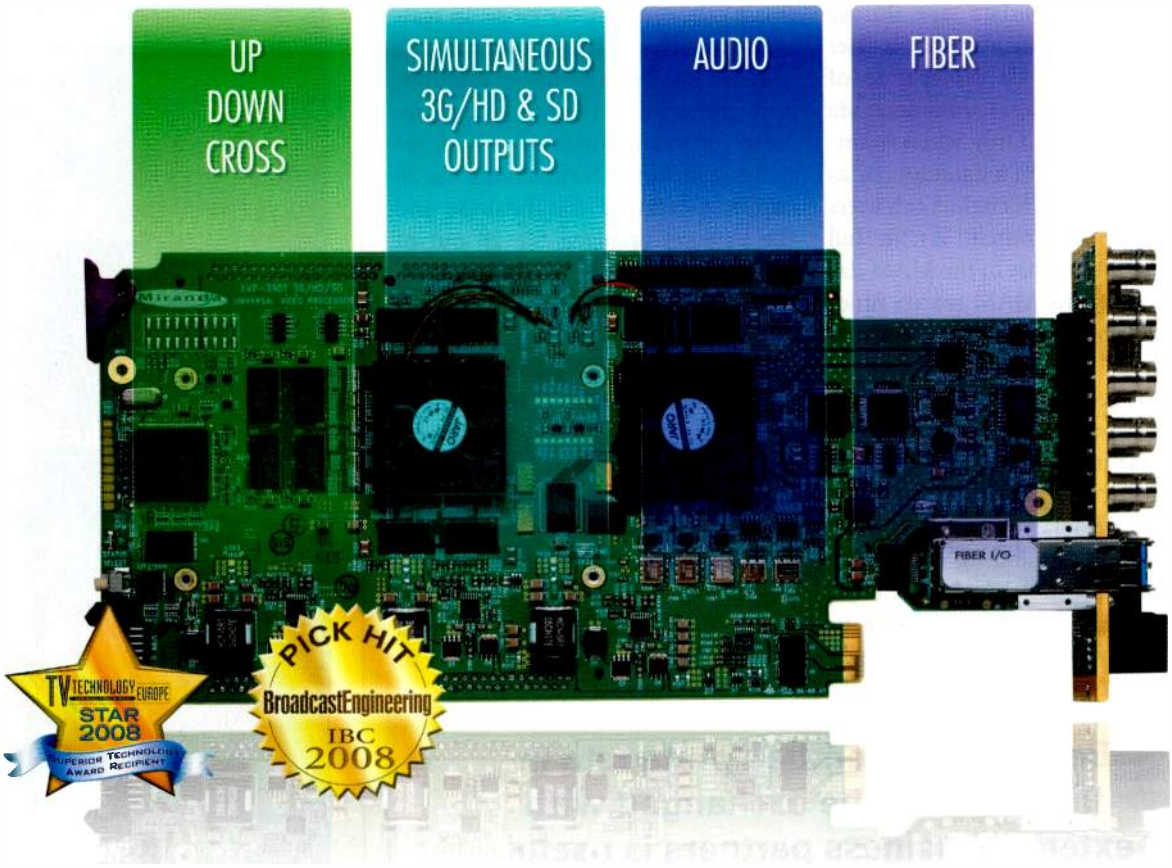
In general, the usefulness of embedded descriptive metadata in archived files is questionable.

Embedded metadata in archives

In general, the usefulness of embedded descriptive metadata in archived files is questionable. At first, there seems to be an advantage in embedded descriptive metadata when archiving because:

- The file can be identified even without a database referencing it;
- In case of a loss of the database, basic information can be restored from the file.

In order to qualify the first point, it's important to understand that, in



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a digital archive, hundreds of thousands of files reside on IT storage systems, primarily data tape storage vaults. There is no way that a user could find a file via exploration of file level metadata, as this metadata is not searchable. Only when maintaining metadata in a database, or as an index in a search engine, can users search and find content. As the full metadata is available in the MAM database, using the MAM search functions is the only sensible way to search for a file.

For the second point, the IT industry agrees that the right way to protect a database is using standard IT database backup. Restoring a failed database typically takes a matter of hours. In the case of an archive of 100,000 hours of content in DV50 with eight audio tracks, it would take close to 260 days of restore time using a single LTO-4 drive. Even if the process used 10 drives in parallel, it would still take almost four weeks to retrieve and analyze the files. It is more sensible to invest in standard IT protection mechanisms and apply related best practices.

There is also the issue of updating embedded metadata. Unfortunately, metadata changes are quite common. Even basic metadata, such as titles, may change throughout the content lifecycle. Hence, there is a high probability that, if not updated, embedded metadata is outdated rapidly.

However, the primary long-term storage technology used in TV archives today is digital data tape, and it is difficult to apply changes to files hosted on data tape. You have to restore the file from tape to disk, apply the change, write the updated file to tape, mark the former version as invalid, and remove it via defragmentation. Defragmentation means copying all valid files to a new tape and releasing the old tape for reuse. In real-world archives, this is not feasible.

A file may even reside in multiple, and potentially remote, locations. Here, metadata updates would require distributed transactions on all copies. Otherwise the database and the primary archived file go out of sync, and the files in the various locations would have different metadata.

Metadata in file exchange

Being able to embed metadata in files that will be exchanged with external business partners is useful, as it allows you to tightly couple metadata and essence. Within a business, metadata exchange can also be accomplished in alternative ways. Examples are partial database synchronization and exchange of metadata via API or XML files.

Being able to embed metadata in files that will be exchanged with external business partners is useful.

Due to the lack of recommendations and standards, partners that want to exchange content with embedded metadata have to agree upon the extent and the semantics of the metadata. The extent may differ depending on the type of transaction and the partner relationship.

Whether the embedded metadata you receive remains in the file after importing it to the MAM database or is deleted is of little importance, even though it is a good idea to retain it. It is important to remember, though, that it will have to be updated when the file is retrieved from the archive and delivered to another partner, as it may have been modified in the database. Or the exchange may require a different set of metadata and semantics. BE

Peter Thomas is CTO for Blue Order Solutions.

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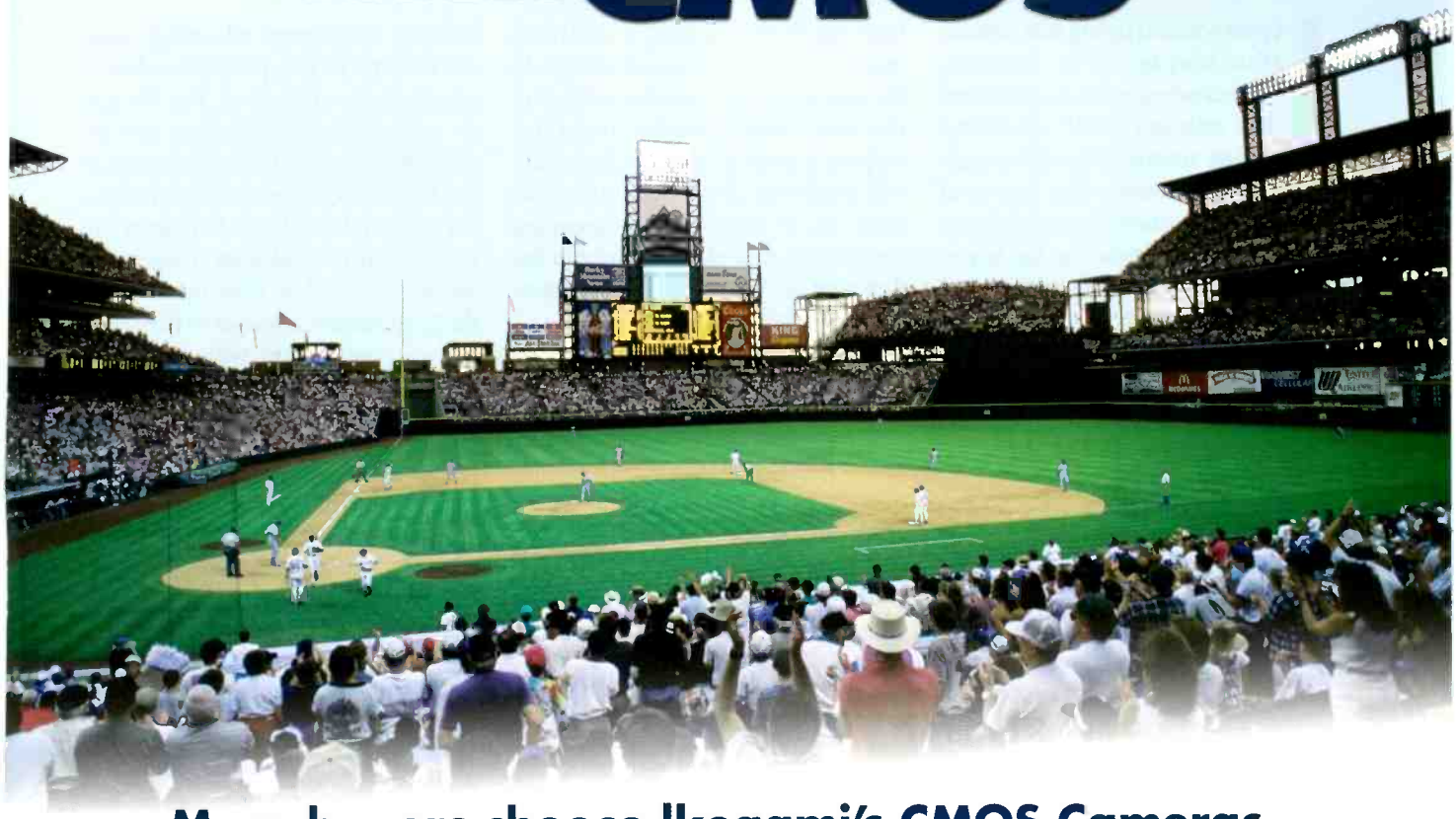

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Personalized television

Addressable ads require asset-based video processing.

BY CHRIS GORDON

It goes without saying that personalized television is "in." Subscribers increasingly demand content they selected, while advertisers are moving toward interactive, personalized advertising. The power of the Internet to customize ad delivery per user has set a new bar for advertising ROI. Few are feeling the impact of this change more acutely than the old guard of news and information, the newspapers. The Internet started as a text-based medium and now offers much of the same content found in the paper. Users have taken notice and are changing their behavior, with advertisers following their every move. As the Internet evolves from text to rich multimedia, savvy video service providers are adjusting their businesses to deliver the personalization demanded by the user while providing the audience segmentation and customization increasingly demanded by the advertiser.

Addressable advertising

Addressable programming and advertising represents a large opportunity for today's video service providers. While local advertising revenue continues to be a growing business for cable operators, it is being outpaced by the rapid growth for the advertising-supported Internet giants. Furthermore, the percentage of paid-click, or click-through, advertising continues to increase, representing a new category of high-value advertising not currently tapped by today's video service providers. Growth in ad spending has been slowly migrating from traditional broadcast outlets to interactive or personalized outlets. As the economy continues to evolve over the next several quarters, many anticipate that the pace of ad migration will accelerate. At the same time, the recipients of this shift in ad spending have announced plans to move in the direction of "display," which is Internet-speak for television.

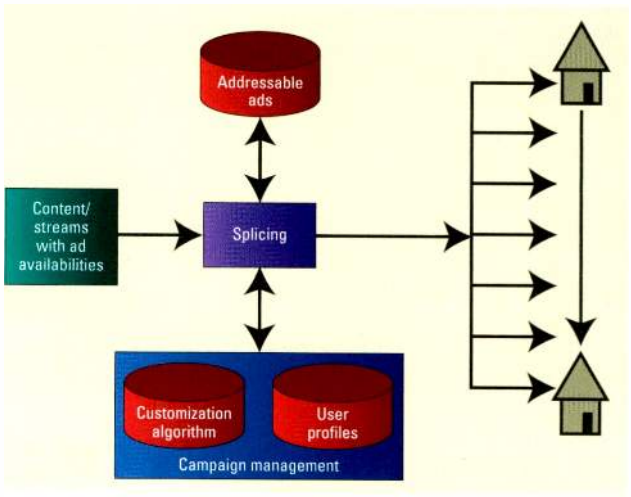

Figure 1. Today's stream-based ad splicing technology works well for regional ad placement.

The demand for personalized advertising is an enormous opportunity for today's video service provider. Addressable advertising in the context of the home TV environment is the Holy Grail for today's ad buyers. Viewers are receptive and engaged, and personalized messages have high value. Video service providers therefore have a unique opportunity to dramatically increase the advertising CPM by providing advertising messages that deliver on that promise.

They can also tap the relatively new category of high-value paid-click or click-through TV advertising while providing the advertiser with unparalleled metrics about the viewing audience. Video service providers also have an important advantage over the Internet service providers when it comes to the subscriber. For Google to compete with the video service providers, it needs to make us change our lean-back TV behavior, our home network and our love affair with the remote control. Video service providers can extend their offerings to meet the 21st century demands of users and advertisers without asking much of the consumer. All they really need to change is the back-end technical infrastructure.

There are four high-level types of technology required to provide addressable advertising: the subscriber database, the personalization algorithm, the ad splicing technology and the required bandwidth. Service providers have excellent subscriber databases that support billing and marketing efforts, while personalization algorithms are readily available from a variety of vendors. This discussion will focus on the latter two types.

Ad splicing technology

Ad splicing, while relatively new to local operations teams, is a relatively mature technology. Standards for signaling ad avails and transferring files are well understood by a broad array of technology vendors. In short, splicing is easy. (See Figure 1.)

However, splicing ads into programs on a scale of granularity to match the number of televisions in the network is an entirely new challenge. Video processing and quality control must be separated from the ad splicing function such that video processors are allocated per asset (ad

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or program) and not per stream. Today's stream-based ad splicer is a fully equipped piece of video processing hardware, capable of changing the video pixels and macroblock quantization to create the correctly sized and shaped space for the inserted advertisement. While this stream-based approach has worked well for regional ad placement, it has two fundamental limitations for addressable advertising: quality and cost. By enabling these platforms to modify the video to insert the advertisement, operators lose control over the quality of the program and advertisement. The highly distributed architecture required to support personalized ad insertion makes the QC issue exponentially larger.

The costs of stream-based systems scale up with the number of streams. To enable ad splicing, every stream requires its own video processing unit. While this cost model works when shared across thousands of subscribers, it falls apart when each television requires a unique stream and a dedicated processor. To solve the quality and cost problems, there must be a fundamental shift from the legacy approach of stream-based video processing to a new approach of asset-based video processing. Ad or program assets can be preprocessed and stored, once and only once, as a constant-quality variable bit rate stream. They can then be combined by a scalable splicing multiplexer at the network edge in a cost-effective manner without compromising quality.

Required bandwidth

Addressable ads require addressable bandwidth, and bandwidth in a cable or satellite system, while extensible through incremental capital investment, is finite and in high demand. The introduction and expansion of HD programming is critical to the success of the enterprise, but HDTV demands four to five times the bandwidth of SD. HD VOD is a valuable revenue generator and competitive tool, but the bandwidth required to support it further reduces the available pool of bits. While it may be possible to store the advertisements locally on the associated set-top box/digital video recorder, the vast majority of deployed set-top boxes don't have the storage capability and could not participate. Therefore, to deploy an addressable advertising solution in the near term, the unique and personalized ads have to be delivered centrally, much like VOD assets. And while neighborhood segmentation will get us part of the way there, to match and exceed the value of Internet ad placement, video service providers need to provide customization at the household, and even TV room, level.

There are several bandwidth management tools available today. Satellite operators and some content providers have adopted MPEG-4 for HD programming. Cable operators are transitioning to digital and deploying switched video technology, but more is required. MPEG-4 is not practical for cable in the near term due to the large deployed base of MPEG-2 set-top boxes. Switched digital video will not work for satellite due to the inherent one-to-many design of the satellite transmission system.

It is clear that providing the personalization users and advertisers demand will require a holistic approach. For cable operators deploying switched digital video, much of the bandwidth gain is realized on the long-tail content, or content that is not highly viewed (not where advertisers typically want to buy time). So while switched video is a critical first step to addressable programming, the operator will need to first create the bandwidth/space for the new tier of switched services in addition to optimizing the switched programming for the most efficient bandwidth use.

First, video service providers need to take a careful look at how to optimize the broadcast spectrum, the largest part of spectrum use today. By applying advanced compression techniques, up to 50 percent of the broadcast spectrum can be reclaimed to support addressable programming and advertising.

Second, service providers must find methods to deploy the known and proven technology of VBR statistical multiplexing on the personalized programming that viewers and advertisers demand. By enabling VBR for these streams, another 50 percent gain of the switched/on-demand bandwidth can be realized and applied to addressable programming. The critical event is a shift from stream processing to asset processing and a separated, cost-effective edge multiplexing and splicing capability.

Finally, and perhaps most importantly, quality cannot be sacrificed. Today's premium consumers, those most coveted by advertisers, are increasingly aware of quality differences and are being aggressively marketed to on the basis of quality claims. Sacrificing quality to achieve addressability would be a strategic mistake, and the consequences would become quickly apparent.

Embracing a new approach

The opportunity to provide addressable programming and advertising is enormous. It is the lifeblood of the new media giants and a critical component of the 21st century media and entertainment landscape. The potential is great, and the enabling technology is within reach.

To provide an architecture and cost model that will enable addressable ad splicing, service providers must embrace a new approach to asset-based video processing. To provide the required bandwidth, they must optimize their systems holistically, squeezing every last bit from all segments of the spectrum. And to maintain a strong competitive position against up-and-coming service providers, they must continue to provide the highest-quality programming on the most important display — the television. BE

Chris Gordon is director of product management for Imagine Communications.

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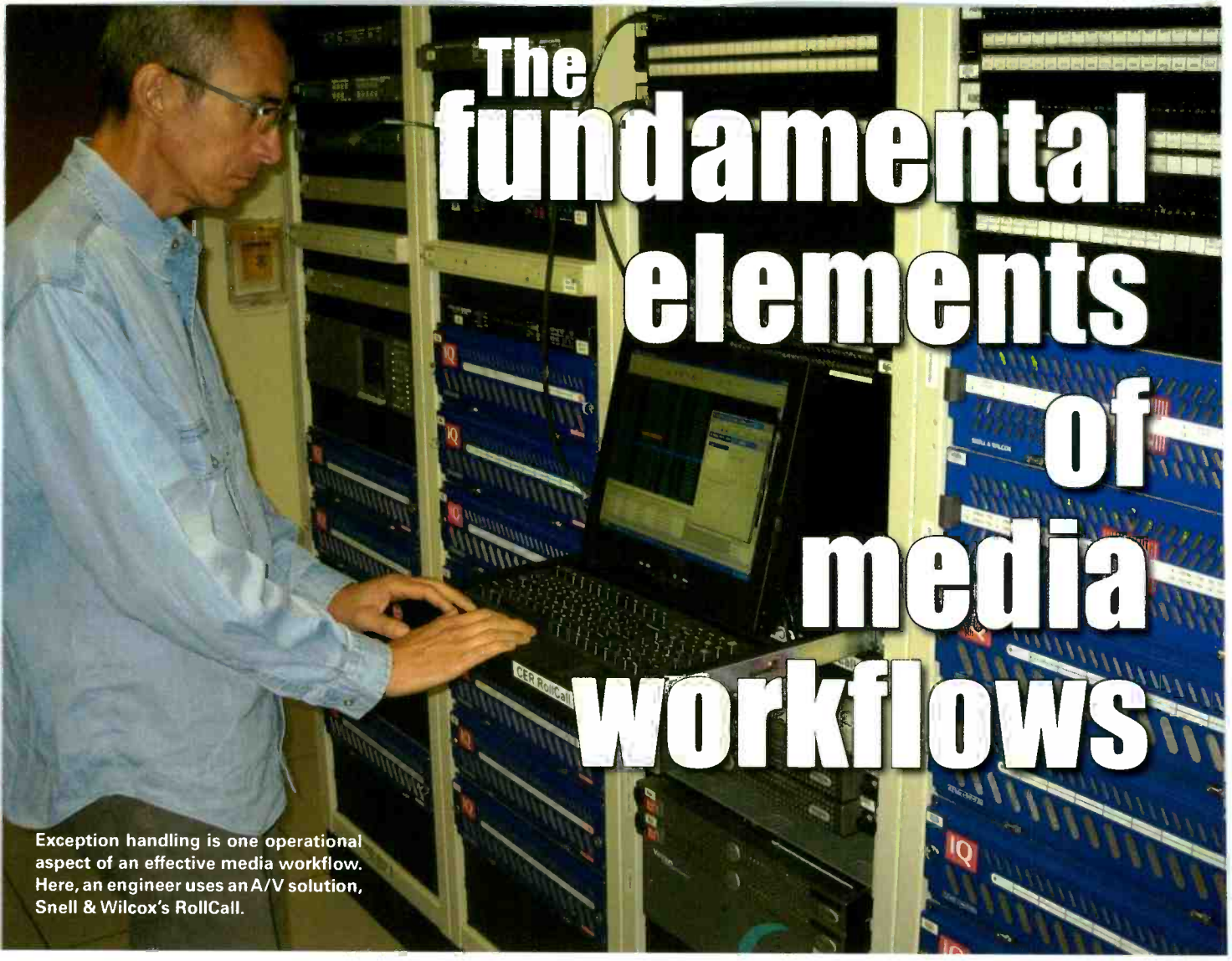
The fundamental elements of media workflows



Exception handling is one operational aspect of an effective media workflow. Here, an engineer uses an A/V solution, Snell & Wilcox's RollCall.

BY AL KOVALICK

Since the advent of file-based technologies, innovative and powerful implementation strategies are being used for broadcast, news, post and digital intermediate (DI) workflows. This article covers four key features of these workflows: system design considerations, process orchestration, operational aspects and workflow agility factors. Several fundamental flow models have been developed that are components in other more elaborate systems. These include high availability concepts, documenting workflow using unified modeling language (UML) diagrams, file transfer advantages, loosely coupled design ideas, service-oriented architecture (SOA) integration and more.

Key elements of media workflows

Workflows are found everywhere in life. Basically, workflow is defined as "a set of sequential steps needed to complete a job." Some workflows are easy to implement, needing only a few tools, whereas others demand mountains of infrastructure and human capital.

Figure 1 on page 44 shows the five precincts of interest for media workflows. The central box represents the actual workflow steps. The other four domains help define the "what and how" of workflow functionality. Some of these are common to all workflows, such as operational elements, whereas others, such as audiovisual streams and file-related processes, are specific to media systems.

For the media enterprise, almost agnostic to size, A/V processes are often implemented using a combination of traditional A/V plus IT gear and processes. (See Figure 2 on page 44.) These hybrid systems support various workflows. Ideally, the implementation is malleable and can morph to meet the needs of future workflow changes. Also, built-in reconfigurability is vital.

Throughout this article, the constituent elements of Figure 1 will be explored with examples. The end goal is to provide a simple, high-level checklist to refer to when building a new workflow or modifying an existing one. This coverage is not exhaustive; not every aspect will be examined. However, you will be versed in the language and concepts of media flows and their design.

The design element

Any viable workflow needs a design stage. The key elements of interest are:

- *Architecture.* What solution space do you need?
- *Reliability/scale.* There are 14 methods for building

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reliable systems.

- *Standards and interoperability.* For example, SMPTE, IETF, IEEE, ITU-T, W3C and AMWA.
- *Implementation.* This includes choice of vendors, systems integrator and support.
- *Documentation.* Workflow design is not just wiring and layout.

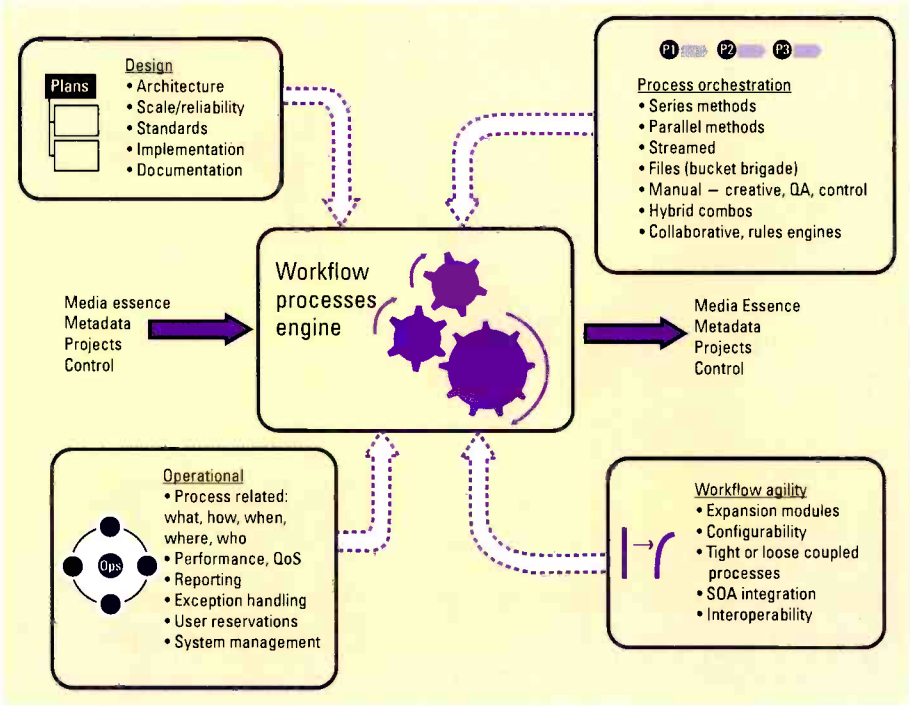

Figure 1. The essential elements of media workflows

The famed Chicago skyscraper architect Louis Sullivan said, "form follows function." This simple yet powerful axiom applies to media workflows as well as skyscraper design. In essence, define your work space, and design it. Allow for growth, support agility and high availability as budget permits, and document not only layout and wiring but flows too. Figure 3 on page 51 shows a typical generic flow for program production. This could be modified for broadcast, live event production, news, DI, or any number of flows.

Figure 3 may be the first step in defining the work space for a new project. The level of detail is intentionally high. The design architecture will support these functions at a minimum. As the designer applies the divide and conquer rule, each process is implemented with the end goals in mind of one unified infrastructure, not islands of operations. Any given process may connect to central storage, application servers, a LAN/WAN, or traditional A/V router.

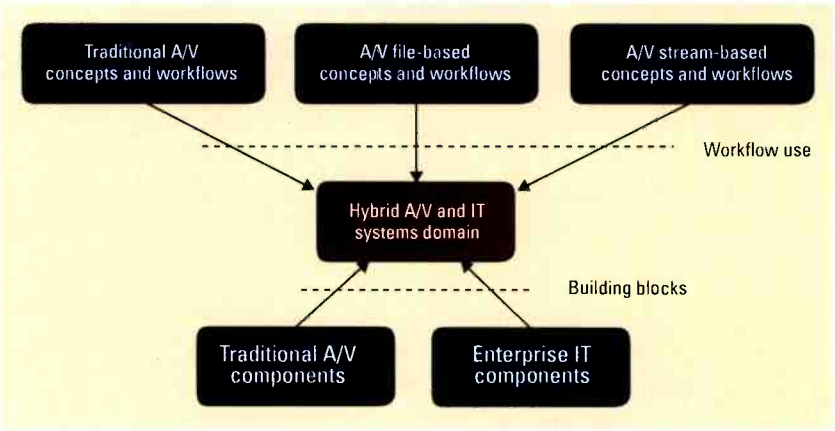

Figure 2. Fundamental relationships — A/V and IT systems domain

Designing for reliability

Let's consider the aspect of designing for reliability. Figure 4 on page 51 outlines 14 strategies to achieve high availability (HA) designs. For the ultimate doomsday, bulletproof system, all 14 could be applied at once. This is hardly practical, but some real-world, mission-critical systems come close. Normally, a few methods are applied, as determined by business needs.

Every design should have a service availability goal as a percentage of uptime. For example, 99.9999 percent uptime or ~32 seconds per year of downtime could be a goal. This value is achievable and allows for one or more serious failures with 32 seconds available, or less, to route around the failed element. Another approach is to decide what length of time a system can afford to be down and design from that value. Given the acceptable downtime, a designer can select options from Figure 4 to meet this goal.

Important concepts in HA designs are a single point of failure (SPOF) and no single point of failure (NSPOF). An SPOF device is not designed with redundant components. If any critical component fails — such as power supply, controller or storage — then the unit often fails. SPOF devices are used when NSPOF is not necessary or affordable. NSPOF, on the other hand, is used when the element is a critical link in a workflow. For example, most large video server storage arrays are designed with NSPOF thinking. In this case, any single element can fail, and the unit keeps plugging along with no apparent downtime. NSPOF devices have dual power supplies, multiple fans, duplicate network I/O, dual controllers, passive backplanes

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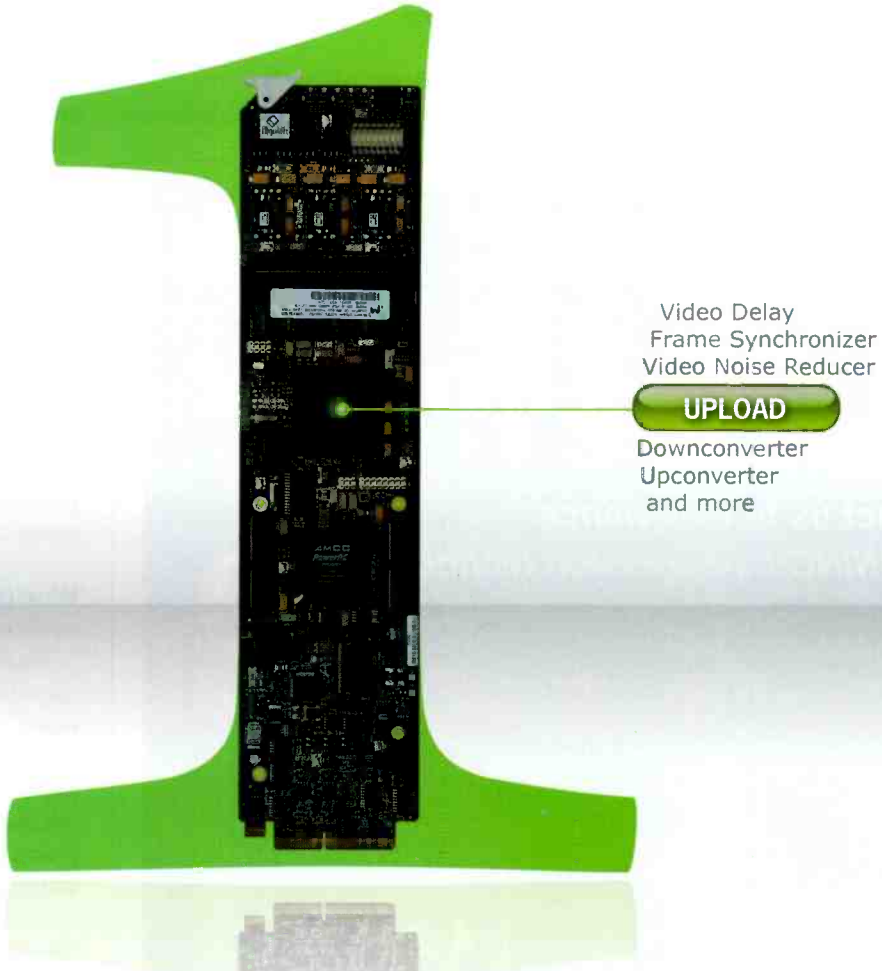

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Some themes in Figure 4 are dual elements and I/O, dual pathing, NSPOF, mirrors, self-healing, caching, and failover to a spare. Each of these helps to resolve a particular device, link, I/O port, store or control point failure. Auto failover is vital when coupled with other methods. When a standalone element fails, such as a link, it is necessary to reroute the data traffic to an alternate link automatically. So, early fault detection is also paramount in an auto failover scenario. The total time it takes to detect and correct, or bypass, a fault is important.

Standards ubiquity

No practical system should be constructed without applying standards from a broad range of sources. Gone are the days when SMPTE standards were the only glue needed to create a video system. Today, in addition, we need the standards from the Internet Engineering Task Force (IETF), W3C and the Institute of Electrical and Electronics Engineers (IEEE) among others. User groups such as the Advanced Media Workflow Association have a mission to create best practices and recommended technologies for implementing workflows in networked media environments. They are currently developing specifications for the Advanced Authoring Format (AAF) and Material eXchange Format (MXF) component inventory method (AS-02) and a constrained MXF version for program delivery (AS-03) to broadcasters and other specifications.

Workflow documentation methods

Finally, under the design banner, consider documentation. For many years, facility documentation was a collection of diagrams showing equipment layout and racking with detailed wiring and inventory diagrams. This level of documentation is still necessary but not sufficient to describe the workflow component of an installation. While not every installation will require a workflow diagram, many will. If the workflow is complex, with disparate processes and time-related dependencies, the following methods should be of value.

Workflow stakeholders include the analysts who create and refine the processes, the technical developers responsible for implementing the processes, and the technical managers who monitor and manage the processes. Two diagramming methods are gaining acceptance to define process flow. One is based on Unified Modeling Language (UML) and another on Business Process Modeling Notation (BPMN).

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workflow using networked media. Videotape flows are limited in many ways, and networked media allows for many dimensions not permitted using only tape.

Comparing flow types

Next, let's compare three flow types — one using pure streaming and two using file transfer. (See Figure 6 on page 56.) The general idea is to process an incoming video signal program as follows: ingest/record, apply an aspect ratio convert and add side panels, add a lower-third graphic and finally output the result. The top flow is most commonly seen using SDI (or AES/EBU links for audio-related applications) connectivity. Of course, a process may be any transform or human-assisted means. For live events demanding a minimal in/out latency (few video frames), SDI streaming connectivity is often used.

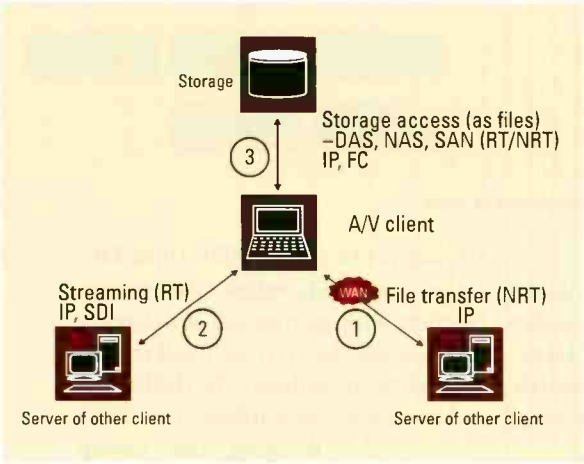

Figure 5. Fundamental media transfer modes

The middle flow uses the bucket brigade method. First, the entire program is ingested and saved to storage. Then, either by a file transfer between processes or via an intermediate "parking place" storage device, the program file is moved to the aspect ratio converter (ARC) process then to the graphic composite overlay process, and finally is output. In each step, the entire file is imported to a process and then exported to the next process in the chain. Hence, the bucket brigade nickname.

The delay from in to out can be quite large, on the order of 10 minutes to 20 minutes (total ARC and composite process delay) for a 60-minute program, not counting the time to ingest the incoming program (60 minutes). The faster each individual process, the shorter the total in/out delay. A designer would choose this method when completion delay time is not a critical metric. For example, if the completed program is needed the following day, then by all means, use this flow method. When timing is not critical, low-speed transfers and slow processes may be used. Note, too, that individual processes do not need to work in real time, and this relaxes their design. In fact, most A/V processes can work faster than real-time video.

The third flow is useful when the in/out delay needs to be low delay, but not as short as the fully streamed flow. Basically, the target file is continuously streamed between processes. This style may be called "process-while-record," with "edit-while-record" being a common version. So, as process 1 finishes say the first 30 seconds of its task, process 2 can start its task and so on. There's no need to wait for an entire process to complete before another process in the chain can start, as with the bucket brigade. As long as the next process does not work ahead of the succeeding process, then all is well. Process timing is critical. Edit-while-record is used with some

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These flow methods may be combined in hybrid means to form serial/parallel versions. Decision steps are also needed, so a process branch may occur. A rules engine may be useful to automatic process tasks. Look for opportunities to automate common process chains. This does not only save manpower and speed up a process chain, but also it yields metrics to improve the flow.

The metric of money

One common metric of interest to all facility managers is daily operational cost of a given process flow. If file transfer is involved between site locations, the cost of bandwidth may be a large factor in workflow cost. We all know the proverb time equals money. In the spirit of the analogy, there is a corollary to this: 1/Time = Money. This is also true because 1/T is rate (such as Mb/s), and we pay for transfer date rates. A 1Mb/s WAN link costs substantially less than a 100Mb/s link.

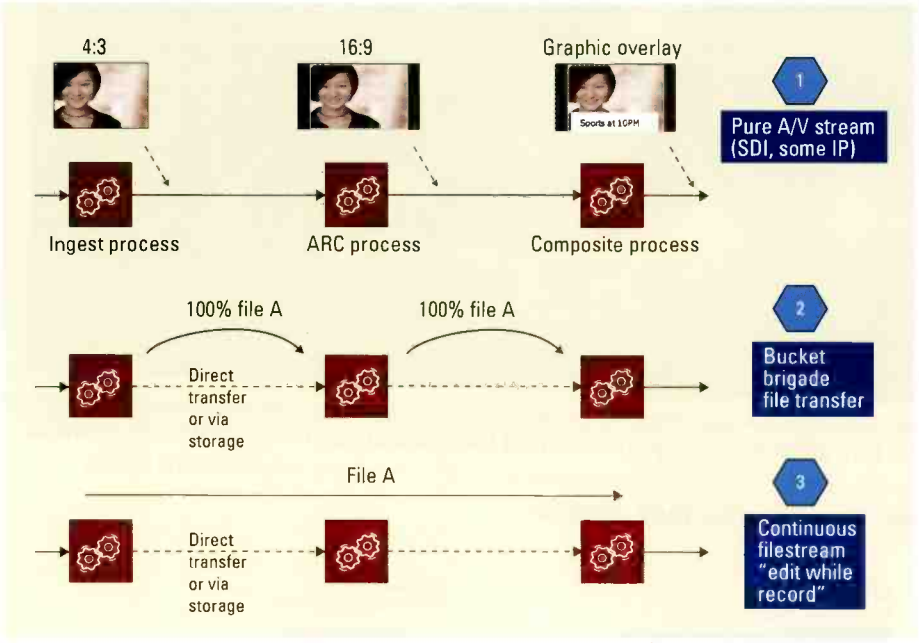

Figure 6. Three common media flow models

The operational element

When defining a workflow process step, it is good practice to define each of the following five characteristics for each step. For this example, let's use the create proxy step in Figure 3.

- What are the specs for the create proxy step (encoder type, data rates, speed, file format, invoke means, input/output means, etc.)?
- How will create proxy be implemented? Use Vendor X's encoder, running on Vendor Y's server connected to storage main (reliability means, failover means, scale means, monitor means, Web services means, API means, etc.).
- When will create proxy be invoked, (workload, duty cycle, peak/average jobs, etc.)?
- Where will create proxy be located (local instantiation, remote service, contracted service, etc.)?

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• Who will own and manage the create proxy service (A/V operations, IT operations, contracted operations, etc.); and who will use it (number of invokers, department, etc.)?

The process of answering each question forces a designer to think deeply about each process. This way, hidden efficiencies may be uncovered, such as we can share server Y with other processes, because the create proxy workload is small even with two times more loading. Or, we can locate server Y in room M, because there is ample power and cooling available.

Performance QoS, reservations, exceptions

Related to the five questions discussed previously, it is valuable to define the performance quality of service (QoS), reservation methods and error handling as separate aspects. Documenting application QoS is useful when scaling or changing a service in the future. When a service is shared (edit suite), then a reservation system with time, billing and resource usage may be required. Providing a system-wide reservation board (similar to a flight departure/arrival schedule display) available for all to see is often good practice at a large facility.

Exception handling deals with hardware and software warnings, faults, errors and status messaging. When something is out of order, it should be registered and personnel notified to repair it. Exceptions may range from warnings of intermittent errors, to out-of-spec signals (audio peaks), to resource status (90 percent full), to a complete device failure. High-end infrastructure monitoring systems are available from traditional IT vendors. A/V specific solutions are available from several vendors.

Investing in monitoring and diagnostics products is a matter of return on investment for the most part. If you are offering services, such as creative tools by-the-hour or commercial program playout, then money spent on keeping the facility up and running is worth the investment.

Workflow agility

Agility is defined as the ability to move in a quick and easy fashion, or change directions quickly. Typically, media workflows are purpose-built — broadcast, post, animation, news, live events, DI and so on. It is prudent, as discussed, for form to follow function. Nonetheless, within the bounds of scale, future changes and reconfigurations, a workflow should be agile.

Loosely coupled designs

One key aspect of flexibility is the concept of loose versus tight coupled processes. This industry is built on tightly coupled designs — hard-wired, rigid, A/V systems with little flexibility for reordering, or quick reuse of components. Sure, SDI and AES/EBU audio links are routable, but this does not constitute a loosely coupled system.

Loosely coupled designs rely on the aggregation of distributed services. A service is a networked application function available for use by others. Examples are video transcoders, media encoders, transfer engines, 3-D render engines, a media asset management (MAM) searching engine and technical QA evaluation. Each function is available over a networked IP connection, is instantiated on an application server, provides a standardized access API and defines a performance QoS for each client user.

Given a collection of relevant services, a designer can configure them to perform useful operations. These services are scalable, reliable (based on methods explained above), reusable (the mantra of services design), and well-defined in terms of API interfacing, data structures and performance QoS.

One outstanding example of a services specification is defined by the W3C.org group. It has defined what is called Web services, and this includes specifications for all aspects of interfacing to services, securing, naming, addressing, finding, monitoring and so on. Despite the name Web services,

these are not bound to the Web. They may be implemented across the Web or inside a secure enterprise environment. Google, Yahoo, Salesforce.com, Amazon, MySpace, and many others offer Web services (or similar RESTful services) for public and private use. Some enterprise media facilities use Web services for select applications. They are not a panacea for all aspects of a media workflow. Real-time A/V operations often require dedicated devices to meet their QoS specification, and Web services fall short today. Still, when real time is not an issue, workflows using Web services are practical and will see more light of day as the industry builds confidence in their practical value.

Thinking SOA

The SOA is broadly defined as an architecture of loosely coupled, wrapped services communicating via published interfaces over a common middleware layer. This definition is not universal; there are others, but this will suit our needs and scope. SOA is strongly linked to Web services and other related networked service concepts. It provides the discipline to create scalable, reliable, managed business and media workflows. Using the technology principles of service reuse, granularity, modularity and interoperability, an SOA provides a firm infrastructure for efficient applications deployment.

SOA is not a technology, but rather an approach — a framework for creating solutions. Its acceptance is growing in medium- to large-scale enterprise organizations. According to the analysis firm Forrester Research, at least 63 percent will have one or more SOA implementations by the end of 2008. Looking forward, many media organizations will be using SOA principles. This affects equipment design because vendors will begin to provide service interfaces on their products to better interface into SOA environments. In the end, this creates more flexible workflows and efficient facilities.

Conclusion

The definition of workflow as "a set of sequential steps needed to complete a job" is deceptively trivial. Yet, behind these few words lies a world of sophistication in terms of design, planning, documentation, implementation and operational aspects. By using these concepts and maxims as a guide or checklist, architects, designers and engineers will have additional confidence in the merits their workflow solutions. **BE**

Al Kovalick is a strategist and fellow with Avid Technology and author of "Video Systems in an IT Environment — The Basics of Networked Media and File-Based Workflows (second edition 3/09)" (www.theAVITbook.com).

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HD MONITORS

Eliminate flat-panel monitor 2:3 pulldown judder.

BY STEVE MULLEN

In last month's article, "24p judder," we explored solutions for the 24p judder issue that results from using low-cost cameras. This article will be a continuation of that discussion.

Deinterlacers used by flat-panel monitors must correctly process 720p60, 24p carried within 720p60, 1080i60 and 24p carried within 1080i60. In the first case, frames are simply passed though the deinterlacer and, if necessary, upscaled to 1920 x 1080.

Interlaced video must, of course, be deinterlaced. When not carrying 24p, deinterlacing is a relatively simple process. When carrying 24p, a more complex process is used that requires a deinterlacer to correctly detect the presence of 2:3 pulldown.

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Video frame 1		Video frame 2		Video frame 3		Video frame 4		Video frame 5	
Odd field 1	Even field 2	Odd field 3	Even field 4	Odd field 5	Even field 6	Odd field 7	Even field 8	Odd field 9	Even field 10
Video frame 1		Video frame 2			Video frame 3			Video frame 4	
↓	↘	↓	↘	↘	↓	↘	↓	↘	↘
Film A	Film A	Film B	Film B	Film B	Film C	Film C	Film D	Film D	Film D
Video frame 1	Video frame 2	Video frame 3	Video frame 4	Video frame 5	Video frame 6	Video frame 7	Video frame 8	Video frame 9	Video frame 10

Figure 1. Film mode deinterlacing of 24p

Frame A		Frame B			Frame C		Frame D		
Video frame 1		Video frame 2		Video frame 3		Video frame 4		Video frame 5	
Odd field 1	Even field 2	Odd field 3	Even field 4	Odd field 5	Even field 6	Odd field 7	Even field 8	Odd field 9	Even field 10
↘ + ↓	↘ + ↓	↘ + ↓	↘ + ↓	↘ + ↓	↘ + ↓	↘ + ↓	↘ + ↓	↘ + ↓	↘ + ↓
Film D' A	Film A A	Film A B	Film B B	Film B B	Film B B	Film C C	Film C D	Film D D	Film D D
Video frame 1	Video frame 2	Video frame 3	Video frame 4	Video frame 5	Video frame 6	Video frame 7	Video frame 8	Video frame 9	Video frame 10

Figure 2. Video mode deinterlacing of 24p

Frame A		Frame B			Frame C			Frame D		
A	A	B	B	B	C	C	C	D	D	
A	A	B	B	B	C	C	D	D	D	
D'A	AA	A	AB	B	BB	B	BB	B	BC	C	CC	C	CD	D	DD	D	DD	D	DA'

Figure 3. 60Hz and 120Hz LCD monitor operation

Deinterlacing 24p video

When 2:3 pulldown cadence is detected, a deinterlacer must switch from video mode to film mode. (See Figures 1 and 2.) In film mode, 540-line Fields 1 and 2 are combined to make one 1080-line progressive frame, which is displayed twice (green). Next, 540-line Fields 3 and 4 are combined to make another 1080-line progressive frame, which is displayed three times (blue). Four fields have now been converted to five progressive frames.

Next, Field 5 (red) is skipped, and Fields 6 through 10 (except Field 8) are converted to another progressive five frames. Through this process, eight fields (four film frames) are converted to 10 progressive frames.

Unfortunately, more than 80 percent of 125 monitors tested by *Home Theater* magazine failed a 2:3 pulldown detection test. The high rate of pulldown detection failure raises a red flag to those editing 24p material on flat-panel monitors.

When unable to detect 2:3 pulldown, a flat-panel monitor falls back to video mode deinterlacing. The result, as shown in Figure 2, is the display of three frames — within a stream of 10 frames — that contain pictures from two different film frames (gold). The outcome is 18 frames every second with degraded quality.

Many flat-panel monitors, however, offer a way to bypass the deinterlacer — a 1080p24 input connector. This connection accepts 24 progressive frames each second. (See top row in Figure 3.) To use a 24p connection, your computer's graphics card, or hardware connected to your computer, must be able to output 24p via an analog or digital connection.

LCD monitors

No matter whether a 1080p24 input is used or pulldown detection is perfect, LCD technology has a liability — perceived motion blur. The top row in Figure 3 shows four progressive frames. As shown in the second row, each presentation is visible for 1/60th of a second. Our eyes use the presentation of every new frame (top row) to determine the motion vector of a moving object. Following this vector, our eyes track the object.

An LCD monitor presents a continuous image until it is replaced by another picture. Each picture leaves a trail on the moving retinas we experience as monitor motion blur.

By using electronics and LCD panels that operate at 120Hz, motion blur can be reduced using several techniques. The third row of Figure 3 shows the 1/120th of a second presentation of a black frame every other presentation time. Each presentation erases the previous image from the retina, thereby decreasing motion blur. Because display brightness is significantly reduced, this technique is typically employed only by professional LCD monitors where low display brightness is not an issue

The fourth row in Figure 3 shows every other frame (green) generated by electronics that interpolate these frames from adjoining frames. This technique has two advantages. First, when there is motion, each interpreted picture is different from the preceding one; therefore, each picture replaces the image on the retina, thereby reducing motion blur. (Next-generation panels will operate at 240Hz.)

Second, several 120Hz LCD monitors are able to display a full 1080 lines of vertical resolution even when objects are in motion. (Most 120Hz displays offer about 580 lines of verti-

cal resolution when there is motion, and 60Hz LCD monitors measure at only 330 lines.)

The interpolation technique, however, has two disadvantages. First, there is a possibility the interpolator will generate image artifacts. Second, the interpolator essentially temporally upsamples the video, thereby eliminating the desirable low temporal sampling judder in 24fps media. This loss shifts the viewing experience from film-via-video *looking similar to film* to film-via-video *looking like video.*

Figure 4 shows an alternate technique supported by some 120Hz LCD monitors. It uses what is called 5:5 pulldown. Each frame is repeated five times, generating a 120Hz refresh rate without 2:3 pulldown artifacts. While this technique eliminates visible 2:3 pulldown judder, it has a downside.

As the display refresh rate increases, the image sampling rate input by our eyes also increases. The higher the sampling rate, the smoother the motion appears. Even though 5:5 pulldown presents only 24 new pictures per second, the repeated four pictures push the overall sampling rate high enough to shift our experience from that of film to that of video.

Plasma monitors

Plasma monitors refresh at 60Hz, although one brand (Pioneer) offers the option of 72Hz when displaying 24p. When running at 72Hz, as shown in Figure 5, each frame is repeated three times — 3:3 pulldown. (Pioneer monitors can obtain 24p via a 1080p24 input or from a 1080i60 signal using its film-mode deinterlacer.)

Pixels that are illuminated follow a cycle of charge, activation and discharge (erase). During each pixel's brief activation period, its brightness is determined by pulse-code modulation. Motion blur is low because from the time of discharge through the display of all other rows, and including the pixel's next charge, the pixel is dark.

When operating at 72Hz, a plasma monitor replicates the viewing experience created by a film projector that employs triple-bladed shutter.

Eliminating 2:3 pulldown judder

It has long been a goal to view 24fps media on a video monitor without the contamination of 2:3 pulldown. Although 120Hz LCD displays that offer 5:5 pulldown are marketed as meeting this goal, their very high refresh rate detracts from the film experience.

A plasma display operating at 72Hz, or potentially an LCD monitor that can switch to a 144Hz refresh rate for 24p media, correctly replaces 2:3 pulldown judder with filmic motion judder. (See Figure 6.)

Equally important, the inherent temporal sampling judder of 24fps media is preserved.

Pulldown is also employed with 720p60 video. To move 24p video over a 60p connection, 36 extra frames are added each second. Figure 7 shows four progressive video frames in the top row. In the second row, frames are transferred (↓) or repeated (↘). Deinterlacing is not required as each 720-line frame can be sent directly to a flat-panel. The 2:3 cadence creates visible pulldown judder on 60Hz displays.

To eliminate pulldown judder, the monitor's deinterlacer can generate 3:3 (72Hz) or 5:5 (120Hz) pulldown. (In a similar fashion, 720p30 and 1080p30 require the use of 2:2 or 4:4 pulldown to drive a 60Hz or 120Hz display.) BE

Video frame A					Video frame B					Video frame C					Video frame D				
↓	↘	↘	↘	↘	↓	↘	↘	↘	↘	↓	↘	↘	↘	↘	↓	↘	↘	↘	↘
A	A	A	A	A	B	B	B	B	B	C	C	C	C	C	D	D	D	D	D

Figure 4. 120Hz 5:5 pulldown

Video frame A			Video frame B			Video frame C			Video frame D		
↓	↘	↘	↓	↘	↘	↓	↘	↘	↓	↘	↘
A	A	A	B	B	B	C	C	C	D	D	D

Figure 5. 72Hz 3:3 pulldown

Video frame A			Video frame B			Video frame C			Video frame D		
↓	↘	↘	↓	↘	↘	↓	↘	↘	↓	↘	↘
A	A	A	B	B	B	C	C	C	D	D	D

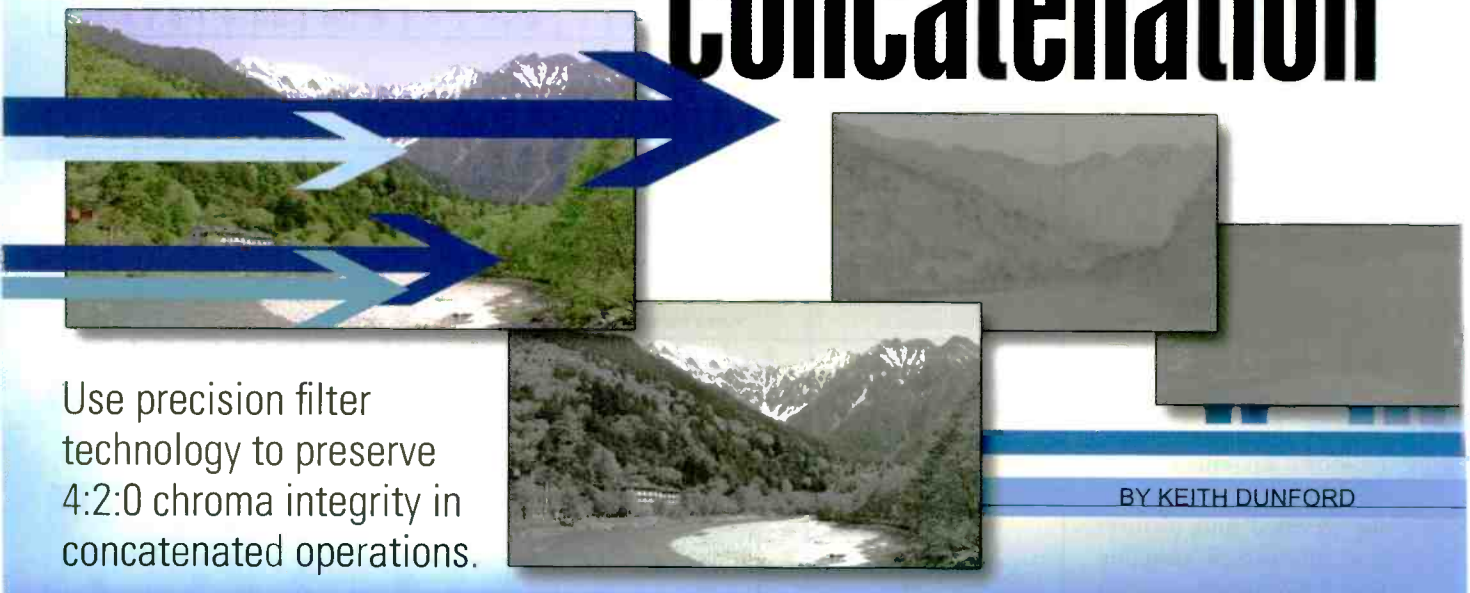
Figure 6. 3:3 pulldown with alternating black frames

Frame A		Frame B			Frame C		Frame D		
↓	↘	↓	↘	↘	↓	↘	↓	↘	↘
Film A	Film A	Film B	Film B	Film B	Film C	Film C	Film D	Film D	Film D
Frame 1	Frame 2	Frame 3	Frame 4	Frame 5	Frame 6	Frame 7	Frame 8	Frame 9	Frame 10

Figure 7: 60p progressive 2:3 pulldown

Steve Mullen is owner of Digital Video Consulting, which provides consulting and conducts seminars on digital video technology.

Cure for concatenation



Use precision filter technology to preserve 4:2:0 chroma integrity in concatenated operations.

BY KEITH DUNFORD

Since the early days of transcontinental and intercontinental networking of TV content, several intermediate communication links have generally been required to complete end-to-end delivery. This is referred to as "concatenation" and has been an area of significant attention regarding the maintenance of video and audio quality and integrity. In earlier analog systems, demodulation and remodulation of the TV signal at each en route microwave or satellite terminal contributed to signal degradation (particularly video signal-to-noise), which, in many instances, reduced the image at the point of delivery to less than that normally acceptable for broadcast.

The transition to video compression and digital networking has created new challenges in mitigating the effects of degradation caused by concatenation in the multiple encode-decode process associated with digital turnaround over satellite, wireless and terrestrial links. One particular problem is maintaining integrity of the 4:2:0 chroma component where an HD-SDI interconnect is used between concatenated decoders and encoders. This relates equally to both the widely used MPEG-2 and newer MPEG-4 (H.264/AVC) codec standards. (See Figure 1.)

HD-SDI is inherently a 4:2:2 interconnect, which requires that a 4:2:0 stream be upsampled and then downsampled at each digital turnaround. This can, within as little as four to five concatenated links, result in visual blurring of the color image to the point where the quality and integrity of HD content can be severely compromised.

This is of particular importance in applications such as HD digital electronic newsgathering, where the use

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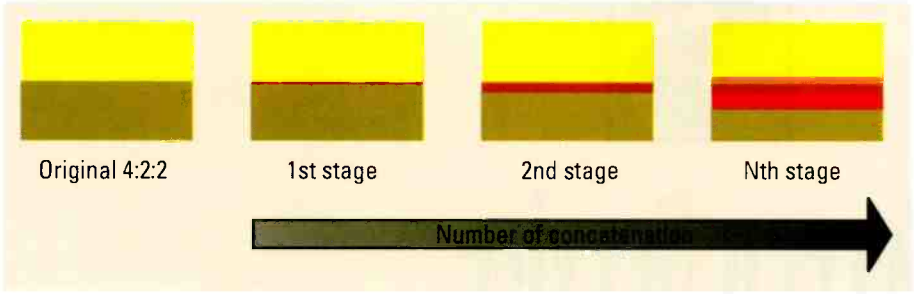

Figure 1. Degradation of the 4:2:0 chroma component in concatenated operations

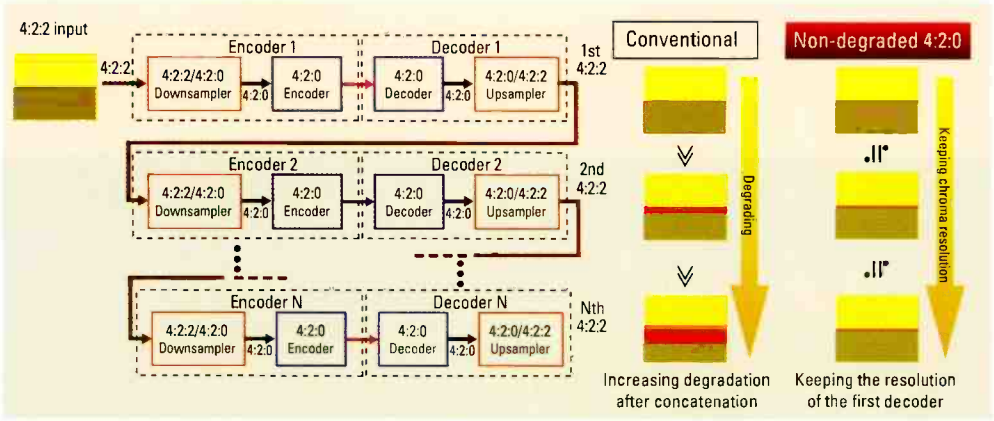

Figure 2. Conventional and non-degraded 4:2:0 concatenated links

of lower data rate encoding and 4:2:0 chroma sampling can provide operational and economic advantages. In HD-DENG, a significant number, possibly as many as 10 or more, of concatenated operations can take place before final delivery to network affiliates and others.

Chroma encoding formats

The two most widely used chroma encoding formats in broadcast TV applications are 4:2:2 and 4:2:0. (See Figure 2.)

The original HD 1080i picture shown in Figure 3 has 1920 pixels in the horizontal scan and 1080 pixels in the vertical. The components of the picture comprise the luminance, or Y component, plus the two U and V chroma components. It is commonly accepted that the human eye is less sensitive to chroma than it is to luminance, which enables chroma resolution to be reduced to less than that for luminance in the encoding process.

In a 4:2:2 format, the two chroma components are therefore downsampled by a factor of two from the horizontal luminance component, resulting in a pixel ratio of 960 x 1080; whereas in the 4:2:0 format, the U and V chroma components are downsampled by a factor of two in both the horizontal and vertical, resulting in a pixel ratio of 960 x 540.

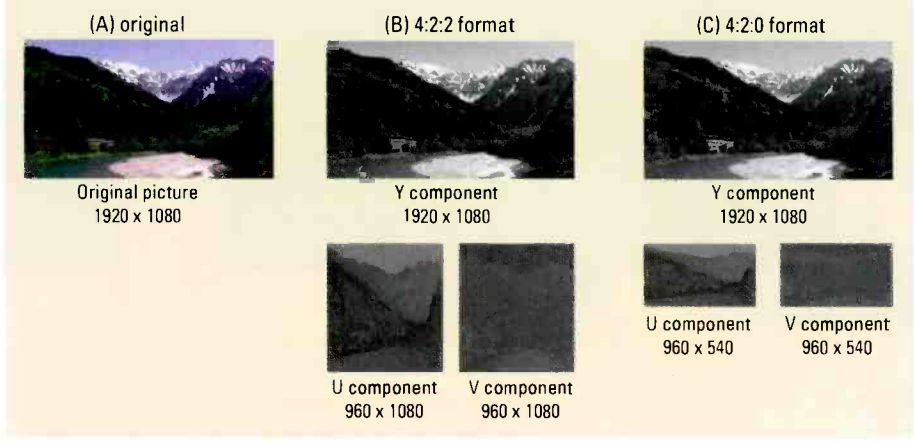

Figure 3. Comparison of 4:2:2 and 4:2:0 formats

Chroma sampling and MPEG-4

The recent introduction of the MPEG-4 (H.264/AVC) compression standard has delivered yet another improvement in digital network use. Most MPEG-4 content can be carried in less than 50 percent of the bandwidth required for similar MPEG-2-encoded content. MPEG-4 HD video performance at encoded data (bit) rates below 10Mb/s is generally accepted as sufficient to meet many broadcast TV operations, including HD-DENG.

For lower encoded video data rates, those at or below 10Mb/s in MPEG-4 (H.264), 4:2:2 chroma sampling may not produce any significant improvement in performance compared to that of 4:2:0. It also requires more bandwidth for a specific encoded data rate. Content encoded at 10Mb/s 4:2:0 requires approximately 20 percent less bandwidth than 4:2:2-encoded content.

This presents both an opportunity and a challenge: whether to use 4:2:2 chroma sampling and accept about a 20 percent increase in bandwidth cost, or to use the more efficient 4:2:0 format with potential chroma degradation in concatenated links.

Precision filter technology

One solution now available uses a precise set of filters that process the 4:2:2 chroma component and down-

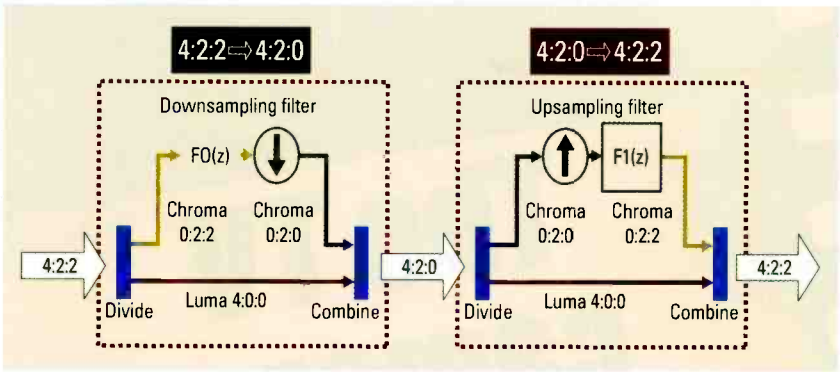

Figure 5. 4:2:2 downsampling/4:2:0 upsampling process

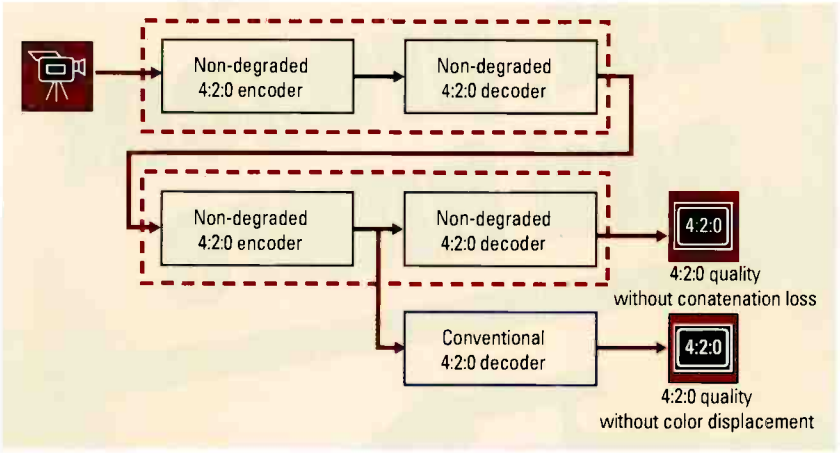

Figure 4. Interoperability with conventional MPEG-4 decoders

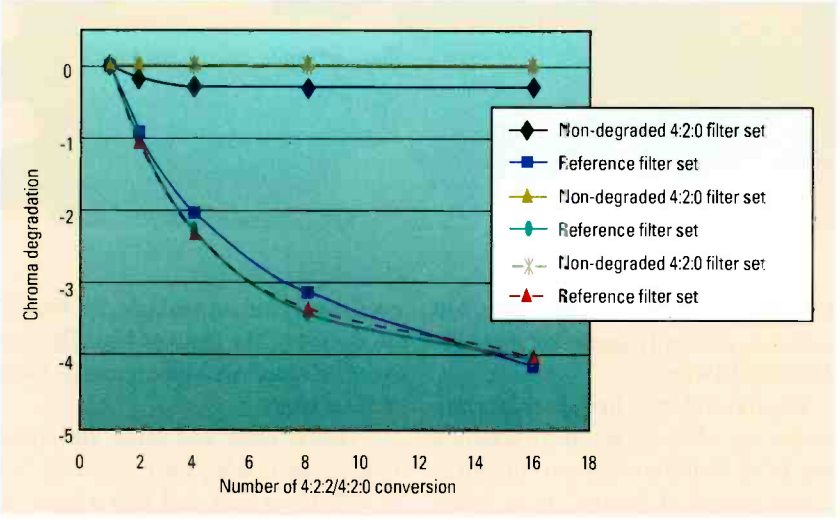

Figure 6. Chroma PSNR of conventional and non-degraded technology

samples it with a low-pass filter and 2:1 vertical sampler to create a 4:2:0 output. At the receive end, the 4:2:0 chroma component is accurately upsampled to recreate a 4:2:2 signal, as shown in Figure 4, that can be passed to the next concatenated link over an HD/SD-SDI interconnect.

This process allows an encoded 4:2:0 stream to be carried efficiently over any digital communications link.

To maintain non-degraded 4:2:0 chroma resolution throughout the concatenated chain, it is necessary for all encoders and decoders in the transmission link to use identical filter sets. However, the 4:2:0 stream may be decoded with degradation, but without undue errors or color displacement by decoders not fitted with the precision filter technology. (See Figure 5.)

The precision filter technology has been proven in tests demonstrating its ability to protect the integrity of the 4:2:0 chroma component in up to 16 concatenated encode and decode operations. Now, let's examine the protection that such precision filter design provides.

In a series of tests, a comparison between the original chroma PSNR was made with that at the output of the second, fourth, eighth and 16th concatenation of the 4:2:2/4:2:0 conversions. Test results shown in Figure 6 demonstrate chroma degradation in conventional concatenated operations and the level of protection provided by the non-degraded 4:2:0 precise filter solution that maintained PSNR close to that of the original 4:2:2 source.

It is generally recognized that downsampling and upsampling is more difficult for interlace than for progressive video largely because of nonlinear phase characteristics. The generation of unwanted artifacts is also more pervasive. Even so, the precise filtering discussed here properly handles both video formats.

It appears that such a solution can enable longer-distance encoded video communications links with less degradation. As such, many of the problems of multiple concatenations could become a thing of the past.

Author's note: The original research and material of Akira Nakagawa of Fujitsu Laboratories contributed to this article.

BE

Keith Dunford is currently a consultant for the video solutions group of Fujitsu Computer Products of America as well as managing partner of The Exam Group.

The TV camera: Past, present and future

BY SPRING SUPTIC

One key to predicting the future of a technology is being able to analyze its past. Over the past 50 years, *Broadcast Engineering* has followed technology trends. This article takes a look at the history of the television camera and predicts where the technology is headed.

The early days

Early cameras from the 1940s and 1950s may be dinosaurs now, but they're still relevant in that they've captured the curiosity of collectors like Chuck Pharis. He currently own 130 cameras, primarily made between the 1930s and 1960s.

Pharis was bitten by the camera bug at the age of seven when he watched the PGA Golf Tournament on ABC's "Wide World of Sports." As an adult, he became a cameraman for that same program. He began collecting and restoring cameras after finding an old camera in a dumpster outside of a TV station. He took the camera home and rebuilt it into working condition.

Pharis' collection includes an RCA TK-30, which was the first camera he ever used. Not surprisingly, it's one of his favorites. The focus of his collection is on RCA and DuMont cameras from the late 1940s.

"They're black and white, and some of them are crudely made," he says. "To be able to go back and take a piece of '40s television equipment — and some of this stuff has been sitting for 30 or 40 years in peoples' basements — and take it apart, rebuild it, and actually make an image on it is just fascinating to me."

One challenge to his endeavor of bringing these cameras back to life is that the proper parts are difficult to

Transforming the Video Experience with Medianet

INSIDE

See how the buildout of medianets—media-optimized IP networks—unleashes new capabilities and cost savings through every aspect of rich media production, contribution, distribution, and consumption, from the point of ingest all the way to the customer screens.

Video Changes Everything

Yesterday, if you wanted to watch a show or broadcast event, that meant arranging your schedule to be in front of the TV at a certain time. Today, rich media services can come to you—wherever you are, through whatever device you're using at the moment. To make this "Connected Life" a reality, broadcasters and content providers are radically altering their operational and business models behind the scenes. They are evolving from basic TV service providers to multi-platform "experience providers," delivering entertainment and news in a more fluid and immersive environment than ever before. They can now provide:

- **Greater mobility by delivering content to multiple screens—TV, PC, and mobile device**
- **Superior quality including high-definition video**
- **Unprecedented interactivity with new ways to access, control, and share media experiences**

Already, broadcasters worldwide are delivering these new capabilities and services using Cisco® solutions, which encompass the IP network platform as well as advanced video encoder, decoder, and transcoder solutions. In this supplement, you will read how:

- **During its Olympics coverage, NBC used a Cisco IP network for transcontinental IP contribution from sports venues in Beijing to studios in New York**
- **Spain's Abertis Telecom reduced costs with a Cisco architecture combining satellite and terrestrial IP content delivery**
- **Denmark's DR adopted an all-digital workflow that helped to double the number of programming hours—with the same budget**

As the worldwide leader in networking, Cisco is transforming how people connect, communicate, and collaborate. Our IP video network solutions address the growing technical and business challenges that broadcasters and content providers face in the new media marketplace, and enable powerful new capabilities and efficiencies. For example, highly efficient encoding technology enables broadcasters to deliver high-quality standard-definition and high-definition video. Video assurance tools allow rapid identification and remediation of issues before they affect the quality of the subscribers' experience. And Cisco Wide Area Application Services (WAAS) enable long-distance IP video contribution, avoiding travel time and expense.

Read on to learn how Cisco technology is helping broadcasters to move beyond digital video and IPTV to develop and deliver the integrated media services that are part of the Connected Life.

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Cisco Navigates the "Any Time, Anywhere, Any Platform" Landscape

With increased competition and the erosion of network TV viewership due to audience fragmentation, it's become clear that traditional program and advertising distribution business models have to change.

However, as the demand for high-definition content and new types of interactive services continues to grow across all distribution platforms, content distributors face a number of challenges to ensure a satisfying end-user experience. What they have found is that the distribution platform as well as the way content is presented and consumed have become key differentiators.

That's because as digital video recording and file streaming technology has advanced, the consumer has become empowered to watch content when and where they want. For all types of Content Distribution Systems (CDS), being successful in today's highly competitive marketplace means supporting not only traditional television, but also the Internet and portable devices; provided as part of some type of video-on-demand (VOD) or real time streaming service.

The opportunity for CDSs and other media companies is to combine time-shifted live programming and live chat supplied by broadband connection to make the experience richer, while also being able to carry video, voice, and data on the same network. Studies show that video services are still the most compelling way to attract advertising dollars.

Cisco is currently developing solutions to meet these and other emerging needs at a time when customers need them most. The company's Media Satellite and Broadcast division offers a variety of end-to-end solutions—from ingest to media management and on to consumption—and is deeply involved in working with both CDSs and advertisers to develop the most effective advertising models that target multiple sectors of the audience simultaneously.

Video transport is key to this strategy and Cisco's CDS product portfolio is now at the heart of a number of different targeted advertising platforms that leverage Cisco's vast experience in media asset management and content repurposing.

Scalable, End-to-End Solutions

Cisco's product line is broken down into four main segments of the market: Production, Contribution, Distribution and Consumption. These products are highly scalable, so that unique customization to fit individual needs is fully supported.

For Production and Contribution, Cisco solutions are applicable for IP/terrestrial as well satellite networks. They include the D9094 HD/SD encoders that provide very high quality (4:2:0 and 4:2:2), low latency (as low as 300 milliseconds) and high compression encoding using H.264 for real-time performance. The Cisco D9900 DCM (Digital Content Manager) MPEG video-processing platform provides ASI to IP conversion, transrating, PROMPEG COP3 Forward Error Correction, bandwidth clipping, and ad insertion features. Cisco also offers a professional HD/SD decoder (D9894) and an IP infrastructure and network and service management platform called ROSA.

The main company focus in the areas of Distribution and Consumption is ensuring that video quality remains as high as possible to meet the growing demand for HD content in all forms. Using the latest H.264 MPEG-4 HD encoders (model D9054), Cisco's engineers have achieved data rates as low as 5 Mbps, while still maintaining superior quality video results. (The current industry standard is about 8 Mbps before the artifacts become noticeable.) Meanwhile, the bandwidth savings are significant, allowing distributors to send multiple video streams over existing IP infrastructures (e.g. VDSL2 and ADSL2); delivering twice the channel capacity compared to MPEG-2 technology for comparable video quality.

Even after multiple passes of compression and last-mile packet wrapping, the "video quality experience" at the set top box does not suffer. In fact, several third-party field tests have confirmed that consumers preferred images compressed and distributed with Cisco products to competitive technology.

This quality and real-time performance are also critical to live broadcasts, where events are captured and presented live via remote transmission. Events like the Olympic Games and international coverage of the U.S. presidential inauguration in HD are good examples. Both events leveraged Cisco technology.

The Sky News coverage of the Obama inauguration represented the first time MPEG-4 compression technology had been used over the transatlantic Easynet Global IP network.

Based on its experience working with all types of broadcasters, which all have unique requirements, Cisco recognizes the common goal of production quality and distribution efficiency. If your goal is to get content where it needs to go, whether for HDTV or two-way interactivity, taking advantage of proven solutions and an experienced team of experts that understand the value of "any time, anywhere," Cisco has the end-to-end technology and people to make it possible at reduced costs.

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

An End-to-End Medianet for Media, Satellite, and Broadcast Companies

The media and broadcast industry is undergoing profound transformation, but one change stands above all others: the rise of the consumer. In the past, video entertainment was effectively a one-way street, with programmers and broadcasters determining which content would air and when. Today, the consumer is king, demanding a richer, higher-quality media experience and more kinds of content than ever before. Consumers want the same interactivity, personalization, and mobility from their media entertainment that they have come to expect from the Internet. And they want the ability to access any type of content, whenever and wherever they choose, over a variety of devices and screens.

These changes present significant challenges for media companies, who must fundamentally change the way they create and distribute media content. However, they also present exciting opportunities to capitalize on a new generation of consumer media experiences and revenue models. Broadcasters and content providers that embrace creative new approaches to delivering media will be able to:

- **Drive down costs throughout content production and distribution processes**
- **Accelerate the delivery of new content to more consumers over more platforms**
- **Increase revenues through new advertising and business models**
- **Strengthen their brand among consumers**

Medianet is the Key

The best way to unleash a new generation of media experiences and revenue models is to embrace the "medianet": an intelligent network that is optimized end-to-end for the delivery of rich media experiences. In the traditional media model, most aspects of content production and distribution are independent applications with fragmented infrastructures, content formants, and processes. A medianet provides a single, scalable IP architecture that extends from the point of content ingest through every aspect of editing and production, across video contribution and distribution networks, all the way to the customer screen.

By taking this medianet approach, media companies can:

- **Transform the customer experience by delivering more content, mobility, personalization, and control**
- **Take advantage of an IP Next-Generation Network (NGN) to assure a high-quality customer experience end-to-end**
- **Virtualize content and applications through every phase of the media value chain to reduce capital and operational expenses**
- **Monetize content and advertising in new ways, across more platforms**

Content Production

When studios, programmers, and broadcasters move from tape-based production environments to IP networks and digital workflows, they unleash unprecedented collaboration and cost efficiencies. The medianet model allows content providers to:

- **Easily extend content to any business unit, partner, or customer device, anywhere in the world**
- **Reduce costs by consolidating and virtualizing media applications and infrastructures**
- **Accelerate the delivery of new content by breaking down application silos and linking production processes directly with distribution platforms and partners**
- **Increase revenues by repurposing content for multiple platforms and advertising models**

Content Contribution

Media companies worldwide are turning to IP-based video contribution networks that offer more flexibility and control than conventional contribution systems at a much lower cost. With IP contribution networks, media companies can:

- **Get new content on air and online more quickly**
- **Reliably deliver content to studios and distribution partners for a fraction of the cost of satellite contribution systems**
- **Deliver content anywhere with a single network that supports all services, video formats, and quality levels**

IP contribution networks also boost agility by allowing broadcasters to decouple the point of video ingest from physical editing and production facilities. During the 2008 Olympics, for example, NBC editors used an IP contribution network to work on events being recorded in Beijing from their home studios in the United States.

Content Distribution

A media-aware IP NGN is robust and resilient, and scales easily to enable the cost-effective delivery of content and services worldwide. IP distribution technologies help media companies:

- **Rapidly scale new content and services to national and global audiences**
- **Drive down costs by distributing content once for all affiliates and formats**
- **Preserve quality of the customer experience by retaining tight control over the way signals are received and manipulated**
- **Unlock new revenue streams by extending content and brand identity across multiple platforms**

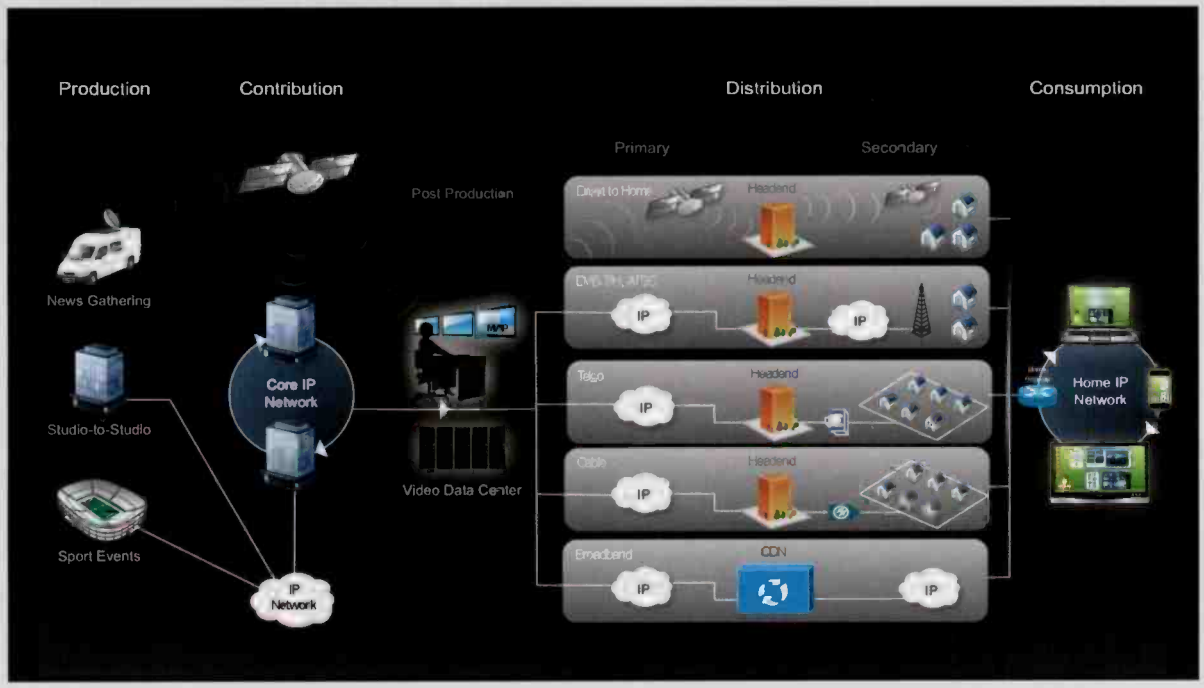
Content Consumption—the End-User Experience

A medianet lets media companies boost the value of their content by enabling non-linear (on-demand) content consumption, targeted niche content, and delivery of rich media experiences across the TV, PC, and mobile device. Moving to digital content delivery also provides potentially lucrative opportunities for Web 2.0-type social networking and personalization capabilities. By linking consumers with content in new ways over more platforms, a medianet also supports new transaction-based and revenue-sharing business models. And, by delivering ads based on subscribers' unique demographics, profiles, and interests, content providers can benefit from much more targeted and lucrative advertising. ■

For More Information

Cisco and its industry-leading partners offer deep expertise in IP networking, digital media technologies, video transport, and solutions for the customer home. Cisco can converge all of these solutions into a single, harmonious IP architecture that extends media-aware intelligence from end to end, helping content providers create and capitalize on a new generation of media experiences. To learn more, visit www.cisco.com/go/medianet

Building Blocks of the Media Value Chain



The Time Is Right for IP Video Contribution

Broadcasters know that a "video" signal is much more than just video. Delivering content in multiple video formats, with all of the auxiliary audio and data services needed to present the seamless experience of broadcast TV, is a complex task, especially in real-time TV environments. When video quality, network performance, and nonstop availability are critical, broadcasters and content producers need an extremely robust, resilient video contribution infrastructure.

Today, more media companies are turning to IP-based video contribution to take advantage of the inherent flexibility, control, and operational cost reductions of IP networks. As the worldwide leader in IP network technologies, Cisco can provide state-of-the-art video contribution solutions that deliver all of the advantages of IP with the quality, performance, and resiliency that real-time media services demand.

An Industry Evolution

Until recently, contribution networks were dominated by satellite and terrestrial ATM networks. Despite the compelling flexibility and cost efficiencies of IP, many media companies simply did not consider the technology ready to transport real-time video. As IP networks have evolved, however, IP has emerged as the video transport technology of choice. Today, major broadcasters worldwide are deploying IP-based transport networks, video encoder/decoders, and gateway technologies in real-time video environments.

The key reasons for this shift are:

Growth of HD Video

The accelerating introduction of HDTV in media markets places extraordinary new capacity demands on contribution infrastructures, as well as a need to deliver excellent video quality at higher resolutions. IP networks can provide the bandwidth, flexibility, and service control to support these and future services.

Demand for More Flexibility

Instead of employing rigid conventional contribution links tailored to the needs of a specific application, media companies are seeking more versatile infrastructures that can support a variety of services, formats, quality levels, and broadcast applications.

Need to Reduce Operational Expenses

By using affordable, widely available IP network equipment, broadcasters and content producers are delivering multiple services over a single network and reducing the cost of contribution links. In fact, many broadcasters moving from satellite-based contribution to IP have realized a return on investment (ROI) in two to three months.

Opportunity for Convergence

Instead of using dedicated contribution networks for each stage in the production process, IP provides a common platform to support all applications. This convergence (and its associated cost savings) occurs both in the network, which can now carry all types of services, and at network endpoints, where a single IP platform can often replace several dedicated switching technologies. Since broadcasters and content producers often already have IP infrastructures in place, upgrading these networks to support real-time TV services is also often less expensive than building or leasing new higher-capacity contribution links.

Opportunity to Enhance Competitiveness

IP contribution networks can have a profound impact on a media company's agility. After all, once content is within the IP domain, it can be delivered to anyone, anywhere, as needed. IP contribution networks allow broadcasters to decouple the point of video ingest from the physical editing and production facilities, and offer opportunities for new production workflows and radical operational efficiencies. During the 2008 Beijing Olympics, for example, NBC editors used an IP contribution network from Cisco to create broadcast highlights of events in China from their home studios in the United States, even as events were being recorded.

Cisco IP Contribution Leadership

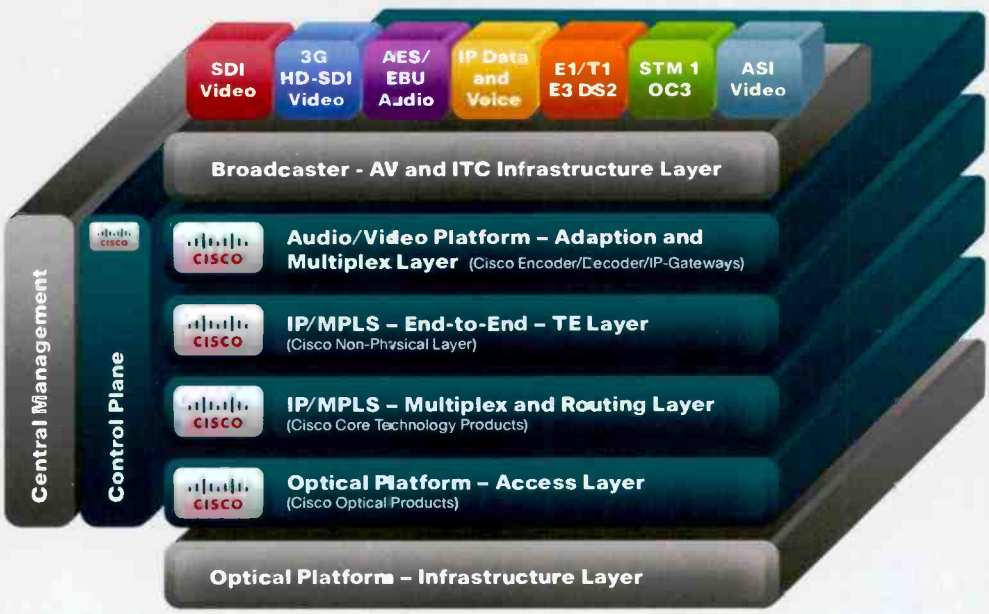
While IP offers compelling advantages, broadcasters need contribution networks they can trust. They need proven IP solutions that deliver the performance, reliability, and end-to-end quality control intelligence that demanding real-time media services require. As the worldwide leader in IP networking, Cisco can create the ideal IP contribution solution.

Cisco IP contribution technologies include:

- **Robust IP routing and switching platforms that deliver up to 40 Gigabits per second**
- **Widely deployed multiservice optical transport platform in the world**
- **High-performance audio/video encoder, decoder, and IP gateway solutions to support major video formats and compression technologies, and virtually any combination of quality, latency, and bit rate**
- **Sophisticated management and control solutions**
- **Expert system integration services from partners with extensive experience implementing complex media infrastructures**

With a proven IP expertise and broad portfolio of IP, optical, and video technology solutions, Cisco can provide a complete IP contribution solution for media customers.

Cisco IP Contribution Solution—An End-to-End Architecture



Cisco Enables NBC Coverage of Beijing Olympics

NBC Olympics' coverage of the 2008 Olympic Games set new records, with 3600 broadcast hours, or 212 hours a day. What's more, viewers could use their PCs and laptops to access 2200 hours of on-demand video, as well as 3000 hours of highlights, rewinds, and encores. And people on the go could watch video and view results on their smartphones.

Behind it all was an innovative long-distance, file-based workflow, based on a Cisco network solution.

High-Performance Transocean Link

To transfer video between Beijing and New York, NBC deployed three 150-Mbps OC-3 connections. A Cisco 12004 Router combined all three into one gigantic virtual pipe with 450-Mbps bandwidth. Cisco Quality of Service (QoS) technology enabled NBC to dedicate 400 Mbps to video content, giving it priority over other types of traffic sharing the same pipe.

Thanks to the high-performance network, shot selectors and editors could work from New York as if they were in China, saving NBC the time, costs, and carbon emissions of sending 300 to 400 employees to China.

Faster Shot Selection for an Excellent Viewer Experience

The file-based workflow worked as follows:

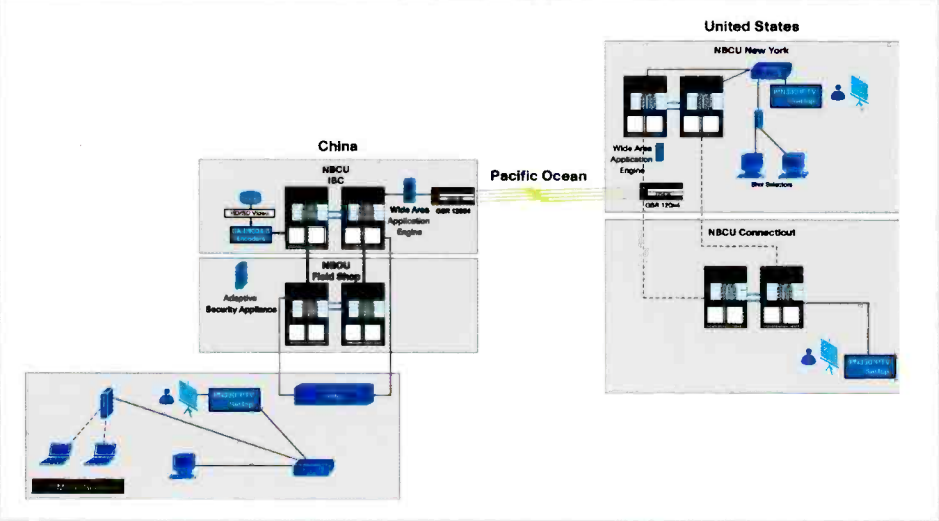
An application server in China digitized and ingested high-definition (HD) and standard-definition (SD) feeds and simultaneously created full-resolution HD files and low-resolution proxy files of all recordings. While still being recorded, the files were actively transferred to a storage system in Beijing. From there, a file transport engine transmitted only the low-resolution proxy files over the Cisco network to another active storage system in New York. With Cisco Wide Area Application Services (WAAS), files were available to editors and shot selectors in the United States as fast as if these personnel had been in China.

Shot selectors in New York edited the low-resolution files, and then sent the Edit Decision Lists (EDLs) to Beijing to request the desired SD and HD high-resolution footage for final production editing. ■

"With the Cisco network solution, we've achieved the Holy Grail of digital video, which is the ability to perform shot selections on low-resolution files and extract high-resolution material from those files even as they are being recorded," says Craig Lau, vice president of IT, NBC Olympics. In fact, employees could select shots and distribute them to affiliates even before the athletes finished their events.

Lau concludes, "Cisco is a trusted partner, and in the demanding IT environment for the Olympic Games, we depend on trusted relationships. We have absolute deadlines for when Olympics coverage begins and ends. Cisco technologies help us exceed expectations and meet our timetables in an unforgiving environment."

NBC Built a High-Performance Transocean Link to Transfer Video Between Beijing and New York



Interview with Bob McIntyre

Broadcast Engineering Supplement/Cisco

A former chief technical officer (CTO) for Scientific Atlanta, a Cisco Company, Bob McIntyre designs systems based on the integrated end-to-end technology portfolio of Cisco's Service Provider Group that help service providers accelerate the launch of new revenue-generating applications on their networks.

Bob McIntyre
Chief Technology Officer
Cisco Service
Provider Group

McIntyre began his career at Scientific Atlanta in 1991 and has held significant leadership roles in the company's Transmission and Subscriber businesses. While leading the Subscriber business in 1996, his team designed the first real-time digital TV systems (using US $150,000 prototype encoders) and held the first digital TV field trials over a Hybrid Fiber Coax (HFC) infrastructure in 1997. He was named CTO at Scientific Atlanta in 1999.

Under his leadership, Cisco has remained focused on the transition to more and more HD content, and the evolution to alternative business models that support the consumption of non real-time video services on a variety of viewing devices.

What's the biggest challenge facing content distribution networks today and how will that change in the future?

Content owners are faced today with many challenges including the operating cost of the distribution networks, sometimes globally, the desired transition from satellite/cable-based distribution to hybrid satellite/IP based distribution, legacy issues with existing set-top deployments, and the transition to more and more HD content.

Customers are also challenged with the evolution to alternative business models that support the consumption of video in non real-time and on a multitude of viewing devices, from TVs, to PCs, to mobile devices.

Compression schemes continue to get better, enabling more HD content over ever-smaller bandwidth. How will this affect the industry going forward?

There are two things in play here. First, compression techniques continue to get better and better in both efficiency and video quality. Today's H.264 compression tools are light years more powerful then the MPEG-2 standards and will continue to see further enhancements.

Secondly, as more and more video is utilized for entertainment, communication, and collaboration on a global scale, we believe that people will continue to build infrastructures that support the utilization of video for these purposes.

How does a provider ensure quality to the end user while simultaneously conserving bandwidth?

Content owners and providers have a few sacred cows when it comes to competitive advantage: video quality and quality of service are two of those. As such, content owners, who place a lot of value in the image quality of their content and their brand, must select best-in-class distribution technologies to support error-free distribution.

Ultimately, however, they must make the trade-off decisions between video quality and bandwidth utilization while weighing the associated costs.

Is IP delivery the most efficient way to distribute content?

We at Cisco believe that IP is an extremely cost-effective means of distributing content, but we continue to offer a complete portfolio of products that provide hybrid IP/Satellite distribution capabilities. This proven technology helps content owners and services provides with the complex requirements of distributing their content on a global basis.

The key to our solutions is that we give the providers the tools to develop hybrid distribution models based upon quality, cost, and quality of service. Only hybrid systems can successfully optimize these issues on a global basis.

Cisco has been involved in a number of live events, such as last summer's Olympic Games for NBC. What value does Cisco bring to the production of events like these?

Cisco's comprehensive IP Contribution solution enabled the "first IP Olympics," according to NBC, and consisted of IP video networking that took advantage of both MPEG-2 and MPEG-4 compression. This helped bring content to air (and online) much faster than ever by separating the content ingest process in Beijing from the physical editing, which occurred in New York. This saved the network a significant amount of money by not having to send editors to China.

It also resulted in a very satisfying end-user experience because content was available from all of the venues on demand, compared to past Olympics when only the most popular events were shown during prime time hours. Leveraging the metadata used by the editors also facilitated a variety of advanced search functions and interactive features that were used by online consumers.

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

Transforming Media Production Processes: The Cisco Media Workflow Platform

Media outlets and platforms continue to proliferate, driving demand for more content than ever before. Broadcasters and programmers that can meet this demand and extend their content and brand across multiple platforms will reap the rewards of this industry transition. To get there, however, media companies need to operate in very different ways than they do now. They need to enable a more collaborative business model, with the ability to extend content to people and functional areas across the company, and to a widening ecosystem of external production companies, outsourcers, and business partners. They need a new kind of media production workflow, delivered by a new generation of digital workflow tools.

The Cisco Media Workflow Platform is the foundation for a more collaborative and cost-effective digital workflow model. It provides a flexible and interoperable infrastructure for efficiently pooling applications and file-based video, and allows applications at all stages in the production process to communicate with each other and dynamically move media to the right people at precisely the right time.

A Better Workflow

Traditional media workflows are based on self-contained production systems, using video content that is transported and managed via physical tapes. Even when media companies adopt digital file-based media for some segments of the workflow (such as post-production or newsroom processes), these systems are usually managed as independent applications, supported by proprietary technologies with dedicated servers and infrastructures. The result: a production workflow that is fragmented, fraught with delays and costly replication of processes, and poorly equipped to meet the growing demands of multi-platform distribution.

The Cisco Media Workflow Platform provides the foundation for an end-to-end digital workflow that dynamically moves media through the production and distribution process, and supports company-wide collaboration. It breaks down application silos, eliminates unnecessary duplication of processes, and provides the flexibility and performance that production environments demand.

The Cisco Media Workflow Platform encompasses:

A Service-Oriented Architecture (SOA)

An SOA provides the framework for integrating applications and processes across large, diverse broadcast and production environments. It decouples workflow processes from dedicated applications and infrastructures, and allows content to be easily shared across business units and among ecosystem partners. An SOA model helps broadcasters and programmers to:

- **Effectively manage tape-less production environments**
- **Integrate media production with non-production business processes (such as marketing, legal, and resource management)**
- **Accelerate the introduction of content across new platforms**
- **Reduce costs by aligning production and IT functions within a single, converged infrastructure**

Cisco Data Center 3.0

Underlying the SOA that powers a digital workflow is a highly flexible, high-performance data center. Cisco Data Center 3.0 technologies transform media infrastructure silos into pools of resources that can be dynamically aligned to meet diverse application and business needs. These technologies support a centralized media data center that is more responsive, efficient, and resilient, and that can cost-effectively serve stakeholders throughout the media value chain.

IP Next-Generation Network

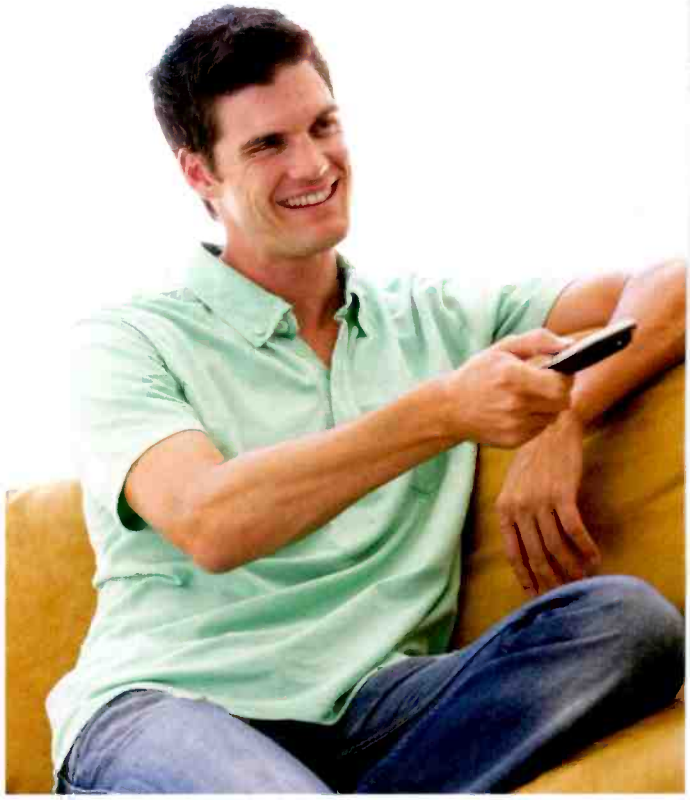
Content producers must provide real-time access to media applications and content for stakeholders both within and outside the company campus. They need a next-generation network that enables high performance and rock-solid availability regardless of where users are located. As the worldwide leader in IP network technologies, Cisco provides innovative LAN and WAN solutions that optimize the delivery of content and resources throughout the media ecosystem.

Complete Media Solutions

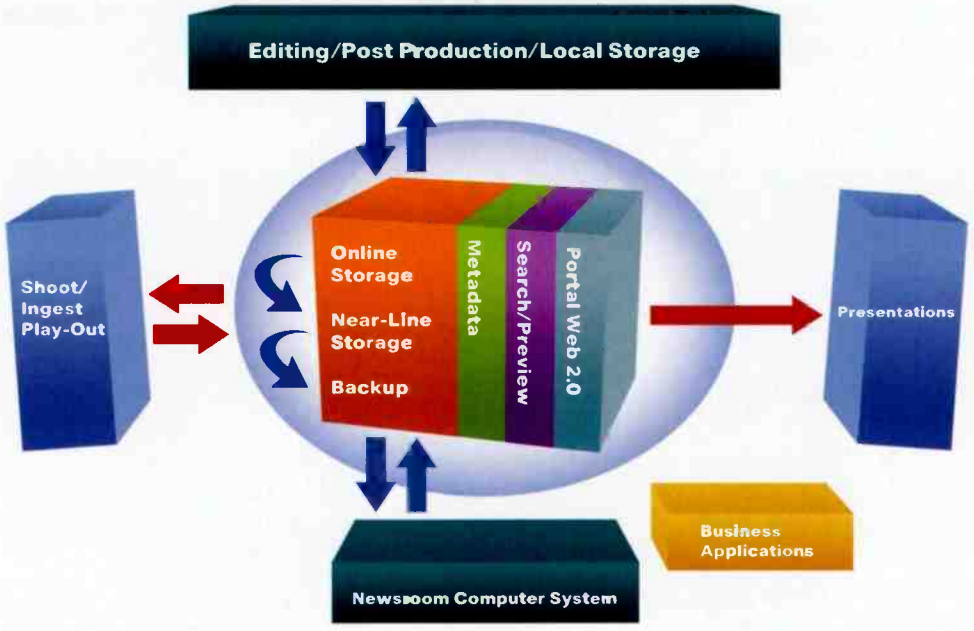
Production environments demand highly specialized applications. That's why broadcasters and programmers have traditionally chosen to work with proven media production systems, even at the cost of having to operate them as isolated infrastructures. With the Cisco Media Workflow Platform, broadcasters and programmers don't have to give up the production tools they trust to enable a company-wide digital workflow. Cisco is partnering with some of the largest, most respected media technology vendors in the world to deliver a solution that supports the most demanding production environments.

Together, Cisco and its industry-leading partners can deliver an end-to-end media workflow platform that:

- **Breaks down application silos to increase collaboration and responsiveness**
- **Reduces capital and operational expenses by consolidating and virtualizing media content and applications**
- **Provides exceptional availability and performance to meet demanding broadcast requirements**
- **Accelerates innovation by linking content production directly with media distribution platforms and partners**



Connecting all Production Processes with the Cisco Media Workflow Platform



DR Increases Programming without Increasing Cost

DR, Denmark's national television and radio broadcaster, has doubled the number of programs it broadcasts without increasing costs. Its solution: an all-digital workflow for recording, editing, producing, and broadcasting all types of content, using a Cisco IP multiservice network.

Digital Workflow: A Way to do More with Less

To compete successfully with global media companies, DR urgently needed a way to do more with less. The broadcaster has a fixed budget based on the yearly US $400 license fee paid by each citizen who has a television or radio.

Adopting a digital workflow would solve the business challenge in two ways:

- **Reduce capital and operating expense by replacing multiple specialized networks with a single, reliable IP network**
- **Enable DR to repurpose the same content for different media. Rather than assigning separate TV, radio, and web journalists to cover the same story, DR could assign one journalist, store the content in digital format, and then customize the content as appropriate for the delivery channel.**

Consolidate Networks, Consolidate Buildings

The opportunity to adopt an all-digital workflow came when DR built a new 132,000-square-meter broadcasting house in Copenhagen. The building, known as DR Byen (Media City), consolidates the 12 facilities previously used for radio, television, and web broadcasting and a concert hall.

DR outfitted the new building with a three-tier Cisco network (access, distribution, and core) that performs the work of previously separate networks for radio and television recording studios, telephony, intercom, mixing consoles, and lighting control.

"Platform for Storytelling"

The new Cisco network, which DR calls a "platform for storytelling," is used for content production, content editing, broadcast, telephony, and wireless access.

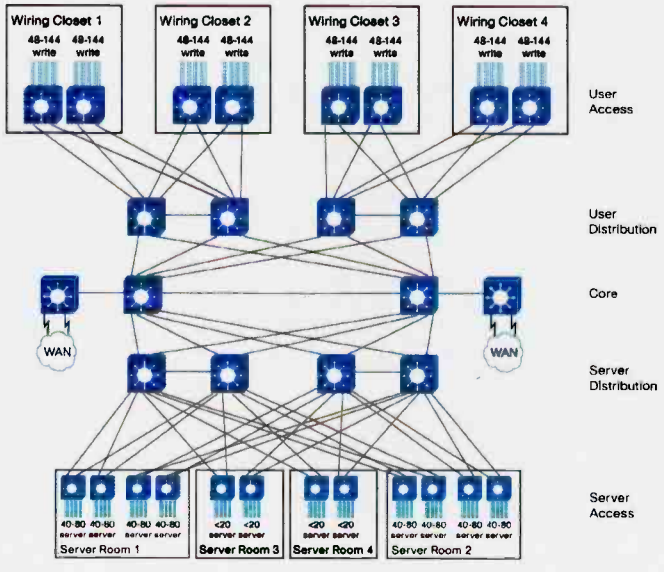
DR's video editors now have unprecedented flexibility in how and where they work. They can work on high-resolution files from any wired desktop in the building, all of which provide a 1-Gbps connection. If they want to work wirelessly, they can edit low-resolution files, which require less bandwidth to access. The resulting Edit Decision Lists (EDLs), which contain text only, not the actual video, provide the instructions applied to the high-resolution video.

A server-based workflow enables multiple people to work on the same file simultaneously, increasing productivity.

Measurable Return on Investment

Since deploying its IP network, DR has doubled the numbers of hours of programming that it produces without increasing the budget, an accomplishment that the company attributes partly to technology. The broadcaster plans to further capitalize on its network investment by offering high-definition video. ■

DR uses a Multiservice Cisco Network as the Platform for Digital Editing, Telephony, Intercom, and Studio Lighting



Preserving Quality and Control in Primary Distribution Networks

As the media landscape has evolved, primary distribution has become more complex and costly for content creators. To bring finished content into viewer homes, broadcasters and programmers must distribute to cable, satellite/direct-to-home (DTH), and IPTV head-ends, as well as conventional over-the-air (OTA) broadcast systems in hundreds of markets. In the United States alone, a programmer may need to reach several thousand affiliate locations, and deliver content that will be consumed in a variety of video formats ranging from standard definition (SD) to high definition (HD), and from analog to MPEG-2 and MPEG-4.

Cisco provides a comprehensive suite of primary distribution solutions to help content providers meet these unique challenges. Using scalable Cisco technologies, broadcasters and programmers can lower costs, control quality, and meet an ever-changing array of technical and business requirements.

The Changing Face of Video Distribution

Satellite has long been the most practical mechanism to distribute content to large numbers of affiliates. But, as the number of video formats and compression technologies has grown, it has become difficult to cost-effectively distribute content in all the required formats. The biggest culprit: high-definition video.

To compete for customers and advertising dollars, content providers are rushing to offer more HD content, but the quality and bandwidth demands of HD signals are substantial. New technologies such as MPEG-4 and DVB-S2 modulation are helping to make it less expensive to transmit higher-bandwidth signals. However, these innovations also create new complexity. Whereas a single SD signal might have sufficed a few years ago, today meeting the needs of all affiliates means delivering SD, HD, and analog versions, and often MPEG-2 and MPEG-4 as well. With satellite transponder costs as high as US $200,000 per month, primary distribution has become a significant cost burden.

Broadcasters and programmers need distribution technologies with the flexibility to meet the needs of a broad spectrum of affiliates. They need solutions that deliver the highest-quality video for the lowest cost, and that assure strong content protection and control throughout the distribution process.

Cisco Primary Distribution Solutions

Cisco provides a comprehensive primary distribution solution that gives broadcasters and programmers the ability to deliver any format required by affiliates and consumers, while minimizing transmission and operational costs. The centerpiece of this strategy is the ground-breaking Cisco D9858 Advanced Receiver Transcoder.

As demand for HD services grows each year, content owners need a solution that allows them to distribute content over the satellite once, with the highest quality and the lowest transmission bandwidth, and then enables satellite receives at affiliate locations to reformat that content to any resolution and compression standard required. The Cisco D9858 Advanced Receiver Transcoder provides this capability today. It can receive MPEG-4 HD compressed transport streams and output analog and MPEG-2 SD and HD versions of the incoming programming, and simultaneously pass through the original MPEG-4 content. This innovative technology lets programmers simplify their networks and reduce costs by providing content to their affiliates in all required formats with a single satellite transmission signal.

In addition to the D9858 Advanced Receiver Transcoder, Cisco offers a broad portfolio of MPEG-4 encoders, gateways, multiplexers, and integrated receiver/decoders (IRDs). In fact, more major HD MPEG-4 distribution systems worldwide use Cisco technology than any other provider. Cisco distribution technologies include:

- **Industry-leading encoders and IRDs to address all major video formats and compression technologies**
- **DVB-S2 modulation**
- **Robust content security with the PowerVu conditional access system**
- **Integrated and deployed systems using third-party conditional access systems**
- **Advanced uplink system control and decoder management with the PowerVu Network Management Center**

Cisco is also leading the way in other ground-breaking video distribution innovations, including:

Hybrid Satellite/IP Distribution

Cisco solutions support hybrid distribution networks via DVB-S/DVB-S2-enabled IRDs and can also deliver the signal via IP networks to some targeted markets. This gives programmers and broadcasters the flexibility to mass-distribute via satellite, while meeting requests for special quality or bit rates in specific markets.

Advanced Multiplexing and Splicing Capabilities

The Cisco Digital Content Manager (DCM) Model D9900 unlocks powerful new switching and splicing capabilities in distribution systems. The system allows content providers to retain much tighter control over the way signals are received and manipulated, and assure the highest-quality experience for their viewers.

Building on a tradition of leadership in video distribution, Cisco is helping content providers create versatile distribution systems that deliver the highest video quality and control, at the lowest cost, to all markets. ■

Abertis Telecom Reduces Costs of Nationwide Television Network

Spain's leading telecommunications infrastructure and services provider, Abertis Telecom operates 3200 broadcasting and distribution sites serving more than 12 million homes, as well as a fleet of 24 satellites. The company earns a large portion of its revenue from national and regional broadcasting for television and radio and is also expanding into international markets.

Digital Switch-over: Converting Mandate to Opportunity

Abertis Telecom needed to comply with Spain's mandate to convert from analogue to digital broadcasting for terrestrial television by April 2010. The operator seized the opportunity to reduce the costs of both its satellite and ATM terrestrial networks. Passing on the savings to its broadcast customers would position Abertis Telecom to increase market share.

Nationwide Digital Video Broadcasting Transport Solution

In 2008, Abertis Telecom rolled out a nationwide Digital Video Broadcasting (DVB) transport solution, based on Cisco technology and services. "We like to work with vendors that have a global view and the capacity to advance the market," says Sergio Tortola, Technology Director, Abertis Telecom. "In addition, we like Cisco's approach and commitment to service."

The new architecture combines satellite and terrestrial IP to distribute signals to broadcast transmitter sites and content production centers throughout Spain. To increase bandwidth efficiency on its satellite network, Abertis Telecom deployed Cisco D9804 Multiple Transport Receivers, which support the DVB-S2 satellite modulation scheme. "Instead of using three transponders and six reception devices per site, we now need only two transponders and can receive all streams within a single unit," says Tortola. "As a result, we need fewer spare parts, have greater redundancy, and can offer better service-level agreements."

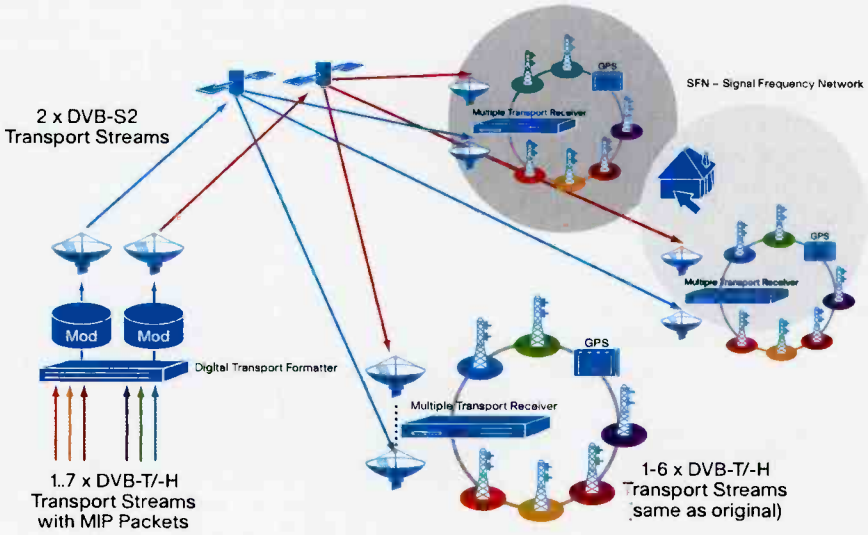
At the same time, Abertis upgraded its terrestrial distribution network from ATM to IP, using Cisco Asynchronous Serial Interface-to-IP (ASI-to-IP) gateways.

Lower Costs and Increased Market Share

Capital costs have decreased because a single Cisco multiple transport receiver can accept up to six multiplex transmissions, and content that previously required three transponders now requires just two. Operating expenses for the satellite network have decreased by 33 percent, from bandwidth optimization and in-band control. "We have transferred our cost savings to our customers in the form of lower prices, which helped us increase market share by 20 percent," says Tortola. What's more, global service-level agreements are better than ever.

Abertis Telecom is currently developing new services to be delivered over the Cisco network. Tortola concludes, "Being early to market with new solutions gives us a competitive advantage. A high degree of collaboration with Cisco has helped make this project a success." ■

Abertis Telecom Distributes Multiple Transport Streams over Satellite



An End-to-End Platform for Video Transformation

Today's media landscape is undergoing massive disruption. The traditional linear broadcast value chain—in which content is created for a single channel and aggregated, packaged, and broadcast to millions of viewers—is changing before our eyes. These changes are being driven by:

- **The advent of the Internet as a distribution platform, which has rewritten the rules for accessing and interacting with video content**
- **Explosive growth in video channels, outlets, and content—including user-generated content**
- **Expansion of media to new platforms, including mobile phones and personal media devices**

Advertisers have been quick to recognize these changes and are investing more resources in non-linear and Internet-based platforms, and less in traditional linear broadcasters and content producers. Broadcasters and programmers that can adapt their business models to respond to these changes—that can transform from basic TV channels into true "cross-platform" brands—will emerge as the leaders in the evolving media landscape.

Navigating this transition will require new content production and distribution tools, and a new approach to consumers and partners throughout the media ecosystem. It's a daunting journey, but one that media companies don't have to undertake alone. With the broadest video portfolio in the industry and global leadership in IP technology, Cisco can provide solutions and expertise through every phase of the media broadcast chain.

End-to-End Expertise

The trends that are reshaping the media industry present new challenges, but also new ways to reach customers and enhance the broadcaster's or content producer's brand. To profit from these innovations, media companies need new technologies and processes that can address the growing number of video platforms and formats, connect stakeholders within and outside the company, and reduce costs at every stage in the media value chain. Cisco is ideally positioned to help media companies successfully meet these objectives.

Cisco's end-to-end portfolio of media and broadcast solutions encompass:

Production

Currently, most media companies rely on production systems that are managed as independent applications, supported by dedicated infrastructures and physical tapes. The result is a production workflow that is fragmented, fraught with delays and duplicated efforts, and poorly equipped to meet the demands of multi-platform distribution. Cisco provides the foundation for an end-to-end digital workflow that dynamically moves media through the production process, breaks down operational silos, and supports company-wide collaboration.

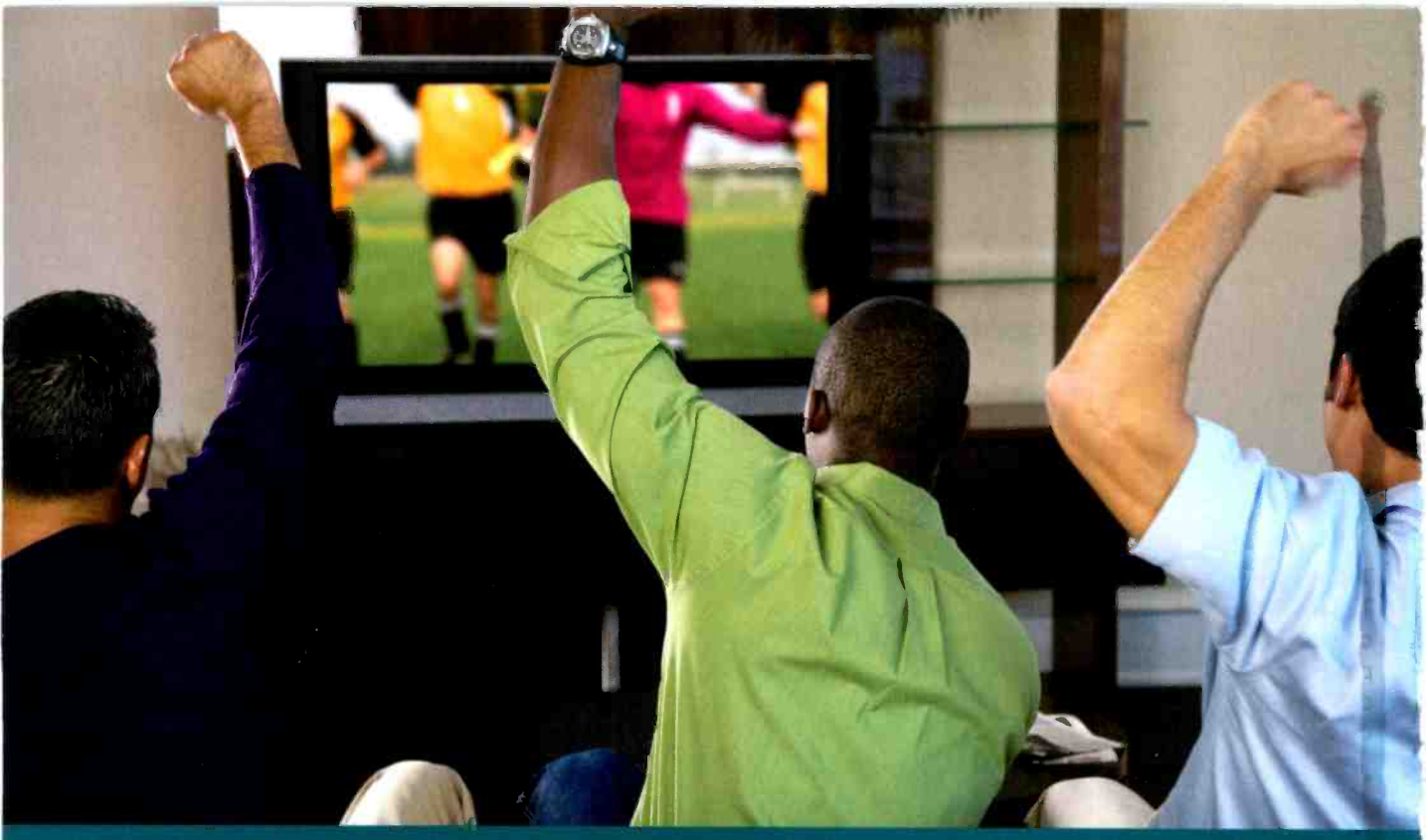
Contribution

The same innovative approaches that are transforming media production can also be applied to the delivery of video between studio locations and media partners. Cisco video contribution solutions deliver the performance and availability that real-time broadcast environments demand, while providing the flexibility, granular control, and substantial cost savings of IP networks.

Distribution and Consumption

To bring finished content into viewer homes, content providers must distribute to hundreds of operator head-ends and affiliate locations, and meet demands for diverse video formats, quality levels, and compression standards. They also need to be able to deliver content to consumers over multiple platforms and multiple screens (TV, PC, and mobile device), both in the home and on the go. Media companies need solutions that can meet these stringent demands and deliver the highest quality for the lowest cost. Cisco provides a comprehensive suite of distribution and content consumption solutions to help broadcasters and programmers lower costs, tightly control quality, and meet an ever-changing array of technical and business requirements.

Combining decades of Scientific Atlanta's expertise in video technology with Cisco's worldwide leadership in IP networking, Cisco can deliver the full spectrum of solutions to help broadcasters respond to the challenges of a changing media environment.



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Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at www.cisco.com/go/offices.

This RCA Iconoscope camera was made around 1939. The camera paved the way for future technology advances. Photo courtesy Chuck Pharis.

come by.

The elusive camera that has yet to make it into Pharis' collection is the Iconoscope.

"It was the first decent, working camera tube," he says. "It didn't look very good, but it made an image."

It took a lot of light to make an image that wasn't that good. However, once the basic circuit was made, people used it as a foundation to make better cameras. In the early days, Pharis says that there were a lot of experimental cameras homemade by TV stations. They were often strange looking and difficult to move around.

"And those got junked really fast," he says.

In the late 1940s, the image orthicon was invented, and that was when TV as we know it today really got its start. It was on two GE image orthicon cameras that industry consultant John Luff started his career working at a college TV station. Color was just breaking onto the scene. And that's when camera technology really took off.

Color and mobility

"The move from black and white to color, from a technical standpoint, was a quantum leap," Luff says. "It became one of the reasons TV studios grew such large engineering staffs."

And while it's still a technical job, back then, Luff says, operating a camera was something of an art with position, temperature, alignment and location. A good video operator was highly prized. Then, with solid-state cameras, it became quite a different job, according to Luff. Cameras became more stable, and registration was set at the factory.

The monumental move from black and white to color came with an equally monumental camera. The RCA TK-40, which was soon followed by the TK-41, was enormous. It had three image orthicon cameras sandwiched into one case.

These cameras weighed several hundred pounds, and it took four people to carry them up to the top of a stadium.

"RCA tried to make these cameras a little lighter and easier to move," Pharis says. "So, they came out with the TK-42. It was a miserable camera to operate because they put the zoom and focus controls right on the back of the camera instead of on the handles. And you couldn't tilt the camera down. You couldn't pan it properly. RCA improved it with the TK-43, which is the same camera body, but with the zoom and focus handles back on the camera."

These first steps toward making cameras more portable were still far cries from the camcorders we use today.

"A camcorder was a physical impossibility 30 years ago," Luff says.

A camera rig required two or three people to operate. One problem was that lighter weight camera cables were needed. The Hawkeye was developed as a portable camera with a portable recorder. The TK-76 offered the first practical CCD camera.

That mobility is important. Pharis remembers working on a 1970s disco show with a PCP-70 strapped to him. He could only carry it for one hour at a time. Two-shoulder camera rigs are not very portable portable. And now, all cameras are portable, as most manufacturers no longer make large studio cameras. Instead, portable cameras are placed into a sled to be used as a studio camera.

The prosumer shift

"Broadcasters need equipment that's extremely rugged, extremely versatile, can shoot in very low light and can handle wide temperature swings, day in and day out," says veteran cameraman Barry Braverman.

The focus is now on equipment that does everything at a low price. Enter the prosumer camera.

RCA's TK-30 and TK-31 were introduced in 1946 and used during the 1950s. Photo courtesy Chuck Pharis.

"The technology makes it possible; the economics makes it necessary," Luff says.

To continue downward on price and performance, manufacturers need to increase the number of pieces they sell. However, Luff says we've

hit the long tail. The economics will require the broadcast market to be part of a bigger market. Manufacturers now design products for the consumer and professional markets with some of the same parts. The DVC Pro, for example, started out in the consumer market and evolved to the professional market.

The DX1000, a consumer/prosumer DV camera, marked a shift in camera production, Braverman says.

"The Sony DSR150 and the Panasonic DVX100 were a huge step forward from a production perspective," he says.

And he adds that the Sony EX1 and the HDX200 are a continuation of low-cost cameras that do everything, just sometimes not as past professional cameras. For example, he says, a big factor for many shooters is the optics in the cameras. However, as the price of the cameras decreases, the optics get worse and worse.

The first 60 units of RCA's TK-42 camera were delivered in 1965. The camera featured a 4 1/2in image orthicon tube and three 1in Videocon tubes. Photo courtesy Bobby Ellerbee.

"Manufacturers can't give you a $25,000 lens on a camera that costs $8000," Braverman says. "The way they do it is pretty clever. The camera compensates for the relatively modest lenses that come with the camera. So, they provide $8000 industrial lenses, but they have a lookup table in the camera that recognizes that lens and its defects and applies a digital chromatic aberration compensation."

Every manufacturer does this in cameras that have integrated, permanently mounted lenses. Panasonic was one of the first to do it with interchangeable lenses, starting with its PX5000.

"What that means for the industry is that broadcasters can get nearly — but not quite — the performance out of an $8000 or $10,000 lens that they used to get out of a $20,000 lens," Braverman says.

The move toward HD has put a lot of pressure on lenses and optics.

"While they see greater amount of picture detail, they also see, unfortunately, a lot more lens defects," Braverman says.

Standard-definition lenses on high-definition cameras can be problematic because we suddenly see all the problems that before were hidden by standard definition's rougher edge.

Evolution of the craft

Changes in camera technology also reflect a change in production values, Luff says.

Braverman agrees, saying, "We're seeing the convergence of field reporters into one person — shooting, writing, directing, editing, going for coffee. That one person's attention is now spread across multiple disciplines. So, the tools required then also have to be spread across multiple disciplines."

The introduction of the MXF format used in the P2 camera lends itself to this multidisciplinary approach. With the P2 system, files are arranged in folders, so the user can easily produce proxies that can be uploaded by satellite and sent back to the station. Now there are cameras with built-in MPEG-4 encoders, which enable reporters to relay the proxy to the station, so the station can start working on the show before they get back with the physical media.

"Camera people used to be an elite group. Now there's a sense that anyone can pick up a camera and produce remarkable pictures," Braverman says. "It used to be a question of who owned the tools, because the tools were expensive, they took some expertise to run."

For example, Braverman says with film cameras, the operator had to know how to load it and understand F-stop, depth of field, and all kind of issues. Then, as time went by, the tools became available to everyone.

"Today, it's not a matter of who owns the tools," Braverman says. "It's a question of who owns the craft."

Today's cameras are infinitely more capable and rugged, and cost one-third to half of the price. Manufacturers are responding to the economic necessity.

"But from a shooter's perspective, going out on a job, we're asked to do the same level of work, except we're handed a $6000 or $7000 camera instead of a $50,000 camera," Braverman says. "And the capabilities of the two are just not comparable. From a shooter's perspective, it's a challenging time."

The move away from full-sized professional cameras with broadcast optics has made it much more difficult to produce clean, professional looking images, according to Braverman.

"On the other hand, from a broadcaster's perspective, the lower cost means the ability to buy 10 cameras instead of one camera," he says. "And the fact that they're less sophisticated means that you don't need a cameraman with 20 years of experience."

This proposition is attractive to broadcasters, especially in these economic times.

Where does that leave the craft? With this new economic reality, Braverman says that the apprenticeships and the opportunity for a young

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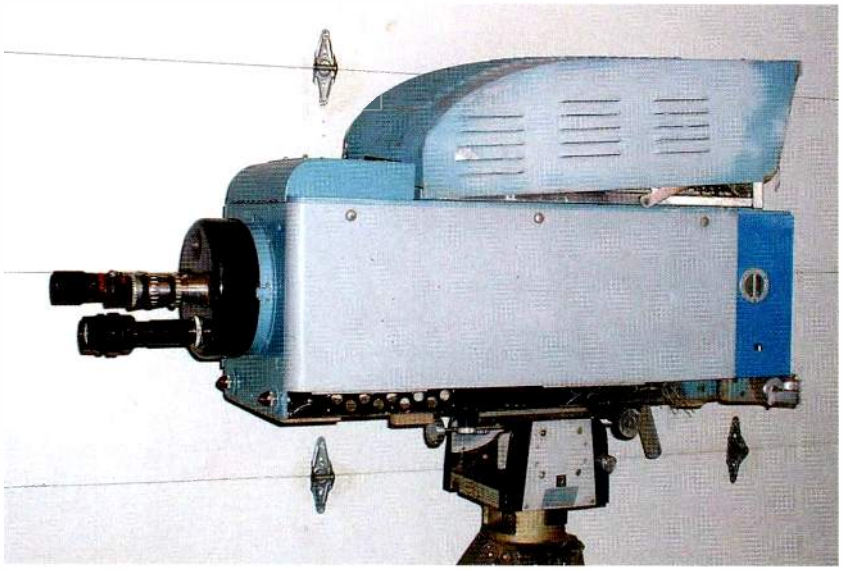
shooter to learn from a master have vanished.

"And this has led to a lowering of standards in many ways because the reference isn't there," he says.

Stewart Pittman, a cameraman for Greensboro, NC, FOX affiliate WGHP-DT agrees.

"I was lucky to start in '89 at an old station with old equipment and old veterans to train me," he says.

He found that carrying a TV logo was a powerful tool. With a TV camera in hand, he could go anywhere. He says that that power has faded a bit in recent years, in part due to cameras no longer being a tool exclusively held by the cameramen elite.



RCA's TK-40 is considered the first color TV camera. Photo courtesy Chuck Pharis.

What these smaller cameras offer, according to Pittman, is a far more intimate approach. The small DV cameras are less intrusive. He sees this change as a small part of the overall changes happening to local news, yet he's reluctant to give up his full-sized XD camera. Having to go into the menus to tweak one little thing on the DV camera bothers him.

"I know my job's not going to get any easier," Pittman says.

But he's also looking forward to a more organic approach to news. A more organic approach is a friendly way of saying one-man-band journalism, something Pittman knows about. He currently works as a solo photographer, creating his own packages for someone else to voice, and he's grooming other photographers to be able to do the same.

"We're operating in an environment where one person is doing it all," Braverman says. "That's changed the demand in the industry for that equipment. The demand is now for equipment that can do it all without a lot of expertise."

Today, the skills required have changed.

"We will never go back to an era of specialization," Braverman says. "It's just the economics and the fact that the broadcast market is so fragmented. Viewers have many, many choices. It's not just the three big networks. Today you have hundreds of choices on cable and satellite, and on top of all that the Internet — all working against the specialization that we once knew."

The full-dimensional future

So where do we go from here? The experts agree that they foresee no great leaps.

"I hate to say it, but we're reaching the point of diminishing returns," Luff says.

Optical science, for example, is reaching the limits of what is possible to diminish the size of the lens. Luff calls this the long tail. But, then, he admits that if you had asked the same question 30 years ago, he probably would have says the same thing.

"Changes are incremental now rather than revolutionary," he says. "A camcorder was a physical impossibility 30 years ago."

Pharis takes a step even further back looking at the strides the industry has taken.

"You go back to the 1930s and 1940s with this big huge technology, and now you can take hundreds of components and put them in a space the size of your thumb," Pharis says. "You still need a camera that someone can hold onto and operate stably. It needs to be big enough for stability."

We tend to think HD is new to our industry. But we've been working on this idea for 30 years. People have been playing around with 3-D for decades. And while the 3-D equipment will be bigger and more complex than what we've become accustomed to, the size will come down, following the same path as HD.

In fact, Luff predicts that we'll have 3-D before 1080p. He says that there's a bigger push for 3-D because it will require consumers to buy new displays.

"New technology introductions, to some degree, are forced on us because manufacturers have to find something else to sell," Luff says.

The important element in looking toward the future is seeing the past. The first Iconoscope cameras produced unimpressive images, but they inspired people to improve on the technology. Obviously, today we're in the microprocessor age, with surface-mount components and CCD cameras, and of course there's HD, and next is 3-D. Who knows what will happen after that. **BE**

Spring Suptic is an associate editor for Broadcast Engineering.

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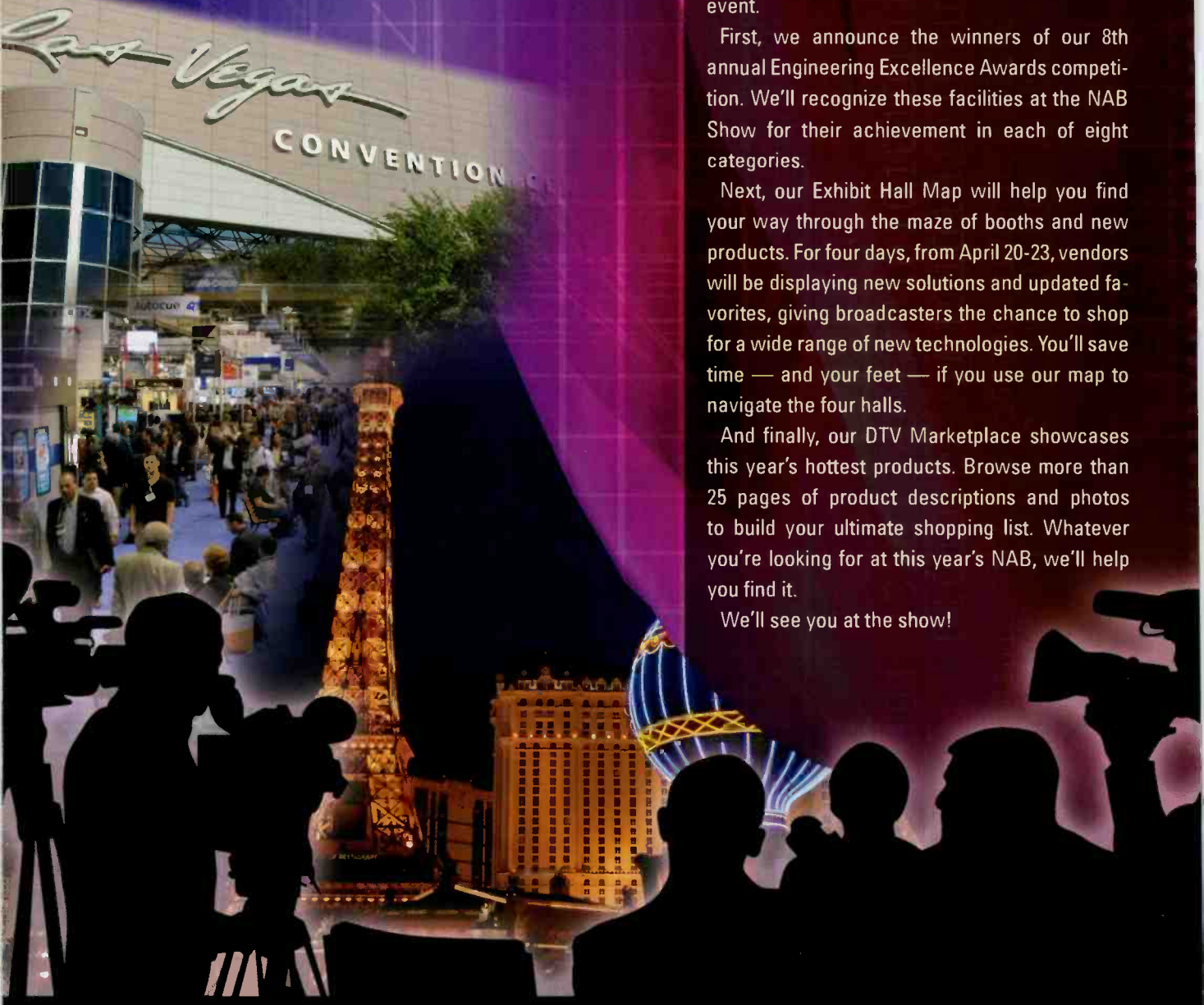

IT'S SHOWTIME!

Lights! Cameras! Action! It's show time again! The NAB Show always serves as a place for broadcasters worldwide to gather and learn more about their industry, and *Broadcast Engineering* is here to help you make the most of this event.

First, we announce the winners of our 8th annual Engineering Excellence Awards competition. We'll recognize these facilities at the NAB Show for their achievement in each of eight categories.

Next, our Exhibit Hall Map will help you find your way through the maze of booths and new products. For four days, from April 20-23, vendors will be displaying new solutions and updated favorites, giving broadcasters the chance to shop for a wide range of new technologies. You'll save time — and your feet — if you use our map to navigate the four halls.

And finally, our DTV Marketplace showcases this year's hottest products. Browse more than 25 pages of product descriptions and photos to build your ultimate shopping list. Whatever you're looking for at this year's NAB, we'll help you find it.

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The BroadcastEngineering 8th annual Excellence Awards

Note from the editor

This year there were 45 entries in *Broadcast Engineering's* Excellence Awards contest.

The winning entries were selected based on thousands of votes we received from our readers on the Web site.

Congratulations to all the entrants in this year's contest. You represent the highest quality in television, production and network technology. To see firsthand the equipment and solutions used by these leading facilities, visit the NAB booths of the vendors described in the stories. For directions to each vendor's booth, check out our extensive NAB map, which begins on page 99.

Brad Dick

Brad Dick
Editorial Director

New studio or RF technology – station

WINNER: ESPN Teleport 92

Submitted by: ESPN

Runner-up: WFYI
Submitted by: WFYI Public Broadcasting

New studio technology – network

WINNER: Global TV 92

Submitted by: Orad Hi-Tec Systems

Runner-up: Scripps
Submitted by: XOrbit

New studio technology – HD

WINNER: The Weather Channel 94

Submitted by: Snell & Wilcox

Runner-up: ET & the Insider
Submitted by: Avid

New studio technology – non-broadcast

WINNER: Carolina Panthers 94

Submitted by: Ross Video

Runner-up: Newseum
Submitted by: Front Porch Digital

Station automation

WINNER: DIRECTV 96

Submitted by: OmniBus Systems

Runner-up: ESPN Star Sports
Submitted by: Television Systems Limited (TSL)

Network automation

WINNER: Rainbow Network 96

Submitted by: Communications Engineering, Inc.

Newsroom technology

WINNER: Sky News 98

Submitted by: BSkyB (Sky News)

Runner-up: The AP
Submitted by: Professional Products

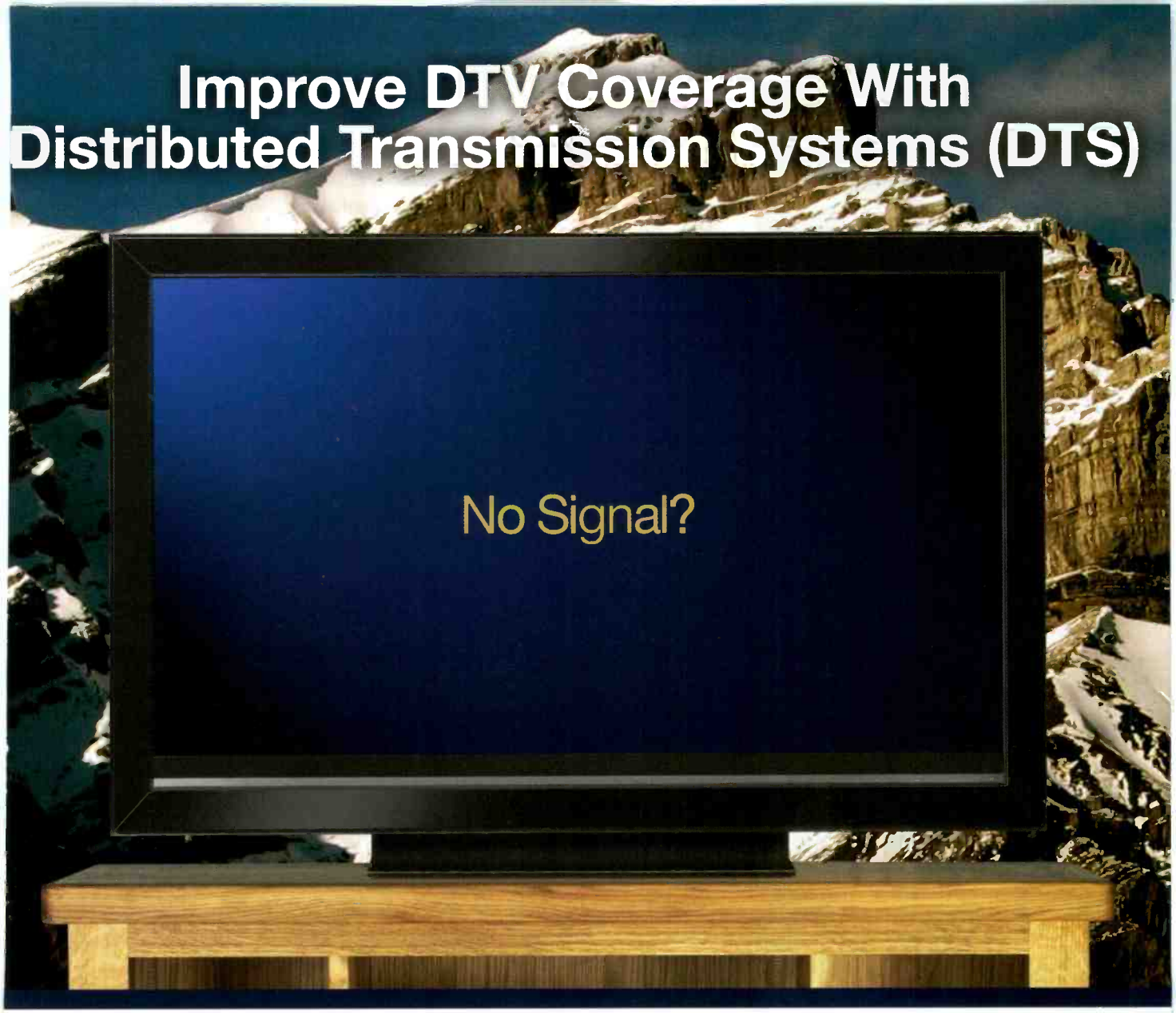
Post & network production facilities

WINNER: NBC Olympics 98

Submitted by: NBC Universal

Runner-up: Turner
Submitted by: AmberFin

Improve DTV Coverage With Distributed Transmission Systems (DTS)



Broadcasters are finding DTS the most effective DTV transmission solution especially when terrain shielding creates gaps in coverage. DTS is also the ATSC M/H transmission solution to improve in-building coverage to mobile handheld receivers.

Axcera is the industry leader in DTS technology and the only company to commercially deploy DTS, some for over five years. To learn more about DTS and how to upgrade your existing transmitter to function in a Distributed Transmission network visit www.axcera.com/dts-solutions

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ESPN Teleport

Winner of new studio or RF technology – station

Submitted by

ESPN

Runner-up: WFYI

Submitted by: WFYI Public Broadcasting

Seven years ago, the initial discussions took place regarding the feasibility of developing a parcel of land near the ESPN campus for transplanting its antenna resources to one common area. By the end of December 2008, the project was completed. The teleport is comprised of five terraces, each lower than the preceding by 10ft. This allows for a clear line of sight to domestic and international satellites by all 22 antennas on the teleport. Eighteen antennas, ranging from 4.5m to 11m, were relocated to the teleport, along with four additional antennas, three of which are 9m antennas and one 7m Torus antenna. The Torus measures 24.4m in length and 7m in height, and it has the functionality of 35 7m C/Ku-band antennas with feed assemblies fully populated. The antenna was positioned to give it optimum reception along the domestic arc. With 30 feed assemblies aligned, the network no longer has to reject feed requests because of the lack of antenna resources. The addition of the Torus for domestic reception frees up 10 4.5m agile antennas for international reception.

The majority of ESPN networks are distributed by seven C-band transmit antennas powered by 1kW solid-state power amplifiers. They were chosen for their wideband characteristics, built-in redundancy and ease of maintenance. ESPN selected 1:2 phase combined traveling-wave tube amplifiers to power three Ku-band antennas for distribution of its international networks to targeted areas not reached by C-band distribution. Fiber optics are used to transport signals between the teleport and the transmission control room; loose tube conduits and air-blown fiber were chosen for their flexibility in meeting future needs. The completion of this teleport, and the expansion capabilities it provides, will allow ESPN to expand upon the 53,000 feeds it currently receives each year, enhancing distribution to the 196 countries and territories currently receiving ESPN content.

Global TV

Winner of new studio technology — network

Submitted by

Orad Hi-Tec Systems

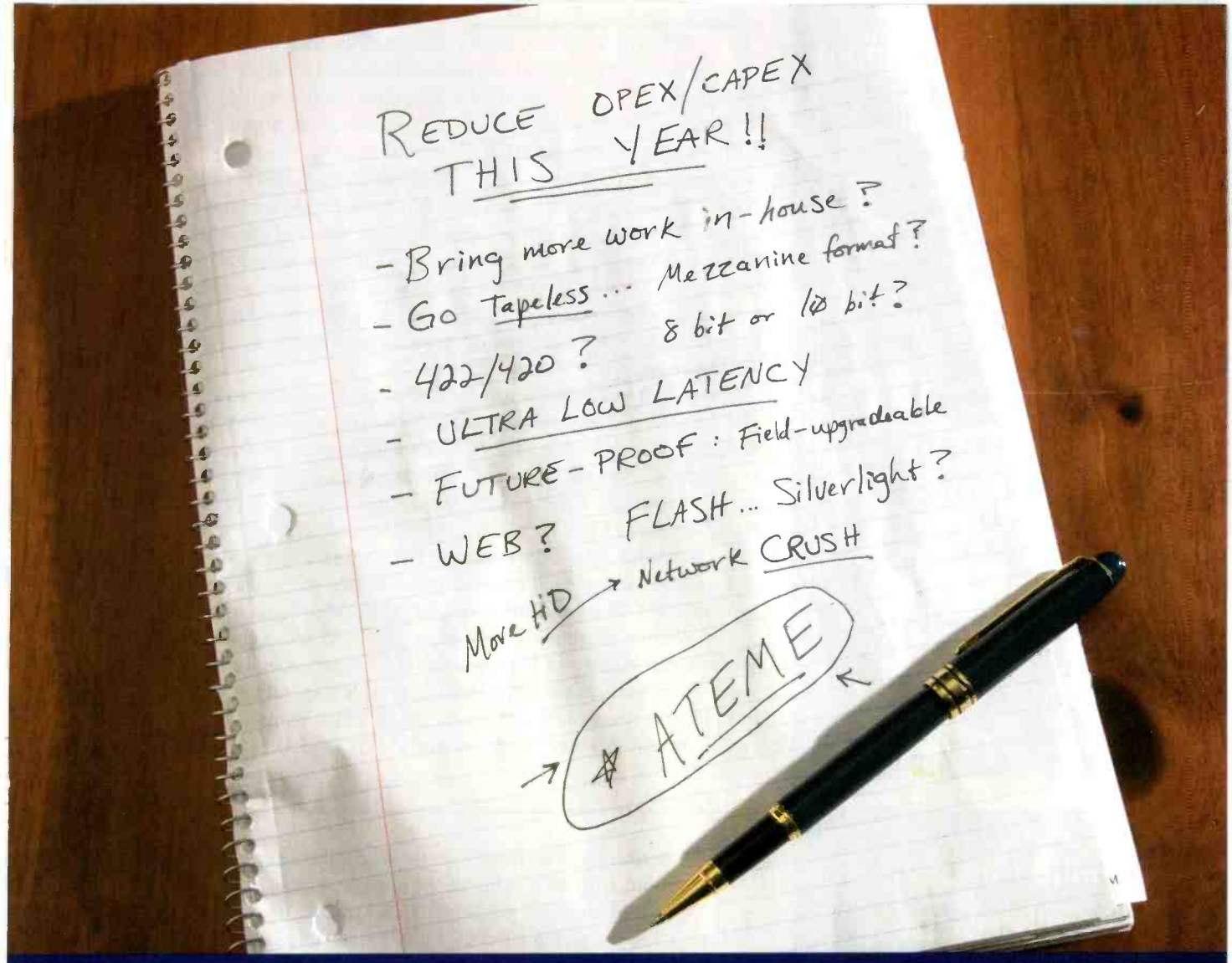
Runner-up: Scripps

Submitted by: XOrbit

Canada's Global Television Network has a viewership spread across five time zones — with regional broadcast centers in Vancouver, Toronto, Edmonton and Calgary as well as stations in 10 other communities. Global TV recently brought online seven new virtual production studios to pave the way for a cost-effective HDTV transition. Based on Orad's ProSet virtual studio solution, it implemented virtual studio production facilities at its broadcast centers in Vancouver, Calgary and Edmonton. The fourth and final virtual production facility, located in Toronto, will be completed by spring 2009.

Each regionalized newscast uses local talent, while production of the news show is centralized at the virtual studio. Local news items are transmitted to the centers via FTP prior to each broadcast. At airtime, remote-control cameras transmit the image of the local anchor, sitting in front of a green screen, via fiber. The smaller stations rely on a two-camera studio setup, while the larger stations use three cameras; all use Telemetrics robotics and an H-Frame rig.

At the production facility, ProSet provides virtual studio backgrounds and produces images appropriate to the program's location. It then transmits the broadcast back to viewers in the local market. Global TV uses the Orad HDVG (high-definition video graphics) rendering platform to ensure that its virtual sets run in real time without a hitch. Global TV built the foundation for its conversion to HD with a one-time investment in equipment, which can be leveraged across multiple newscasts and time zones. This represents an estimated one-fifth of the capital expenditures that would have been required to upgrade each regional control room. With the virtual studios, local news directors and producers remain in complete control of their programs, but ProSet gives each show a unique look and allows common content to be repurposed across multiple broadcasts and time zones. The best resources of the network can now be brought to bear for any regional news production.



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The Weather Channel

Winner of new studio technology – HD

Submitted by

Snell & Wilcox

Runner-up: ET & the Insider

Submitted by: Avid

In 2008, The Weather Channel completed the migration of its Atlanta broadcast plant to native HD and launched production from a new HD studio. To ensure uninterrupted production, The Weather Channel alternately deployed Snell & Wilcox Kahuna SD/HD multiformat production switchers in its main production control rooms. Equipped with FormatFusion technology, the Kahuna systems enable simultaneous SD and HD operations in the same mainframe and the same control panel. The network thus was able to continue producing a high-quality SD feed while preparing HD-capable control rooms for the HD studio launch. The Kahuna's internal conversion capability allows staff to merge a broad range of SD and HD material provided by external sources, taken from archive or acquired by the network, seamlessly into live broadcasts.

The primary objective across the HD upgrade was to create a highly flexible and dynamic production environment. The HD studio, a 5000sq-ft LEED-certified facility, reflects this goal, featuring a 360-degree set that can be shot from any angle. A 35ft x 8ft video wall, comprising three Christie 8K rear projection systems linked by a Vista Spyder, displays video and weather graphics from a WSI HD Titan and a Vizrt VizWeather system, as well as monitor fills from a Ross Video SoftMetal server. An Ultimatte HD chroma keyer feeds a backlit display that rotates to serve as a key-over map in one position and a wall in another. An Avocent KVM allows anchors to control and modify five 20in on-set screens.

The Weather Channel uses Ikegami HDK-75EX cameras with Canon HD lenses in the studio and Panasonic 2000 cameras for live and P2 field record. Switching of video to the set and to the Evertz MVP multiviewer within the control rooms is handled by a Thomson Grass Valley Trinix routing switcher and Encore control. Wheatstone audio consoles support 5.1 channel surround sound audio.

Carolina Panthers

Winner of new studio technology — non-broadcast

Submitted by

Ross Video

Runner-up: Newseum

Submitted by: Front Porch Digital

The Carolina Panthers' goal was to rebuild the control room with new equipment to make it HD-compliant before the fall football season. The biggest challenge was to select the right technology to meet future equipment needs by the new football season. Everything had to be seamless, from audio to video, interfacing the equipment and the construction of the control room. It was a large undertaking, especially making the transition to computer-based technology. A new experience in the design was the increased awareness regarding how to process all signals. Special acoustical considerations included raising the solid floor to install cabling underneath. A simple change that has made a big impact on the Carolina Panthers' live game productions has been the Riedel intercom system. The increased communication added to an improved overall production environment. Ross Video's Vision production switcher is complex yet simplifies productions. Vision is modular, so it's easy to switch things out. The Panthers found that Ross is a people-oriented company that puts a lot of thought into the design of its products, and it has great understanding of the live sports production industry.

The key to improving workflow was increasing the efficiency of the space. The ergonomics posed a challenge, as a typical game day requires 16 people to be in the control room. The ability to control everything remotely was important, as all the servers and equipment were moved into their own separate climate-controlled engineering room. Every detail was taken care of to ensure that the design was customized for all production needs, and to ensure increased communication and flexibility. Creating a separate climate-controlled engineering room drastically changed and improved workflow. The control room also has better communication with the team's Avid edit suites. The entire rebuild has given the Carolina Panthers the framework to move toward HD sports production. The plan is to produce in HD for the 2009 football season.

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See us at NAB, booth: SU1917

DIRECTV

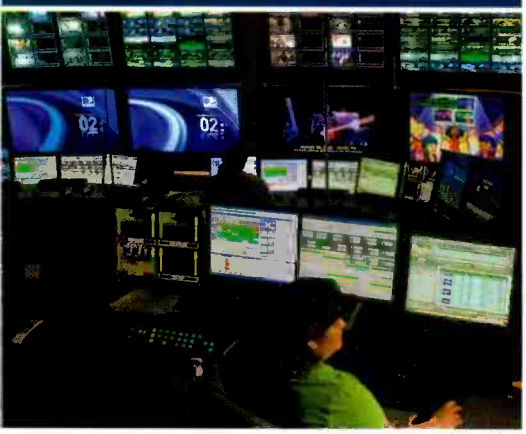
Winner of station automation

Submitted by

OmniBus Systems

Runner-up: ESPN Star Sports

Submitted by: Television Systems Limited (TSL)



DIRECTV began construction of its new HD playout area in May 2007 with a tight deadline: nine months to deploy up to 80 fully redundant new HD channels based on a flexible system architecture that could rapidly accommodate future services.

OmniBus iTX was chosen for its versatile features and performance, space efficiency and because, as an integrated system, it can be installed and commissioned in a comparatively short time. Integration needed with DIRECTV's proprietary business and engineering management systems required custom development from OmniBus. Web services and high-level interfaces were used to develop further solutions for specific requirements such as real-time connectivity for schedule updates, real-time alerts to provide feedback to the engineering monitoring system and interfaces to DIRECTV's conditional-access systems to automate the insertion of access information into playlists.

A major requirement was the flexible handling of Dolby surround sound. The solution was OmniBus' audio engine with native Dolby surround encoding and input/output remapping, which gives staff control over the integration of encoded material into the schedule. The iTX software runs on HP ProLiant servers with Isilon storage. Using these industry-standard hardware components helped the project stay on time and on budget. The installation of 80 channels was increased to 120 to coincide with the launch of a new satellite and provide capacity for future channels. iTX provides significant workflow benefits and serves DIRECTV in three key areas: pay-per-view HD channels; automated commercial insertion, whereby live signals are passed through iTX and commercials are automatically inserted at specific times using SCTE104 triggers (this is the first use of SCTE104 carried in the VANC and was developed specifically for this system architecture); and playout of highly crafted channels requiring a significant degree of flexibility.

Rainbow Network Communications

Winner of network automation

Submitted by

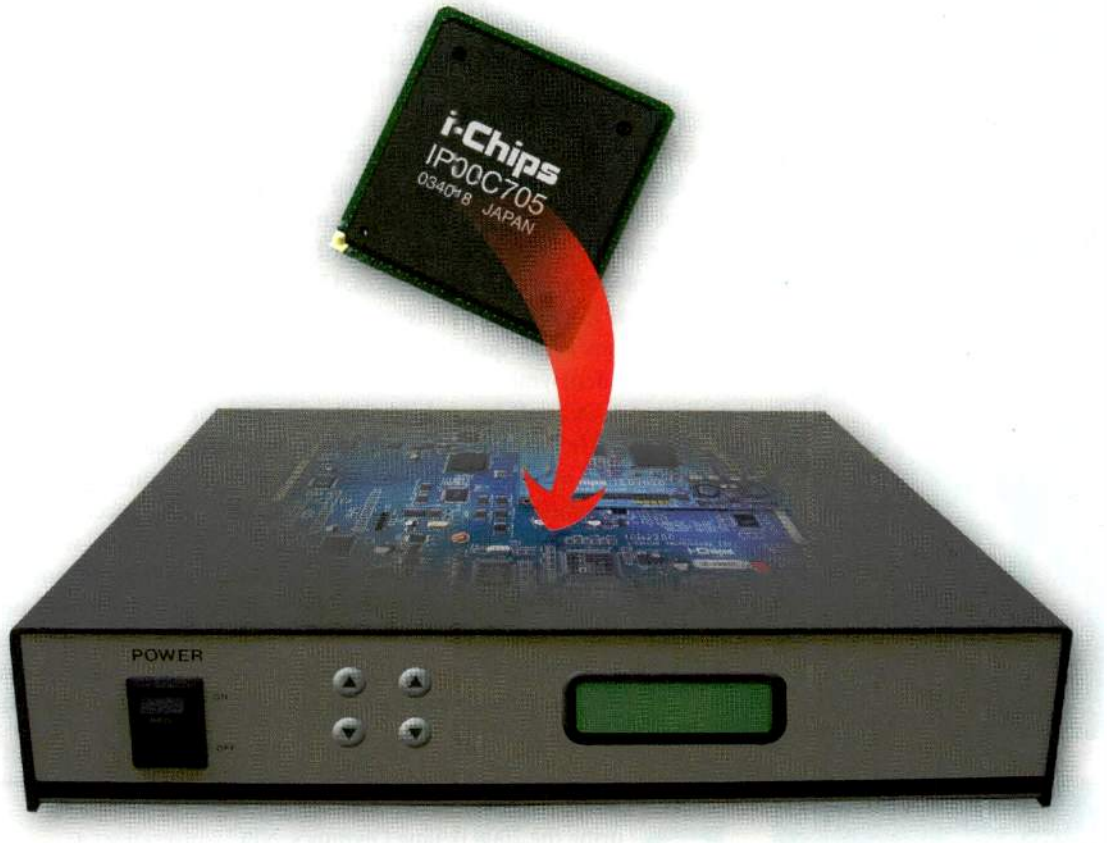
Communications Engineering, Inc.

Rainbow Network Communications made a significant investment in 2007-2008 in the HD upgrade of the master control facilities that originate the air playout of Rainbow's flagship network channels in Bethpage, NY. The upgrade, which was designed, integrated and installed by Communications Engineering, Inc. (CEI), of Newington, VA, had a twofold purpose. First, the AMC, IFC, and WE tv channels were augmented with HD air channels. Second, all long-form playback for all channels was moved from tape-based to an all server-based system driven from an HD and SD digital archive.

The HD channels were mandated to air all program content in full screen 16:9 with no letterbox or pillared segments. This was a challenge because some interstitial and long format elements were provided in either SD or in non-full screen HD formats. Special upconversion circuits were devised with automation-enabled format selection. 5.1 surround sound, along with a separate audio program and a stereo PCM down-mix channel, were required for all HD channels. Special audio up-mix and down-mix circuits were implemented for situations where SD signals were upconverted for HD playout or where HD signals did not have the proper audio formats. Downstream processing of the program channel included the insertion of bugs, logos, animated snipes, local commercial avail signals, closed captioning and ratings signals in preparation for air release. All downstream devices were put under automation control for schedule based playout.

The master control rooms accommodate up to six channels of simultaneous playout. Signal confidence monitoring was converted from an all-SD glass monitor wall to a mixed SD and HD array of LCD displays driven by an integrated multiviewer system. Distributed operational workstations allow for individual channel playout control and monitoring. A central master control platform allows for live programming for special events.

12-bit Full-HD Processing?



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Booth SL8827

Sky News

Winner of newsroom technology

Submitted by

BSkyB (Sky News)

Runner-up: The AP

Submitted by: Professional Products

The Sky News NOC is at the very heart of the channel's newsgathering infrastructure. This hub has been devised and built to ensure the channel stays ahead of the competition in the fast-paced world of delivery in any format, from any platform. Using the NOC, it can seamlessly contribute the majority of its media, including live video streams and packages, from anywhere in the field and from its bureaus around the world via a variety of IP networks.

Like other media organizations, Sky News has become increasingly reliant on content fed via the Internet or through its private data networks. The NOC, coupled with the aforementioned infrastructure, allows the channel to be live and submit packages in higher quality, more quickly and in a more cost-effective manner than before. It uses a variety of IP providers, enabling Sky News to acquire content from multiple sources. Using the latest streaming technology, the channel has the flexibility to receive material across the whole spectrum, from a low bit-rate, lower quality, highly portable kit to full broadcast-quality, full-bandwidth deployments in our major or fixed locations. A specialist team of dedicated NOC staff has hybrid skills, adapted for this emerging technology. It has IT and broadcast experience to respond and adapt quickly to technical change, as well as for fault finding. Field crews recently underwent fundamental changes in training and use of equipment, but the NOC specialist team ensures the whole IP-based operation runs smoothly. Use of the NOC within Sky News has allowed the channel to cover breaking news in a way not possible before, both logistically and financially. The NOC opens up a additional possibilities for instant deployment worldwide. The organization believes the high availability of reliable Internet connectivity in numerous locations around the world enables its crews to be far more effective than it would have been prior to the investment in the NOC.

NBC Olympics

Winner of post & network production facilitites

Submitted by

NBC Universal

Runner-up: Turner

Submitted by: AmberFin

During the 2008 Beijing Olympics, NBC Universal set a precedent for successfully delivering content across platforms. An ambitious infrastructure allowed content to be recorded and ingested in China to a digital media storage array. It instantly became available to the many systems and users requiring media files and finally delivered in the correct formats to various new media outlets.

Omneon MediaDecks ingested feeds at the IBC, while the MediaGrid provided 180TB of storage in China and 120TB of storage in New York. Blue Order Media, along with Cyradis, OPIS and IDS, used the schedules created in ScheduALL to manage the media files, generate statistic metadata and create the EDLs read by MOG Solutions, which auto composited the high-quality essence based on instruction. Stats metadata was merged with the streaming files created by Digital Rapids for unified display on NBCOlympics.com by CMS provider Deltatre.

During the ingest process in China, shot pickers in NY screened, logged and produced the content for digital distribution using low-res proxy files created by the MediaDecks. Conformed SD and HD video, images and EDLs were sent to Avid using Cisco WAAS for more finished edits and/or to the Anystream system for transcoding for new media outlets. Anystream's Velocity, located at Englewood Cliffs, NJ, auto-ingested production metadata entered by producers at 30 Rock via a customized MS application. Based on the metadata, Velocity instructed Agility to transcode the correct format. After each transcode passed quality assurance, distribution packages, which included thumbnails, various resolutions of Windows Media, MPEG-2 video and XMLs, were auto published by Velocity based on an outlet's requirement to MCDS. MCDS, an in-house application powered by Signiant, sent out packages to the appropriate outlets, such as NBC Direct. For VOD packages, all 50Hz content was standards-converted through a Snell & Wilcox Mach 1, controlled by Agility and re-encoded as 60Hz with ad-stitching for delivery to the appropriate cable VOD outlets.

NAB SHOW | April 20-23, 2009 | Las Vegas, Nevada

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ExhibitHall Map

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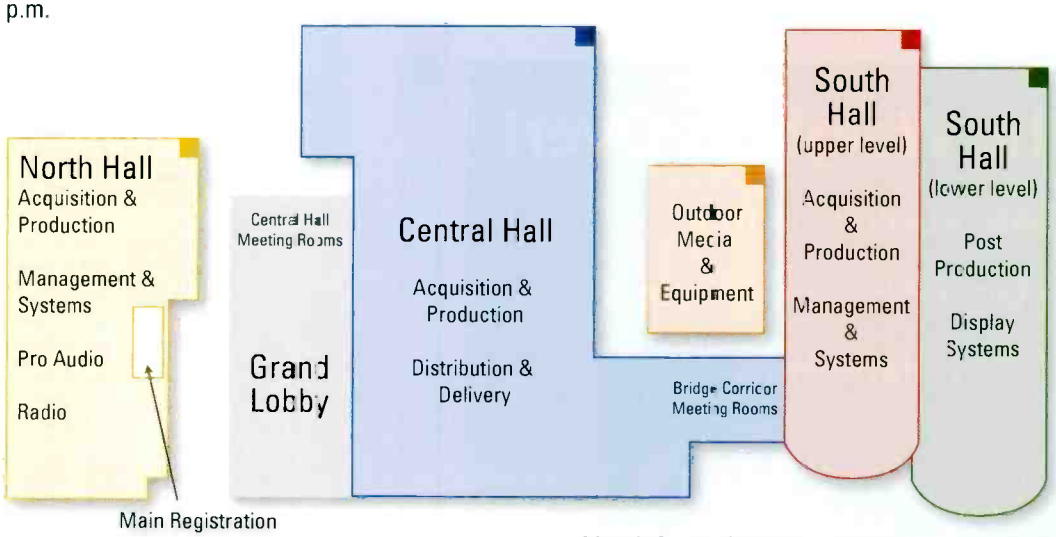
Las Vegas Convention Center, Las Vegas

EXHIBIT HALL HOURS

Monday, April 20 - Wednesday, April 22
9:00 a.m. - 6:00 p.m.

Thursday, April 23
9:00 a.m. - 4:00 p.m.



Map information current as of Feb. 23, 2009

MAP INFORMATION

The following is a brief description of what you will find in this year's NAB map from *Broadcast Engineering*.

To the right, you will see a listing of the NAB categories and what products can be found in each. Next to each listing you will find a color square that indicates the convention hall each category is located in. On the overview map (above) you will see each hall with its product categories.

Our table of contents lists each hall and the pages they are found on. On each of these pages you will notice some booths are highlighted with different colors. The ☐ highlighted booths are our magazine advertisers, while the ☐ highlighted booths are our map advertisers.

We thank all of our advertisers for their support of our NAB coverage and exhibit hall map.

TABLE OF CONTENTS

PRODUCT CATEGORIES

Acquisition & Production — Cameras, lenses, lighting and grip and ingest technologies.

Post-Production — Video editing, graphics, animation, special effects software and hardware, audio editing, and music/sound libraries.

Management & Systems — Video servers, systems integration, database technologies and digital asset management.

Distribution & Delivery — Transmitters and towers for television, radio broadcasting, satellite technologies, cable, fiber, IPTV, mobile video and streaming products.

Display Systems — Projection equipment, LCD and plasma displays and digital signage.

Pro Audio — Audio recording and mixing equipment, encoding and compression technologies.

Radio — The entire spectrum of products and services for analog, digital and streaming radio.

Outdoor Media & Equipment — ENG vehicles, outdoor signage, satellite services, power products and production equipment.

Content — Owners, aggregators and producers showcase their digital content to align with broadcasters, distributors and delivery technologies.

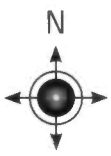
Technologies for Worship — Video and audio capture, mixing and presentation technologies and services geared toward the religious marketplace.

See Videssence at booth #C8428 on page 7

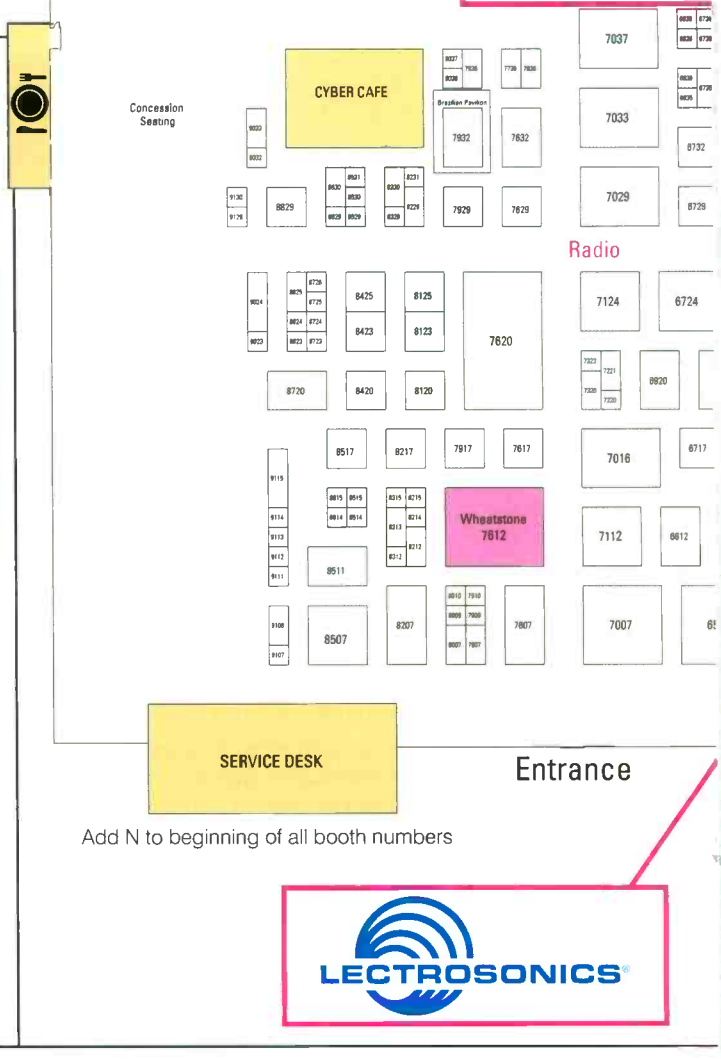
NORTH HALL

Advertisers | Map advertisers | Points of convenience

MAP #	COMPANY	BOOTH
1	Junger Audio	N4937
2	ESE	N3124
3	Azden	N2614
4	Media Genix	N2233



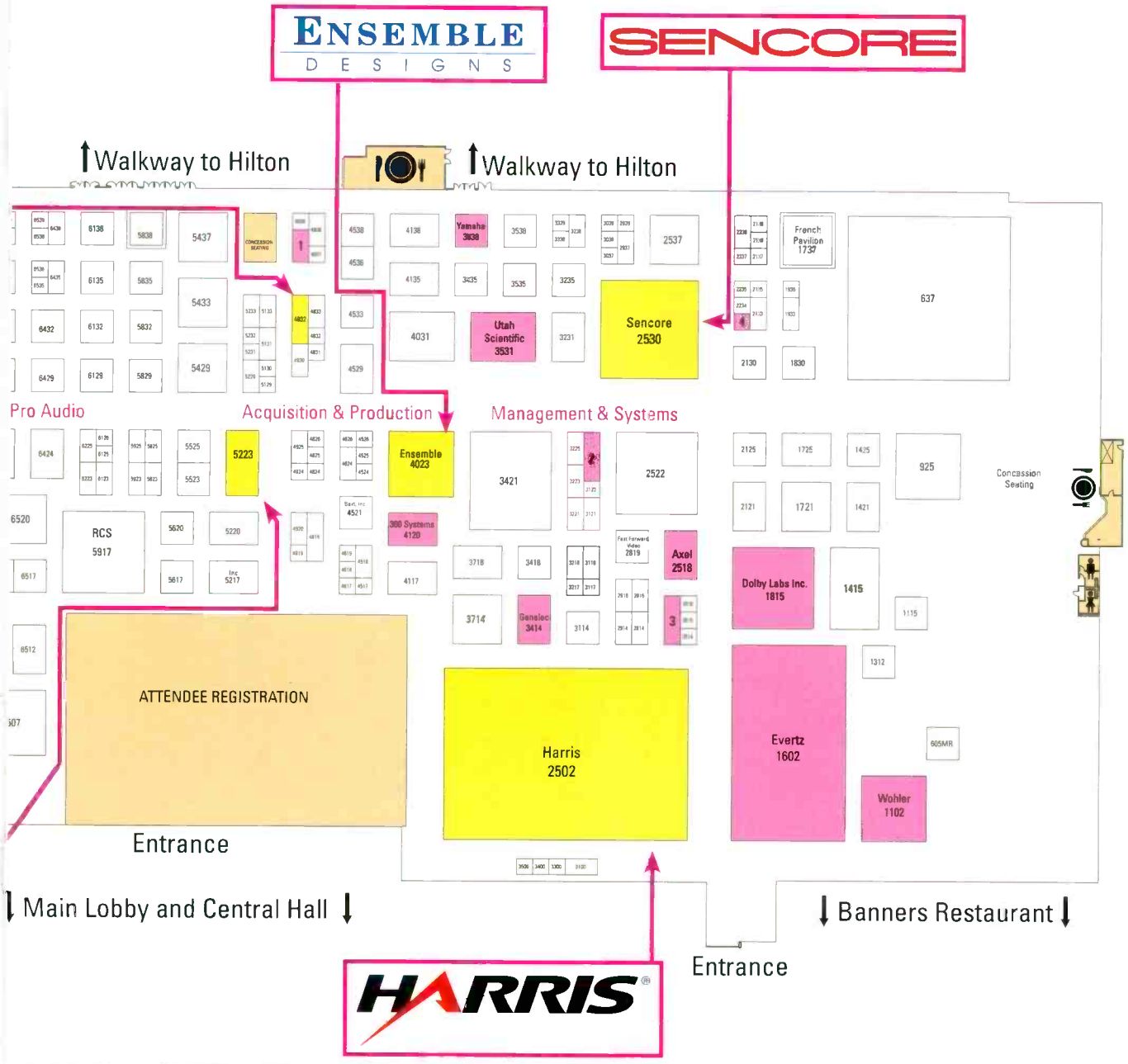
See Lectrosonics at booth #N5223 on page 5



Add N to beginning of all booth numbers

See Harris at booth #N2502 on page 5

NAB Exhibit Hours, April 20 - 23, 2009
Mon. - Wed.....9 a.m. - 6 p.m.
Thurs.....9 a.m. - 4 p.m.



CENTRAL HALL

Advertisers | Map advertisers | Points of convenience

NAB Exhibit Hours, April 20 - 23, 2009
Mon. - Wed.....9 a.m. - 6 p.m.
Thurs.....9 a.m. - 4 p.m.

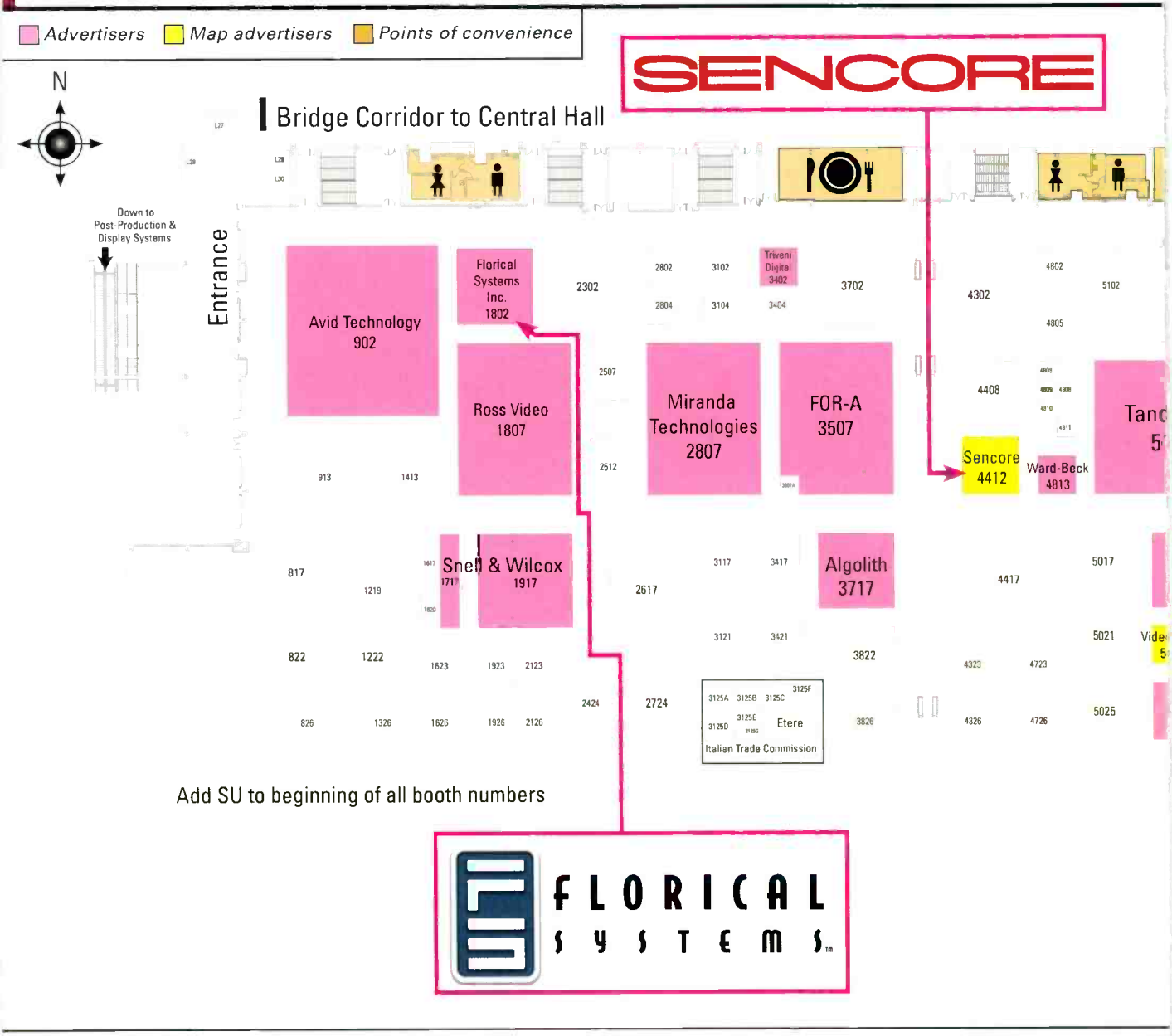
ll and Equipment

To South Hall and Outdoor Media & Equipment

MAP #	COMPANY	BOOTH
1	Emerson Network	C1732
2	White Sands	C1839
3	Videssense	C8428
4	Fischer Connectors	C9114
5	Otari	C10820

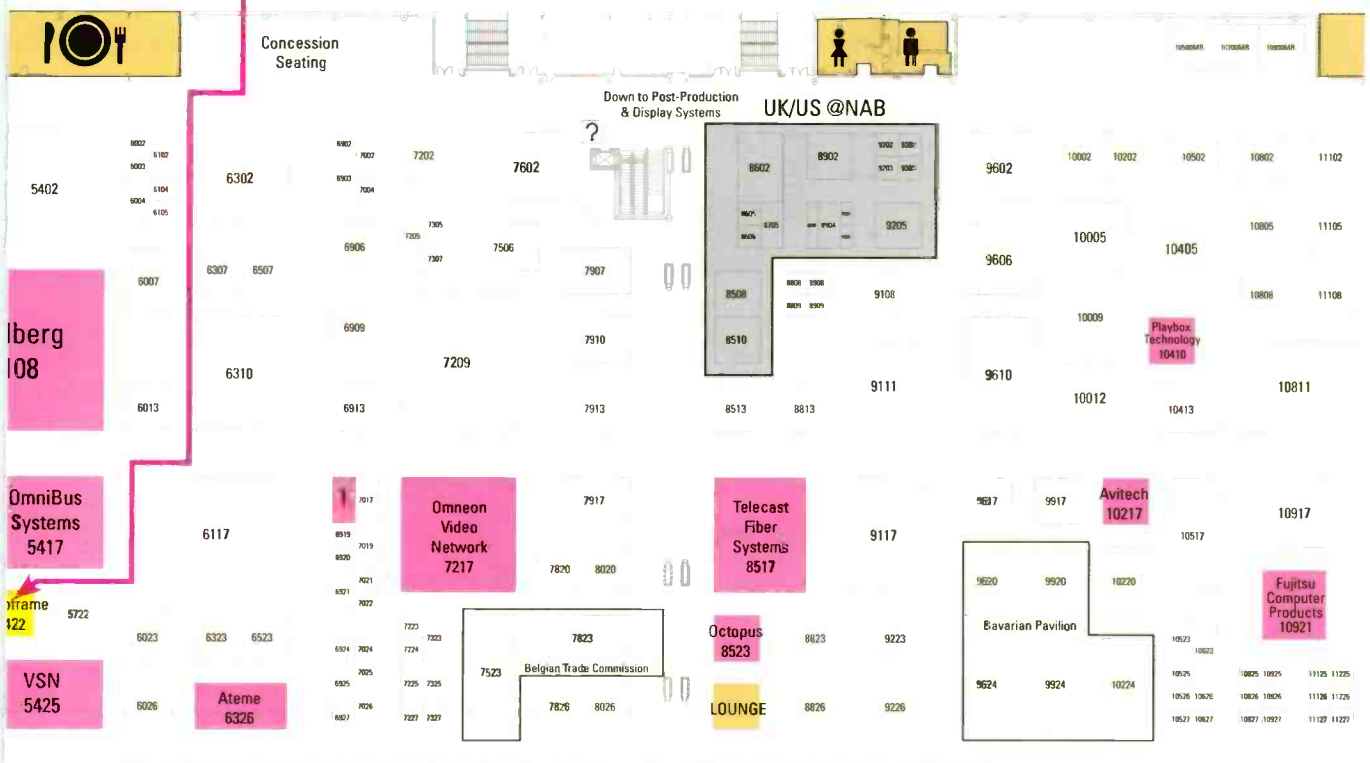
See Autoscript at booth #C6026 on page 6

SOUTH HALL, upper level



See Sencore at booth #C8546E on page 7

Videoframe™



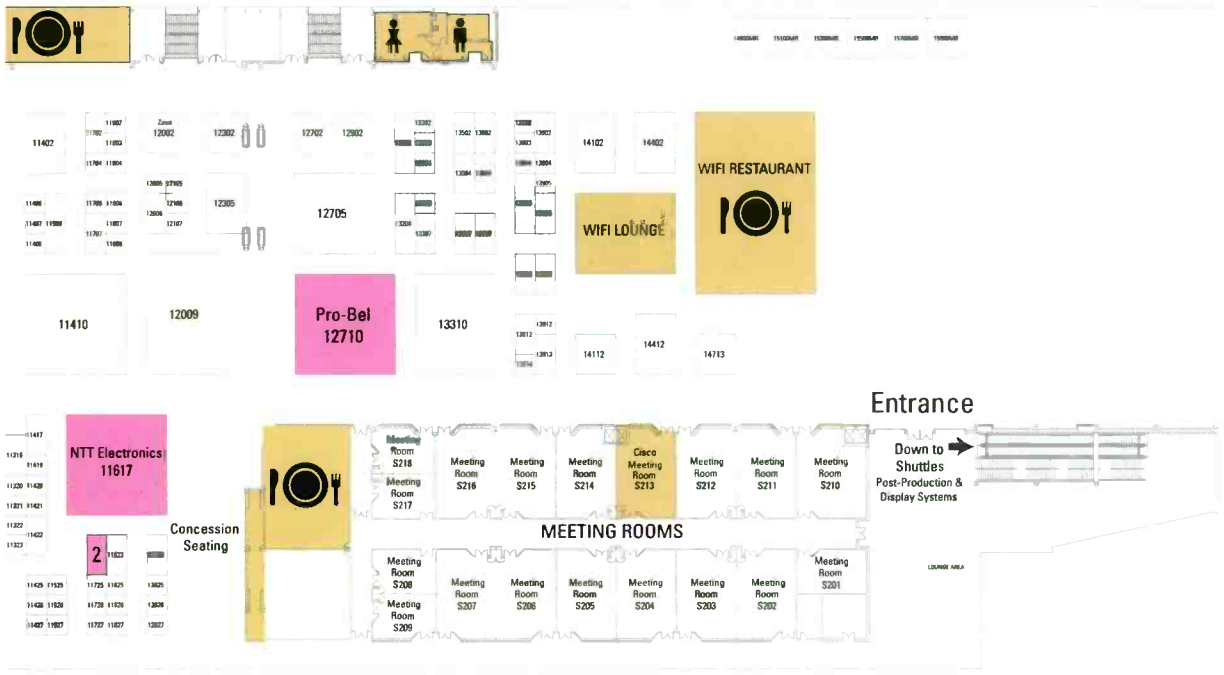
MAP #	COMPANY	BOOTH
1	MultiDyne	SU6917

South Hall (upper) continues on page 10

SOUTH HALL, upper level

Advertisers | Map advertisers | Points of convenience

MAP #	COMPANY	BOOTH
2	NTT Electronics	SU11723

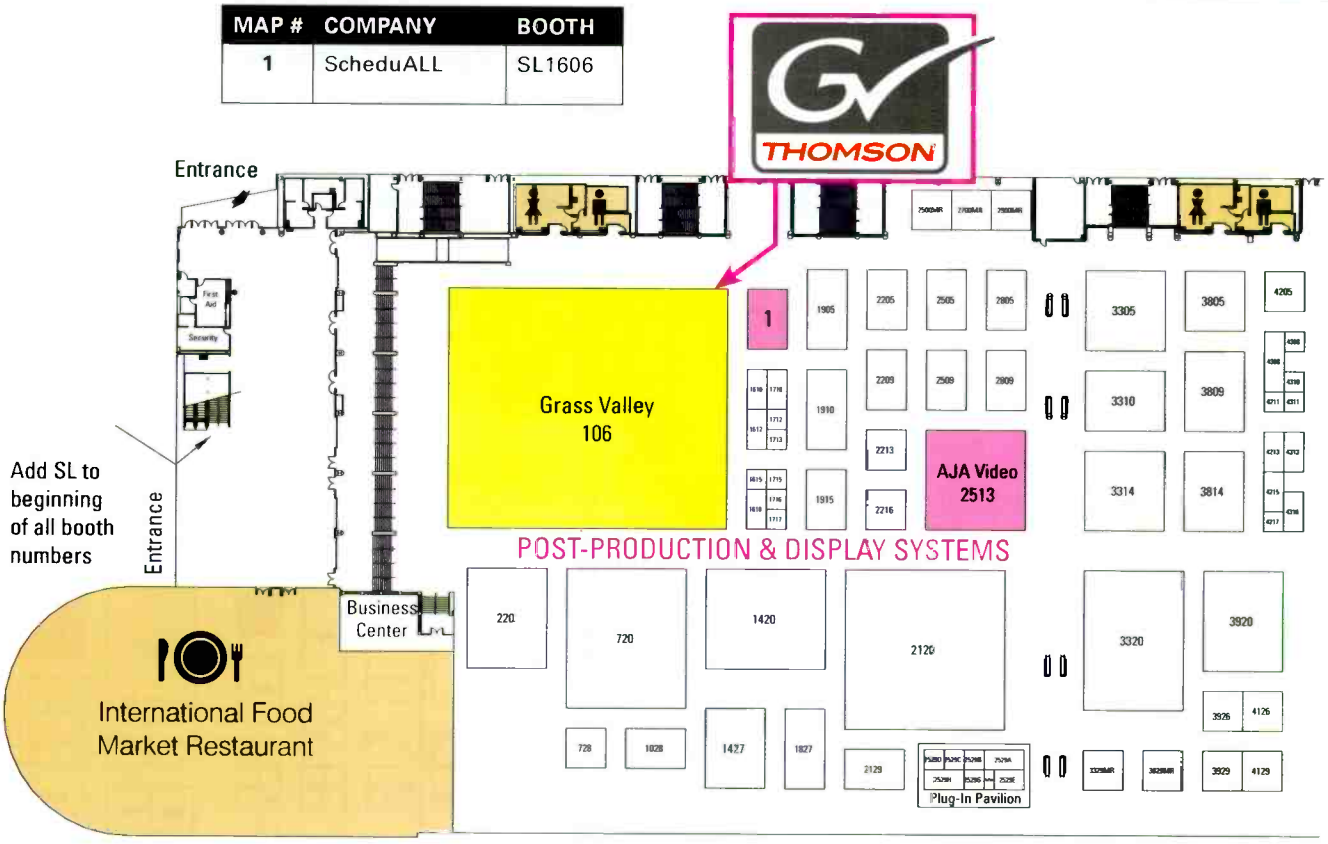


South Hall (upper) continues on page 9

SOUTH HALL, lower level

NAB Exhibit Hours, April 20 - 23, 2009
Mon. - Wed.....9 a.m. - 6 p.m.
Thurs.....9 a.m. - 4 p.m.

MAP #	COMPANY	BOOTH
1	ScheduALL	SL1606

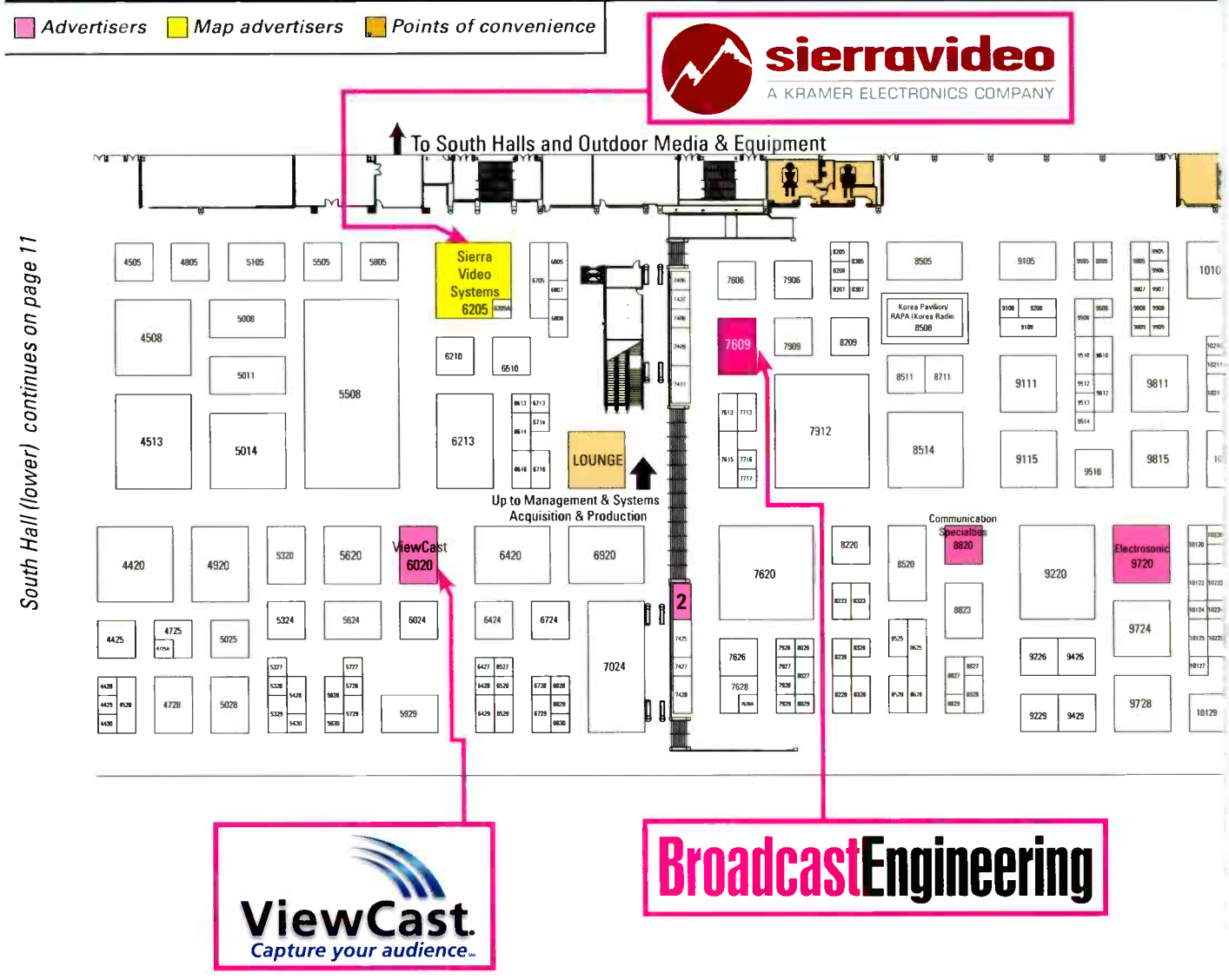


South Hall (lower) continues on page 12

See Thomson/GV at booths #SL106 on this page

SOUTH HALL, lower level

Advertisers | Map advertisers | Points of convenience



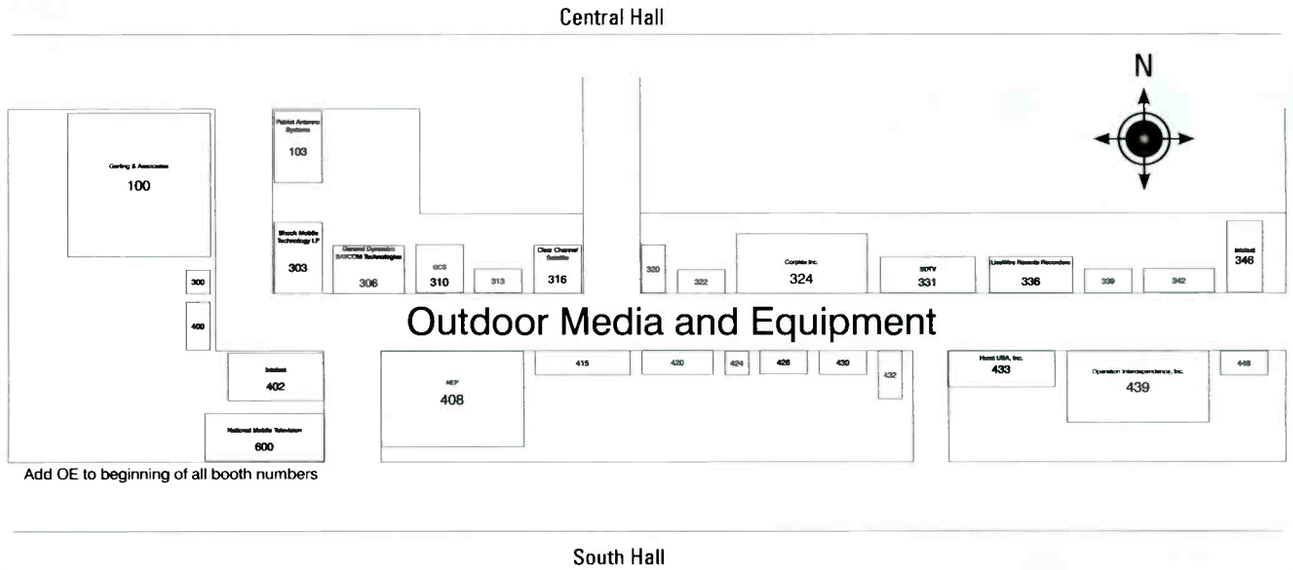
South Hall (lower) continues on page 11

See Telestream at booth #SL5405 on this page

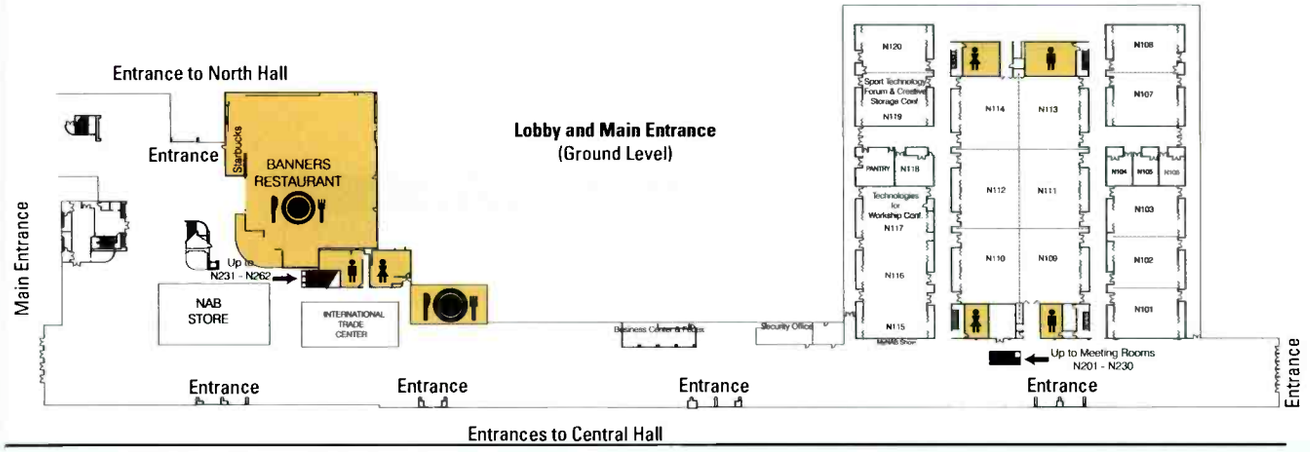
MAP #	COMPANY	BOOTH
2	Analog Way	SL7423

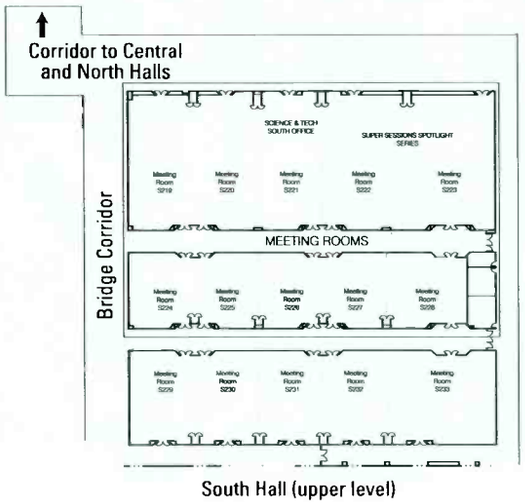
OUTDOOR MEDIA & EQUIPMENT

Advertisers | Map advertisers | Points of convenience



MEETING ROOMS





MAP INDEX

Color listing indicates advertiser

KEY

Here is a key to help you understand the NAB's hall lettering and numbering system.

C = Central Hall
N = North Hall
OE = Outside Exhibits
SL = South Hall, Lower Level
SU = South Hall, Upper Level

MAP INDEX

COMPANY	BOOTH
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Davicom	N5233
Dawnco	C6345
Dax Solutions	SL6714
Day Sequerra	N5129
Dayang Technology Development	SU9606
DB Elettronica Telecomunicazioni	C3018
DCA	SU8026
Dedotec	C9818
DekTec Digital Video	SU11108
Delta Digital Video	SL12717
Delta Meccanica	N4824
Delta RF Technology	C1929
Deltacast	SL10908
Denon & Marantz Professional	N7636
DeSisti Lighting	C9031
Devlin Design Group	R301
DFT Digital Film Technology GmbH	SL13313
DG Fast Channel/Pathfire	SU4302
DH Satellite	C4437
Dialight	N2237
Dielectric Communications	C1324
Digico Soundtracs	N8630
Digidia	N1737F
DigiEffects	SL 2529D
Digigram	N9024
Digital Alert Systems	N2135
Digital Broadcast	SU6302
Digital Horizon	C3244
Digital Nirvana	SU8808
Digital Rapids	SL6213
Digital Streams America	SL9208
Digital Vision	SL8514
Digitronics	SU7004
Dimetis	SU9920A
Discovery sysko	SU9620D
Diversified Marketing	C1127
DK Technologies	N3235
DMT System	C2622
DNF Controls	N1721
Dolby Laboratories	**N1815**
Doremi Labs	SU5021
Dorrough Electronics	N6429
Dow-Key Microwave	C1734
DPA Microphones	N4819
Draper	SL4208
DSC Laboratories	C10218
DSI RF Systems	C1328
DTV Exchange	N3100
Dulce Systems	SL4428
Duma Video	SU6924
DVB	C2239
DVEO/Computer Modules	SU4908
DVS Digital Video Systems	SL6920
Dynacore Technology	C3844
Dynascan Technology	SL6724

E

COMPANY	BOOTH
E.L. Marsden Wireless	C1122
E2V	C1331
E^3	SU9620C
Ebenezer Technology	SL8326
Echolab	SU2302
Echostar	C6045
Eckel Noise Control Tech	N8823
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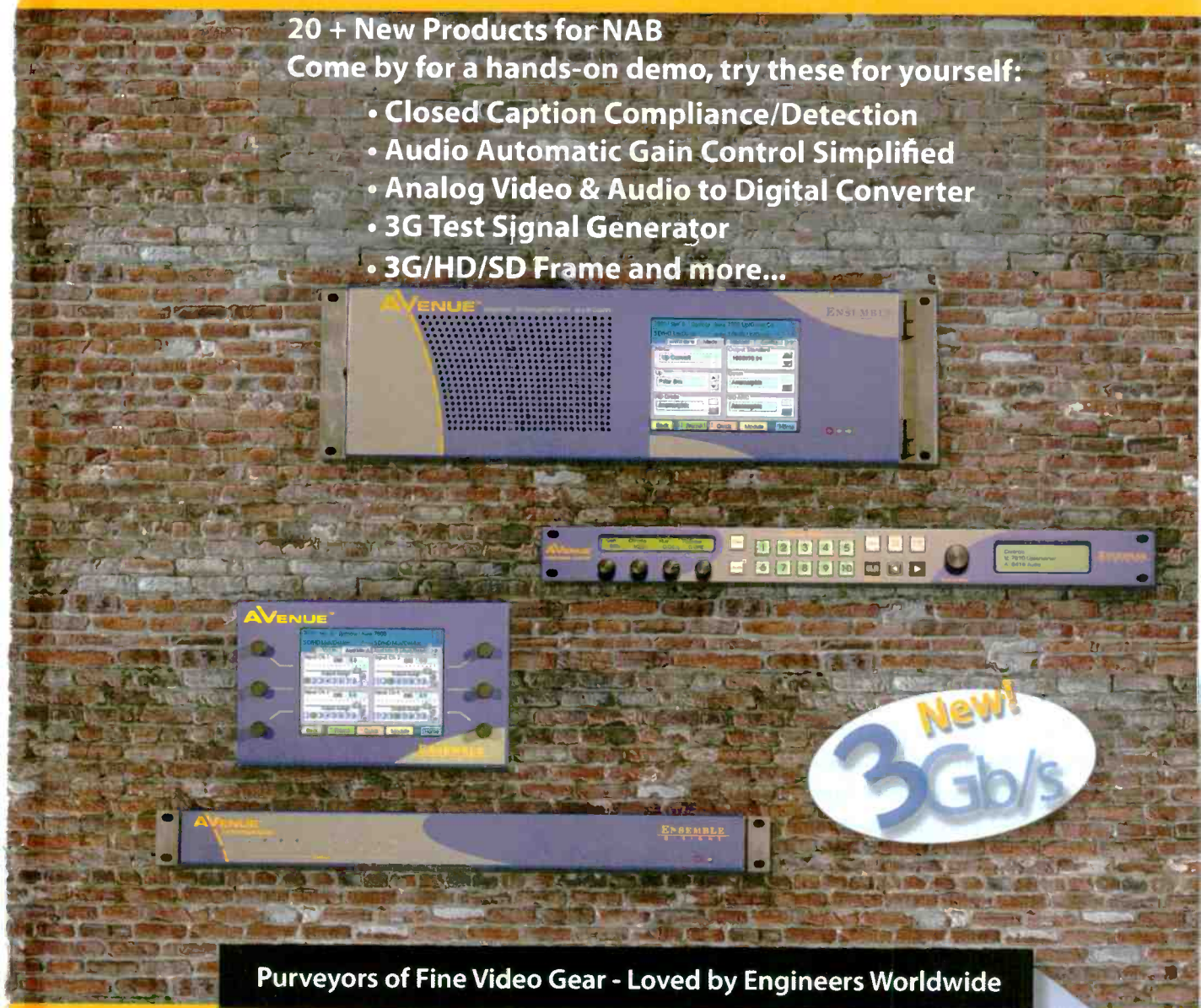

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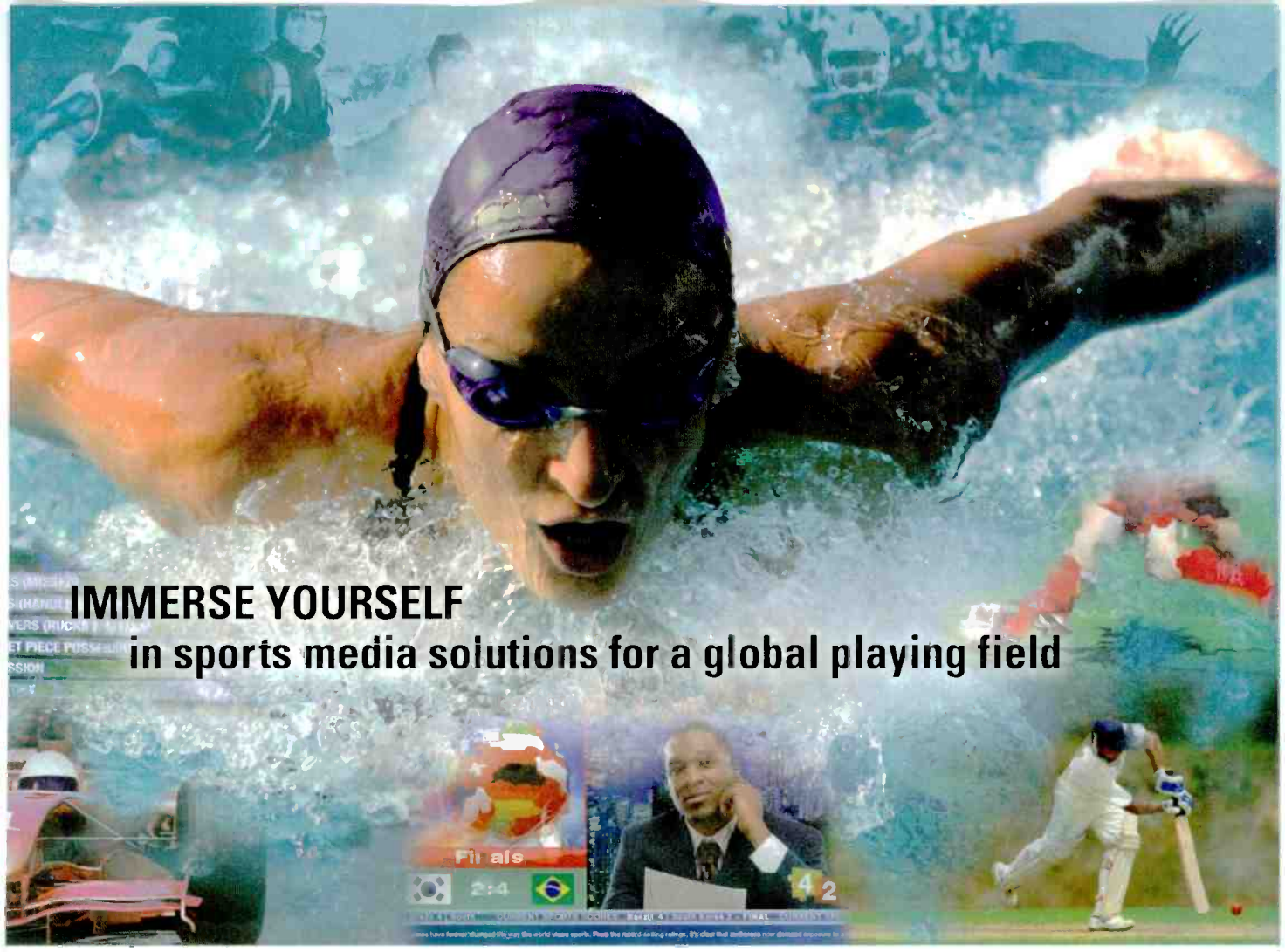

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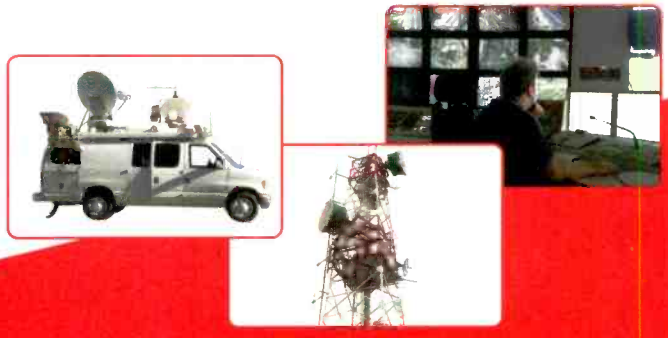

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+49 221 709130; www.rtw.de

Booth: N3123

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Dolby DP600

Program optimizer provides automatic analysis and intelligent correction of audio loudness and metadata (if applicable) for common broadcast media file and audio formats in use today; offers the option of faster-than-real-time file-based encoding and decoding of Dolby Digital, Dolby Digital Plus, and Dolby E content, as well as efficient transcoding between the formats.

415-558-0200; www.dolby.com

Booth: N1815

Audio mixers, on-air, portable, studio, playback

AUDIO CONSOLE
Wheatstone D-8

Surround-sound audio console for medium and smaller market stations, remote trucks, or secondary on-air/production rooms in larger facilities; features 24 motorized input faders, surround, four submasters, two main buses, two aux sends, and extensive processing (four-band parametric EQ, filters, compressor/limiter, de-esser).

252-638-7000; www.wheatstone.com

Booth: N7612

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Yamaha Commercial Audio Systems DME64N/DME24N

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www.yamahaca.com

Booth: N3838

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+49 30 677 7210
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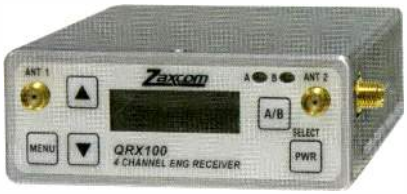
Zaxcom QRX100



A four-channel RF audio receiver; receives four channels of audio from up to two stereo or mono digital transmitters, then outputs these received audio channels as both analog and AES digital formats; a unique interface allows broadcasters to record all channels from four-channel ENG cameras quickly and easily.

973-835-5000; www.zaxcom.com

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Strategy & Technology (S&T) TSBROADCASTER 2

Software that allows an operator of interactive services to set up the automated generation of transport streams containing object carousel file systems for interactive TV; the second version of the company's DSM-CC Object Carousel product for DVB (MHEG-5 and MHP), OCAP/tru2way and ETV platforms provides a new and enhanced user interface as well as improved performance; the OCAP/tru-2way version now includes out-of-band playout, common download and DTA support.

303-926-4933; www.s-and-t.com

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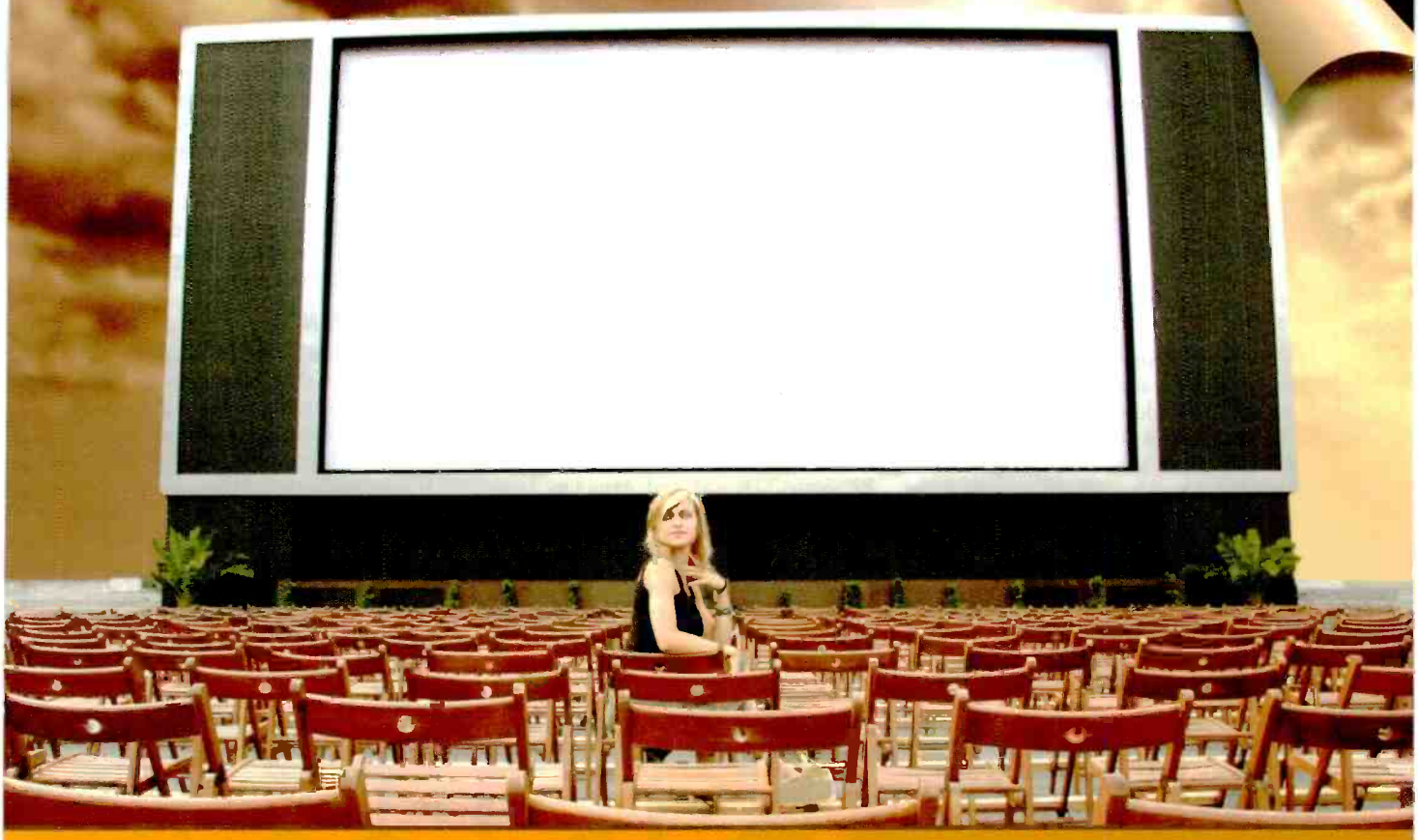
Visit us at NAB
Booth: C12431



Connectors Matter, choose wisely. Contact **Emerson Network Power** for your **Connectivity Solutions**. Today, our products enable high definition digital video transport and extend signal range from feet to miles. Video coax patch-jacks and patch panels for HDTV help cable management; HD-SDI and DVI fiber optic converters extend distance of uncompressed video; Expanded beam optical connectors offer repeatability in harsh environments. And for tomorrow, Johnson sub and microminiature 75-Ohm connector series make higher frequencies possible in even the smallest of form factors.

Visit us at the Booth C12431 at the NAB show to find your digital video transport solution. For more information please visit www.stratosoptical.com/video or contact us at ConnectivityInfo@Emerson.com

Wireline, Wireless and Optical Connectivity Solutions.
Just another reason why Emerson Network Power is the global leader in enabling *Business-Critical Continuity™*.

Connectivity Solutions

EMERSON
Network Power

EMERSON. CONSIDER IT SOLVED.™

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AUTOMATION SYSTEM
Pro-Bel Morpheus ICE

Combines automation, master control, media playout and storage; can be scaled up simply by adding more of the compact 3RU modules as the operation expands; could even be used to add capability to larger automation systems.

631-549-5159; www.pro-bel.com
Booth: SU12710

TRANSCODING SOFTWARE
AmberFin iCR Version 4.5

Content mastering and transcoding software; now offers native support for Avid DNxHD and Final Cut Pro, offering instant interoperability with Avid and Apple editing systems; strengthens the link between content creation and distribution to expedite editing and versioning; extended MXF support of native Panasonic P2, Sony XDCAM and Avid Op Atom MXF further increases interoperability with a wide range of tapeless cameras, VTRs, editing and server systems.

866-939-3167; www.amberfin.com
Booth: SU4323

TRANSMISSION SYSTEM
OmniBus iTX On-Demand

Allows broadcasters to transmit conventional channels and save VOD-ready content from the same iTX workflow and hardware, without having to reingest or reformat material explicitly for VOD use; can be used to create everything from low-resolution files for Web download or mobile phones to HD MPEG-4 files with Dolby surround sound for broadband IPTV applications.

303-237-4868; www.omnibus.tv
Booth: SU5417

CONTROL PANELS
Videoframe LCD24PL/24PR

Machine control and router-master control panels feature 24 programmable LCD switches; the four menu buttons are located either to the left of the LCD switches (24PL) or to the right of the LCD switches (24PR); use Power over Ethernet technology, eliminating the need for an external power supply.

530-477-2000
www.videoframesystems.com
Booth: SU5422

NEWS PRODUCTION SYSTEM
vsn vsnnews

Allows text/video editing in the same application; covers all issues in a uniform environment, including rundown planning and creation, resource management, word processing, video feed recording, and archive storage, organization and cataloguing.

305-629-3201; www.vsn-tv.com

Booth: SU5425

TRANSFER AGENT
Florical AssetDispatcher

Option in S.M.A.R.T. Central; streamlines central ingest systems; uses spoke dub lists and programming settings to push commercial and program from a centralized ingest location to spoke sites after material has been approved; timing and metadata can be entered once and shared by all.

352-372-8326; www.florical.com

Booth: SU1802

Cameras, lenses, accessories

HDV CAMCORDER
Sony HVR-Z5U

Offers native 24P recording as well as tapeless recording capability through an optional CompactFlash adapter; uses three ClearVid 1/3in CMOS sensor chips, which are designed to provide high sensitivity, deep resolution, high-speed reading, low noise and a wider dynamic range; the CMOS sensors capture full HD 1920 x 1080 resolution, resulting in better picture quality when recorded onto miniDV tape in the HDV format (1440 pixels x 1080 lines).

201-930-7330

www.sony.com/professional

Booth: C11001

HDTV LENS
Canon HJ14ex4.3B

Wide-angle portable HDTV lens; combines an extended 14 times zoom range and 4.3mm wide angle while also improving on the optical performance of its predecessor; newly developed Digital Drive unit provides improved operability and ergonomic advances for user comfort and convenient control of lens functions.

800-321-4388

www.canonbroadcast.com

Booth: C4325

TAPELESS ENG SYSTEM
Ikegami GF series

Developed in cooperation with Toshiba; includes the GFCAM HDS-V10 tapeless camcorder, the GFSTATION GFS-V10 studio deck and the GFPAK high-capacity flash media to record more than two hours of HD video; features an open-codec HD/SD architecture, proxy video and metadata convenience.

201-368-9171; www.ikegami.com

Booth: C5108

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COLOR VIEWFINDER
Panasonic AJ-CVF100G

Designed for operation with the company's P2 VariCam series (AJ-HPX3700 and AJ-HPX2700), the AJ-HPX3000 and AJ-HPX2000 P2 HD camcorders, and the AJ-HDC27H VariCam and AJ-HDX900 DVCPRO HD camcorder; using a 1in diameter imager system, affords color accurate viewing, which minimizes the possibility of misdirected shots; delivers low maintenance costs and can accommodate larger cine-like lenses.

201-392-4127; www.panasonic.com/broadcast
Booth: C3712, C3327

HDTV STUDIO/FIELD PRODUCTION CAMERA
Hitachi Kokusai Electric SK-HD1000

Offered with hybrid fiber-optic cable or digital triax cable transmission; converts into a solid-state field recorder and wireless configuration; features two-piece body design, F10 sensitivity with 60dB signal-to-noise ratio, 14-bit analog-to-digital conversion and CCU outputs of 1080i, 720p or switchable between the two.

516-921-7200
www.hitachikokusai.us
Booth: C4310

HD CAMCORDER
Panasonic AG-HPX300

P2 HD camcorder with 10-bit, 4:2:2, individual frame recording and native 2.2-megapixel imagers; offers the flexibility of interchangeable lens but comes standard with a 17x HD Fujinon lens; incorporates advanced 1/3in 2.2-megapixel 3-MOS technology to acquire full native resolution HD images.

201-392-4127
www.panasonic.com/broadcast
Booth: C3712, C3327

PORTABLE FIELD/ CAMERA-TOP MONITOR
Marshall Electronics V-LCD70P-HDA

Features digital TFT-megapixel high-res LCD screen with 1.2 million pixels, four-pin XLR power jack and optical-grade polycarbonate screen protection; digitizes analog signals using 10-bit processing with 4X oversampling and adaptive five-line comb filter; available in 3G SDI and HDMI configurations.

310-333-0606; www.lcdracks.com
Booth: C8908

PROHD CAMCORDER
JVC GY-HM700

Shoulder-supported camcorder records directly to SDHC memory card in the QuickTime format for Final Cut Pro, and optionally to SxS media compatible with Sony's XDCAM EX format; includes several key technology innovations that result in improved resolution in the camera's CCD/optional block, lens and viewfinder.

973-317-5000; www.jvc.com/pro
Booth: C4315

Camera support, robotics, virtual sets, batteries

ELEVATOR PEDESTALS
Telemetrics EP-PT-S2 and EP-PT-S2-2

Remotely controlled, motorized telescoping tripods are designed to add pedestal height control to the Telemetrics Robotic Pan/Tilt product line; available in two versions: 1-stage (EP-PT-S2) and 2-stage (EP-PT-S2-2) for additional height.

201-848-9818; www.telemetricsinc.com
Booth: C9525

ROBOTIC STUDIO PEDESTAL
Shotoku Broadcast Systems TRP-100

Designed for all studio applications, including news, sports and current affairs; features 220lb payload and full manual override; supports advanced virtual studio tracking applications; allows full X, Y and height camera movement in conjunction with conventional pan and tilt motion.

310-782-8491; www.shotoku.tv
Booth: C8314

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CAMERA-MOUNTED FIBER-OPTIC TRANSCEIVER

Telecast Fiber Systems CopperHead INF

Designed for the Thomson Grass Valley Infinity camcorder; enables use of the Infinity as both a camcorder and an HD-SDI multicam production camera; fits between the Infinity and its battery, delivering bidirection HD-SDI, composite video, audio, intercom, genlock and camera control between the camera head and the remote base station over a single lightweight, battlefield-ready fiber-optic cable.

508-754-4858
www.telecast-fiber.com
Booth: SU8517

ROBOTIC AND MANUAL PEDESTAL

Vinten Radamec Fusion FP188

Recognizes new, compact L-shaped floor targets that offer more precise reference positioning across a wider range of floor finishes; features smoother on-shot transition sequencing and collision avoidance protection; 187lb (85kg) payload supports an expanded camera/prompter package, including the talent-facing vanity monitor often attached to the head during HD production.

845-268-0100; www.vinten.com
Booth: C6029

CGs, prompters, captioning

GRAPHIC GENERATION AND OVERLAY

Compix Media Channel Brander

Designed for channel branding, dedicated logo insertion, EAS message generation and automated template-based sports-score generation; accepts static graphic/logo import of TGA, BMP, JPEG, GIF, PNG, and TIF files, automatically converting images to and from different video resolutions as needed; uses Compix Media's GenCG software; offers 4000 True Type fonts and 300,000 premium quality images.

800-589-2555
www.compixmedia.com
Booth: SL5105, SL4805

PROMPTER MONITORS

Autoscript LEDTFT-Plus monitors

High brightness LED flat screens for all Autoscript prompter systems; include 8-, 12-, 15-, and 17in versions, all of which will feature an illuminated control panel for easy visibility in dark studio conditions; feature improved operational performance, environmentally friendly construction, and a two-year warranty.

203-338 8356; www.autoscript.tv

Booth: C6026

Consulting services, technical engineering

ENGINEERING SERVICES AND DESIGN

TV Magic

Offers complete design, renovation and build-out of facilities, including television stations, post-production studios, houses of worship, city council chambers, college and university A/V rooms, and production studios; follows a rigorous five-phase system, which is a complete, extensive process consisting of initial design, system drawings, and line-item equipment lists that follow on to system installation, proof of performance, and end-user system training.

858-650-3155; www.tvmagic.tv

Booth: SU4723

LIGHTING DESIGN

FX Group Lighting Optimization Program

Provides consultation, design and installation in a station's studio by a professional lighting designer; lighting solutions specifically for HD broadcasting; consultations with talent to optimize lighting for skin tones and hair colors; and return maintenance visits on a regular basis.

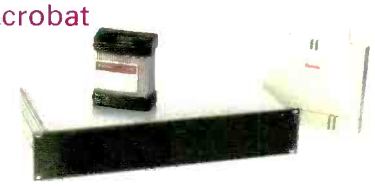
407-573-0499; www.fxgroup.tv

Booth: R300

Intercom, IFB products

DIGITAL WIRELESS INTERCOM

Riedel Acrobat



License-free, full-duplex, wireless communications intercom; allows the operation of an unlimited number of wireless beltpacks; features both partyline and point-to-point communications, digital audio quality and no interference with radio microphones or in-ear monitoring.

914-819-0495; www.riedel.net

Booth: C7637

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INTERCOM SYSTEM
Clear-Com Concert 2.0

Connects to the Eclipse matrix system via the IVC-32 high-density card, establishing a single communication environment for traditional and IP intercom users; customizable user interface is now available in a soft panel that emulates a traditional intercom station, offering functionalities such as push-to-talk, monitor and latch-to-talk keys for communication with other Concert users, as well as connection to predefined conferences.

510-337-6600; www.clearcom.com

Booth: C6521

Lighting equipment

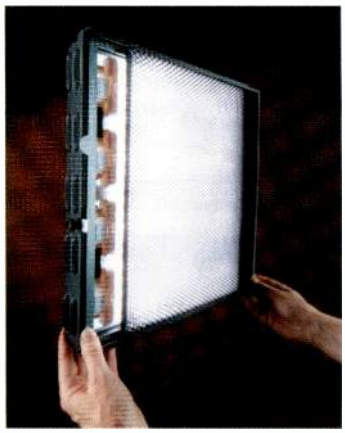
FLUORESCENT LUMINAIRE
Videssence Power Key

Adjusts from the back of the fixture, allowing users to leave on the zone screen; a slide of a lever at the back of the fixture adjusts each lamp cell; available as a one-, two- or four-lamp fixture.

626-579-0943; www.videssence.tv

Booth: C8428

LIGHTING SYSTEM
Kino Flo BarFly 400



Uses True Match 55W QFL daylight and tungsten lamps; draws 4A of power on 120VAC; features four-lamp remote fixture and removable center mount; mounts to stand; includes 90-degree honeycomb louver, gel frame and built-in harness; runs up to 75ft from ballast.

818-767-6528; www.kinoflo.com

Booth: C8242

Media storage, archive systems, asset management

HD PRODUCTION CLIENT
Thomson Grass Valley
K2 Summit

Supports SD/HD live event news production and live-to-tape/disk applications; supports four bidirectional channels of DVCPRO HD, DVCPRO 50 and DVCPRO 25; features responsive performance, a small form factor, instant playback of recorded material and built-in transition effects that only take one playback channel.

530-478-3000
www.thomsongrassvalley.com
Booth: SL106

SHARED STORAGE
SmallTree GraniteSTOR abcSAN

iSCSI-based shared storage solution designed for audio/video and graphic artists to manage shared and direct attached storage solutions; provides robust (greater than 600MB/s), consistent performance over Ethernet networks, while offering optimal cost-efficiency; features an intuitive GUI with single pane class management for users who wish to manage RAID sets, volumes, targets and shares from one screen.

866-782-4622; www.small-tree.com
Booth: SL10210

SD/HD/2K VIDEO CARD
Blackmagic Design
DeckLink HD Extreme

Features SDI, HDMI and analog component, NTSC, PAL and S-Video capture and playback, combined with dual-link 3Gb/s SDI technology and hardware downconversion; SDI, HDMI and analog video capture and playback, combined with both balanced analog and AES/EBU digital audio, lets users connect to all decks, cameras and monitors; instantly switches between SD and HD video.

408-954-0500
www.blackmagic-design.com
Booth: SL10820

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MEDIA SERVER SYSTEM
Omneon Spectrum
Enables broadcasters to migrate from analog to digital, tape to disk, SD to HD and from single- to multichannel operations; incorporates open, advanced architecture; includes MediaController, MediaDirector, MediaPort I/O modules, MediaStore storage arrays and SystemManager.

408-585-5000; www.omneon.com

Booth: SU7217

SERVER
360 Systems MAXX-2400 HD
Plays up to four HD video streams at once, or can record two streams, while playing two others; also can be used as a graphics store, with linked key-and-fill capability; standard features include HD-SDI video I/O with frame synchronization for recording wild sources like tape and satellite feeds; audio formats include embedded audio, and your choice of AES/EBU digital or balanced plus four analog.

818-991-0360; www.360systems.com

Booth: N4120

PRODUCTION SERVER
EVS XS Studio

A four-channel video production server specifically designed for studio applications; part of the new Silverline brand; optimized for the recording of multiple audio and video feeds, as well as instant control and multichannel playback operations; offers multiple SD and HD codec configurations with native support, such as IMX, Avid DNxHD and Apple ProRes 422 for faster and easier media exchange with post production.

973-575-7811; www.evs.tv

Booth: C9508

STORAGE
Bycast StorageGRID 8
Virtualizes information retention and access over a range of storage devices from high-performance disk to archival media, distributed over multiple sites; features the new Distributed File System Gateway (DFSG), a high-performance clustered file system front-end; provides a unified solution to manage the storage of digital data and images from primary storage to deep archive.

866-217-6813; www.bycast.com

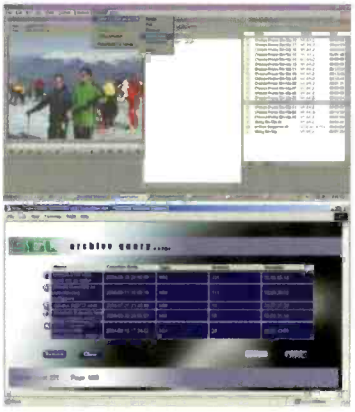
Booth: SU6925

HD/SD-SWITCHABLE GRAPHICS SERVER
Chyron MicroClyps
Provides instantaneous clip recall and playout; can be configured as either HD or SD with synchronized audio, video and key outputs as well as a built-in keyer for compositing clips on program video; features local and remote browse, media management and playback control.

631-845-2000; www.chyron.com

Booth: SL1420

ARCHIVE SYSTEM
SGL FlashBox



Based on SGL's FlashNet content archive and storage management software and hardware; provides scalable disk and tape storage, whilst providing from 1000 to 5250 hours of DV25 storage in a single appliance; when combined with Flash-Browse II, can serve as entry-level storage and content management.

+44 1489 88 99 30; www.sgluk.com
Booth: SU8508

HD WORKFLOW
Avid HD News

An end-to-end HD News system that enables broadcasters to cost-effectively produce HD programming; broadcasters can easily acquire, edit, network, manage assets, playback and control functionality of XDCAM HD (long GOP HD MPEG-2) content with a workflow designed to deliver significant time, storage and bandwidth savings; consists of the new AirSpeed Multi Stream production server version 1.0, NewsCutter software version 7.5, as well as the Interplay Production Asset Management and Unity shared storage systems.

978-640-6789; www.avid.com
Booth: SU902

TRANSMISSION SERVER
SeaChange BMLxt

Adds features and performance capabilities to Broadcast MediaLibrary system; features SAS drive-based design that improves reliability; scales from a single 3.6TB node to a nine-node cluster providing almost 100TB, which can be combined with MediaClient software codecs for broadcast-quality HD and SD channels.

978-897-0100; www.schange.com
Booth: SU12009

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RESOURCE MANAGEMENT APPLIANCE
ScheduALL Enterprise Resource Management

Delivers resource sharing across facilities; enables resources to be shared on a one-to-one basis with dedicated business units or made available to the entire corporate network; consolidates financials, resource planning and reporting across the enterprise.

954-334-5406; www.scheduall.com

Booth: SL1606

Microphones, accessories

ENG RECEIVER
Lectrosonics Digital Hybrid Wireless

Features two independent channels that can feed separate inputs or can be mixed internally to feed a single input; offers two diversity modes — SmartDiversity reception is employed by independently combining antenna phase for each receiver channel, while the two channels can be used together in True Diversity Ratio mode as a single receiver.

505-892-4501
www.lectrosonics.com

Booth: N5223

WIRELESS MICROPHONE SYSTEM
Azden 325ULT series

Dual-channel UHF camera-mount wireless systems; feature 188 user-selectable frequencies displayed on an LCD screen so users can always find a free channel; consists of the 325UPR dual-channel on-camera receiver, the 35BT beltpack transmitter, the 35HT handheld microphone/transmitter and the 35XT plug-in transmitter; the 325ULT comes with 2 35BT/EX-503L body-pack mics along with the 325UPR receiver, packed in a carry case.

516-328-7500; www.azdencorp.com

Booth: N2614

New media, streaming products, multimedia/Internet

MULTISCREEN TRANSCODER
Harmonic ProStream 4000

Offers real-time transcoding of MPEG-2 and MPEG-4 AVC content for Internet, 3G/4G mobile and broadcast mobile TV services; can transcode up to 16 channels simultaneously; features an all-IP infrastructure and flexible software.

408-542-2500
www.harmonicinc.com

Booth: SU7209

VIDEO OVER IP ENCODER/DECODER
Electrosonic ES7100

Enables 3G-SDI, HD-SDI and SDI video transmission over IP networks at bit rates of 10Mb/s to 150Mb/s; features PURE3 codec designed specifically for network transmission; provides resilience to network errors with real-time error concealment and constant latency of 70ms; can encode or decode.

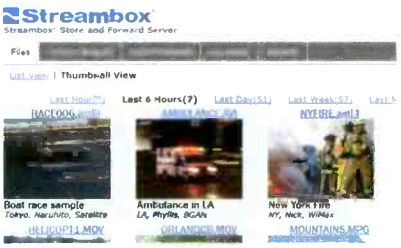
818-333-3602
www.electrosonic.com
Booth: SL9720

AVC SD/HD ENCODER
Fujitsu IP-9500

Supports HD satellite newsgathering applications that require high picture quality at SD bit rates with low delay; features advanced H.264 compression technology; produces high-quality bit rates of 4Mb/s to 27Mb/s; other features include 300ms low latency, low bit rates, DVB-ASI or IP transports for network flexibility, and full compatibility with industry-standard decoders.

800-626-4686; http://us.fujitsu.com
Booth: SU10921

IP-BASED VIDEO SERVER
Streambox Store and Forward Server



Supports hundreds of simultaneous video file uploads from field crews, stringers and citizen reporters; provides searchable metadata via a Web-based interface; can be customized to facilitate rule-based transcoding to and from a variety of file formats.

206-956-0570; www.streambox.com
Booth: SU14413

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ONLINE COMMUNITY PLATFORM
Cisco Eos

A hosted software platform that enables media and entertainment companies to deliver community-driven Web sites, creating more personalized experiences around their content and brands while increasing overall end-user engagement and retention; unlocks unrealized value in media company Web sites by integrating social networking, content targeting, asset management, and site administration features into a robust backend system.

800-553-6387; www.cisco.com

Booth: S214LMR, S213LMR

ENCODER
ATEME Kyrion 2101

An HD MPEG-4/AVC encoder targeting a broad range of DTV applications; features a large operating scale, from 0.5Mb/s to 25Mb/s, with advanced Main and High Profile encoding, allowing bouquet aggregators, broadcasters and IPTV service operators to reach their audience with a high picture quality; offers a complete set of MPEG-4/AVC tools including full support of interlaced video (MBAFF).

+33 1 69 35 89 89; www.ateme.com

Booth: SU6326

DTV IFB RECEIVER
Nucomm ProQ

An IFB solution for ENG users during DTV transmission, monitoring of DTV signals through a DVB-ASI output, and streaming video over an IP connection to a laptop or other IP-enabled device; measures 5in x 1.75in x 8.5in; features dual UHF/VHF antennas, two advanced silicon tuners and sixth-generation VSB demodulators; contains an MPEG Layer 1/Layer 2 audio decoder that is capable of decoding two independent sound programs, providing up to four audio channels and using bit rates as low as 32kb/s for each.

908-852-3700; www.nucomm.com

Booth: C3707

HDTV ENCODER
NTT Electronics

Encodes 4:2:2 chroma AVC/H.264 HDTV/SDTV real-time, ultra-high quality video; supports MPEG-2 format to enable smooth migration from current MPEG-2 technology to future AVC/H2.64,

+81 42 796 2496; www.nel-world.com

Booth: SU11617, SU11723

STREAMING SOLUTION
Bitcentral AirNow!

Streams a live shot from the field without a laptop, software or special training; connects to a camera and streams content directly in real time; uses EvDO to deliver broadcast-quality video; provides a portable wireless hotspot that converts the broadband cellular network to standard WiFi.

949-253-9000; www.bitcentral.com

Booth: SU913

Production switchers, video effects, keyers

ENCODER
ViewCast Niagara 2100

Media appliance allows even nontechnical personnel to stream high-quality live video; built-in Web interface simplifies system set-up and operation, allowing complete system control from anywhere on the network; users can simply set streaming parameters from the intuitive interface and then begin streaming in multiple resolutions and bit rates with a single push of the front panel stream button.

800-540-4119; www.viewcast.com
Booth: SL12415

HD TIME CODE READER/ GENERATOR/INSERTER
ESE HD-488

Accepts multiple HD formats; generates/inserts time code; features dual LTC output, USB setup interface, time zone offset, LCD setup/status display and a universal power supply; enables as many as 30 characters to text to be superimposed onto the video.

310-322-2136; www.ese-web.com
Booth: N3124

DIGITAL PRODUCTION SWITCHERS
Ross Video CrossOver series

Designed for small studios, small mobile trucks, flight packs and linear editing; comes in both multidefinition and SD versions and with either six or 12 inputs; available in four configurations; features include a patented UltraChrome chroma keyer, dual animation stores, two channels of 2-D DVE and four up/downconverters.

613-652-4886; www.rossvideo.com
Booth: SU1807

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MD SWITCHER
Echolab Overture1, Overture2

Available with 1 or 2 M/Es; now features 3Gb/s (1080p60) format support to its existing range of SD, 720p, and 1080i over a single SDI or HDMI input; offers internal conversion and synchronization with powerful key layering and special effects to put creative control at the user's fingertips; uses internal frame synchronization to help ensure the quality of effects.

978-715-1020; www.echolab.com
Booth: SU2302

SD/HD PRODUCTION SWITCHER
Snell & Wilcox Kahuna

New features include the K-Watch software application, which allows file content and graphics to be converted and uploaded to one or multiple networked Kahuna systems, and the K-Mirror software application, which facilitates the rapid backup and sharing of Kahuna projects; also features 3-D stereoscopic functionality.

212-481-2416; www.snellwilcox.com
Booth: SU1917, SU1717

SD/HD PRODUCTION SWITCHERS
Ross Video Vision QMD/X v9.0

Enhancements include up to eight channels of DVE in a single MLE, WhiteFlash transition type, expanded still-store functionality with thumbnails, animation trimming, new warps, MLE auto follow and memory attributes; also offers an expanded complement of device controls, including serial or Ethernet control of VTRs, video services, audio servers and audio mixers.

613-652-4886; www.rossvideo.com
Booth: SU1807

SWITCHER
Analog Way Di-VentiX LE

A multilayer mixer, scaler and seamless switcher with universal analog and digital input/output and full high-resolution digital processing; offers numerous live effects including picture in picture, downstream keying and chroma key as well as a multilayer mixer operation mode; can display up to four layers: two live sources, one frame and one logo.

212-269-1902; www.analogway.com
Booth: SL7423

Recording media

FIELD RECORDER
Sony PDW-HR1

Part of the XDCAM HD422 Professional Disc system; the HD mobile unit is designed as an ENG/EFP complement for XDCAM HD422 optical camcorders, while also supporting legacy formats including MPEG IMX, DVCAM and 4:2:0 HD 24P content; features a built-in up/downconverter; provides multiformat (1080i/720P) recording flexibility, as well as HD/SD conversion and crossconversion during playback between 1080i and 720P.

201-930-7330
www.sony.com/professional
Booth: C11001

HD RECORDER AND CAMERA HEAD
Panasonic
AG-HMR10/AG-HCK10

Recorder is equipped with an HD-SDI input and output; provides the flexibility of low-cost, SD memory card-based recording and full 1080 and 720 resolution capture in a small, portable unit; utilizing AVCHD, an MPEG-4 /AVC Hi Profile-based format, provides a near doubling of bandwidth efficiency with improved video performance over the older MPEG-2 compression used in HDV formats; camera head features three 1/4in native HD resolution MOS imagers; iris, focus, zoom control and power are supplied from the HMR10 recorder; cables connecting the camera to recorder available in lengths up to 10m.

201-392-4127
www.panasonic.com/broadcast
Booth: C3712, C3327

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Satellite equipment, services

TRANSCODER
TANDBERG Television RX8250

Part of an end-to-end cable HD distribution system that allows content providers to carry six to eight MPEG-4 AVC HDTV channels on a satellite transponder; helps operators with networks that have a large installed base of MPEG-2 HDTV set-top boxes by enabling efficient transcoding of MPEG-4 AVC/DVB-S2 distributed content into high-quality MPEG-2 HD.

678-812-6300; www.tandbergtv.com

Booth: SU5108

SATELLITE NEWSGATHERING
Stratos BGAN

Provides an SNG solution in a small, portable satellite terminal; offers broadcast-quality IP streaming and store-and-forward capabilities; simultaneous voice and data lines allow field reporters to maintain voice contact with the studio for cueing without compromising data.

709-748-4226
www.stratosglobal.com

Booth: OE411

Studio and support products, multi-image displays

IMAGE PROCESSING SOLUTIONS
Algolith Algogear

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www.panasonic.com/broadcast

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A state of mind: winning or losing

The plan was to be all digital by now. Unfortunately, politics being what it is, many broadcasters are being forced to endure another four months of unplanned transmitter power bills. What does this mean to general managers and engineers? It means even greater economic pressure to reduce OPEX and find new ways to create capital.

Fortunately, there are ways to reduce costs and make more money. Modern technology enables a wide variety of operational efficiencies, many never before possible. Automated workflows, integrated production systems and the feasibility of creating new delivery channels are all readily available. The decision for a progressive manager then becomes which to implement and when.

Perhaps a predictor of a winning philosophy might be seen in the stations that planned and then executed the switch to all digital back on Feb. 17. These broadcasters now are enjoying the freedom of supporting only one OTA format, using one less transmitter and benefiting from a greatly reduced power bill. These stations took a leap of faith that digital OTA was the future and said, "Let's get on with it."

The same winning attitude holds true when implementing other new technologies. Whether it's adding studio automation, file-based workflows or digital archival systems, launching multichannel DTV and soon, or delivering content directly to personal handsets, the winners are typically the first willing to try new things.

Certainly these are trying times, but let's add a historical fact: New businesses and services launched during lousy economic times have a 20 percent greater chance of being successful than if those same companies and products were started during good times. Those companies and leaders that take risks in tough times are more likely to succeed than those who keep waiting for a better day.

Which are you?

Wayne Madden
Group Publisher,
Broadcast Engineering and *Radio* Magazine

Larry Dunn
Publisher,
Broadcasting & Cable and *Multichannel News*

Contents

Maximizing 'three screen' revenue

BY PHIL KURZ

Local broadcasters have a tremendous opportunity to extend their presence and generate revenue from mobile TV and the Internet, but doing so will require some changes.

Matt Dumont, Ignite director at WFTV/WRDQ in Orlando, FL, can control content for air and distribution online via Thomson Grass Valley's MediaFUSE.

How important are alternative distribution platforms, often called the three screens, to maximizing revenue in today's television business? If being where the eyeballs gaze is necessary, the latest figures from Nielsen suggest they are quite important.

The figures released in late February reveal that viewing of video on television, Internet and mobile devices continues to grow in popularity among viewers. In the fourth quarter of 2008, the average American watched more than 151 hours of television per month — an all-time high, according to Nielsen. Viewing was strong on mobile devices and the Internet as well. Among Internet video viewers, the average was three hours per month, and mobile video viewers reported watching almost four hours per month on their cell phones and other mobile devices.

"The American fascination with television and other video content is not easing up, as consumers keep turning to TV, Internet and mobile at record levels," says Susan Whiting, Nielsen's vice chair.

It's one thing to identify where the viewers are; it's another entirely to cash in. While the Web and mobile devices aren't new, most local broadcasters are still in the early stages of determining what works and what doesn't. Until those kinks are worked out, maximizing revenue will remain a worthy, yet unattained goal.

According to Pete Conti, senior VP of Borrell Associates, a research and consulting company in Williamsburg, VA, the first step for local broadcasters is to recognize that video advertising will experience dramatic growth on the

Momentum builds for ATSC Mobile DTV

All eyes in the broadcast industry later this year will likely be trained on 69 full-power TV stations that will launch a trial mobile TV service using the Open Mobile Video Coalition-backed ATSC Mobile DTV standard.

Up from the 63 stations announced in January at the 2009 International CES, these stations not only represent a vanguard in the competition to claim a stake for broadcasters in mobile TV, but also a conspicuous bellwether that CE manufacturers can point to for reassurance as they evaluate whether or not to build receivers. Early this summer, two broadcasters also will begin running model ATSC Mobile DTV stations where device manufacturers can test their receivers, OMVC says. Launching ATSC Mobile DTV service is attractive to many broadcasters because of the potential for new revenue as well as ease of setup and relatively minimal financial commitment — about $100,000 to add a single non-redundant simulcast channel.

Modifications to existing DTV transmission infrastructure require the addition of a mobile TV MPEG-4 H.264 encoder, a special multiplexer that integrates the mobile encoded stream into the main 19.4Mb/s DTV stream and a mobile TV exciter, says Brett Jenkins, director of technology, strategy and development at ION Media, which has taken a leadership role in the OMVC. According to Jenkins, who has been involved in the setup for several trials to date, making the modifications will take a broadcast engineer about a half day.

The Open Mobile Video Coalition relies on specially equipped test vehicles to evaluate the performance of ATSC Mobile DTV transmissions during the trials conducted to date.

While there's been a good deal of discussion in some engineering circles about the need to modify DTV antenna polarization for ATSC Mobile DTV, no such changes have been required for successful transmission and reception in any of the tests so far, Jenkins says. An OMVC subgroup is analyzing whether or not to recommend circular or elliptical polarization, but nothing conclusive has come out of the group's work so far, he adds.

Internet.

"Video is huge for broadcasters," he says. "We predict that in the next five years, of all the ad categories we track in online advertising, video will grow to be the largest."

However, cashing in on the increasing importance of online video as an ad medium won't come from cannibalizing the existing TV market. Rather, given the much lower costs associated with the Web, stations seeking to exploit online video advertising as an important source of revenue will develop new categories of advertisers, who couldn't afford air time.

"Here is the opportunity," Conti says. "Build out video directories and leverage them."

Conti advises broadcasters to leverage their knowledge of video and the tools they have to build business directories and help wanted ads using video rather than text.

"Leverage your local television strength and go out and do one- or two-minute videos for the different businesses," he says. "Build out a video directory and promote it on TV with a 15- or 30-minute show on Sunday to drive demand."

Doing so will help stations develop what he terms "spiral marketing." Once the site is promoted on-air, give visitors an incentive to submit their e-mail address and build a database that can be used to send out targeted e-mails that drive visitors back to the site.

"The only way you can get that started is by using traditional media to drive traffic to your site," Conti says.

Video-centric, hyperlocal

News12, seven regional news channels covering different New York metro areas on Cablevision, recently has completed a major overhaul of its Web site to — among other things — take advantage of the revenue-generating potential of online video presents.

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add new revenue opportunities to more of what consumers are doing on the Web," says David Kirschner, News12 general manager.

According to Kirschner, those opportunities include looking at video pre-roll, adding classified advertising and opening up additional sponsorship areas for business and entertainment.

"We also are giving people the opportunity to go hyperlocal on their ad buys," he says. "If someone wants to buy a certain section of Long Island, instead of running a banner across all of Long Island, they can segment the audience and buy what they need to reach their specific audience."

The new site, which Kirschner describes as "thematically different" from News12's original site, is one component of a larger effort at News12 to make it easier for consumers to do transactions. Another critical component is Channel 612 iO, an interactive channel that gives viewers a Web-like experience on their TVs. Viewers can browse to a section called iO Extra, where they can use their remote control to access video material that normally does not make it to News12's linear broadcast, such as extended press conferences, and weather and traffic coverage. Recently, News12 has added a new revenue component to Channel 612 iO, which lets viewers request more information about what they are watching.

"A consumer watching a video about Disney on Channel 612 wanting more information about a tour package can just press a button on the remote control, and the control knows who they are and what their street address is," Kirschner says. "That's sent directly to Disney as a qualified lead."

Brand strength

Achieving financial success with new distribution platforms, however, is not a certainty, says Elliott Wise, corporate VP, news and local programming, Bright House Networks.

"The key to success, whether it's Web or mobile, is do you have a strong enough brand to extend over multiple platforms," Wise says. "What I am seeing are stations that have a weak local brand looking at the Web and mobile and digital multichannels as panaceas, and they are not. They're going to be a brain and cash drain."

David Kirschner, general manager of News12 (left), Aleksandr Kagan, systems developer (seated) and Carl Corry, executive producer, discuss news content at the News12 Interactive ingest room in Woodbury, NY.

Since 1999, Bright House Networks has done weather on a digital subchannel and soon after began offering Spanish-language programming on another. From that experience, Wise has a bit of advice: Don't expect to make a lot of money.

"The returns are going to be very small," he says, "not only because of the current sales environment, but also because it takes years to ramp up sales."

Success with any of these platforms demands controlling costs, reining in expectations, realizing that the revenue from these alternate platforms won't approach that from the core linear channel and having a strong core brand, Wise says.

"A lot of people say, 'I can't make any money in Web,'" Wise says. "Well you can't make any money in Web because your original brand isn't strong enough. If you think you have competition on linear, look at the competition you have on the Web."

However, in the view of Sam Matheny, general manager of News Over Wireless, news delivered to one alternate platform, mobile devices, can help to build the core brand of TV stations largely because cell phones are becoming the first touch point viewers have with a station when news breaks.

"If TV stations want to remain the No. 1 option and they want to remain at the front end of the chain, the mobile phone is the key," he says.

Owned by Capitol Broadcasting — the same company that owns WRAL-TV in Raleigh-Durham, NC — News Over Wireless has grown since December 2004 from offering one station on one wireless carrier to 111 stations and three non-TV content companies on AT&T, Sprint and Verizon.

News Over Wireless offers stations a simple business proposition. Stations that sign up with the company can sell as much of their ad inventory on mobile as possible. The rest is aggregated with the mobile avails of other clients and sold via four different national mobile ad networks. A News Over Wireless ad router automatically sends

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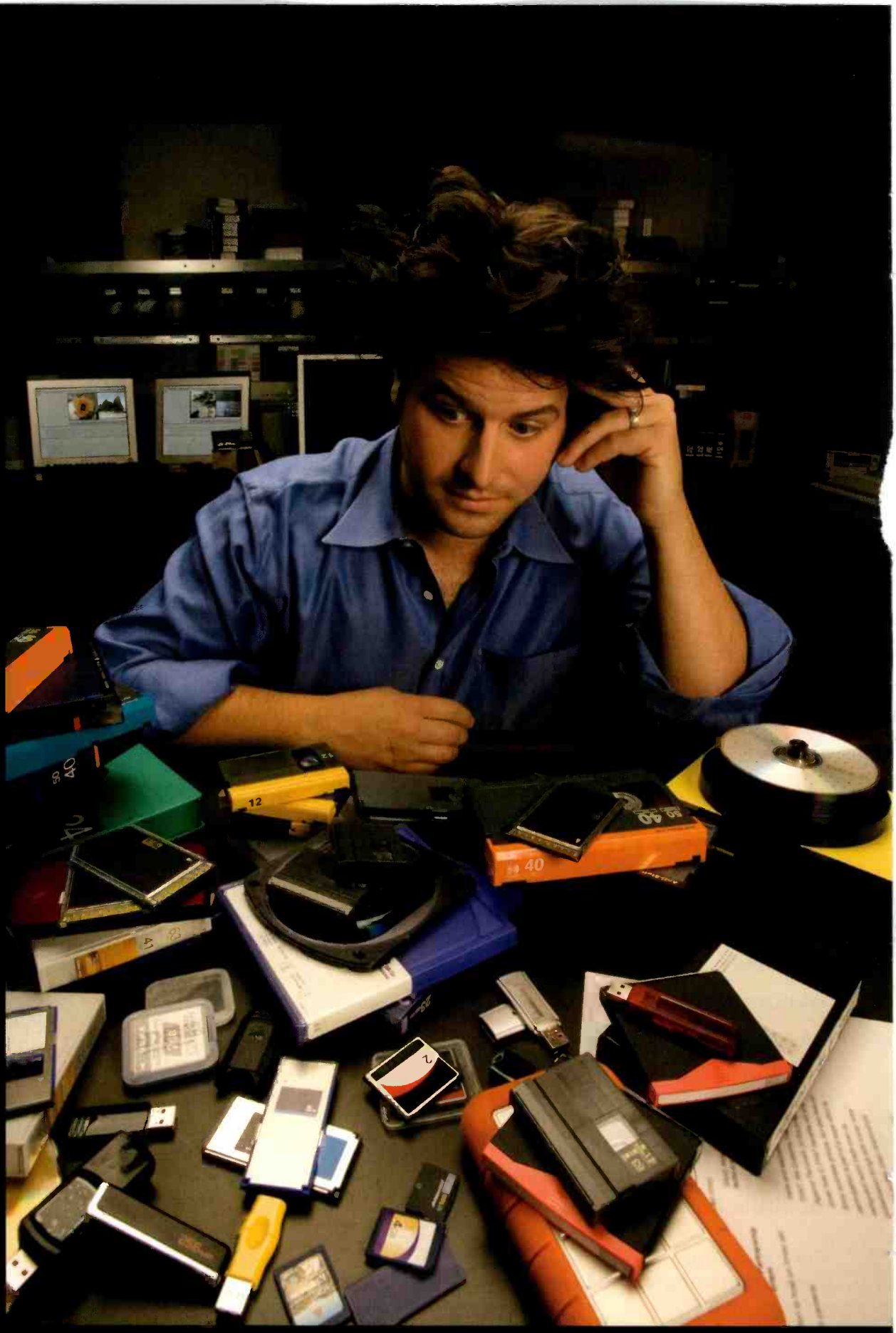

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the advertisements to the mobile devices without any further involvement needed from the station. Stations share ad and mobile video channel subscription revenue with News Over Wireless.

Workflow

From a workflow perspective, News Over Wireless has taken steps to be as unobtrusive in the editorial process as possible.

"We designed our system as a broadcaster," Matheny explains. "We did it so none of our stations have to add head count or additional hardware."

The News Over Wireless content management system automatically accepts a wide variety of feeds, including text, Doppler radar images and traffic camera video. Editorial involvement is required up front to identify what is published. After that, the system is "plug-and-play to work with a station's natural workflow," Matheny says.

For stations in the process of designing and upgrading their facilities to accommodate mobile and Web content creation and distribution, workflow and involving new media producers in workflow design are paramount, says John Demshock, director of engineering for WFTV/WRDQ, which serves Orlando, FL, and central Florida.

According to Demshock, using watch folders to collect multiple edited stories on the same topic is becoming popular. One story placed into the folder may be destined for air, requiring it to be transferred to playout server, but another will only be available on the Web.

"That watch folder ingests and transcodes the second story and does whatever it needs to do to make it ready for the Web," Demshock says.

News12 recently launched a new Web design with a greater use of video as part of a larger effort to monetize its Internet presence.

Stations need to ensure that content in the folder can get through their switched system as well as meets the needs of the Web.

"During design, you have to make sure the IP process is involved to ensure connectivity on the IP goes to the switched system properly," Demshock says.

He likened the process to the traditional way a video router is laid out to ensure it connects all sources and destinations.

"You have to make sure everything flows through there," Demshock says, "and the IT person has to get involved in the plant design."

Demshock cautions, however, that sometimes traditional broadcasters and their new media coworkers speak a different language, which can lead to confusion on the part of both.

"When dealing with new media people, such as those in the Web area, remember they may not understand what a television video router is, or they may not understand what unity gain means," he says. "There are also a lot of terms when talking with people who are Web-centric that mean something different in the Web world compared to the TV world. You almost need a little glossary of terms for things like headers, storylines, bylines and packages."

Fade to black

As the time spent watching video on cell phones and computer screens increases, broadcasters must grapple with how to maximize their revenue potential from these emerging platforms. Doing so demands new ways of thinking about far more than technology and content.

To truly tap the potential, local broadcasters will have to rethink their sales apparatus, too. In the view of Conti, existing station sales personnel may be so locked into their sales groove and so fearful of cannibalizing their existing market to sell Web or mobile that they may not be equipped to get the job done.

"In the early '50s, most newspapers owned TV stations," Conti says. "They sent out TV salespeople from the newspaper. What did they sell? A poster of a car lot with a camera trained on it. That's not television. Sometimes it's better to take the whole thing, put it in a different building, give it its own name and let it go so it can build itself up. What it needs is a lot of marketing, promotion and money for technology."

Regardless of the specifics of how stations organize their Web and mobile sales efforts, what's needed is an entrepreneurial spirit to lead the effort. And when it comes to sales, look for someone who understands promotions, coupons, samples and contests because that's where a lot of the spend will be.

"Hire a radio person because they are quicker to react and better with promotions," said Conti. "They understand the mix of media a little better, and we find there is a high success rate with radio salespeople selling online."

Changing models

Raycom Media president and CEO Paul McTear says a new approach is necessary if it is to remake itself into a true 24-hour-a-day local news business serving three screens.

In the 34 years Raycom Media president and CEO Paul McTear has been in the business, the fundamental broadcast model hasn't changed all that much, he says. Signals come in, and they get passed around the station. Production is essentially handled the same way as is master control.

However, that model must change if Raycom is to get where McTear wants it to go: a true 24-hour-a-day local news business serving television, Web and mobile TV audiences. For McTear, a keynoter at the Competitive Television Summit co-produced by *Broadcast Engineering* and *Broadcasting & Cable* magazines in Orlando, FL, March 4-5, arriving at that destination is requiring a rethink of just about everything.

"Almost every aspect of the local broadcast business model, the way that we have conducted business over the last decade, we are in the process of dismantling, examining and putting back together again," McTear says.

The reassembled pieces will be leaner, more efficient and able to draw on the resources of other broadcasters — both within and outside of Raycom — to produce a compelling product for the three screens, he says.

"As we got ready for the 2009 budgeting process, we examined the organization chart and the workflow of how our television stations were put together and actually collapsed certain departments and consolidated them in most of our markets," McTear explains.

Raycom Media president and CEO Paul McTear says Raycom Media is putting nearly every aspect of the broadcast business model under the microscope in an effort to reshape its business.

For instance, the production department has been melded with the news department — an important element in positioning personnel resources to meet the demands of a 24-hour-a-day news cycle.

Closely related to this reorganization is revamping job titles and descriptions.

McTear says this is a cultural change. The days of having dedicated studio camera operators, floor directors and audio operators are gone.

"We don't have those jobs anymore," he says. "We have people who do that as part of their jobs."

Of course, equipping station personnel with the skills to be proficient at a wider variety of tasks requires training.

"We are examining all of those challenges of how we can cross-train and get the human element to be able to work in multiple ways throughout their shift," he says.

Another important component, leveraging news resources, will take two forms, one from within and the other from without.

"We are working to aggregate all of our newsrooms and all of our news producers into one seamless system so that the smallest of our television stations — maybe in Lake Charles, LA, or Jonesboro, AK — has the ability to look at the work product of some 30 news stations across the group and be able to click, drag and drop a story into their "unlist," McTear says. "They can rebrand it, recut it and put their own logo face on it. They have the opportunity to draw from a greater pool of content than they otherwise would simply being the news provider in Lake Charles or Jonesboro."

To squeeze even more productivity out of individual newsrooms, Raycom has also begun discussing pooling newsgathering resources with competitors to cover stories such as the obligatory press conference.

"Instead of sending four news crews to cover a particular event, if it is just a routine news event, one station could do it and share it on a pool basis," McTear says. "The same thing is true with helicopters and possibly news vans and other things in the future." ■

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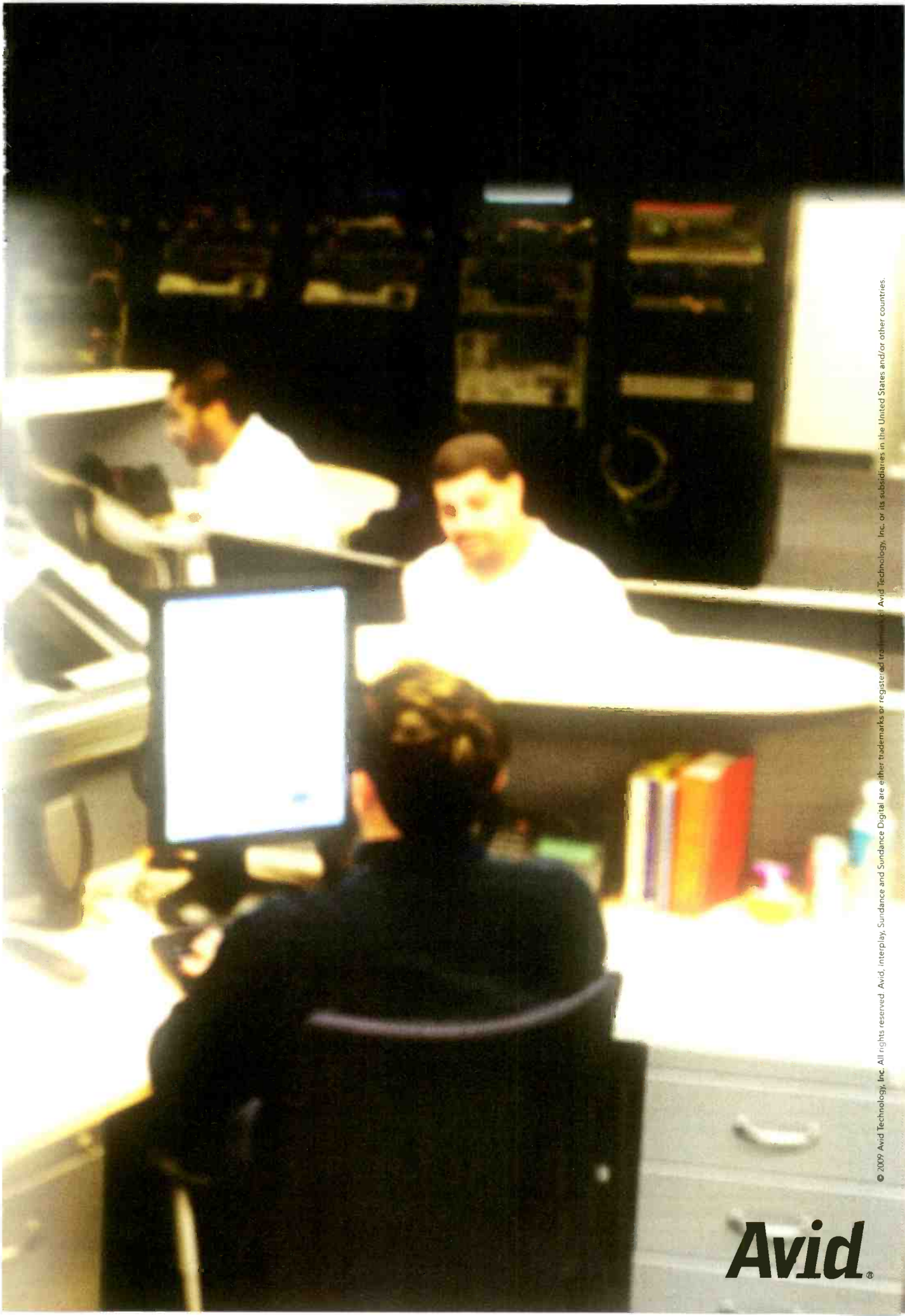
Open Archive Solutions = Protecting Your Content

Media assets probably represent the single biggest investment of enterprises involved with content creation. And users of these assets will almost certainly want to preserve them in as secure an environment as possible. Avid offers a number of archiving solutions, including support for third party archive management and robotic library systems.

Open Automation = Innovative Solutions

Avid also provides solutions for Transmission automation through its Sundance Digital range of products. By their very nature, automation systems must interface with a wide range of third party systems and applications. Sundance engineers are actively participating in the SMPTE committee that has developed a format for the exchange of – particularly traffic related – broadcast data. Once adopted by traffic and automation vendors, it promises to deliver very close integration between delivery systems, scheduling departments and automation control.



Let's get competitive

Maribeth Papuga, senior VP, director local broadcast, at StarCom/MediaVest Advertising, offers concrete ways local stations can tap into new ad dollars and get more competitive.

While many local TV broadcasters face significant economic challenges, opportunities exist to become far more competitive and successful, says Maribeth Papuga, senior VP, director local broadcast, at StarCom/MediaVest Advertising.

Papuga, a keynote speaker at the Competitive Television Summit, co-produced by *Broadcast Engineering* and *Broadcasting & Cable* magazines March 4-5 in Orlando, FL, says there are steps local broadcasters can take to attract more advertising revenue.

At the top of her list is taking steps to compete for national advertising dollars. The key here is re-examining how certain dayparts are sold. If stations in a broadcast group or across multiple groups could partner on this effort, they could be competitive in attracting revenue from national advertisers — an advertising pie to date they've been denied, she says.

"Maybe a few (broadcast) groups will have a 50 to 60 percent footprint in the United States," Papuga says. "They could aggregate and come up with a new measurement capability where they could actually compete on an NTI (National Television Index) panel."

For this to happen, broadcast groups need to invest in acquiring audience metrics that will let them compete on an apples-to-apples basis when advertisers are evaluating national buys.

"Stations already have a relationship with Nielsen," she explains. "There are two different currencies Nielsen offers — one on a national level and the other on a local level. Now might be the time for groups to combine some of their units across markets without having to pay huge fees to Nielsen to aggregate that back up."

Maribeth Papuga, senior VP, director local broadcast, at StarCom/MediaVest Advertising, suggests local TV stations should begin positioning themselves to tap into national advertising buys.

Another area in which stations can improve their competitiveness is the commercial length options they offer advertisers.

"Fifteen seconds has been utilized in pretty hefty volume at a national level for a pretty long time," Papuga says. "They're natural."

But stations make it difficult for advertisers to place 15-second spots locally.

"The 15-second spots have always been automatically preemptable by a :30," she explains. "Local stations also charge a premium if you want to isolate them; otherwise, you have to pre-pair them even before you can offer it to the station."

So, if an agency's client wants to run a 15-second spot, the agency must first find another client willing to buy a 15-second commercial. Local broadcasters also can make it easier for advertisers and agencies to do business with them, Papuga says. While the industry is making headway on efforts to implement e-business efficiencies, more is needed.

"There are still so many legacy systems that aren't talking to each other that it becomes difficult to do things on a retail basis or things that need to get done quickly," she says.

Perhaps Papuga's most far-reaching suggestion to get competitive zeros is on the unique gatekeeping function local stations play in the television market. As more alternative delivery systems come to a given market, local TV stations are uniquely positioned to offer advertisers custom placement on different distribution platforms.

"Cable, satellite, FiOS and AT&T ... I may not want to run the same copy across all those systems," she says. "Stations could offer a split signal opportunity where I could pick out and target audiences. The local broadcaster is kind of the lighthouse in the middle because he is able to offer his signal across various channels."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HD realities

BY PHIL KURZ

From audience reaction to engineering realities, making HDTV a competitive advantage raises some interesting questions.

WBAL-TV in Baltimore went live from its new, network-level HD control room and studio in January after six months of work and producing its SD newscast from a temporary set in the newsroom.

The steady march of HDTV sets into the living rooms and dens across America continued apace last year, reaching 39 million U.S. households by year-end, according to research firm In-Stat.

While the economy may be dampening demand for new HDTVs somewhat these days, interest among consumers in high definition and HD spin-offs, such as 3-D TV, remains strong. For example, a recent survey jointly produced by the Consumer Electronics Association and the Entertainment and Technology Center at the University of Southern California found that 16 percent of consumers are interested in watching 3-D movies and TV shows in their homes. To be sure, 3-D television is barely on the distant horizon for most local broadcasters, but the survey demonstrates continued willingness on the part of many consumers to seek out novel, lifelike television viewing experiences in the home.

Large and mid-market stations and television networks have been doing a remarkable job of feeding this appetite for true-to-life — albeit 2-D — television imagery and sound. Nearly all major sporting events are produced in high definition, and most everything from network morning news shows to late-night entertainment is done in high def. Hundreds of high-definition channels also occupy HD tiers on satellite, cable and IPTV systems.

On the local level, too, the list of larger and mid-sized stations originating local content — mostly local news — in high definition continues to grow. Even smaller market stations, with far fewer resources, have begun originating HD.

HD economy

Despite such progress, high-definition local origination is nowhere close to ubiquitous, and many larger stations that already have put HD studios and control rooms in place continue to postpone or limit HD field acquisition. Many acquire footage in the field in widescreen SD and upconvert for insertion into their newscasts. Others have fielded HD cameras but have chosen at this

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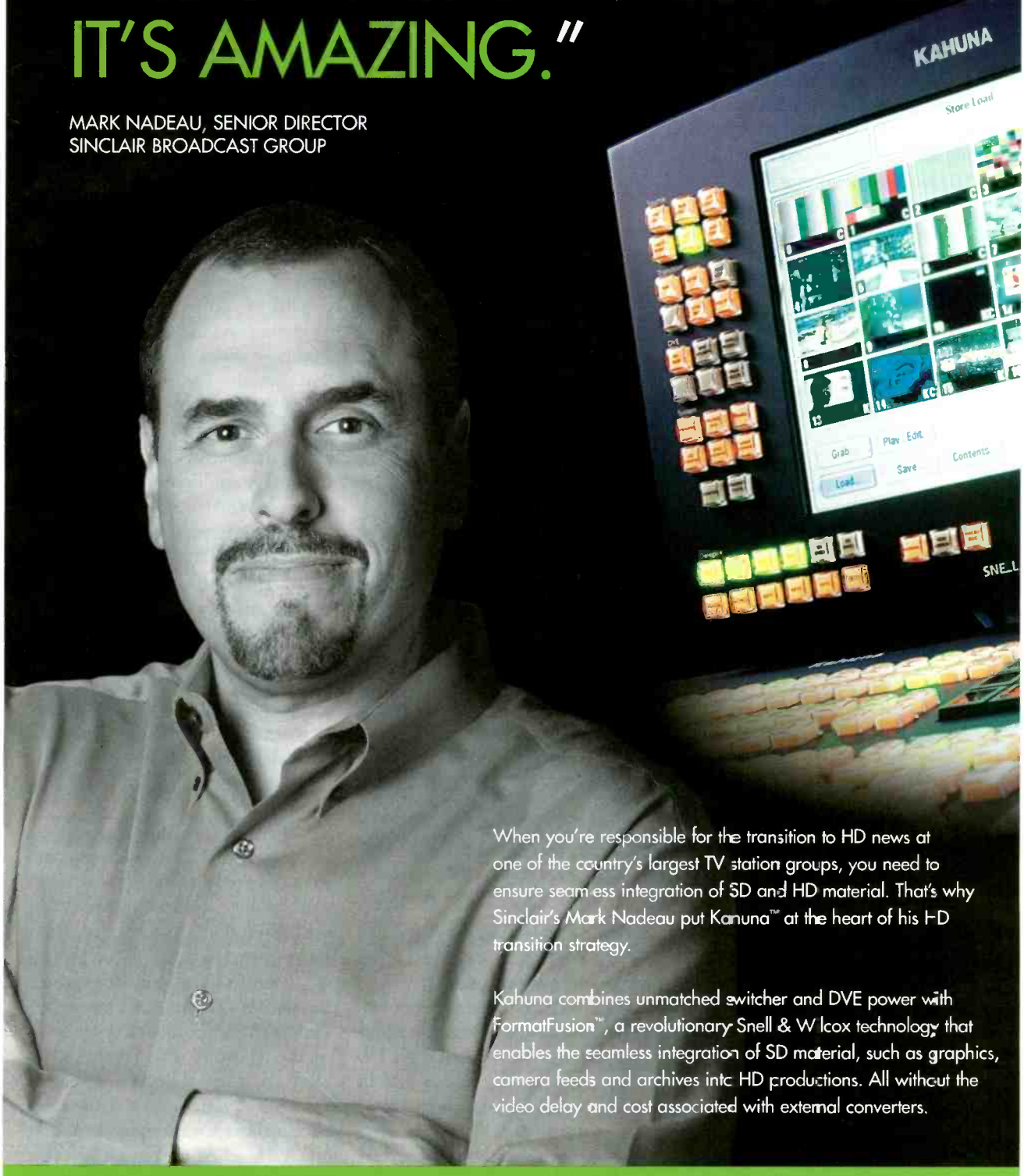
MARK NADEAU, SENIOR DIRECTOR
SINCLAIR BROADCAST GROUP



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 Mark Nadeau put Kahuna™ at the heart of his HD transition strategy.

Kahuna combines unmatched switcher and DVE power with FormatFusion™, a revolutionary Snell & Wilcox technology that enables the seamless integration of SD material, such as graphics, camera feeds and archives into HD productions. All without the video delay and cost associated with external converters.

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time not to incur the expense of the HD encoders and decoders necessary for high-definition live shots and backhaul.

In today's existing economic climate, many stations are satisfied with their HD progress or are looking for innovative ways to initiate HD local origination with less capital outlay. For example, Raycom Media last year rolled out HD local origination at about a dozen of its TV stations but is looking for a way to do HD locally at its smaller market stations for far less money.

"When you look at the small markets, these stations are under increasing stress with the economy," says Paul McTear, Raycom Media president and CEO. "Is there a way in the future that may be market-specific in which small- and medium-sized market broadcasters get together and instead of doing the HD conversion in each and every television station, they fund a broadcast operating center?"

Taking this approach would allow multiple stations in the market to share HD acquisition and preparation costs, and by so doing jointly fund the HD infrastructure necessary for such a broadcast operating center.

"That may help to keep us all from spending hundreds and hundreds of thousands of dollars in each and every television station," he says. "I think there could be some interest in creating a broadcast operating center for such markets in the future."

In the view of Sterling Davis, Cox Broadcasting VP of engineering, his station group has arrived at a satisfactory level of HD origination.

"We put a lot of stations on the air (in HD) pretty early and spent a lot of money," Davis says. "It's not like we are against HD or lukewarm about it. We think it is great. But from a Cox perspective, we have arrived."

For Davis, that means being satisfied in some markets to shoot widescreen SD in the field that is upconverted at the station and in others not adding the components needed to do live HD shots from the field even though HD cameras are in use.

"Adding field acquisition is just a matter of the economy, meaning if the economy doesn't straighten up, it will be longer," he says. "Normally, it would be a year or two or three."

To minimize any disruptions, WSYX-TV in Columbus, OH, produced its SD newscasts from a temporary studio and control room while it completed its HD news facilities.

HD conversions

Beyond the capital expense needed to convert an existing SD station for local HD origination, another significant financial piece of the puzzle centers on protecting the technical integrity of existing SD newscasts — and the commercial revenue they generate — while work proceeds on the high-def upgrade.

Many times, stations will set up their new HD infrastructure in parallel to existing SD technology, insulating the SD technology and workflow from the demands of the upgrade. For example, director of engineering Jeff Halapin at WBAL-TV, the Hearst-Argyle Television station in Baltimore, set up a temporary studio in the newsroom to keep WBAL's SD newscast on the air uninterrupted as work progressed on the HD conversion.

"We chose to do one big bang at the end with the control room, cameras, studio, new audio board, new graphics and the whole works," Halapin recounts. "I'll tell you it was really, really challenging technically to make all of that come together while doing a Nextel project (2GHz BAS relocation) and a building renovation."

On Jan. 3, 2009, WBAL went live with its first HD newscast from what Halapin describes as a "network-quality control room and studio." While the project stretched Halapin and his team to their limits, it went off without disrupting the station's SD newscast throughout the entire six-month ordeal.

Like Halapin, Dan Carpenter, chief engineer at WSYX-TV and WTTE-TV, the Sinclair Broadcast Group-owned stations in Columbus, OH, relied on temporary facilities to minimize disruption to ongoing SD news operations as Carpenter and his team put in place their new HD control room and studio.

"We're very lucky," Carpenter says. "We have two production

How to Evaluate Your Television Station's HD Acquisition Needs:

"Why Good Enough Is Not Necessarily Good Enough."

Considering:

1) That consumer HD screens are now topping 60-inches and continue to advance in size, contrast ratio, and overall sharpness

2) That Blu-ray discs are dramatically raising the bar for HD image quality in living rooms

3) That the competition between alternative HD delivery media is escalating and image quality is acquiring increasing importance

4) That television station competition within each market will rise in the ensuing years

Then, the HD acquisition needs of television stations must take into account the following:

a) There exists a broad hierarchy of HD cameras and camcorders – in terms of HD image performance and associated pricing – that loosely separate into three "production platforms"

b) Within this hierarchy the 2/3-inch HD lens offers the maximum optical sharpness

c) That the codec in an ENG camcorder will be followed by consecutive codecs (editing, contribution, ATSC transmission to the home etc) within a broadcast infrastructure that will progressively erode image quality ultimately delivered to the home

d) That the 2/3-inch image format and the higher production platform in cameras and camcorders will produce the very best HD imagery – assuring maximum competitiveness under all circumstances

e) That the 1/2-inch image format associated with high performance production platforms represents an optimized balance between high levels of image quality and cost of ownership

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control rooms and two studios. We moved our existing set into our small studio overnight after the 11 p.m. show, and we put our smaller control room on the air. We were fortunate to have the opportunity to gut the main studio and control room and start over."

In May 2008, the stations went live from the facility's new HD production control room and studio.

Full circle

The same In-Stat study showing that 39 million U.S. households owned HDTVs as of the end of 2008 also echoed the findings of previous studies indentifying a sizable gap between the number of households owning HDTVs and those actually receiving HD programming. Of the 39 million households, In-Stat found 17 million do not view HDTV shows on those sets. That begs the question: Why not?

Lack of understanding and lack of the financial resources to subscribe to pay TV are often cited as reasons. But there may be a more troublesome, yet unavoidable answer: Perhaps, millions can't tell the difference. Even raising such a heretical suggestion is sure to invite criticism and derision from some quarters. But first, consider carefully the viewpoint of Davis.

"The viewers can't tell the difference (between widescreen SD and HD)," Davis says. "We have seven stations that are high-def from the studio. All the rest of the stations that do news — Johnstown (PA), Steubenville (OH) and El Paso (TX) — are doing widescreen news, but not in HD. I'm not sure the viewer knows the difference."

This is not to say that Davis regrets Cox Broadcasting transitioning its seven stations that are doing HD origination from their studios.

Andrew Bales, technical director for KCTV5 News serving Kansas City, MO, and KS, produces a newscast from the station's new HD control room.

"The money didn't go anywhere," he says. "It just got us new cameras, new sets and stuff like that, but you know we didn't change the ratings any nor did HD change the ratings of our competitors who might have done it before or after us in a given market. Nothing changed. Now widescreen makes a difference, but not a ratings difference. People don't choose to watch a newscast because it is widescreen or narrow-screen. They choose to watch it because of the content or anchor or whatever. I don't know all the reasons people choose newscasts, but it's certainly not because of the screen shape."

As broadcasters continue to weather the financial storm gripping the nation's economy and consider how best to allocate their 19.4Mb/s bit budgets, Davis' insights may be particularly important as they ponder things like mobile TV.

However, Patti Dennis, VP and news director of Gannett-owned KUSA-TV in Denver, doesn't agree with Davis' perception. In her view, television viewers certainly can tell the difference between SD and HD, especially when there are competitors in the market on-air in HD.

KUSA, solely on-air with HD local news for four years, has faced HD competition for Denver news viewers for about a year. The stations' ongoing competition came into sharp focus during local coverage of the Democratic National Convention (DNC) last summer.

"When we were all on location doing hours of DNC coverage," Dennis says, "if we didn't produce something in HD, and someone else did, viewers noticed and complained."

Kirk Black, senior VP and general manager of Meredith-owned KCTV serving the Kansas City, MO, and KS, metropolitan area, expressed a similar sentiment. In October 2008, the station went live with its local news in HD.

"There are now three stations in the market in HD, and I'm happy for a level playing field," Black says. "There are so many people out there watching TV that are already HD-ready and expect high definition that I haven't personally gotten a lot of compliments for being on in HD. We got more complaints when things were not in HD. So, I take the lack of those complaints as a reverse compliment."

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Content company first

David Barrett, Hearst-Argyle Television president and CEO, looks at the ongoing evolution of distribution platforms as an opportunity to better serve the company's viewers and advertisers.

Hearst-Argyle Television, like many station groups these days, is grappling with the onslaught of new distribution platforms and the evolving media consumption habits of its audience.

Still, while the screen sizes and shapes may be changing and the places viewers choose to consume content evolving, at its core, Hearst-Argyle Television is a content company that is reliant on technology — ceaselessly ever-changing technology — to deliver that content, says David Barrett, company president and CEO.

"We're not in the technology business but ultimately have to adapt the local content we produce and the national content we exhibit on a local basis to different technology platforms," says Barrett, who is a keynoter at the *Broadcast Engineering* and *Broadcasting & Cable* co-produced Competitive Television Summit March 4-5 in Orlando, FL. "We've been a company that has tried to pursue a strategy of on-air, online and on-demand and really be responsive to the different media consumption behaviors that are relevant."

That strategy appears to be paying off. In the past year, Hearst-Argyle Television's investment in TV station Web site developer Internet Broadcasting and has generated more than 1 billion page views across all of its stations' Web sites.

"We've grown that to be a very significant and strategic part of our business, and we are making strides in monetizing that," Barrett says. "But we have a long way to go as well."

According to David Barrett, Hearst-Argyle Television president and CEO, the company has pursued a strategy of on-air, online and on-demand.

The other new component in the evolving distribution technology mix is mobile television, and there too Barrett is positioning Hearst-Argyle to establish a significant presence.

"I am struck by how pervasive these (mobile TV) devices are in Korea," Barrett says. "I am struck by how a younger generation is so reliant on these devices for all manner of information."

Looking down the road in the United States, Barrett expects to see similar mobile TV devices in wide use as people on the go increasingly turn to them to consume media.

"I am struck by how advanced the iPhone is, for instance," he says, "and the content applications there are very intriguing."

These sorts of changes in the distribution mechanism of video serve only to advance the prospects of Hearst-Argyle and other broadcasters that adapt their content to these devices.

"This all links back to our business. At our core, we are all local media companies that have a real beachhead in each of our local markets," Barrett explains. "We have real relationships with our viewers, and our relationships with our advertisers are second to none. To the extent that we can leverage those kinds of relationships to extend to new platforms and new ways to deliver local media to people, that holds business promise."

The mother of all distribution platform evolution has been the DTV transition. Originally scheduled for Feb. 17, President Barack Obama signed into law days before the scheduled switch a bill delaying the DTV transition until June 12.

While Barrett appreciates the concern of those in government over viewers who remained unprepared, he says he was quite concerned about the confusion a delay might cause viewers.

"Given my druthers, we would have moved forward early," Barrett says, "but I think the only practical thing for us to do was to accommodate those who thought a June date was preferable and do everything we can to respond to any concerns that are out there."

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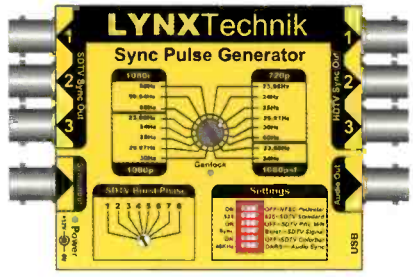

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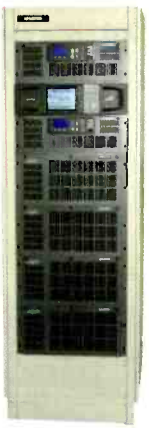

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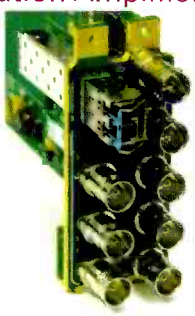

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714-894-3311; www.for-a.com
Booth: SU3507

EDITING SOFTWARE
Avid Media Composer v3.5
Now includes native support of the Sony XDCAM format, allowing users to playback and edit directly from the disc, render, mixdown, export sequences and clips with eight audio tracks, and write back with sequence time code; supports stereoscopic workflows, enabling users to acquire, edit and display stereoscopic 3-D material; eliminates the need for a dongle key to activate new software purchases and upgrades; all new software sales and single seat upgrades will be licensed by a system activation key.

978-640-6789; www.avid.com
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Video routing

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www.utahscientific.com
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516-671-7278; www.multidyne.com
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631-549-5159; www.pro-bel.com
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514-333-1772; www.miranda.com
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408-226-9800; www.aheadtek.com
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609-987-8090; www.scopus.net
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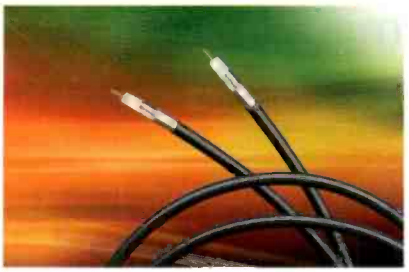

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Tape machines

Advances in consumer videotape recording technology keep the professional use alive — for now.

BY JOHN LUFF

The first practical (i.e. commercially viable) electronic recordings for television were shown more than 50 years ago at NAB in 1956. Later that year, CBS became the first user when "Douglas Edwards with the news" was delayed for rebroadcast on the West Coast. We have come a long way in 53 years. Though it is clear that videotape was one of the most influential inventions in our business, it was just in 2005 that the National Academy of Television Arts and Sciences awarded a lifetime achievement award to the engineering team that paved the way for this important development.

A 90-minute reel of quad tape weighs about 30lb, whereas a DV tape weighs only a fraction of that. Quad tape photo courtesy LabGuy's World.

Though the importance of video recording on moving media has diminished, it is clear that there is a long way to go before videotape is dead. The demise of videotape has been predicted for many years, however, based in no small measure on the increasing importance of new methods of recording to static memory, optical media and disk drives. These alternative media have found niches in the industry, including in consumer recorders.

Volumetrically, videotape is still incredibly efficient. A standard equipment rack might hold a few tens or perhaps a hundred terabytes. In terms of storing complete television programs, only recently could a rack of spinning disks hold as much content as the same volume of readily available DV videotapes. While not exactly shocking, it points out that videotape on shelves, which is a green method of storing content, competes well with arguably more modern methods that consume kilowatts of power.

Identifying a professional video recorder

Increasingly, our industry relies on advances in recording technology from consumer electronics research. I don't think it is in dispute that the DVC PRO format, which clearly had a large impact on news acquisition, would not have been introduced if most of the development cost had not been shared with consumer products. Over time, many of the DV-based camcorders that found their way into news departments worldwide were modified consumer products.

To me that begs the question: What constitutes a professional video recorder these days? Though a definitive answer to such a broad question is impossible, the answer is partly features and partly performance. In considering performance, I choose to speak only of digital recorders, as analog recording is both hard to find and not appropriate given the state of the art today.

High-end modern video recorders can record 880Mb/s. Such high bit rates are obviously suited to high-quality mastering for digital cinema and high-end production. Other common bit rates used today are based on the DV 25Mb/s standard, for both HD and SD content. Advances in compression technology have increased the quality of recorded content to such an extent that you can't simply look at the bit rate and extrapolate relative quality. For example, it's impossible to compare MPEG-2 at 25Mb/s (long GOP) and AVC coding at 25Mb/s (AVC Intra); they are not equal. The improvements in codecs are such that 25Mb/s AVC content compares favorably with a considerably higher data rate for long GOP MPEG-2.

Other formats abound. JPEG 2000 is in use for digital cinema and broadcast. At high bit rates, suitable for mezzanine

recording formats for high-quality use in studio production and backhaul, JPEG 2000 offers excellent results in multigeneration performance. Recorders in commercial use for JPEG 2000 are not videotape at this time, but rather IT standard recording media.

Size-wise

It is interesting to look at the evolution of videotape in a second dimension, or more correctly in several more dimensions: weight, thickness, width and length (of tape). A 90-minute reel of quad tape weighs about 30lb. In contrast, an 83-minute DV tape weighs only a few percent of that. Not surprisingly, it is also only a few percent of the volume. While quad tape is fully 2in across, DV tape is only 6.35mm across (12 percent of quad tape's dimension). No one who has seen pictures from both eras would disagree that for a fraction of the cost, weight and volume, DV produces a vastly superior picture. I'm not surprised because I remember changing tubes in Ampex VR-1000A recorders from the late 1950s. Refurbishing recording heads on a quad recorder cost more 20 years ago (even in uninflated dollars) than a new professional DV recorder that produces superior quality.

For a fraction of the cost, weight and volume, DV produces a vastly superior picture.

Unvideotape

I have not yet discussed "unvideotape," which is my favorite name for data tapes used to archive video content. I think I can make the argument that LTO and other data formats are lossless videotapes. In the future, we will certainly find a huge uptake in data tape storage of video content. Robotic libraries can hold thousands of hours of content in the same volume the VR-1000A of my previous life represented. Ironically, I enjoy robotic video transports of the 1970s. They are more reliable and eat tapes less often. They also facilitate the long-term preservation of content that video recorders cannot be relied upon to do.

Signs point to an end

No one can predict when videotape will disappear. But the signs pointing to the elimination of tape are everywhere. Recently, the last plant duplicating VHS went offline. Fortunately for all of the news operations that depend on DVC PRO and DVCAM, the same media is used in ubiquitous consumer recorders, which provides a bit of insurance. When it ceases to be profitable for manufacturers to supply consumers, I bet that all professional uses of videotape will feel the threat. BE

John Luff is a broadcast technology consultant.

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

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Livestation goes mobile

Watch out for this ATSC-M/H competitor.

BY ANTHONY R. GARGANO

Last year I wrote about my experience as a beta tester for Livestation, a streaming client that delivers a variety of live, on-demand news channels to your laptop or desktop. (Check out my June 2008 column at *http://broadcastengineering.com/news/internet-television-0601*). This free service has taken off with tremendous popularity. Originally delivering a selection of world news channels, the client app, which is now available in both PC and Mac versions, has included the capability for users to add their own favorite channels to the streaming player.

For the past two months, I have been part of an alpha test group for a new Livestation product — a streaming client that can reside on either an Apple iPhone or iPod Touch. Chosen for purposes of the alpha test, the variety of channel offerings include Al Jazeera, BBC World News, Bloomberg Television, Euronews, France 24 English and Russia Today. For a news junkie, this level of portability in live TV news services, i.e. news on-demand anytime you want it, anywhere you are, can be quite addictive. The sheer convenience can result in tuning in at the oddest of times and in the strangest of places.

Mobile news on its way

At the recent CES in January, the Open Mobile Video Coalition (OMVC) announced plans by a contingent of U.S. broadcasters for the rollout of a mobile DTV service later this year. Presumably, this would be sometime after the adoption of ATSC's Mobile DTV M/H standard, which is expected to occur sometime around midyear. That, along with currently available wireless TV services and Livestation's planned entry into this market, sets up an interesting battle for mobile viewers' eyeballs.

The Livestation folks, with their focus on news, seem to have gotten it right. News channels are ideal content for portable viewing. By its nature, portable viewing does not readily lend itself to scheduled programming nor does it seem appropriate for long-form or episodic content, unless you find it tolerable to watch such program content intermittently, as time permits, and on a small screen.

But the other clear advantage that Livestation has is Apple's sheer popularity. In its most recent SEC filing, for the quarter ending in December 2008, the company reportedly sold 4.4 million iPhones and more than 23 million iPods. The numbers, and remember these sales figures represent just three months (albeit the holiday buying season), were not broken down by country or model. But an AT&T Wireless report for the same period indicating it had activated 1.9 million iPhones gives us some calibration of the U.S. market share. Where the ATSC-M/H approach requires dedicated reception hardware or a wireless device with embedded reception capability, the Livestation approach only requires a client app that can be readily installed on any of the millions of iPhone and iPod Touch devices already in service.

Livestation CEO Matteo Berlucchi indicated that plans are being finalized and negotiations are underway with both Apple and broadcasters to offer single-channel client apps via Apple's iTunes Store. So, rather than offer a multichannel broadcast service, the viewer will have the option of a personalized service by downloading only the specific broadcast channel apps of interest, thus using his iPhone or iPod as the content aggregator. Livestation, in addition to having developed the client app, will offer the broadcaster an end-to-end solution for the streaming of content to user devices.

For the ATSC-M/H camp, look out: You've got a potential new competitor. For the broadcaster, it's another way to get your content out there. And for the viewer, life is good. BE

With Livestation, viewers can watch news channels from an Apple iPhone or iPod Touch. They can personalize service by downloading only channels of specific interest.

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

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

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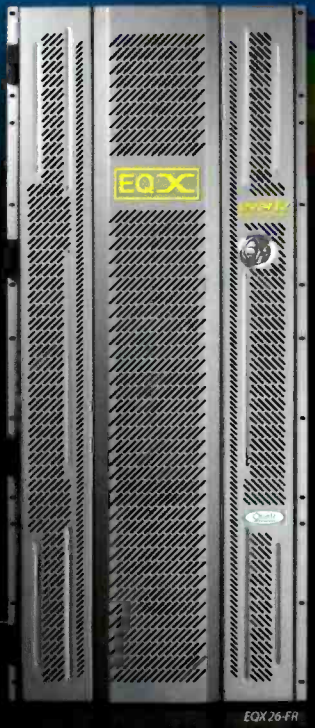

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VIP-X is the complete solution for your next control room or facility, offering a complete facility routing platform and industry-leading multi-image display technology in a single modular package. No control room is too small. With the VIP-X, none of the router outputs are wasted.

3Gb/s Support

VIP-X is a true 3Gb/s platform, with end-to-end support of SMPTE 424M HD-SDI content. The router is capable of passing 3Gb/s, and the multi-image display system can display 3Gb/s images as well.

Industry Standard User-Interface

VIP-X multi-image display outputs are controlled using Maestro™ - Evertz® industry standard graphic interface, now installed in over 1000 locations world-wide.

Monitoring: On-Screen and Using SNMP

VIP-X offers real-time monitoring with visual on-screen alarms and via SNMP, offering all of the extensive alarming the industry has come to value, including monitoring for video loss, active picture level, audio loss, over, under etc...

The Complete Control Room Solution •

With 1152 3G/HD/SD inputs and 288 multi-image display outputs, the VIP-X is the most expandable and economical routing and multi-image display system available!

featuring XCLINK TECHNOLOGY

VIP-X eliminates system complexity, saves space, and is more economical compared to traditional autonomous solutions. It can be tailored for all control room signals and budget requirements.

It is available in several package sizes, from a 32 input system with up to 32 router outputs and as many as 24 multi-image displays, up to larger systems that accommodate up to 288 inputs and 288 router outputs and as many as 72 multi-image displays.

VIP-X addresses two common challenges by combining a functional and highly reliable routing platform with a modular multi-image display system in one integrated package. Building your next control room will be simple using VIP-X, as it enables two complex items in the control room to function as a single system.

The biggest difference between the VIP-X and other multi-image display systems is that the foundation is a purpose-built routing platform. It can be used to satisfy the routing and multi-viewer components for any project, without compromise to the router or multi-viewer size or functionality. The solution is perfect for anywhere that needs high quality image display.

VIP

Monitoring & Multi-Viewers

Loudness and Lipsync

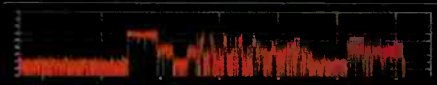
Resolving the Industry's 2 Biggest Problems with "Sound Advice" by Evertz®

IntelliGain™ Audio Loudness Processor (patent pending)

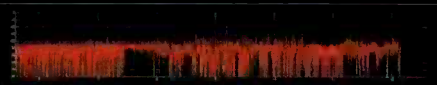
IntelliGain™ is an award-winning audio processing technology developed by Evertz® to control loudness of audio programs on the fly. More specifically, it calculates the perceived loudness of the input audio and modifies the audio to ensure that the long-term average loudness level is at the target level. IntelliGain™ works with mono, stereo and multi-channel audio per program and can handle up to 8 audio programs simultaneously. *Over 1000 channels on-air today with IntelliGain!*

Featuring:

- Loudness calculations based on ITU-R BS.1770 algorithm
- Artifact-free transitions between program and commercial
- Consistent audio loudness levels within a channel/program
- Automatic gain control within a program interval to preserve audio dynamic range
- Elimination of drastic volume changes during commercials and interstitials
- Ideal for aggregator applications and multi-channel playout facilities (DTH, Cables, IPTV, etc)
- VistaLINK® controlled and monitored!



Before IntelliGain™



After IntelliGain™

IntelliTrak™ Real-Time Non-Intrusive Lipsync Analyzer NEW for 2009

IntelliTrak™ is a lipsync analysis technology designed by Evertz® to accurately measure the lip sync error between the audio and video by analyzing the content in real-time. IntelliTrak™ does not introduce any type of watermarking or flag insertion into the stream, and therefore operates in a completely non-intrusive manner. IntelliTrak™ is designed for on-air use, when it counts!

Featuring:

- Non-intrusive in-service lipsync error measurement
- Accurate reporting with +/-1ms
- Works with all types of audio and video signals
- Supports multi-channel audio (such as 5.1)
- Designed to report lip sync error through all sorts of processing
- For use within plant or external with outdoor broadcasting units

Professional Audio Upmixing & Downmixing with Evertz®

Evertz® has also paid close attention to the need for professional upmixing and downmixing of audio programs. Both in-house developed technology cores are offered as ordering options to a wide range of the Evertz® portfolio. This flexible approach makes the surround sound transition manageable and affordable. Look for the +UMX and +DMX options.

IntelliGain™ and IntelliTrak™

The Single Card Universal Processor

Evertz® 7812UDX Series Audio and Video Processing Modules

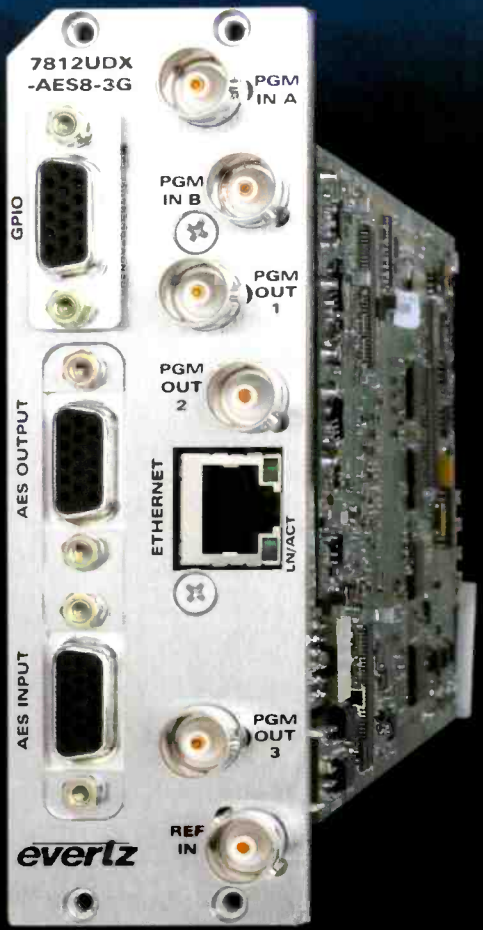
The 7812UDX series modules are broadcast quality Up/Down/Cross Converters offering a wide variety of video and audio processing options, including 3G/HD/SD video inputs & outputs, 16 channel embedded audio processing, 8x AES in and 8x AES out (-AES8 version), and IntelliGain™ audio processing (+IG option)...and they are fully AFD-enabled and VistaLINK® -capable.

Video Processing:

- 3G/HD/SD video inputs & outputs
- Frame synchronization
- Per pixel motion processing
- 3D noise reduction
- 3D video de-interfacing
- Advanced film mode processing
- Up/Down/Cross conversion
- Aspect ratio conversion
- Fully AFD-enabled
- Video proc amp controls
- Color correction and legalization
- Fill input option (+F)
- Static or animated side panel playout from embedded compact flash (+CF2G)

Audio Processing:

- 16 channel embedded audio processing
- Audio/Delay/Gain/Invert/Channel swapping
- 5.1 to stereo down-mix
- 8x AES in and 8x AES out (-AES8)
- Dolby encoding (+DEE)
- Dolby decoding (+DD)
- Stereo to 5.1 up-mix (+UMX)
- IntelliGain™ audio processing (+IG)



intelliGain

VistaLINK

AFD READY

7712UDX Series Modules

& Audio Routing

Control System
Without Limits

- nber of sources
- er of destinations
- nber of tielines
- athfinding
- outer hops
- nber of names
- destination
- ed users
- nber of panels

uter control
ertz® SNMP equipment
Evertz® multiviewers

Bringing advanced capabilities to the world of routing switchers, with a new generation design starting with a solid multi-format router core.

In today's broadcast environment, a router must be reliable, resilient and cost effective. Evertz® Xenon routers excel in all of these areas while offering the flexibility of multi-format operation, as well as the ability to add Signal Processing Technology. Great care has been taken in the design of Xenon to avoid single points of failure. Active assemblies are all hot swappable from the front of the frame. Power, control, cooling and reference generation are available in redundant configurations.

Featuring:

- Distributed architecture for greater reliability
- Mixed format (HD, SD, AES, Analog Audio, 3G)
- X-LINK multiviewer integration WITHOUT using up outputs
- Shuffle/Swap embedded audio
- Video proc on selectable destinations
- Fiber Optic I/O

Xenon

Multi-Format Routing Systems

Systems from 32x32 to 128x128

Multi-Image Display and Monitoring

The Largest and Most Flexible Multi-Image Display Platforms

MVP

Multi-Image Display Processor

The most expandable, versatile and robust multi-image display processor the industry has ever seen.

The Largest and Most Flexible Multi-Image Display Platform

The MVP® revolutionizes the multi-display marketplace with a highly flexible, intuitive yet comprehensive approach to virtual wall monitor applications. The possibility of displaying any input signal to any output monitor can now be realized without the need for DAs or upstream monitor routers.

A single MVP® system can expand from 8 inputs with a single output, to as large as 1000+ inputs to more than 50 displays.

Featuring:

- The best image quality in the industry
- Nielsen rating displays
- Dynamic clock displays
- Remote SNMP monitoring and thumbnailing (VistaLINK® PRO)
- ASI display
- Over 120 images per display
- On-screen mouse & keyboard control

VistaLINK ThumbLINK IAFDI READY CRESTRON Integrated Partner AMX

Monitoring & Multi-Viewers

Solutions

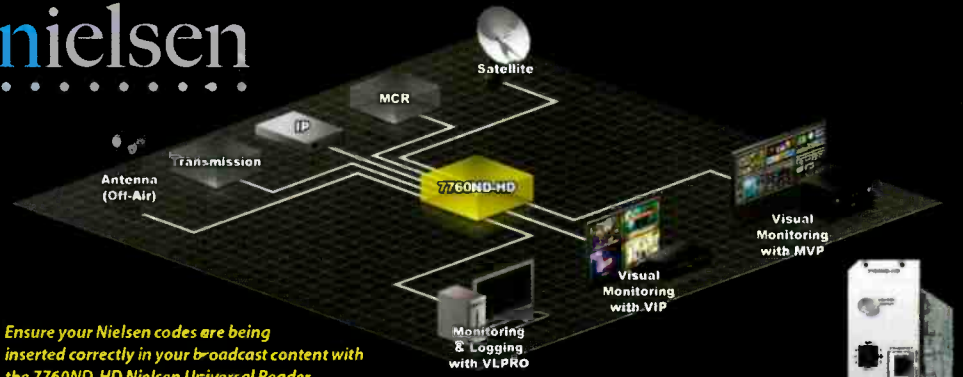
VIP-A advanced

The VIP-A and the VIP-A DUO are the most advanced compact multi-image display processors available.

The VIP-A has been developed to meet the demands of the broadcast control room with the features and reliability expected in Production Control, Outside Broadcast and Master Control environments.

The VIP-A DUO supports up to 3Gb/s SDI inputs and up to 2 unique display outputs. It takes compact multi-image display to the next level.

nielsen



Ensure your Nielsen codes are being inserted correctly in your broadcast content with the 7760ND-HD Nielsen Universal Reader.

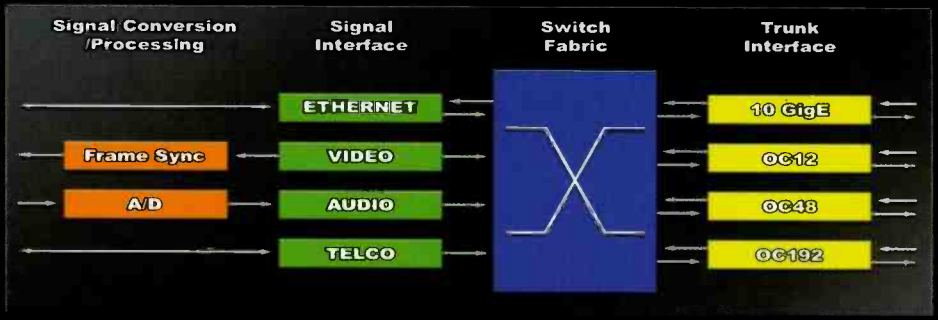
Evertz® 7760ND-HD provides a solution for monitoring the presence of Nielsen codes from the broadcast path. It monitors both the video AMOL1/AMOL2 data as well as the audio NAES data. The 7760ND-HD accepts a baseband video input transported on SD-SDI or HD-SDI with embedded audio.

Advanced Optical Transport Platform

Evertz® 3700ATP

The 3700ATP is the most advanced, scalable and highly flexible media transport platform for professional video, audio and datacom signal transport applications.

At it's heart, sophisticated non-blocking Switch Fabric technology allows for unicast, multicast and broadcast signal distribution over existing SONET/SDH or IP networks. The ATP platform itself may also comprise the network elements by direct connection over dedicated fiber or WDM systems. Integration with Evertz® full 7700/7800 series product line provides comprehensive signal processing & conversion capabilities, in one extremely versatile and scalable platform.



In its chassis, ATP allows the use of any Evertz® 7700/7800 series module, providing nearly unlimited additional *Signal Processing & Conversion* functions for outgoing or incoming signals, all in one platform.

Signal Interfaces provide input and output connections for user video, audio, datacom and telecom signals.

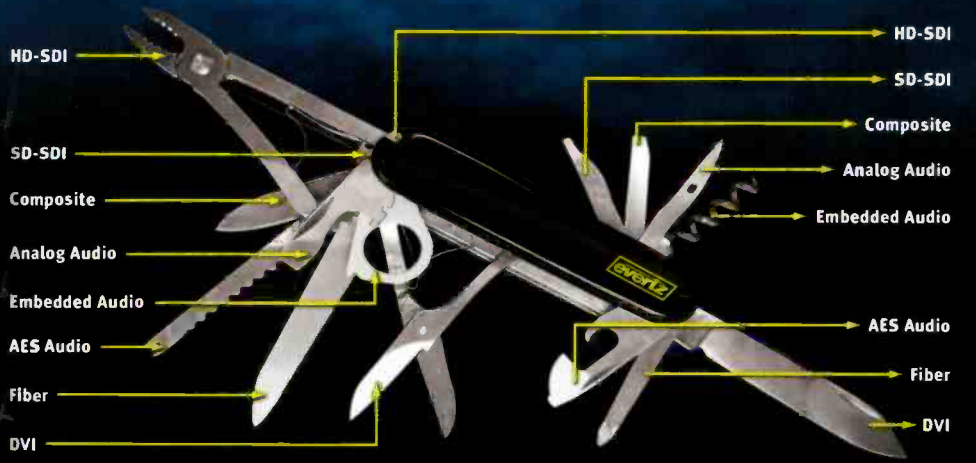
The Switch Fabric lies between the Signal and the Trunk Interfaces and forms the heart of an ATP node.

Trunk Interfaces connect to the switch fabric and encapsulate signals for transport on SONET/SDH, IP or dedicated fiber/WDM networks.

3700ATP Transport Platform

HD2020 Video PassPort™

Award-Winning 1RU Multi-Path Video Converter & Frame Synchronizer



Finally, everything you need to transition to DTV & HDTV...in a single 1RU platform!

The HD2020 Video PassPort™ is a high performance 1RU video converter and frame synchronizer platform designed for high availability 24/7 operations. It integrates four fully independent and unique up/down/cross conversion paths (including frame synchronization) and a wide range of video/audio inputs/outputs.

VistaLINK® and the CP2200E

The Video Passport™ is equally suited for analog, digital, HDTV and hybrid facilities, representing the ideal choice for broadcasters making the transition to DTV and HDTV. The HD2020's processing capabilities and simple-to-use front panel interface also make it perfect for ENG and DSNG truck applications.

New H.264 Compression!

Demodulators

Encoders

Complete Encoding Solutions
- MPEG-2 New!
- H.264 New!
- JPEG-2000

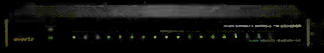
For All Aplications
- Contribution
- Distribution
- Remote Monitoring

Complete Demod Solutions
- QPSK, DVB-S2 for Satellite New!
- 8VSB for Off Air New!
- QAM for Cable TV

Conditional Access Modules
- DVB-CI Modules
- BISS & BISS-E

Decoders

Complete Decode Solutions
- Modular & Bulk Decoders New!
- MPEG-2 & H.264 New!
- SD & HD
- ASI & IP Inputs
- AC3, Dodby E, AAC
- Musicam Audio Decoder



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The Complete Control Room Solution

1152 INPUTS

288 OUTPUTS

With 1152 3G/HD/SD inputs, 288 multi-image display outputs, the VIP-X is the most expandable & economical routing and multi-image display system available.

The VIP-X simultaneously addresses two common challenges by combining a functional and highly reliable routing platform with a modular multi-image display system in one integrated package. It eliminates system complexity, saves rack space and is more economical compared to the other solutions on the market. The VIP-X can be tailored for all control room sizes and budget requirements.

ROUTING & MULTI-IMAGE DISPLAY JUST GOT EASIER.

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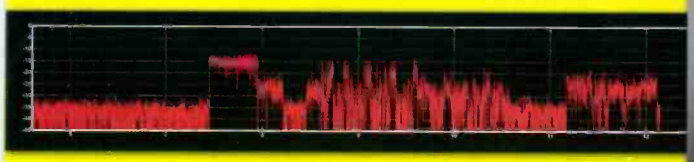
Evertz® - The Leader in Audio Solutions

IntelliGain™ Loudness & Dynamic Range Processor

Inter-Program and Intra-Program Loudness Control

Broadcasters are always challenged to provide audio content to their target audience while minimizing complaints about variations in loudness between programs and commercials, and from channel to channel.

Evertz® provides the solution with the award-winning IntelliGain™ 'Sound Advice' product suite.



Program Audio without IntelliGain™ Applied:

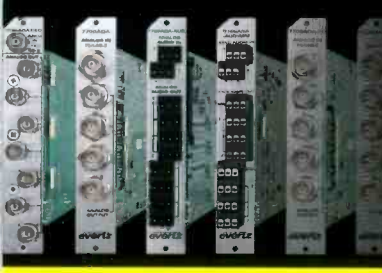
Program Audio with IntelliGain™ Applied:

IntelliGain™ Features:

- Consistent audio loudness levels within a channel and/or program
- Automatic detection and level adjust for loud commercials
- Gain control within a program interval to preserve audio dynamic range
- Artifact-free transitions between program and commercials
- Elimination of drastic volume changes during commercials & interstitials
- Ideal for aggregator applications and multi-channel playout facilities
- VistaLINK® controlled and monitored

IntelliGain™ can be applied to a number of Evertz® products including:

- ***Frame Synchronizers***
- ***Protection Switches***
- ***Audio Embedders***
- ***Audio De-Embedders***
- ***Dolby Encoders***
- ***Dolby Decoders***
- ***Routers***
- ***InteNigent Distribution Amplifiers***
- ***MPEG Decoders***
- ***Up/Down/Cross Converters***



Over 1000 Channels Served with IntelliGain™ ...and Counting!

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Randall Smith,
Senior Director,
KVOA News Tucson

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