JULY 2007

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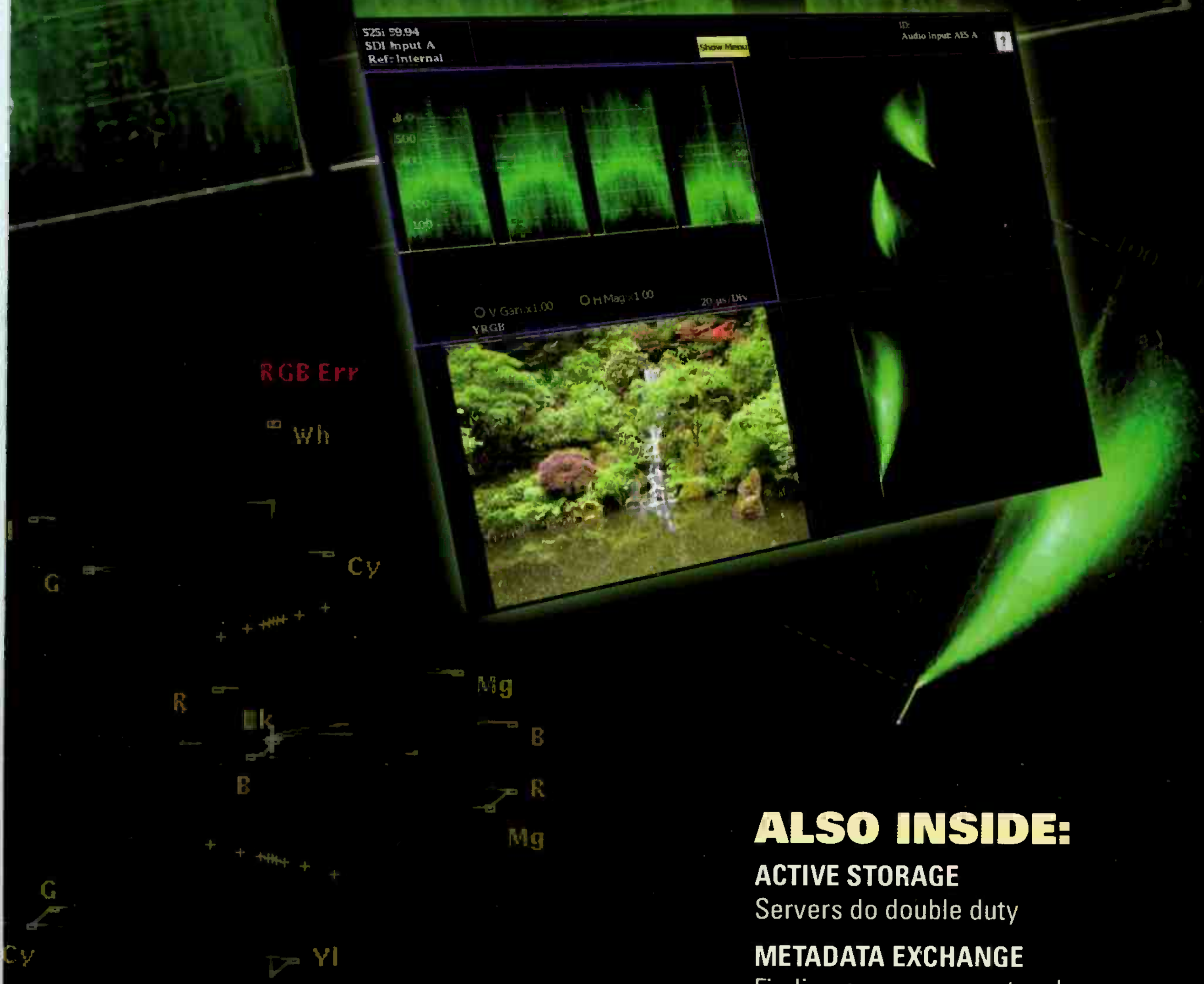
LEGALIZING VIDEO

The dangers of image impairment



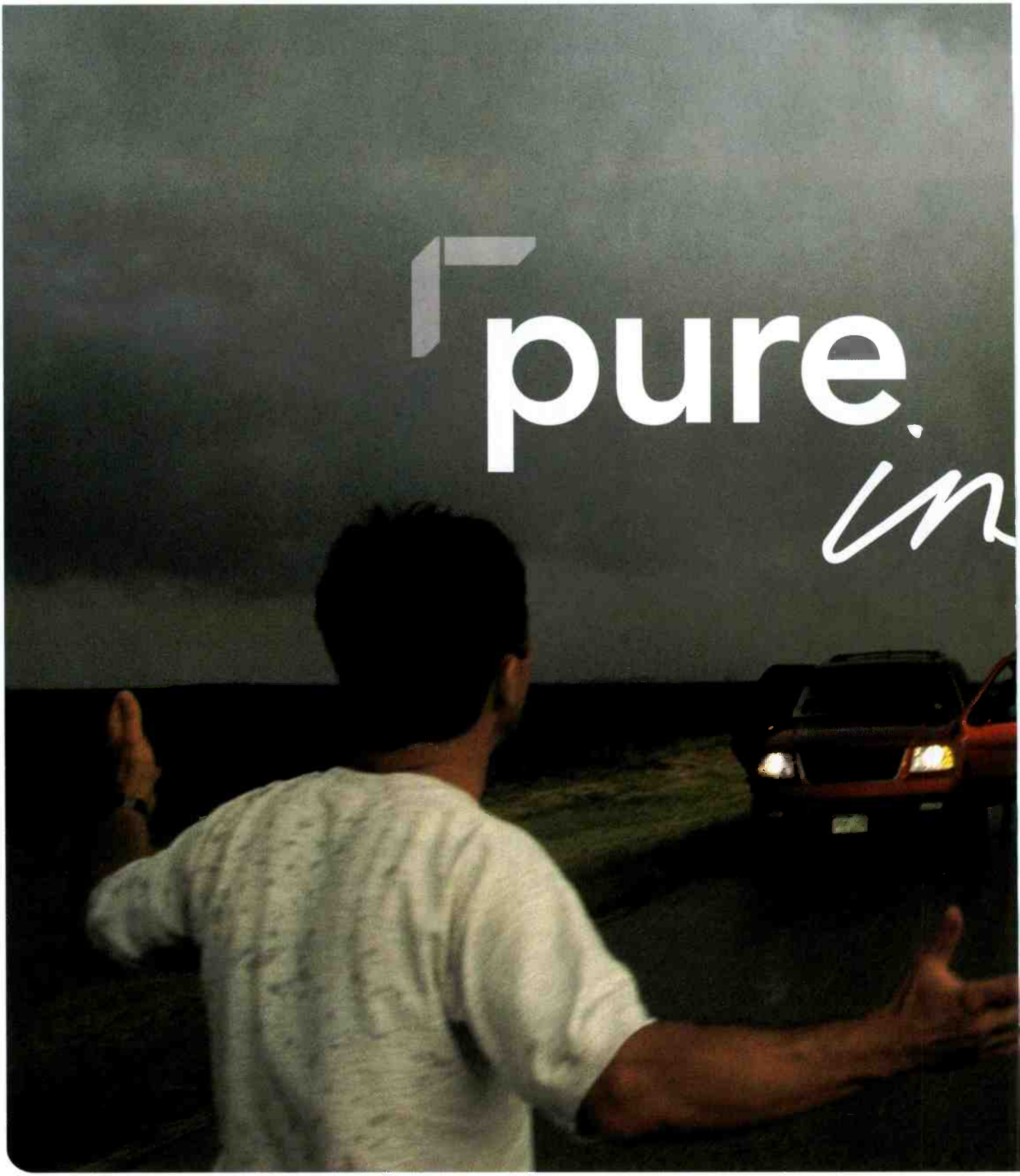
ALSO INSIDE:

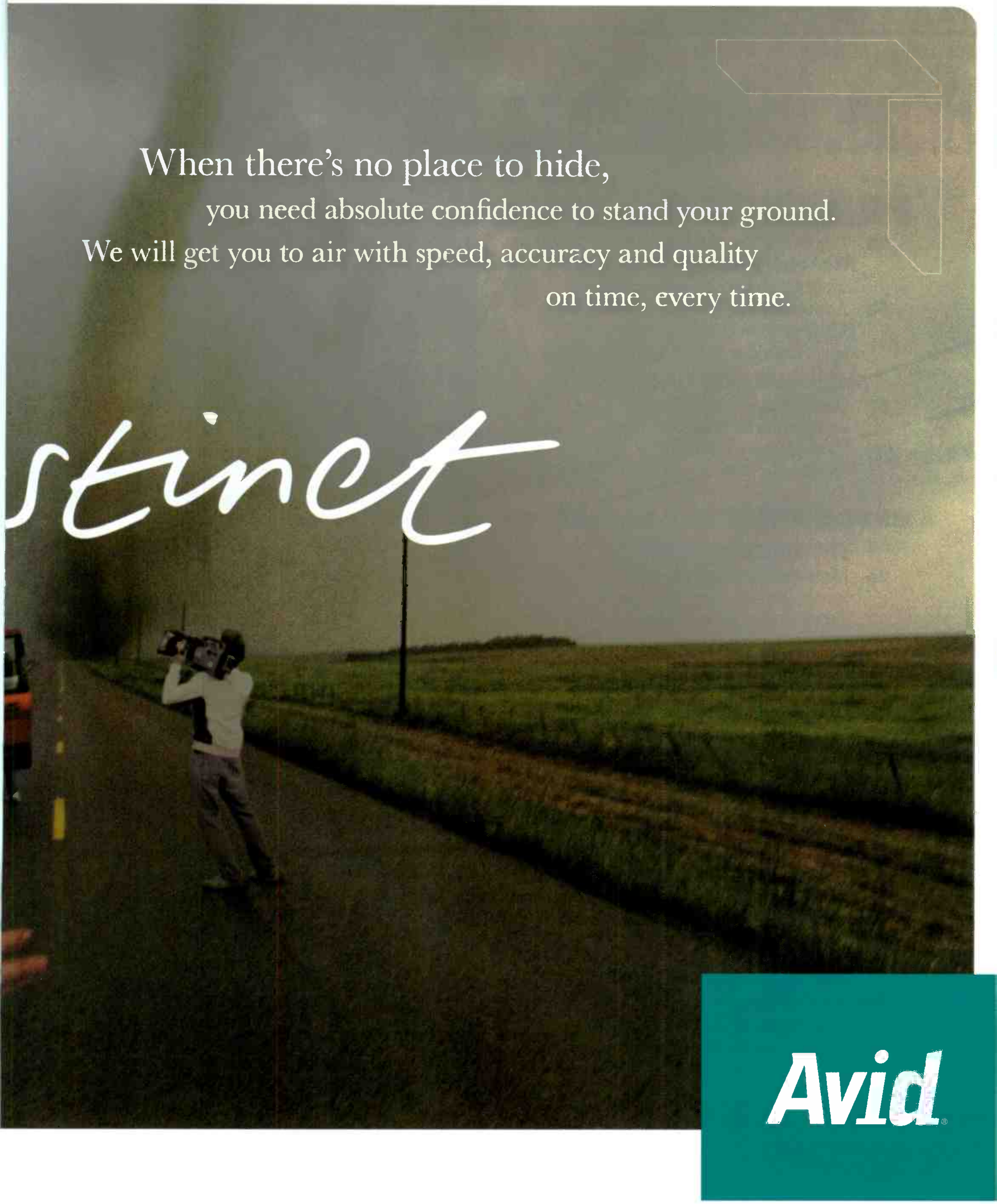
ACTIVE STORAGE
Servers do double duty

METADATA EXCHANGE
Finding a common system language

VIDEO OVER WI-FI
Is it really a working solution?

A PENTON MEDIA PUBLICATION


pure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you need absolute confidence to stand your ground.
We will get you to air with speed, accuracy and quality
on time, every time.
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BroadcastEngineering®

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DIGITAL HANDBOOK

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ON THE COVER:

Legalizing video can degrade the quality. Cover art concept created by Robin Metheny. Waveform images provided by Tektronix.

THIS MONTH'S FREEZEFRAME QUESTION

We all know about MPEG-1, -2, -4, -7 and even -21, but what about MPEG-3,-5 and -6? What is the status and application for these three MPEG labels?

Readers submitting correct answers will be entered in a drawing for a copy of the new book, "IPTV Crash Course" by Joseph Weber, Ph.D. and Tom Newberry. Enter by e-mail. Title your entry "Freezeframe-July" in the subject field and send it to: editor@broadcastengineering.com. Only those entries complete with a return mailing address will be eligible for the drawing. Entries must be received by Sept. 1, 2007.

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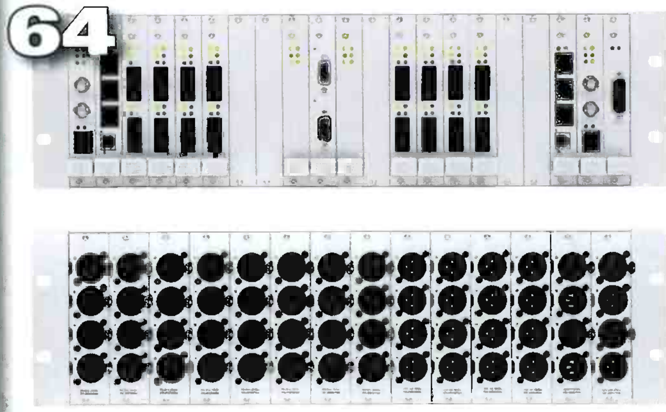
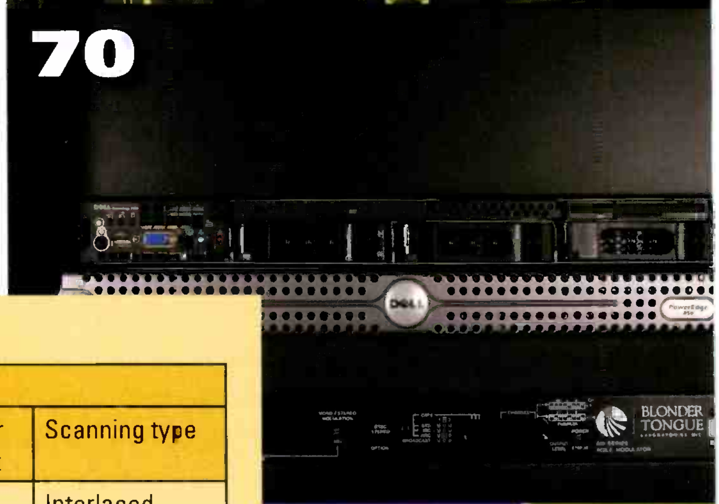
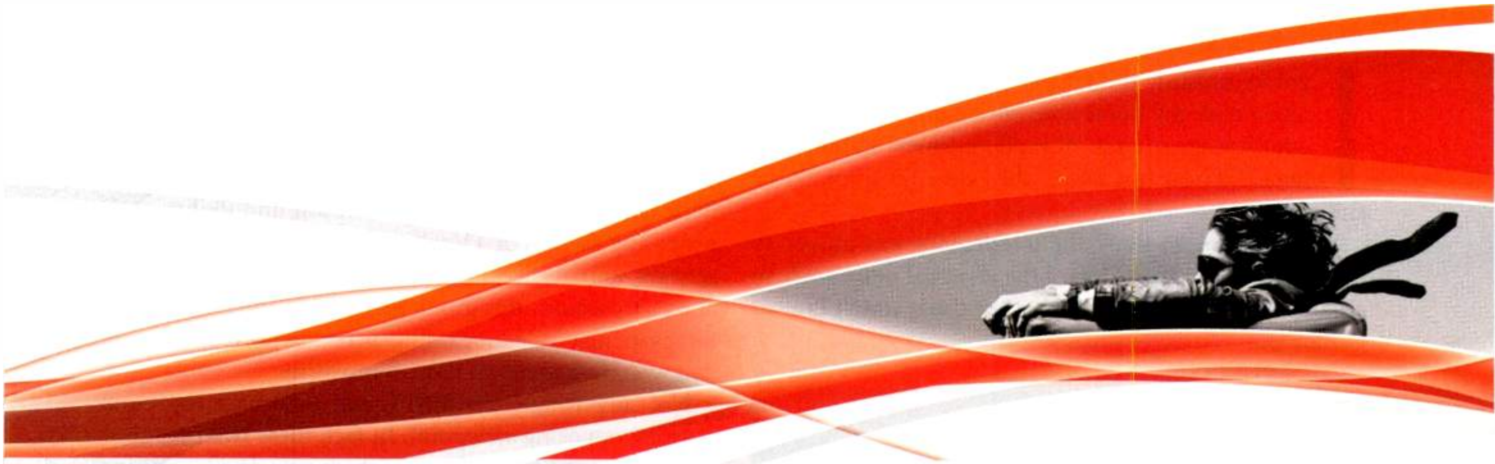




APRIL'S FREEZEFRAME ANSWER

Video raster sizes						
System	Visual width	Visual height	Aspect ratio	Raster width	Raster height	Scanning type
525i30	720	480	4:3	780	525	Interlaced
625i25	720	576	4:3	864	625	Interlaced
625i25Wide	720	576	16:9	864	625	Interlaced
720p60	1280	720	16:9	1650	750	Progressive
1080i25	1920	1080	16:9	2640	1125	Progressive
1035i30	1920	1035	17:9	2200	1125	Interlaced
1080p60	1920	1080	16:9	2200	1125	Progressive
1080p25	1920	1080	16:9	2640	1125	Progressive
1080p24	1920	1080	16:9	2750	1125	Progressive

APRIL WINNER: Al Van Dinteren




63
maxell
D5C63M
XD
1/2 DIGITAL
64
HDCAM
maxell
LTO
Ultrium3
32
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Digital
BETACAM
126
maxell
Professional Disc 23GB

Could interference kill DTV?

I got to seriously thinking about interference recently when both my home and work computers began to emit strange sounds. At random times, on both systems, I'd hear this buzz...dit...dit...dit through the audio system.

I was starting to think the interference was unique to Kansas City, but when I heard the identical noise while in an office in San Jose, I knew that the cause wasn't limited to Kansas.

A few minutes on the Internet led me to the likely culprit, and a couple of quick tests confirmed the offending source. GSM-based cell phones are interfering with my computers. Every time my — or a nearby — GSM phone pings the nearest tower, saying, "Here I am," that transmission is picked up by the computer's audio system. It's not just a computer issue because a wide variety of devices are susceptible to external interference — even your digital television.

In March, the FCC's Office of Engineering and Technology (OET) released a 200-plus page report (FCC/OET 07-TR-1003) concerning interference to DTV receivers. You can read the report yourself, but it basically states: "No receiver appeared to fully achieve the ATSC recommended guidelines for interference rejection performance — guidelines that are less stringent than the receiver performance assumptions on which current DTV interference protection criteria are based."

Reading between the lines, it says that the odds of your OTA viewers getting the perfectly clear digital image you are transmitting is as likely as finding an honest politician.

A group of familiar consumer manufacturers — Dell, EarthLink, Google, HP, Intel, Microsoft and Philips — is proposing the use of TV white space for a variety of new services and devices. Collectively known as the White Spaces Coalition, this group is lobbying the FCC heavily for particular rules regarding personal/portable devices that would transmit on those frequencies.

Not surprisingly, the MSTV and NAB have expressed a strong opposing viewpoint. In fact, these two organizations claim a high likelihood of these new devices causing massive interference to OTA DTV signals.

In their May 15, 2007, reply comments, MSTV and NAB claim that the FCC's OET report "... shows that a 100mW transmitter operating on the first adjacent channel could cause interference to DTV viewers in 80 percent to 87 percent of a TV station's service area."

The MSTV and NAB also state that a study by the Canadian Research Centre and University of Kansas suggests that interference from white space unlicensed devices could interfere with viewers' reception in more than 95 percent of a TV station's area.

The situation probably isn't that dire, but remember who the members of the coalition are. It's composed of the same guys who want you to always back up your computer (because you know it'll fail), click on start to turn it off, and replace it every two years. Believe them? I don't think so.

Oh, and the cell phone vendor's solution to my GSM phone interference? Separate the phone from the interfered with device by placing it in another room.

Hmmm ... That'll work well in my office and car. **BE**

Brad Dick

EDITORIAL DIRECTOR
Send comments to: editor@broadcastengineering.com

Analyze this

Aldo Cugnini:

In the January article "Compression toolkit," you discuss the typical and critical test videos for analyzing encoder performance. Where are such discs available? Also, could you recommend a good picture quality analyzer for a comparative analysis?

Anand Dua

Aldo Cugnini responds:

Some test videos include:

- *Ovation Multimedia's AVIA Pro.* The multidisc calibration, set-up and test suite consists of seven DVDs, plus a three-ring bound user manual with a full disc index. The all-inclusive product is designed for video and audio system calibration.
- *Digital Video Essentials (DVE).* Developed by A/V expert Joe Kane, the suite offers a wide range of audio and video test signals for home system tune-up. The set includes many production-valued elements and is available in both consumer and professional versions, the former being included in the latter. The full set contains six discs, covering NTSC, PAL and WMV with both ITU-601 and ITU-709 color encoding.

For picture quality analysis, nothing beats a trained eye. This, however, takes time and skill. A quicker result can be obtained by some automated equipment, such as the following:

- *Tektronix's PQA300.* The picture quality analysis system analyzes picture quality with repeatable, objective measurements that directly replicate subjective human visual assessments. It both generates and analyzes reference test material for testing compressed video systems.
- *KWILL's VP21H.* The video quality analysis system achieves automated, real-time picture quality measurement and analysis by comparing the source and the tested video. Video DNA technology provides objective evaluation that highly correlates with subjective testing.

Coupon confusion

Dear editor:

I just finished reading the March 9, 2007, NTIA final rule regarding the federal government program to provide $40 coupons toward the purchase of DTV set-top converter boxes. At paragraph eight, it states the NTIA considered but rejected a rule that coupons should only be available to households without cable or satellite service. Yet in paragraph 19, the final rule says that in order to obtain a coupon, an applicant must certify that they "only receive over-the-air television signals using an analog-only (NTSC) television receiver."

Huh? This might be fertile ground for your next editorial.

Dane E. Ericksen
Hammett & Edison

Brad Dick responds:

My first comment is, "So, what did you expect from government bureaucrats? Accuracy?"

On the other hand, maybe those folks are so polluted by Potomac fever (or so young) that they don't know where or how television originates. We've now reached the point where an entire generation of viewers have been raised on pay-TV cable! How would these people know the difference between free, over-the-air, NTSC, analog, digital or any other kind of TV?

The only thing the NTIA's plan is going to do is waste another billion or so of our tax dollars providing cover for politicians.

Compression basics

Dear editor:

If I want to transmit a single 640 x 480i SDTV format, do I have to compress that data with MPEG-2 if I want to broadcast it over the 6MHz standard frequency envelope found in terrestrial broadcasting?

Bill Lloyd

John Luff responds:

First off, 640 x 480i is neither a broadcast nor computer format. 640 is the horizontal count for one of the VGA family of standards. Interlace, however, is used only in broadcast. U.S. NTSC terrestrial broadcasting can, however, deliver an analog signal produced with this format, at least until February 2009, when analog broadcasting ends.

Unless the signal is played over an analog (NTSC) channel, compression must be used. 640 x 480/30i produces 147Mb/s of active picture data alone, assuming 8 bits per pixel 4:2:2 coding, plus audio and some overhead for synchronization. To fit into a 6MHz DTV channel, that requires a compression ratio of more than 7.6:1. MPEG-2 is the worldwide standard for terrestrial broadcasting, though the channel bandwidth and modulation vary. **BE**

Test Your Knowledge!

See the Freezeframe question of the month on page 6.

Send answers to editor@broadcastengineering.com

The UTAH-400 Router Gives You The Power

When you get your hands on a UTAH-400, you've got all the routing power you'll ever need.

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More timely than news

Broadcasters started real-time delivery. Now they must meet consumers' anywhere at anytime demands.

BY CRAIG BIRKMAIER

Do you remember the good old days when television news began covering real-time and near real-time news events?

I was in high school when I watched the events unfold in Dallas after President Kennedy was shot. I sat mesmerized as Jack Ruby murdered Lee Harvey Oswald before Kennedy was even laid to rest. Two years later — while still in high school — I produced my first video documentary, examining the conspiracy theories surrounding the assassination.

By 1971, I was directing the news for the ABC affiliate in Tampa, FL. The news crews shot 16mm film every day and rushed back to the station by 4 p.m. so they could process the film and splice together their stories in time for the 6 p.m. newscast. While they were editing, I was often colorizing AP wire photos with translucent markers. (Talk about the news highlights of the day.)

While all of this was going on, the networks were pushing the envelope, covering a war halfway around the world in Vietnam. For the first time in history, Americans experienced warfare on the TVs in their family rooms within days of the film being shot. Before that, my parents went to the local theater to watch the newsreels.

Changing times

A few decades and a new world of technology later, news crews now sit on the beach broadcasting live via satellite as troops land for an invasion. We live in a world of virtually instant ENG and made-for-TV live news events.

Who can forget the morning of Sept. 11, 2001, when the news broke that a plane had hit the World Trade Center? I turned on the TV and watched the second plane hit the other tower. We experienced the tragedy as it happened, together as a nation.

News crews now sit on the beach broadcasting live via satellite as troops land for an invasion.

Less dramatic, but equally relevant, is the growth of live faux news. Crowds gather for a demonstration, pose for the ENG cameras and then disperse the moment the ENG trucks leave. Much of what passes for news these days is planned and staged. There are more TV studios in Washington, D.C., than New York and Hollywood combined. Capturing real, live news is rare and happens by chance. We have an appetite for more live news than ever. Enter the viewer-reporter.

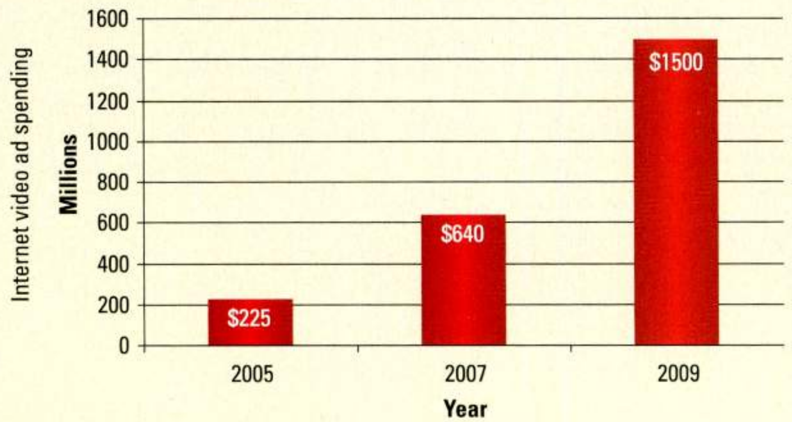
For example, a French videographer, working on a documentary about New York firefighters, captured the only high-quality video of the first plane hitting the World Trade Center.

Cameras in police cruisers, and security cameras on street corners and in shopping center parking lots more frequently capture news events as they unfold. Today, the average citizen captures that one-in-a-million still image or video clip of a news event as it happens via his or her cell phone.

One might think that the technology for portable ENG has completely matured — or even that it has come a bit too far. Some believe that the next big thing in TV news has little to do with the ability to capture news anywhere, anytime, in real time. Rather, the world of news is being

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

Internet video advertising revenues increasing
In 2009, revenues will reach $1.5 billion



Source: eMarketer *www.emarketer.com*

transformed by the Internet and the ability for consumers to find the news they want and to consume it anywhere, anytime, often in mobile and portable viewing environments.

A more enlightened view is that ubiquitous IP networking is about to revolutionize the techniques used to capture the news and the ways in which those stories will be distributed and viewed.

Ubiquitous IP networking is about to revolutionize the techniques used to capture the news.

Untethered ... but still on a leash

ENG technologies keep evolving, in large part because of the high cost to put news crews on the street or in the air. In the '60s, only the networks could afford to cover news events live, relying on the telephone companies to get their signals back to the operation centers in Los Angeles and New York. Satellites transformed the news landscape at the same time the film cameras were being replaced by portable cameras and U-matic tape decks, which evolved into camcorders.

In recent years, many stations purchased inexpensive DV camcorders for ENG applications, allowing them to put more cameras on the street — and to throw them away when they break. The more innovative stations have taken advantage of the digital workflow enabled by DV camcorders, which can easily feed notebook and desktop video editing systems. Now this workflow is being updated with tapeless camcorders that use solid-state memory and recordable optical discs.

ENG trucks are now commonplace. While they use wireless satellite or microwave links to get the signals back to broadcasters, in most cases, the cameras are still tethered to the truck. That too is changing thanks to advances in video compression and wireless microwave links between camera and truck.

At NAB, JVC introduced the ProHD Libre, a 720p HD camcorder with integrated MPEG-2 compression and an onboard camera-back transmitter developed by Broadcast Microwave Services. The system allows ENG crews to work in locations away from the ENG truck where it is not feasible to pull cables. These capabilities helped earn the Libre a *Broadcast Engineering* Pick Hit award at NAB2007.

New technology allows crews to venture farther from the ENG truck. For example, the JVC ProHD Libre camcorder has an onboard camera-back transmitter developed by Broadcast Microwave Systems.

Compact video compression products are also making it possible to use a wide range of wireless IP networks to send stories back to the station, both as live feeds or as downloaded files. In some cases, the compression technology is little more than a software package that runs on a laptop computer, which also serves as the editing system for packaged stories.

In essence, it is now feasible to feed ENG-quality video from any building with a broadband IP network. Advances in wireless network bandwidth are likely to make it possible to feed live HD video from virtually any location in most cities within the next five years.

These advances, along with the relentless advances in the Swiss Army knife of mobile communications — the cell phone/PDA — are creating new venues for the consumption of news as people commute or sit in airports.

YouNews

The trend away from packaged TV news may well be the biggest story here. Alternative distribution channels that rely on the Internet are beginning to challenge the major news media outlets. Blogs, podcasts and video-sharing services such as YouTube are giving voice to many alternative viewpoints and to information rarely covered by the big news organizations.

Bottom line: Portable news technology is changing the way news is covered. Freed from the cost and distribution headaches of paper, even local newspaper reporters may soon carry camcorders instead of notebooks and compete for eyeballs.

Newspapers, radio stations and TV stations might already have merged were it not for government regulation, but that's another story. BE

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

? Send questions and comments to: craig.birkmaier@penton.com

Web link

Broadcast Engineering NAB2007 Pick Hits; June 2007 issue
http://broadcastengineering.com/products/broadcasting_nab_pickhits/index.html

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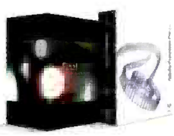

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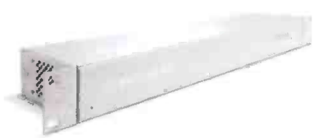

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The Drawn Together images are courtesy of Comedy Partners.

Converting to DTV

New TV label requirements educate consumers.

BY HARRY C. MARTIN

In May, the FCC addressed some practical issues related to the DTV conversion, which is now set for February 2009. Below is a summary of the actions taken.

Digital labeling requirements

To promote awareness of how the DTV transition will affect consumers, the commission adopted a labeling requirement, effective immediately. It requires all new analog-only TV sets to contain a label on the actual product, or positioned next to the product, informing potential purchasers of the limitations of the TV set and how those limitations could affect the product's usefulness. Online marketers must display the same notice next to the image of the TV set.

This action comes as a result of recent studies that indicate more than 60 percent of the public are not aware of the upcoming DTV transition.

Digital signal carriage

The commission is proposing giving cable operators two options:

1. Carry the signals of all must-carry stations in an analog format to all analog cable subscribers.
2. Carry all-digital system signals only in digital format.

This is, of course, provided that all subscribers have the necessary equipment to view the broadcast content. The goal is to ensure that all cable subscribers have the ability to watch all local must-carry programming.

Additionally, the FCC has reaffirmed that when a broadcast station is transmitting an HD signal, cable systems must carry such signals in HD format without material degradation. The proposal does not address multichannel must-carry of a TV station's multiple DTV channels.

Waiver requests and DTV construction permit extensions

By July 2006, all TV licensees were required to build out digital facilities that serve 80 percent to 100 percent of their analog service areas, depending on the post-transition DTV channel. Licensees that did not meet the deadline faced the possibility of losing considerable interference protection for their permanent facility.

As a result of the deadline, 145 stations filed for construction permit extensions (to construct even the basic facility), and 192 stations filed for interference protection deadline waivers. The commission set new deadlines or, in some cases, fashioned broad relief for those stations still not in compliance with the requirement.

More than 60 percent of the parties received extensions until Nov. 18, 2007. The affected stations include those that claimed equipment delays, financial problems or other circumstances beyond their control had prevented them from meeting the earlier construction deadlines.

In these cases, the affected stations must construct their full digital facility, or they must complete construction if they are operating with less than full facilities. Other stations, for example those assigned one digital channel for the pretransition period and another for post-transition, received a temporary reprieve from constructing their DTV facilities twice.

The steps up to the DTV transition

In a new rulemaking proceeding, the FCC asks what practical steps it will have to take to assure that all full-power stations are operating digitally by Feb. 17, 2009.

One proposal suggests that every TV broadcaster file a report (new Form 387) with the commission providing a snapshot of where the station is in relation to the completion of its digital facility and what steps still need to be taken.

The proceeding includes a table listing 752 stations that are ready to operate with their licensed post-transition DTV facilities. The commission asked the listed stations to advise the agency if they are not ready to operate their DTV facilities.

The proceeding also addresses the issue of permitting stations with different pre- and post-transitional DTV channels to construct only on the post-transition channel.

The commission has also proposed to adopt a 0.5 percent interference standard for all maximization and new allotment requests in the post-transition world. Previously, the commission permitted a proposed modification or allotment to cause up to 2 percent interference, but now it intends to tighten the interference protection rights. BE

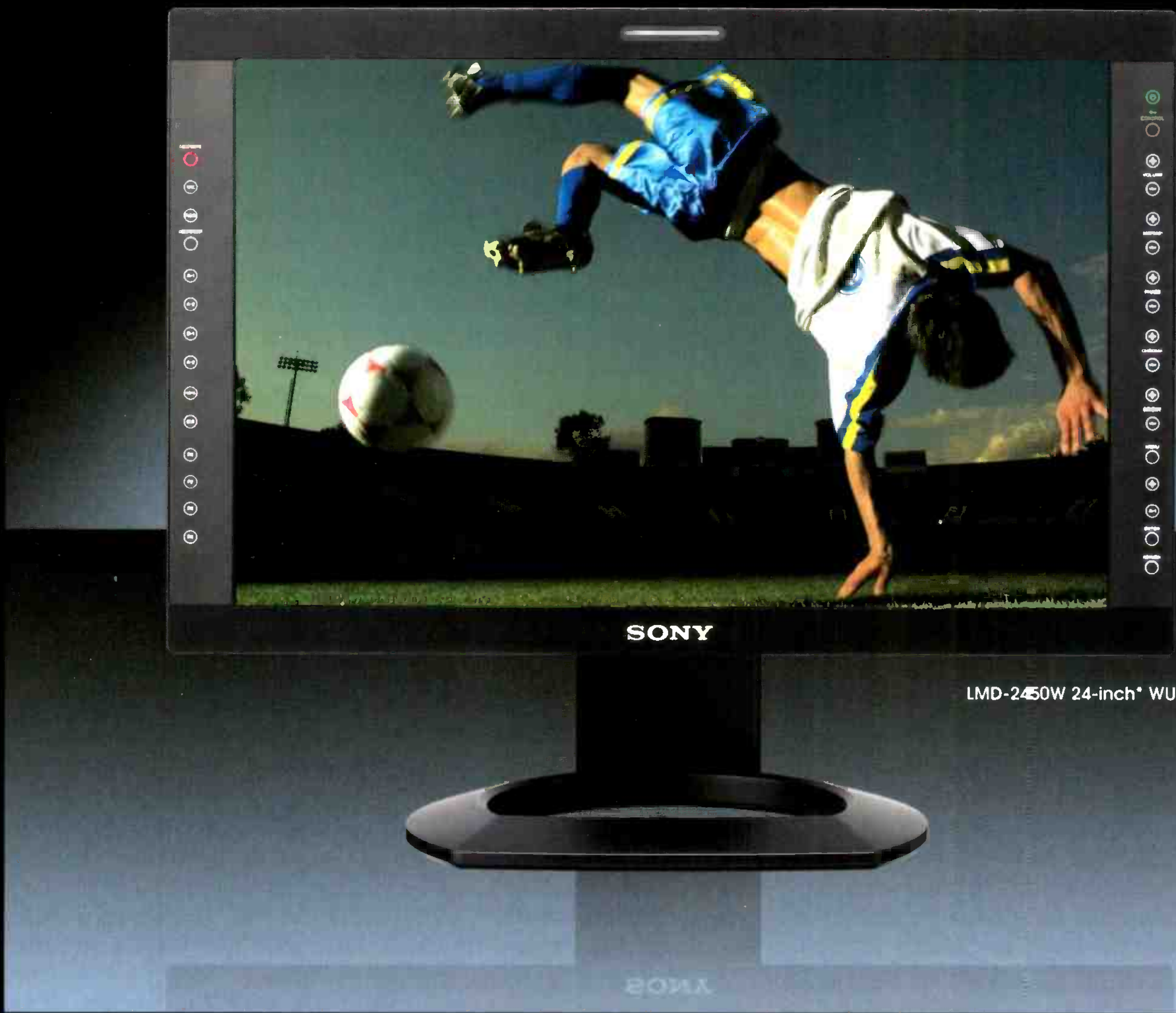
Harry C. Martin is a past president of the Federal Communications Bar Association and a member of Fletcher, Heald and Hildreth PLC.

Dateline

- TV stations in Illinois and Wisconsin must file their biennial ownership reports by August 1.
- By August 1, TV stations, including Class A stations, in the following states must place their annual EEO reports in their public files and post them on their Web sites: California, Illinois, North Carolina, South Carolina and Wisconsin.

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

SONY



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Video over Wi-Fi

The digital connection begins to blur the distinction between the Internet and broadcast video.

BY ALDO CUGNINI

Wi-Fi is all around us, destined to be as ubiquitous as terrestrial broadcast. Can it eventually replace broadcast? Could it make DTV obsolete in a short time? To find out, we need to understand the elements of the system, and see why it's become so widespread.

Alphanumeric soup

First things first. Contrary to widespread belief, the term "Wi-Fi" does not mean "wireless fidelity," though that phrase has been used to promote the system. Wi-Fi is a name trademarked by the Wi-Fi Alliance, a global, nonprofit organization whose goal is to drive the adoption of a single, worldwide-accepted standard for high-speed wireless LANs.

By various accounts, Wi-Fi is not short for anything, having been developed by a branding consultancy searching for a catchy name. Others put the origin at a contracted variation of "wireless physical layer."

Naming aside, Wi-Fi operates in accordance with the 802.11 set of IEEE standards, with amendments including nearly every letter of the alphabet — 802.11a, 802.11b and so forth. The standard employs orthogonal frequency-division multiplexing (OFDM) — used in DSL services, DVB and integrated services digital broadcasting (ISDB) — with varying bands, modulation and occupied bandwidths. The most popular variants are listed in Table 1.

Standard	Spectrum	Maximum data rate	Typical data rate
802.11a	5GHz	54Mb/s	25Mb/s
802.11b	2.4GHz	11Mb/s	5.5Mb/s
802.11g	2.4GHz	54Mb/s	24Mb/s
802.11n	2.4GHz or 5GHz	700Mb/s	100Mb/s-210Mb/s

Table 1. Wi-Fi standards cover different bands and rates.

In the 2.4GHz spectrum, 802.11b, 802.11g and 802.11n each specify 14 overlapping channels, with center frequencies 5MHz apart. The spectral mask for 802.11b requires that the signal be attenuated by at least 30dB at ±11MHz and at least 50dB at ±22MHz from the center frequency. The masks for 802.11a and 802.11g have related, though somewhat more involved, requirements, with the result that an 802.11a/b/g product occupies the equivalent of about five channels. Thus, in a crowded situation, communications in the 2.4GHz band are limited to channels 1, 6 and 11. An 802.11g network is compatible with both 802.11g and 802.11b devices.

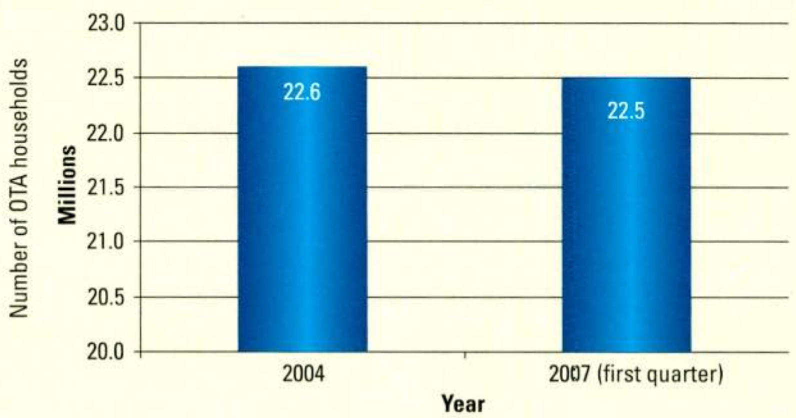
The 802.11n standard, expected to be published September 2008, uses multiple-input multiple-output (MIMO) technology that employs multiple antennas and possibly multiple tuners. The D-Link Super G system uses two 802.11g channels to achieve a typical data rate of 40Mb/s to 60Mb/s.

While the 802.11a and 802.11g standards offer the same data rates, the 5GHz 802.11a/n band has more channels and is less susceptible to interference from common devices, such as 2.4GHz cordless phones, cell phones and microwave ovens. Interference from neighboring wireless networks can be a problem in the systems with fewer channels, a problem exacerbated by the popularity of

FRAME GRAB *A look at tomorrow's technology*

Over-the-air households are slow to transition to DTV

Today, 22.5 million households still rely on OTA television



Source: Association of Public Television Stations *www.apts.com*

802.11b. Thus, the 5GHz solutions can provide a better overall wireless connection. However, the higher frequency band may have slightly less range because of the greater signal attenuation through walls.

Figure 1. Wi-Fi can relay video, supplied by a PC, to a remote display.

While it may be obvious that the difference between these technologies and broadcasting is that Wi-Fi is bidirectional, there is a more subtle component, one that makes the connection much more robust. Not only can one communicate in both directions — a must for Internet traffic — but the wireless LAN operates much like a wired LAN, with handshaking an important element. The channels are constantly being negotiated, and if there is interference that disrupts the communications, then the communicating parties are instructed to retransmit the faulty data. Thus, when the channel gets bad, the data does not get corrupted; the data rate just goes down. This is the beauty of the system — reliable, multirate data communications.

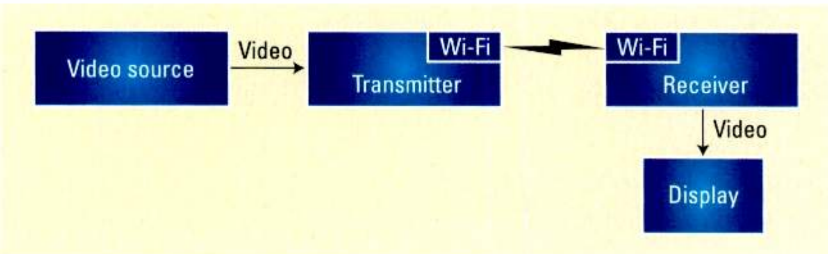


Figure 2. Point-to-point Wi-Fi can replace cumbersome cabling.

When the channel gets bad, the data does not get corrupted; the data rate just goes down. This is the beauty of the system — reliable, multirate data communications.

Point-to-point vs. broadcast

One of the great attractions of Wi-Fi is that, with a digital connection, any data can be transmitted, including video. The Microsoft Media Center Extender for Xbox is one such product. With a wireless connection to a PC running Windows Media Center, the Xbox console can display video originating from the PC on a TV connected to the Xbox. (See Figure 1.)

The video engine in this case is the game console. However, there are other implementations of this kind of system, where the receiver is a dedicated adapter that connects the display to the wireless network.

Another point-to-point application merely replaces the wired interface used to connect a video source (A/V center or similar) to a display. In this setup, a Wi-Fi video transmitter and receiver provide an analog television user with installation mobility, allowing display placement without a wired connection to the video sources. Using MPEG or similar compression and 802.11a, units can deliver up to 350ft of range (line-of-sight without obstructions) in a small STB-like form factor. Multiple units can be operated simultaneously, and analog NTSC, PAL and SECAM can be supported. (See Figure 2.)

One such unit operates at an actual payload data rate of 4Mb/s, 8Mb/s or 14Mb/s. The Advanced Encryption Standard (AES) is used to assure privacy, and system latency is specified at less than one-second roundtrip. Composite, S-video or HDMI connections are available, and stereo audio can be provided. An integrated IR receiver and IR blaster can be used as well to provide support for remote functions on the video source. Of course, the entire receiver can be integrated with a display, forming a new type of Wi-Fi television. Similarly, various conference-room video projectors now use 802.11b and 802.11g technology to receive video (often at low refresh rates) from PCs without the need for clumsy cabling.

Support for Wi-Fi HD video is just emerging, including HDMI interface. Amimon's WHDI provides wireless HD video connectivity at a quality equivalent to that achieved with HDMI. It uses the MIMO protocol. A demo last year delivered uncompressed 720p content at an equivalent data rate of 1.3Gb/s, from an HD DVD player to a projector. The chip set supports transmission of video at up to 3Gb/s — possibly using lossless or near-lossless JPEG compression — which can support 1080p content. The technology has been demonstrated at ranges of up to 100ft through walls, and has a latency of less than one millisecond.

Broadcast Wi-Fi

The most accessible version of this delivery is already in growing use — Wi-Fi connection of a PC. As such, any PC with a wireless card can receive video over the Internet, but some uses

are starting to blur the distinction between Internet and broadcast video. Two years ago, Dartmouth College beefed up its Wi-Fi network in Hanover, NH, to support four channels of educational video. Starting with a little more than 600 access points covering 150 buildings in one square mile, the system today comprises 1300 wireless access points. Certain areas of the campus carry a limited selection of channels from DarTV, a service that delivers broadcast television over Dartmouth's data network. Forty channels of both educational and recreational TV are already available on the wired network.

An interesting spinoff of this infrastructure now promises wireless video delivery to video-centric handheld displays, such as the just-released Archos 604 WiFi.

A new Wi-Fi system called WiMAX promises to enable a connection range of at least a few miles from an access point. However, the size and power consumption of the WiMAX receiver still need improvement to service a handheld class of products and users. The FCC recently approved the first WiMAX wireless broadband interface card for notebook computers.

The original wireless TV system could get serious competition from Wi-Fi networks in the not too distant future.

The future

With numerous metropolitan areas now offering ubiquitous Wi-Fi access, it seems conceivable that the original wireless TV system — good old VHF/UHF television, even in digital form — could get serious competition from Wi-Fi networks in the not too distant future, not only for content, but for actual access footprint.

Nonetheless, when channel interference occurs and video data is retransmitted, the lapse in timing must be accommodated somehow. One solution is to switch to lower data rates in the video, but this is complicated by the need to maintain program continuity and the requirement of a dynamic video compression rate. Don't be too surprised if all of these issues are quickly resolved and yet another viable medium for video delivery emerges. BE

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Metadata interchange

The technology will standardize communication between systems in broadcast workflows.

BY BRAD GILMER

Metadata has been a popular topic for several years, but in many cases, the discussions have fallen short. Frequently, the topic of preserving metadata during file transfer is discussed, but this use case does not encompass a facility-wide view, nor does it address critical differences in types of metadata and how this metadata can be used outside of simple file transfer.

Metadata interchange must go beyond simple exchange of information about a piece of video or audio in a file. It must become a part of a higher level system workflow.

In 1998, an EBU/SMPTE Task Force directly addressed the issue of metadata. While SMPTE and other organizations have done a lot of work regarding metadata, there is still much to be done.

Essential metadata

Let's begin with some important concepts. Perhaps you want to send a 30-second spot from one place to another as a file. In this scenario, there are some things that the receiving equipment must know to correctly play the spot. I am not talking about the name of the spot. You could play the spot without any difficulty even if you did not know its name. I am talking about the technical information about the content, such as the frame rate or compression parameters. While you might be able to guess at these parameters, it would be easier to play the spot if this information was included when you sent the file.

Metadata critical for proper content reproduction at the receiving end is known as essential metadata. It is important to keep this metadata tightly bound to the content. To achieve this, essential metadata is frequently included in the data area of the video or audio format (this area is known as the ancillary data space in serial digital video), or it is sent as part of the data stream in the case of compressed packetized content (MPEG program clock reference or program transport stream, for example). Some system information may also be essential — for example, time code or unique material identifiers (UMIDs).

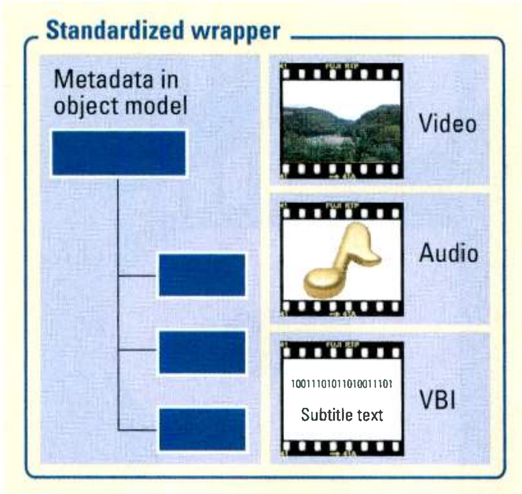

Figure 1. The EBU/SMPTE Task Force recognized that there was a need for a standardized wrapper that could hold video, audio, vertical blanking interval (VBI) and other data essence, along with metadata in an object model.

Data essence

Essential metadata should not be confused with data essence. Data essence is a piece of content that appears in the form of data, such as closed captioning or interactive cues. Just like video and audio, it is part of the program. Data essence is not essential metadata because it is not information about the program, but rather a part of the program itself.

Compositional metadata

Another common type of metadata is compositional metadata. This metadata, which is frequently encountered in editing environments, describes how various pieces of video, audio and data essence are related in time, so as to create a finished program.

Compositional metadata is not as critical as essential metadata because it is not required to view a piece of video. It is, however, important when describing how various pieces of video and audio should be edited together to make the final version of a program.

Standardized wrappers

The Task Force recognized that there was a need for a standardized wrapper to hold various pieces of content and metadata. It would be much simpler to handle a 30-second spot as a single file rather than as four separate files (a video file, an audio file, a closed-captioning file and a metadata file).

The wrapper is a container that can hold any of the many different video, audio and data types in common use today, along with essential metadata, compositional metadata and other metadata. Examples of standardized wrappers include the Media eXchange Format (MXF) and the Advanced Authoring Format (AAF).

These wrappers include the concept of a common object model. (See Figure 1.) A common object model means that there is a universal way of storing matrox MXO™

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metadata within these wrapper files and that the place where the metadata is stored conveys information about the metadata. In other words, a time code associated with a particular video track is stored in a specific location in the data model so that someone looking at this time code knows that it is associated with a video track and not an audio track that might also be contained in the wrapper.

Exchanging files that contain video, audio and metadata is certainly a critical application in broadcast facilities, but this only scratches the surface of where broadcasters want to go.

All of this work is well advanced, and the industry is now focusing on how to use these wrappers and metadata to develop solutions in particular application areas.

The next step: application workflows

Exchanging files that contain video, audio and metadata is certainly a critical application in broadcast facilities, but it is important to recognize that this only scratches the surface of where broadcasters want to go. The next critical area of work involves moving metadata and passing messages at the system level.

For example, let's say that a broadcaster is ingesting several commercials at the same time. Wouldn't it be beneficial if there was a common way to indicate to the automation system that the ingest was complete?

Here is another example: A station group has several servers loaded with MXF files. A program management system needs to know what programs are available on the servers. It sends a message to a Web service, which returns a list of the available programs.

The first example involves the exchange of event-related metadata or messaging across a network. The second example involves extracting metadata from the MXF files and sending it across a network to be stored in a database. These are two examples of processes associated with application workflows. The power of these processes extends well beyond simple file transfer, and I contend that this is the level of functionality that users want when converting from analog- to IT-based facilities. Fortunately, work is now under way to deliver this functionality.

If broadcasters want to build application workflows, such as those based on automated commercial delivery or automated content repurposing, then they must establish metadata pipelines that are consistent throughout their facility. Metadata must be available at different steps throughout the workflow process. This metadata should be available through standardized means.

Imagine how difficult and expensive it would be to develop the connections described above between a program management system and server systems if each one of these components spoke a different language. One potential solution is to develop standardized software interfaces to provide the functionality needed to support a particular workflow.

Frameworks

There is good news. The software industry has developed frameworks that help engineers develop and deploy standardized interfaces. One of these frameworks is called software-oriented architectures.

Another important concept is Web services. These services are available on a network that can perform specific tasks on behalf of someone else. For example, a Web service might automatically contact all MXF servers on a network and prepare a list of content available on that network.

In the example above, the program management system could contact the Web service and ask it what content was available without having to contact each server itself. Furthermore, it could make this query through standardized software calls. Other systems could make the same inquiry of the same Web service using the same software function calls. This is an extremely powerful concept.

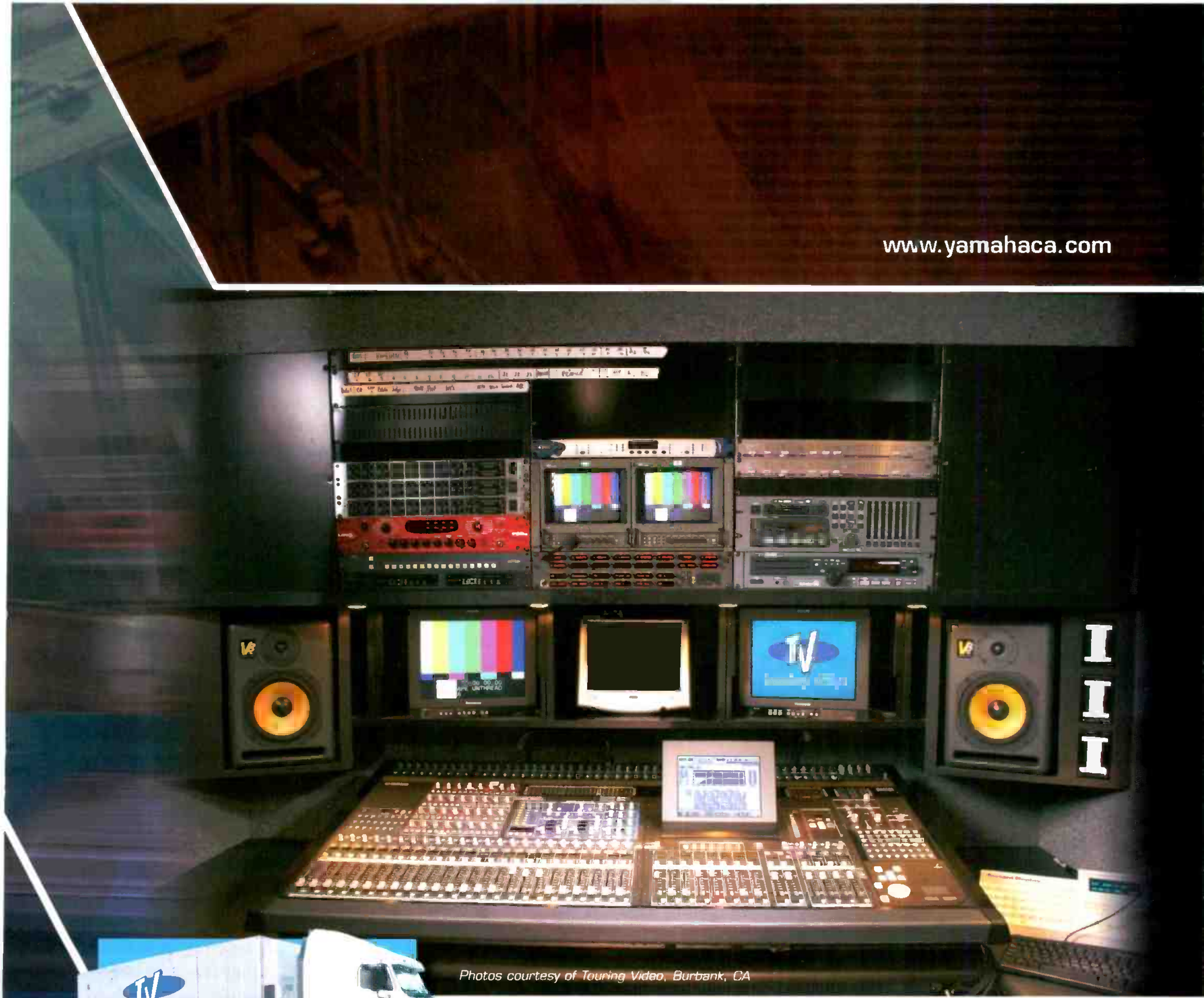
Conclusion

SMPTE's S22-10 group is standardizing the Broadcast Exchange Format (BXF), which embodies many of these concepts. (To learn more about BXF, read "Modern automation" on page 44.) The Media Dispatch Group is developing the Media Dispatch Protocol (MDP) to standardize system functions to allow devices to request delivery of content and monitor the progress of the transfer at a system level.

This is a great new area of study for the industry. While it may take some time for the benefits of this work to reach the broadcaster, when they do, they will have a profound effect on workflows and facilities. **BE**

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

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



Photos courtesy of Touring Video, Burbank, CA

Camera support

New accessories and add-ons improve camera support.

BY SUSAN ANDERSON, MANAGING EDITOR

Selecting the right camera support system is critical to a production's success. Fortunately, a myriad of camera support solutions have been introduced recently. Here is a review of some of those systems.

Pan and tilt heads

Miller Camera Support offers a new range of Arrow fluid heads, including the Arrow 25, Arrow 40 and Arrow 55.

The Arrow 25 supports the latest acquisition formats, from the film-ready HDV alternatives to lightweight ENG camcorders. It features 5+5 selectable pan and tilt drag positions to allow camera operators to choose from repeatable light to heavy drag settings. Four selectable counterbalance positions combine with a 70mm sliding camera platform to accommodate camera payloads ranging from 7.7lbs to 30.9lbs.

The Arrow 40 fluid head features seven-position pan and tilt drag selection, four counterbalance positions to suit portable ENG camcorders weighing 15.4lbs to 35.2lbs, rear-mount controls, and backlit illumination on pan and tilt indicators and bubble level.

The Arrow 55 is designed for documentary, lifestyle and HD productions, as well as long-lens shooting environments or in studio EFP configurations. It accommodates a higher load capacity of 22lbs to 55.1lbs. Features include seven-position pan and tilt drag, four counterbalance positions to suit all portable EFP camcorders, rear-mount controls, and backlit illumination on pan and tilt indicators and bubble level.

OConnor recently introduced the 120EX extended capacity fluid head. The unit features a stepless counterbalance system as well as an ultra-smooth pan and tilt fluid drag designed for film-style shooting.

It delivers counterbalance through the full ±90-degree forward and backward range for camera packages weighing from 30lbs to 120lbs. In the EX-mode, the unit can counterbalance up to 240lbs at a tilt range of ±60 degrees, based on an 8in center of gravity.

OConnor's 120EX is designed for large cameras and film-style shooting.

Panther's Trixy remote head weighs 11lbs and can carry a 33lb camera load. It comes with external motors to drive the lens zoom, focus and iris controls from all lens manufacturers. All motors, including the lens control motor, are controlled via CAN bus. A single cable provides the head with all necessary controls, signal and power. Slip rings allow unlimited movements on all three axes.

Sachtler's new fluid heads — the FSB 2 and the FSB 6 — are designed for MiniDV and HDV users. The units feature three damping steps: horizontally, vertically and zero.

The FSB 2 accepts a payload up to 4.4lbs and features a counterbalance of 0 and 1. The FSB 6 accepts a payload from 1lb to 13.2lbs and is available with either the Snap & Go sideload plate S or with the Touch & Go camera plate. The sideload system gives the camera plate a sliding range of 120mm.

For shooting high-speed movement, Shotoku offers the S-DASH pan and tilt head. It delivers precise response in complete silence via direct drive motors and digital control.

The unit's pan-bar controller takes the form of a small pan and tilt head that can carry a viewfinder monitor TV and standard lens hand controls. Ratio mode allows the operator to modify the response speed of the head and controls inputs up to 2X to produce 180 degrees of camera movement for 90 degrees of input.

The other control option is the joystick, which is a desktop unit for use in production areas, OB trucks and other confined areas. It operates the pan and tilt functions, while a rocker controls zoom, and a rotary knob is used for focus. RS-422 interfaces allow the operator to be up to 492ft away from the camera for improved operator safety and ease of installation.

Shotoku also recently introduced the CMC-400 camera motion control series, which updates aging robotic heads. The series replaces old electronics with a new design and allows the heads to be integrated with the most current Shotoku systems.

Ethernet or RS-422 connections enable direct connection to other manufacturers' robotic pan and tilt heads. Depending on the type of head used, the series can either be mounted directly to the side of the head using the same mountings as the existing head control unit, or it may be wall-mounted using the brackets supplied.

Telemetrics' PT-LWP-S3 is a weatherproof pan and tilt head for outdoor applications. It includes the electronics needed to interface with the company's new compact weatherproof housing, the LWP-HOU. A weatherproof power supply enclosure provides power to the camera. There is direct Ethernet connectivity for

networked applications, while a mounting base with internal cable management minimizes external cabling.

Telemetrics' PT-LP-S3 offers a serial camera control interface for most Hitachi, Ikegami, JVC, Panasonic and Sony cameras.

For studio applications, the company offers the PT-LP-S3. The pan and tilt head integrates with LCD studio teleprompters, cameras and lenses. It provides camera-operator-like camera movements, and heavy-duty bearings and motors with isolation mounts provide smooth, quiet operation. The unit includes up to 255 presets and is controlled through serial data using RS-232 or RS-422, or through 10/100 Base-T Ethernet.

The head's virtual set interface option includes high-res optical encoder feedback for pan and tilt, as well as Ethernet connectivity and increased load capacity to handle larger teleprompters. The head interfaces to a virtual set lens interface unit, which mounts directly to broadcast lenses and connects through the pan and tilt head to provide high-res positioning feedback of zoom and focus.

Vinten Radamec's FHR-100 Fusion robotic head is designed for use as a standalone device or for seamless integration with the company's FP-145 pedestal and FPH-145 integral height drive and FBH-175 bolt-on height drive. The head has a 121.3lb payload and automatic configuration for directly driving any full servo digital Canon or Fujinon broadcast lens. It contains its own power supply unit, allowing for mains to be taken into the head, eight from the pedestal or directly from the studio supply.

The company's Vector 950 Active head for full-facility studio and OB cameras is suitable for cameras from 35lbs to 264lbs. In addition, Vinten and Canon technology enables precise pan and tilt data from the head to be transmitted to the stabilization system in Canon's long field lenses.

Tripods

For its 100/150mm tripods, Panther introduced a stable metal

spreader. It can be transformed quickly into a dolly when used with the 100/150mm tripod. The spreader can be equipped with either studio wheels with brakes and cable guards or track wheels.

Telemetrics' TelePod is a motorized elevating tripod designed for use in a field environment or studio, where a small footprint, quick setup and transportability are important. The tripod consists of a motorized column with collapsible legs that enable the unit to rise to a manual height of 46in, with an additional motorized elevation range of 26in for a total height of 72in.

Movement is controlled remotely from a control panel or locally with a manual up/down switch on the power supply. The tripod interfaces with the company's CP-ITV control panel for RS-232 control of the camera, pan/tilt/zoom/focus, iris and elevation, as well as the company's robotics products.

Battery systems

Anton/Bauer's ELIPZ 10k battery employs high-capacity Li-Ion cells and delivers all-day operating times for a typical 10W handheld camera. It features an under-the-camera mounting design, which allows one face of the battery to quickly attach to the camera through a shoe-type mount similar to quick-change tripod adapters. The other face of the battery has a universal ¼-20 mounting thread, creating a standard interface with monopods and tripods. The battery lowers the camera's center of gravity while handheld.

Anton/Bauer's ELIPZ 10k battery provides a stable, strong camera platform.

Sachtler recently introduced the FSB CELL, a 7.2V Li-Ion rechargeable battery for MiniDV and HDV cameras. Fitted directly below the camera, it provides eight hours of shooting time. The battery incorporates the company's Snap & Go camera attachment system into its top and bottom surfaces, ensuring easy connection between the camera and the FSB 2 and FSB 6 pan and tilt heads. The result is safe attachment. In addition, the weight of the battery on the fluid head improves handling for camera operators, ensuring even, steady pans.

Stabilization system

Sachtler's artemis DV Pro FX camera stabilization system fits handheld DV and HDV camcorders. It comes with a sled, vest and arm, and features complete control of all adjustments as well as the flexibility needed for smooth camera movements.

An integrated 7in LCD monitor slides and tilts to optimize viewing and aid dynamic balance. The system offers 16:9 and 4:3 aspect ratios. Its smart monitor automatically switches between NTSC and PAL, depending on signal input.

Height drives

For broadcasters that want extra elevation and the ability to move and mount the height drive on a wide variety of legacy pedestals, Shotoku offers the TI-12 robotic height drive. The unit can extend the range of possible shots in robotic studios from a single camera position, making it ideal for news, sports, current affairs and virtual set studios.

Driven by the company's CMC camera control series, the TI-12 features a height range of more than 39in, with a maximum speed of 4.7in per second. With the company's adapter kits, the robotic height drive is compatible with most spring, gas and pneumatic pedestals made by other manufacturers.

Shotoku also introduced the TI-11 i-Height. Using a smooth and vibration-free elevation column, the unit offers a height range of 23.4in. It's compatible with the TG-18 and TG-19 robotic pan and tilt head, and it uses the same drive electronics and interface to eliminate the need for additional control channels and cables.

Dollies and cranes

The Panther Buddy Dolly displays the base of its Evo-Plus camera crane. It can crab and steer but does not come with the electromechanical, computerized column. It can be used with the turnstile attachment or any riser or outrigger via Euro adapter. The dolly has a payload of 550lbs and provides a full range of movement to capture unique camera angles and POV shots.

Panther's Euro-Foxy adapter allows any existing Foxy crane to be used like a jib arm. It can be used as a base with any Panther dolly. With an overall maximum length of 13ft, the Foxy Jib can carry as much as 143lbs.

Trolley systems

The Telemetrics TeleGlide camera trolley system provides fast, smooth and quiet operation, and it is designed to handle heavy loads to accommodate broadcast cameras and lenses. Primarily for use in studio or sports applications, the system is fully compatible with the company's complete line of camera robotics systems.

The system consists of a single or dual trolley for optimal load stabilization. The track is a dual-rail system with connecting brackets. The system is fully servo controlled for smooth operation, with location feedback for preset positioning and motion control. The track is also designed to be cut and curved to user specifications, and it can be floor-, wall- or ceiling-mounted. BE

Life-cycle management

Connecting editing systems to life-cycle management saves broadcasters time and money.

BY WES THIESSEN

A file-based workflow can streamline program playout for broadcasters — when supported by a strong media life-cycle management and digital library system in conjunction with a station automation system, video servers and content delivery services. In many cases, the use of tape has been nearly or totally eliminated.

For editing systems, it's a different story. Only recently, editing systems have started reaping the benefits of a truly tapeless workflow by being integrated with a facility-wide media life-cycle management system. Editing systems have tended to remain islands, with their own specialty storage, shared or otherwise, and ingest (digitization) procedures. Offline editing, or at least screening, is still often done using videotape, with manual logging and clip selection.

Digitizing from videotape to the online editing system occurs in real time. Often it's just easier, especially overnight, to ingest all of the source material, instead of stopping, fast-forwarding and starting the source VTR to ingest only selected clips, even though this uses up a significant amount of the editing storage.

After a clip has been edited, it is usually copied to videotape. Then finally, when it's time to be aired, it is ingested to a playout video server or servers. These real-time manual processes involve converting the editing files to baseband A/V with possible quality hits and re-ingesting to the playout server format. This is an inefficient way to use time, people and machines.

By including editing along with program playout and library functions, a TV facility can gain a more holistic approach to managing its entire workflow, not just a portion of it.

Connecting editing to life-cycle management

A facility-wide media life-cycle management system should be able to manage content across its life cycle — from the time it enters the station to the time it's finally deleted from library storage. By including editing along with program playout and library functions, a TV facility can gain a more holistic approach to managing its entire workflow.

After content is ingested or delivered — and this is done only once — it can automatically migrate with its associated metadata as needed throughout a facility based on rules and policies, with little or no manual intervention.

A powerful media life-cycle management and digital library system can keep track of assets and all instances of assets, in all locations — local and remote — that it's connected to. That includes editing storage, video servers, any cache storage and the digital library.

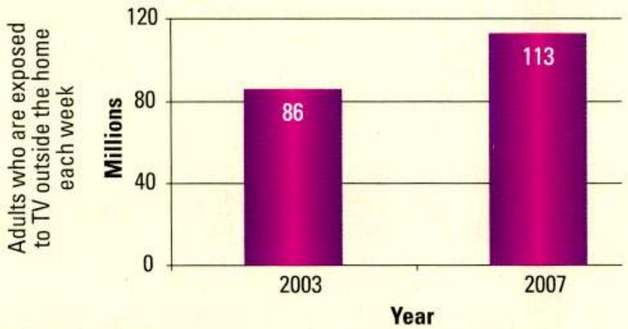
The media life-cycle management system becomes a central repository for a facility's digital media assets, which is another huge advantage. How can this create a tapeless workflow for an editing system? In short, clips can be prescreened and selected offline on a desktop computer using automatically created proxies linked to the high-resolution ingested material. The edit decision list (EDL), along with the selected clips, can be automatically transferred to the editing storage, and if necessary, it can be automatically transcoded to the file format used by the editing system.

FRAME GRAB

A look at the consumer side of DTV

Increasingly, consumers are exposed to TV outside the home

Each week, 113 million adults view TV outside the home



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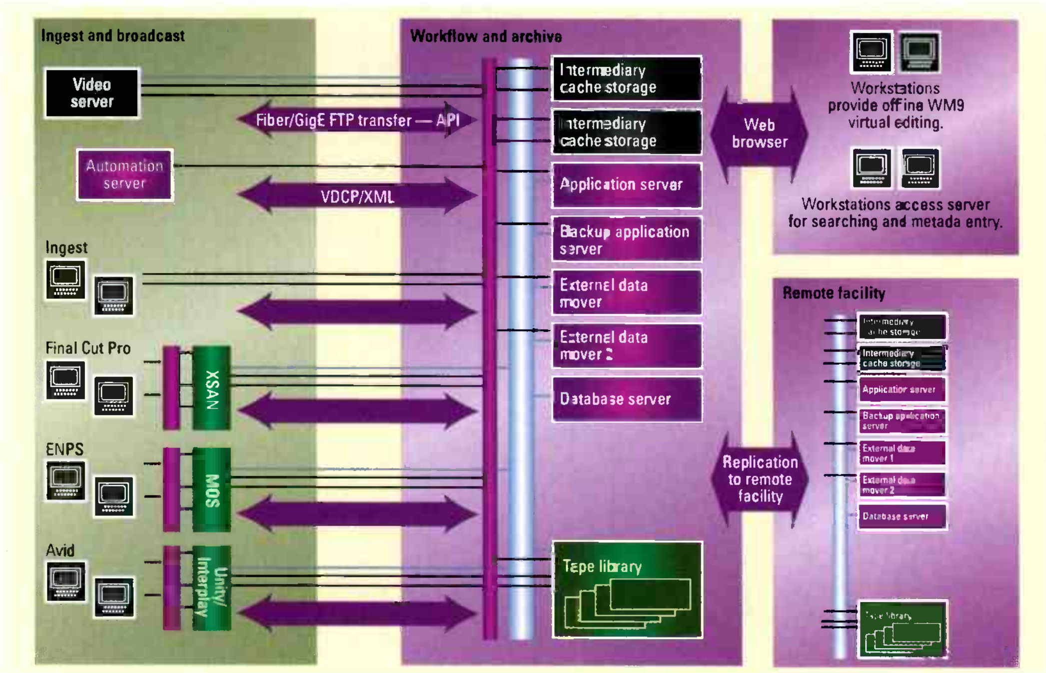

Figure 1. The first step of a life-cycle management system is the ingest process.

All the material that the craft editor needs becomes readily available without going through time-consuming and costly manual digitization processes. After the material is edited, it can automatically be transcoded and copied to a video server ready for air, and the edit session itself can be saved in native format to be recalled later.

The power of proxy editing

Many of the efficiencies gained in a file-based editing workflow are due to the power of proxy browse and editing when integrated into a complete media life-cycle management system.

It all starts with the ingest process. (See Figure 1.) Any material used for editing must first be ingested into the media life-cycle management and digital library system. If the material originates on videotape, it is typically copied to a video server

or NLE so it can be changed to a file-based form. If delivered from a satellite or Internet media content delivery service or on a flash drive or optical disk, the material is already file-based. For editing systems in particular, ingesting raw footage in a digital library makes economic sense because the digital library uses less-expensive storage than that associated with an editing system.

Once material is ingested or delivered in a file-based form, a well-designed media life-cycle management system can be configured to automatically recognize the new content. When the content falls under the watchful eye of the media life-cycle management system, it can be made readily available for any purpose a TV facility needs, including browsing, editing and play-to-air.

Based on rules and policies set by the user, the system can automatically copy new content to a digital library in its native or ingested format, transcode the file from one format to another (or others), and create frame-accurate, low-resolution proxies, without user intervention. Transcodes and proxies are created in the file-based domain without having to be converted to baseband A/V. Proxy bit rates are generally in the range of 300kb/s. Depending on system configuration, proxies should be able to contain such data as burned-in time code, closed captioning and ID numbers.

When the content falls under the watchful eye of the media life-cycle management system, it can be made readily available for any purpose a TV facility needs.

Efficiency all around

So why should TV facilities perform proxy editing in the first place? Proxy editing is much less expensive per seat than a craft editing station. In addition, proxy browsing and editing is more efficient and can be done on the network with a desktop computer. There's no need to tie up VTRs or editing bays. Clips can more readily be found from a digital library than by looking through reels of videotape. In and out points are easily marked, a rough cut can be viewed, and the process automatically creates an EDL.

If editing stations prepped

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material for air by trimming in and out points of commercials and promos, and segmenting programs, the proxy editor could easily pick up these tasks and leave the edit rooms free for more complex and creative craft editing. In a well-designed system, the proxy editor can transfer the prep information directly to a station's automation system, bypassing the craft editing stations altogether. This creates another time and cost savings for broadcasters.

Proxies in practice

The proxy files automatically created by the media life-cycle management system should be accessible across a network to users' computers. They should also be playable with common media players, such as Windows Media 9. A successful media life-cycle management solution will provide security so that only authorized users can access the proxy material. (See Figure 1.)

In preparation for an edit session, browse software should allow users to easily search for needed clips by various search criteria. It should also allow users to view the proxy versions using the computer's media player. Systems can also be designed to view full-resolution clips, but they require specially designed and more costly networks with bandwidth large enough to handle this throughput. In contrast, proxies can be sent over normal broadband networks and can be quickly accessed, viewed and edited on a computer.

A browse system is even more valuable if it also includes proxy edit functions such as the ability to select portions of each clip by marking in and out points, view cuts-only edits on a timeline and create an EDL that will later be transferred to the online craft editor.

The user interface should be taken into consideration. Many users prefer a hardware jog/shuttle panel with the feel of VTR machine control instead of a keyboard/mouse interface. A hardware scrub wheel can help locate in and out points more accurately.

If the EDL created in the proxy editing system is to be used in a craft editor, the system should be able to save it in any format. Depending on the system, EDLs could be stored in a local computer's hard drive and e-mailed or copied to the editing system, but a more advanced and flexible approach would be to store them in the media life-cycle management system. That way the EDLs are searchable and available as any other asset, and they can be reviewed, edited and renamed. They can also be more easily brought into the editing system.

When the craft editor selects a particular EDL created by this process, a media life-cycle management system can be configured to automatically copy over the high-resolution clips needed for the edit session.

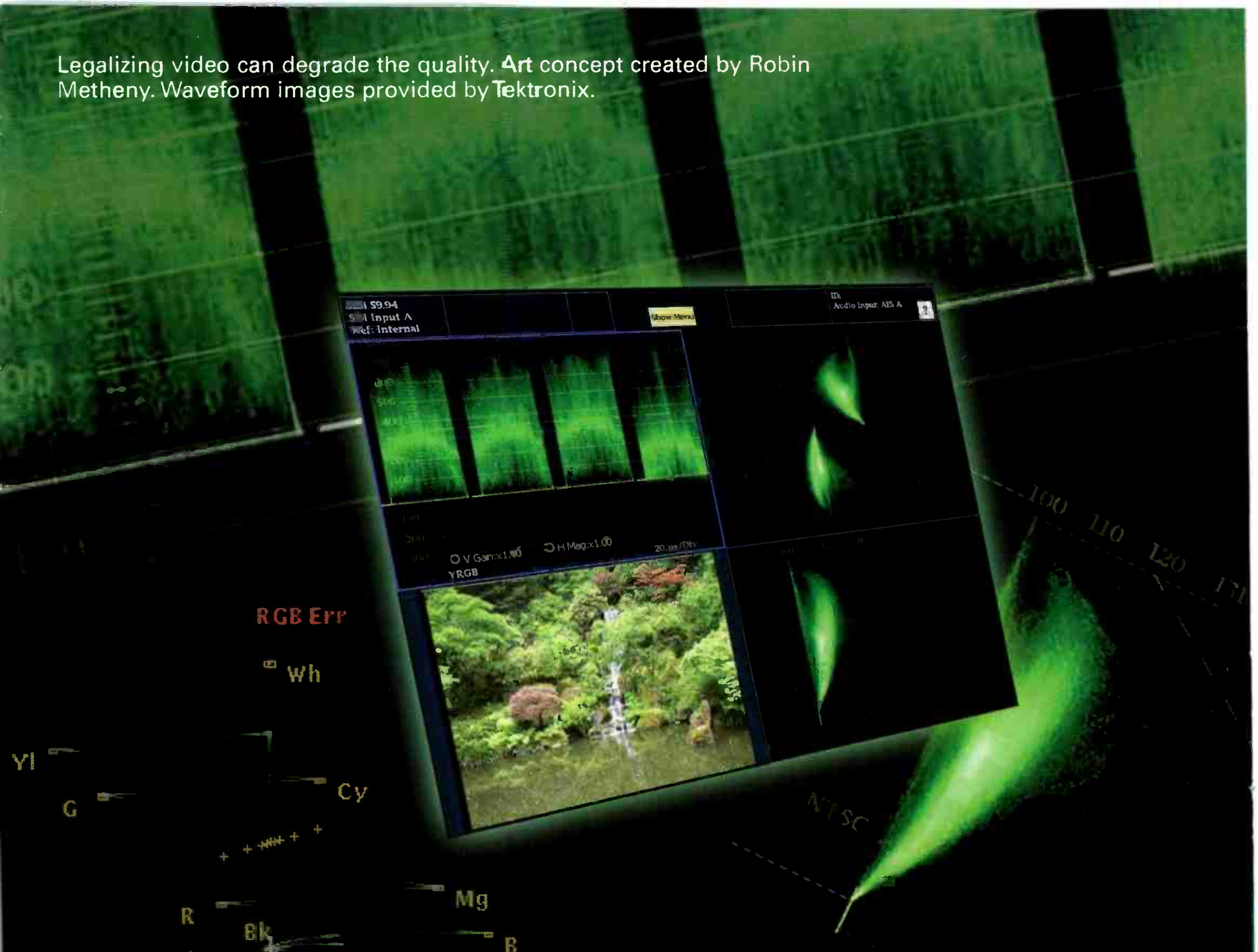
One advantage of engaging a facility-wide media life-cycle management system in the editing process is that it maintains the relationship between the proxy and the high-resolution material.

Partial file extraction is a powerful tool, whereby the media life-cycle management system copies only the selected cuts (as determined by in and out points) instead of the entire clip, which in many cases can be hours long (think sporting events). Less of the expensive editing storage is used, and content transfers are faster.

Conclusion

Television facilities should consider annexing their editing islands to their mainland media life-cycle management and digital library system. If a broadcast facility doesn't incorporate a complete workflow, it will never be able to get rid of tape and its inefficiencies. BE

Wes Thiessen is senior product manager for Masstech Group.



Legalizing video can degrade the quality. Art concept created by Robin Metheny. Waveform images provided by Tektronix.

The challenge of legalizing file-based video

BY THOMAS DOVE

To most people, video legalization means ensuring that the levels in a baseband digital video signal are legal — that is, they are within the legal range. For SD video, the analog waveform is represented by 8-bit digital values in the range 0 to 255, either in RGB or YUV/YPrPb color spaces. Depending on the color space, some of these values and combinations of values are outside the range of full black to full white; they are sync signals or over-white, or simply cannot be converted from one color space to another.

As an example, for SD video conforming to BT-601, the value of the Y component of the YUV signal should be within the range of 16 to 235. This is because the values of 0 to 15 are below black or within the range of sync values. Likewise, there are upper limits as well as limits on the U and V components, both in their own values and in combination — the combination values being relevant when conversion to the RGB color space occurs (where specific YUV values can generate values outside the legal RGB color space). Video legalization or auto-correction is where these signal levels are monitored, and if they lie outside the valid/legal ranges, then the values are clipped to ensure they are within the ranges required.

Legalization alters the data values — generally losing detail — and affects the video signal in a way that the content provider did not intend. This aside, there are many reasons why video legalization won't work for file-based video.

In effect, legalizing afterward is a bit like papering over cracks.

Types of errors

File-based video is by definition digital files that store the video and

Level of video abstraction stack	Types of checks/tests
File organization and structure	File association, metadata
Video and quality	Subject assessments and objective measurements
Broadcast playout center requirements	Measurable limitations to be suitable for transmission
Video and audio elementary stream	Syntactical/logical checks
MPEG-2 transport stream	Compressed representation — abstracted time
Baseband digital	Direct timed correlation to physical signals
Analog signals	Physical signal, direct measurements

Increasing abstraction

Video legalization

Figure 1. Video abstraction levels

audio. In the majority of cases, the video is compressed in some way (usually the audio is compressed as well), and there is transport stream data (or a transport layer/mechanism) and metadata. There is a large increase in abstraction from the baseband signals, as the video/audio data is compressed and metadata is added — and video legalization occurs only at the lowest level. (See Figure 1.)

Therefore, there are many problems that video/audio legalization does not address. In fact, as file-based video is relatively new compared with the well-understood old analog video signal levels, the vast majority of problems are completely unrelated to video legalization. Therefore, it is vital that any test/checking system can detect these.

Problems that occur in file-based video include:

- Transport stream errors, such as incorrect PIDs, PATs, PMTs and PCRs.
- Multiplexing errors, for example, where the video and audio have been truncated when extracted from a multiple program transport stream.
- Missing required data, for example, when closed captioning or teletext are not present.
- Metadata errors, such as missing copyright information or other data used by an automation system.
- Simple factors, such as incorrect play time. Other examples include when the audio has been put on channels 3 and 4 instead of 1 and 2 (or omitted altogether) or the wrong version of the content has been provided.
- Incorrect bit-rate for the video or audio.
- Incorrect stream set-up, such as when three seconds of audio silence is required at the start but is not present.
- Compliance to various industry de-facto standards, such as CableLabs 1.1 compliance.
- Encoding quality errors where the encoder produces a series of blocky video frames, for example, when there is lots of movement.
- MPEG encoding syntax errors, which can occur due to multiple mux/demux operations, or an encoder blip.
- Errors in the syntax of the video and audio elementary streams.
- The stream is correct and legal, but still not what the broadcaster needs. For example, it should be NTSC but is

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PAL, or it should be 4.5Mb/s peak but goes to a peak of 4.6Mb/s. Typically, a broadcaster will have many such constraints/requirements.

• Errors due to the way the data is split out and put onto a video server. Some servers separate video, audio and metadata, and if there are some errors in these elementary streams or other parts of the data, then this process of splitting up can generate errors. Baseband test systems cannot detect these types of errors, and video legalizers cannot to fix them.

In order to do the testing of the baseband as required for video legalization, the compressed video file must be fully decoded to baseband. If there is then a gamut/legality problem and the video is then legalized, it must also be recompressed to the same video standard (MPEG-2, MPEG-4/AVC, VC-1, etc.) and remultiplexed with the audio and metadata. (See Figure 2.)

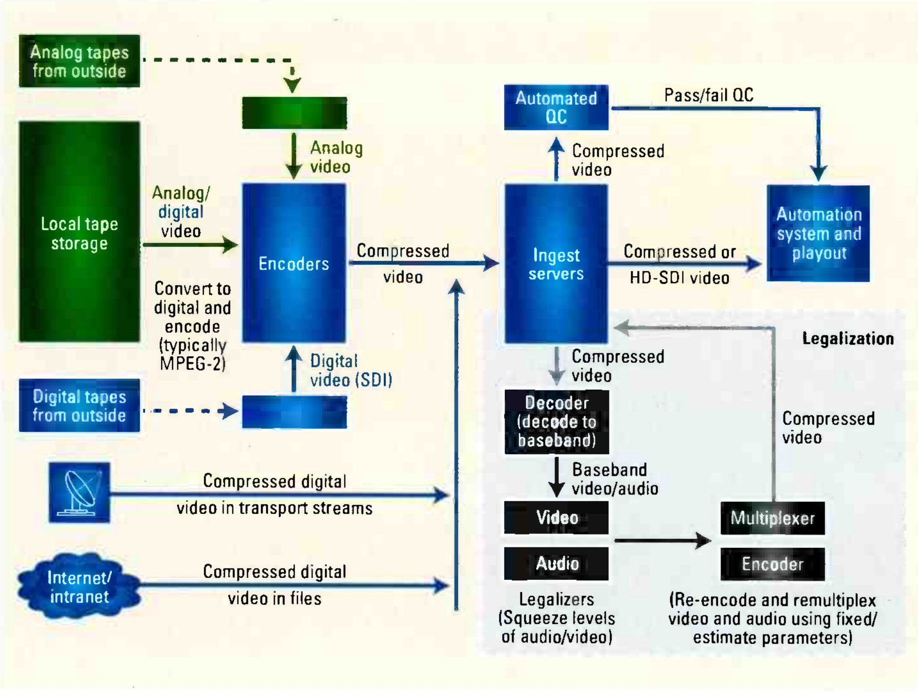


Figure 2. The steps involved with video legalization

However, all the encoding schemes use lossy compression, meaning that some of the quality is always lost. The original compressed file had some loss due to the first encoding, but the content provider would (likely) have done a careful and painstaking quality control to ensure that the picture quality was as required.

An automatic re-encoding as done by a legalizer would add enormously to the compression artifacts. It may well be that artifacts not visible on first encoding become visible on re-encoding after legalization. In addition, there would not be the careful quality control afterward, so the results of the legalization may be video with unacceptable artifacts.

Previous research has indicated a 5dB loss in visual quality from doing a second-generation re-encode.

Testing

In order to do the testing of the baseband as required for video legalization, the compressed video file must be fully decoded to baseband. If there is then a gamut/legality problem and the video is then legalized,

the following may be needed:

- The file must be recompressed to the same video standard — MPEG-2, MPEG-4/AVC, VC-1, etc.
- It must keep the same parameters, which are sometimes set manually over a range of frames to get the optimum appearance.
- The compressed video will need to be remultiplexed with the audio and metadata.
- The metadata might need to be updated as well.

This is not easy to do, and there is a great chance that this process will introduce errors. As a result, rather than fixing a minor video legality problem, more serious errors have been introduced.

In addition, typically a content provider or broadcaster would have carefully assessed and chosen specific encoders to be optimal for their requirements. With automatic legalization, this will likely use whatever encoder the legalizer has — whether it is good, bad or indifferent. Plus, the encoder in the legalizer would have to be able to deal well with all the different video standards and be able to remultiplex these seamlessly.

The content provider will have all the correct tools and setup to encode correctly and check the video. It is, therefore, far better for a broadcaster to do a comprehensive check at ingest and go back to the content provider in the event of problems. This then means that the content is resupplied with the visual quality that the content provider intended. Also, reporting the problems back to the content provider may mean that future content is perfectly OK.

Crushing

In SD digital video terms, black is assigned a value of 16, and white is assigned a value of 235 (in 8-bit systems like DVD and DV). Legalizers will clip the video signal at those levels. There will never be a sub-black or over-white signal on a DVD, though the format is capable of carrying the entire 0-255 range. (The dynamic range is limited to these values, but it's not relevant to this point.) The legalizer controls can be driven to ensure that the video signal coming off tape and being color-corrected lies between 16 and 235 and is not crushing. Of course, there's always a margin of error in any kind of process that is controlled by a human operator, but it wouldn't be expected that this crushing would exceed 1 percent, which is negligible.

So, if there was a sequence of video bytes, say a luminance ramp from black to white, which was coming in as 16, 17, 18, 19, 20, 21, 22, 23 ... 233, 234, 235, and the lift control was turned down so these values became 13, 14, 15, 16, 17, 18, 19, 20 ... 230, 231, 232, then at the output of the legalizer, the signal would be 16, 16, 16, 16, 17, 18, 19, 20 ... 230, 231, 232.

Thus, some original detail has been clipped off or crushed out and could never subsequently be recovered. If the lift control is later turned back up on this modified signal, the sequence would be 19, 19, 19, 19, 20, 21, 22, 23 ... 233, 234, 235. Most of the picture would be returned to its original value, but the blacks would now be raised up, and black would be a dark gray; the original near-black detail is gone forever.

Conclusion

Video legalization can have a role in quality checking of file-based video, but this method only deals with a small subset of the errors that can occur with the content. There are two key points about video legalization of file-based video:

- Although the color gamut can be corrected, legalizing the video can degrade video quality badly and can result in a file that has been re-encoded in a way that was not intended.
- The video can be legally compliant. It can have the correct gamut but still have incorrect syntax, which can cause the set-top box to crash.

The most effective way to check the health of file-based content prior to transmission is by checking that the syntax of the file is correct. It is useless

To legalize file-based video, it must be decoded and re-encoded. This can destroy the video quality, which is evident in the image on the right.

to check gamut if the syntax is not correct, so syntax must be the first check.

File-based video generally comprises one or more complex digital files with many elements, all of which must be correctly decoded for the file to play. A large proportion of file-based video has some syntax errors, so it's important to look for tools that can automatically check for correct syntax, enabling you to find the errors before you get complaints that the end-consumer's set-top box has crashed. BE

Thomas Dove is senior manager, compressed video, Tektronix.

SPECIAL REPORT

Understanding multicast and QoS in IP routers

BY CIPRIAN POPOVICIU

The consolidation of the Internet Protocol as the foundation of most communications services has become indisputable. IP's simplicity, open standards development, relative low cost of deployment and, most importantly, a killer application — the World Wide Web — led to its extraordinary rapid uptake. Measured in terms of Internet adoption, the success of IP is unprecedented. It took 38 years to attract the first 50 million radio listeners and 13 years to attract 50 million television viewers. It only took four years for the Internet to attract its first 50 million users.

A large and rapidly increasing IP user base, at both individual and institutional levels, naturally led to the exploration of other applications and services that could leverage IP. These efforts were aided by advancements in media technologies, such as Wi-Fi, cable and xDSL, which led to availability of increased bandwidth at lower costs for broadband subscribers and enterprise users.

IP's ambitions focused on services such as telephony or video and audio content delivery, operating within a different paradigm than typical IP-based data exchange. With data exchange applications, the complete delivery and integrity of data is paramount. With the new services, the focus shifts to timely delivery of information even if some random, small amount is lost along the way. Moreover, while the original IP communications model targeted host-to-host exchange of information, the need to simultaneously deliver the same data to multiple hosts was also identified. IP evolved to support a wider range of services and applications.

This article is a follows-up to the Special Report in the August 2006 issue, "Understanding IP routers," which analyzed the basic operation of a router and its generic architecture. It builds on that introduction to discuss some of the more advanced functions performed by routers today.

IP multicast

In its original version 4, IP was designed to support two types of communication:

1. *Unicast.* One-to-one, with one source to one destination.
2. *Broadcast.* One-to-all, with one source to all destinations within an IP subnet.

What happens, however, if several hosts in the same or different subnets

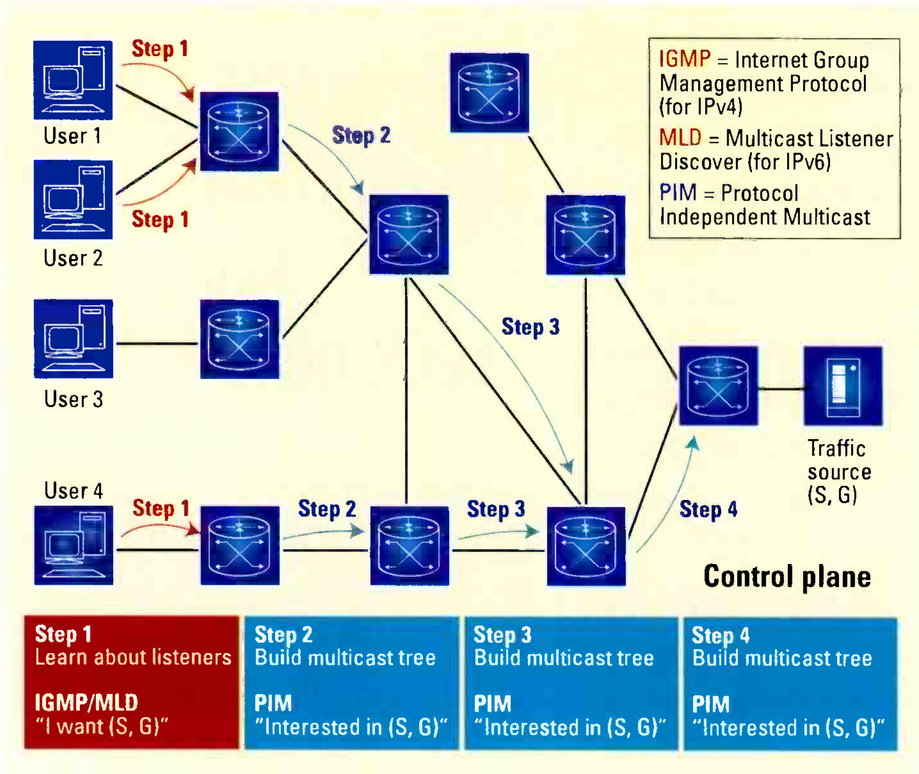


Figure 1. Conceptual operation of IP forwarding — control plane

are interested in the same packet at the same time? This scenario applies to the distribution of a software package within an enterprise or the delivery of a video program to broadband subscribers. Broadcasting the packet is not efficient because it bothers hosts that are not interested in the information.

The packet could be sent via unicast to each destination, but in this case the resources of the source and network are dramatically taxed. A one-to-several communication mechanism, also called multicast, is more appropriate.

In a nutshell, the idea behind multicast is to enable the IP network to learn which hosts are interested in a given traffic (identified by a group address G) and to figure out how and where to optimally replicate that traffic. This way the source of the traffic (identified by its unicast IP address S) sends a single packet that will only reach all the listeners. Subscribers can be interested in the traffic regardless of the source (*, G) or in the traffic provided by a specific source (S, G). The IP routers providing network access to subscribers learn of their interest in a multicast group, and they signal that upstream.

Routers within the network collectively build a tree that enables them to optimally forward — over the shortest path between the source and the listeners — the traffic for a given multicast group. Due to the tree structure, it can avoid looping packets. While there is a lot more to the multicast operation (see Reference 1 on page 55), this overview highlights the additional functions of a multicast-enabled router:

- Learn about listeners.
- Build the multicast tree.
- Replicate packets.
- Verify that packets are not looping.

Figure 1 describes the process of a network building the knowledge necessary to forward multicast traffic, while Figure 2 shows the process of forwarding the traffic over the multicast tree.

In relation to router architecture, the multicast state build-up and maintenance is handled in the control plane, and it requires processing and memory resources. The multicast traffic forwarding and replication takes place in the data plane and can be performed either in software or in hardware depending on the router.

IP multicast has gained significant visibility over the past several years. Enterprises are leveraging it for internal applications while service providers are using it to provide audio and video content over IP. Multicast is now an essential feature of modern IP networks.

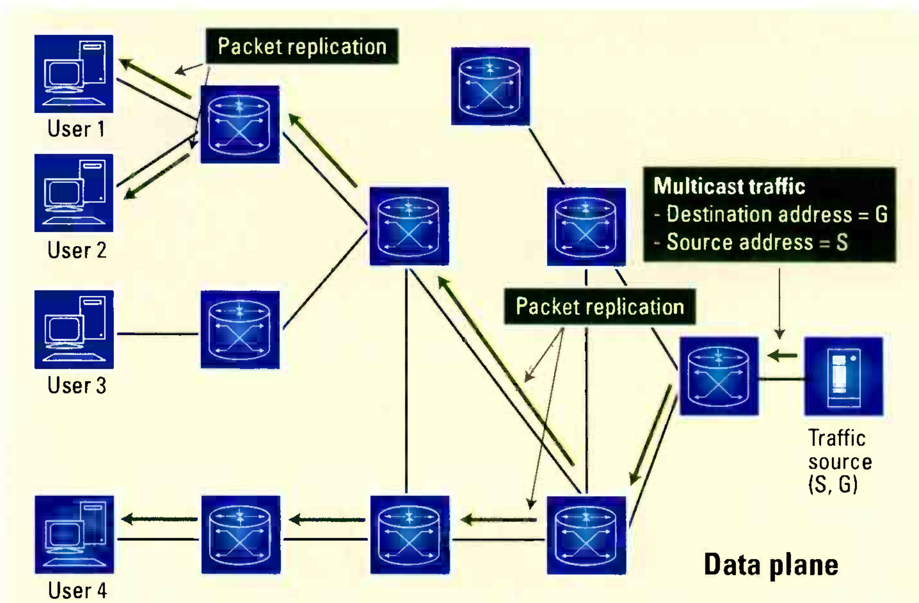


Figure 2. Conceptual operation of IP multicast forwarding — data plane

Quality of service

So what do today's routers do? They transfer data between hosts over the shortest path and for certain applications with minimal or no packet drops. They support telephony services where packets cannot be delayed significantly. They deliver video content — sensitive to both drops and delays — and replicate it to multiple hosts or routers. And of course, they must handle the control plane messages essential to the proper operation of the network. This is a lot, both in terms of amount of traffic and the variety of service requirements. It is tempting to throw resources at the problem, more memory, CPU and bandwidth. But aside from the inevitable cost increase, congestion is a fact of life in a connectionless, best-effort environment such as IP networks. Routers need help to use their resources smartly in handling the various traffic types.

There are two architectures that enable IP to provide quality of service. The integrated service (IntServ) architecture brings IP forwarding closer to a circuit-oriented-type protocol. In this case, before the traffic is exchanged between the source and the destination, the necessary resources are reserved across the entire path. The reservation is done with the help of signaling protocols.

The alternative architecture is called differentiated service (DiffServ). In this case, all routers are preconfigured with a set of classes and the resources that should be allocated to each class.

When IP packets enter the network, they are assigned — based on the service or application they support — to one of these classes, and their headers are marked with a 6 bits pattern corresponding to each class. Routers recognize the marking and handle the packet according to the policy defined for that class.

While IntServ provides more granular control of resource allocation, DiffServ does not require state maintenance in the network, making it simpler, more scalable and more resilient.

This IP QoS brief overview

Key points

Mulicast enables routers to optimally deliver the same packet to multiple destinations simultaneously.

QoS helps routers to manage their resources to best support various types of user traffic and services.

References

1. Beau Williamson, "Developing IP Multicast Networks, Volume 1," Cisco Press 1999
2. Srinivas Vegesna, "IP Quality of Service," Cisco Press 2001

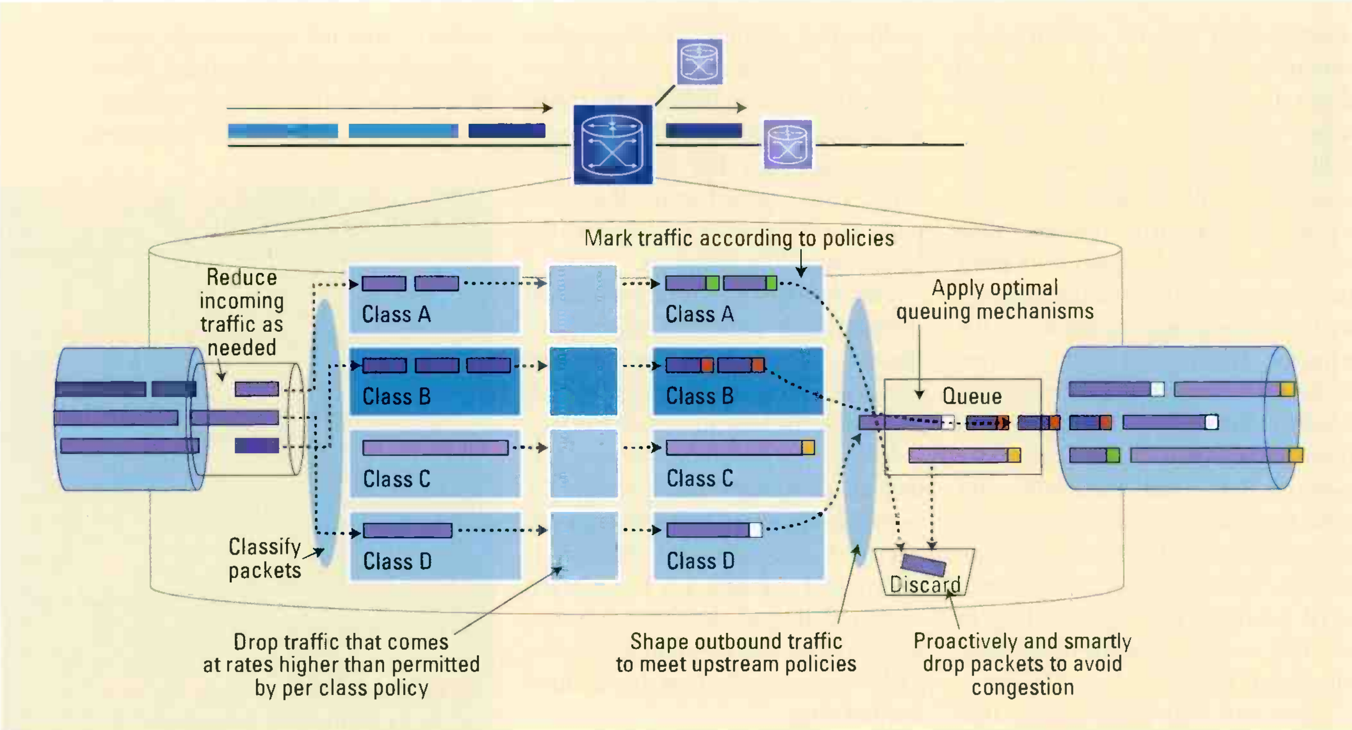


Figure 3. Conceptual operation of DiffServ

represents one aspect of an overall QoS architecture, which involves, for example, optimizations of the media layer as well. Leaving the details to dedicated references (see Reference 2 on page 55), we can summarize the additional functions performed by a QoS-enabled router:

- Classify IP packets.
- Mark packets based on classification.
- Apply the appropriate resources to handle the packets.
- Perform signaling if necessary.

Figure 3 depicts some of these functions in the context of DiffServ, which is the most commonly deployed QoS architecture.

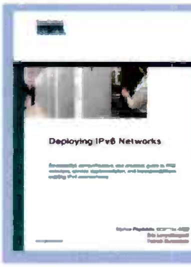
With an increasing portfolio of services and an increase in users' expectations with respect to these services, QoS is becoming an important component of IP networks. It is particularly important in the lower bandwidth access portion of networks.

Congestion is a fact of life in a connectionless, best-effort environment such as IP networks. Routers need help to use their resources smartly in handling the various traffic types.

Summary

Routers have evolved beyond mere forwarding of packets across IP networks. They discover users that share a common interest, and they optimally deliver the traffic of interest to them. Routers allocate the right amount of resources to each traffic type in order to meet its service requirements. The complexity and capability of today's routers meet the needs of a diverse set of services and applications, which have one thing in common: They run over IP. BE

Ciprian Popoviciu, PhD, CCIE, is a technical leader within the Networked Solutions Integration Test Engineering group at Cisco Systems. He is also a senior member of the IEEE.



Ciprian is an author of "Deploying IPv6 Networks," a comprehensive guide to IPv6 concepts, service implementation and existing interoperability in IPv4 environments. The book is available from Cisco Press.

Active storage

BY PAUL TURNER

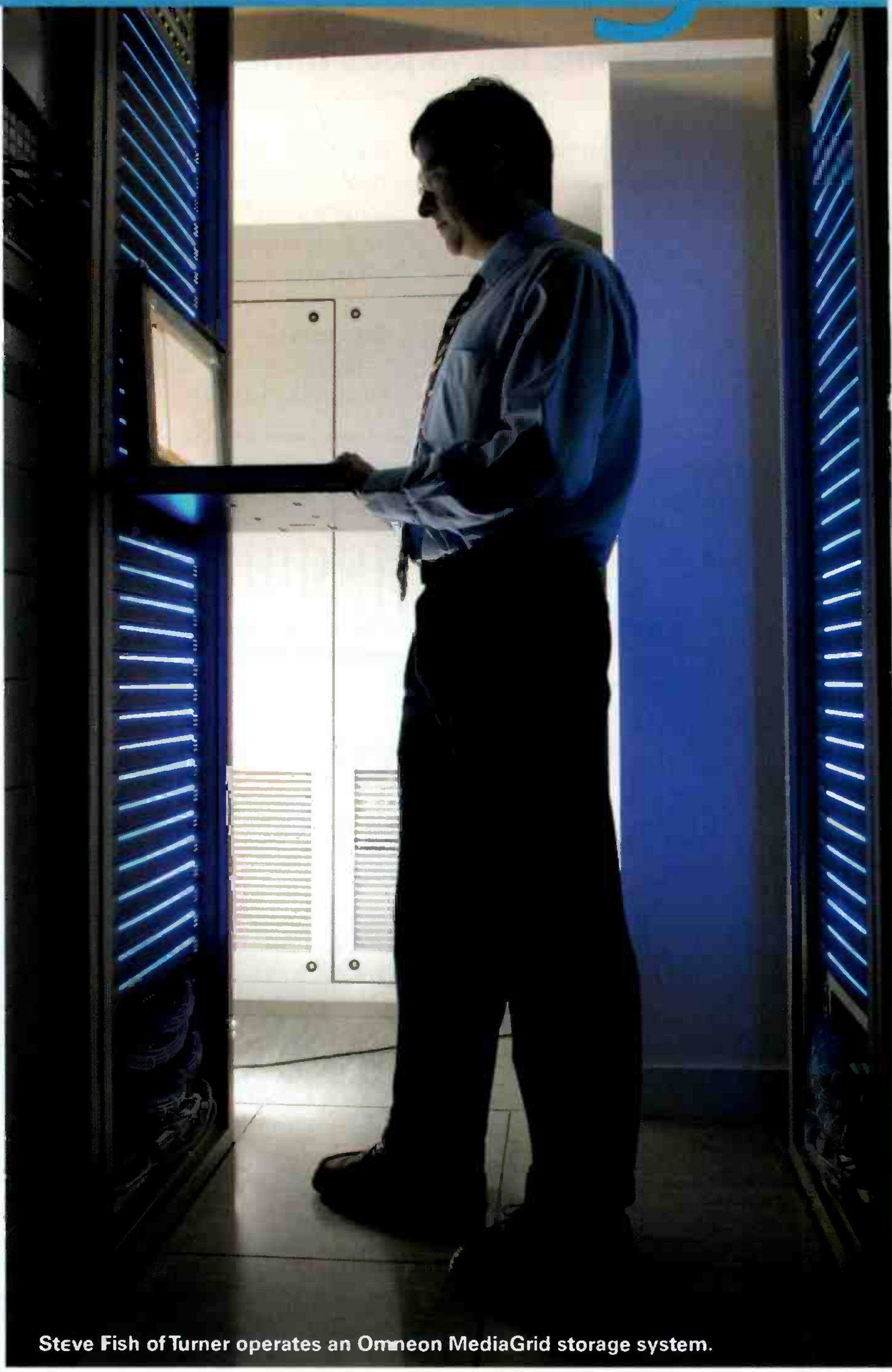
In the evolution from tape- to file-based workflows, asynchronous IP-based storage is increasingly chosen for online and nearline archive storage.

While in many cases, the mainstay of this activity has been RAID-based NAS or SAN solutions, grid storage has made inroads over the last year or so. Offering large storage capacities and simplified system management, grid storage is an alternative approach to the idea of bulk data storage, but it also offers another possibility: active storage. This article will examine the concept of active storage — what it is, how it works and the advantages that it can bring to the entire workflow.

The fundamentals of grid storage

In a nutshell, grid storage is comprised of separate, standalone content servers that are each responsible for storing only part (usually referred to as a slice) of each file loaded onto the system. In this way, the file itself is scattered onto multiple autonomous content servers. Separate metadata servers decide which slice goes to which content server. (See Figure 1 on page 60.) The metadata servers provide the file system namespace to the various clients in the system.

This arrangement is analogous to the operation of a standard hard drive. The content servers are similar to the sectors of a hard drive, and the metadata servers are like the file allocation table of the drive, where a file name is translated into the addresses of the sectors of the disk where the data can be found. The idea has simply been



Steve Fish of Turner operates an Omneon MediaGrid storage system.

expanded in the case of grid storage.

This architecture allows clients, whether reading or writing, to first ask the metadata servers for the locations of the slices and then interact directly with each content server to gain access to an individual slice. This is significantly faster than the traditional NAS approach, where all access to storage must pass through the NAS head — an obvious bandwidth bottleneck.

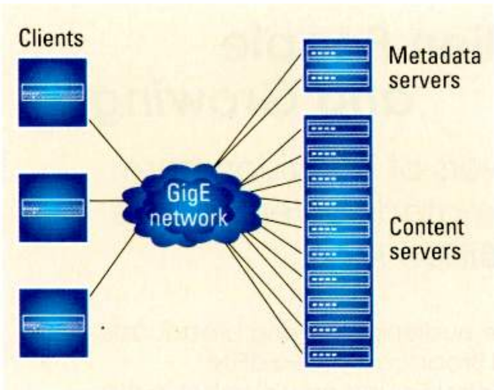


Figure 1. A typical grid storage system

Another unique attribute of grid storage is its ability to provide data protection. Data protection is achieved by making copies of the slices onto other content servers in the grid. At any point in time, there exist at least two copies of all of the slices of each file. The principle is that the failure of any individual content server does not render the data unrecoverable because there's always at least one other copy of each slice available somewhere else on the grid.

The content servers operate autonomously, so re-replication of missing data can happen simultaneously through a number of content servers operating in parallel. An important item to note is that grid storage systems rebuild data, whereas RAID systems rebuild drives. The latter includes rebuilding sectors of the replacement drive that never held valid data in the original, which is clearly an invalid operation. This prolongs the rebuild time and extends the window of vulnerability for another drive failure.

Re-replication of data in a grid storage system happens significantly faster than rebuilding of a hard drive via RAID engine, massively reducing the window of vulnerability. If the replication factor is set to three or higher, the failure of any drive or content server will not leave the system in a vulnerable state because even if one copy of the file is completely lost, the data is safe, as there are at least two other copies of the affected slices somewhere on the grid. This offers even greater user-selectable data resiliency capabilities.

Replication has other advantages too. For example, the average latency encountered by each individual client decreases as the replication factor increases, which is extremely important in today's production environment.

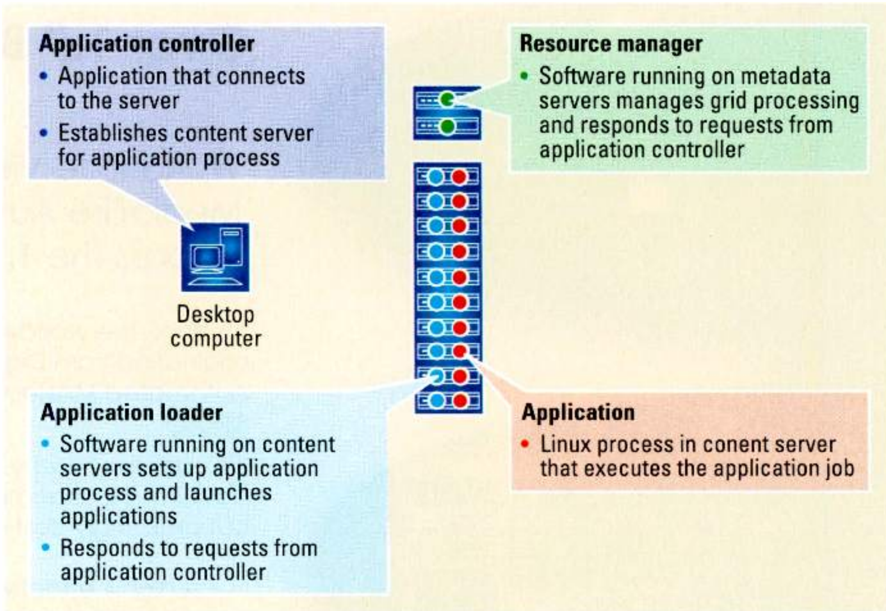


Figure 2. Typical grid processing management components

The concept of active storage

Until recently, storage systems have been passive members of the workflow. Once media was stored on them, it remained there until external systems read the data, manipulated it and then put the result back onto the storage. This issue was true when media was stored on tape and has remained true in most cases when using disk-based storage.

Grid storage offers a new opportunity. As previously mentioned, grid storage is made up of separate content servers, each of which has a CPU, RAM and all of the other hardware that make up a modern platform. It is entirely possible for a powerful content server platform to take on additional processing tasks.

For example, each CPU can examine the slices located on its hard drives and perform automatic error checking, calculating a cyclic redundancy check (CRC) from the data. It then compares the CRC to a CRC that was calculated for the slice at the time it was created and was stored along with that data as part of the write process. If the two numbers don't match, the content server can declare its slice to be invalid, and the metadata servers can respond by causing the slice to be re-replicated from a known good copy of the slice to some other storage location within the grid. This effectively makes the system self-healing, with an associated reduction in the need for manual intervention by maintenance staff.

Taking this idea a step further, it is equally possible to use some of the processing power of the content servers to manage and process media. If the storage is aware that the data it is holding are actually media files, it is possible to use some of the CPU power of the individual content servers to perform media-specific processing tasks in addition to the activity of storing and serving up data.

It is, of course, vital that such use does not impinge on the ability of the content servers to provide data services to the various clients connected to the grid, which is its primary purpose. To this end, it is necessary to add a management layer to the system's code to ensure that no content server becomes oversubscribed. The remaining CPU power can be used as raw processing capability, acting on the data stored on the grid, or even being given external data sets, along with instructions on how to manipulate the data by some external application server. Typically, the components of such a configuration include:

- application controllers, on which the client application GUIs can run, which manage the operation of their individual applications;
- grid resource management software, which can receive requests for CPU cycles from the application controllers and in response allocate available CPUs to each requestor; and
- a grid application loader, which runs on each content server to set up the processing environment on that server and physically launch a process.

Suddenly, the system ceases to be a mere storage repository and becomes an active part of the user's workflow. It is easy to see how adding this capability can improve the business of processing material as it passes through the workflow. And such active workflows, by the nature of their parallelism, can operate substantially faster than their passive counterparts. Figure 2 is an example of the processes needed to manage grid storage in this way.

There are several activities that immediately come to mind when considering the possibilities enabled by active storage.

Integrated transcoding of material

It is extremely common for a facility to have media in different file formats at various stages of the workflow. The house ingest format, for example, is hardly ever used to archive material. For this reason, broadcasters are forced to transcode material as it makes its way through the production process, resulting in significant numbers of network transfers as the material is sent to the transcoding engine and the result is transferred back to the central storage.

Imagine a world where the central storage system automatically transcodes media based on business rules configured by the user and delivers it to the next stage of the process once a business metric, such as an editorial approval, has been met. The transcoding process lends itself to grid-based processing and is accelerated in direct proportion to the number of CPUs that are targeted at the transcoding.

Transoding technology also automatically generates proxies, based on user-supplied business rules. For example, high-res material is proxied to the house proxy format as soon as it is placed in the requisite location on the central grid storage system.

Content providers often need to provide a finished product in a variety of formats for the myriad of delivery and display systems. Once again, having this format conversion happen in the grid storage prior to handoff to the delivery subsystem is a great benefit.

A secondary benefit in the transcoding case comes from the inherent distributed nature of grid processing. At the moment, several transcoding manufacturers offer the ability to have multiple transcode engines available for use in a transcode farm. An individual job is given to an individual transcode engine. Therefore, if you have five engines free at any point in time, only one will be given a particular job. In the case of grid processing, however, all five could be pressed into duty to transcode the source clip, resulting in significant reduction of transcode time compared with the current method. (See Figure 3.)

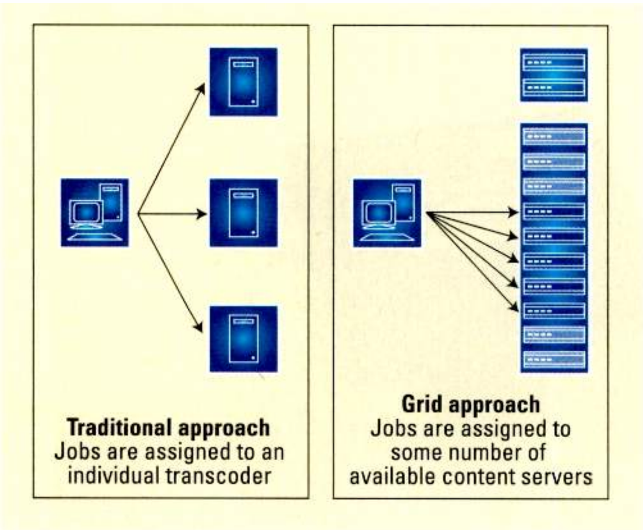


Figure 3. An example of a traditional transcode farm vs. a grid processing approach

Moving forward, it may also be possible to section up a transcode job so it is given to the content servers that physically contain the source slices. In this case, the individual content servers would only transcode the slices they contain, resulting in a reduction in network bandwidth, as there would be no need to transport the source slices to a specific content server for translation. These potential savings offer a real improvement in the transcoding workflow.

File verification and technical QC

Broadcasters can expend significant effort in technical QC of material after ingest and in file verification after transfer from one location to another. Such a labor-intensive activity can effectively be performed via software applications, which can check files for such things as GOP errors, macroblocking, audio levels and gamut. These applications can even detect and flag long periods of silence in the middle of an individual clip, signifying a potential error. These activities, which once required intervention by an operator, can easily be integrated into a grid storage and processing platform.

There is no proposal that QC for content and censorship can be performed within the central storage, though one can envision that some of this can be automated. Human judgment still needs to be applied to these activities.

Having central storage actively participate in operations ultimately leads to active workflows in which material is moved from storage location to storage location throughout the entire facility based on the rules engine detailed above. Material can be recorded into an ingest server and automatically moved, while it is still being stored, to the central server. Next it can be instantly checked for technical quality. Then, via a proxy automatically generated after the full-res material passed technical QC, it is passed on to the QC operator responsible for artistic content. After this stage, the material can be automatically rewrapped for editing and packaging. And after approval, it is automatically transcoded into the needed delivery formats.

While some of the above is forward looking, there are transcoding and technical QC products that can already hand jobs off to an active storage device for processing. Certainly, grid storage systems exist with the CPU horsepower to operate as active storage devices.

Conclusion

With the advent of grid-based storage systems, the idea of storage as an active participant of the end-to-end workflow becomes possible. When storage ceases to be merely a passive agent in the workflow, several tangible improvements can be made that offer the potential to substantively improve the efficiency of operations.

Active storage and active workflows will undoubtedly become more important as further improvements in storage components and distributed software applications become available. This approach offers significant improvements in bottom line performance. When the storage performs many of the processing tasks on stored media, there are savings in time, network bandwidth and cost.

The great news is that the foundations for this change are all already available from manufacturers, and integration of these functions into central storage systems is already underway. Storage is about to get much more interesting! BE

Paul Turner is vice president of marketing for Omneon.

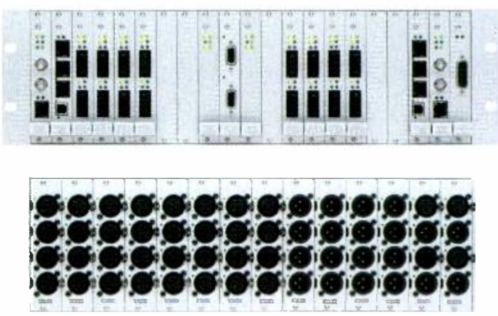
SSL's MORSE

Synchronous routing produces real-time results.

BY ANDREW CLARK

The growth in news, sports and other real-time TV production demands constant increases in flexibility and efficiency from all production facilities. Improved productivity from facilities that represent high capital investment and carry significant labor costs is often promised by new digital technologies, which rarely deliver consistent improvements.

A key to increasing efficient use of a facility is the ability to mix and match any studio area with any control room, with the added benefit of migrating production seamlessly from one area to another to cope with maintenance or other scheduling demands. In real-time applications, key requirements are guaranteed low latency, reliable connection, embedded data transport and secure resource management. With the increase in HD production, signal quality is also a significant issue.



A typical mid-size router (512 x 512) and a production area Stagebox

There are IT approaches to delivering this type of plant routing; however, these are often compromised in some way. Other traditional approaches to this level of operational flexibility, such as using physical multichannel patching, can be expensive or restrictive, often forcing all production areas to have the same type and quantity of equipment regardless of their intended use.

Synchronous audio bulk transport

With larger broadcast installations that cover areas of one city block or more, the technical challenge of quality loss over long cable runs has been solved by optical fiber. Yet from an operations viewpoint, joining studio and control areas is often difficult. This situation may be more complex for audio than for video, due to the higher number of discrete signals and the multiple different analog and digital formats commonly used.

An established audio bulk transport format such as Multichannel Audio Digital Interface (MADI) is a practical solution. MADI offers up to 64 channels of audio plus signaling data over a single cable. And it does not suffer quality loss or significant latency because the audio is not compressed and can quickly be deserialised at any receiver node.

Solid State Logic's Modular Resource Sharing Engine (MORSE) uses MADI-over-fiber and redundant, modular connectivity to provide a system that is reliable, flexible and well integrated into the TV environment. Consisting of a central, fully redundant audio routing core and satellite I/O frames, it allows any production/machine area to be instantly connected, bidirectionally, to any audio control suite. Integration with the full range of professional equipment found in a TV facility is achieved with different I/O cards, offering all formats from microphone preamp inputs to HD-SDI interfaces. The router can accept up to 48 MADI streams, equivalent to more than 4Gb/s data throughput, and has a fully redundant 4096 x 4096 crosspoint matrix.

SSL's C100 digital broadcast console can control the router's crosspoint matrix and the preamp settings on any production floor mic from its control surface, offering a transparent experience for the audio operator, with full recall.

Resource management

Proper resource management, such as arbitrating potential conflicts between users that want access to specific resources simultaneously, is vital to any multiuser routing system. For example, when more than one operator needs to use a mic preamp, the system should allocate access to on-air users in preference over preshow, rehearsal, maintenance or other users.

This is essential to avoid one control area unknowingly disrupting an on-air production by changing a shared resource. Audio sources should be freely accessible by simultaneous users, but the control settings, such as mic gain, and the ownership of audio destinations, such as recorder/transmitter feeds, must be securely managed.

Proper resource management, such as arbitrating potential conflicts between users who want access to specific resources simultaneously, is vital to any multiuser routing system.

Cross-media integration

Control of any router as part of a larger routing infrastructure is often required, providing global management from one master control system. MORSE integrates well in this scenario, acting as an audio layer within the facility router via several common protocols.

Video suites and other nonaudio areas can have parallel access to sourcedestination crosspoints within the system without any audio staff intervention. This is done either from existing XY control panels or via customizable PC software with access controlled by secure log-in accounts.

On-air reliability

Regardless of external control mechanisms, no part of the audio router should be based on off-the-shelf software or hardware due to the security and reliability vulnerabilities that these inevitably introduce.

Instead, a fault-tolerant embedded controller with full redundancy and comprehensive diagnostics should be employed to manage all the user rights, audio and control data. Hot-swap designs are also highly valued, as the chassis never needs to be power-cycled, avoiding the greatest stress on the electronics.

Fanless (silent) chassis are essential for I/O units placed in production areas. And status/configuration reporting over TCP/IP provides remote monitoring for maintenance systems.

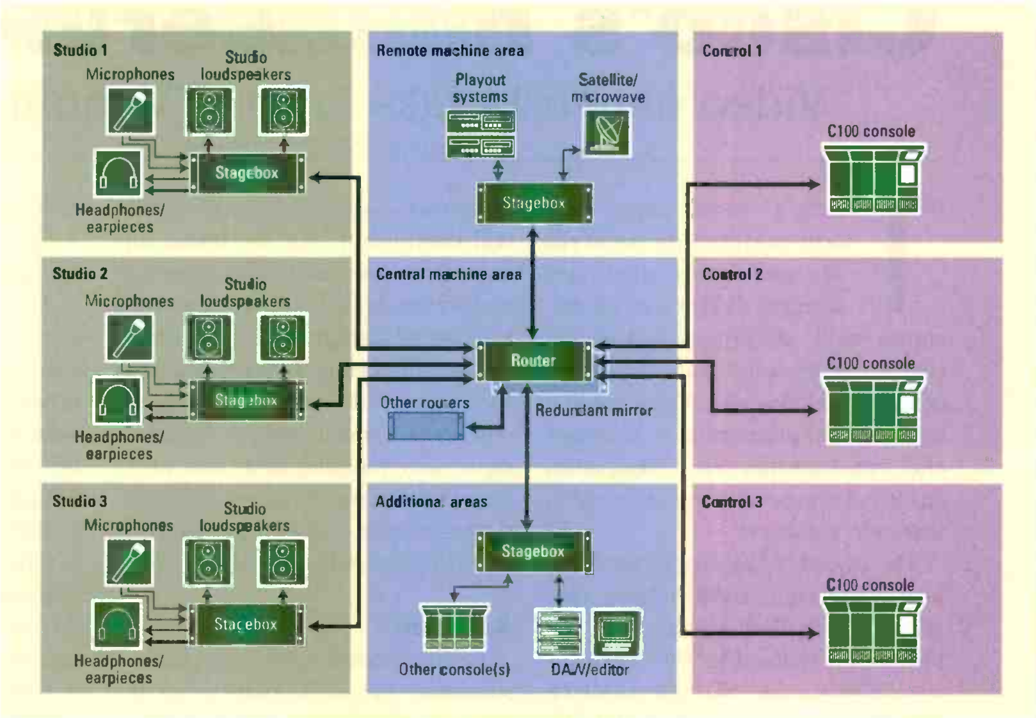


Figure 1. SSL's MORSE features ideal audio resource-sharing topology. The system offers interoperability between production, technical and control areas.

Conclusion

With the growth of HD production, the need for an audio resource-sharing solution with real-time transfer, high-quality signals, capacity for significant expansion, and on-air reliability and security has never been greater. MORSE's close integration with the C100 audio console and the larger broadcast infrastructure allows new levels of high-quality productivity for live television. BE

Andrew Clark is C100/MORSE product manager for SSL.

Cisco's multiservice trio

Video networks take Iowa PTV multiplatform.

BY ROBERT COLLMUS

Today's broadcaster content contribution networks are undergoing significant changes as HD content becomes more ubiquitous and as the cost for fiber-optic connectivity becomes more affordable. This changing environment presents new challenges and opportunities for broadcasters and service providers that offer video transport solutions.

The digital video format for these broadcast-grade contribution networks is SDI. Both HD and SD-SDI formats are defined by SMPTE. They are 270Mb/s for SD-SDI (SMPTE 259M) and 1.485Gb/s for HD-SDI (SMPTE 292M).

Most providers have historically been offering a 270Mb/s service to enable transport of SD-SDI from facility to facility content, be it from a sports venue to a production studio or among various geographically dispersed pre- and post-production facilities. Forward-looking service providers are now establishing rates to address uncompressed HD-SDI content.

Challenges

There are a number of unique challenges faced by broadcasters and service providers when transporting broadcaster-grade video. The high bandwidth associated with the HD-SDI video signal poses significant challenges, requiring creative solutions for leveraging existing infrastructure.

In addition, broadcasters will continue to require transport of SD-SDI content, as well as encoded ASI content. Many times, this is a program-specific requirement that means that simplicity is important to affording viable customer premise-based solutions.

As fiber becomes more available, it is clear that the use of dedicated, dark fiber solutions will be growing, particularly among major facilities. However, spurs to venues and small studios will continue to rely on leased circuits. Providers and broadcasters will require flexibility in interfacing with a number of various infrastructures.

Most important to broadcasters is the quality of the transport associated with these valuable signals. Solutions must offer minimal delay and jitter-free performance. In addition, redundant operation is essential to ensuring the successful delivery of the content.

Solution

Cisco, in conjunction with its new subsidiary Scientific Atlanta, has developed a flexible suite of solutions for broadcasters and service providers to provide them with efficient multiplatform transport. These solutions draw on the extensive video and networking expertise of the company to offer integrated, high-quality systems that support a wide variety of applications.

The solution set consists of three key components that can be deployed individually or in combination with each other:

1. Scientific Atlanta Prisma IP video adaptor;
2. Cisco ONS 15454 multiservices provisioning platform (MSPP); and
3. Cisco ONS 15454 multiservices transport platform (MSTP).

The IP video adaptor addresses a variety of video formats and infrastructure types to meet the varying programming requirements while minimizing investment. The adaptor offers six video ports that can be used in four configurations:

1. Up to six SD-SDI and/or ASI inputs.
2. One uncompressed HD-SDI and up to three SD-SDI and/or ASI inputs.
3. Two losslessly compressed HD-SDI inputs.
4. One losslessly compressed and up to four SD-SDI and/or ASI inputs.

The video adaptor leverages a standards-based SONET/SDH interface and uses redundant, modular optics, so it can be deployed as a standalone transport in multiple configurations:

- *Configuration 1.* A simple point-to-point video connection over dark fiber. (See Figure 1.)
- *Configuration 2.* A simple point-to-point video connection over a wavelength. (See Figure 2.)
- *Configuration 3.* A simple point-to-point video connection over SONET/SDH circuit. (See Figure 3.)

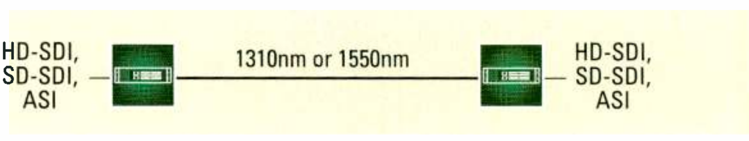


Figure 1. Venue or studio to production facility over owned/leased fiber

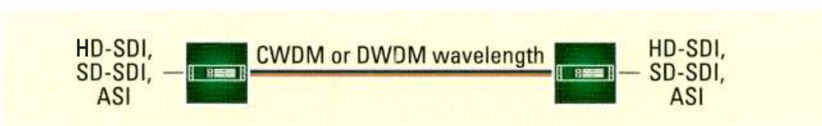


Figure 2. Venue or studio to production facility over leased wavelength

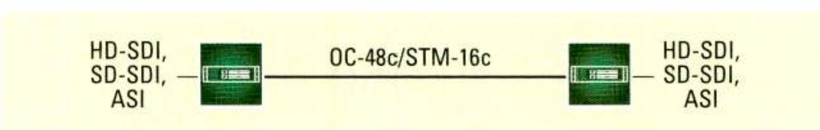


Figure 3. Venue or studio to production facility over leased circuit

• *Configuration 4.* A simple drop-and-continue video connection over dark fiber or SONET/SDH. (See Figure 4.)

In addition to the more simple video-only configurations demonstrated previously, Cisco can offer multiservices, multiwavelength solutions that feature full connectivity from any feed to any location:

• *Configuration 5.* Multiservices, any-to-any connectivity over SONET/SDH. (See Figure 5.)

• *Configuration 6.* Multiservices, high-bandwidth network over multiple wavelengths. (See Figure 6.)

These approaches leverage a combination of the video adaptor and the MSPP and MSTP. Extensive interoperability testing has been completed to verify broadcast-grade performance.

The transport solutions are capable of supporting the high bandwidths associated with video contribution services. However, it is clear that bandwidth efficiency is important to successfully deliver these services.

There are three key features that offer this desired efficiency:

1. *SONET/SDH multiplexing.* Use of the standards-based OC-48c/STM-16c within the video adaptor allows multiplexing into an OC-192/STM-64 circuit by the MSPP. Additionally, the MSTP offers a 4xOC-48 to OC-192 wavelength.

2. *Wavelength multiplexing.* The MSTP offers the ability to multiplex up to 40 10Gb/s (OC-192/STM-64) signals onto a single fiber. On a smaller scale, the coarse or dense wavelength division multiplexing (CWDM and DWDM, respectively) modular optics in the video adaptor enables efficient use of fiber assets.

3. *Lossless compression.* The video adapter offers a compression mode that enables two 1.485Gb/s HD-SDI feeds to be transported over a single OC-48/STM-16 (2.5Gb/s). The differential pulse code modulation (DPCM) algorithm provides transparent compression affording broadcast-grade video and full pre- and post-production processing.

As with any video transport solution, the key concern is quality, particularly when associated with the extremely valuable content contribution. Scientific Atlanta's video experience in conjunction with Cisco's networking expertise ensures jitter-free performance and the successful delivery of services.

Conclusion

HD-SDI video will continue to grow in importance and usage. Broadcasters' content contribution networks will evolve to address the required incremental bandwidth and availability of fiber-optic infrastructure.

The Prisma IP and ONS 15454 platforms offer the performance, quality and deployment flexibility that broadcasters and service providers need. **BE**

Robert Collmus is director of business development for transmission network systems at Scientific Atlanta.

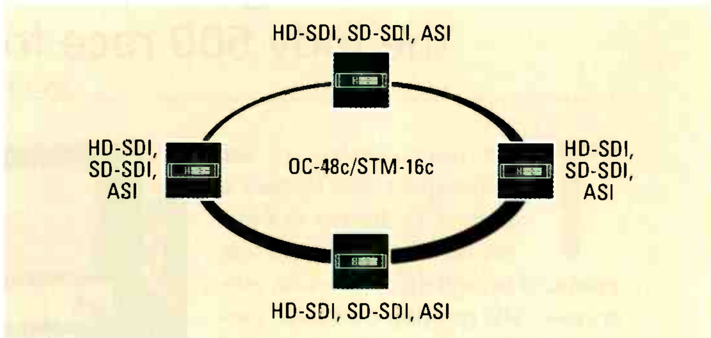


Figure 4. Venue or studio feed to multiple facilities

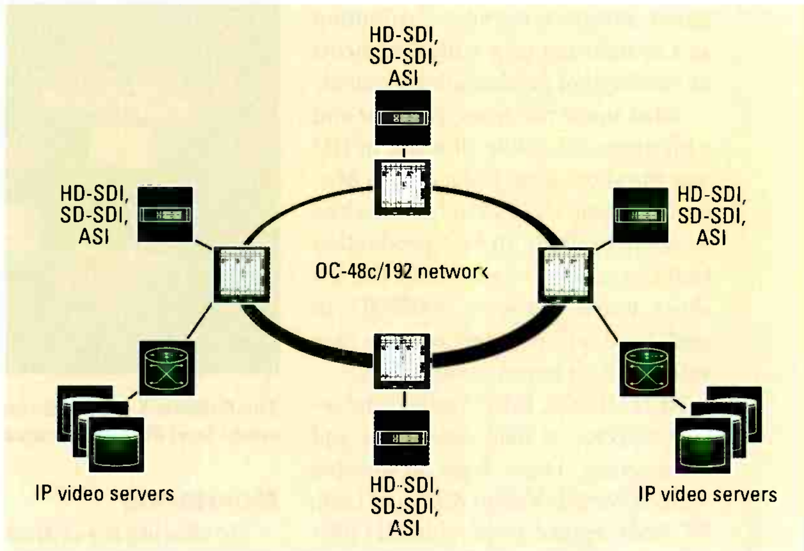


Figure 5. Facility-to-facility interconnection over a leased circuit

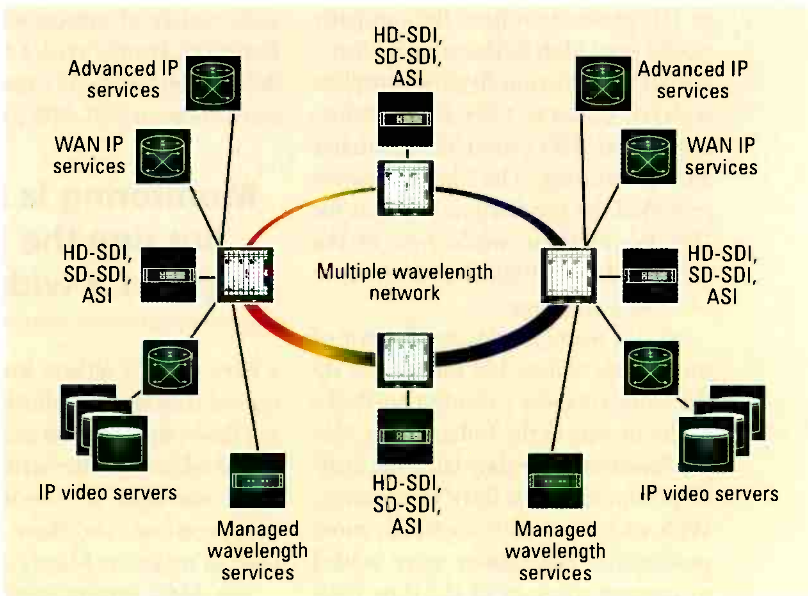


Figure 6. Facility-to-facility interconnection over owned or leased fiber

Miranda's Kaleido-X

The multi-image display processor helped broadcast the Indy 500 race for the first time in HD.

BY PHIL KURZ

This year's coverage of the Indianapolis 500 became a piece of TV history as it was the first time the event was produced in high definition. Like other major HD sporting events, the production of the race combined some of the latest HD production, fiber-optic signal transport, routing, distribution and monitoring gear with the talents of hundreds of production personnel.

What made the event different and a bit more difficult to produce in HD was the short time Indianapolis Motor Speedway (IMS) Productions had to come up with an HD production facilities vendor — essentially the few short weeks between NAB2007 in mid-April and the start of Indy race action, which began in early May.

At NAB2007, IMS Productions senior director of field operations and engineering Dave Gass connected with All Mobile Video (AMV) of Lodi, NJ. AMV agreed to provide HD production facilities for the event, with one proviso. Instead of using one of its HD production fleet, the company would send Matrix, its extensive turnkey HD production flypack complete with HD cameras, 128 x 128 multiformat router, HD production switcher and monitoring. The Matrix flyaway provided the production facilities for IMS Productions' world feed of the race, used by ESPN/ABC for the core of its race coverage.

AMV's team, headed by director of mobile operations Lee Blanco, set up the Matrix on May 3 inside a no-thrills trailer on-site at the Indianapolis Motor Speedway. Five days later, the facility produced its first Indy TV coverage. With each successive weekend, more production capabilities were added to support coverage of the time trials leading up to race day May 27.

The Kaleido-X supports multiroom display, which was used to drive displays in the world feed EVS room adjacent to the production control room.

Monitoring

Monitoring is a critical component for any live production, but one the size of the Indy 500 needs to support a wide variety of sources with ease and flexibility. For the race, a mix of more than 50 HD and SD cameras (in-car cameras were SD), HD graphics, and a bevy of EVS servers for replays required constant monitoring. Stationing the Matrix flyaway in a temporary trailer added another wrinkle because space was tight, air-conditioning was at a premium, and there wasn't a lot time to make the Matrix operational.

Monitoring is critical for any live production, but one the size of the Indy 500 needs to support a wide variety of sources with ease.

For AMV, integrating the Miranda Technologies Kaleido-X multiroom, multi-image display processor into the production setup made the most sense. The unit offered the size, quality and bandwidth necessary to meet the needs of the production.

IMS Productions' world feed producer wanted a monitor wall that was large but also quite specific. "Piling up monitors," in the words of Blanco, with under-monitor display units, to meet that requirement would have lengthened the time needed for setup. It also would have required a larger trailer with additional air-conditioning capacity to handle the heat generated by CRTs.

The multi-image display processor

supports unlimited image sizing and repetition across all displays. It can handle a mix of 96 image inputs, including HD, SD and analog, and can provide up to eight independent outputs to accommodate unrestricted monitoring in multiple rooms.

At the Indy 500, the Kaleido-X displayed 4:3 aspect ratio versions of all sources — HD as well as the SD in-car cameras — to allow the world feed director to call his show without having to make a split-second decision about whether SD viewers at home would be able to see something in the 16:9 raster.

While Blanco said he appreciated the size, image quality and bandwidth of the Kaleido-X, its graphical capabilities and flexibility made the multi-image display processor particularly well-suited for an application like the Indy 500. Offering not only video display but also UMD capability and tally, the multi-image display processor extracted unnecessary complexity from setup when compared with conventional approaches. It also offered the production staff a way to get more involved so they could be comfortable with their environment.

Taking the checkered flag

All of the equipment that was part of the Matrix flypack used for the race, including the multi-image display processor, was exposed to the rigors of the road — the potential for dings, drops and damage. The Kaleido-X unit used at Indy didn't escape unscathed.

The chassis sustained noticeable damage in transit to Indianapolis, but despite those blows, it worked flawlessly from its first use attempt without requiring any maintenance. That degree of reliability, as well as flexibility, image quality and compact size, put the Kaleido-X in the Indy 500 winner's circle for AMV and IMS Productions. BE

Phil Kurz writes several Broadcast Engineering *e-newsletters, including HD Technology Update.*

Despite its chassis being damaged in transit, the Miranda Kaleido-X multi-image display processor operated flawlessly during the Indy 500.

The Outdoor Channel

DVEO solutions enabled the broadcaster to stream HD.

BY TOM ROBINSON

Since its creation in 1991, The Outdoor Channel has grown to providing family-oriented adventure programming to nearly 27 million viewers.

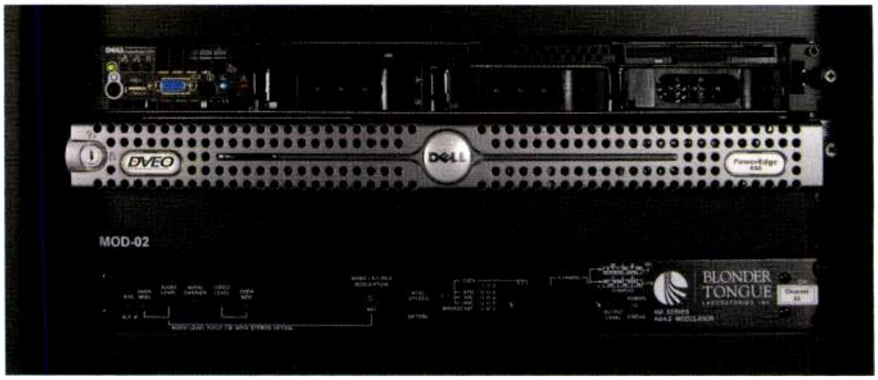
When the broadcaster launched a separate HD channel from its new technical operations center located north of San Diego, it needed a cost-efficient way to monitor its East Coast and West Coast HD feeds from the Panamsat G10R satellite downlink on its in-house screens.

The goal was to cherry-pick the ASI stream of the broadcaster's HD signal from the satellite receiver and convert it into an 8-VSB format that the technical operation center's consumer HDTV monitors could display. The HD feed also needed to be available to executive offices and in the facility's lobby.

The contractor, Technical Innovations Broadcast Solutions Group, recommended equipment from DVEO, a division of Computer Modules.

Part one: Filtering HD

The solution came in two parts. First, The Outdoor Channel selected DVEO's QuadMux demultiplexer to pull the HD programming out of the download signal. The system is a 1RU unit with DVB-ASI in and out.



DVEO's QuadMux demultiplexer (pictured top) can be managed remotely over IP through a Web-oriented console. The company's T-Streamer (pictured bottom) is a real-time, ATSC-frequency agile 8-VSB modulator.

The Outdoor Channel's control center features a DVEO T-Streamer, which is fed by an ATSC-compatible stream from a DVEO QuadMux.

Its primary function is to filter out any desired HD transport stream from a larger multiprogram transport stream and output a transport stream with a bit rate that fits the requirement of the ATSC display system. The unit can be managed remotely over IP through a Web-oriented console that provides control over start, stop and packet ID selection.

The broadcaster needed to select the output from any of four feeds it uploads to viewers via satellite. In order to feed the desired signal to its HD display system, it was important that the system could groom the HD content from 43Mb/s down to 18Mb/s, which is a requirement for the broadcaster's ATSC-compatible display monitors.

Part two: Modulating the HD stream

For the second part of the solution, The Outdoor Channel modulated the digital HD stream into RF by sending the transport stream through DVEO's T-Streamer. The system is a real-time, ATSC-frequency agile 8-VSB modulator that can take in DVB-ASI or SMPTE 310M input from the QuadMux or other similar devices through a BNC connector. It supports all ATSC HD formats, including 720p, 1080i and 1080p, and offers an easy-to-use Windows XP-based GUI with on-screen keyboard.

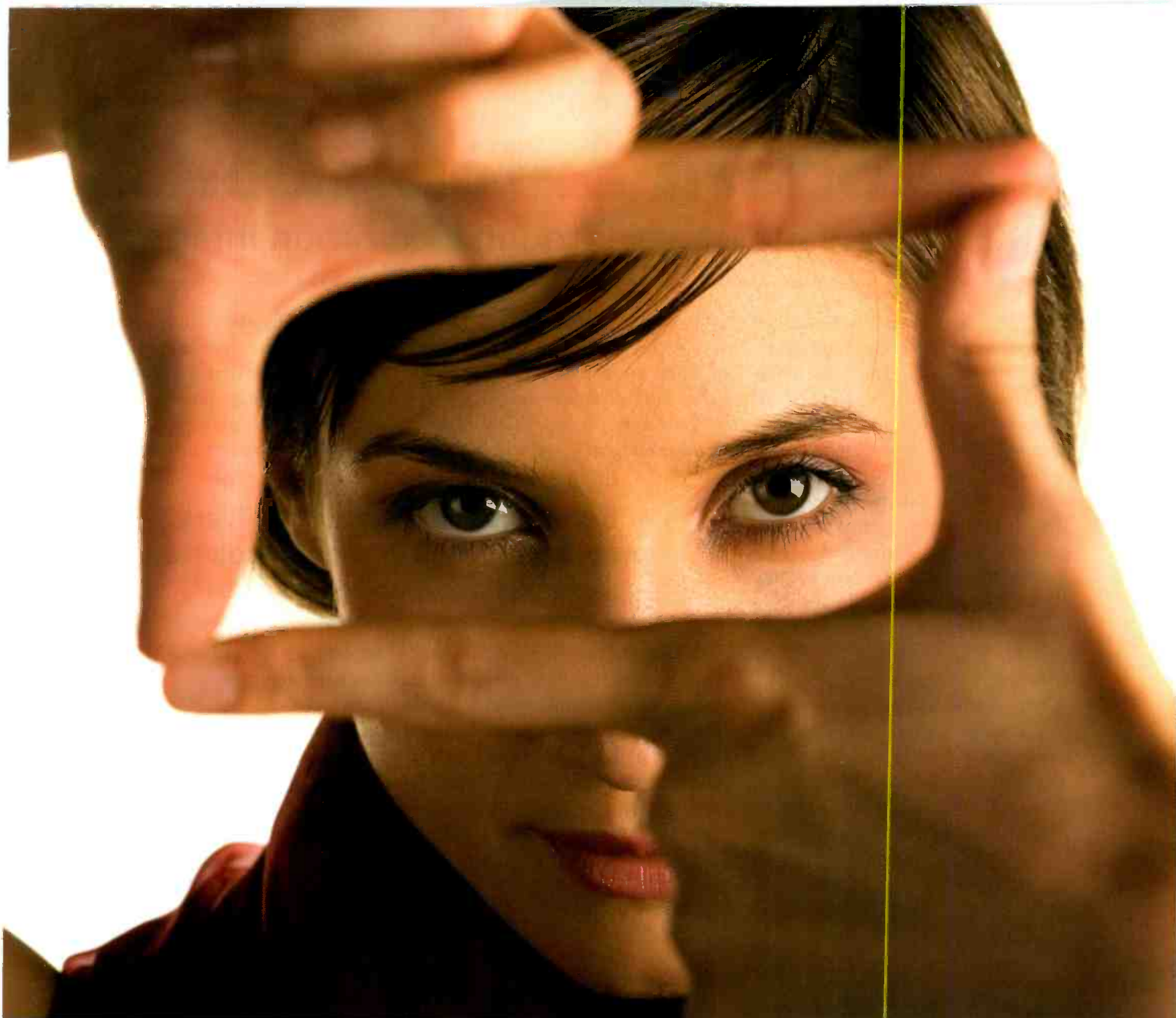
The unit's RF output is selectable from channels 2 to 69. It supports multiplexed transport streams up to 19.3Mb/s, so it is able to provide live feeds of 18Mb/s to all the HD televisions with LCD and plasma screens.

HD programming reaches consumers

Today, in The Outdoor Channel's technical operations center, the T-Streamer is being fed an ATSC-compatible stream from the QuadMux and converted to an 8-VSB HD feed that can be seen on channel 2. This RF signal carrying the desired HD feed is combined with the output of several other analog video modulators, amplified to improve its signal strength and sent via RF trunks throughout the building to both SD analog and HD digital screens for confidence and content monitoring.

The combination of these two systems has provided a cost-efficient method of sending HD programming to any consumer-level digital display in the facility. BE

Tom Robinson is the technical operations manager for The Outdoor Channel.



Modern automation

BXF delivers messages through a common interface.

BY JOHN LUFF

There are many reasons why a station should install automation. The most obvious is the apparent cost savings in labor. The math is simple. Theoretically, if a station makes a one-time investment in hardware, software and installation, the recurring cost of master control operators goes down or is eliminated. I note that this is a theoretical gain because the answer depends on the question and the initial conditions.

Manual intervention

For automation to be successful in a modern station, it must be connected to a multiplicity of devices and information sources and destinations. An automation system's playlist is derived from the air log generated by traffic. If the traffic log is without errors, it is possible to import it directly into automation, though that is often executed manually. The reason is quite simple: One would not want to blow away a currently running playlist to load a new one.

Some current systems are capable of appending new sections of log to a running playlist, though this is most often done manually to confirm that the operation is truly desired. Thus, at the very least, a person working in traffic or master control must make a manual decision to load a list.

There are plenty of other operations that require intervention. New media must be ingested to provide the necessary linkage between the media identification and house numbers generally used to track media assets once they are in-house. (See "Coding progression.") These critical pieces of metadata provide the basis for tracking and managing the assets on servers, videotape or other media appropriate for audio or video content to be managed.

Some types of content delivery promise to make content resolution and timing unnecessary.

Part of the ingest process includes marking the start and end of the message, normally using SMPTE time code. In the case of syndicated content, the information captured may include segment times. Content may also be screened for inappropriate language or visual content to protect the station from potential fines. Even at this early point in the chain, it is easy to see that an unattended operation is largely a myth. Human evaluation of the content is almost always needed.

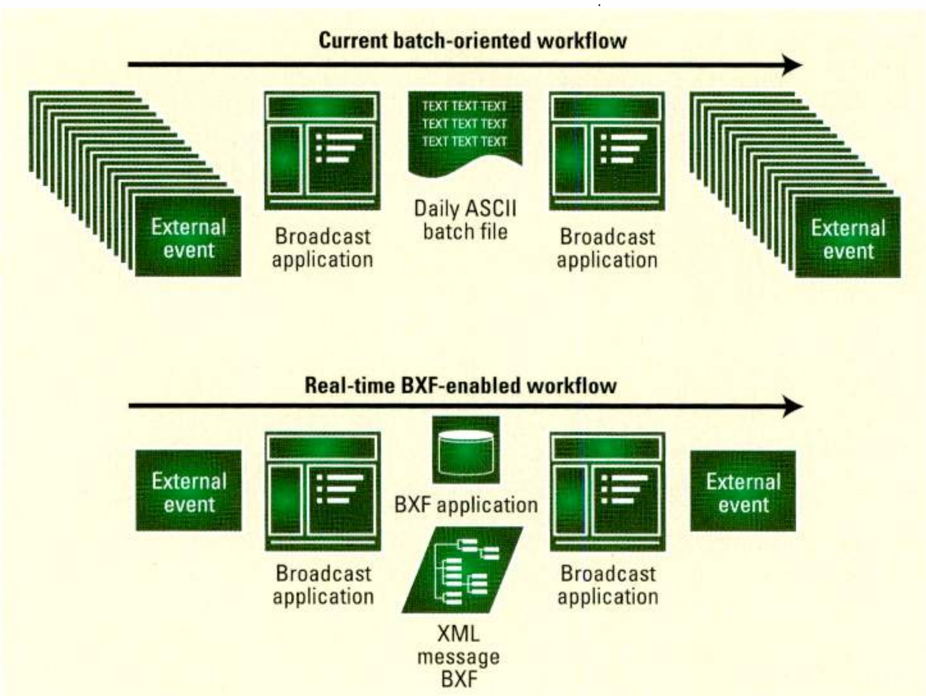


Figure 1. The BXF standard is an XML-based method of delivering messages through a common programming interface. Figure courtesy Avid's Sundance Digital.

Broadcast Exchange Format

Some types of content delivery promise to make content resolution and timing unnecessary. Content delivered by commercial services can contain the appropriate metadata, which facilitates the transfer automatically to the air server systems. Some services can deliver the media using MXF wrappers that contain the metadata in standardized ways.

The new SMPTE Broadcast Exchange Format (BXF) facilitates the delivery of messages containing details from edge delivery servers to air server systems, automation and traffic systems. (See Figure 1.) This makes integration among all applications much tighter and allows support for enhanced functionality.

BXF provides a route to additional functionality, which is otherwise hard to achieve unless a manufacturer supplies both traffic and automation. Reconciliation of the final running order on-air to the intended traffic air log has always been a tedious process. With manual operations, it is time-consuming to compare a paper log to the printed traffic run list. Even with automation, it is necessary to successfully map two data files to a common format (the output of traffic headed to automation and the as-run log from automation headed back to traffic). BXF allows a continuous reconciliation, item by item, between traffic and automation in a standardized communication format that does not need to be customized for each installation, which is a great improvement.

Any time multiple manufacturers can get together and work toward a standard, the industry benefits.

BXF deserves more discussion in this context. Any time multiple manufacturers can get together and work toward a standard, the industry benefits. In this case, automation, traffic, server, archive and PSIP generator vendors; distribution service companies; the advertising community; and others have contributed to a process that could greatly simplify implementing complex systems to support modern broadcast automation. Subcommittee S22.10, part of the Committee on Television Systems Technology, chaired by Birney Dayton of NVISION, is completing BXF.

The standard provides an XML-based method of passing messages through a common programming interface. Each manufacturer writes a BXF parsing engine, which sends and receives commands. By attacking the problem in this manner, there is no need to write unique interfaces for each new implementation. If the devices and software can communicate in a BXF system, they should simply work. It's an elegant solution in an industry that is in constant evolution.

Recently, the American Association of Advertising Agencies, which originated Advertising Digital Identification (Ad-ID), has become involved in the BXF initiative. (See Figure 2.) The association hopes that similar technology might be used to electronically communicate all the way back to the order issued by ad agencies. Ad-ID is used in many other forms of advertising, such as print and Web, so this holds good promise for the broadcast industry.

Figure 2. Ad-ID Advertisement Coding Schema courtesy American Association of Advertising Agencies

The DTV conversion

DTV is creating important new reasons for broadcasters to consider modern automation systems. Stations that have adopted multicasting, or that will by the DTV conversion deadline less than two years away, will recognize that multiple streams can be delivered practically only with automation. The simple program continuity demanded by many secondary channels can be accomplished by a variety of master control hardware approaches, and automation can execute without intervention once all the media is ingested.

With the explosion in the number of channels of distribution, one might ask if there is anything that could limit the long-term penetration of automation into broadcast delivery. The only reasonable answer is to carefully consider the impact of nonlinear delivery of on-demand content. That is a whole new ball game. **BE**

John Luff is a broadcast technology consultant.

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

Coding progression

ISCI system

- The Industry Standard Coding Identification system contains eight characters — four alpha, four numeric.
- The 30-plus year system was created to standardize the identity of television commercials for scheduling, tracking and storing. ISCI is no longer adequate in a world of digital and addressable media.

UPC bar code

- Universal Product Code bar codes are 10 digits long.
- The system was created to speed up the checkout process at retail. It was first used on May 4, 1974, when a cashier scanned a pack of Wrigley's gum in a Marsh Supermarket. Today, all products in retail outlets have a bar code.

Ad-ID system

- The Advertising Digital Identification system contains 12 characters — four alpha, eight alphanumeric.
- The American Association of Advertising Agencies created this system to standardize coding in the advertising industry for all assets. Today, there is no consistent coding method across advertising mediums, thus the lack of ability to communicate system to system.

NV5128-MC — NVISION

Master control system combines digital master control and multiformat routing in the same frame; the 8RU unit allows facilities to save on valuable rack space; features optional built-in Dolby E decoding and a variety of standard features, including A/B mixing with full auto transition control, multilevel video keying, logo store, two-picture squeezeback and audio over mixer.

530-265-1119; www.nvision.tv

LumaVue — Wireworks

Custom panels and plates can be rear-illuminated for instant identification; ideal for use in low light studio and broadcast truck interfaces; provide maximum electrical isolation between connectors; can be bused for any connection panels, switch panels and diagrams; rear engraving ensures that the markings cannot be marred or destroyed.

908-686-7400; www.wireworks.com

FS1 — AJA

Universal HD and SD, audio and video frame synchronizer and converter simultaneously supports HD and SD video in full 10-bit broadcast-quality video and 24-bit audio; supports virtually any input or output as analog or digital, HD or SD; can up- or downconvert between SD and HD, and provide simultaneous outputs of both formats; supports closed captioning and the conversion of closed captioning between SD and HD formats.

800-251-4224; www.aja.com

PDW-F355 — Sony

Professional disc camera provides a choice of 1080/60i, 50i or 24p, 25p, 30p capture; supports both over- and undercranking, slow shutter and interval recording functions; includes 16:9 3.5in color LCD display; SD-SDI output with edge crop mode for SD downconversion EE out; provides longer recording time with dual-layer 50GB discs.

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

Rainier — Avitech

Multi-image display processors feature a small form factor; can auto-detect up to 32 different computer and video inputs; offer up to 20 different selectable output resolutions; integrated on-screen display provides labels, borders and tally information.

**877-284-8324
www.avitechvideo.com**

Red Range series — Wohler

The HD2SD is a low-cost HD-to-SD downconverter with a 10-bit data path and multipoint interpolation; the HD12DAC is an HD digital-to-analog converter that can de-embed AES/EBU or analog audio; the SD12DAC is an SD digital-to-analog converter with de-embedded audio.

510-870-0810; www.wohler.com

Qmaster — QTV

IP-based prompter is part of the QNxt product suite; uses IP architecture and comprises a software application on the control PC, which communicates over an Ethernet link with a highly compact QBox unit to scroll the script; enables operation of remote prompters from a central location.

203-406-1400; www.qtv.com

DVStation-IP — Pixelmetrix

MPEG-2 test platform provides real-time and comprehensive signal measurements with user-configurable alarm thresholds and graphical displays; performs MPEG-2 transport stream analysis and monitoring over an IP connection via 10Mb/s, 100Mb/s and 1000Mb/s Ethernet ports.

866-749-3587; www.pixelmetrix.com

S5 Fusion — Euphonix

Digital audio mixer features DSP SuperCore, which powers the mixer's signal processing and routing, providing full multiformat channels with EQ, filters and dynamics together with mix, aux and group busses with bus processing; EuCon Hybrid, which incorporates the EuCon high-speed Ethernet protocol, extends the control capabilities of the console beyond the DSP SuperCore to bring Mac and PC DAW tracks onto the console surface for mixing.

650-855-0400; www.euphonix.com

StormWarn HD — Baron Weather Services

Severe weather alert system delivers all the functionality of the SD system, adding 16:9 display and native 1080i or 720p performance that requires no upconversion; allows stations to internally and externally key graphics; features bilingual support for English and Spanish, as well as customizable alert and display features.

256-881-8811; www.baronservices.com

Channel Box with VDS software — Chyron

An HD/SD switchable, turnkey branding system integrated with Video Design Software's Promotor Auto-Promo Generation suite of applications; provides end-to-end solution using business rules management and support for complex animation.

631-845-2000; www.chyron.com

iCR — **Snell & Wilcox**

Enables broadcasters and content owners to master content once and repurpose it for multiple distribution platforms; workstation combines image conditioning tools, content mastering, quality control and content repurposing functionality.

212-481-2416; www.snellwilcox.com

PIsys — **Irdeto**

Modular, large-operator conditional-access system for any kind of content; developed as a transport platform independent solution, and can be used as a convergent solution to secure DVB, IP and mobile content; enables users to grow their subscriber base from thousands to millions with ease.

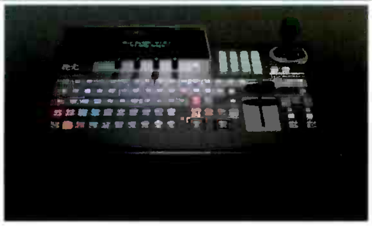
425-497-2800; www.irdeto.com

RVON-C — **RTS**

Voice-over-IP card provides the VoIP functionality of the RVON-8 for ADAM to the Cronus intercom system; converts analog audio to digital VoIP audio; installs directly into Cronus chassis; houses up to four cards in the Cronus frame, providing 32 channels of audio plus data.

800-392-0498; www.rtsintercoms.com

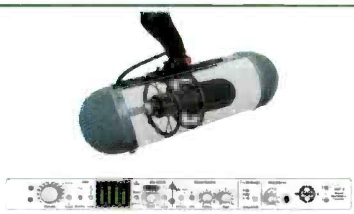
HVS-600HS — **FOR-A**



Compact production switcher supports four HD/SD-SDI inputs and five HD/SD-SDI outputs in the base configuration; the switcher is integrated with a 3-D DVE with polygonal-based visuals, which produces a variety of effects; dual-channel PIP function can be used without tying up the 3-D DVE; in its maximum configuration, it supports eight HD/SD-SDI inputs and five HD/SD-SDI outputs, as well as two or four analog inputs and three analog outputs.

714-894-3311; www.for-a.com

DSF-2 — **Soundfield**



Mic system provides both the surround and stereo soundscape at large-scale OB events; the multichannel audio it generates from a single point source is completely phase coherent; this enables the broadcaster to collapse the surround to stereo or mono for TV feeds without loss of information, frequency imbalance or any other phase problems associated with spaced microphones or multicapsule dummy head arrangements.

+44 1924 201089
www.soundfield.com

LDK 4000 mk II — Grass Valley

Single-format camera is targeted at fixed 1080i or 720p environments; uses 14-bit A/D conversion and other signal processing improvements derived from the new LDK 8000 multiformat camera; switchable between 50Hz and 59.94Hz; its light weight and compact size make it ideally suited for handheld or crane operation; uses HD-DPM+ CCD image sensors.

503-526-8150
www.grassvalley.com

TFT-MegaPixel — Marshall Electronics

HD monitor provides high-pixel density for 10.4in to 3.5in displays in one-, two, three- and four-screen configurations; newly developed proprietary technology delivers a completely digital image process onto each screen; features improvements in brightness, contrast ratio and viewing angles; configurations are available with HD-SDI, SDI, DVI, component HD/SD and composite video inputs.

800-800-6608; www.lcdracks.com

mc²90 — Lawo

Digital console features a user-definable center section that lets users hot-swap the control modules to fit their needs; offers the ability to accommodate up to five rackspaces of outboard gear into the meter bridge or the control surface; central control functions can be transferred to anywhere on the desk; Double Star Technology makes redundancy ubiquitous for live and broadcast operation.

888-810-4468; www.lawo.de

NetVX ENC-A21 — Harris

Third-generation compression system for encoding HD under H.264 includes Context Adaptive Binary Arithmetic Coding; supports wide range of compressed image resolutions, including D1, and a full complement of analog and digital video and audio interfaces.

513-459-3400
www.broadcast.harris.com

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Help Wanted

DIRECTOR OF ENGINEERING

Blue Ridge PBS, (WBRA-TV/DT, WSBN-TV/DT, WMSY-TV/DT) serving Western Virginia and portions of four other states with three regional transmitter sites headquartered in Roanoke, VA has an immediate opening for a Director of Engineering. This position is responsible for all phases of the Engineering Department including personnel, budgeting, maintenance and on-air operations. The station operates/maintains six full-power television transmitters and associated microwave paths that serve 26,000 square miles in the beautiful Blue Ridge Mountains. The ideal candidate will have a minimum of 5 years broadcast experience in a digital environment, strong technical skills and possess SBE certification. Proficient IT abilities required. Applicants must be self motivated with good organizational and communication skills. Salary DOE. Good benefits. For a complete job description, visit our website: **www.blueridgepbs.org**. To apply, e-mail cover letter and resume to: **jobs@blueridgepbs.org**. Blue Ridge PBS is an EOE. Women and minorities are encouraged to apply.

POSITIONS AVAILABLE

Interviewing for Temporary/Contract, TV News Photographers & Microwave truck Operator, (combos preferred) in a west coast TV Station. Please Email resumes to. **tv-jobs@hotmail.com**

Help Wanted

REGIONAL MANAGER – WEST COAST

Network Electronics, a world leader in 3Gbps routing and transport electronics for television and pro-video, has an immediate opening in the greater Los Angeles area for a dynamic and accomplished sales professional to take full charge of all field operations in California, Arizona and Nevada. Recent successful solutions-based selling of professional video-related electronics to the Southern California television and post community is essential, ideally both direct to end-users and through sales partners. This full time position reports directly to the CEO of Network Electronics U.S. Exceptional growth opportunity with attractive compensation package. For prompt consideration, please submit your resume in full confidence by email attachment sent to **tore@nordahl.tv** or call Tore Nordahl at 818-366-0448 for additional information. Get company details at **www.network-electronics.com**. An equal opportunity employer. No agencies please.

SATELLITE TRUCK ENGINEER

Satellite truck engineer who can also shoot, edit Avid Express pro. Atlanta production firm offers growth, competitive salary, benefits. Will relocate. Fax resume & salary requirements: 678-553-1193.

NETWORK OPERATIONS TECHNICIAN

Wyoming Public Television, a full-service, public television station licensed to Central Wyoming College in Riverton, Wyoming seeks a full-time Network Operations Technician. The successful candidate will be responsible for the installation, operation and maintenance of the Wyoming Public Television digital television systems. Assists with the installation of equipment for digital television systems and helps maintain network control digital operations and provides assistance with IT functions throughout the system. Knowledge of computer networking including LAN, WAN, SAN AND NAS systems in broadcast television a must. Bachelor's degree in related field and two years related experience preferred. Competitive salary and generous benefits package. The complete position announcement and application procedures can be found at **www.wyoptv.org** or **www.cwc.edu**. Open until filled with priority to applications received by July 10, 2007. CWC is an EOE.

NBC UNIVERSAL/TOPS NEWS FIELD & SATELLITE OPERATIONS-DAILY HIRE
Long Island City, New York

Responsibilities include maintaining electronic equipment, handling support calls, building and maintaining camera systems, and coordinating surveillance remote jobs. Qualified candidates must have a minimum 5 years broadcast audio/video experience and engineering bench tech experience. For full job description and to apply, please log on to **www.nbcunicareers.com**, job #601646. EOE

Help Wanted

MOBILE UNIT ENGINEER

TRIO VIDEO, the Midwest's leading mobile television production company, is seeking qualified applicants for the position of Mobile Unit Engineer to operate and maintain its standard and high definition mobile unit fleet from its base of operations in Chicago. Responsibilities include coordinating, troubleshooting and maintaining on-site mobile unit operations and equipment. All experience levels considered with: engineering degree, technical training, multiple years of hands-on broadcast experience or any combination.

Qualified candidates should send their resume to: Trio Video, 2132 West Hubbard, Chicago, IL 60612; resumes@triovideo.com; fax 312-421-0361.

VP OF TECHNOLOGY & BROADCASTING

KCPT in Kansas City, MO seeks VP of Technology & Broadcasting. Position will oversee the architectural design & implementation of the operational transformation into digital technology, automation & multi-channel broadcasting. Position reports to CEO & will be responsible for leading & managing the engineering, production services & IT depts. Successful candidates will have an undergraduate degree in engineering or related field, min 10 yrs television exp in technologies or eng field, including a min 5 yrs leadership/management exp, 3 to 5 years computer & network related systems mgt exp, an extensive understanding & knowledge of all FCC broadcast requirements & exc verbal & written communication skills. PTFP grant writing exp a plus. Job description at www.kcpt.org. Send resume with salary requirements to: Human Resources, KCPT, 125 E. 31st Street, KCMO 64108. EOE

ENGINEER

WLKY-TV, a Hearst-Argyle Television station, and the CBS affiliate in Louisville, KY seeks an Engineer for maintenance and repair of all broadcast equipment and operation of ENG/SNG trucks and video shading. Transmitter or SNG experience helpful and knowledge of computers preferred. A general radio operator license or SBE certification is required. Qualified applicants should send a resume to Jim Mercer, WLKY-TV, 1918 Mellwood Avenue, Louisville, KY 40206. EOE

CHIEF ENGINEER

KBTV – Beaumont, Texas is seeking a chief engineer to oversee the operation and maintenance of its studio facility and transmitters, both analog and digital. Knowledge of STL and IT skills are preferred. A minimum of 5 years broadcast experience is required. SBE Certification a plus. Good computer skills required. Chosen candidate will be responsible for managing a budget. EOE. Send résumé's to KBTV c/o General Manager, 6155 Eastex Freeway Suite #300, Beaumont Texas 77706 or email to **jobs@kbtv4.tv**.

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The race begins

Will the ATSC respond quickly to emerging standards?

BY ANTHONY R. GARGANO

Broadcasters at this year's NAB show were formally introduced to yet another approach at using a portion of the DTV stream to deliver video and data to mobile and handheld devices. Harris and LG introduced a system they have given the moniker MPH — an acronym for mobile, pedestrian and handheld.

At NAB2007, the companies indicated that they would not go through the long and drawn out process associated with ATSC standardization. Instead, they plan to market the standard directly to the broadcast community. Standards be damned? A marketplace decision? Evidently not.

Taking the fast track

The post-NAB plans seem a bit more conventional but also take into account rapidly moving business realities. The post-NAB strategy is to dual-track MPH, which means readying it for the market while simultaneously pursuing the standards-body process through the ATSC.

The plans could be the result of an overzealous booth staff demonstrating MPH, or they could be the effect of broadcast customers long steeped in the tradition of technology standards feeling uncomfortable with solely a marketplace decision. (Anyone recall the FCC debacle of the AM stereo marketplace decision?) Maybe it was a combination of both.

Critically, Harris and LG think the market for the delivery of broadcast and other video content to mobile, portable and handheld devices is moving quickly. Ostensibly, they see a danger in the normal timeline of a purely traditional approach of standards committees, subcommittees, lengthy technical evaluations and the ever-present, behind-the-scenes political machinations.

The danger is that during the several years it would take for the process to result in an adopted standard and to produce exacting technical documents and descriptions, the actual business opportunity will pass broadcasters. Thus, the parallel approach is to push for fast-tracking at the standards level while simultaneously moving forward with the market rollout.

> **Can the ATSC respond quickly enough, or will the broadcasters' mobile video opportunity crash and burn?**

For MPH, time is of the essence. And this line of thought appears to be consistent with many broadcasters' views. The objectives of the recently formed Open Mobile Video Coalition include accelerating new technology and solutions as well as facilitating a rapid and smooth standardization process within the ATSC. Just prior to this year's NAB, nine station groups representing almost 300 stations in 49 of the top 50 markets chartered the coalition.

Where the interest lies

It's not just commercial broadcasters that are interested. The public television sector has been an early adopter of DTV technology and digital content distribution.

Recently, public television broadcasters have been involved in approaches to use a portion of their DTV capabilities for first responder and emergency alert communications systems. To that end, they have entered into joint projects with the Department of Homeland Security to deliver this invaluable capability. Here too, the MPH partners see potential for their technology to assist in fulfilling the public television sector's goals to be a resource in times of emergency.

From a supplier perspective, Harris and LG's strategy for the market seems reasonably sound: Initially develop a lab platform, demonstrate and field test it, and ultimately deliver complete systems to customers shortly after NAB2008. Their comprehensive approach calls for the delivery of a workflow-oriented system complete with traffic and scheduling. Broadcasters must decide, however, how much of that valuable 19.38Mb/s bandwidth they can devote to a mobile TV service. Delivery of a 1Mb/s payload, for example, costs 4Mb/s of digital pipe.

Will the ATSC respond in time?

In any event, a mobile standard will facilitate improved emergency communications capabilities and will allow broadcasters to participate in a huge new market. Market researchers Frost & Sullivan and IDC project the mobile video market will exceed $1.5 billion by 2009.

Today, we live in an era that moves at the speed of thought. The standards bodies are in danger of being left in the dust. Whether it is MPH, A-VSB or another technology, the question is: Can the ATSC respond quickly enough, or will the broadcasters' mobile video opportunity crash and burn? BE

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

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

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