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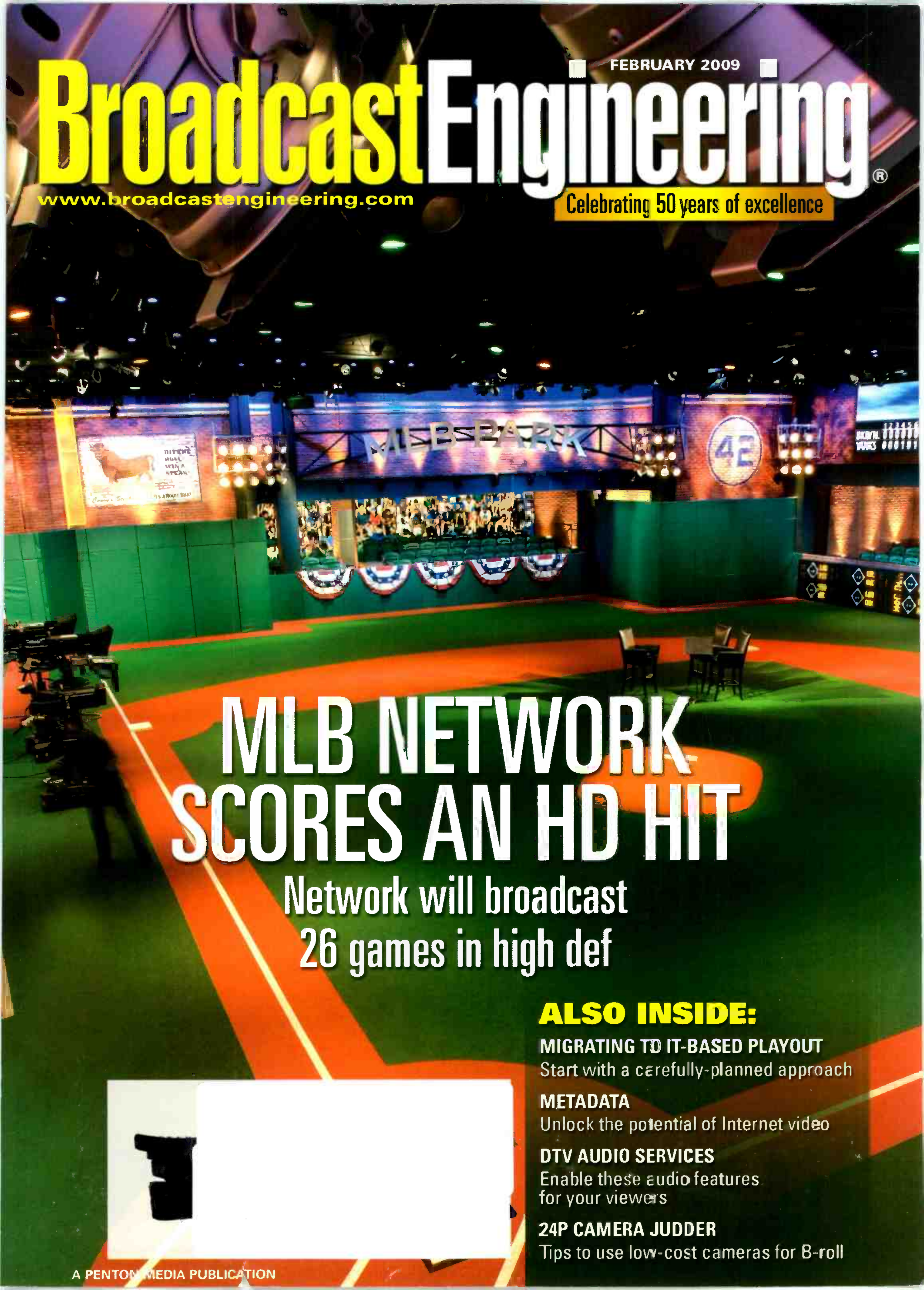

MLB NETWORK SCORES AN HD HIT

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ALSO INSIDE:

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Start with a carefully-planned approach

METADATA
Unlock the potential of Internet video

DTV AUDIO SERVICES
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A PENTON MEDIA PUBLICATION

WHEATSTONE D-9 Audio Control Surface at WPEC-TV, West Palm Beach, Florida

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FEBRUARY FREEZEFRAME QUESTION

Examine the following drawings. What is different between them and why?

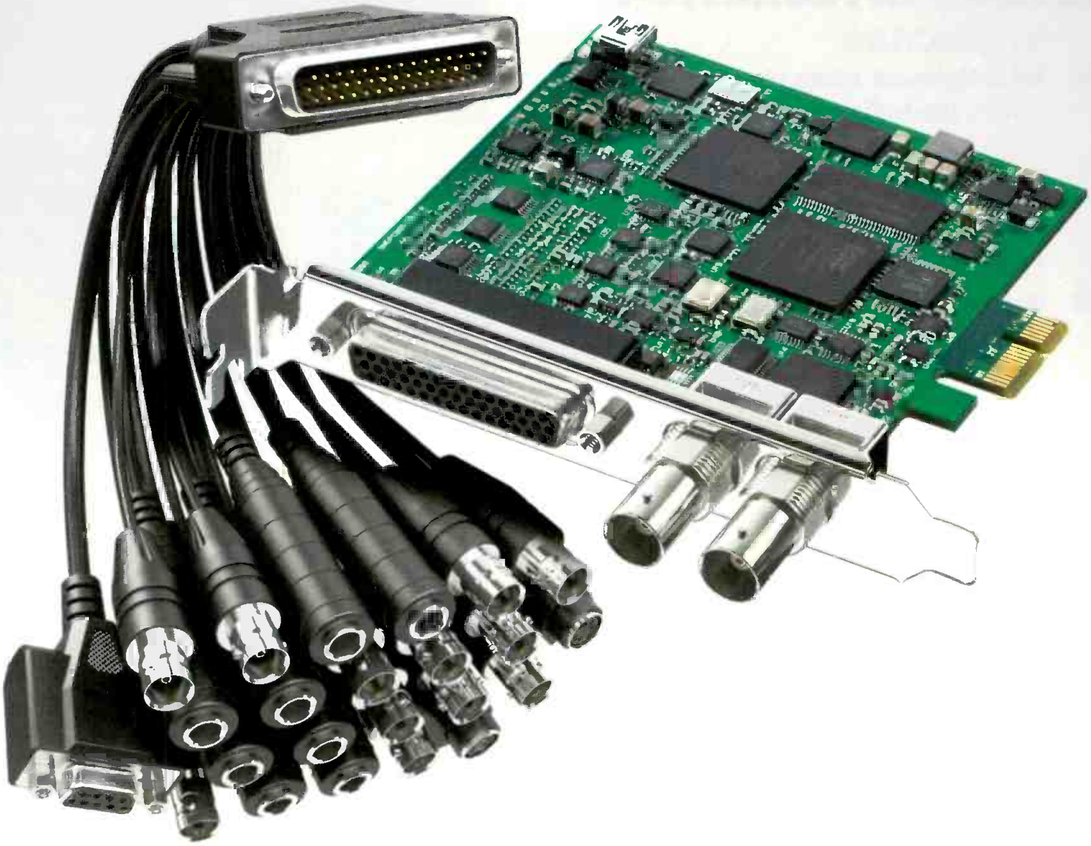
Figure 1

Pairs	T/R	RJ-45 pin	Wire color	RJ-45 pin	Ethernet
Pair 2	T3	1	White/orange	1	TxData +
Pair 2	R3	2	Orange	2	TxData -
Pair 3	T2	3	White/green	3	RecvData +
Pair 1	R1	4	Blue	4	
Pair 1	T1	5	White/blue	5	
Pair 3	R2	6	Green	6	RecvData -
Pair 4	T4	7	White/brown	7	
Pair 4	R4	8	Brown	8	

Figure 2

Pairs	T/R	RJ-45 pin	Wire color	RJ-45 pin
Pair 2	T3	1	White/orange	3
Pair 2	R3	2	Orange	6
Pair 3	T2	3	White/green	1
Pair 1	R1	4	Blue	4
Pair 1	T1	5	White/blue	5
Pair 3	R2	6	Green	2
Pair 4	T4	7	White/brown	7
Pair 4	R4	8	Brown	8

Blackmagicdesign



The new DeckLink Studio has SD/HD-SDI, loads of analog connections, down converter and more for only $695!

Turbocharge your creativity with DeckLink Studio, the SD/HD broadcast video card that costs hundreds of dollars less than SD solutions! With SD/HD-SDI and enhanced analog connections, DeckLink Studio connects to a massive range of equipment such as HDCAM, HD-D5, Digital Betacam, Betacam SP and more!

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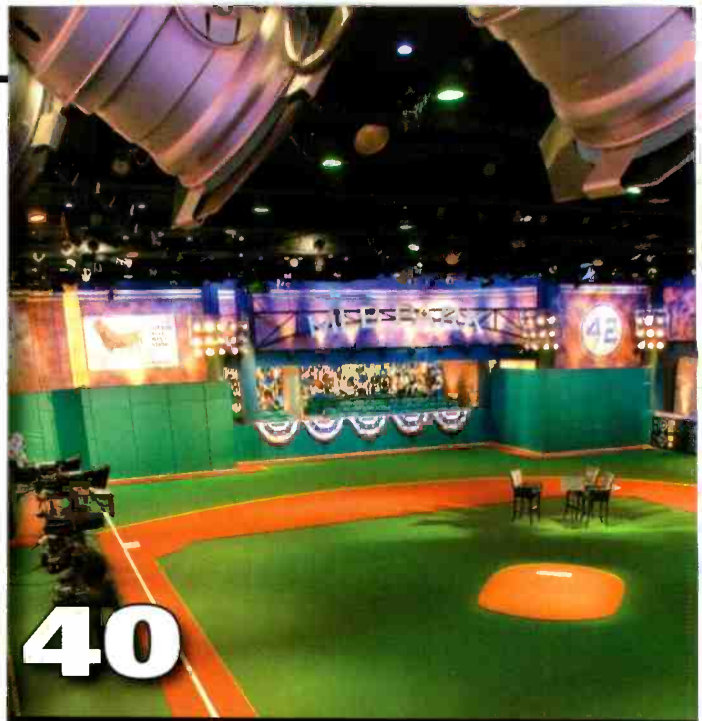
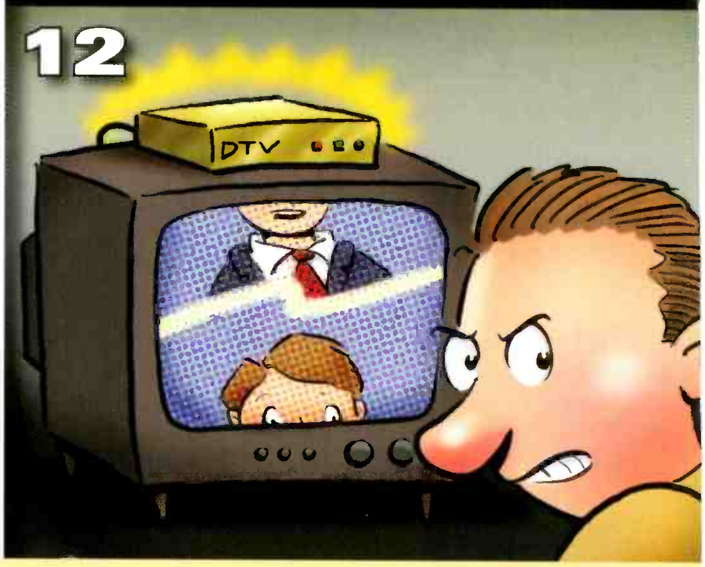


ON THE COVER:
The MLB Network facility in Secaucus, NJ, features several new HD studios, including Studio 3, where its "MLB Tonight" highlights show will originate. Photo by Andy Washnik/Corpricom.



FEBRUARY FREEZEFRAME ANSWER

Standard Ethernet cable wiring is shown in Figure 1. A connector wired in this manner is used to interconnect unlike devices. In other words, it could be used to connect a network interface card (NIC) to a router or modem. The wires connect to identical pins on both ends of the cable.

Figure 2 illustrates a crossover cable. This cable is used to connect like devices together such as NICs or switches. This wiring provides a crossover feature, moving the data transmit pins on one connector to the data receive pair on the other connector.

To determine if you have a straight cable or a crossover cable, compare the color of wires on the cable's two connectors. If the colors of the wires are in the same left-to-right order on both connectors, you have a straight cable. If not, you have a crossover cable.

Unlike audio cables, which use obviously different male and female connectors, Ethernet cables look pretty alike. This makes it easy to mistake what type of cable you have, and this can cause no end of troubleshooting frustration. A good wiring tip is to use different jacket colors for different types of cables.

*Source: Glen Ballou's new "*Handbook for Sound Engineers,*" Focal Press. Editor's note: This 1700-page book covers much more than just audio and is an excellent reference for any engineer's office.*

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real Real Broadcast Network (RBN), the leading global provider of live, multi-format, media services - featuring ViewCast® Niagara® systems.

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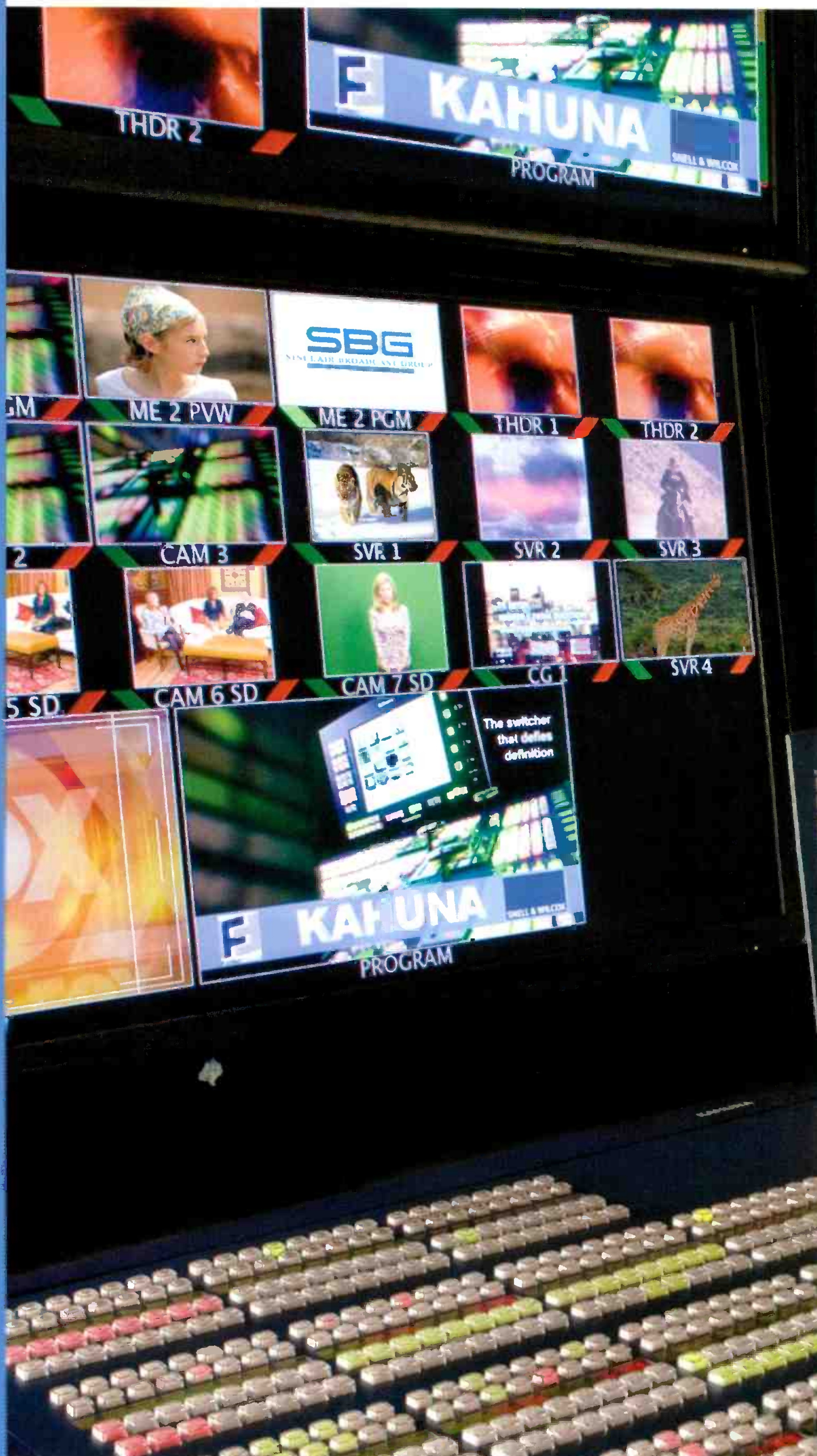


When you're responsible for the transition to HD news at one of the country's largest TV station groups, you need to ensure seamless integration of SD and HD material. That's why Sinclair's Mark Nadeau put Kahuna™ at the heart of his HD transition strategy.

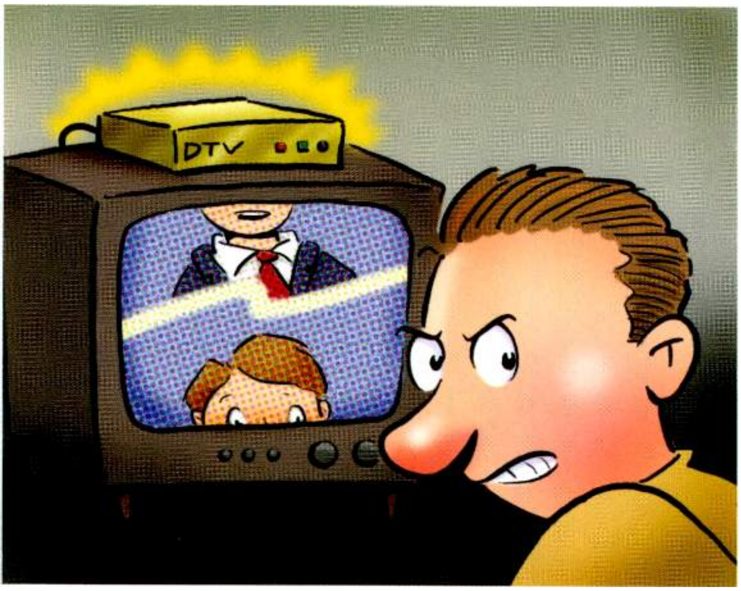
Kahuna combines unmatched switcher and DVE power with FormatFusion™, a revolutionary Snell & Wilcox technology that enables the seamless integration of SD material, such as graphics, camera feeds and archives into HD productions. All without the video delay and cost associated with external converters.

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

KAHUNA™

The $650 million DTV converter box

We've all heard about how wasteful the government is when it comes to spending our money. Examples include the $100 million wasted to purchase 270,000 purchased — but unused — commercial airline tickets, the $355,000 of taxpayers' money spent on NASCAR drivers, and the $25 billion the government shelled out in 2003 but has no idea on what that money was spent. It's about to get worse.



I just finished reading the 334-page American Recovery and Reinvestment Act of 2009 (ARRA). That is the official name for the biggest pork project in the history of mankind. This colossal, budget busting sea of red ink makes all other government spending look like small rain drops.

After downloading the entire bill, I looked up DTV funding. Here's what ARRA says about DTV:

DIGITAL-TO-ANALOG CONVERTER BOX PROGRAM

Notwithstanding any other provision of law, and in addition to amounts otherwise provided in any other Act, for costs associated with the Digital-to-Analog Converter Box Program, $650,000,000, to be available until September 30, 2009: *Provided*, That these funds shall be available for coupons and related activities, including but not limited to education, consumer support and outreach, as deemed appropriate and necessary to ensure a timely conversion of analog to digital television.

That's it! These 73 words justify the spending of $650 million. That's almost $10 million per word!

The most noticeable part of the bill's specificity is the absolute lack of it. NTIA is given more than (another) $0.5 billion, and the only thing NTIA has to do is educate, support and outreach. I'd hope you could do a whole lot of those three things for that amount of money.

I once worked at a university that knew exactly how to fund itself with Federal grant money. It was the university's policy to keep the first 25 percent of any government grant before it was passed on to the researcher's department. So, for example, if a professor received a grant for $200,000, she would actually only get $150,000. The university kept the other $50,000 as an administrative fee. You get the picture. I think the mafia calls this practice skimming.

The issue now is that much of the additional $650 million will never actually be spent supporting Americans' digital OTA viewing. Millions of people received coupons late last year but never actually used them to buy a DTV box, and the coupons then expired. If the $40 coupon was never exchanged, that NTIA money was never actually used.

While the NTIA claims to be out of money, it's simply an accounting slight-of-hand. All of the original money wasn't actually spent, and the remainder now rests in some government coffer. How much? No one is saying. (Think administrative fee.)

About 8.8 million households have yet to convert to DTV. That means Uncle Sam is budgeted to spend at least $74 per household — just to give them a $40 coupon. And how many of those remaining 8.8 million viewers will actually use a coupon to buy a DTV converter box? Half? Three-quarters? I suggest that the actual price of the NTIA providing DTV coupons that are actually used to buy a DTV converter will turn out to cost the U.S. taxpayer thousands of dollars per coupon.

Broadcasters spent $20 billion building out DTV, and yet our government can't do its part and get a simple $40 coupon into the mailbox of a few million American viewers without spending another $650 billion.

I'll bet almost any business in America could do the same thing for less than $1 per coupon. But, this is all about "change" isn't it?

Brad Dick

EDITORIAL DIRECTOR
Send comments to: editor@broadcastengineering.com


UP NEXT
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Now hiring?

Dear editor:

After reading your editorial in January's issue, "This too shall pass," it's hard to believe that the TV job market is going to get better any time soon. I am the man in the illustration holding up the sign that says "TV executive will work cheap."

I'm a freelance operations/technical producer, and my clients have cut back to accommodate the current economic conditions. I have no freelance jobs right now. Jobs have become few and far between.

About a year ago, I started applying for full-time jobs. I was hoping to land a job before things got too bad, but I have had no success. I have been on the short list of candidates for some jobs, but I always lose the job to an internal candidate.

Many jobs have descriptions that match my skills exactly, using the same language as I have in my cover letter and resume, and yet they tell me I'm overqualified. Why?

Also, new clients tell me their project is going to happen, they have the budget, we discuss the job, they agree to the rate, and then they disappear. They say the job went away. I have had so many clients tell me the job was a sure thing, and then nothing happens. It's incredibly frustrating. The only thing keeping me above water is the fact that my wife has a job.

After 25 years of working in the business, doing everything from studio camera to designing and building an entire HD facility, you would think I could get a job. I find my self-confidence is in the toilet.

I'm considering applying for a job at Lowe's home improvement store. They have a "Now Hiring" sign on the door.

Overqualified and out of work

File-based delivery

Dear Brad Gilmer:

I read your "File-based delivery" article in the November issue and have some questions. We've got a post-production facility in Johannesburg, South Africa, and this year we will be producing syndicated programming for some broadcasters in Lesotho, Botswana, Tanzania and Nigeria. Instead of the overnight courier route, we would like to take the file-based delivery one. Between P2P networking and one-way IP transmission, which model is advisable, especially in Africa? Also, in the case of live shows, can we use these two models, or are there other cost-effective models besides ATM and satellite?

Roland Dianzambi

Brad Gilmer responds:

Of these two choices, P2P is preferred. One-way IP transmission requires special applications tailored to satellite technology that may not be available in your area. Depending upon the size of the files you are sending, straight FTP over the Internet may also work. But in any case, you probably need a client that will automatically retry sending the files if the connection is dropped and that can resume sending at the point where it left off. Some FTP clients will do this, but not all of them. Read the specifications on the client to find out. Since P2P sends files as pieces, resumption of transmission in the case of a link failure is provided in the client.

In the case of live shows, neither P2P nor one-way IP transmission are suitable. However, it is quite possible to use IP networks for live show transmission. To be successful using professional-quality IP transmission, you cannot use the public Internet. You must use a private IP network where QoS can be specified and maintained.

Test Your Knowledge!

See the Freezeframe question of the month on page 6.

DRM technology

Enable mobile video content with DRM.

BY DAVID AUSTERBERRY

Discuss digital rights management (DRM) with a group of people and you will most likely draw strong and opposing views. Unlike most engineering topics, the use of DRM is an emotive subject. On one side is a predominately younger group that abhors anything that obstructs the free sharing of content. On the other side are the content rights owners, who want fair payment to view their assets.

Whatever the philosophical issues, a broadcaster may be bound by contract to prevent the copying of content. The problem has existed since broadcasting was analog and copying used tape formats like VHS.

Conditional access (CA), DRM and copy protection are terms that are often used interchangeably. They each have separate roots. However, in the converged world of the connected home, they are being integrated into a unified system to protect the rights and revenues of content owners and distributors.

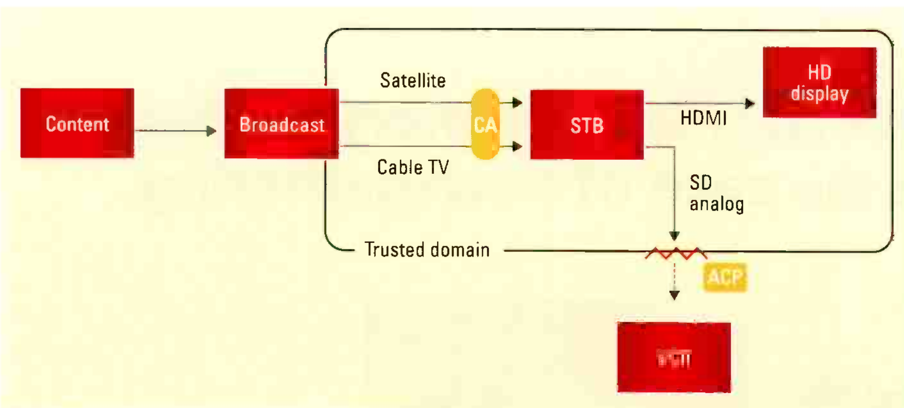


Figure 1. Conventional pay TV controls access to subscription channels. Protection must be employed to prevent copying to external devices.

Traditional broadcast model

The traditional model used by broadcasters for revenue protection has been CA. It was designed to manage access to subscription services delivered via cable or satellite. The broadcaster scrambles all the pay channels. The set-top box (STB) is provided with the key to unscramble the channels that the viewer has chosen to pay for.

The problems for content owners started with the birth of the VCR. A viewer could make a copy of a program. Developments like Macrovision's analog copy protection (ACP) made copying to a VCR more difficult by distorting the sync signal. However, the generation loss of each VHS copy meant that many rights owners were content to put up with a certain leakage.

Digital television has changed all that. A clone of an HDTV broadcast is very good quality. It can be easily copied and distributed across the world, leading to substantial loss of market for subscription services and retail products such as Blu-ray and DVD.

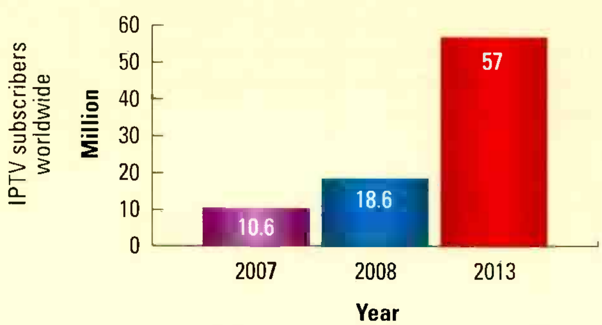
Copy protection

With the introduction of HDTV, a solution to the problem of copying was devloped in the introduction of high-bandwidth digital content protection (HDCP). The STB forms a protected domain for the content. It can output downconverted SD through conventional connections, but HD signals are only available via a protected link, e.g., HDCP over HDMI or DVI. (See Figure 1.)

HDCP is a proprietary system, which is only licensed to trusted suppliers. An HD display manufacturer incorporates the technology to decrypt the link, extending the trusted domain to the display.

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

IPTV subscription continues to increase worldwide
By 2013, there will be 57 million IPTV homes.



Source: Informa Telecoms & Media *www.informatm.com*

Unlicensed devices cannot decode the video signal.

With the mass adoption of the DVR, viewers now expect to copy programs for later viewing at a convenient time. The DVR can also be designed as a trusted system, so that content can be recorded at will but not transferred to a third-party device.

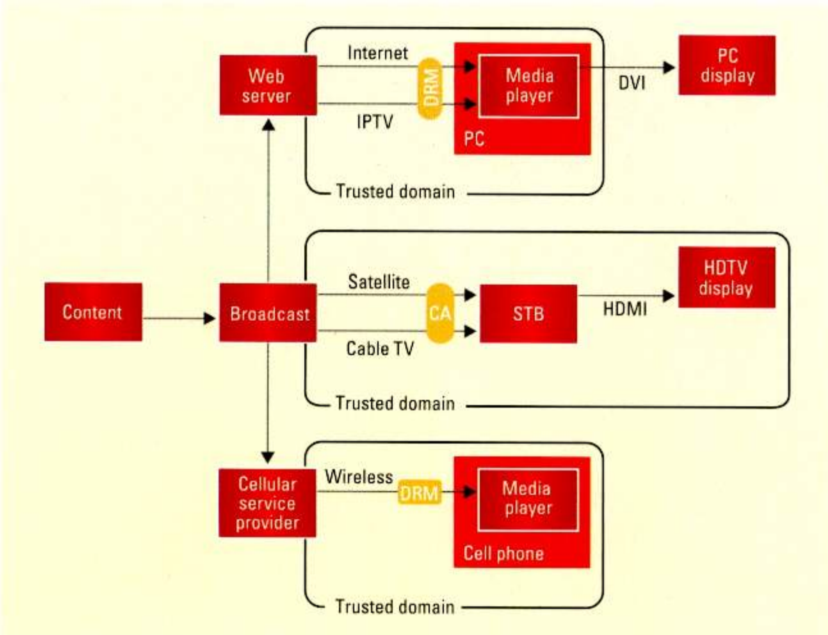


Figure 2. DRM protects broadcast content delivered to the Web and mobile devices.

The broadcast copy flag was intended to allow broadcasters to control redistribution of content, although currently the FCC has been deemed to be operating outside its remit in mandating that implementation.

New media

The broadcast landscape has been transformed with the introduction of new means to distribute and view video content. As streaming and progressive download became popular for the delivery of content to PCs, something equivalent to CA was needed to protect revenue. Unlike the controlled delivery of cable TV and the STB, streaming takes place over an open system, the public Internet. (See Figure 2.)

In contrast to the service protection of CA, DRM was developed to protect the content. DRM provides a means of delivering paid-for content to a trusted media player on the PC. Where CA allows access to a number of defined channels, DRM allows access to a single item of content.

DRM operates by encrypting content on the media server, from where it is delivered over the Internet much like a Web page. In order to view the content, the viewer must obtain a decryption key. Bundled with the key is a set of business rules, which defines how the content can be viewed. It can allow a straight purchase or rental for a set period or number of plays. Content may be a live view only or it may be downloaded, again defined by the business rules.

Broadcasters on the Web use popular streaming platforms like Adobe Flash, Apple iTunes and Microsoft Silverlight to serve their content. All these systems offer DRM as an option with Flash Media Rights Management, FairPlay and PlayReady, respectively.

DRM does suffer the same problems as CA. Once the media is decoded in the player, it can potentially be copied. This is changing as operating system developers and chip manufacturers implement more trusted systems that will make it more difficult to copy to other devices.

Running a DRM system

For broadcasters looking to offer streams or downloads of programs from their Web sites, there are several ways to implement these systems. Assuming that the broadcaster already has Web servers, the additional requirements are a media server to host the programs and a license server to host the keys. The media server is akin to a Web server, but can manage the real-time delivery of the video streams.

The simplest way to offer protected content to viewers is to use a service provider. They can handle the complexities of issuing domain certificates and licenses to view content. Several content delivery networks (CDNs) have partnered with the software vendors to provide such managed services. The alternative is to purchase server licenses and set up your own systems, not a trivial undertaking.

Convergence

With the convergence of media formats, the division between CA and DRM is blurring. The public are looking to a world where they can access content from their STB, via IPTV, the Web and mobiles devices. Not only that, once they have access to content, they want the ability to share the content across many media player, from their television to handheld devices. At present content can be protected in separate domains — one for pay TV, one for the Internet and one for mobile TV.

CA and DRM are developing to meet this converged world. CA manages delivery of pay TV, and DRM manages Internet and mobile delivery. The content can be viewed once it reaches the trusted player.

But the public wants to time shift, to share content across their many viewing devices. This requires a system to protect content and provide copy management across the media

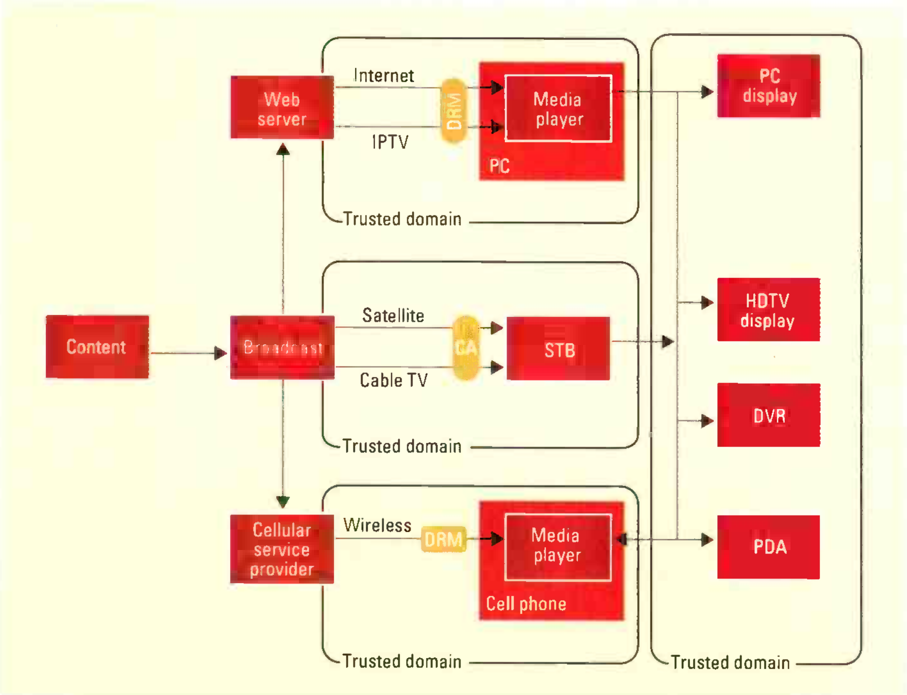


Figure 3. The goal for the connected home is the secure linking of trusted domains.

devices in the home. (See Figure 3.)

HDMI/HDCP was an early example of this, but it does not provide a complete solution. A father may want to copy a program from his DVR to a seat-back player in a car to entertain the children on a long drive. A financier may want to copy a financial program from a PC to watch on a PDA.

Such freedom to watch any content, anywhere, on any device presents many challenges for content distributors and broadcasters who must comply with the terms specified in contracts they signed when they acquired the rights to air content. DRM systems, by their very nature, are highly proprietary. To move content from one domain to another requires a DRM bridge. Implementing such bridges without compromising product security is difficult.

Forensic watermarking

Piracy will always exist. However, there are several ways to combat the theft of content. The first is to make it simple and affordable for the public to purchase what they want, and for them to be able to view on the device of their choosing.

The broadcaster can make it difficult for pirates to obtain quality copies through the use of robust CA and strong DRM for Internet and mobile delivery. CE device makers can incorporate secure hardware and link protection for interconnections like HDCP. And when all else fails, the final step is to use forensic techniques like watermarking to aid the legal enforcement of copy protection. However, the courts have not always been on the side of the content owners as the debacle of the broadcast flag has demonstrated.

The trio of technologies — DRM, CA and copy management — is there to protect revenues. It falls to the lawmakers to set where the divide between fair use and proper reward lies. BE

David Austerberry is editor of Broadcast Engineering World.

Send questions and comments to:
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FCC to fill DTV gaps

A digital translator can bolster DTV coverage.

BY HARRY C. MARTIN

On Dec. 23, 2008, the FCC released a notice of proposed rulemaking (NPRM) that would allow full-power TV stations to apply for digital replacement translators, which can fill in gaps in the coverage of stations' primary DTV signals. These filings are being accepted even though applications for new translators generally may not be filed without an application window, which the FCC evidently does not intend to open for the replacement translator service.

The new replacement service is intended to fill in holes in signal coverage resulting from the DTV transition, so the FCC has put the NPRM on a fast track. Comments will be due a mere 10 days after the proposals are published in the Federal Register. And even before the comments start, applications are being accepted. The FCC authorized the Media Bureau to start accepting applications in late December. While the applications may not be granted until the rulemaking is completed, the staff can grant special temporary authority for replacement facilities.

How to file an application

Applications will be processed on a first-come, first-served basis, with the earliest filed application getting priority. If more than one mutually exclusive application is filed on the same day, the FCC will allow a 10-day settlement period. If there is no settlement, the applications will be held for a future auction — most likely a year or more hence.

Replacement translators may be requested only by the licensee of a full-power station and only to fill in an area covered by the station's analog signal but not covered by its digital signal (although the FCC asks whether de minimis extensions of the analog service area should be permitted, and if so, how de minimis should be defined). The translator license will be ancillary to the full-power license, so it cannot be sold or assigned apart from the full-power station. Presumably, a replacement translator may not convert to LPTV status or originate separate programming, although the FCC does not explicitly say that in the NPRM.

Applicants must first search for a channel in the range 2-51. If no channel is available, an application may be filed for channels 52-59, with notice to be given to local public safety entities that will ultimately have access to those channels. Stations are also encouraged to consider three alternatives: installing multiple transmitters on their full-power channels, under the recently adopted distributed transmission systems rules; buying time on existing LPTV stations; and buying time on another full-power station's secondary digital stream. Exhausting these possibilities is not, however, a prerequisite for filing for a replacement digital translator, but some commenters will undoubtedly request that replacement translators be a solution of last resort. The FCC also proposes a use-it-or-lose-it policy, where replacement translator construction permits are valid for only six months rather than the traditional three years.

Applications will be processed on a first-come, first-served basis.

Applications for replacement translators will have priority over all other Class A, LPTV and TV translator applications, except applications for displacement relief where a station is forced off its channel by interference. Replacement translators will have equal priority with displacement applications. Presumably, the first-come, first-served principle would protect earlier filed displacements. However, pending applications for new or modified Class A, LPTV and TV translator stations, including digital companion channels, could be bumped by a replacement translator application. Seemingly, all granted Class A, LPTV and TV translator applications would be protected, even if the facility isn't built. BE

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

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

Dateline

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

Imagination to Creation

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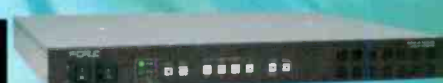
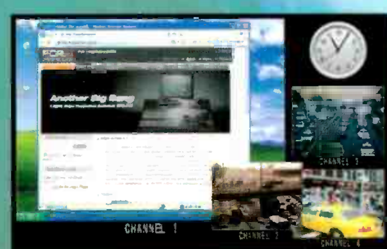
WUXGA (1920 x 1200) DVI-I Output
Video Transfer Via Network
Layout Editor



MV-410HS NEW
HD/SD/Analog (NTSC/PAL) 4 Mixed Input
WUXGA (1920 x 1200) DVI-I Output
Video Transfer Via Network
Layout Editor

MV-410RGB NEW
PC/Analog Composite 4 Mixed Input
WUXGA (1920 x 1200) DVI-I Output
Layout Editor



HD/SD Multi Display Processor

MV-1610HS NEW

- Max. 16 mixed input of HD-SDI, SD-SDI, analog composite, and PC (RGB) signals
- Supports mixed input of different frame rate signals
- WUXGA (1920 x 1200 pixels) DVI-I High-resolution output
- Includes layout editor
- Network video transfer function
- 8-channel audio level display
- Tally display, Title display, and Time display functions
- Video loss detection function
- Secondary DVI-I output (option)
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RGB/Video Multi Display Processor

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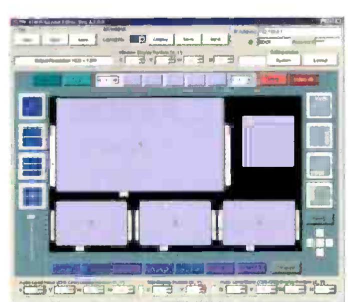
- 4 mixed input of RGB signals and analog composite signals
- Total 8 inputs: 4 DVI-I inputs and 4 analog composite inputs (choose any 4 channels)
- WUXGA (1920 x 1200) DVI-I outputs
- Including layout editor
- Title display and analog clock display functions

HD/SD Multi Display Processor

MV-410HS NEW

- 4 mixed input of HD-SDI, SD-SDI, and analog composite signals
- Supports mixed input of different frame rate signals
- WUXGA (1920 x 1200 pixels) DVI-I High-resolution output
- Includes layout editor
- Network video transfer function
- 8-channel audio level display
- Tally display, Title display, and Time display functions
- Video loss detection function
- Redundant power supply (option)



Layout Editor GUI

Digital audio for DTV

Use new audio services and metadata to augment video programming.

BY ALDO CUGNINI

There are various technologies available to broadcasters and consumers to augment video and audio programming. Digital technology allows the use of additional services and features, but doing so effectively means understanding the underlying requirements and limitations. Among the useful features of ATSC are associated audio services and audio metadata.

Associated audio services

Typically, ATSC broadcasters transmit audio using the complete main audio service (CM), which contains a total audio program with dialog, music and effects. This service can include one to 5.1 channels. One way to support multiple languages is by transmitting multiple CM services, each in a different language. In addition to the main service, the ATSC Standard A/52 includes support for several other specific audio services: music and effects (ME), dialog (D), visually impaired (VI), hearing impaired (HI), commentary (C), emergency (E) and voice-over (VO). While these are mostly self-explanatory, a few usage issues are pertinent.

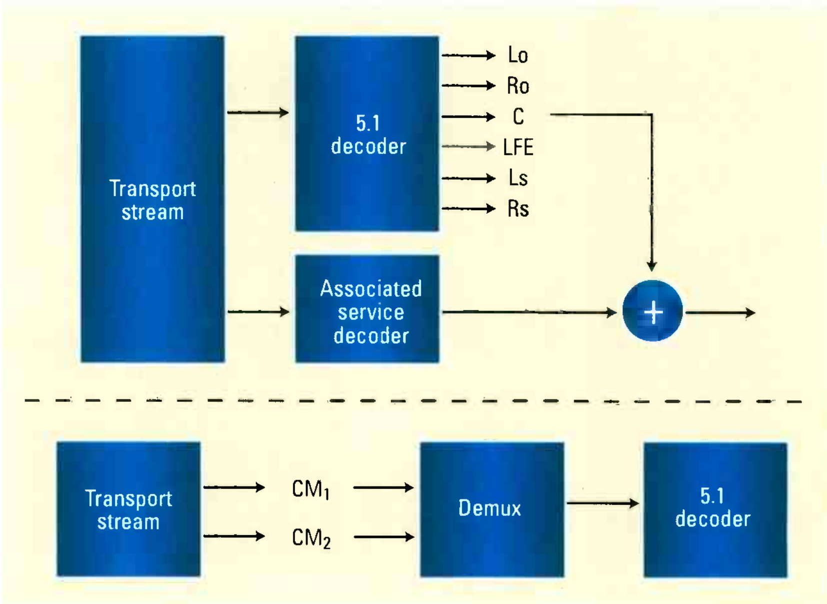


Figure 1. An associated audio service can be sent separately, requiring a separate decoder. Alternately, the second audio program can be sent on a second CM service.

The ME service is similar to the CM service, but it does not contain the dialog for the program, which can be transmitted separately using one or more D services. In this manner, a more efficient use of bandwidth can be achieved, such as when transmitting multiple languages, each on its own D service. Supporting this type of transmission requires receivers to simultaneously decode one ME service and one associated D service in order to form a complete audio program, i.e., the receiver would require multiple audio decoders. The D service audio is then mixed with the main audio, usually with the center channel, if present. (See Figure 1.)

The VI associated service provides a narrative description of the visual program content, a feature that grew from the need for audible descriptions of program action for visually impaired viewers. Special audio-only receivers could also be designed this way for viewers not needing the

FRAME GRAB

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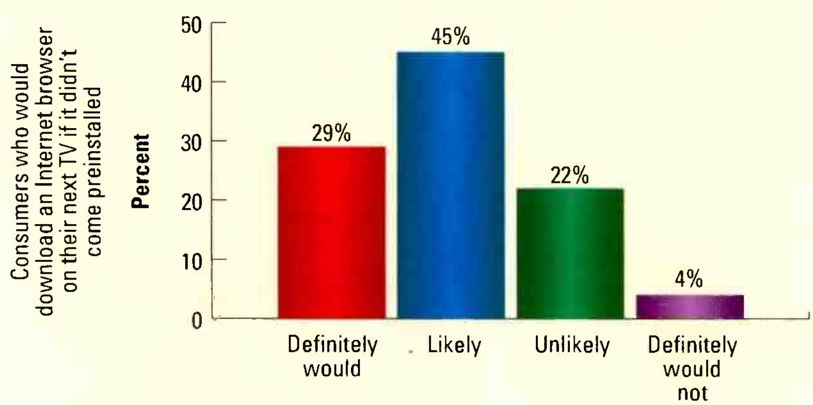
45 percent would download an Internet browser to their next TV.



Source: Oregan Networks/Micronas *www.oregan.net/www.micronas.com*

picture. Currently, many broadcasters are using the VI audio service for video description, according to the WGBH National Center for Accessible Media (NCAM) in Boston. VI is used throughout the Public Broadcasting System, as well as some of the other networks' stations, providing the video description produced by NCAM to local affiliates.

But there is currently no requirement for the transmission of the VI service. In 1998, NCAM sent a letter to the FCC, recommending that all DTV receivers should be equipped with the appropriate audio decoding and mixing capability (i.e., dual-stream decoding) to access and deliver the VI associated service and that all DTV receivers should be capable of selecting video description when available. In 2000, the FCC adopted rules mandating that a certain amount of programming contain video description. These rules took effect in April 2002, but were struck down by a federal court in November 2002. As a result, video description is not required, and its use is voluntary.

While the FCC requires broadcasters to comply with the ATSC standard, it does not require broadcasters to transmit specific elements of the standard other than PSIP, closed captions,

It is not clear exactly how many broadcasters are using associated services. There are also no ATSC receiver mandates for associated audio services.

and ratings information and descriptors. In addition, the FCC has stated that digital-to-analog converter boxes are not required to process all associated audio services. (The FCC nonetheless advises consumers to check with manufacturers and retailers to understand whether specific products provide video descriptions.)

The requirement in the FCC's rules that emergency information provided on television should be accessible to individuals who have vision disabilities was updated recently, but the specific means were not addressed. Emergency audio could be supplied using the special E service, ostensibly by automatic receiver switching, but this mechanism is not mandated by the FCC, and neither is the transmission of an E associated service. Instead, broadcasters typically replace regular program audio with an emergency message.

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It is not clear exactly how many broadcasters are using associated services. There are also no ATSC receiver mandates for these services, so it is unclear how many receivers provide support. (ATSC A/53 Part 5 informatively asserts that "the capability to simultaneously decode one main service and one associated service may not exist in some receivers." Readers are encouraged to refer to this standard, as well as ATSC A/52, for further details.) Therefore, neither transmissions nor receivers are currently required to carry or decode the associated audio services.

To get around this ambiguity, most stations will resort to a second CM program mix, labeled as a supplementary audio service, which is allowed by the ATSC standard. Although this is not bandwidth efficient, it does get around the problem of receiver compatibility, however, as multiple decoders can increase receiver costs.

Carrying audio metadata

Another area of growing interest is audio metadata. Although our discussion applies to all metadata in general, let's use one specific element as an example — dialnorm — because it's becoming increasingly used (or misused) in the audio chain. Dialnorm sets a consistent loudness level over time and across multiple services using AC-3 (Dolby Digital) encoding. We'll skip the background (as it's been covered here recently and extensively), but recall that the dialnorm value is used in the decoder to return the program level to a standard dialog loudness level. It's important to realize that not all sources and destinations use AC-3, and the ultimate recipient of the program is a home viewer/listener, who may or may not be receiving an AC-3 encoded program.

Today, a home TV viewer will receive broadcast programming from one of several means: OTA reception or retransmission by means of cable, satellite or telco. For OTA reception, all digital transmission in the United States is by ATSC, which will always have AC-3 audio, and therefore dialnorm will always be present. The critical issue here is whether it has been set properly by the network or local broadcaster.

When a local station receives programming from the network, it is usually by means of an uncompressed or near-lossless compressed feed. It is then up to the local broadcaster to set the correct dialnorm value when ATSC encoding is carried out. However, some local broadcasters take a precompressed ATSC feed from the network (or even one using Dolby E, which likewise carries metadata) and carry out program insertion (bit stream splicing) to insert local programming. In this case, the network-originated programs will already have the dialnorm value set, and this will be passed along to the viewers. However, the local insertion programming must also have the correct dialnorm setting, so the local production workflow should consider this.

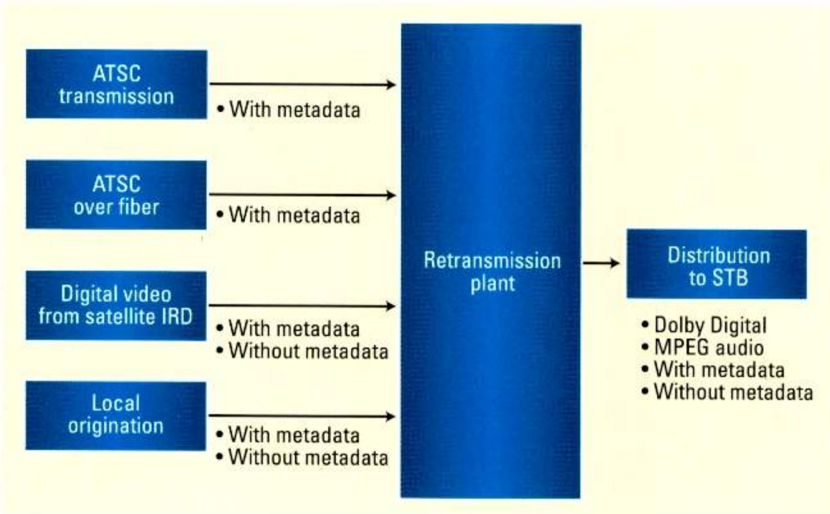

Figure 2. Various sources and distribution channels may have different or absent metadata.

For cable, satellite and telco retransmission, a mixed mode operation is always present, as different sources may or may not be available with audio metadata. (See Figure 2.) Sources that already contain metadata can pass it directly to the audio decoder, as all AC-3 decoders will use this data properly. This is the ideal situation, as it will result in a closed system that is not susceptible to mishandling.

However, sources without metadata that will be delivered digitally must be encoded at the plant in either AC-3 or MPEG. The former will require a correct local setting of the dialnorm value. The latter has no equivalent, so the program audio level must be set manually. In this case (as well as that for an analog cable channel), a loudness processor must be used that sets the outgoing program level appropriately with respect to the digital channels, so that the audio decoder will have consistent levels across all programs.

Broadcasters and retransmission operators need to work together to manage loudness across all programs and services, and fully understand and agree on their specific loudness practices. Useful references include the CableLabs document "OpenCable Host Device 2.0 Core Functional Requirements" and the CEA document "EIA/CEA-CEB-11 NTSC/ATSC Loudness Matching." BE

Aldo Cugnini is a consultant in the digital television industry.

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IP addressing basics

Maintain critical broadcast networks with IP addressing.

BY BRAD GILMER

Internet Protocol (IP) addresses take the form xxx.xxx.xxx.xxx, where xxx (an octet) is a number from zero through 255. There are public IP addresses and private IP addresses. Public IP addresses are assigned by the Internet Corporation for Assigned Names and Numbers (*www.icann.org*), and are routable over the Internet. Private IP addresses are not routable over the Internet; they are intended to be used within a facility.

As a broadcast engineer, it is important to understand how this process happens and how to assign addresses logically in your own network.

Private IP addresses

If you are building an internal network, how do you know where to start? Fortunately, early on, the Internet Engineering Task Force (IETF) realized it needed documents to describe how the Internet functions. These documents are known as request for comments (RFCs). A good place to find RFCs is *www.rfcs.org*. One particularly helpful document is RFC 1918. It sets aside three blocks of IP addresses solely for private networks. These blocks are: 10.0.0.0 to 10.255.255.255, 172.16.0.0 to 172.31.255.255 and 192.168.0.0 to 192.168.255.255. Public IP addresses are outside the blocks specified in RFC 1918 and are routable across the Internet.

Introduction to DHCP

When you plug a computer into a local network and it just starts working, how does it get its IP address? How does this new computer not clash with another computer on the network? The answer is found in RFC 2131, which describes Dynamic Host Configuration Protocol (DHCP).

If your computer is set to obtain an IP address automatically when the computer is connected to a network, it begins a series of exchanges with a DHCP server. The server's task is to assign IP addresses according to a predetermined plan established by the network administrator.

The conversation between the DHCP client (your computer) and the DHCP server (the computer responsible for assigning IP addresses) follows a specific pattern. First, your computer sends out a discover message asking DHCP servers to reply with an offer of an IP address. Second, DHCP servers respond to the discover message with an offer message containing an IP address. Third, the client sends a request message back to the DHCP server requesting a specific IP address. Finally, the DHCP server sends an acknowledge message, recognizing the IP address assignment. At a later time, the client may release the IP address when it is no longer needed. (See Figure 1.)

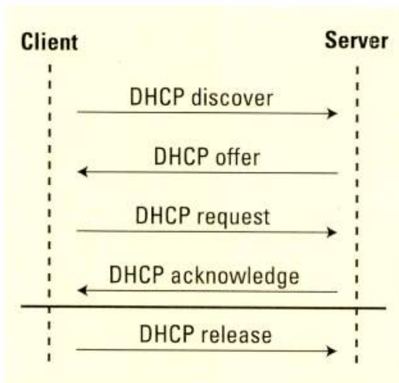

Figure 1. The DHCP negotiation process involves four steps: discover, offer, request and acknowledge. Later, a client may request that an IP address be released.

Manual assignment

In many cases, you will want to manually assign IP addresses. Unfortunately, there is no standardized way of configuring client computers. One of the easiest ways to do this is to use an Internet search engine to find out how to manually set IP addresses for your operating system.

In smaller networks with less than 253 computers, you can assign them all to the same private network, meaning that the first three octets are the same, but the last octet is different for each computer. For example, you might select 10.25.56.xxx for your network. All computers on the network would have IP addresses that begin with 10.25.56, but the last three numbers would vary. Larger organizations may want to arrange the networks by department, assigning all computers within that department to the same network. For example, graphics might be 10.25.56.xxx, but news might be 10.25.66.xxx. This would allow you to have a large number of computers in each department.

Stay away from addresses that end in zero, and 254 to 255 inclusive. These addresses are reserved for special network applications. Also note that gateways — routers that allow you to connect to other networks — usually have a LAN address ending in one. In our example, a gateway router would be assigned the address 10.25.56.1.

The role of a subnet mask

A subnet mask is applied to an IP address to determine which portion of the address refers to the network and which portion refers to a specific computer on the network. On most computers, the network mask is set to 255.255.255.0, which effectively turns the subnet mask off.

When working with an internal network where you can create all the addresses needed, you may never have to worry about setting the subnet mask to anything other than 255.255.255.0. On the other hand, if you ever work with a piece of equipment that is directly connected to the Internet, you will almost always need to set the subnet mask appropriately.

CIDR	Available addresses	Usable addresses	Subnet mask
/32	1	0	255.255.255.255
/31	2	0	255.255.255.254
/30	4	2	255.255.255.252
/29	8	6	255.255.255.248
/28	16	14	255.255.255.240
...			
/25	128	126	255.255.255.128
/24	256	254	255.255.255.0

Table 1. An ISP will give you a range of IP addresses in CIDR notation, which defines the available addresses, usable addresses and subnet masks.

It may be easiest to understand subnet masks by looking at an example. Let's say that you are an engineer at a television station that has a T1 connection to the Internet. Your Internet service provider (ISP) says you have six public IP addresses and that the address range is 66.235.22.8/29. The ISP is giving you a range of IP addresses in Classless Inter-Domain Routing (CIDR) notation. (Read more about CIDR in RFC 1518 and 1519.) The /29 indicates that there are a total of eight IP addresses in this block. As Table 1 shows, the number after the slash indicates the total number of IP addresses available.

Why does Table 1 show that eight addresses were issued, but the ISP says you only have six? The reason is that the first and last addresses are reserved. Given the CIDR of 66.235.22.8/29, you would be free to assign the addresses 66.235.22.9 through 66.235.22.14 to host computers you want to connect directly to the Internet. Note that you would set the subnet mask on these computers to 255.255.255.248.

As you know, 255 is a common number in Internet address notation. What is so magical about 255? It is an easy number to represent in binary.

In binary, the right most digit represents ones, the next digit to the left represents twos, the next digit to the left represents fours, and so on. As you can see in Table 2, a binary value of 11111111, or eight ones, equals 128 + 64 + 32 + 16 + 8 + 4 + 2 + 1, which equals 255. A group of eight binary

Base-10 value	128	64	32	16	8	4	2	1
Binary	1	1	1	1	1	1	1	1

Table 2. An example of binary values

IP address	66	235	22	8
Binary	01000010	11101011	00010110	00001000
Subnet mask	255	255	255	248
Binary	11111111	11111111	11111111	11111000

Table 3. Network address assigned by the ISP and the corresponding subnet mask in binary

digits is sometimes referred to as an octet. Internet addresses are specified by four octets separated by periods. The reason 255 is a common number in Internet notation is because it is easy for computers to count from zero to 11111111 in binary, and to make decisions based upon values that are all ones or zeros.

Now, let's go back to the number that represents the quantity of public IP addresses at our disposal in this example. Why would the number /29 be chosen to represent eight addresses on the network? To answer this question, it might be useful to look at the network address assigned by the ISP and its corresponding subnet mask in binary. (See Table 3.)

There are 29 ones in the binary representation of the subnet mask. Not only that, but if you look at the subnet mask, you will see that only three binary numbers are set to zero — the last three. A binary value of 111 equals seven. So, if you use the subnet mask to strip off all but the last three digits of the assigned IP address, the maximum number of values that can be represented is eight (zero through seven). It is possible to design logic that can quickly strip off the first 29 bits, or the last three bits.

One reason CIDR notation is common is because it is convenient. It is much easier to say 66.235.22.8/29 than it is to say 66.235.22.8 with eight valid IP addresses, or 66.235.22.8 with a subnet mask of 255.255.255.248. **BE**

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

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24p judder

Learn solutions to solving the judder problem.

BY STEVE MULLEN

The arrival of compact and relatively low-cost HD camcorders has opened the opportunity to employ them as b-roll cameras. Naturally, attention must be paid during camera setup and/or post to achieve an optimal visual match between these camcorders and more expensive digital cinema cameras.

When shooting 24fps and 30fps video, there is another visual characteristic that must be considered. All low temporal rate media exhibit judder when viewed. Nevertheless, there is concern that low-cost HD camcorders exhibit more judder than do film and digital cinema cameras.

In two white papers written for the BBC, Alan Roberts makes a convincing case that video camera technology differences, not simply camera operator inexperience, are responsible for excessive judder from low-cost HD camcorders. (The white papers can be found at *http://tinyurl.com/9n4wb9* and *http://tinyurl.com/88rv95*.)

Temporal sampling judder

Film and video cameras sample motion at regular intervals. Frame rates of 24p and 30p have lower temporal sampling rates than 60p and 60i. Therefore, 24p and 30p media will often be represented by too few samples to accurately capture complex motion.

For this reason, motion captured at low frames rates will be less fluid than when captured at high field and frame rates. The lack of fluid motion is called temporal sampling judder. It is a signature film look, and it is a desirable type of judder.

Motion judder

The frame rate used for motion pictures is 24fps — a rate considered ideal for narrative motion pictures. Some feel 30fps is also acceptable.

If film was presented at 24fps, image flicker would be intolerable. To increase the presentation rate to 48Hz, film projectors use dual-blade shutters to show each frame twice. (For a relatively dim picture, a 48Hz rate only slightly exceeds the critical flicker frequency. Brighter pictures demand a higher presentation rate, hence triple-blade shutters.) Flicker from 30p video is eliminated the same way — by repeating each image twice (60i).

Doubling the presentation rate inherently creates eye tracking artifacts. Figure 1 illustrates a horizontally moving square. When film is projected with a double-bladed shutter, a new picture is flashed 24 times per second, and each picture is flashed twice. Between each presentation, the screen goes dark. The dark period tells our eyes a presentation is complete and clears the image from the retina.

As we watch the projected image, our brain uses the series of new images to determine the square's motion vector. In a series of short movements called saccades, our eyes track the moving square. When the projector shutter opens a second time on the same frame, our gaze — following this vector — has advanced halfway to the anticipated position of the square at the next new frame's presentation.

The square, therefore, is imaged onto our retina a second time, at a position displaced along the motion vector. These repeat images, which are not where they should be based on the motion vector, degrade the perception of motion. This degradation is called motion judder. A certain amount of motion judder is accepted as part of the look of film projected in a theater.

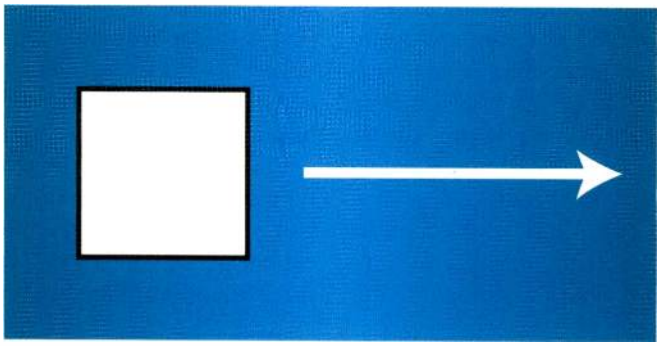


Figure 1. Eye tracking motion vector

Excessive motion judder can be prevented, for example, by panning with a moving object. Follow panning itself creates another eye tracking artifact called background strobing. However, by forcing a shallow depth of field, background detail is reduced, thereby minimizing background strobing.

Pulldown judder

When film is telecined or when 24p video is broadcast, 2:3 pulldown is added to enable the media to be carried within 60i video. (See the blue and yellow cells in Figure 2 on page 36.) While temporal sampling judder remains, motion judder is replaced by pulldown judder.

The dots in the second row in Figure 2 represent an object moving from

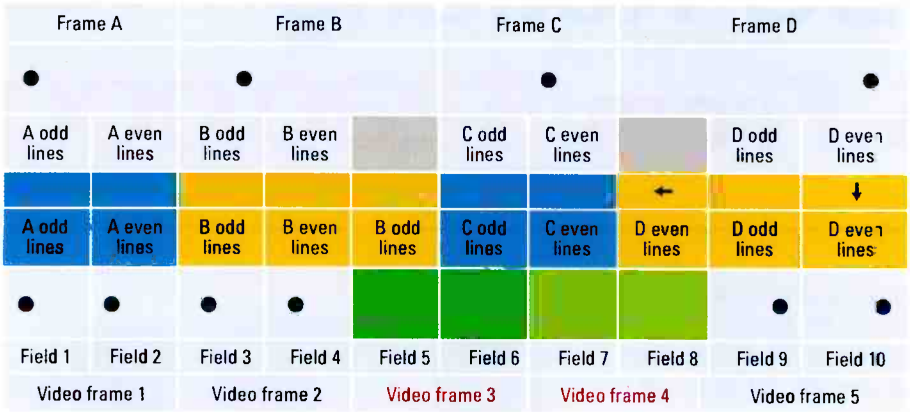


Figure 2. Interlace 2:3 pulldown

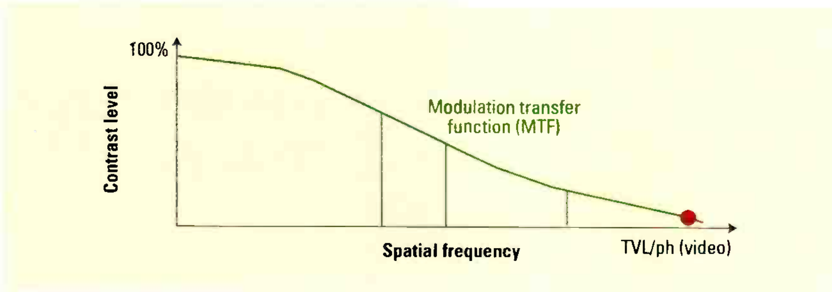


Figure 3. Modulation transfer function (MTF)

left to right. Each field, within frames A, B, C and D, should successively carry an image captured 1/60sec earlier. Fields 3 through 5 show the process of adding 2:3 pulldown.

In field 6, the odd field within video frame 3 carries motion captured 1/30sec earlier. And the even field within video frame 4 carries motion captured 1/30sec later. The nonuniformity of motion in video frame 3 (dark green cells) and video frame 4 (light green cells) mixed with the uniform motion in video frames 1, 2 and 5 creates a visual 2:3 cadence. The 2:3 cadence creates judder. For this reason, video frames 3 and 4 are called judder frames.

Camera components

According to the BBC white papers, the perception of temporal sampling judder, as well as motion (30p) judder or pulldown (24p) judder, is determined by the edges of moving objects. Hard edges create distinct moving objects. These increase our perception of judder. Therefore, any aspect of a camera's optical or electronic components that increases edge sharpness inherently increases the perception of all types of judder.

Edges have relatively low spatial resolution compared with fine detail. The perception of judder is increased by an unfavorable balance between a band of midspatial frequencies and an upper band of high spatial frequencies carrying fine detail.

A modulation transfer function (MTF) describes the relation between image contrast and spatial resolution. (See Figure 3.) An MTF curve's shoulder starts high and rolls off to a long foot. The higher the frequency the roll-off begins, the more fine detail passes through a lens.

Expensive cinema lenses have an extended MTF that transmits images with loads of fine detail. The lens on a less expensive camera has a lower frequency roll-off that significantly attenuates fine detail.

A camera's sensor size determines its ability to obtain a minimum depth of field (DOF). Film and digital cinema cameras, with their large frame size, offer a shallow DOF. Next come video cameras with 2/3in chips. At the bottom of the heap are cameras with 1/3in or 1/4in chips, which are unable to suppress background judder because they have an inherently deep DOF.

The perception of judder depends on image contrast, which is a function of a camera's gamma. Moderate-cost video cameras allow the selection of several gamma curves. (See Figure 4.) Panasonic has equipped its DVCPRO HD and P2 camcorders with a

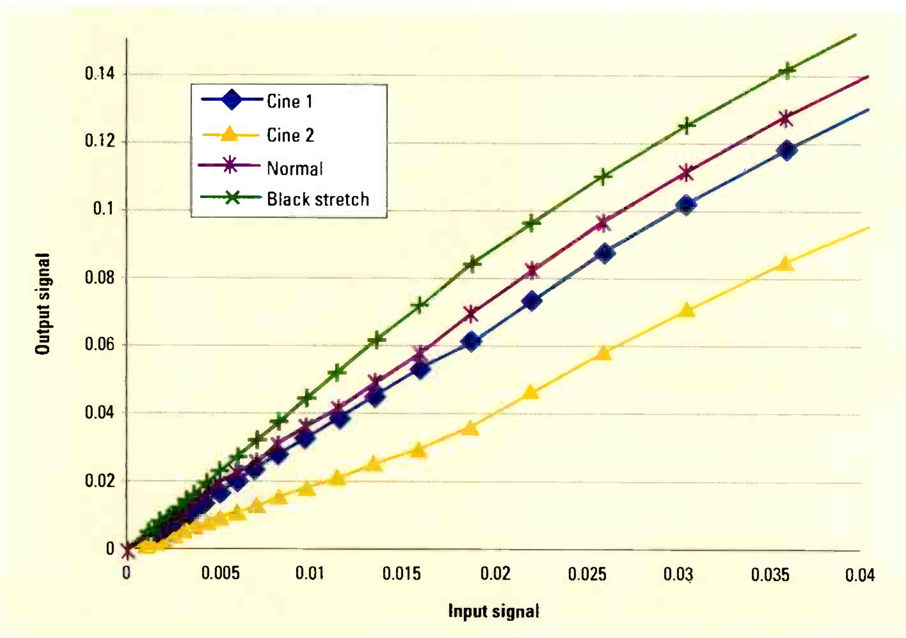
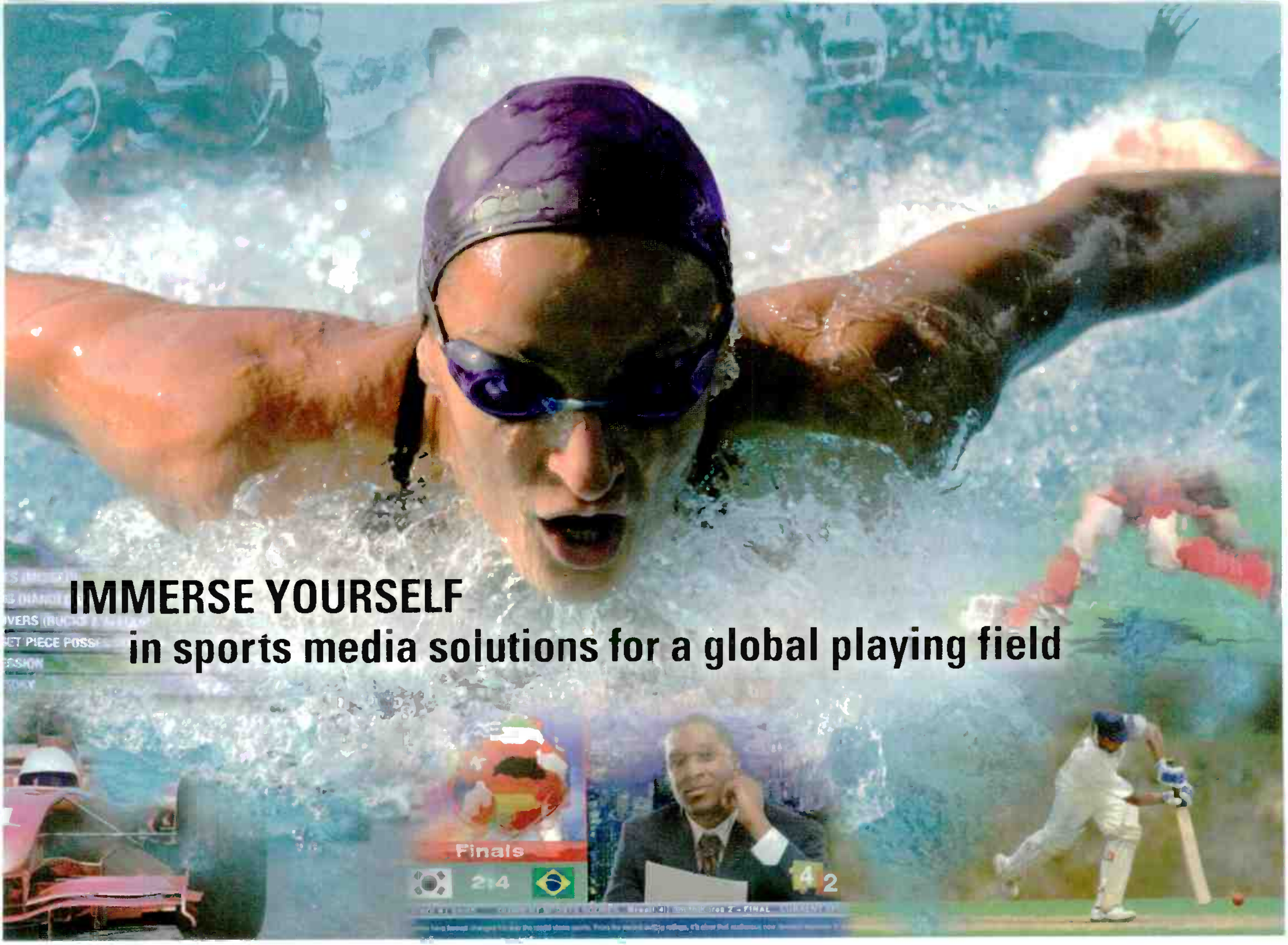


Figure 4. Typical camcorder gamma curve



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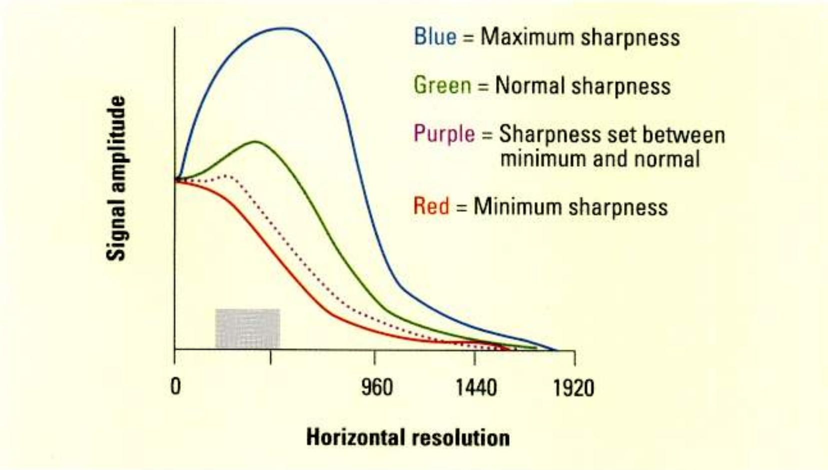


Figure 5. Example of horizontal spatial resolution

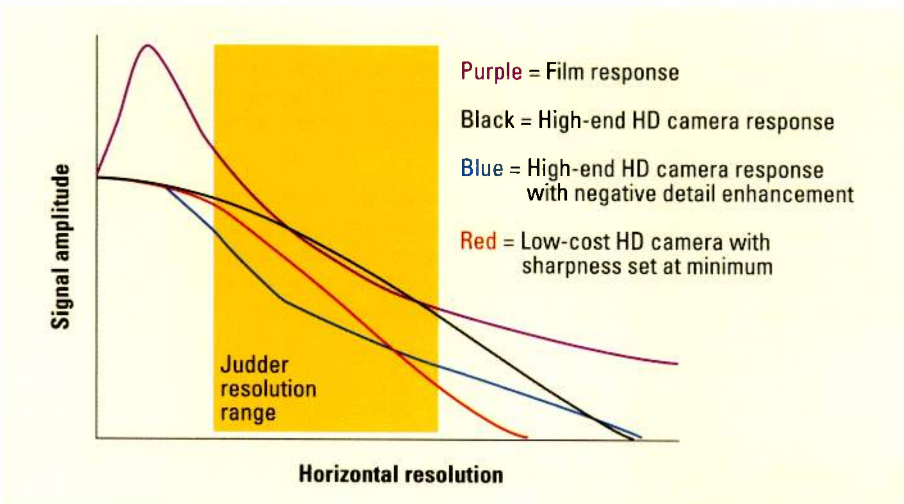


Figure 6. Anti-judder correction applied (blue)

sophisticated Tele Gamma mode for use where the content will be viewed on televisions. (These camcorders also feature a different Cine Gamma mode for use where the content will be transferred to 35mm film.)

It seems obvious that an HD camera's sensor(s) should have resolution equal or greater than the recording resolution. At low frame rates, however, cameras that use horizontal and vertical green shift to quadruple the number of pixels may yield less judder because their softer video attenuates edge sharpness. (This softness may not be desirable at high field or frame rates.)

All video cameras incorporate a low-pass anti-aliasing filter to prevent aliasing when a sensor's signal is digitized. The more sophisticated the filter, the steeper the filter's slope. Conversely, an inexpensive filter rolls off more slowly. The former allows a high cutoff frequency and thus less lost detail. The latter forces the turnover point to be further below the Nyquist frequency, thereby causing a significant loss of fine detail.

Both vertical and horizontal components are further filtered to match the recording format used. The red curve in Figure 5 illustrates the horizontal spatial resolution from a typical low-cost 1440 x 1080 camcorder.

As shown by the red curve in Figure 5, signal strength is already very low by the midpoint of the recording bandwidth. Video cameras have a sharpness (detail enhancement) control that adjusts the amount of boost applied to the signal. In Figure 5, the green and blue curves represent, respectively, normal (midpoint) and maximum sharpness. The boost expands the area under the curve — thereby increasing overall image sharpness — and lifts the higher frequencies, thereby preventing loss of fine detail.

Unfortunately, even at a normal setting, the horizontal frequency response curve has a moderately large peak within the frequency range that creates judder. (See the gray zone in Figure 5.)

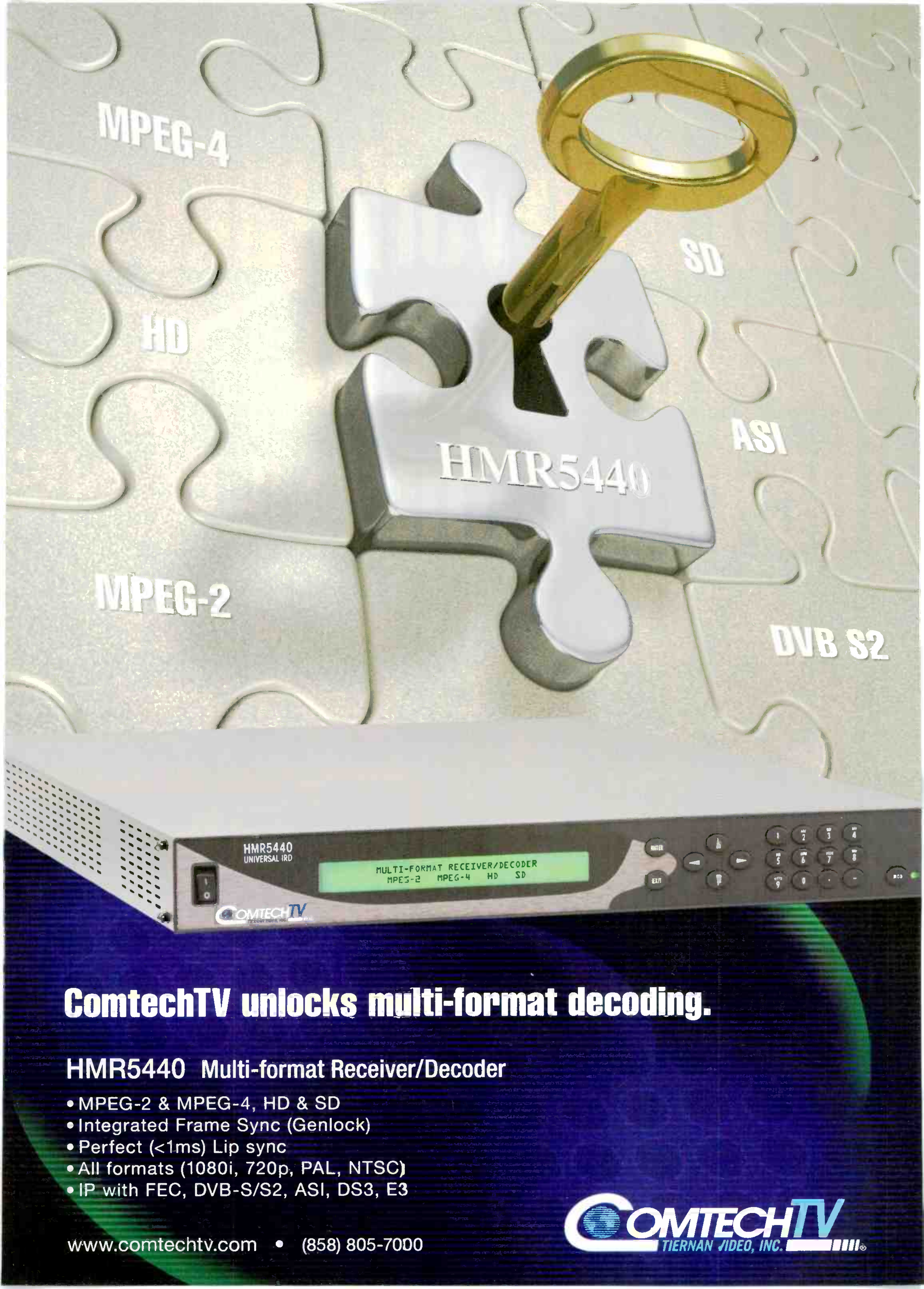
More sophisticated camcorders have separate controls for detail enhancement and aperture correction. While the detail control alters edge sharpness, the aperture control alters the amount of fine detail. These controls enable a camera operator to balance edge detail and fine detail to minimize judder.

Figure 6 illustrates the judder band (orange) plus three representative response curves: film (purple), a digital cinema camera (black) and the response of this camera with negative detail enhancement (blue). Negative detail correction, as offered by Sony HDCAM and CineAlta camcorders, reduces the perception of judder.

Until low-cost HD camcorders incorporate the ability to dial-in negative detail and yet not reduce the amount of fine detail, a camera operator can try to eliminate excessive judder by setting sharpness midway between minimum and normal. Figure 5 shows this curve by a series of purple dots. (Setting sharpness at the minimum, as is often done in an effort to create a film look, simply strips video of fine detail, as shown by the red curves in Figures 5 and 6.)

Another judder reducing solution is to include the use of appropriate optical filters and/or a slightly slower shutter speed that increases motion blur. Likewise, a camera operator can control camera motion while the director controls the movement of objects within the frame. **BE**

Steve Mullen is owner of Digital Video Consulting, which provides consulting services and publishes a series of books on digital video technology.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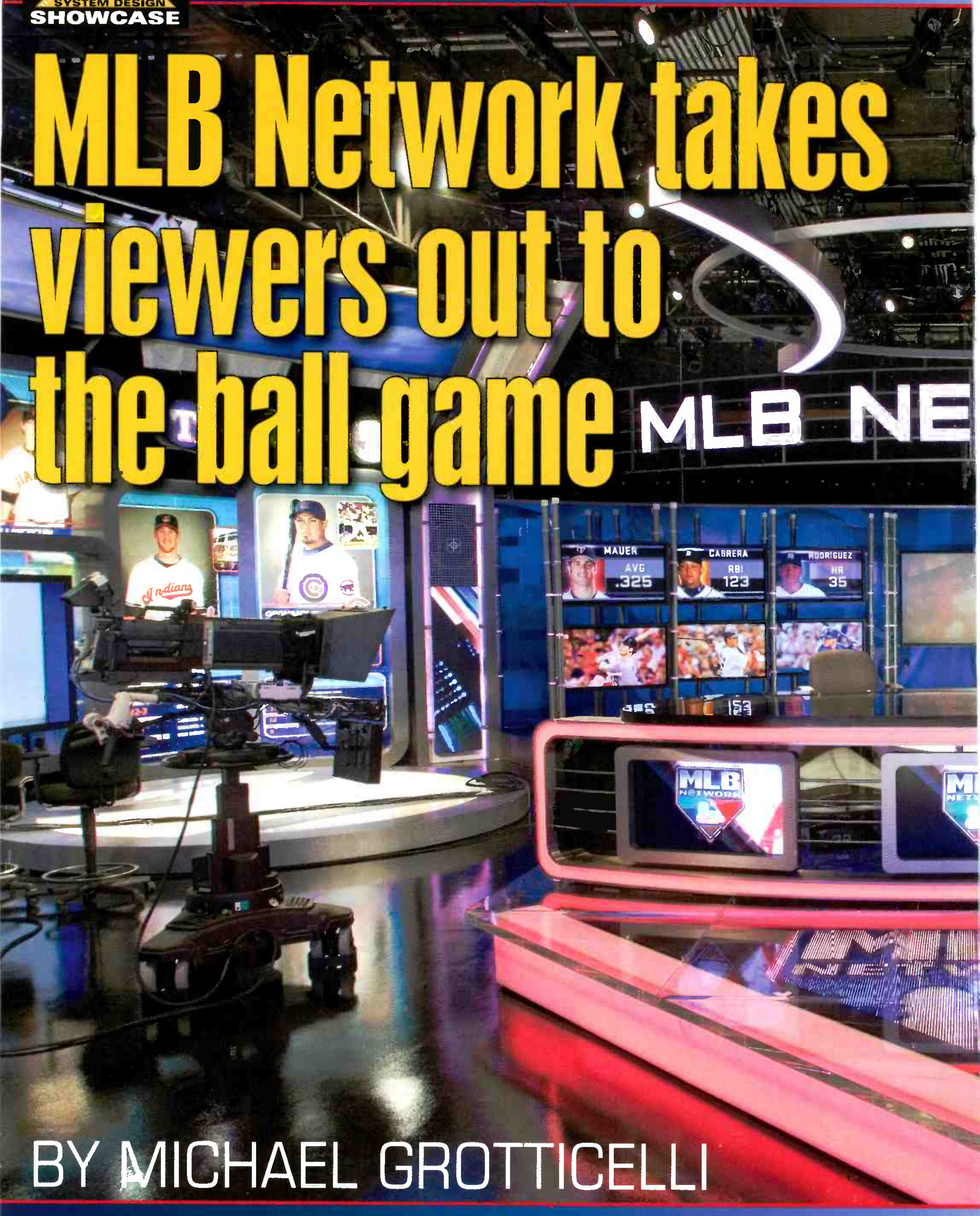

BY MICHAEL GROTTICELLI

The MLB Network facility in Secaucus, NJ, features several new HD studios, including Studio 3, where its "MLB Tonight" highlights show will originate. Photos by Andy Washnik/Corpricom.

Major League Baseball (MLB) delivered the first pitch of its new MLB Network channel on Jan. 1 from a renovated facility once used by MSNBC in Secaucus, NJ. The MLB Network is available in 50 million homes. The 24/7 sports channel will broadcast 26 games live in the 720p HD format during the 2009 season. It will also feature a variety of original programming, produced in-house by the MLB Network staff and by MLB Productions, which develops original programming aside from actual games.

After considering several other options for its new home, the MLB Network set up shop in Secaucus with a multilayered, file-based infrastructure that builds on the facility's circa 1995 state-of-the-art digital production environment. The large 140,000sq-ft space is also securely tied into all 30 MLB ballparks around the country and will conduct two-way file transfers, some in real time, on a daily basis during the season.

Systems integrator The Systems Group was tapped to design, integrate and manage the massive facility rebuild under the guidance of broadcast operations consultant CBT Systems. They were careful to ensure that the facility meets the needs of the new MLB Network as well as its sister MLB Productions.

The completely revamped facility features 29 edit rooms (14 Apple Final Cut Pro workstations with surround-sound capability and 15 Thomson Grass Valley Aurora news editing systems), multiple Grass Valley K2 HD video servers, and two large studios, one of which contains a half-sized baseball infield complete with a mound, dugouts and scoreboards. New production space for MLB Productions includes the recommissioning of 15 additional Final Cut Pro edit suites and the addition of two Fairlight-based audio sweetening rooms.

Most systems initially went online in December for testing and rehearsal before the network went live in HD. The original plan, initiated two years ago, was to create a hybrid SD/HD plant with live games shot in the 16:9 aspect ratio. That plan has morphed into a 720p HD infrastructure that's now managed by an NVISION 576 x 1040 router, Miranda Kaleido-X multiviewer, a Grass Valley storage area network (SAN), Evertz modular equipment, an Omneon Spectrum server and a Pro-Bel Morpheus automation system.

Darrell Wenhardt, president of CBT Systems, said having to retrofit the new HD equipment into existing spaces made the installation more challenging than if they had started from scratch, but would not have been possible to achieve from the ground up. Everyone involved with the frenetic six-month build agrees. However, the fact that the facility was originally built for television production made the latest install more realistic given the time constraints.

IT-centric design

Interestingly, no production people were involved in the early stages of the design process, but several IT engineers were tasked with putting together a production platform that could support television, Internet and mobile TV services. The system design incorporates a 1.5Gb/s infrastructure that includes some 3Gb/s capable equipment. However, there are no plans to produce content in 1080p/60 HD anytime soon.

The result is a flexible file-based system that treats video as data that can be routed to any part of the building. Baseband video also has its place internally, for set monitoring and transmission, whereby files are distributed as ASI streams. This marriage of the two technologies is what makes the new facility shine.

Mark Haden, MLB Network's vice president of engineering and IT, said even though the system is complex in terms of its design, it helps to simplify the production process in a variety of ways. Producers and editors have simultaneous access to files stored on the nearline and offline servers, so there's no need to find the right videocassette as they have in years past. Audio and video clips can be searched and retrieved from any desktop in the building by leveraging several layers of metadata. Using Aurora Browse software, the staff can also view clips using proxy video and make rough EDLs at their desktop.

The baseball field studio features four Sony HDC-1450 HD (native 60p) cameras on Vinten Quattro OB

Technology at work

Apple Final Cut Pro editors
Autodesk
- Flame compositing and effects
- Inferno visual effects

Calrec
- Hydra networking
- Omega digital audio console

Cisco IT routing backbone
Evertz
- 7800FR HD-SDI router
- AES router
- Modular equipment
- Quartz MC

Hitachi MPEG-4 encoders
Miranda Kaleido-X multiviewer
NTT Electronics MPEG-4 encoders
NVISION 9000 series router
Omneon Spectrum media server
Pro-Bel Morpheus automation
Riedel 2000 series intercom
Sharp
- 108in HD monitor and 42in LCDs

Sony
- 42in flat-panel displays
- HDC-1450 cameras
- MVS-8000G HD video switcher

Sun Microsystems StorageTek SL8500 library
Telestream FlipFactory transcoder
Thomson Grass Valley
- Aurora news editing
- K2 HD video servers and SAN

Vinten
- Artemis stabilized camera system
- Quattro OB pedestals

Vizrt 3-D platform

The impressive and completely flexible Studio 42 (numbered for Jackie Robinson) includes a half-scale baseball field, where talent can perform interviews and MLB players can demonstrate their hitting and fielding skills. There's also a bleacher area in the outfield, where a studio audience will sit.

One of two HD control rooms, leftover from the MSNBC days, has been rejuvenated with a Sony MVS-8000G HD video switcher, Miranda Kaleido-X multiviewer running on 13 Sony 42in flat-panel displays in each, and a Calrec Omega digital audio console. Both rooms will be used simultaneously during the baseball season.

pedestals, a mini-cam on a jib and another on a Vinten Artemis stabilized camera system. All will be used in unusual ways to give the studio an innovative look.

HD production control

Two control rooms, leftover from the MSNBC days, have been rejuvenated with a Sony MVS-8000G HD video switcher, Kaleido-X multiviewer running on 13 Sony 42in flat-panel displays in each, and a 56-fader Calrec Omega digital audio console linked by Calrec Hydra networking. Both rooms will be used simultaneously during the baseball season. The creative services department is located on the second floor and uses Vizrt 3-D graphics platforms as well as Autodesk Inferno and Flame image compositing systems. This department produces images for both the MLB Network (lower thirds, tickers, bugs, ID and promos) and its various print properties.

Master control includes an Evertz Quartz system, where bugs, a reality check ticker and commercials are inserted before the programs go out to air. A live ingest area with Aurora Ingest workstations supports QC as well as the recording of incoming satellite feeds. There's also an area set aside to ingest audio and video elements that come in on tape, where multiple formats are accommodated.

Because of the massive ingest capabilities installed to handle inbound feeds, the network could have 15 games going on simultaneously. There will be a game of the week, live look-ins of other games and full highlights of all the games combined for highlight shows like "MLB Tonight" on the MLB Network. In addition, Sharp has supplied a massive 108in HD monitor on the set in Studio 3 and more than 40 other LCDs throughout the facility.

Fast turnaround

Sports news production relies on up-to-the-minute highlights. At the Secaucus facility, clips can be on the network (and on-air) within seconds after they actually happen. The Aurora Edit systems allow editors to begin working on clips before they're even finished being ingested into the system, making highlight turnaround lightning fast. Thousands of low-res proxy clips will be available at the touch of a button.

A total of 36 K2 media servers are employed in a RAID-protected SAN for editing and accessing/sharing thousands of audio and video clips on a daily basis. The servers are configured in two redundant paths — 18 servers for "X" SAN and 18 for "Y" SAN — with each SAN providing 1000 hours of HD storage at the highest quality (100Mb/s). There are also 10,000 hours of RAID-protected nearline storage.

As part of a highly collaborative workflow, every night during the 2009 baseball season, the newly renovated all-HD MLB Network facility will receive multiple feeds of every game, and select material will be ingested with statistical metadata provided by MLB Advanced Media (MLBAM) automatically. Dozens of production personnel will then use the equipment and networked systems to quickly edit and play to air highlight packages and short clips for a variety of shows. Working natively in HD, editors in some cases will use the Apple FCP workstations and then bring the rough-cut clips into the editing environment for finishing and playout to air.

Several Telestream FlipFactory systems have been deployed to convert files and distribute content to multiple platforms simultaneously.

Long-term archiving is stored on a Sun Microsystems StorageTek SL8500 library with initial scaling of 17,000 hours on LTO-4 tape cassettes. This archive features storage capacity for more than 30,000 hours of HD content at 100Mb/s. Content is stored using MPEG-2 I-frame only compression.


The master control area features an Evertz Quartz system, where bugs, a reality check ticker and commercials are inserted before the programs go out to air. A live ingest area with Thomson Grass Valley Aurora Ingest workstations supports QC as well as the recording of incoming satellite feeds.

Design team

Major League Baseball — Office of the Commissioner:
Tim Brosnan, exec. VP, business
MLB Network:
Tony Petitti, president and CEO
Mark Haden, VP, engineering and IT
CBT Systems:
Darrell Wenhardt, president
The Systems Group:
Scott Griffin, principal, VP engineering and technology
Belinda Binkley, dir., project ops.

Two-way file transfers

In order to bring fans at home closer to the game, the facility will also be securely tied via fiber to all 30 MLB ballparks in the country, plus league offices and MLBAM (the division that oversees the *www.mlb.com* Web site). The tight integration between the parks and the network production control rooms in Secaucus will be achieved by having IP control over signal routing, camera control and server records/transfers.

Pioneering a system called "BallParkCam," three signals from up to 15 live games as well as 48 channels of discreet audio (effect, TV audio, radio calls and foreign-language commentary) will be sent live via MPEG-4 4:2:2 AVC encoded streams to the highlights factory. A clean version recorded on-site in a server will later be sent via FTP at 100Mb/s to Secaucus for MLB Productions use and archiving. In addition, HD content with multitrack audio can be sent from Secaucus back to the ballpark for use in the scoreboard

The facility includes 15 HD edit suites equipped with Thomson Grass Valley Aurora news editing software responsible for turning around content fast. The HD suites are seamlessly connected to a Grass Valley storage area network.

The machine room features Grass Valley K2 media servers employed in a RAID-protected SAN.

system or in the regional sports network's on-site production truck. Via IP control, MLB Network engineers will be able to adjust the bit rate as bandwidth and monitoring needs arise. HTN Communications is providing bandwidth for the BallPark-Cam DTM network.

Each ballpark will have between two and five robotic cameras, providing unique POV shots of the dugout, centerfield, the pressroom and both bull pens. These cameras will also be controlled via long-distance IP connection. An Evertz 7800FR HD-SDI router, AES router and signal conversion gear — all built into an equipment rack — will also be available at the ballpark. A K2 server is installed at each park to ingest the designated clean feed and highlight clips for later use.

The network is also using a massive Riedel 2000 series intercom that allows the crew, talent and guest players to communicate over IP between Secaucus and the various ballparks.

Unprecedented reach

According to Scott Griffin, vice president of engineering and technology for The Systems Group, the project became a labor of love. The team worked hard to tie together workgroups and build the necessary interfaces between the vendors' equipment. They were careful to choose scalable systems that can accommodate future growth. Griffin called the wide-ranging multilayered infrastructure, which reaches across the country, "unprecedented," and said nothing like it has been tried before. BE

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

Battling the cost crunch

In this tight economy, news automation can reduce your OPEX and increase ROI.

BY SCOTT BLAIR

With today's focus on the economy, broadcasters and media facility managers are looking for ways to stretch revenue while reducing operating expenses. Advertising revenues are shrinking, and the competition for those dollars is increasing. While this is not a new story, it is even more prominent today. Broadcasters are pressured to do more with less without any loss in product quality. In addition, they're expected to maintain and even advance the competitive advantage within the marketplace.

Benefits of automation

News automation is a useful tool in helping broadcasters with the cost-crunch dilemma. While automation doesn't replace an entire control room of people, it can enable a smaller staff to execute live news programming efficiently. With the right features, an automated (one-touch control) or semi-automated (production-assist) newscast looks better to the viewer, because fewer hands are touching each individual show element. Also, repetitive tasks and sequences are handled by automation. In short, errors are reduced, and the look and feel of the programming is more consistent.

Without news automation, the playout of news clips is accomplished by a staff member who loads cassettes into a stack of playout machines and another staff member who rolls each machine. To play out graphics without automation, the operator obtains a list of graphics needed for each show, organizes the graphics according to that list, and then loads and plays out each graphic when called upon to do so. In this workflow, two to three people manipulate show content within the broadcast of the newscast, whereas in a file-based workflow, these tasks could be accomplished with automation.

With today's focus on the economy, broadcasters are looking for ways to stretch revenue while reducing operating expenses.

Automation 101

Automation systems for news broadcasts are not a new concept. However, until recently, only larger broadcasters had steadily adopted the technology to improve and streamline their workflow. Small- and midsize news stations and broadcasters are now seeing the value of these systems, as they offer a quick ROI.

News automation is simply a system or platform of systems that controls various news production devices, such as the video switcher, the audio console, video servers, graphics devices and robotic cameras. The automation is linked to the newsroom computer system (NRCS) through the newscast rundown.

There are two basic classes of news automation. The first is full automation or as it is sometimes referred to as one-touch control, and the other is production-assist automation. Midsize and smaller broadcasters who are not in the market for or cannot fit a large automation system into the budget find that production-assist solutions are scalable to meet their budget requirements and provide a simpler answer to the cost-crunch challenge.

Full automation

Full automation systems are more costly and control many more devices than production-assist systems. They

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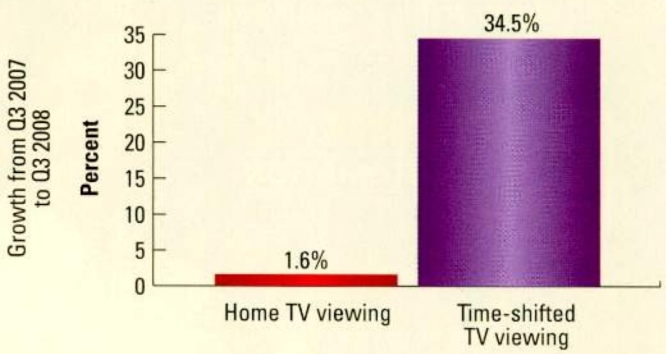

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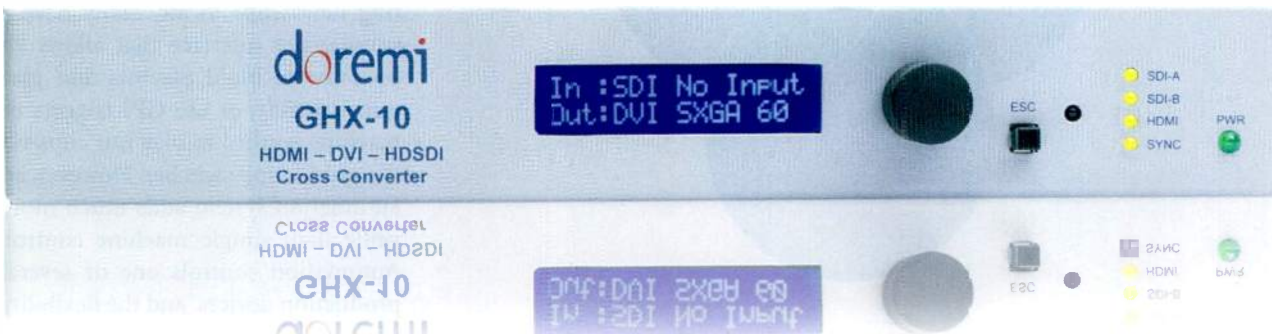

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are often built in association with a specific video production switcher, because switcher control is the most complicated device to control, and it is central to the delivery of the show to air. The automation is dynamically linked to the NRCS rundown, providing the system with playlists and production queues needed in the playout of the newscast.

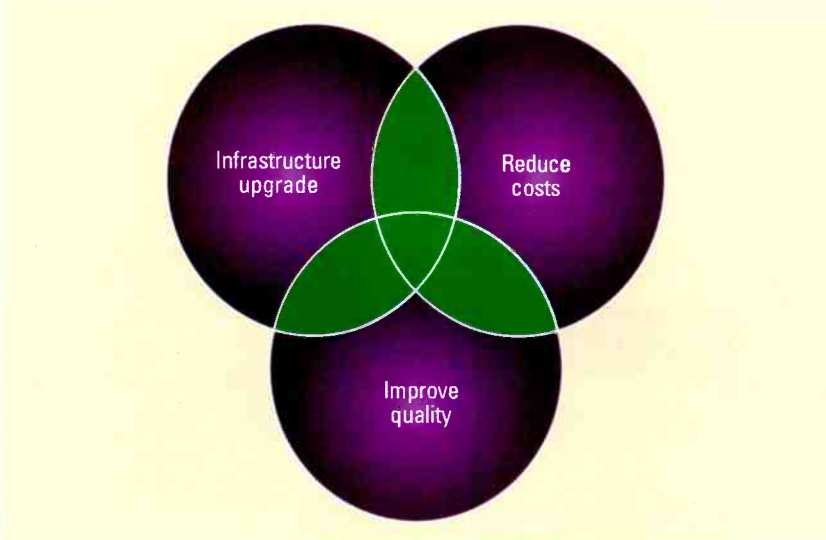


Figure 1. In this illustration of news automation synergies, the green color represents common points in the reasons to add news automation. It helps demonstrate an economy of scale. If a broadcaster adds automation as part of an infrastructure upgrade, it can also receive cost savings through reduction of head count while still maintaining or improving show quality.

Full automation still requires a director/operator to take the show to air, but it does so by controlling all or most of the peripheral devices needed for the show. Medium to large broadcasters who are doing major control room upgrades or who have mandates to control costs on a larger scale are good candidates for these systems.

Production assist

Production-assist automation does not control the production switcher so it is less costly. In this workflow, one or more peripheral devices are controlled through the automation, with video servers and graphics devices such as CGs and clip servers being the most commonly controlled. As with full automation, the production-assist system is linked to the NRCS rundown and receives the same information. MOS, VDCP and Infinit Intelligent Interface (III) are the usual common control protocols used in both types of automation; however, some smaller automation systems have the advantage of interfacing with the production devices and the NRCS natively. The scalability of the production-assist systems gives any broadcaster the ability to add automation into the workflow incrementally as time, money or workflow demands. Major networks like CBS and ESPN all the way to smaller broadcasters find value in production-assist automation solutions.

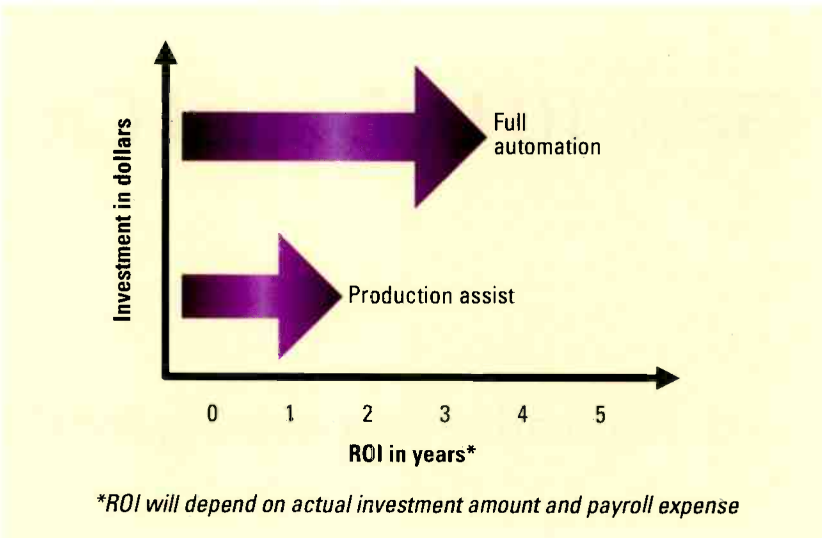


Figure 2. Automation ROI example

Why to invest in automation

A station owner or general manager is really influenced by two factors when it comes to making an investment in news automation and mapping out potential ROI.

The first is whether the broadcaster wants to upgrade to new equipment, going from a tape-based workflow to a file-based workflow. (See Figure 1.) By design, file-based server systems streamline the process of getting news clips to air. Many have a simple user interface that allows an operator to build playlists and play out manually, or use GPI triggers or machine control to play out clips via the production switcher. However, an automation system adds much more value than simple machine control. Automation controls one or several production devices, and the flexibility of editorial control is retained by the producer by dynamically linking the automation playlists with the NRCS.

The second ROI or budget influencer is the requirement to reduce the number of manual interventions needed to get a newscast on the air. Video servers, graphics devices and robotic cameras are built to be controlled manually or by various forms of automation. Automation can provide a single point of control for one or several production devices, and with that, the number of manual tasks is reduced, and staff can be repurposed as needed. An example is an editor in a tape-based workflow who is called upon to load tapes and play out clips as part of the show going to air. In a file-based workflow with automation, the editor continues to edit late-breaking stories for that show or the next.

As a news director, the production quality of the show is as important as the editorial content. In a typical fast-paced show, an increased number of manual tasks inserted into the show often means a higher opportunity for error. The automation ROI for the news director is not measured in dollars, but in the quality of the end product. Automation linked with the NRCS rundown and controlling production devices reduces the number of fingers touching buttons and eliminates repetitive and complicated production cues.

With automation, these tasks can be executed accurately and repeated with the same accuracy from show to show.

News automation systems can help the budget-conscious owner or general manager realize improved quality.

So for the news director looking to improve the watchability of the newscast, automation can play a large part in creating a seamless flow from the new open to the end break, without compromising editorial flexibility.

Adding an automation component to your news production, whether it is a large switcher-based automation system or production-assist system, can add extra efficiency and increased productivity to the newscast and the bottom line. The amount of automation and ROI will be determined by the size and economics of the newscast production and the amount of efficiency that is desired. (See Figure 2.)

Today's economic condition is forcing broadcast owners to take a hard look their operations and be creative in seeking profitable avenues. News automation systems can help the budget-conscious owner or general manager realize improved quality and a better bottom line. BE

Scott Blair is product manager, news automation, for Avid Technology.

File conversion

Avoid systems that promise a universal solution.

BY STOYAN MARINOV

Today, the "tapeless" dream has already been realized. Tape is still used for acquisition and archiving but has been long ago forgotten in the post-production and playout departments. Although file-based technology is progressing, compatibility issues still remain. While using fast, nonlinear applications to broadcast media is a true time-saver, dealing with various file formats and compression types can be a real headache.

In the past, we had to deal with a number of mutually incompatible tape formats, such as BetaCam, DV-CAM, DVCPRO, D1, D9, etc. Now we are drowning in a mixture of file formats and compression types, such as MJPEG, MPEG-1,- 2, -4, Windows Media, QuickTime, DV, JPEG2000, etc., as well HD and SD and the requirement to work with other non-TV image formats including those of mobile phones. In many cases, the speed and flexibility benefits are compromised by the hassle and quality degradation involved when converting from one format to another.

It seems the file-based approach is not a panacea for content workflow. While modern networks and storage backbones can transfer content blazingly fast, dozens of times faster than the real-time content duration itself, content conversion is still a tedious, semiautomated task. New file formats or compression types introduce even more challenges to content conversion engines. Not to mention that every manufacturer tends to create and fight for its "own" media implementation of the "same" format, sometimes within the standard specs, sometimes not — and this is when a nice standard emerges. A good example would be AVC-Intra, which is essentially AVC (H.264 compression) that doesn't take advantage of the interframe compression algorithm; therefore, every frame is independent from the others.

Why so many file formats and compression types?

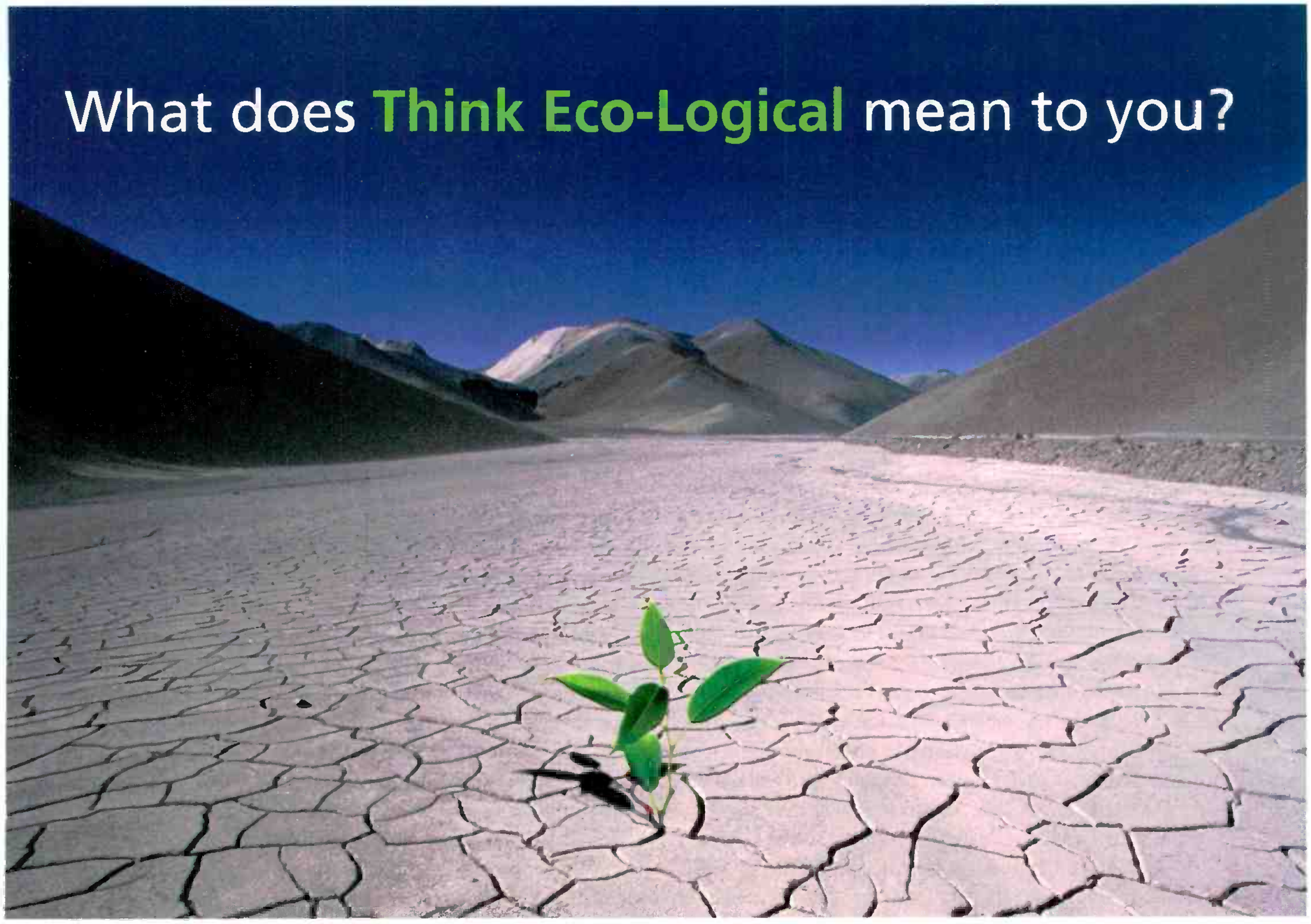
This question may sound familiar to many because it reflects the not-so-old "tape format war" discussions. And the answer is still the same: No single existing format is perfect for all applications. As a rule of thumb, the larger the tape is, the better quality it provides (for its time). However, there are always a bunch of lightweight, portable formats that are not up to the large tape quality but are acceptable for newsgathering and other outdoor activities. It is the same situation today — MPEG-2 is perfect for transmission and storage purposes, but it is not so good for editing, while DV edits easily, but has a relatively huge file size. Economy versus flexibility, reliability versus mobility, quality versus speed — these are all trade-offs when dealing with formats to suit particular parts of the scene-to-screen chain.

Role of content conversion

Simply put, content conversion is necessary because of the compromises and limitations of the various individual file formats and compression systems. Many of the file-based products on the market (NLEs, playout servers, etc.) are designed to work with one or two media formats. This simplifies product development and significantly shortens the time to market. For example, a server that supports only DV can be launched in less than half a year; a server that supports only MPEG-2 can start shipping in about one year. Imagine how long it would take to launch a product that supports every existing compression system or format today; it is just not feasible.

	Production	Post production	Playout	Broadcast
Internet/ mobile	H.263 MPEG-4 H.264	WMV 2Mb/s-5Mb/s	WMV 2Mb/s-5Mb/s	WMV < 1Mb/s Flash < 1Mb/s
SD	Beta SP DV DV50 IMX P2	DV AVC-Intra MPEG-2 I-frame 50Mb/s MJPEG Baseband 270Mb/s	MPEG-2 IBP 8Mb/s-15Mb/s DV	MPEG-2 2.5Mb/s-5Mb/s H.264 1Mb/s-3Mb/s
HD	DV HD MPEG-2 HD	DV HD MPEG-2 HD 8Mb/s-300Mb/s Baseband 1.5Gb/s	MPEG-2 HD 20Mb/s-80Mb/s	MPEG-2 15Mb/s-20Mb/s H.265 8Mb/s-16Mb/s

Table 1. Compression types and file formats operating at particular data rates are chosen as a "best fit" for each application across SD, HD and Internet/mobile applications, making file conversions essential to run the scene-to-screen workflow.


What does Think Eco-Logical mean to you?

Some manufacturers go in the opposite direction by using their own proprietary formats so they can lock customers to their product line only. Previously, content had to undergo at least three or four conversion stages in a file workflow from ingest to transmission and archiving. Today, many systems can consistently support the major compression types and file formats, so such conversion is not mandatory. (See Table 1 on page 50.)

Content conversion is a complex process to consider. Do we need to convert from one compression type to another, e.g. MPEG-2 to DV? Do we need to convert from one resolution to another, e.g. SD to HD? Do we just need to move content from one file container to another, e.g. AVI to MXF? Or do we need to do all at the same time? The conversion can be lossless or lossy, quick or slow, simple or multistep, depending on exactly which processes are required.

Despite all efforts to avoid compression conversion, we usually end up with at least one conversion: the transmission encoding. Whatever the choice for the in-house file format, the transmission format is always different, or at least the bit rate is. Even if we choose to stick to MPEG-2 (studio quality) for good in-house storage ratio, for the MPEG-2 satellite transmission, we need to provide an even lower bit rate, somewhere in the 2.5Mb/s-4Mb/s range. And although the compression is essentially the same, recompression needs to be done. (See Figure 1.)

Containers and codecs

"Codec" stands for "COder and DECoder," and usually means "COmpressor and DECompressor." It is the engine that transforms the baseband (uncompressed) video into a compressed stream and vice versa. The container is the file wrapper that is used to hold the compressed stream in one entity (the file) throughout the file system of the storage equipment. File wrappers are related to codecs and to the computer operating system as well. However, these relationships are not very well documented or standardized. As a general rule of thumb, Apple computers use QuickTime containers for storing video, regardless of the codec involved, while Windows computers use a variety of containers depending on codec and implementation, including QuickTime files (if the QuickTime add-on is installed).

The most popular container type on Windows used to be AVI, also known as Video for Windows. It can hold virtually any type of compressed stream. This means that you can find MPEG-2 AVI, DV AVI, MPEG-4 AVI, MJPEG AVI, etc. Even though these share the same file extension, their content is not compatible in terms of a single codec. Today, Microsoft is promoting its Windows Media Video, which is stored in WMV or ASF file formats. Additionally, all MPEG formats have their own file types, e.g. MPG, M2P, M2T, MP2, MP4, TS, etc. Note that file extensions are not a warranty of compatibility. For instance, the same file extension, MPG, can be used both for MPEG-1 and MPEG-2 streams. Only an analysis tool can identify the content codec inside.

The trouble with most converters is that they do not care about seemingly nonessential things such as metadata, closed-captioning data, teletext, etc. The reason is that these nonessentials are stored in different ways for each file format or in a different place in the stream. So when choosing a conversion solution and wondering why some cost much more than others, check the small print. It is most likely that the cheap solutions will discard nonessentials. Additionally, during the HD transition period, special attention needs to be paid to aspect ratio information (WSS, AFD) so

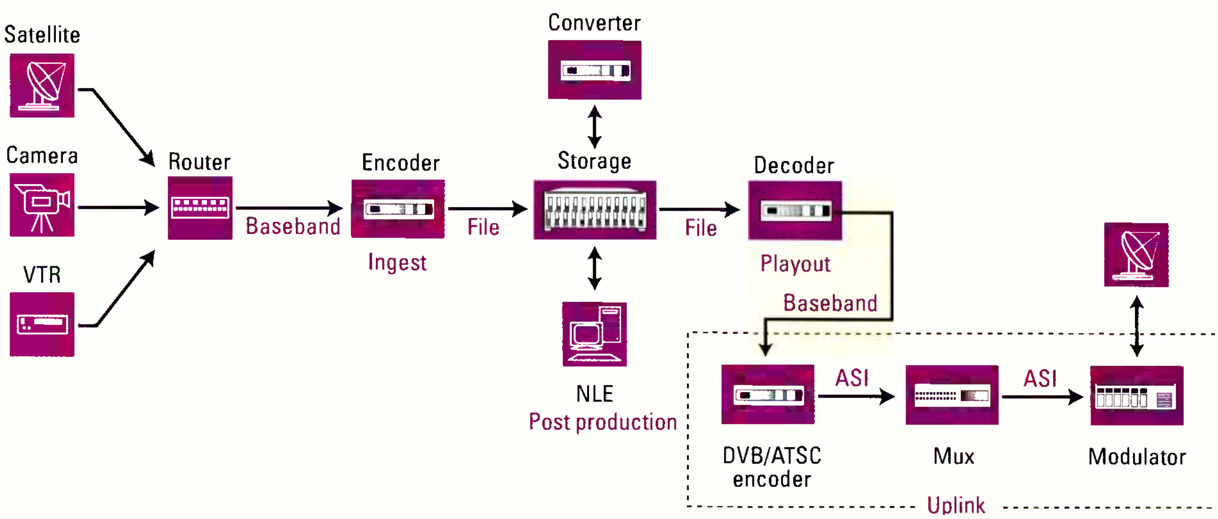


Figure 1. Tapeless broadcast workflows can include both file-based and baseband video supported by a series of encoders and decoders. With playout able to read the files from ingest and post production, a file-based area is formed around central storage with baseband used only in the real-time areas of live video input and transmission playout.

it's correctly applied during conversion. Advanced converters would offer additional benefits such as audio transformation, normalization, multiple tracks, etc.

An effort has been made toward unifying file containers — at least in broadcast equipment. The MXF format is gaining momentum with all broadcast manufacturers. However, it will be awhile until equipment from one brand properly talks to another through the MXF format. MXF is an excellent move, but it enables so many operating profiles that few manufacturers can entirely support it. The "MXF-compliant" label does not necessarily mean that this equipment can handle any MXF content. This compliance can only refer to a specific codec within an MXF container, or to a specific profile of the format. Therefore, don't assume MXF files can be used with all MXF-compliant equipment.

Select the best converter

Despite the progress with MXF, it seems certain that the number of file types, codecs and wrappers will continue to increase, so format wars are set to continue. The best approach when selecting file converters is to always verify manufacturers' claims. Try to avoid the universal type of converters; they are usually mediocre in most aspects. They will either be too slow or too simplified. Here is a short list of steps that can be taken to ensure against misunderstandings:

- Get a trial unit or license.
- Try it with your own files.
- Benchmark its performance against competing converters with the same content.
- Benchmark its quality preservation against competing converters at the same target bit rate and other conversion settings (e.g. quantization factors, GOP size, etc.) using a PSNR comparison tool, or visually.
- Make sure it behaves properly with long files (larger than 2GB).
- Check the lip sync at the beginning and the end of the converted file.
- Verify the resulting converted file with the equipment that is destined to use it afterward. Look for drifting lip sync and smooth playback.
- Look for the small things such as additional audio tracks, metadata, closed-captioning, etc.
- Optionally, send a small sample file to an analysis facility that can give a verdict on whether the file complies with the relevant standard, e.g. if an MPEG-2 file complies with ISO-13818. These facilities have expensive tools that the average broadcaster cannot afford to purchase. BE

Stoyan Marinov is chief technology officer at PlayBox Technology.

The latest developments in hybrid systems will enable IT-based playout to move from an exciting concept to a very real and practical path forward for mainstream broadcasters.

Migrating to IT-based playout

BY MICHEL PROULX

There's widespread acceptance that broadcasters will move toward IT-based playout over the coming years. The benefits in terms of lower capital and operating costs, as well as greater workflow flexibility, are just too significant to ignore.

However, the reality is that many broadcasters are unsure about how best to make the transition to IT-based playout. Many station engineers are wary of making a radical move to a completely new production and playout model, due to the obvious risks to business continuity. Many others simply don't have the resources right now for such a bold move.

Hence, there is a demand for a migration path to IT-based playout that is phased, smooth and secure. Before looking at how a gradual transition can be achieved, let's first consider the IT-based playout model, and how it differs from traditional playout.

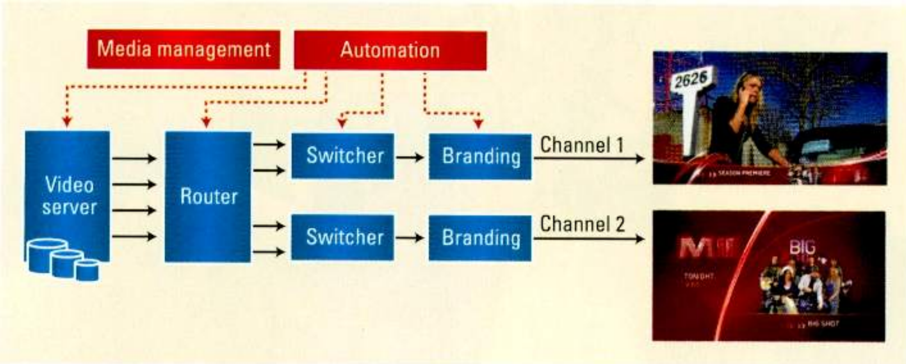


Figure 1. Traditional television playout chain overview

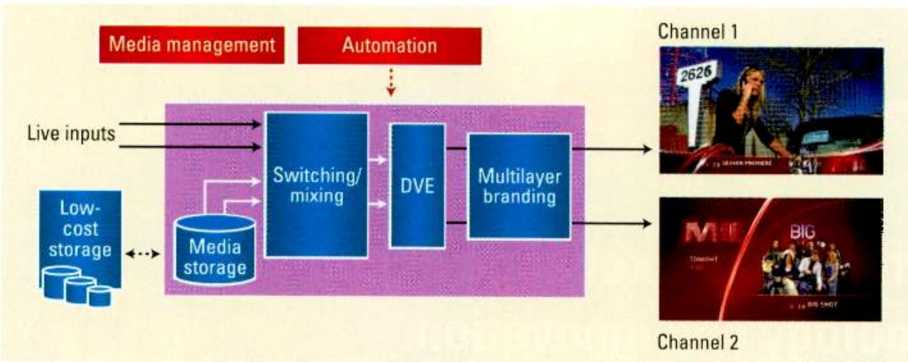


Figure 2. Streamlined IT-based playout model

Contrasting traditional and IT-based playout

Traditionally, television playout has involved multiple hardware devices in a typical playout chain, including a video server, router, master control switcher and channel branding device, which are all controlled by playout automation. (See Figure 1.) Each of these dedicated pieces of hardware is typically costly and demands its own automation interface. It's the norm for these pieces of equipment to come from multiple vendors, and this sometimes creates demanding installation, integration and support issues.

In contrast, the IT-based model involves replacing many of these elements with a single device that combines the functions of a playout server, master control switcher and branding processor. (See Figure 2.) The leading systems on the market offer all the rich capabilities of the traditional equipment, including multichannel audio handling and high-end graphics performance. These channel-in-a-box devices typically provide several days of video storage, with content updated as file transfers originating from low-cost, IT class archival storage. Like the traditional model, the channel-in-a-box can also accept HD/SD signals to allow switching to network feeds or live action. By dramatically reducing the amount of equipment required for playout, the capital costs are significantly reduced with IT-based playout. Automation interfacing and maintenance are also simplified with less hardware.

The simpler channel-in-a-box architecture has significant benefits for multichannel playout. Whenever an additional channel is required, the system can be expanded by increasing the number of channel-in-a-box devices on the network. Naturally, with larger systems, the cost savings inherent with a more streamlined playout path are even more significant. This lower cost for additional channels is a critical issue when revenues per channel are generally falling, and it can make the difference between a new channel being viable or otherwise in a tight market.

Whenever more functionality is packed into a single box, there is often some concern about reliability because a failure is potentially more catastrophic. In reality, feature-rich designs often work in favor of resiliency because critical products are generally designed with exceptional levels of redundancy. Naturally, there are also fewer parts that may fail in the playout chain overall.

Perhaps more importantly, the cost efficiency of these highly integrated products makes it much easier for stations to add levels of redundancy to their system. This can be done by adding extra channel-in-a-box devices to the system to create back-up channels. Indeed, the very different cost structure makes a full, mirrored off-site back-up facility a much more realistic option for many broadcasters.

Hybrid model

For many stations, the real need is for a development path that enables them to move toward IT-based playout, without abandoning all their existing investment in hardware and business systems. It takes years for a station to develop effective processes across media management, traffic and sales, with this task made more complex because key systems, like automation and media management, tend to come from separate vendors specializing in these disciplines.

The simpler channel-in-a-box architecture has significant benefits for multichannel playout.

Hence, many broadcasters need something quite different from the first approaches to IT-based playout, which were focused primarily on green field site operations, where there is more scope to install completely new hardware and software systems.

With a hybrid model, broadcasters can leave their critical business systems alone until they are ready to make changes.

This requirement has spurred the development of the hybrid model, which allows co-existence of traditional and IT-based playout. (See Figure 3.) This allows new channels to be added that operate with IT-based playout, while the existing channels are unaffected. The important thing about this approach is that it allows a phased migration path toward new technology, without the high level of disruption caused by a complete technology shift. With a hybrid model, broadcasters can leave their critical business systems alone until they are ready to make changes.

The key to successful hybrid operation is the ability of the IT-based playout devices to operate under the same playout automation as the traditional playout chain. For instance, the server portion of an IT-based playout device can be controlled by the widely adopted VDCP protocol, while the switching and branding functions are controlled by established switching and branding control protocols. This may seem like a pretty unremarkable concept, but the reality is that this is not the norm in the industry, and the impact of this approach is far-reaching in terms of enabling the adoption of new technology among broadcasters.

These hybrid-ready playout servers with integral switching and branding are now available, and they have been shown to work effectively with many of the leading international automation vendors. Importantly, these devices feature uncompromised operation, with high-performance playback of long-form and short-form clips, clean switching between sources, and advanced multilevel graphics capabilities.

To be a practical proposition, the automation integration to these channel-in-a-box systems needs to be mature and richly featured. For instance, the control of switching and branding should include full control of secondary events, with graphic template population directly from the playout automation. Effective automated control of graphics is an important issue because competitive pressures in the television industry are driving the production of larger volumes of in-show and episodic promos to encourage audience awareness and retention. This high volume demands the use of highly automated, database driven graphics techniques.

Ideally, the graphics workflows should be integrated across the traditional and IT-based elements in a hybrid system, with common workflows across work order management, graphics preparation, data-interfacing and playout. This high level of graphics workflow efficiency is important because operating costs are subject to just as much scrutiny as capital costs, with a drive toward leaner, more centralized operations evident across the industry.

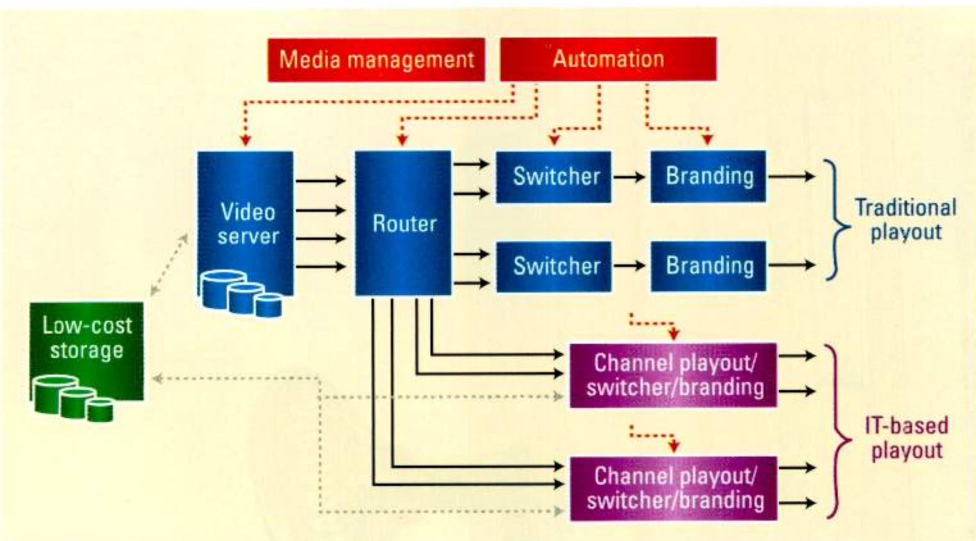


Figure 3. Hybrid model combining traditional and IT-based playout

Conclusion

The latest developments in hybrid systems will enable IT-based playout to move from an exciting concept to a very real and practical path forward for mainstream broadcasters. It offers the opportunity to realize an IT-dominated playout infrastructure in the longer term, without the high risks associated with a sudden and complete technology shift. By following this way forward, the industry can expect to further reduce its costs per channel, while opening up opportunities for additional low-cost channels. BE

Michel Proulx is chief technology officer for Miranda Technologies.


METADATA

METADATA:

Unlock the potential of Internet video

BY SAM VASISHT AND PATRICK DONOVAN

Internet video is all the rage among consumers, and publishers, broadcasters and advertisers are all eager to catch this wave. Internet video is projected to be the majority of consumer Internet traffic in the coming years, and the Internet a significant distribution medium for video. Paradoxically, publishers are facing challenges in monetizing Internet video despite consumer demand.

The Internet differs from traditional means of distribution. Much of the value propositions of the Internet as a distribution medium have not been recognized and used toward the strategic goals of video publishers.

Metadata is the linchpin to unlocking this value. With high-quality metadata, content publishers can create video experiences integral to Internet audiences and new monetization schemes around these experiences, including advertising. Metadata enables the following and more:

- search, both at a file and scene level;
- multiple navigation paths within or across different videos in a manner that users are accustomed to in Internet navigation;
- clip and playlist creation for exploiting viral sharing and social networking trends;
- dynamic and targeted programming to create higher user engagement;
- precise targeted advertising tailored to user behavior; and
- accurate reporting and analytics critical to advertising and monetization. (See Figure 1.)

Metadata is the third key element of video production, after video and audio. While metadata is critical to the success of Internet video strategies, costs associated with authoring metadata are insignificant to the overall costs of video production.

Metadata quality must be assured to deploy successful Internet video strategies. High-quality metadata is written by humans as opposed to automated. While automated schemes are neither sufficiently accurate nor reliable, they also do not allow the programming choices possible with human authored metadata. At the same time, such metadata can be added to video even after video has been published, creating new use cases and programming options.

Such high-quality metadata cannot be an afterthought or, worse, overlooked. Successful Internet video strategies may well rest on suitably authored metadata and metadata management systems.

Metadata applications

It is also important to understand that metadata is not a single attribute of video, but rather serves multiple purposes. Among these, it creates new avenues for creative expression by video publishers and new models of advertising. It also allows for increased advertising and programming options, as well as increased new consumer video experiences.

Let us consider a few examples of video programming that have been tailored for Internet audiences using metadata:

- *Dynamic ad insertion and flexible ad logic.* Implementations of metadata for dynamic advertising and flexible advertising logic enable broadband video publishers to enhance how they monetize their video libraries by creating structured metadata that describes each meaningful scene within the original source videos. This metadata defines the optimal in-stream video ad insertion points, allowing publishers greater control and flexibility with their advertising strategies. In addition, the ads served in the precise insertion points can be targeted by third-party ad providers based on the scene metadata, such as character name, player name, topic and keyword. Banner or overlay ads can also be targeted based on the rich metadata. As a result of this greater ad logic flexibility, rather than just pre- and post-rolls for each asset, publishers can set their ad logic to use the midroll insertion points. The publisher sets the ad timer, and the ad plays at the next available insertion

Metadata-enabled features
Video search (asset level)
Video search (scene level)
Seek and skip functions
Video packaging and presentation
Playlisting
Dynamic program updates
Multiple navigation paths within or across videos
Mashups/remixes
Advertising (in-stream, overlay, banner)
Personalization and targeting
Sharing and social networking
Reporting and analytics
Recommendations

Figure 1. Metadata-based applications allow the inherent value of video to be unlocked and monetized on the Internet.

point, no matter what asset or scene is being viewed, after the timer has expired. The result is that the viewer has the freedom to sample more assets and navigate directly to the most interesting scenes, while the publisher can monetize that experience in the most effective way possible.

- *Search, clips and playlists.* Extreme Outdoor Network (*www.xontv.tv*), which specializes in outdoor video such as hunting and fishing, realized that having rich metadata for each scene within its 60min videos would allow the viewer to search or jump right to their favorite segment by species, weapon, location and so on.
- *Chapterization, skip and search.* When Fox Reality decided to broadcast its Fox Reality Really Awards show on the Web, it indexed the entire awards show in segments so that users could watch sections that were of interest to them. Through metadata, users can skip to sections based by award, show, presenter, musician and so on, as well as create playlists and watch them in linear fashion.
- *Dynamic programming and multiple navigational paths.* Sports Illustrated uses metadata to create dynamic programming for sports fans through its FilmRooms video portals. Users can navigate through multiple paths to view highlights, which are updated as the games progress and rankings change. Users can search by team, player, position and more to create

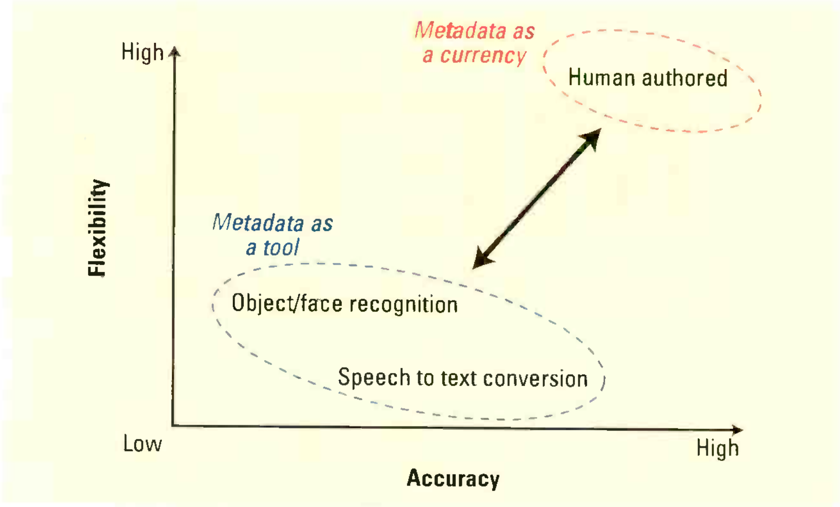


Figure 2. There are two ways to author metadata. High-quality metadata is human authored as opposed to automated.

their own highlight clips that can be shared with others and posted on user Web sites and blogs.

- *Mashups, personalization and sharing.* Lifetime uses metadata to allow users to define their own virtual scenes within a video program. These scenes can be shared with others and concatenated to create user-defined playlists (mashups).
- *Reorganize and collaboration.* Carleton University uses video on demand to create lectures that students can tailor to their needs through indexing parts of video lectures and reorganizing them to their individual requirements. At the same time, student notes and annotations make the videos searchable by other students.

Low production costs

One of the underlying questions is the cost of authoring metadata and whether one approach is more cost-effective than another. (See Figure 2.) This boils down to the question of quality versus quantity. If accuracy and premium end-user experience is secondary to processing large volumes of video for a basic search index, then automation is likely to help solve the problem better than a human. Automation, such as scene change and speech to text, serves well in the production stage of video because there is a lot of raw footage, and the people handling the video are professionals. Their task is to manage the video production, not to consume or monetize the video.

The cost of human-authored metadata is not only less than automated metadata, but it is also insignificant relative to the overall video production costs. Human metadata authoring can typically be accomplished in much less time than the duration of the video. People don't have to be trained to recognize speech or images like machines do, reducing upfront investment of time and resources. Lastly, human authored metadata allows for further human creativity and reasoning to be applied to video programming, bringing new elements of creativity to an already creative process with negligible incremental costs.

Conclusions

Metadata is a critical element to the success of video on the Internet. Publishers need to address metadata creation as an essential part of the video production workflow.

Publishers need to incorporate systems that author and manage metadata toward these objectives as they look to build audiences and advertising with their Internet video strategies. BE

Sam Vasisht is founder of 2/1 TechMedia and Patrick Donovan is vice president and general manager at Gotuit.

Harris' Maxiva

The solid-state solution represents a shift in UHF transmitter design.

BY MARTYN HORSPOOL

Recent advances in LDMOS device power density and performance have contributed to significant improvements in UHF power amplifier linearity, efficiency and reliability. Such devices can be applied to broadcast transmitter designs for terrestrial transmission of traditional television and multimedia content, including analog and all digital worldwide standards. The challenge for broadcasters is to provide these services at high quality in the most cost-effective and efficient manner.

Harris has developed a solid-state transmitter based on its patented PowerSmart architecture that allows terrestrial broadcasters to transmit an array of local, over-the-air broadcast services at various power levels. The architecture leverages these new advances in LDMOS technology and other design initiatives to provide a multitude of benefits that equate to a more efficient and cost-effective operation at any power level. The new transmitter design is available to UHF broadcasters through its Maxiva range of liquid- and air-cooled transmitters.

The transmitter platform has been engineered for power levels from about 10W to more than 20kW average power. With the PowerSmart architecture as its backbone, the transmitter provides significant space savings through a compact transmitter footprint. In addition, the architecture provides a sharp reduction in operating costs through improved efficiency, a green design that is compliant to industry standards and future-proof software-defined modulation techniques to address multiple broadcast standards.

Available in power levels from 10W to 2kW, Maxiva transmitters are well suited for low-power applications.

LDMOS advances

The transmitter employs a low-gain building block approach. Each power module comprises smaller sub-assemblies to replace an RF pallet, RF device or AC-to-DC converter with ease and without the use of expensive test equipment. A simple test fixture can be provided for remote diagnosis of the module.

The LDMOS device technology at the core of the architecture delivers the power density improvements in the transmitter. Recent solid-state designs could achieve about 3.4kW average COFDM power and 10kW peak sync analog power per 19in rack cabinet. As newer RF device technology has emerged, several manufacturers have taken advantage of the higher per-package power levels of these devices to develop transmitter power levels up to 5kW to 7kW average power and up to 16kW analog peak power.

To provide even higher power density, the company, in partnership with a major semiconductor supplier, has employed state-of-the-art LDMOS devices to provide additional RF pallet power. These UHF LDMOS devices use a 50V structure, which results in an immediate improvement in power per device and linearity/efficiency.

Benefits

The 50V devices are rated at 450W continuous wave (CW) power per package — superior to LDMOS devices used in previous and current generation transmitters that use 150W to 250W power devices. An RF pallet using a pair of the new devices can operate at an 180W average DVB-T power — a 250 percent improvement in power per pallet.

The transmitter uses four identical RF pallets per plug-in PA module to create a compact and power-dense module design. The overall PA module is rated at 650W average DVB-T power, which is significantly above the 460W obtained from a previous Harris PA module that used twice the number of pallets per module. Maintenance is also simplified, with field service based on maintaining individual power supplies and pallets versus entire modules. Broadcasters installing Maxiva transmitters from both the liquid-cooled (ULX) and air-cooled (UAX) series have the advantage of sharing spare parts because both designs use the same internal circuitry and technology.

Another important feature of the new 50V LDMOS devices is that the gain of each device is about 19dB, a large boost over standard 32V parts with typically 14dB to 15dB gain per device. This increased gain reduces the number of driver stages required, with power amplification handled in a single device as opposed to using a series of lower power RF devices for staged amplification.

Design features

The single-stage power amplifier minimizes parts in the transmitter, which drastically reduces the transmitter footprint — a key tenet of the PowerSmart architecture. All Maxiva transmitters also incorporate cooling designs that enhance the compact nature. The efficient, liquid-cooled design of the ULX range transfers heat generated within the transmitter to a built-in cold plate with liquid before being directed outdoors. This puts less stress on the AC system, as the heat is passed directly outside, and reduces the cost of cooling the transmitter facility.

The low-power UAX transmitters use the same RF pallets, but the pallets are mounted instead on a standard heat sink and cooled by fans providing clean filtered air. The efficient design uses fewer modules, each producing less heat than previous designs.

The architecture also enables a simple analog-to-digital upgrade path for international broadcasters through the use of Harris Apex exciter technology. All ULX transmitters integrate the Apex M2X exciter — a software-definable platform that enables analog broadcasters to easily transition to digital in the field and enables multichannel broadcasting of HDTV, DTV and mobile TV channels.

The transmitter provides significant space savings through a compact transmitter footprint.

Green improvements

The transmitters incorporate several green design initiatives to minimize the environmental impact of the transmitter. The architecture addresses European regulations such as Waste Electrical and Electronic Equipment (WEEE) and RoHS. The reduction in AC power requirements reduces greenhouse gases emitted at the power generation plant.

The green design initiative carries over to the operational efficiency of the transmitter. While there are a multitude of factors that can affect long-term cost of ownership, perhaps the most important and most often misrepresented by suppliers is the overall transmitter efficiency. The new 50V devices provide more than 28 percent typical PA module efficiency (AC power in versus RF power out), resulting in overall transmitter efficiencies typically in the range of 22 percent to 25 percent. This represents an efficiency improvement of up to 10 percentage points compared to previous designs, or an improvement of 35 percent or more from the original figure.

The range of liquid- and air-cooled transmitters represents a shift in transmitter design for UHF broadcasters. The PowerSmart architecture is the basis for this evolution, lowering the cost of ownership for UHF broadcasters over the course of the transmitter life through a compact and energy-efficient design. BE

Martyn Horspool is the television product manager for Harris Broadcast Communications.

Newpoint's Compass

The system allows operators to manage services across the entire network from a single interface.

BY PHILL HOWARD

A broadcaster's revenue is generated from the quality of the services carried on its network, and keeping them on the air translates to the bottom line. If there is an equipment failure that causes a loss of service, how quickly a broadcaster gets back online can determine how much it will cost in money and customer satisfaction. The problem with today's solutions is that although they can identify what equipment has failed, they cannot tell you what services or traffic is affected by the equipment failure.

The operators of these facilities are faced with the challenge of ensuring these services are kept on the air using a myriad of systems. Recovery of failed services may require an operator to switch between multiple systems. This makes identifying the root of the problem difficult and can add seconds if not minutes to the outage. Operators need a single system that displays all network elements from the source to the destination associated with every service they are managing on the network.

Get rid of the shoehorn

Newpoint offers answers to these challenges by providing a single solution called Compass, which can interface with third-party element management systems and provide an end-to-end view of all components on the network used to carry a particular service.

Compass provides the foundation layer to interface with the elements of the system, whether that is by directly interfacing to the physical device or by interfacing to an existing element management system. The operator can control the services through an interface called TrueNorth, which allows any workstation with a Java-enabled Web browser to become a powerful service management tool.

Getting to the top

When looking at rows of racks full of equipment, the effort to manage a service passing through would appear to be of epic proportion. This is further complicated when multiple element management applications are used to manage this equipment. With the introduction of the new Compass Network Management and Service Management Modules, the operations staff can go from managing disparate systems to managing the services across their entire network from a single GUI. Operators have the capability to view the status of every service, and when a failure occurs, they can reroute to redundant equipment. The Service Management Module also makes bringing new services online quick and easy by allowing operators to set up equipment to prepare for new services with a few mouse clicks from a Web-based GUI.

Most broadcasters have the foundation in place to allow them to achieve full service management. The lowest layer is element management that provides the real-time data from the equipment. (See Figure 1.) Most broadcast facilities are using one or more element management products today to control their equipment. And in those instances where the equipment is not being managed by an element manager, the equipment supports an interface to third-party element management applications.

Compass addresses this layer by having an open architecture that facilitates standard and proprietary interfaces into the broadcasters' existing infrastructure. Tying all the components of the

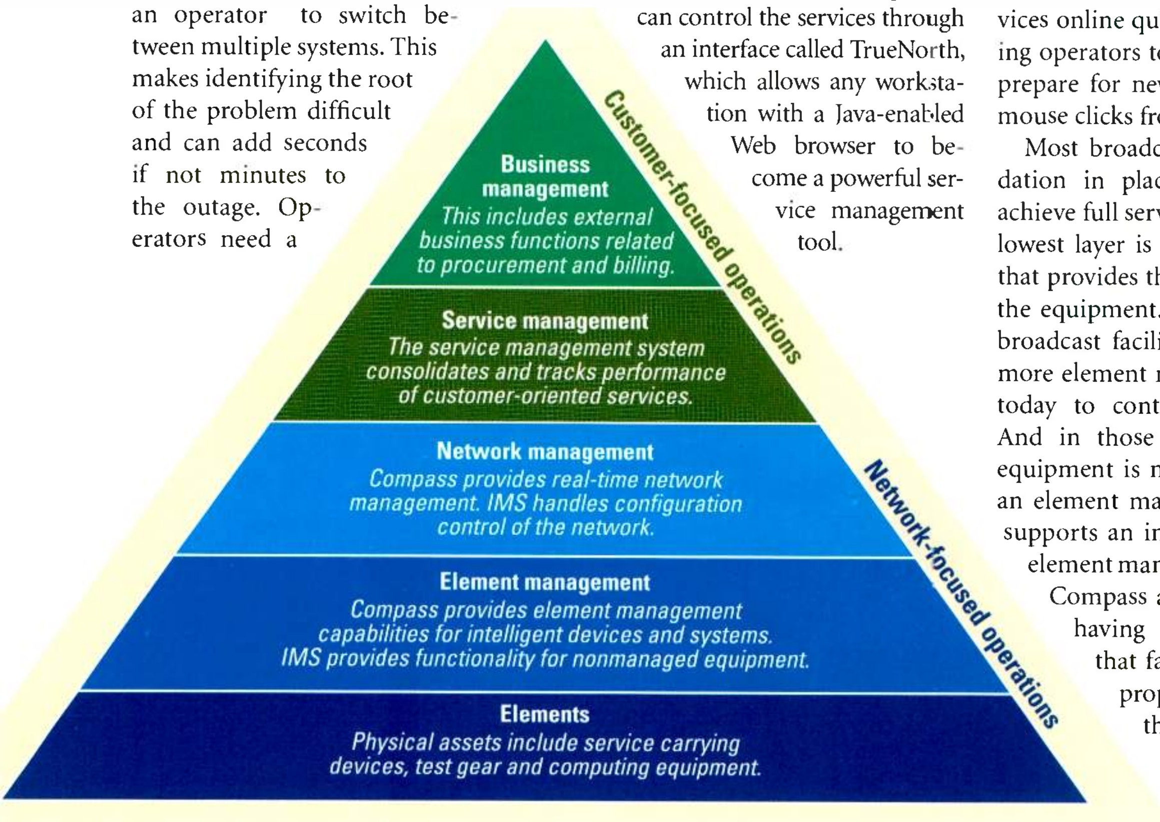


Figure 1. Overview of management systems

system together under a common platform is the first step to effective service management.

The real-time data collected in a common application facilitates the network management layer where topology and configurations of the components are managed. Topology manages the system architecture and connectivity amongst the components. Defining topology is important to the service management layer. It provides the framework for the services and gives the operator the ability to identify and isolate the source of the problem quickly, reducing the system downtime and penalties associated with service interruption.

Configuration management provides an intelligent way to manage the equipment arrangements from a higher level based on the service that will be carried on the network instead of manually configuring detail parameters for each device required to bring the service online. Topology and configuration management minimize the time required to isolate a problem on the network and to restore services, reducing the cost impact of equipment failures. In addition, they speed the bringing up and tearing down of services that are transported on the network.

The integration of the foundation layers allows the application to function at the service management layer. An application functioning at this layer uses the combined intelligence of the lower layers to build an entity comprised of elements, parameters, configurations and associated topology. Operations with an application at this layer maximize their ability to manage what is truly critical to their business instead of micromanaging details of the elements. The ability to restore a service through a redundancy chain of available resources or through a diversity site demonstrates the importance of an application functioning in this layer compared with the efforts and time required to execute the same function at the lower layers.

Tying it all together

Operators functioning in the service layer focus on the higher level functions of the business instead of the minute details of the elements. Giving operators the ability to manage the revenue sources effectively allows them to manage more services and at the same time maximize the revenue from their existing service level agreements (SLA).

The Compass Product Suite was designed to get broadcasters to the service layer without replacing their existing infrastructure so they can realize the maximum return out of their facility. It also considers the value in the exchange of service intelligence to the business layers (billing and SLA management, CRM, etc.) and facilitates the exchange of the information from the service layer. The solution allows operators to focus more on running the business and less on figuring out which shoehorned system to use to recover a failed network component. BE

Phill Howard is strategic sales manager for Newpoint Technologies.

The right connections

Wire, cable and fiber hold your facility together; make sure they're properly installed.

BY JOHN LUFF

Plumbers have pipes, and broadcasters have cables, but the concept is the same. Cables transport electrons while plumbing transports water or other fluids and gases. Voltage might be equated to pressure and amperage to volume. Frequency is hard to equate because plumbing is a DC medium, but it can be compared to velocity.

This article will explore how these concepts can be instructive in understanding what's at the core of your facility.

What's under those cables?

It's important to know what kind of plumbing you're connecting. Until relatively recently, you could look at the outer jacket of a coax cable and be pretty sure what kind of signal was in it. That's no longer true. In most broadcast plants there are many types of signals on the same coax medium, including NTSC, SDI (270Mb/s NRZI coding), HD-SDI (1.485Gb/s), SMPTE 310 (19.39Mb/s), AES audio (3.07Mb/s) and ASI (270Mb/s NRZ coding — phase sensitive!), not to mention RF signals that vary from slightly above DC to just below light. To ease the confusion, 1V is the standard for most of the pressure in our plumbing metaphor. But the velocity (frequency) is clearly all over the map! Cables vary from 3Mb/s to 1.5Gb/s, a ratio of about 483:1. Broadcasters cannot expect the plumbing to work equally well in a wide range of uses.

Broadcasters use many types of coax because it's convenient to snake more pipes into a given space. Coax diameters for precision use vary from about 0.16in to 0.41in, with performance trade-offs that are well understood. At short distances a coax pipe can carry any signals, but of course with different performance. For example, SMPTE 292 HD video might be expected to work in miniature coax for only 100ft, though high-quality fat pipes would be good for about 5X the distance.

Think about the municipal water system again, with 30in main lines and 1in pipes into your house, which works for similar reasons. A 30in main to run to your bathroom makes little sense, as does 1/2in copper under your street, but both work in the right application. With cable density increasing in television plants, it is appropriate to look at all types of cable, including fiber, before picking the medium you should use for any application.

Proper installation is half the battle

Like plumbing, installing cable correctly will make a world of difference in performance. Using true 75Ω connectors, minimizing patching and other signal interruptions, and installing cable properly are important. We don't often think about the mechanics of cable, but as frequencies increase, from AES to 3Gb/s SMPTE 424 HD interconnects, cable performs completely different.

Anything that changes the return loss characteristics of the cable assembly will directly affect signal integrity. Sharp bends, any mechanical deformation of the cable and mishandling will limit the performance and change what comes out the other end of the pipe. Coax is called precision cabling because it truly is just that. Many of us have learned by experience that proper handling of microwave interconnects on heliax and waveguides is critical at gigahertz frequencies, but often that level of caution and consideration is not given to how we deal with video signals in the digital domain.

Cable manufacturers advise that their product must work at twice the bit rate to adequately handle the content. With SMPTE 424 that means a bandwidth of about 6GHz, which is in the middle of the range for broadcast microwave RF applications.

Belden FiberExpress fiber-optic distribution cables support the data backbone at Lucas Oil Stadium in Indianapolis. The main equipment room is linked with more than 50 telecommunications rooms, A/V amp rooms and other locations.

Stepping on a cable might seem like a difficult thing to avoid, but if we wouldn't do it with heliax, it makes no sense to risk precision video cabling. Cables have specifications for pull strength, crush resistance and bend radius that must be carefully followed. It is convenient to pull long runs, but care must be taken to ensure that the installation process maintains the integrity of the original product.

One of the most overlooked pitfalls is tying cable in place. Clean installations do not require overly tight cable bundles. Regular and excessively tight cable ties can cause a periodic deformation of the cable, severely compromising the return loss and leading to much shorter working distances before signal degradation.

Unfortunately, you might not know the cabling is poorly installed until years later, when the characteristics of the hardware on either end of the pipe changes. This makes a marginally performing cable visible as errors begin to show up in the content that weren't there at the time of installation.

Now, signals can be interconnected over fiber almost as cheaply as over coax when longer runs require equalizing amplifiers in the middle of a pathway. An HD news studio I worked on in 2008 needed amplifiers between

In the long term, we certainly have arrived at the point where fiber is much more technically practical and affordable. It is easy to install.

weather graphics computers on set and the transmission rack room, where the production switcher electronics were located. Today, installing fiber is not difficult, and an increasing number of manufacturers offer fiber connections. Fiber itself is actually cheaper than copper cabling, though the signal electronics often make fiber less attractive due to the cost of optical to electrical conversion.

Wrap-up

A few years ago, many people thought that SMPTE 292 (1.485Gb/s) signals on copper were impractical. Today, many think the same of SMPTE 424 (3Gb/s) signals. I expect new technologies for signal equalizers to be shown publicly in 2009 that will move the barrier a bit further out. In the long term, we certainly have arrived at the point where fiber is much more technically practical and affordable. It is easy to install, and in some ways less susceptible to degradation over time than copper cabling in plants with typical broadcast interconnection logistics and distances. **BE**

John Luff is a broadcast technology consultant.

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

Quadro FX 4800 — NVIDIA

Graphics card features 1.5GB of graphics memory and 30-bit color; a 128-bit precision graphics pipeline and 32X FSAA deliver high image clarity and quality; dual 10-bit display ports deliver a color palette of more than 1 billion colors as well as a single dual-link digital display connector.

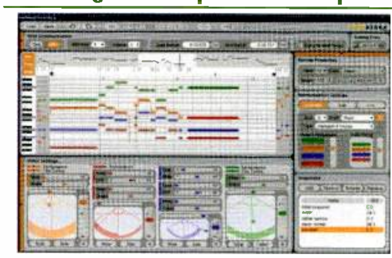
408-486-2000
www.nvidia.com/quadro

SoloistHD-Pro — Adtec Digital

Multicodec decoder supports ASI, GigE, SPTS or MPTS decoding; decodes MPEG-2 SD 422, HD 420, AVC SD and HD video as well as a single channel of Dolby Digital, Dolby 5.1, MPEG-1 Layer 2 and AAC-LC audio; outputs broadcast-quality video, including D1 (composite), HDMI with HDCP and HD-SDI with embedded audio; can up/downconvert between HD 1080i or 720p and NTSC or PAL.

904-394-0389; *www.adtecinc.com*

vielklang v1.5 — zplane.development



Audio harmonization instrument for generation of vocal or instrumental harmonies with up to four voices; uses voice leading and harmony progression models to create harmony parts in a more musical way than traditional harmony processors; features live MIDI input, new harmonization styles, new export options including Audio/MIDI file export for individual voices and MIDI export of harmony tracks, improved input melody analysis with a new note detection algorithm and interoperability with Pro Tools 8 and Cubase 5.

+49 30854 09 150; *www.zplane.de*

iVDR Xtreme — Maxell

Rugged, removable media for high-speed, high-resolution video imaging; has a capacity of 250GB; can store up to 20 hours of HD video, 19 hours of digital video and 110 hours of DVD-quality video; based on an SATA model with a 26-pin interface; features speed and transfer rates of up to 3Gb/s and shock-absorbent technology to resist shock from a 4.6ft drop onto a hard surface; is hot-swappable.

800-533-2836; *www.maxell.com*

Techno-Jib 24 — Telescopic

Telescoping remote camera jib arm instantly extends or retracts to obtain the best shot possible; moves the camera smoothly, silently and quickly in and out of hard-to-reach areas; lets a single operator control diverse camera movements; offers control over zoom, focus and the telescoping of the jib arm through a customizable user interface; extends from a minimum reach of 9ft to a maximum of 24ft.

818-917-5677
www.telescopicjib.com

COS-11D — Sanken

Lavalier microphone designed for use with Zaxcom's digital wireless recording transmitters; incorporates design advances that deal specifically with digital and digital/analog hybrid wireless transmission; comes in standard and reduced sensitivity models.

323-845-1171; *www.plus24.net; www.sanken-mic.com*

PT-CP-S4 — Telemetrics

Pan/tilt head can be set up with the camera mounted on the side or on the top, as well as being positioned upright or inverted; a DC-DC converter at the base of the head converts 48V power to the appropriate levels for the head, auxiliary robotic devices, camera, lens and viewfinder; offers a newly designed cable management system and serial data control with multiprocessor architecture.

201-848-9818
www.telemetricsinc.com

Final Cut Pro v6.0.5 — Apple

Version 6.0.5 software incorporates support for the professional PH recording mode offered with the Panasonic AG-HMC150 handheld AVCCAM camcorder, which provides high-quality 1080 and 720 recording in an AVCHD format at bit rates up to 24Mb/s; adds editing support for 720 60/30/24p formats and 1080 30/24p in addition to 1080i.

800-692-7753; *www.apple.com*

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Blade-based storage subsystem offers dual drive storage elements, 10Gb/s Ethernet switching, and redundant power and cooling; supports resolutions up to uncompressed HD and 2K via up to 400MB/s per engine; scales to maximum performance by storing data across 12 engines of 4.8GB/s or a total of 32 streams of uncompressed HD or 240 streams of uncompressed HD; provides a total capacity of 384TB (maximum) or 196TB (when fully mirrored), with full system monitoring.

978-640-6789
www.avid.com

For Sale

Test Equipment

Help Wanted

Innovative Technologies, Chantilly, VA seeking MANAGING ENGINEER with 10 years television broadcast technical systems/ design, proficient AutoCAD and VidCAD to manage team of engineers, budgets and timelines. Also seeking Mid-level engineer to design AV facilities in CAD. Email resume to Jennifer Lightburn at jlightburn@iti-corp.com or call 703.322.9400, ext 127. **www.iti-corp.com**

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Bright House Sports Network, 24-hour all sports operation in Tampa Bay, seeks a Maintenance/Systems Engineer. Work in our facility and support our production staff at sporting events in beautiful sunny Florida. Enjoy great benefits, competitive salary, awesome co-workers and the latest technology. If you can repair broadcast equipment, support and troubleshoot PC hardware/software, provide system and application support for operators, are familiar with server/network administration and don't mind getting your hands dirty, this job could be for you! Applicants must have an AS degree or equivalent technical training in equipment maintenance and repair. Technical background with PC's, software and networking expected. This is not an entry-level position. Three years or more experience in the installation and maintenance of analog and digital television systems required. Strong background in ENG/SNG trucks, microwave systems, satellite systems, fiber networks and studio automation required. Apply online at www.bhsn.com EOE M/F/D/V – all candidates are encouraged to apply.

Hearst-Argyle, WXII, Winston, NC. is looking for an experienced TRANSMITTER TECHNICIAN. ATSC, FCC regulations and computer knowledge. Visit WXII.com for details or send resume and salary requirements to WXII 700 Coliseum Dr Winston-Salem NC. 27106 **humanresources@wxii12.com**

Help Wanted

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America's most successful premium television company is seeking full-time Engineers for its Hauppauge, NY Broadcast facility.

BROADCAST ENGINEER

The Broadcast Engineer will provide hardware and software maintenance of systems utilized both in the on-air environments, as well as those operating in the 'background' that provide support of on-air, such as production/ duplication asset caching and TQC. The Engineer will also be involved in testing of demo equipment earmarked for on-air or other environments and in the technical support of components of Video On Demand and Broadband streaming of the HBO networks.

Candidates should have 3 to 5 years of Broadcast engineering experience, as well as exp with Repair/replacement/configuration/software interface and upgrades of video & audio components utilized for signal routing, device remote control, Neilson encoding, closed caption encoding, Dolby E/AC3 processing, downstream keys, network changeover switching, network monitoring and other functions for On-air, On Demand, and Production Department environments. Maintenance of hardware and software for Grass Valley XP profile servers, as well as K2 servers, whether they are for "On-Air", "On-Demand", R&D or disaster recovery.

RF ENGINEER

The RF Staff is an integral part of the HBO delivery system for both the linear and file based HBO/Cinemax networks. The candidates for this position need to be fast thinking and able to make split second decisions based upon whatever situation arises. The person should have a solid background in broadcast satellite communications.

Candidates must have exp in construction, installation, and maint. of RF satellite earth stations and systems, knowledge of encryption systems such as Tandberg, TVIP, Digicipher II, MPEG4, and DVB-S2 modulation. Must be familiar with remote satellite transmission operations. Must be able to understand schematics, diagrams, and use them in the troubleshooting of equipment and systems. Candidates must have 3 to 5 years of RF experience or similar education.

To apply send resumes to:
kristin.simmons@hbo.com
For more information please visit
http://www.hbo.com

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Never say never

Here's my perspective on 1080p/60 for broadcasters.

BY ANTHONY R. GARGANO

For years, analog NTSC just chugged along with relatively simple routing and switching requirements. The future-proofing challenge when laying out a new router installation was simply to ensure that the matrix can expand as needed to accommodate additional sources and destinations. But television is a high tech industry, and as we have learned over the past decade or two, the rate of technological change, especially in high technology industries, seems to increase in geometric proportions.

Not that long ago, a 270Mb/s station infrastructure was deemed to be more than adequate for routing and distribution of any program content. But in the high tech world in which we live and work, analog evolved into digital, parallel interfaces into serial and composite digital into component digital. Analog television became DTV, and SD — even in news operations — is transforming into HD.

Feeding the bandwidth hog

You were fully prepared for Feb. 17, so whether your switchover occurred then or is yet to occur between now and June 12, you've essentially weathered the DTV transition. You find yourself comfortable with that new 1.5Gb/s plant only to discover that the latest chatter is about 3Gb/s data rates, and manufacturers are pushing 3Gb/s system infrastructures. Ah, you think, that's for production and post facilities dealing with 1080p/60 content. It has nothing to do with the broadcaster, right? After all, the highest format levels specified by ATSC are 1080p/24 and 1080i/30, and they can move comfortably through a 1.5Gb/s router. And what would you do with 1080p/60 content anyway? Forget MPEG-2, and if you could transmit it today, you'd better get that analog channel back because at double the bandwidth of 1080i/30, it certainly would not fit in your existing 6MHz pipe.

But, hold on. Let's take another look at how this bandwidth hog is evolving, what the applications for it might be and how that might affect the broadcaster. First and foremost we have to recognize that every broadcaster is in a mortal battle for eyeballs. That living room screen not only hosts broadcast channels but also cable and satellite channels, set-top box delivered movies, video games, DVD and Blu-ray players, and time-shifted DVR content. As in any market, the players are always looking for a way to differentiate their product, to get that initial edge on the competition.

This is a game in which the over-the-air broadcaster is at a bandwidth disadvantage. The broadcaster is limited by regulation to a single assigned 6MHz pipe. The competition, on the other hand, by delivering content via a dedicated set-top box or player, controls the interface to that living room display. By doing so, they can be bandwidth-agnostic as long as the output matches some form of input on the display device.

The typical display devices or television receivers that are sold today for large-screen applications, such as living room, rec room and media room use, now accept 1080p/60. Just look through the weekly ads in the Sunday paper, and you will be hard pressed to spot a large-screen receiver that isn't capable of 1080p/60. Leading the popularization parade of this format are nonbroadcast media such as video games and Blu-ray players.

Moreover, with cable and satellite services always sniffing around for ways to increase that monthly bill, they have an extreme interest in looking at the delivery of 1080p/60 services as a potential premium channel tier. Fiber delivery companies, too, have an equal motivation. So, where does this leave the broadcaster?

Many cable systems receive their broadcast feeds directly from the station as opposed to off-air. If the content was available in that format, providing a 1080p/60 feed to a cable system would be one opportunity to not be left behind. Obviously, this not only requires the appropriate content but a system infrastructure to handle it; 1.5Gb/s won't do it. One hope is ATSC 2.0, the loose moniker given to a planned major update to the original ATSC specification. It has many issues, including 1080p/60 for the broadcaster — potentially another vote for 3Gb/s. Also, in the not too distant future is 3-D. At CES, major manufacturers demonstrated new 3-D capable television receivers. Only time will tell how 3-D plays out for entertainment.

Consider 3Gb/s for the future

As a broadcaster, do you need a 3Gb/s plant today? The answer is certainly no. But with the potential of so many bandwidth-consuming streams on the horizon and with the need to remain competitive for a position on that home display, it had better be a key part of your future-proofing and survival strategy. Any broadcast plant being built today must address the needs of what the coming years will bring.

One thing is certain; the last bastion of interlace display, the CRT, is all but dead. Transmitting an interlace signal only to have it deinterlaced for a flat-screen display seems silly. Welcome to a progressive future. **BE**

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

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