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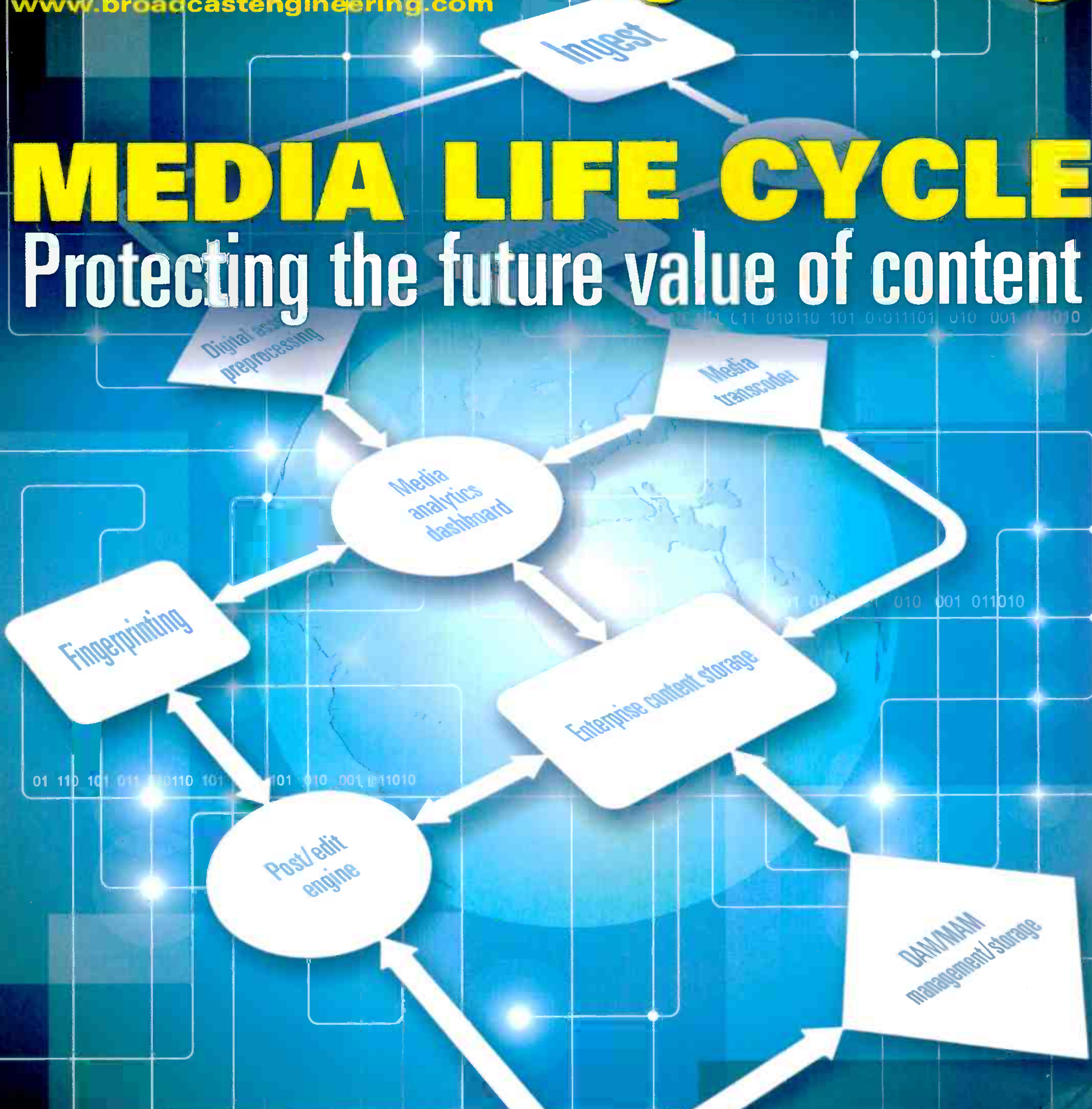

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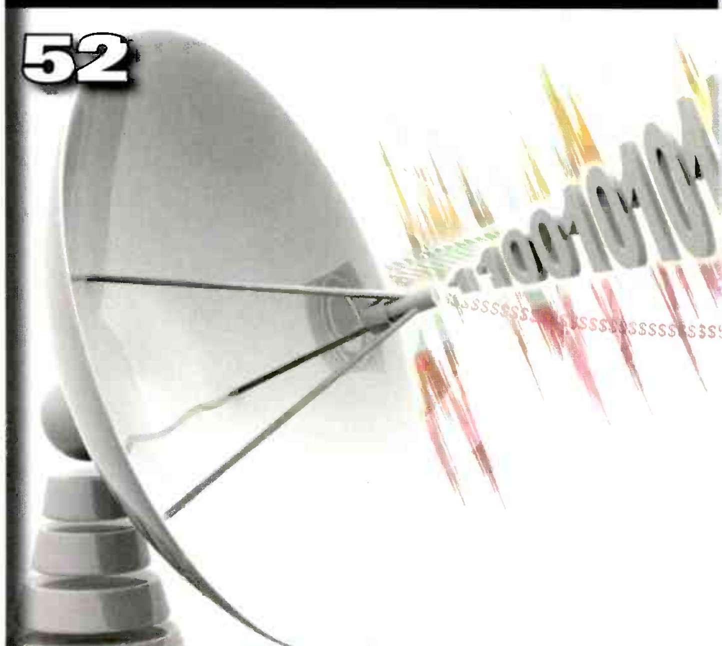

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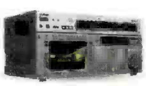

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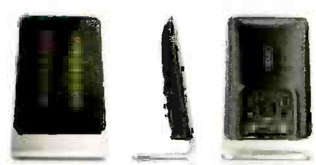

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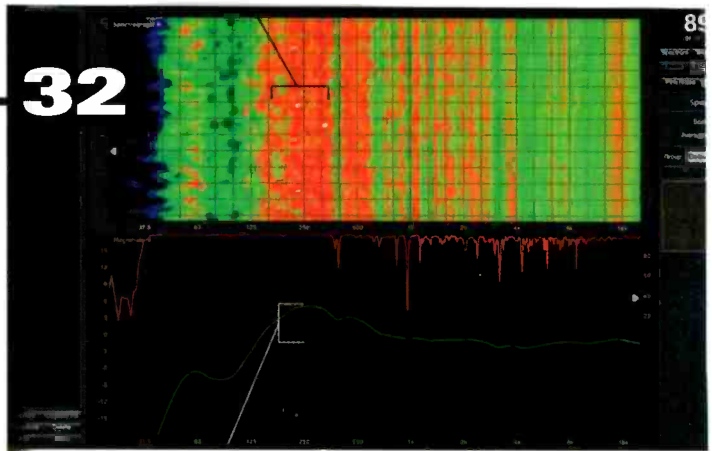

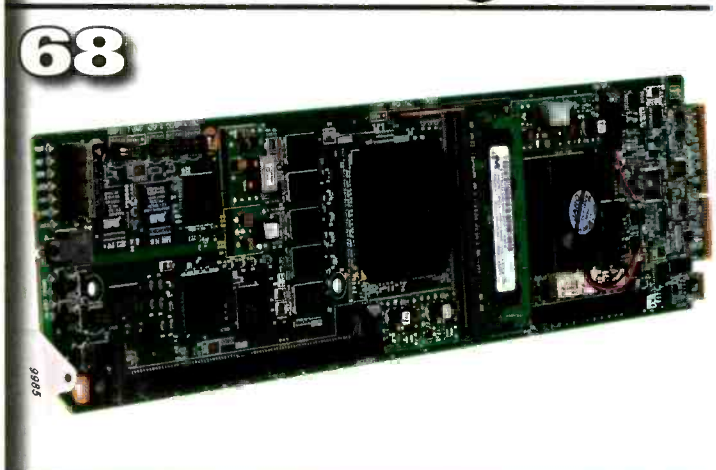

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Content double jeopardy

What if you purchased a morning paper, but were only allowed to read it at the breakfast table? Or, suppose you bought a USA Today at an airport, but it came with restrictions that prevented you from reading it anywhere except on an airplane? That ice-cream cone you just bought at the Dairy Queen? You may enjoy it only while inside the store.

Such limitations sound ridiculous, don't they? Yet, that's exactly what happens when someone subscribes to a cable or satellite service. Sure, you can watch all the content you've paid for, but it must be done only in your

own home and on your big-screen TV. Should you desire to walk to the park and then enjoy an episode of HGTV's "Yard Crashers" on your Galaxy tablet, forget it. Despite the enabling technology, the content owners and cable and satellite companies are limiting the use of that content to the viewer's home.

With ubiquitous high-speed Internet now available, viewers are pushing back against such restrictions. Today's viewers want the ability to watch the content they've already paid for when they want to watch it and anywhere they want to watch it. And, viewers don't like being told they must pay again for that same content.

"TV everywhere" was an early proposed solution. With much fanfare, Comcast, Time Warner Cable and Verizon conducted field trials. Consumer acceptance has been, shall we say, less than stellar; some experts say the results were even dismal. Not all programming was available, and some cable MSOs tried to charge extra for the "service."

The latest MSO hurrah focuses on tablet applications. The Time Warner website touts, "TWCable TV app turns your iPad into another TV screen and lets you watch selected live cable TV channels with your home WiFi connection."

But before you sign up, let's dissect that statement. The first key phrase is: "selected live cable TV channels." Not all channels are available. Second, viewers must subscribe to Time Warner's Internet service. Third, the service works, not surprisingly, only in subscribers' homes.

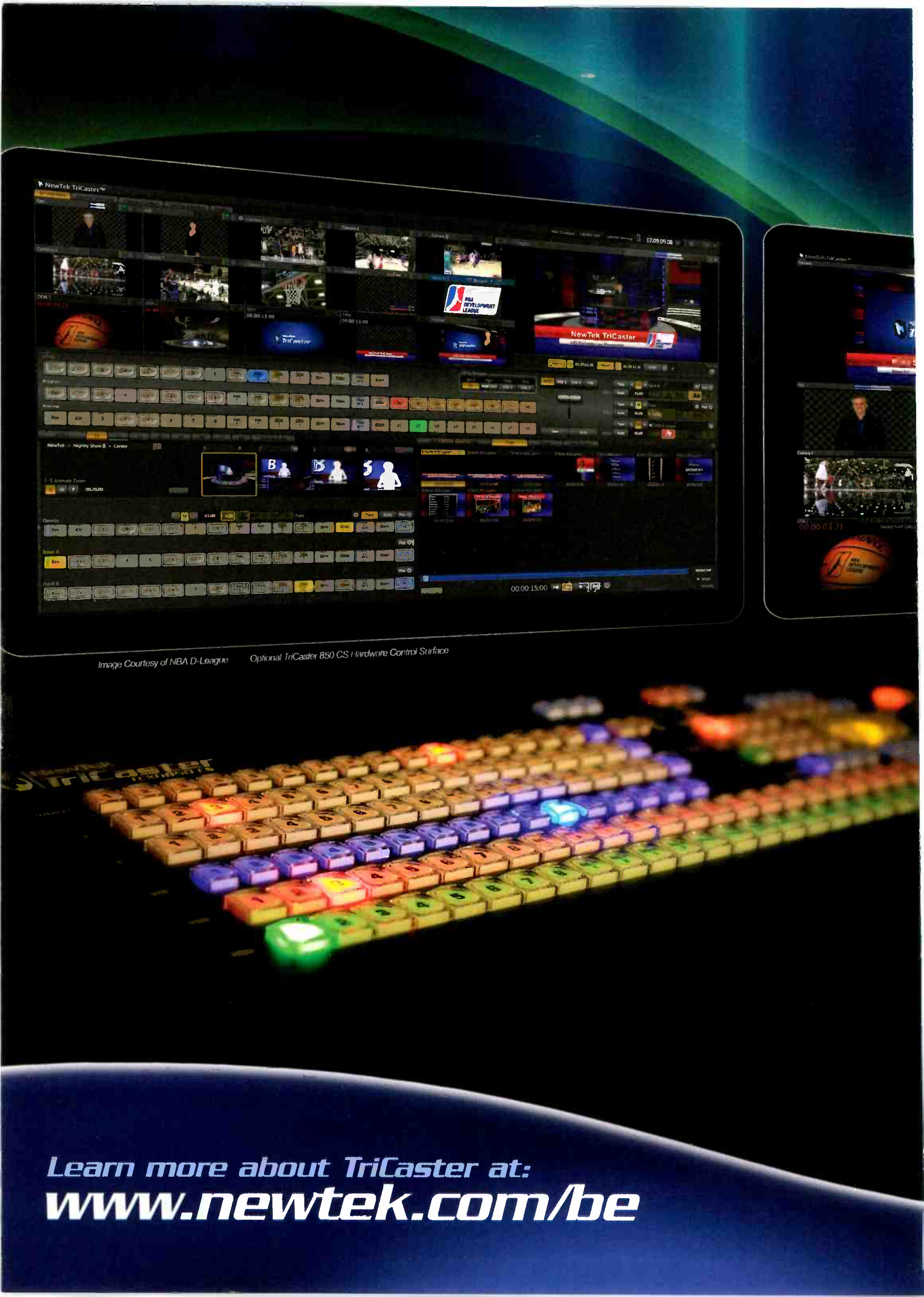
Could there ever be a solution to viewers' desire for no-cost portability that also provides the security that content owners and multichannel video programming distributors (MVPDs) desire? Possibly. In late March, Adobe released a new product called Adobe Pass. Leveraging Adobe's Flash platform and HTML5, Adobe Pass enables pay-TV providers and content owners to deliver a wider range of content on more devices while ensuring a high-quality, secure user experience.

With Pass, an Adobe Flash widget runs in the background while viewers access video streams from authenticated sites. For Apple devotees, instead of Flash, Pass relies on HTML5 and some JavaScript code. Adobe provides the software free to cable companies, the MSO manages all the customer data, and the content owners (networks) pay Adobe to manage viewer access. The platform may help fast-track over-the-top (OTT) delivery to millions who already pay for content, but just want to watch it on other devices and outside their homes.

Although MTV is using the platform, the feature is only available to Verizon subscribers. Other networks using Adobe Pass include Turner Broadcasting's TNT, TBS, Adult Swim, Cartoon Network and TruTV. Additionally, Comcast, DISH, Verizon and Cox have agreed to support the service.

Pass may prove not to be the ultimate solution, but even so, it represents a huge step in the right direction to provide viewers with the portability they crave and the security that content owners and MSOs require. But wait, wouldn't that be like free OTA broadcasts that viewers can already enjoy? BE

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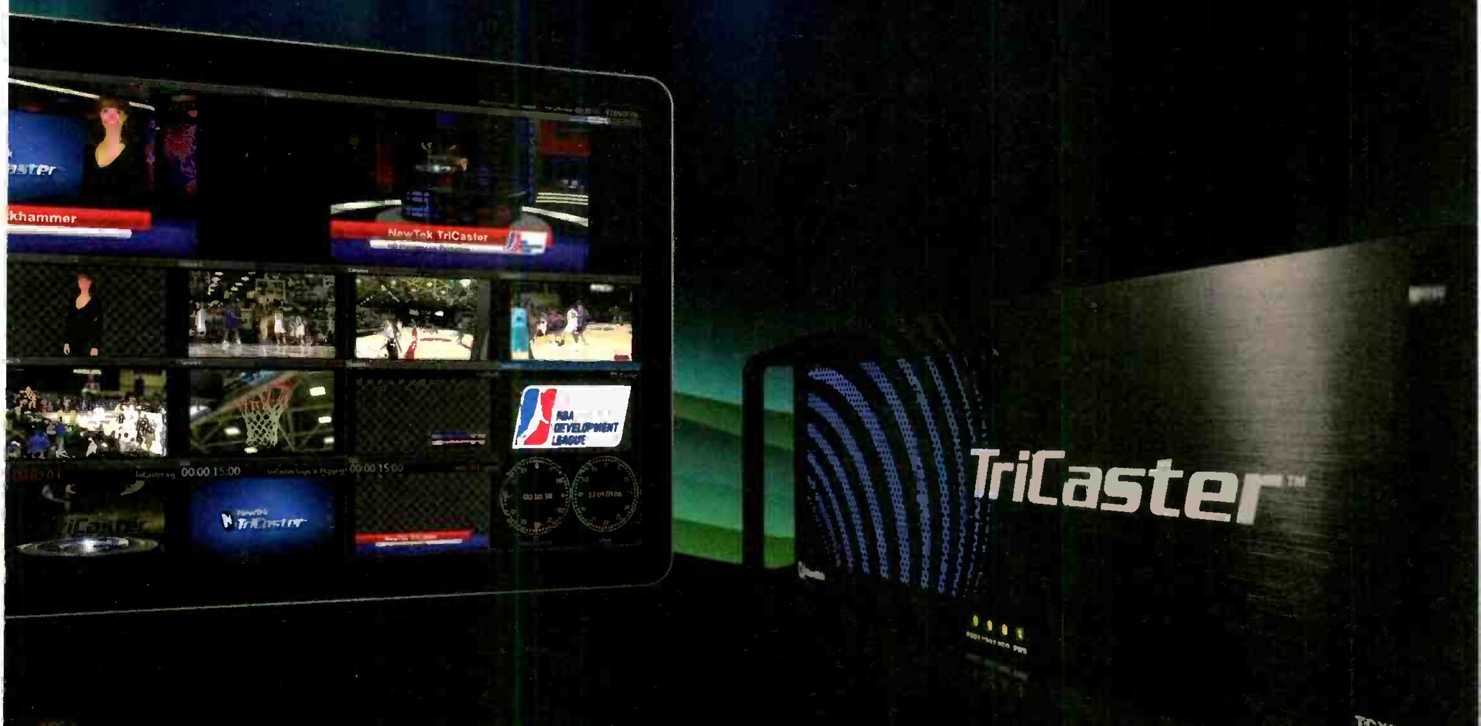

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LED lighting

The new generation of lights offers longer throws, better control and improved focus.

BY STEVE MULKEY

In today's challenging economy, broadcasters are looking at every possible way to save money. The economics of using LEDs to light a television news studio is a no-brainer. Run the numbers, and they speak for themselves. The minimal power required by LEDs, combined with long life and reduced HVAC costs, usually pays for the new lighting equipment in just a few years, with continued savings well into the future.

However, there is a learning curve with LED fixtures. It's not unlike what lighting designers, who were comfortable with incandescent technology, faced in the 1990s, when modern fluorescent fixtures made their debut. Some embraced the new technology, while others watched it pass them by. The challenge is to recognize the great potential of LEDs and find ways to integrate this technology into your studio lighting environment.

I don't find it helpful to compare a particular LED fixture with a legacy incandescent or fluorescent fixture; they're different. Like any other source, you have to learn what each LED fixture is designed to do. You learn the capabilities and performance of each product, and design your lighting accordingly.

The new HD set for KVLY of Fargo, ND, debuted in January 2011. The LED lighting incorporates 30 Litepanels 1x1 fixtures.

That said, the object of lighting with LEDs is the same, regardless of what type of source is used: make the talent look great from every camera angle, separate them from the background, and provide illumination and accent for the set when called for.

New developments

With the introduction of a new generation of LED Fresnel fixtures, there are now LED instruments that perform like a traditional incandescent, with a longer throw and impressive control and focus capability. Just as lighting designers have used incandescent soft lights or fluorescent fixtures, LED arrays have been around for some time now. They emit a soft, high-quality light that works extremely well with HD cameras. There are also LED arrays available in a variety of beam spreads, which gives the designer better control and more options to work with.

One of the properties of many LED fixtures that everyone can appreciate is the ability to dim the source without a color shift. Incandescent has very little latitude to dim before the color starts to shift. So, to maintain color temperature with an incandescent, the choice is to either lamp with a lower wattage, scrim or move the source away from the talent. It's a great feature of an LED fixture to be able to position it where you want it and dial in the light level you need, either locally on the fixture or using DMX control.

Color temperature

LED fixtures are offered in daylight, tungsten or equipped with both daylight and tungsten LEDs that provide the ability to select any color temperature between the two. In a television news studio environment, there are positive reasons for using daylight. On television news sets, there are often a number of monitors (LCD, plasma, DLP, etc.) worked into the design. Most of these monitors display in the daylight range, so if you light the set with daylight, you don't have to adjust the color temperature of the monitors like you do when trying to match tungsten. How many times have we used CTO or had to

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add expensive processing gear to get these monitors to look right?

Often, when people walk into the studio and see it lit with daylight LEDs, they say, "Wow, they're so bright" Usually that's because they've never seen daylight used in a news studio environment. But when the cameras are properly set up to the daylight source, the pictures speak for themselves. Then their reaction is one of pure amazement.

This cable news studio uses Litepanels Sola 6 Fresnel and 1x1 LED fixtures.

The plan is still key

When it comes to creating a lighting plan, you do it the same way you've always done it. You have to look at the set and you have to look at the shots, where the cameras are going to be and what the angles are. That's what you do with any form of lighting. Look at the blocking and say, "We've got three angles on this position and two angles on this one." You can easily take a traditional approach with three-point lighting. I try to get double duty out of the LED fixtures, so if I use one as a key on position 1, it would be nice if when they turned to camera position 2 that key would become a fill. I don't want to light so tightly that I can't get more than one use out of the fixture. And that's no different from what many of us did with fluorescent fixtures before LEDs came along. It's just easier with LED fixtures because they're smaller and can fit into places where the larger fluorescent fixtures just won't go.

For lighting control, where I don't want light from one LED array to fall on the talent sitting one chair over, most LED fixtures can be fitted with traditional barn doors and egg crate, as well as "honeycomb" grids with varying degrees of beam spread. I also find using light diffusion works with LEDs to soften the light or to keep light from traveling beyond the subject. Using the lightest diffusion is often enough to knock the light down and still keep the light quality of the LED.

When it comes to mounting most LED fixtures, they're so much lighter in weight than other types of lighting equipment you may find there is no need for heavy duty grip gear to support them. We recently completed lighting a new set entirely with LEDs suspended from a 3/8in threaded rod. It was the operations manager's idea, and it worked flawlessly.

Caveat emptor

A word of caution to anyone who is unfamiliar with LED technology: All LEDs being sold are not created equal. The truly good LEDs emit a consistent, broad spectrum of light to achieve their color. Be careful. There are fixtures that rely on a variety of different colored LEDs to achieve a broad spectrum of light. This can cast a variety of different colored shadows, which you don't want.

Suffice to say, before deciding which LED manufacturer to go with, you would be well advised to run some tests of your own. Having the equipment in your hands and lighting talent and scenes will be the best way to determine which products measure up. Also, take a look at who is using a particular LED maker's product. Often a customer list will tell you everything you need to know about the equipment and what you can expect.

Don't be afraid to try something new. LED technology is here, it's ready and you need to take a serious look at it. An associate of mine put it this way, "Lighting with incandescent is like using a typewriter. Lighting with fluorescent is like using an IBM 286. When you light with LEDs, you're using an iPad." BE

A word of caution to anyone who is unfamiliar with LED technology: All LEDs being sold are not created equal. The truly good LEDs emit a consistent, broad spectrum of light to achieve their color.

Steve Mulkey heads Redwood Media Group.

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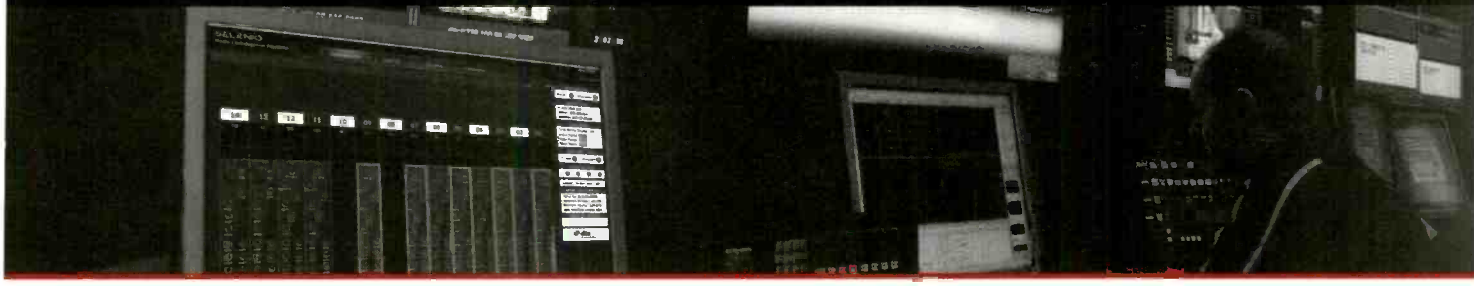

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Incentive auctions

Three new pieces of legislation would compensate broadcasters for giving up spectrum.

BY HARRY C. MARTIN

Three bills have been introduced in Congress that would give the FCC authority to share auction proceeds with broadcasters who "voluntarily" turn in their TV spectrum for broadband use. There are reports of more bills in the works.

It is no secret that the FCC would like to repurpose already-occupied broadcast TV spectrum for broadband use and that broadcasters will strongly resist such repurposing. The impetus behind the new legislation, like the incentive legislation introduced last year, is that broadcaster resistance might be softened or even eliminated by the prospect of large amounts of cash coming out of the proceeds of an auction of the repurposed spectrum. But this scheme requires a change in the law because the FCC is not currently allowed to share the proceeds of its spectrum auctions with private parties.

Spectrum optimization

First this year was S.415 (the Spectrum Optimization Act). A four-page bill from Sen. Mark Warner, D-VA, it would give the FCC authority to conduct auctions of spectrum that is "voluntarily relinquished by a licensee," with "a portion" of the proceeds being shared with relinquishing licensees.

The bill would leave it to the FCC to establish a maximum revenue sharing threshold applicable within any auction. It requires the commission to "minimize the cost to the taxpayer of the transition of the spectrum to be auctioned." The bill has no provision, such as a spectrum tax, to force broadcasters into cooperating.

Spectrum inventory

Rep. John Barrow, D-GA, has introduced H.R.911 (the Spectrum Inventory and Auction Act of 2011). This bill also would give the FCC authority to conduct incentive auctions. But before such auctions could be conducted, the FCC and the NTIA would have to complete an exhaustive broadband spectrum inventory report and make it public. As with S.415, H.R.911 would leave the to-be-shared amount of auction proceeds up to the FCC's discretion.

Importantly, the bill would expressly prohibit the FCC from reclaiming spectrum "directly or indirectly on an involuntary basis." It does not identify what would qualify as an indirect involuntary measure. Nevertheless, the fact that language is included may comfort those who expect that the FCC might come up with coercive measures to persuade TV licensees to give up their spectrum.

Reforming airwaves

Back on the Senate side, there also is S.455, the 51-page "Reforming Airwaves by Developing Incentives and Opportunistic Sharing Act" co-sponsored by Sens. John Kerry, D-MA, and Olympia Snowe, R-ME.

Much like Barrow's bill, it would permit the sharing of auction proceeds while requiring the FCC to conduct a spectrum inventory and other similar exercises. The amount of auction proceeds available for sharing would be left to the FCC, and broadcaster participation would be strictly voluntary. And, as with the two bills described above, it says nothing about spectrum taxes. But it would require that the commission assure that there will be "adequate opportunity nationwide for unlicensed access to any spectrum that is the subject of such an auction." This is intended to protect the continued availability of spectrum for white spaces devices. The legislation contains other proposed changes to the Communications Act that are unrelated to incentive auctions.

Conclusion

It is unlikely any legislation will be approved this year or in 2012 due to the 2012 congressional and presidential elections. Budget and tax issues are likely to crowd out any amendments to the Communications Act leading up to the elections. BE

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

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

Dateline

- Noncommercial TV stations in Michigan and Ohio must file their biennial ownership reports by June 1.
- By June 1, TV and Class A TV stations in the following locations must place their 2011 EEO reports in their public files and post them on their websites: Arizona; Idaho; Maryland; Michigan; New Mexico; Nevada; Ohio; Utah; Virginia; Washington, D.C.; West Virginia; and Wyoming.
- The license renewal cycle begins June 1, 2012, for TV, Class A TV, TV translators and LPTV stations in Maryland; Virginia; Washington, D.C.; and West Virginia. In these states, on April 1, 2012, TV, Class A TV and LPTVs that originate programming must begin their prefiling renewal announcements. The renewal cycle continues region by region until April 1, 2014, when stations in Delaware and Pennsylvania will be the last to file for renewal.

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Captioning systems

Legacy analog issues remain after the digital transition.

BY ALDO CUGNINI

Although the FCC established rules for the carriage of closed captioning quite some time ago, the process of generating, encoding and transmitting captions has had to adapt to the evolution of digital broadcasting. In the analog world, EIA-608 (now CEA-608) defined how captions should be carried on line 21 of an NTSC transmission. With the onset of digital transmission, EIA-708 (now CEA-708) emerged, defining how to carry captions over a DTV transmission.

Captioning is complex

Within the broadcast plant, the distribution of DTV closed captioning (DTVCC) is based on the use of SMPTE 334-1, which defines a method of embedding DTVCC and other data services in the vertical ancillary (VANC) data space of HD-SDI and SDI signals. Carriage over these two interfaces is defined by SMPTE 292M High-Definition Serial Digital Interface and SMPTE 259M Serial Digital Interface, respectively. The 334 standard defines a caption distribution packet (CDP), the basic unit of data that is carried through the DTVCC distribution chain. The CDP consists of a specific sequence of bytes that can carry CEA-708 DTV caption data, CEA-608 caption data, caption service information and SMPTE 12M-1 time code. All SMPTE 334-1-compliant distribution equipment handling HD-SDI and SDI signals should pass DTVCC when properly configured.

> **Caption authoring starts with the creation of captioning intentions.**

A standardized protocol for carrying CDPs over an EIA/TIA-232 (formerly RS-232) serial interface from a caption encoder to an MPEG encoder is defined by SMPTE 333. As with many devices using a serial interface, this protocol uses software (as opposed to hardware) "handshaking" for flow control and synchronization between the two devices. Alternatively, the serial protocol described in SMPTE RP2007 does not use flow control; the caption data is "pushed" from the caption encoder to the MPEG encoder. DTVCC caption data can also be carried in an AES3 digital audio data stream, as specified in SMPTE 337M. Such an application could be used, for example, in place of DTVCC carried in the VANC of an SDI interface.

Caption authoring starts with the creation of captioning intentions: a high-level, usually text-based, description of how and when the captions should appear on consumer equipment. While there have been attempts to establish an agreed CEA-708 caption intentions format, there is currently no such standard protocol. Without a standard, the creation, handling and conversion of caption intentions is often a proprietary process. Caption encoders and VANC embedders consequently may or may not have built-in functionality to translate the caption intentions into CDPs.

Selection of video processing equipment should also take into account how that equipment handles captions when the video is delayed, frames are repeated or dropped, etc. When a processor cannot handle captions appropriately, bridging processors can be used to bypass the problematic system elements. The reader is directed to SMPTE Engineering Guideline EG 43:2009 for further information on the carriage of captions in the broadcast plant.

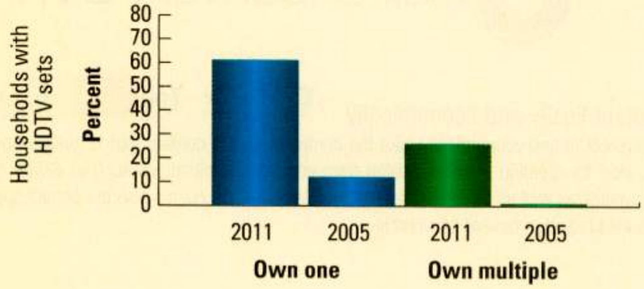
Broadcast carriage required

Both CEA-608 and CEA-708 captioning must be sent on broadcast transmissions for all nonexempt captioned programming. CEA-708 data also includes "legacy" CEA-608 captions, so that analog receivers can use that to generate captions, e.g.,

FRAME GRAB *A look at tomorrow's technology*

HDTV households now dominate U.S. viewing landscape

61 percent of households now own an HDTV, compared with 12 percent in 2005.



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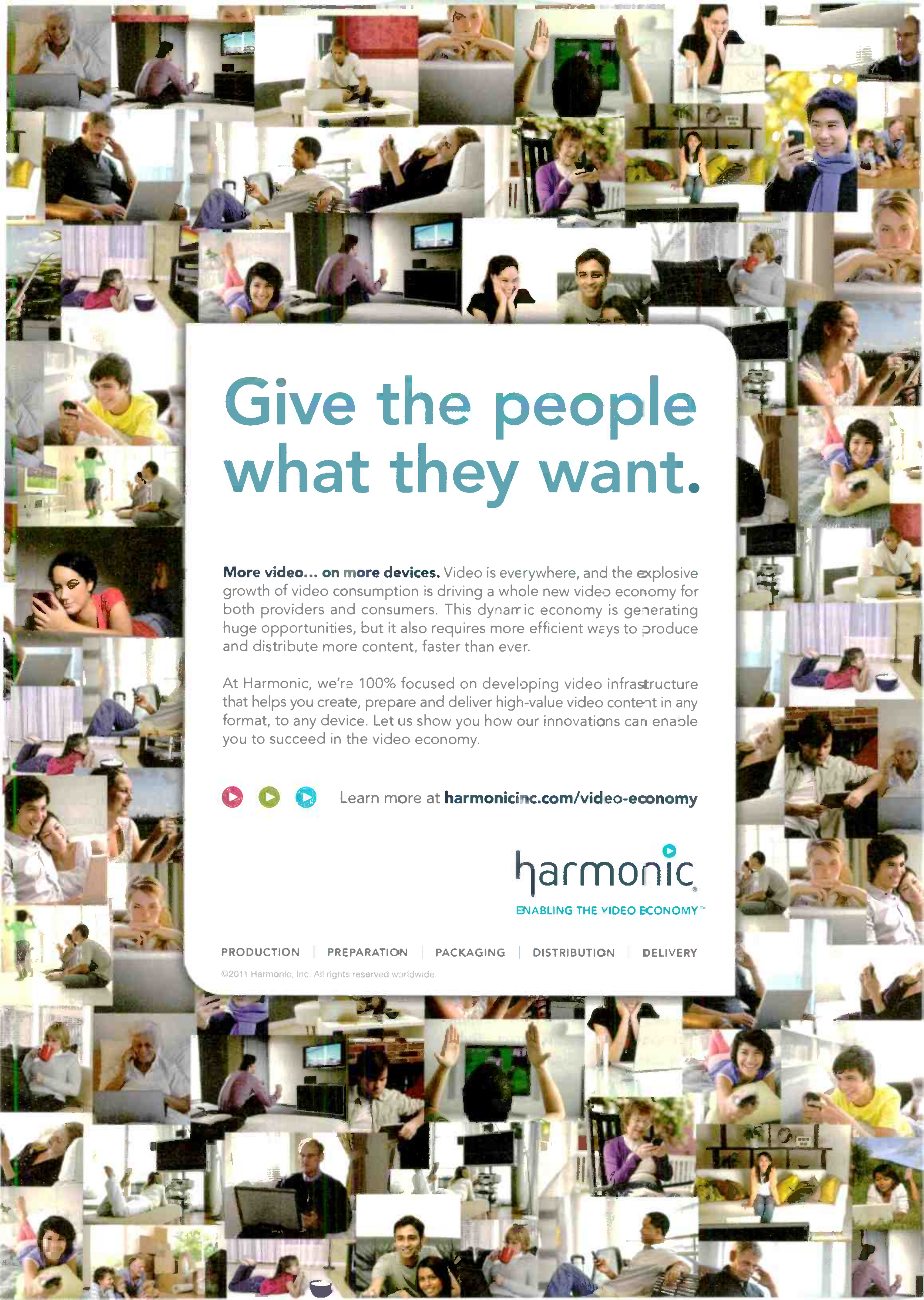
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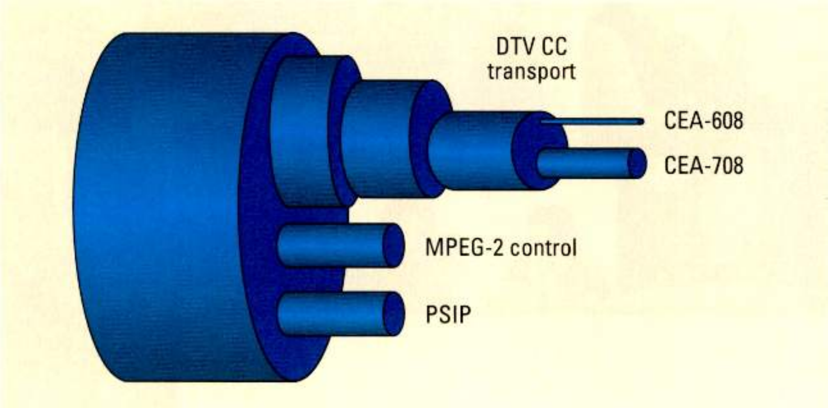

Figure 1. DTV closed captions within the ATSC A/53 transport stream

when the signal is provided through a DTV converter. While DTV receivers can use 608 data when 708 data is not available, this functionality is not mandatory in the receiver.

The carriage of ATSC closed captions is defined in A/53, Part 4. (See Figure 1.) Up to 16 services can be announced in a caption service descriptor (CSD), which identifies each service as "digital" 708 or "line-21" 608-type captions. With NTSC, CEA-608 allowed each field to contain only two characters at one time (2 bytes, or 16 bits); the data rate was thus 2 x 60 = 120 characters per second, or 960b/s. The CEA-708 data rate, however, is constrained only by the particular transport (or transmission) method. ATSC A/53 allows a data rate of 9600b/s, i.e., 1200 characters per second.

ATSC A/72 Part 1 specifies CEA-708 when using AVC; cable systems incorporate it as well for both AVC (ANSI/SCTE 128) and SMPTE VC-1 (SCTE 157). Digital Video Broadcasting (DVB) similarly defines CEA-708 closed captions when using MPEG-2, AVC and VC-1 video coding.

Broadcasters and MVPDs must ensure compliance with FCC regulations on correct carriage of closed captions, and cable plants retransmitting broadcast programming must correctly make captions available to subscribers. In the past, an all-analog cable plant would simply pass the entire NTSC signal from source to subscriber, keeping the line-21 captions intact. Today's situation, with digital sources and mixed analog-digital cable plants, is more complex. CEA-608 captions can be re-encoded onto line 21 in an STB, but CEA-708 (DTVCC) captions require different processing, as the rendered captions are essentially a superset of CEA-608. TVs receiving their video from STBs, whether from cable, satellite or even DTV converters, have the additional complication that the captions could be rendered by the STB or within the TV itself. (See Figure 2.)

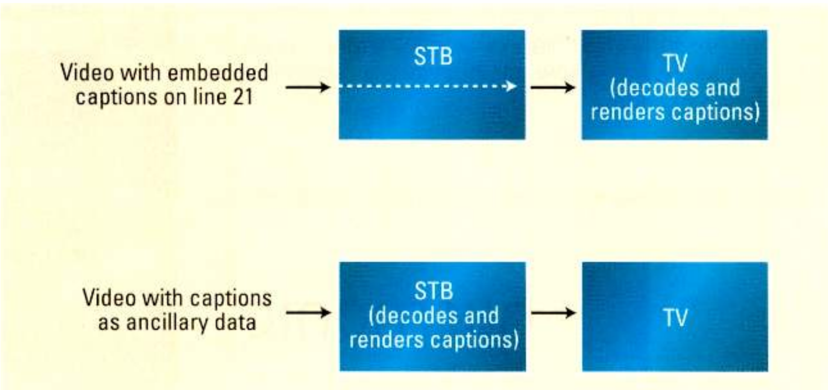

Figure 2. Captions can be processed by one of two means on TVs receiving video from an STB.

Mobile broadcasting has its own adaptation of captioning, too. Because the mobile multiplex is intended to be decoded independently of the main program, mobile captions must be embedded separately within the mobile transmission, even if simulcasting the main program. At present, there is no FCC mandate to carry captions within a mobile transmission.

Captions transmitted in the ATSC mobile standard ATSC A/153, as described in CEA-708D, can be carried using descriptors as defined in ATSC A/65, constrained as per ATSC A/72 (i.e., as for AVC coding). The captions are listed, together with video, audio and other services, in the service map table, or SMT-M/H. One key difference from A/72 is that variable bit rates, not to exceed 9600b/s, are permitted for the closed caption payload. (That is, packing bytes need not be used, and when captions are not present, no bandwidth allocation is needed.) This was an intentional difference from older versions of CEA-708, which required the fixed allocation of 9600b/s for DTVCC. Another difference is that closed captioning, AFD and Bar Data are not carried in the SVC enhancement layer, when that is used. Receivers decoding the SVC enhancement layer are expected to use the information present in the SVC base layer, i.e., the AVC "compatibility" stream.

3-D closed captioning

The Television Data Systems Subcommittee of CEA is considering how CEA-708 caption services can be rendered with stereoscopic 3-D program content, and how basic 3-D coding capability might be added to CEA-608. CEA is welcoming participants to join the appropriate workgroups. **BE**

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SLAs, QoS and guaranteed WANs

Service level agreements are an important part of creating a reliable wide area network.

BY BRAD GILMER

Did you know that IP networks are used every day by Fox to get critical sporting events backhauled from the venue to a facility in Los Angeles? Did you know that other broadcasters, Hollywood studios and media companies do the same thing? You might think that IP transport is unreliable and not suitable for professional video. This article will discuss how to create an IP network with great reliability.

SLAs, SLS', TCAs and TCS'

To get the reliable performance described above, start with a service level agreement (SLA) with your video service provider. An SLA serves as the baseline and sets expectations both on the part of the service provider and the user. We talk about SLAs and quality of service (QoS) together as if they both were technical frameworks, but this is not strictly true. The SLA is the part of a contract between the two parties that describes the characteristics of the transport, particularly in terms of reliability, that the user can expect the service provider to deliver. SLAs can be simple, or they can be complex. But usually SLAs cover two broad areas: business and technical.

When it comes to business aspects, these are broken down into SLAs and service level specifications (SLS). A few aspects of SLAs and SLS' are suitability for use, price and technical support. Of course, when you enter into an agreement for transport from a service provider, the assumption is that the service being offered is suitable. But misunderstandings can occur if the two parties do not both agree what constitutes an acceptable service. There is not much to say about price except that it is a common part of the overall agreement and that pricing, penalties for lost service, and what constitutes a loss of service should all be covered in the SLA and SLS; otherwise, difficulties can ensue. For example, does a one-second loss of signal constitute an outage over a one-month period? What if you get 10 or 20 one-second outages in a month? Is that equivalent to a single 10- or 20-second outage? You get the idea.

An SLA serves as the baseline and sets expectations both on the part of the service provider and the user.

Finally, technical support is definitely something that should be specified in an SLA. When will the provider answer the phone? How will it escalate a problem? Will it do the same thing on the weekend or in the middle of the night?

The SLA and SLS should also include technical aspects. Some common elements to include are performace metrics, availability metrics, mean time to restore, and operations and service windows. Performance metrics you may want to consider are things such as IP loss rate, IP error rate, jitter and wander, and out of order and reordered packets. Availability metrics are interesting. Of course, you want to track the availability of the network, especially if you are going to get a rebate for times when the network is unavailable. But just because you take hits on the network does not mean that the network is unavailable; the terms of the SLA will determine that. You might wonder how this can be. You can measure every single bit as it transits the network, and you can make a note every time a bit is dropped. This is usually reported as bit error ratio (BER). Numbers such as 10-3 or 10-5 are not uncommon. In the case of 10-3, there is one error every 10,000 bits. But it is strictly a negotiation between you and the service provider to determine at what level of error an outage has occurred. You can expect to encounter terms such as BER and errored seconds when you talk about these things.

Also, should you measure every time there is an errored bit during transmission, or are you going to measure outages in terms of errored video output from a decoder? What if the system employs forward error correction (FEC) and can correct for errors in transmission up to a certain level? There is a lot to talk about with your provider, and it is much better to cover these things at the beginning rather than during a problem.

In addition to SLAs and SLS', you will also encounter traffic conditioning agreements (TCAs) and traffic conditioning specifications (TCS'). These documents describe how traffic on the network will be treated. More on this in a minute, but what

happens if you say that, in all cases, video is the most important traffic on the network, but somewhere down the line, a bank has entered into an agreement whereby its bank transactions take priority? If the network gets busy, then the provider is going to drop packets, and if you do not have consistent TCAs and TCS' all the way from source to destination, packets may get lost on purpose because the bank takes precedence.

QoS frameworks

To deliver the quality of service you establish through SLAs and TCAs, providers use QoS frameworks. Figure 1 shows a QoS framework established by the ITU, as described in the document ITU-T Y.qosar. (See Figure 1.) Cisco has a QoS framework, and there are other frameworks as well.

As you can see, the ITU framework has several planes. The management

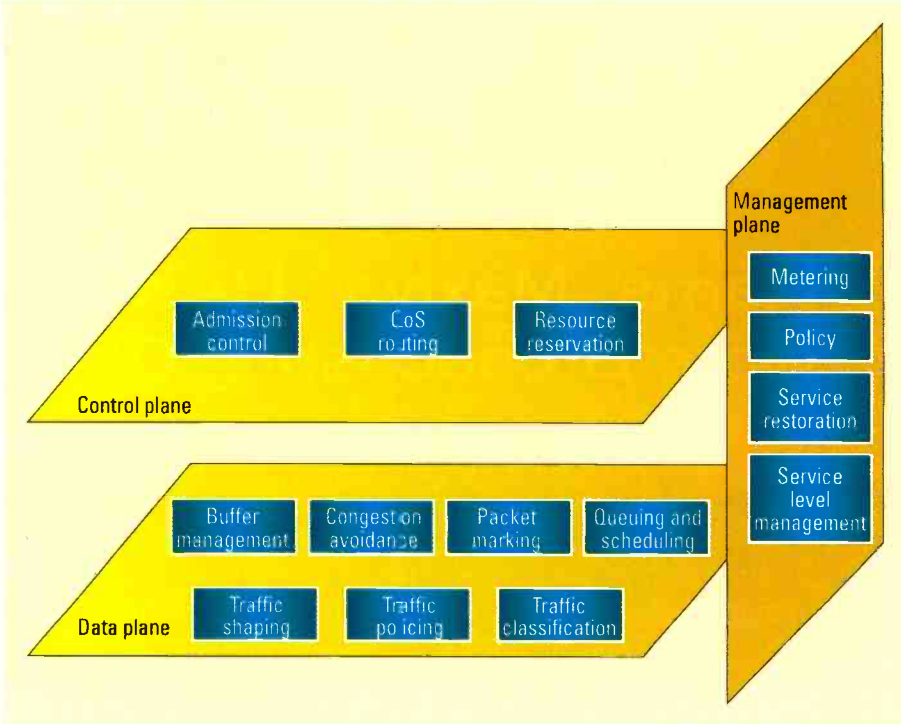

Figure 1. The ITU-T Y.qosar framework

plane allows the provider to manage the performance of the network according to the SLA. The control plane deals with control of the network, and the data plane has to do with the traffic transiting the network. A QoS framework probably will address all of these areas.

> **The good news is that these frameworks allow providers to deliver guaranteed performance across their networks.**

I have a limited space, so I am going to pick a few areas to discuss. You can find more detailed information online.

In the management plane, this article has already covered how the SLA is established. It has also touched on service restoration. Policy and metering has to do with establishing policies for traffic on the network, especially when things get busy. One policy could be that you will discard data traffic before discarding video traffic. Of course, to implement this policy, you will need to meter the traffic on the network in order to know if policies are being followed.

On the control plane, admission control is an important concept. Obviously we are not talking about loosely controlled networks here. We must control what sort of traffic is allowed on the network. This is done through admission control. To control delay variation from one packet to another, QoS routing can be established, where packets always follow the same path through the network. This can also help with out-of-order packets. Also, we want guaranteed throughput, and one way to achieve this is to reserve network bandwidth.

At the data plane, you are dealing with packets on the network. In order to meter traffic on the network at the management level, you will need to know what sort of traffic is on the network. One way to achieve this is to use packet marking to describe what is in the payload of each packet. To do this, you need to use traffic classification to put each packet into a particular group for marking. Queuing and scheduling can be used to control the flow of traffic on the network so that you do not overflow buffers in routing devices, and buffer management can be used inside the routers to allow high priority traffic to avoid being dropped except in the worst congestion conditions.

Do you need QoS?

As you can see, QoS with all of its components is a rather complicated topic. The good news is that these frameworks allow providers to deliver guaranteed performance across their networks. But because of the complication, you might want to carefully ask whether you need this sort of solution before deploying it. **BE**

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Embedded audio

Integrating audio processing into a video routing system presents new challenges.

BY SCOTT BOSEN

The evolution from analog to digital signal distribution in broadcast television facilities has brought about a number of significant changes in routing and distribution system design. One of the biggest has been in how audio is handled. As recently as five years ago, a state-of-the-art facility would include several layers of audio routing, usually a mix of analog and digital, along with the video signal distribution layer.

With the widespread adoption of embedded audio, these separate audio systems have shrunk to islands in production and some master control areas, while the main video routing system transports audio as embedded audio signals. Eliminating audio routing and distribution equipment along with patch panels, cabling and support gear saves money and reduces complexity. The embedded audio world, however, also presents new challenges that must be addressed if desired flexibility, cost-effectiveness and efficiency are to be achieved.

The first problem posed by embedded audio is how to reconfigure audio channels encoded into the digital signal.

Challenges

The first problem posed by embedded audio is how to reconfigure audio channels encoded into the digital signal. This can be as simple as adding a second language track, or making a left-right swap to maintain a consistent channel assignment pattern. In extreme cases, it may be necessary to completely rearrange channel positions. This function, generally known as shuffling, can be handled at the time material is ingested into the facility, in which case the shuffling is performed by dedicated equipment in the ingest system.

Effective stand-alone audio shufflers are also available, but they may be difficult to incorporate into a large, integrated facility where quick changes to live feeds from news or sports events are common. In a facility like this, the idea of including audio processing within the video router is particularly attractive.

Any manipulation of the content within an SDI data stream first requires that the signal be deserialized and decoded into its component data streams. Some video signal processing equipment already does this, but video routers traditionally do not. Instead, they output data that is a faithful copy of what was received at input.

Incorporating deserializing and decoding capabilities into a video router is a relatively new idea. What has made it possible are improvements in large-scale field programmable gate array (FPGA) components that make them smaller, more powerful and more energy efficient. By using these components, it is now practical to incorporate signal processing into a video router's circuitry without compromising its operational reliability. (See Figure 1.)

But this functionality comes at a cost — a literal one. An I/O card with serializing and/or deserializing capabilities is several times more expensive than one that just moves SDI signals.

Modern routing switchers are typically based on a structure that divides the circuitry into three parts: an input card that accepts a number

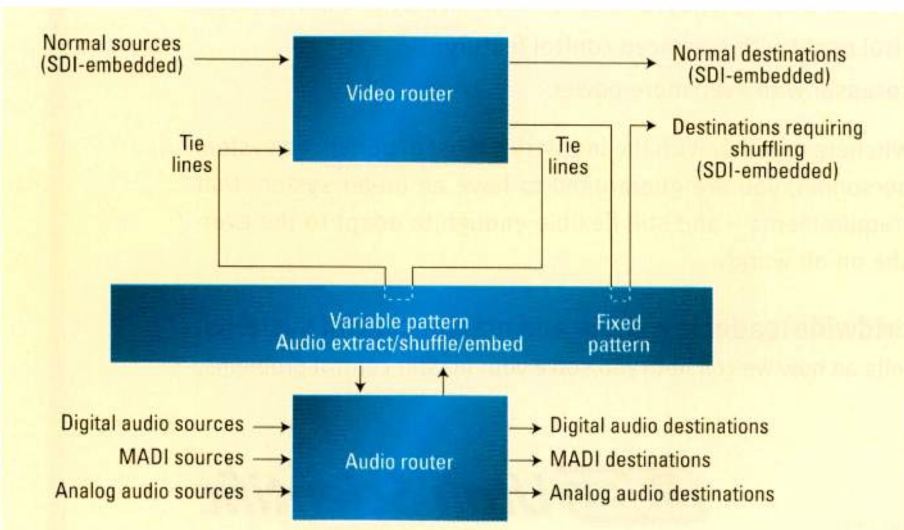

Figure 1. A hybrid audio/video routing system can handle discreet audio sources as well as embedded audio.


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of signals; a central crosspoint card, usually with a redundant card in standby; and an output card, which drives a number of output ports. A basic shuffling capability could be implemented on either the input or the output card. Both approaches have their advantages, but the output card option offers more flexibility because it enables signals from the router's other input cards to be brought in and embedded into the output streams. When signals from multiple sources are being combined to create new ones, an audio subrouter must be included in the video router. (See Figure 2.)

Let's consider how large this audio router needs to be. Each HD-SDI input to the video router has the capacity to carry 16 embedded audio component streams (eight AES pairs). In a midsize routing switcher with 128 inputs, this works out to 2048 individual audio streams. Because every input must be available to every output without blocking, the internal audio subrouter must be designed with a capacity of at least 2K x 2K. That's as big as some of the largest dedicated audio routers in existence, and it is only serving a midsize video router.

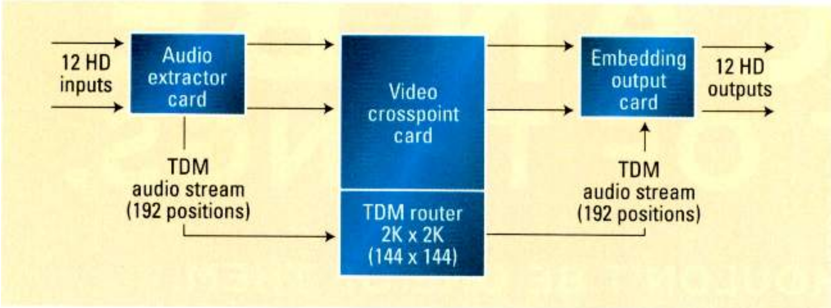


Figure 2. An internal audio subrouter within the video router allows any audio stream to be inserted into any embedded audio position.

Given the large number of audio streams within the router, this function is generally performed by a time division multiplex (TDM) system rather than a crosspoint matrix. The TDM router can be implemented in an FPGA, reducing the number of components required. A TDM subrouter can also be extended to provide digital signal processing (DSP) functions such as mixing, phase reversal and gain adjustments, giving the router the ability to control audio signal characteristics fully.

To increase the flexibility of the combined audio/video routing system, it should also be possible to provide direct connections both to external audio signals and to the audio signals extracted from the video. Audio input cards can handle this job by presenting their signals to the internal TDM matrix as well as to the crosspoint matrix, if necessary. Analog conversion can also be added to these cards, in which case their signals can be presented as digital streams to either or both of the submatrices. On the output side, audio cards can connect the audio streams either as AES pairs or as stereo analog pairs for monitoring or connection to legacy equipment.

When MADI streams are handled the same way, it simplifies the connection to audio mixing consoles or other equipment. This also provides a means of connecting the audio signals within the router to an external audio router, should system requirements exceed the capacity of the internal audio subrouter. Since a TDM matrix is inherently a synchronous system, it is necessary for all of the input signals either to be synchronous or to be synchronized within the router. To provide maximum flexibility for handling "wild" audio inputs, the synchronization process should include

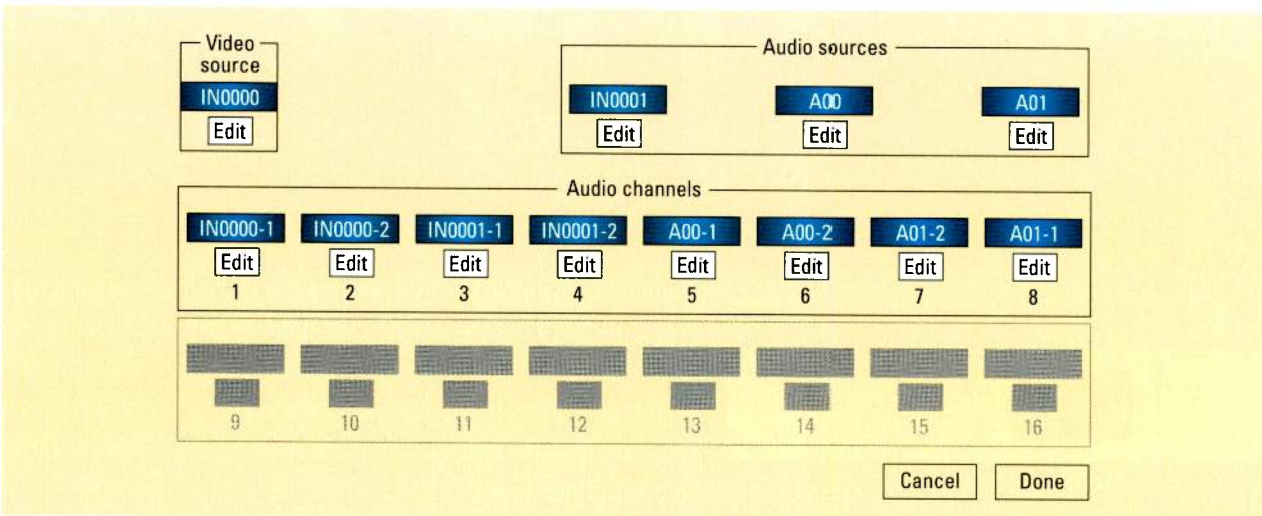


Figure 3. A GUI-based control system provides visual confirmation of the audio stream that is feeding each embedded audio position.

sample-rate conversion facilities that enable digital audio signals from the widest possible range of sources to be brought into the system.

Controlling the combined video/audio router also presents new challenges in the design of user interface devices. Most routing switcher control panels provide basic audio/video breakaway functionality carried over from the days before embedded audio was the norm. Now that there are not only video but also 16 audio positions to control, even the most powerful hardware panels may fall short. More effective is a virtual control panel that provides a visual display of the video signal and its associated audio positions so that the operator can choose the audio signal to be dropped into each position. GUI design also enables control of DSP functions and other signal configuration information to be handled more easily than it is in a traditional hardware control panel. (See Figure 3.)

Controlling the combined video/audio router also presents new challenges in the design of user interface devices.

Conclusion

While the addition of audio processing functionality to video routing brings facility-wide advantages, the equipment is undeniably expensive. When deciding how much audio capability is needed in a router, it is therefore important to analyze requirements carefully and to consider alternatives for external equipment or router re-entry paths. In many cases, it is sufficient to add a relatively small audio-enabled section to the video router, and then implement the router control system's pathfinding facilities and tie-line management to route audio-embedded signals to their destinations.

In summary, it is possible to take cost-effective advantage of the flexibility and operational benefits of embedded audio, but to do so requires careful assessment of need and evaluation of the available technology, as well as solid planning and system design. BE

Scott Bosen is the director of marketing for Utah Scientific.

Listening environment testing

Improve your space with software-based sound analysis.

BY MARK MILLER

Sound waves take up physical space and require physical distance to develop. Anything the sound "touches" can positively or adversely affect what you are listening to. For example, the length, height and width of a room can correlate to how particular sound waves will develop. Materials within the room, from carpet to work surfaces, can affect sound waves as well.

Even professional listening environments can have issues with audio accuracy. Large rooms, including sound stages or broadcast production studios, tend to have reverb (echo) issues. Smaller rooms aren't big enough for reverb problems, but they are notorious for natural resonance issues. Equipment noise can also affect what you hear and, as a result, how your mix will sound.

Fortunately, software-based sound analysis tools such as real-time analyzers (RTAs) can let you "see" what you hear through various tests, so you can compensate for your surroundings. The primary purpose of these tests is to help create a "flat" room, a space in which the listener is hearing the "real" sound that the rest of the world will hear.

Each audio frequency within the spectrum has a wave of a certain size. For example, the 100Hz wave is about 34in long, so you can correlate that particular frequency to how many cycles you'll get in a particular space. It's simple math, really. All right, it might not be simple with so many frequencies, but it is predictable (and your RTA will do the math for you).

You want to hear what's been recorded, unaffected by the environment in which you are listening to it. Without proper analysis, you won't know which frequency or frequencies "get stuck" in the room.

A "room mode" test is generally one of the first tests to run, because you need to identify how the environment is altering the sound. Every room, particularly a small room, has its own natural resonance. A result of the shape of the room, this resonance (or room mode) can cause a buildup of particular audio frequencies.

You want to hear what's been recorded, unaffected by the environment in which you are listening to it. Without proper analysis, you won't know which frequency or frequencies "get stuck" in the room. As a result, you might tend to reach for the EQ to compensate for those frequencies. But when that content, which was mixed to your particular room mode, is played elsewhere, you have a hole in your audio.

An RTA will show a peak of any particular frequencies, so you can resolve any room mode issues, but the quality of your tools can affect the quality of your measurement. Garbage in, garbage out — the old industry adage — applies to sound analysis as well. You have a choice of software programs designed for real-time sound system measurement and analysis.

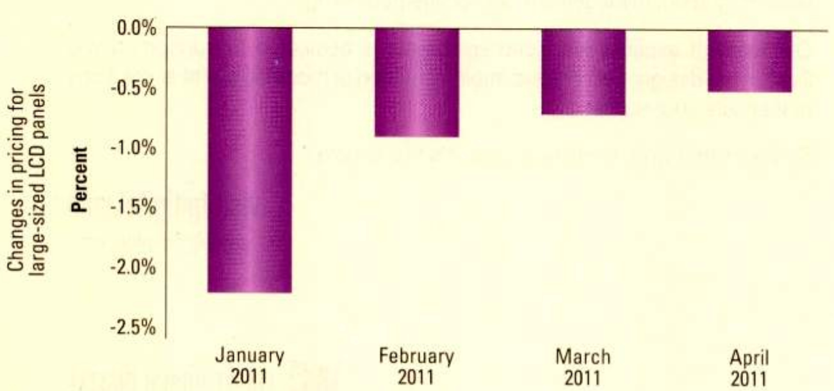
You will also need to invest in a measurement microphone to capture the audio coming from the speakers in the room you are testing. Some mics deliver a certain sound. When it comes

FRAME GRAB

A look at the consumer side of DTV

Earthquake and tsunami cause minimal disruption to LCDs

Large-sized panel LCD prices fell 0.5 percent in April.



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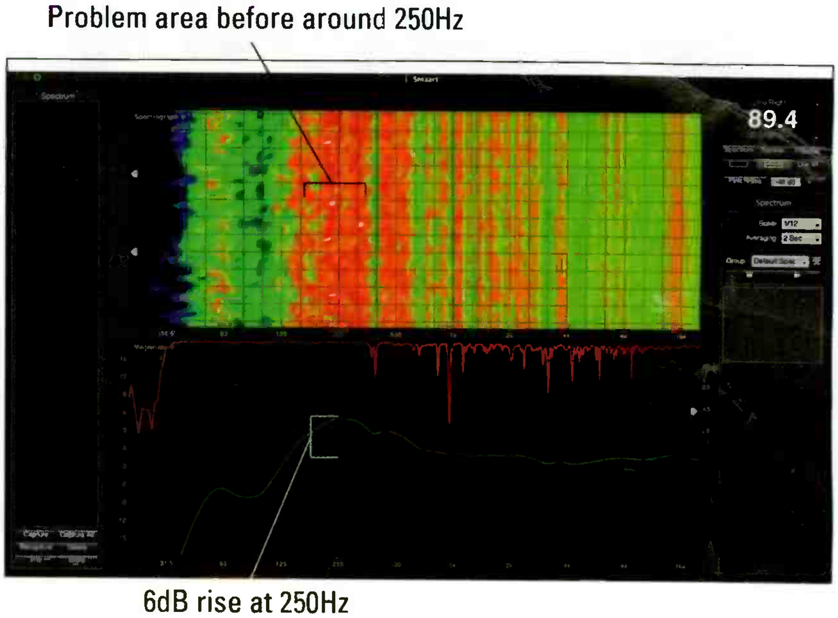

Figure 1. Using Rational Acoustics Smaart software, we can "see" how pink noise becomes acoustical energy in a room. As the transfer function and spectrograph indicate, there is an obvious issue at around 250Hz.

to measuring listening environments, however, you want a measurement mic with a frequency response that is flat from 20Hz to 20,000Hz, the full spectrum of audio frequencies that can be heard by the human ear, which will provide an accurate representation of the room. There are a number of measurement mics on the market. They are not inexpensive but are necessary for accurate results.

The measurement mic needs to be plugged into a preamp and then an A/D converter so you can feed the signal into your laptop via USB. Essentially, you place a measurement mic in the location of the room from which you will be listening, play pink noise (for frequency response and phase tests) through the room's speakers, and analyze the results through the RTA software. Pink noise is the preferred sound to analyze because it includes the full 20Hz to 20,000Hz spectrum, with all frequencies at the same volume.

We used the Rational Acoustics Smaart software to measure the frequency response of a small audio mixing suite. (See Figure 1.) A dual-source measurement called transfer function (seen in the lower part of Figure 1) allows us to compare pink noise as electrical energy to the pink noise once it has become acoustical energy in the room. Along with the spectrograph in the upper part of the image, the test clearly shows an issue around 250Hz, as well as a smaller issue at around 500Hz, which is an octave above 250Hz (and is to be expected). It is likely that in dealing with the 250Hz room mode, the 500Hz problem area will also be resolved.

Once we are aware of the exact issues in the room, we can begin to assess how to deal with them. If you have the luxury of changing the physical structure of the space, you can change the room size or alter the angles of the walls. For most facilities, however, audio issues need to be controlled through absorption or diffusion. Absorption material removes sound energy from a room, while diffusion reduces echoes and reflections but keeps the sound in the space.

Available in a variety of designs, diffusers often have blocks or baffles in their designs. A bookshelf also serves as an excellent diffuser; the different sizes and densities of the books on the shelves serve to radiate sound energy in several directions.

Once we are aware of the exact issues in the room, we can begin to assess how to deal with them.

Depending on the audio issues, absorption materials can be applied to specific areas of a room, not necessarily every square inch of wall space. Plus, with a little more applied math, we can select certain densities of materials that can absorb particular frequencies. Foam panels and ceiling tiles are some of the most

A few more tests

Here are a handful of other tests that can improve your listening environment:

- *Room tuning* — With room mode issues resolved, another wave of pink noise through the measurement mic can show peaks and valleys in what should be a perfect signal.
- *Speaker placement* — Proper subwoofer placement is essential, particularly in 5.1 surround-sound mixing environments.
- *Time alignment* — To compensate for imperfections in speaker placement, this test makes sure audio signals from each speaker arrive at the listener location at the same time.
- *Noise rating* — How much noise from outside sources (such as people talking in the hall) is affecting your listening environment?
- *Reverb times* — The measurement of a room's natural reverb is important so you can replicate it, such as in a sound booth ADR session after shooting on a sound stage.

popular absorption materials purchased to improve room sound. You can also install carpets and tapestries for further sound absorption, as well as fabric-covered office cubicle panels that are designed to reduce noise.

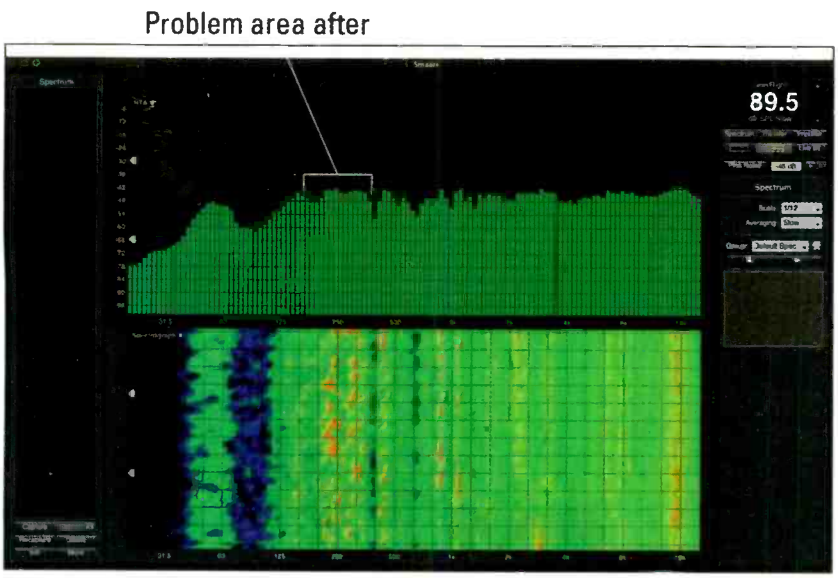

Figure 2. After installing absorption materials in the room, the issues at 250Hz were resolved.

For the audio suite we tested, we used absorption materials instead of relying on an equalizer to compensate for these anomalies. Owens Corning 703, 2in-thick semi-rigid fiberglass boards, or similar materials, have particularly good absorption coefficients down to the 250Hz range. After some trial and remeasuring, we found acceptable acoustic and aesthetic locations for the panels, and we achieved more desirable results. (See Figure 2.) **BE**

Mark Miller is a sales and design specialist with Advanced Broadcast Solutions.

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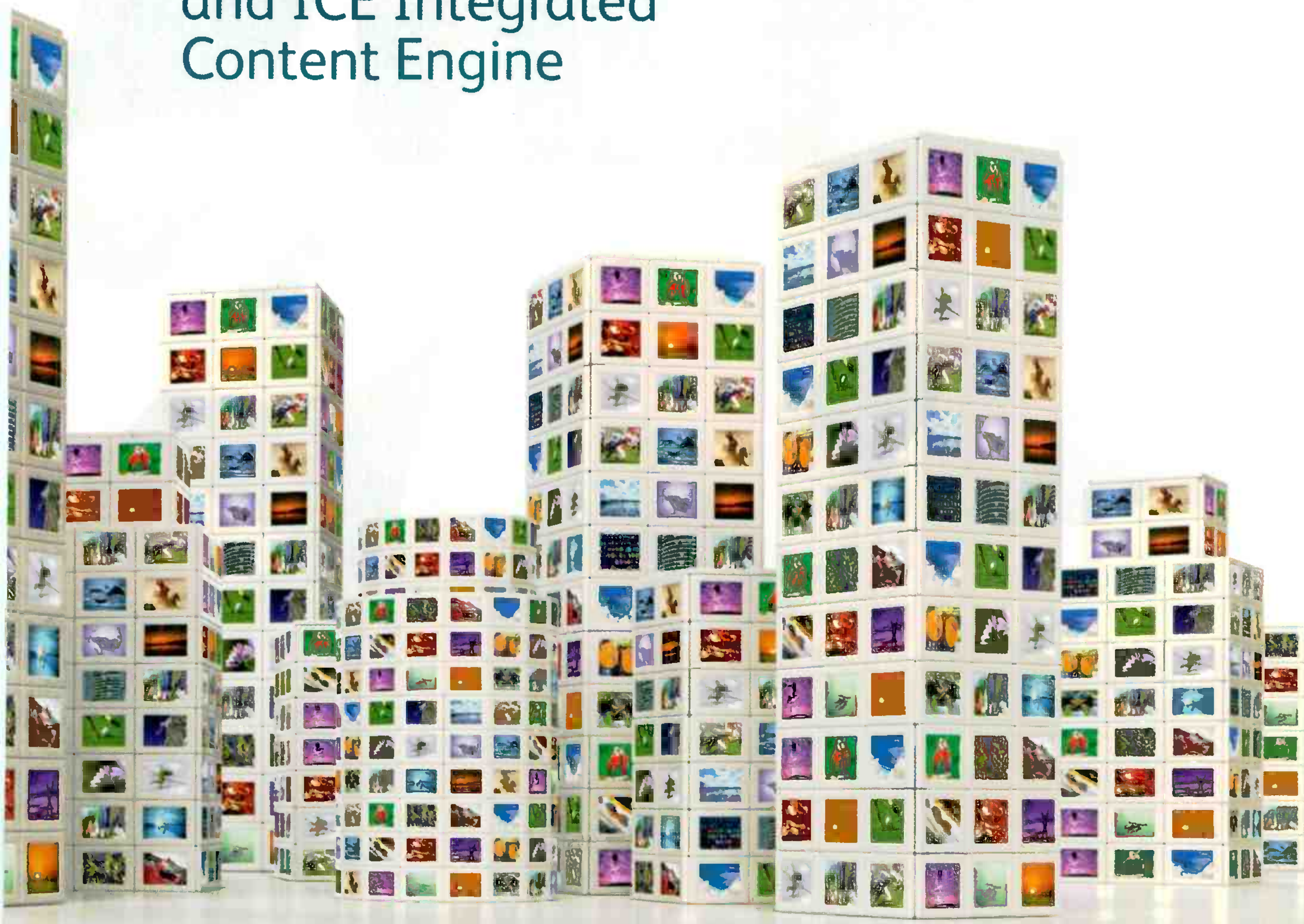

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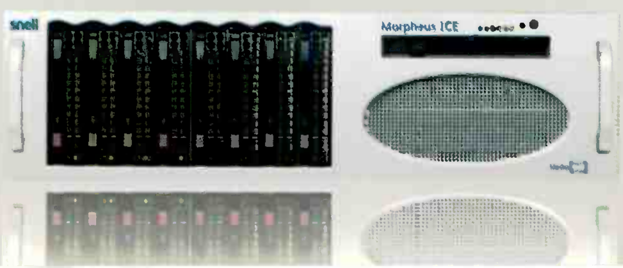

Routing
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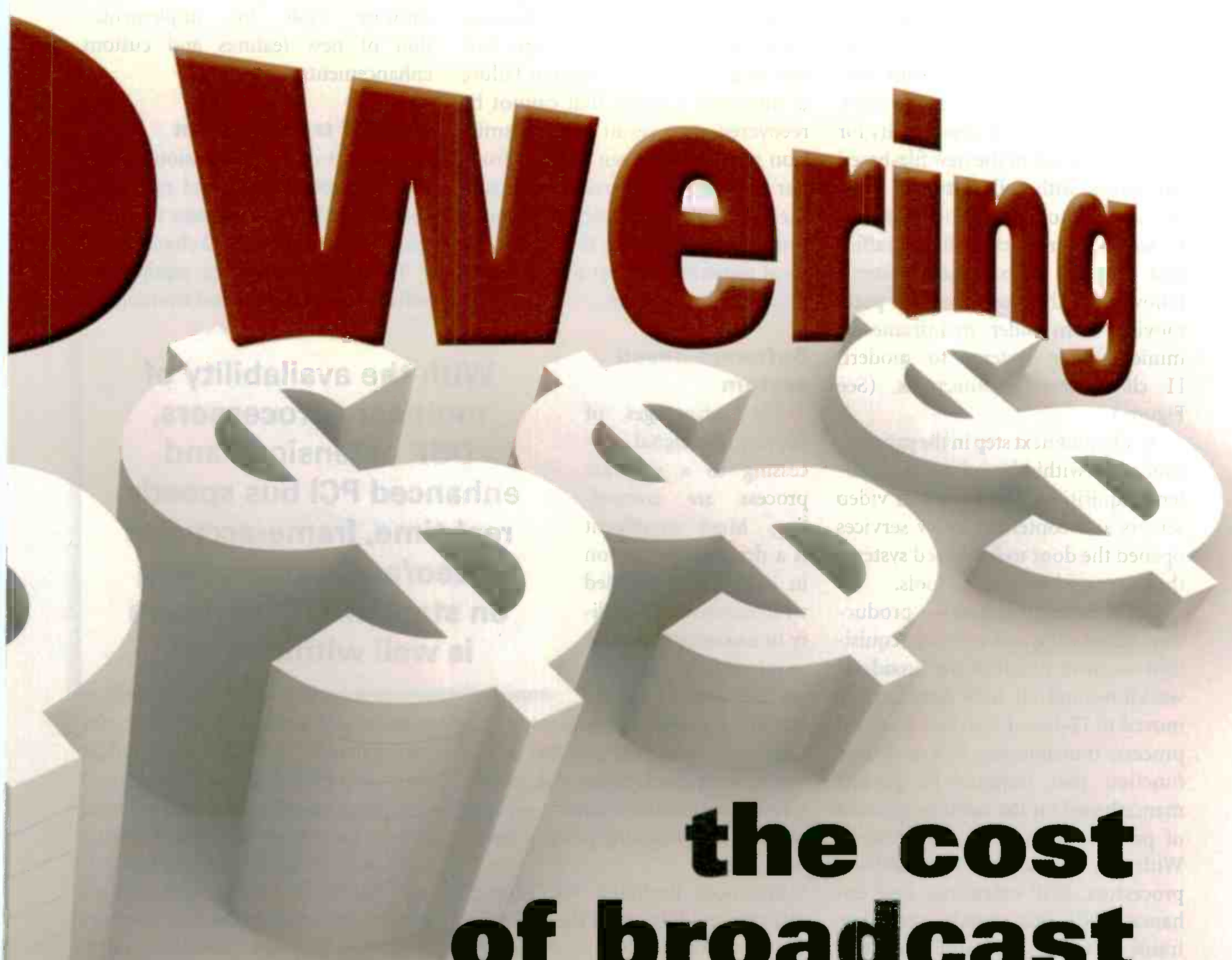


Lowering the cost of broadcast channel delivery

Switching to an IT/software-based system reduces complexity and increases flexibility.

BY JOHN WADLE

Broadcasting has passed a key milestone where many processes, formerly based heavily on specialized hardware components, are now more focused on generic IT components. The emergence of IT as a key platform for new broadcast systems has not only defined a new direction for stations, but is also changing the mix of system providers as well. As a result, broadcasters today have a wide selection of products available, spanning conventional broadcast hardware, IT/software-based systems and hybrids that combine both technologies.

Broadcast workflow

The adoption of IT-based systems has changed the broadcast workflow in a predictable way. Upstream processes, such as content production, provided a lower-risk opportunity for the introduction of the new file-based workflows with "all software" editing systems operating on standard IT workstations. Scheduling (traffic) and program management systems followed on their own parallel path, moving from older mainframe or minicomputer systems to modern IT client-server architectures. (See Figure 1.)

An obvious next step in the progression of IT within broadcast was content acquisition. The advent of video servers and content delivery services opened the door to file-based systems that leveraged existing IT tools.

These three processes — production, scheduling and content acquisition — cover much of the broadcast workflow, and all have been largely moved to IT-based systems. The next process, transmission, is a real-time function that requires IT performance based on the latest generation of processors and bus architectures. With the availability of multicore processors, DSP extensions and enhanced PCI bus speeds, real-time, frame-accurate video/audio processing on standard IT hardware is well within reach.

For linear transmission (scheduled playout), broadcasters have been cautious in adopting major technology changes for this unforgiving process on which their revenue depends. Simply stated, during transmission there are no "do-overs." A spot lost due to a transmission system failure is time and revenue that cannot be recovered. As a result, the transmission process has been the last frontier for IT/software-based systems in the broadcast workflow. At the same time, it is the process that offers the most potential for cost saving with a more efficient system.

Software-based system

The advantages of moving the signal processing to a software process are compelling. Most significant is a dramatic reduction in complexity, coupled with increased flexibility to accommodate new requirements. (See Figure 2 on page 44.) These benefits are seen in several ways:

- Fewer hardware components requiring less rack space, power and cooling;
- Fewer connections among separate components, reducing possible points of failure;
- Enhanced flexibility via "plug-in" software modules, and the scalability of IT hardware;
- Enhanced integration with other IT-based systems with standard technologies such as XML Web services;
- An open platform with available software tools for implementation of new features and custom enhancements.

With the availability of multicore processors, DSP extensions and enhanced PCI bus speeds, real-time, frame-accurate video/audio processing on standard IT hardware is well within reach.

Cost of transmission

The cost of a transmission system includes both capital and operating costs, offset by potential new revenues from added or upgraded channels.

The capital costs for equipment, software, installation and training are usually well-defined by vendors, and can generally be held within budget by careful planning and execution.

Operating costs for a transmission system include predictable, recurring costs such as space, power and cooling. Human resources costs including operations, engineering and management are likewise predictable after the initial start-up period or transition. However, the magnitude of all these operational costs is directly affected by the physical and operational complexity of the transmission system.

Comparing the costs between a conventional and an IT/software-based transmission system requires a detailed

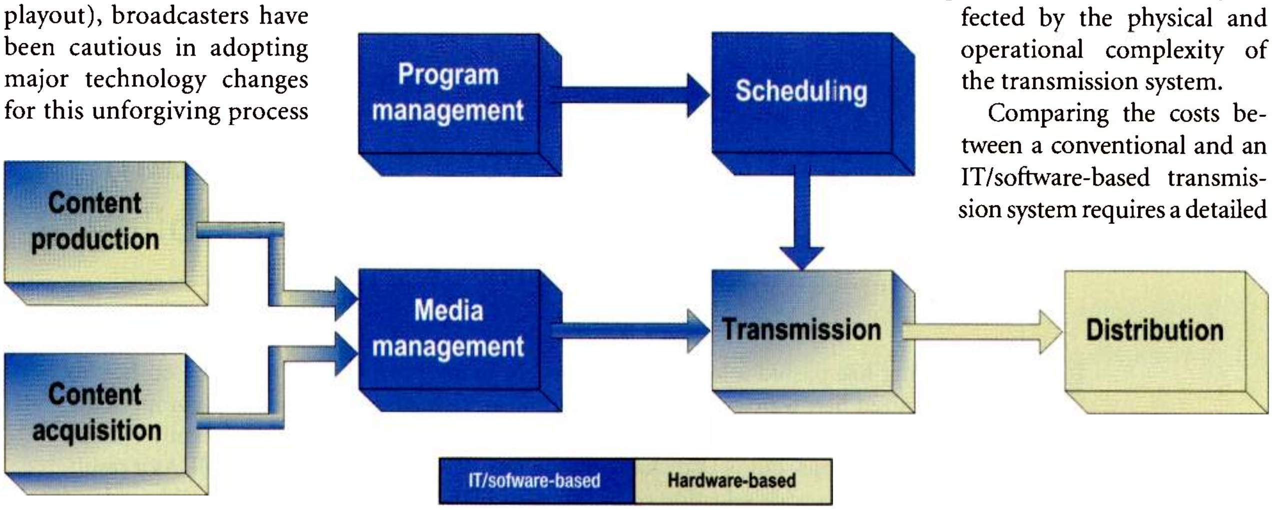
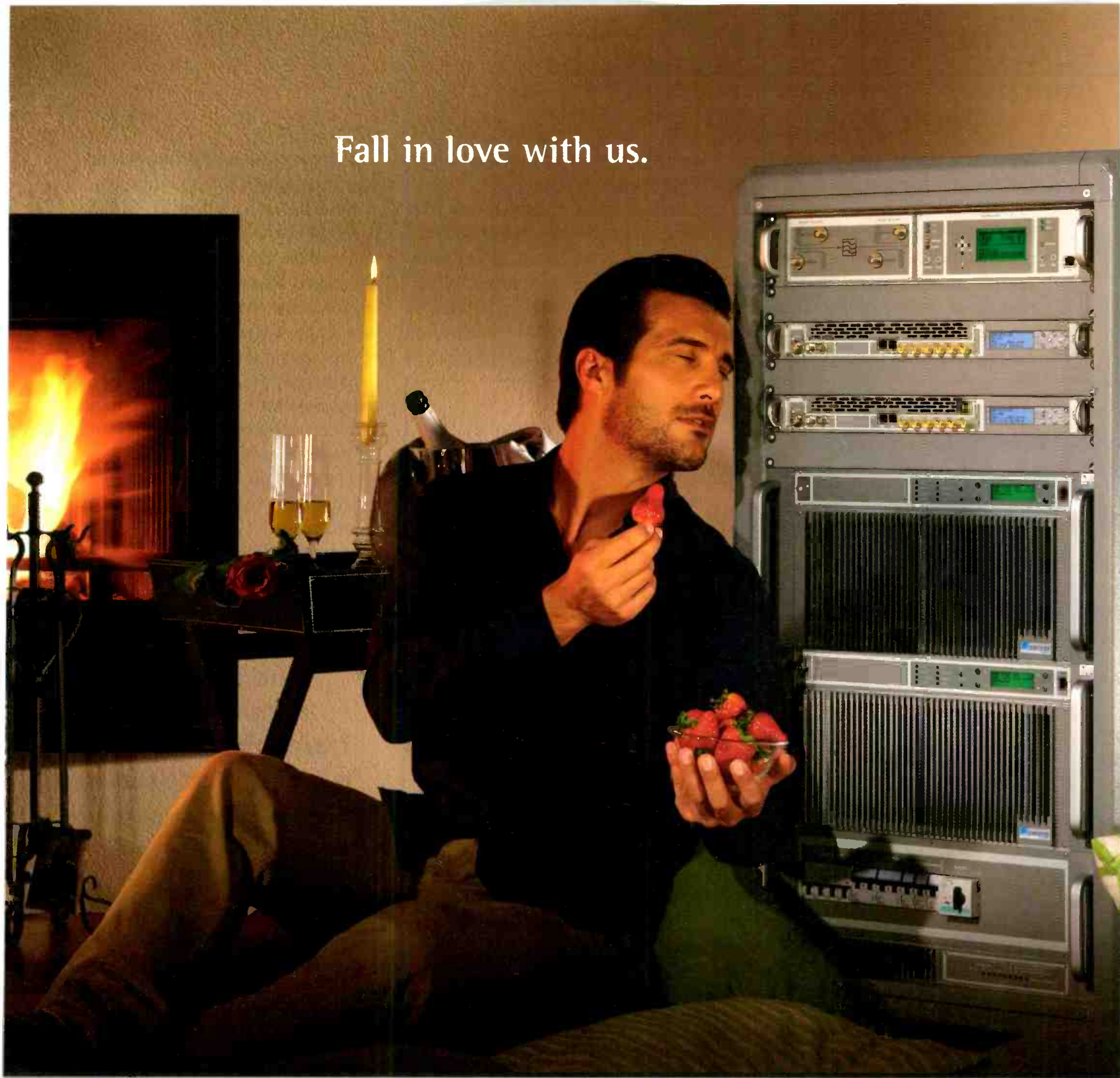


Figure 1. A typical IT-based broadcast workflow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assessment of the capacity, redundancy and features required for the services to be hosted. Some questions include: How many channels? SD or HD? Full redundancy, N+1 or none? How much content must be stored? Is the pass-through of satellite or live sources required? What graphics and branding are required? Are there requirements for Dolby or multilanguage audio? What about closed captions?

Each of these capabilities requires associated hardware and/or software components. Moreover, the requirements may be different for each channel, even if all channels are hosted on the same multichannel transmission system. As a result, the configuration and pricing of a multichannel transmission system is a complex process.

Nevertheless, it is possible to compare the base (infrastructure) and incremental (per channel) costs of alternative systems for a typical set of requirements. Such a comparison can provide the approximate relative costs of these two system alternatives.

As an example, we can define the requirements for a multichannel transmission system to include the following capabilities for each channel:

- HD transmission (1080i or 720p);
- Redundant (mirrored) playout of content;
- Video mix effects (transitions);
- Two-dimension DVE (squeezebacks);

The configuration and pricing of a multichannel transmission system is a complex process.

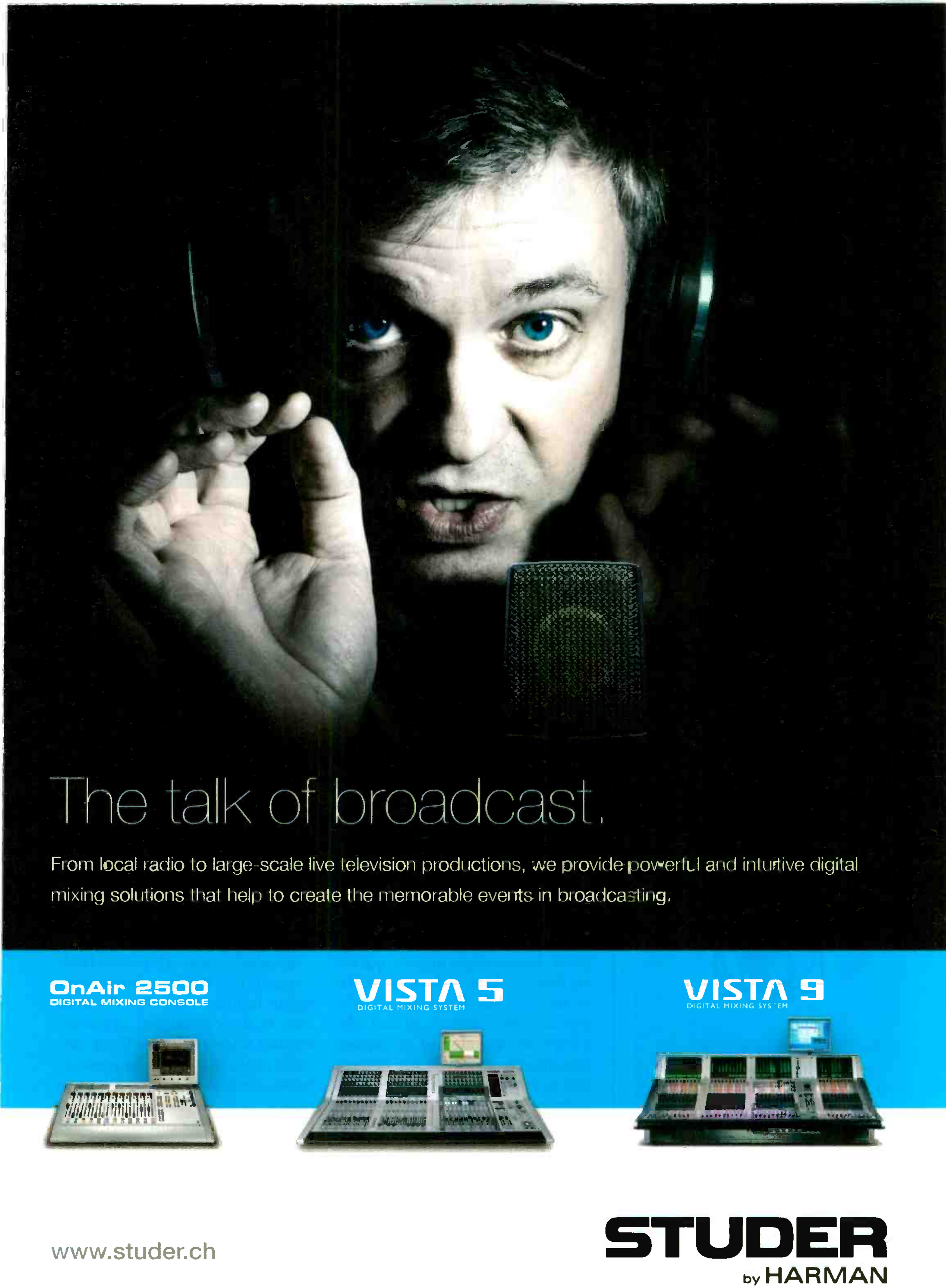
- Logo insertion with animations;
- Text overlays and crawls;
- Dolby Digital audio (AC-3);
- Closed caption insertion.

These requirements define typical full-featured channels, although additional demands such as multilanguage audio, 3-D graphics and SCTE triggering are not uncommon.

Based on these stipulated requirements, we can project both the capital costs and operating resource requirements (space and power) for conventional, hardware-based and IT/software-based transmission systems.

For an example, consider currently available hardware and software systems. To simplify the example, components such as routers and shared content storage common to both systems are excluded from the comparisons.

In this comparison, the IT/software-based system provides a lower acquisition cost at list prices. More significantly, the IT/software-based system requires significantly less space and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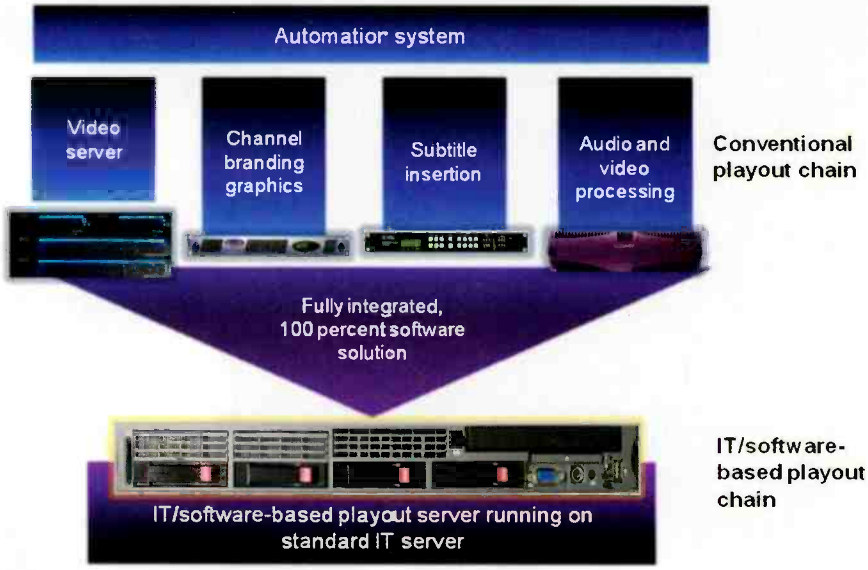

Figure 2. A single-channel IT-based transmission system

power for its operation. This results in lower ongoing costs for floor space, power and cooling.

While this comparison is generic and based on assumptions that will likely differ for any specific transmission facility, the resultant operating resource reductions provided by an IT/software-based system compared with a conventional hardware-based system are significant. This means a substantially improved return on investment (ROI) for new channel deployments.

Adapting to new requirements

Beyond these quantifiable costs, one of the potential cost implications of a new transmission system is its ability to support new service requirements. These changes might include upgrading existing channels from SD to HD or the addition of secondary DTV, mobile or Web channels. In each case, a low-cost expansion of an existing transmission system is the optimal system, but limitations in system scalability or feature set — or the requirement for costly new hardware — can make this option unfeasible.

This leaves two options: install additional transmission system(s) dedicated to the new services, or cancel plans for new services and forgo the potential revenue. Either of these choices has an associated opportunity cost incurred as a result of a transmission system's limitations.

This means adaptability should be a major criterion in choosing a new transmission system. In this context, IT/software-based systems have inherent technology benefits that provide the flexibility to adapt to new requirements more quickly and at less cost than conventional systems. These include:

- Adding a new channel by installing one or two extra 1RU servers and software;
- Upgrading an existing SD channel to HD with only a simple software reconfiguration;
- Adding new features such as DVE or Dolby audio through software plug-ins.

In today's changing broadcast landscape, the true ROI for a transmission system includes more than the basic costs of deployment and operation. Because traditional advertising revenues continue to be under pressure, broadcasters must find new ways to reduce costs and to enhance and expand services. The cost-effectiveness and adaptability of your playout system are an essential component to this objective. BE

John Wadle is director sales engineering at Miranda Technologies.

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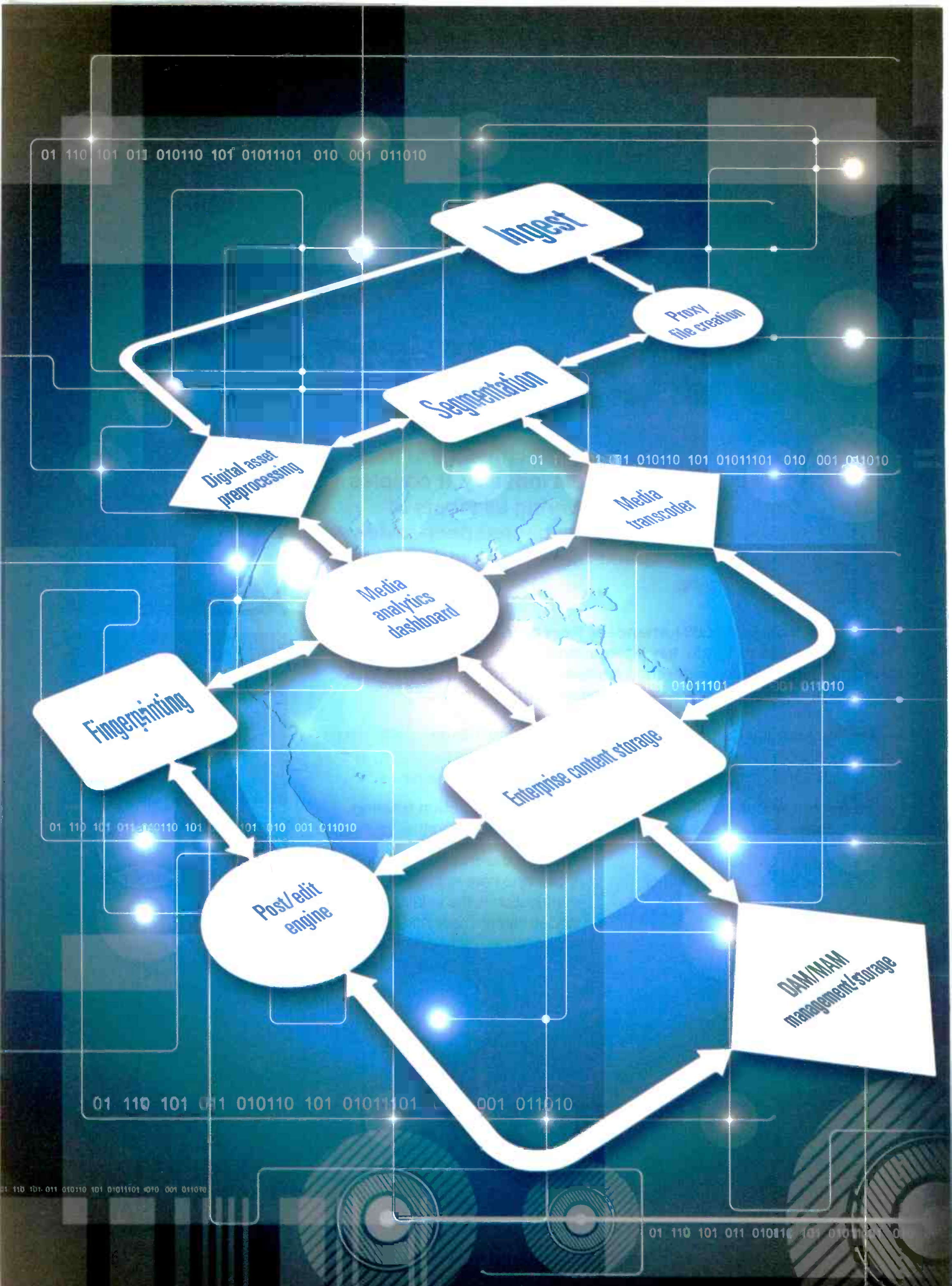
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The media life cycle in MODERN broadcast environments

BY ANDREW WARMAN AND CHRIS SIMONS

A great deal has been written about the importance of file-based workflows for broadcast applications. Often, much of the discussion revolves around video servers and/or nearline storage systems. These pivotal devices are central to file-based workflows, tasked with holding the files for a period of time. Less attention is paid to the processes and circumstances that cause the media to move through these devices, or what controls how media changes through its life cycle.

The life of a media asset often begins before there is a video or audio essence file. For example, it may be a placeholder in a newsroom system that calls for a video clip to add substance to breaking news. It could also be an entry in a schedule for a soap opera or investigative report that is still in planning or production, or any of a vast array of syndicated media or commercial assets that need to be scheduled for playout.

In the case of a newsroom, typically the media asset will reside on a shared storage system until it is archived. Other content may first enter a facility as a file or baseband signal and either be ingested directly to a video server, sent straight to nearline or archive storage, or passed very quickly from an ingest server to nearline or archive storage.

Regardless of what triggers the need for a media asset in a broadcast environment, a human being will assist in creating the need, and a varying number of other people will want to track, log, modify, monetize and eventually purge that media from the workflow.

Asset management

We will assume for the purposes of this discussion that media needs to exist in some form of video server for playout at some point in its life and that it will be archived once its immediate usefulness has been exhausted.

It makes sense that a number of automated steps exist to track the media asset throughout its life cycle to ensure that the status and location of media is known at all times. This requires a system that learns about existence of the media when it first enters the broadcast workflow, and tracks its changes through retirement to a tape- or disk-based archive system. The asset management system should always recall the media existed and be able to restore it in the future for additional manipulation and reuse.

The asset management system should always recall the media existed and be able to restore it in the future for additional manipulation and reuse.

Low-resolution browse copies can help verify content when conducting a search. These can be generated when the media enters a video server or when it is created and/or modified. Ideally, low-resolution content should be generic to allow storage of the browse copies in an open storage environment such as nearline storage. Asset management and browse/editing systems then have equal access to the content.

New technologies for "fingerprinting" low-resolution content allow the asset management system to uniquely link it with all instances of the high-resolution content, whether within online, nearline or archive storage. This approach allows effective use of partial restores by absolute reference and not just by the clip name, for example.

Directly linking the low-resolution copy's location in the asset management system lets the operator immediately preview the content before making decisions on what to do with it. It also allows the operator to determine if the copy is the right version. This is particularly beneficial with assets that have the same or similar names and metadata but are significantly different in content.

Modifying media for delivery

Size often matters. The original media asset may have been uncompressed or captured using high-quality compression during production to get the best possible image quality with the least amount of generational loss. This may well be the level of quality at which the master or "mezzanine" copy will be stored. However, this is likely less than optimal for delivery.

Many versions of the original may be spawned from the mezzanine copy as the number of distribution platforms continues to grow. We are now tracking dozens of potential versions, all generated from the same original media, in different storage systems throughout the organization. This situation is magnified as promos, and teases are cut and linked to the original asset.

Good practices dictate that any operator who has the appropriate privileges should be able to find the location of the right version of the media, determine its current status, add or modify its metadata or the essence itself, and cause it to move and/or be modified to the next step in the workflow. This means searching is unified throughout the workflow, with user rights controlling the level of interaction the operator has with the asset. In this way, there is no mystery as to the location or current state of the media.

Creating value from media

Making money on an aired commercial is unlikely without the proof that it played back on schedule and for its full duration. The "as-run" log is a proven output of playout automation that shows when content was played and for how long. Tight integration to the sales and scheduling system is required to monetize this effort in a way that removes errors and adds simplicity. Enter BXF (Broadcast eXchange Format) and its rich metadata and associated messaging.

The traffic system generates a playlist of content for air, which is automatically imported into the playout automation system's playlist. As the playlist approaches its predetermined time window where a clip's availability is to be played, automation will collect the media from nearline or archive storage if it is not already on the playout server. Issues are reported if the media is missing or unavailable, so there is time to react by ingesting the media into the playout server or replacing it with alternative content.

Status is fed back immediately to the scheduling/sales system once the asset has played out. This avoids the need to reconcile as-run logs at the end of the day. Spotting problems and rectifying them is, therefore, possible at the sales level as well as the master control level. The result is a reduction in make-goods, which adds to the bottom line.

The dynamic capabilities of BXF can also instigate late changes in the schedule direct from the scheduling/sales system. This not only supports the instant scheduling of make-goods within the same time period, thereby minimizing losses, but also opens up the possibility of more dynamic sales and promotional models.

Moving media in a workflow

Whether it's a tape, DVD, hard drive, file or data stream, knowing


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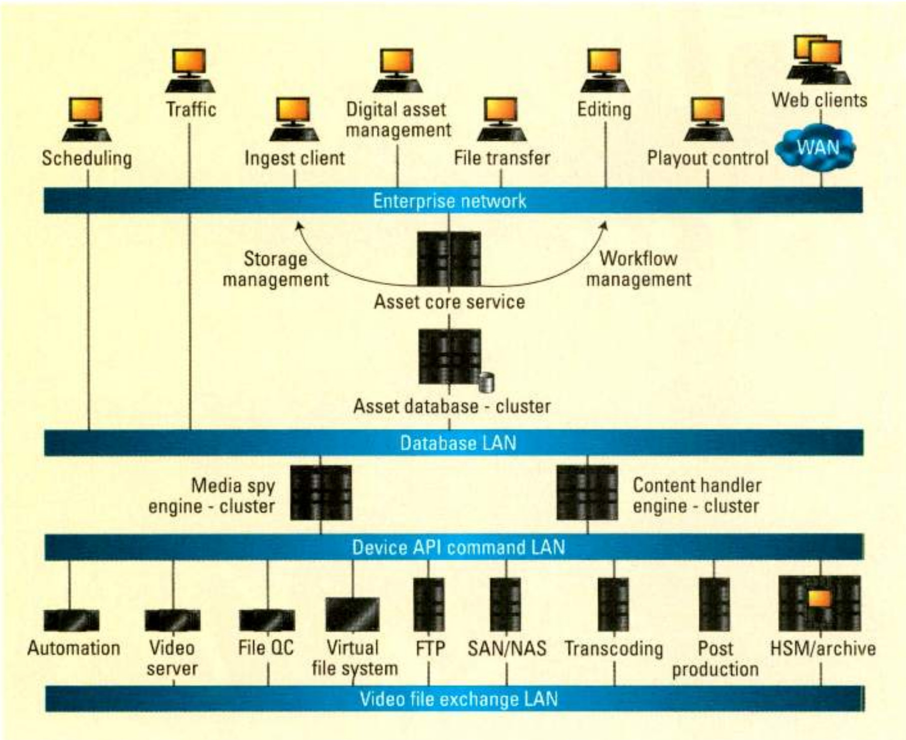


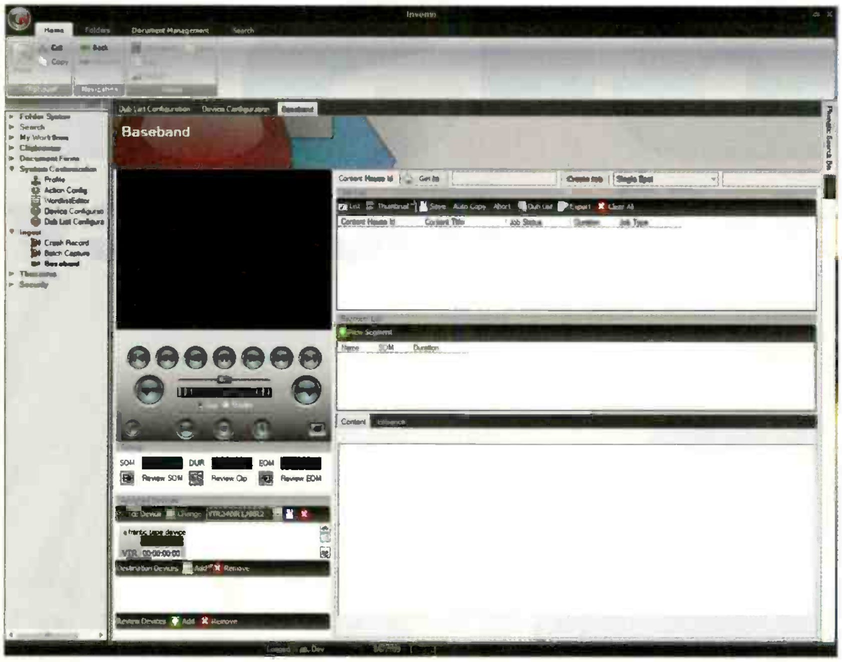
Figure 1. Media moves through a variety of systems in the broadcast workflow, from automation and servers to scheduling and archive systems. The digital asset management component is key to moving content from nearline or archive storage, and verifying it is intact en route to playout.

where your media is and how quickly you can move it around your workflow is important to operational efficiency. The knowledge of whether the movement of media was successful is important to overall quality. Asset management is key to the task of moving content from nearline or archive storage, and verifying that the media is intact after the transfer is complete. (See Figure 1.)

How media, particularly files, reach their target destination(s) varies. FTP is the common approach. It is important to know the size of your data pipe and latency of the link when moving media over great distances. The latency will help dictate if file transfer acceleration is required to add efficiency to the process. This will ensure that full value of the purchased bandwidth is attained while moving the media in a timely fashion.

Scheduling tools and network optimization techniques further enhance efficient delivery, allowing the asset management system to choose when and by what route to send the material to even out network usage and prevent bottlenecks.

Automating the task of moving content, whether based off play-to-air schedules, archive and restore needs, on production workflow requirements can become a very daunting task. Ensuring that a versatile rules-based engine is driving the processes with tight integration to the asset management system will simplify the operator's life. He or she will have a real-time view of an asset in all its current locations and a history of its travels.



The Harris Invenio Capture component of the Invenio digital asset management system facilitates the ingest and transfer of media — and its associated metadata — from tape to storage and archive devices.

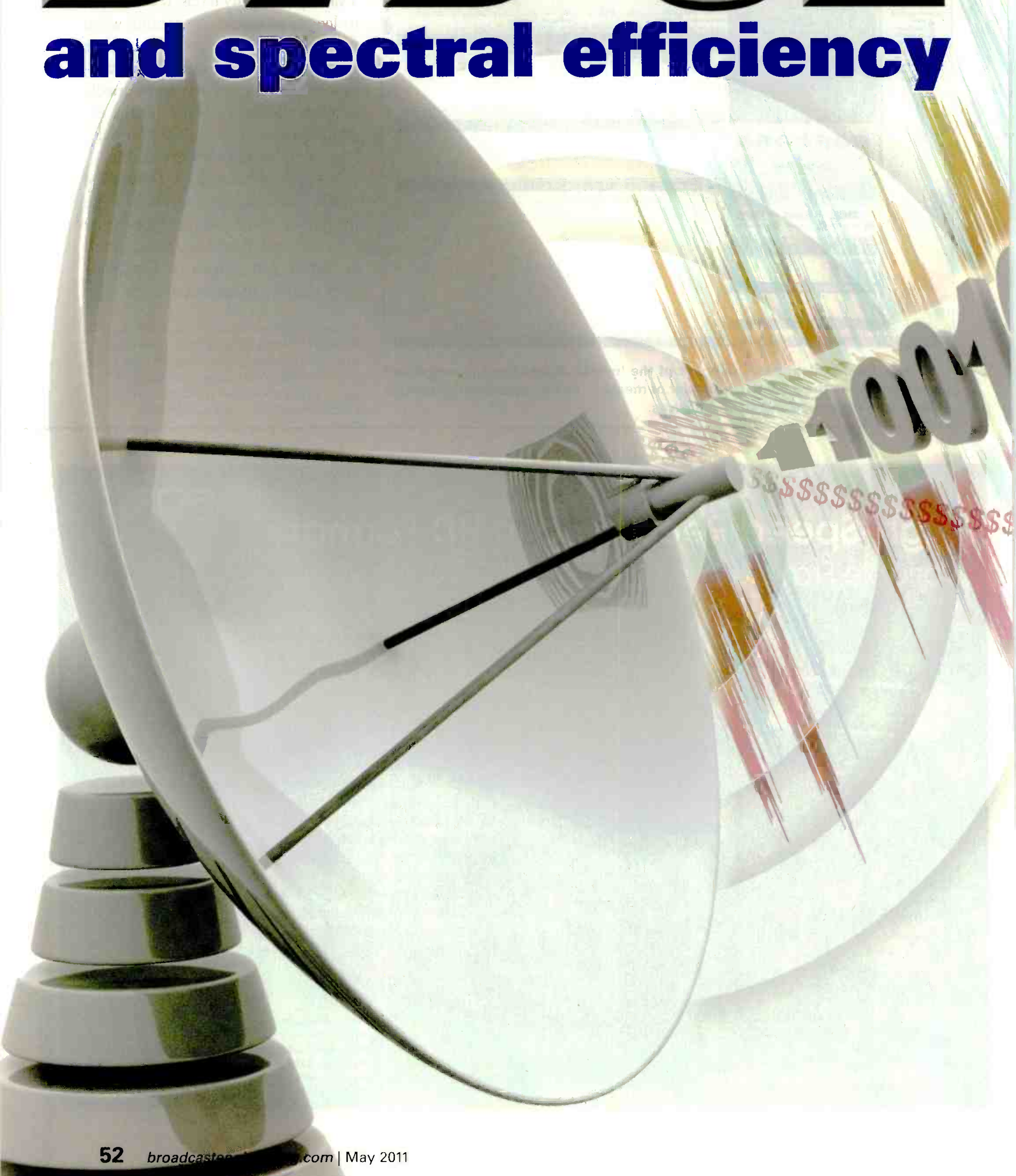
Why we're moving file-based media

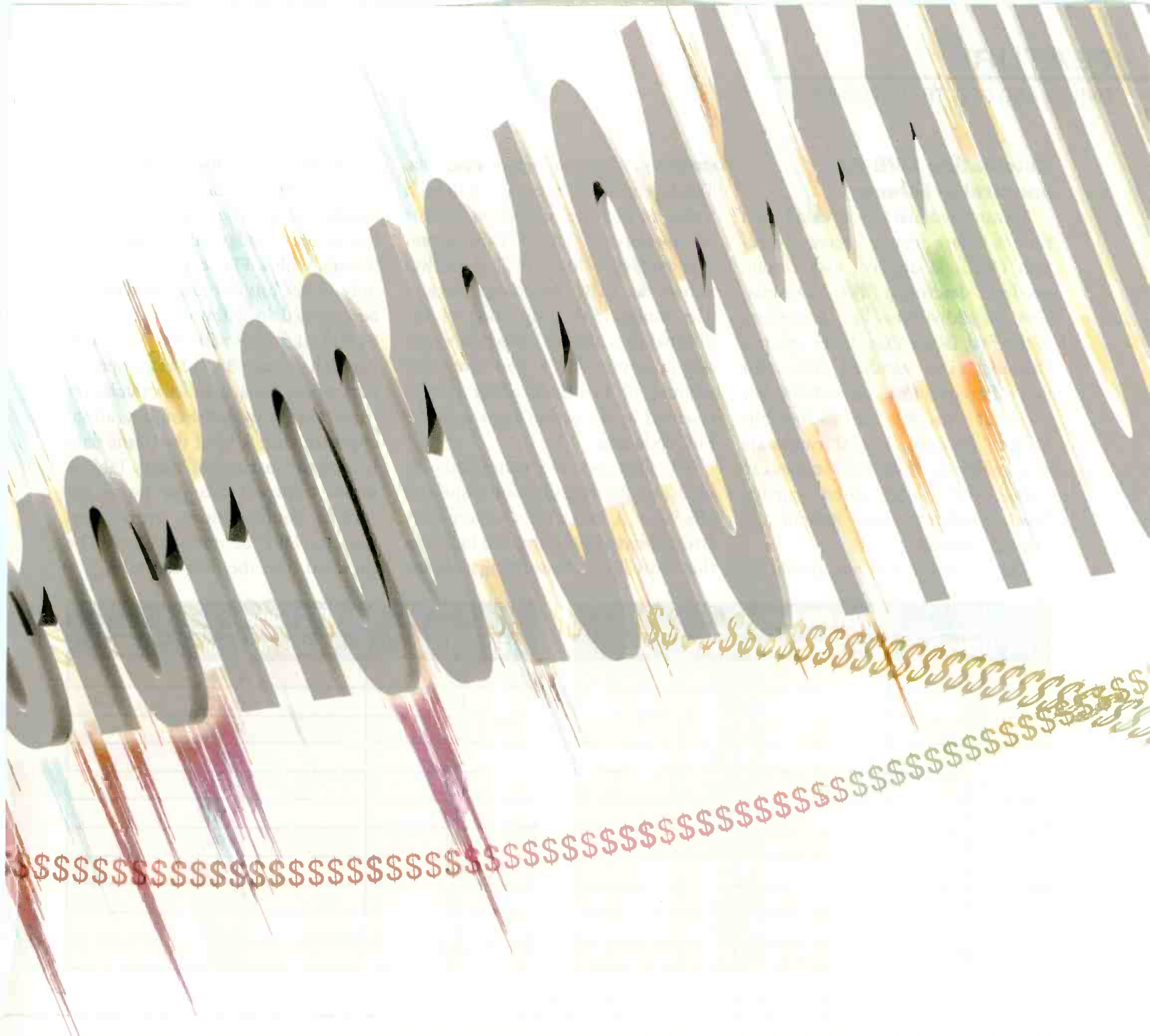
A single piece of media can eventually exist in multiple locations and in a variety of quality levels. It can be cut to length or edited to promote when transmitted. We move media because there is finite storage capacity in transmission servers. We also move media because play-to-air devices in the expanding universe of multiplatform delivery systems have different needs.

We archive because we believe the media has value in the future. The media, we hope, will eventually be recycled, repackaged and transmitted on future generations of multiplatform delivery broadcast devices. BE

Andrew Warman is product marketing manager for servers, editing and graphics, and Chris Simons is vice president of automation and asset management for Harris Broadcast Communications.

DVB-S2
and spectral efficiency





BY RUSS VAN DER WERFF

Industry experts and vendors alike recognize that DVB-S2 satellite modulation offers significant technical advantages. A properly configured DVB-S2 system based on modern transmission equipment can easily justify the outlay required by dramatically reducing operational expenses. This article will examine the benefits of DVB-S2, and how broadcast and cable operators can successfully implement and maximize their investment by deploying a DVB-S2 system.

In digital communications, spectral efficiency is a measure of what bit rate a given RF bandwidth can sustain. While not universally defined, it is often expressed as a ratio of megabits per second to megahertz used in the active channel band. For example, in the ATSC broadcast system, 19.39Mb/s of data can be transmitted in a 6MHz channel. The spectral efficiency of the system could be calculated by dividing 19.39 by six — yielding an approximate efficiency of 3.23 bits per hertz.

The DVB-S2 system is highly flexible; depending on certain modulation parameters, it could provide spectral efficiencies anywhere between 0.5 and 4.5 bits per hertz. Higher spectral efficiencies allow an operator to inject more data into a leased transponder, reducing operational expenses significantly for many operators. However, the highest spectral efficiencies can only be achieved under certain conditions. To understand the trade-offs involved in configuring a DVB-S2 system, it is important to know the factors that contribute to spectral efficiency. The effort is worthwhile, and as demonstrated later in this article, optimal configuration can result in significant savings.

Calculating DVB-S2 spectral efficiency

Transmitted data is divided into frames before forward error correction (FEC) is applied, and certain headers describing the transmission are added. This FEC frame size is the first factor that drives spectral efficiency. The standard allows for two different frame sizes: 64,800 bits ("normal" frames) or 16,200 bits ("short" frames). Normal frames are more efficient, while short frames can reduce end-to-end system latency. Most broadcast video systems use normal framing.

The frames described above include a certain number of FEC bits. Two layers of FEC are applied to each frame to provide protection against RF interference. The DVB-S2 system first applies a fixed FEC algorithm known as BCH encoding. Next, a user-configurable proportion of additional FEC bits are added via a process known as LDPC encoding. The amount of LDPC encoding is represented by a fraction known as the FEC code rate.

The FEC code rate contributes directly to the transmission's spectral efficiency. A lower ratio of transport stream bits to total frame bits indicates that more FEC bits are being included in the frame. This lowers spectral efficiency while increasing link margin (resilience to noise). As an example, in a system configured for 64,800 bit frames, with a FEC code rate of 1/4, only 15,928 bits of transport data can be encoded in a frame. In contrast, 64,800 bit frames with 9/10 FEC coding each contain 58,112 bits of transport stream data. A quick calculation shows that, in the latter configuration, approximately 9/10 of the frame data is used for carriage of video. Table 1 shows transport bits per frame for various configurations, reproduced from the DVB-S2 standard itself. The standard uses the designation K_{bch} –

Normal FEC frames	
FEC code rate	TS bits per frame (K_{bch} – 80)
1/4	15,928
1/3	21,328
2/5	25,648
1/2	32,128
3/5	38,608
2/3	42,960
3/4	48,328
4/5	51,568
5/6	53,760
8/9	57,392
9/10	58,112

Short FEC frames	
FEC code rate	TS bits per frame (K_{bch} – 80)
1/4	2,992
1/3	5,152
2/5	6,232
1/2	6,952
3/5	9,472
2/3	10,552
3/4	11,632
4/5	12,352
5/6	13,072
8/9	14,152
9/10	N/A

Table 1. Transport bits per frame in various DVB-S2 configurations

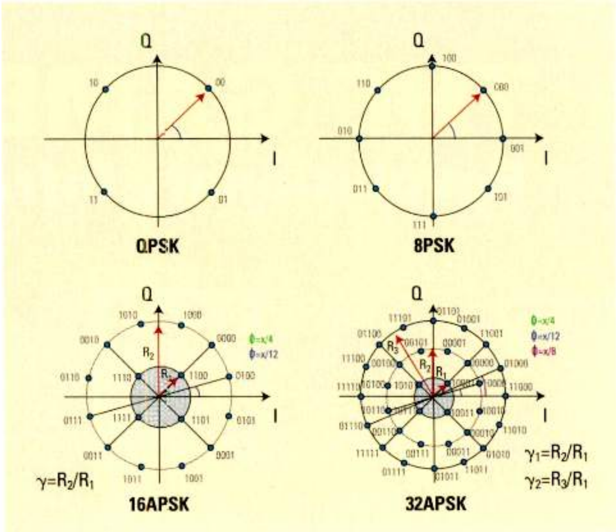


Figure 1. RF constellations supported by DVB-S2

80 to represent transport bits per frame. The subtraction of 80 bits accounts for the space occupied by the baseband header, which contains information indicating, in this case, that the transmission carries a transport stream.

DVB-S2 also allows for the use of several different symbol constellations. These constellations are simply mappings that define how data bits are mapped to symbols in the RF domain. The constellations supported by DVB-S2 are illustrated in Figure 1, as reproduced from the DVB-S2 standard.

The fact that symbols are closer together for "higher order" constellations in the diagrams is significant. This closer spacing correlates to more difficulty for receivers trying to distinguish between symbols; thus, higher-order constellations provide less resilience to RF interference. However, the higher order constellations allow each symbol to represent more data bits. For example, the 16APSK constellation provides 16 symbols, each of which can represent four data bits ($2^4 = 16$). The number of bits per symbol is another important factor in determining spectral efficiency. The DVB-S2 standard uses η_{MOD} to represent bits per symbol.

We have now arrived at a sufficient understanding to begin approximating DVB-S2 spectral efficiency for many configurations. We will begin by calculating the number of transport stream data bits per symbol for a single frame. To determine this value, choose the appropriate constant for transport bits per frame (K_{bch}-80) as defined in the previously reproduced table, and divide by the number of symbols per frame. The number of symbols per frame can be calculated by taking the number of bits per frame and dividing it by the number of bits per symbol. (See Equation 1.)

$$\text{Spectral efficiency} \approx \frac{\text{TS bits per frame}}{\text{FEC block size} \div \text{Bits per symbol}}$$

Equation 1. First cut at spectral efficiency

The equation approximates spectral efficiency based on frame size, constellation and FEC. This value "approximates" spectral efficiency, but there are a few more factors that

Figure 2. Pilot insertion in DVB-S2

need be considered in order to paint the picture in its entirety. The first of these is a feature of DVB-S2 known as pilots. Pilots are not RF carriers in the traditional modulation sense; rather, in DVB-S2, they are simply repeating patterns of symbols that are injected at fixed intervals between symbols containing data. Their purpose, however, is the same as an RF carrier-based pilot — to allow the demodulating device to more easily lock on to the RF transmission. On average, pilots reduce efficiency by about 2.4 percent, although, as will be demonstrated below, this number can vary depending on modulation parameters.

Modulated symbols in DVB-S2 are logically grouped into slots. A slot is simply a grouping of 90 successive symbols, with a pilot string of 36 symbols introduced after every 16 slots — that is, after every 1440 symbols of data. One final factor affects spectral efficiency: Before transmission, a physical layer frame header (PL header) is prepended to each frame. This header allows the receiver to automatically detect modulation parameters, simplifying user configuration of a receiving device. The physical layer frame header adds one slot (90 symbols' worth of transmission time) to each frame, which imparts an additional reduction in efficiency.

An illustration of pilot insertion and physical layer framing is shown in Figure 2.

Thus, to calculate final spectral efficiency, one must account both for pilots and for the PL header. Unfortunately, because frames are comprised of an integer number of symbols, pilots do not add a fixed percentage of overhead; the number of pilots for each frame length and constellation will be different. The number of pilots per frame can be calculated by Equation 2, where the integer function rounds down to the nearest integer.

$$\text{Pilots per frame} = integer\left\{\frac{\text{Slots per frame - 1}}{\text{16 slots between pilots}}\right\}$$

Equation 2. Calculating number of pilots per frame

$$\text{Slots per frame from TS data} = \frac{\text{Total bits per frame}}{\text{Bits per symbol}} \div 90 \text{ symbols per slot}$$

$$\text{Symbols per frame from pilots} = 36 \text{ symbols per pilot} \times \text{pilots per frame}$$

$$\text{Symbols per frame without pilots} = \left(\begin{matrix}90\\ \text{symbols}\\ \text{per slot}\end{matrix} \times \left(\begin{matrix}\text{Slots per}\\ \text{frame}\end{matrix} + \begin{matrix}1 \text{ slot}\\ \text{per PL}\\ \text{header}\end{matrix} \right) \right)$$

$$\text{Efficiency reduction for pilots and framing} = \frac{\text{Slots per frame from TS data} \times 90 \text{ symbols per slot}}{\text{Symbols per frame without pilots} + \text{Symbols per frame from pilots}}$$

Equation 3. Final impact of framing on spectral efficiency

$$\eta_{tot} = \frac{K_{bch} - 80}{\eta_{ldpc} \div \eta_{MOD}} \times \frac{90S}{(90(S+1) + P\lfloor \frac{S-1}{16} \rfloor)}$$

Where

η_{tot} = Spectral efficiency

$K_{bch} - 80$ = Transport bits per frame

η_{ldpc} = Bits per FEC frame (64,800 or 16,200)

η_{MOD} = Bits per symbol

S = Slots per frame (from TS data)

$$P = \begin{cases} 36 \text{ if pilots enabled} \\ 0 \text{ if pilots disabled} \end{cases}$$

$\lfloor x \rfloor$ = Floor function (round down)

Equation 4. End-to-end efficiency calculation for 16APSK transmission using 3/4 LDPC FEC with pilots enabled

Subtract one from the number of slots per frame to ensure that a pilot is not placed as the last slot of a transmitted PL frame. Thus, the final impact of framing on spectral efficiency is given by Equation 3.

At this point, we have described all factors affecting spectral efficiency in a single-stream DVB-S2 transmission. Equation 4 shows the end-to-end efficiency calculation considering all of the relevant framing factors.

Impact on broadcast operations

Why does any of this matter to a system operator? Understanding the DVB-S2 system can help a broadcast engineer properly specify parameters for a DVB-S2 transmission. The industry has recently begun to demonstrate that higher-order constellations and DVB-S2 modulation are practical using recently deployed equipment.

Let us compare a DVB-S2 transmission to a DVB-S transmission with the following example. A satellite operator has leased a 36MHz transponder, which is currently being used for DVB-S, 3/4, QPSK transmission. This DVB-S system provides a spectral efficiency of 1.5 bits per hertz. The scenario in Figure 3 will replace this system with a DVB-S2 system using 16APSK

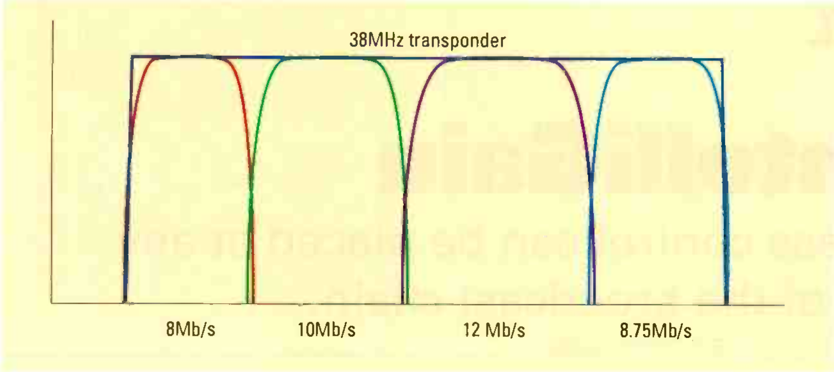


Figure 3. 36MHz transponder saturated by DVB-S transmissions

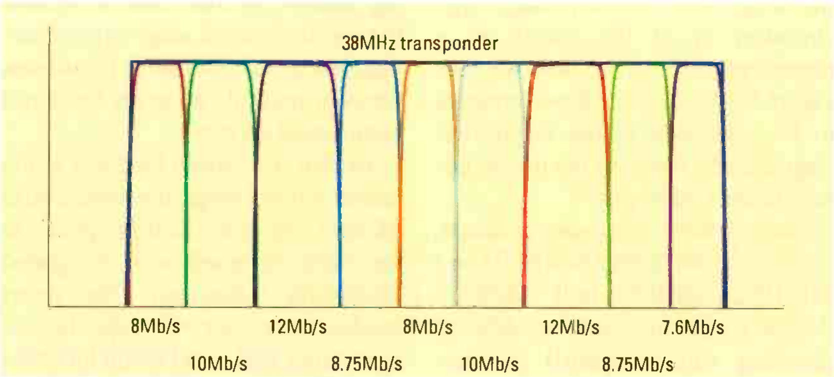


Figure 4. 36MHz transponder saturated by DVB-S2 transmissions

modulation with 3/4 FEC and pilots off. This transmission boasts a spectral efficiency of 2.97 bits per hertz.

Additionally, transmissions must be spaced apart to account for the roll-off factor of the root-raised cosine filter used to shape the bandwidth of a satellite transmission. This filter is applied to reduce intersymbol interference and is required by the DVB-S and S2 standards. DVB-S requires a roll-off factor of 0.35. RF roll-off is another parameter that DVB-S2 has improved upon, allowing the user to select a narrower filter with 0.20 roll-off.

Figure 4 illustrates transponder usage for the DVB-S system, showing four separate transmissions being uplinked on this transponder, with bit rates of 8Mb/s, 10Mb/s, 12Mb/s and 8.75Mb/s. As is apparent, the transponder bandwidth is completely saturated.

In contrast, the DVB-S2 system can carry those same transport streams twice in the same bandwidth, plus an additional transport stream at 7.6Mb/s.

This represents a bandwidth increase of 220 percent. If an operator is paying $2.5 million per year to lease each 36MHz transponder, this improvement could save an equivalent 65 percent in operating expenses, reducing costs by $1.1 million annually for this one transponder alone!

Conclusion

This article has addressed the benefits that accompany an optimally implemented DVB-S2 system and described the principals upon which operators can achieve significant cost savings. When selecting a modulation system, there are other factors to consider as well. Most notably, an operator must carefully consider the link margin required, based on the equipment available at both the transmit and receive site, as well as the satellite RF band being used and relevant geographic conditions. However, a carefully planned DVB-S2 system is an excellent investment, and understanding why can help any operator plan a successful deployment. BE

Russ Van Der Werff is a systems engineer at Sencore.

IntelliGain

Evertz's loudness control can be placed at any stage of the broadcast chain.

BY TONY ZARE

Loudness control is an important issue in the broadcast industry today. In response to audio loudness concerns, President Barack Obama signed the CALM Act in December 2010 outlining information and guidelines for loudness control.

Upon implementing this technology, an important question is: At what stage should loudness control be integrated? There are three strategic locations in a broadcast facility that the loudness control processors are being placed: at the signal acquisition stage, master control stage or at transmission just prior to the encoding stage. All three locations are feasible; however, the loudness control location is ultimately determined by the specific internal practices of the individual facility. Therefore, the user can purchase a processor that accommodates his or her needs.

To achieve loudness control at any stage in the broadcast chain, Evertz offers its IntelliGain loudness processor, which can be added as an option to many of its products.

Loudness control at signal acquisition stage

Loudness control is often applied when the signal lands and is ready for baseband video processing. It can be applied at the output of the IRD, fiber receiver, frame synchronizer or at the output of a playout port from a media server. (See Figure 1.) IntelliGain allows loudness to be controlled at the acquisition stage, thereby enabling the user to adhere to the CALM Act.

Evertz's MPEG decoder products, such as the 3480DEC18-MP2SD and 3480DEC6-MP2HD bulk MPEG-2 decoders, offer high-density MPEG-2 decoding with integrated loudness processing technology on all 18 or six decoded outputs respectively. For further acquisition solutions, the company's 7812 and 7746 series of up/down/crossconverters and frame synchronizers provide an integrated system that enables a central point for monitoring audio and video signal integrity. To meet specific target loudness levels, loudness control at the acquisition stage normalizes all signals coming into the facility before any downstream plant processing. This establishes a target level for all audio flowing through the facility, thereby allowing any deviations in audio levels to be identified and controlled before entering the transmission stage.

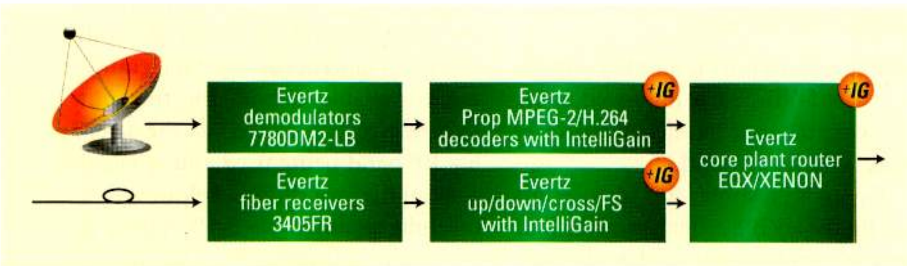


Figure 1. Loudness control can be applied at the output of the IRD, fiber receiver, frame synchronizer or at the output of a playout port from a media server.

Loudness control at master control stage

Another common location for loudness deviation to occur is during master control. This is because the master control stage experiences high levels of traffic due to transitions between multiple program feeds and commercial servers.

To deal with audio loudness at the master control stage, the EMC Evertz Master Control and Switcher platform has been designed with integrated IntelliGain technology. The smart loudness processor will enable the user to monitor and trend audio loudness in real time, thereby achieving target levels. The automation function enables the user to oversee a wide range of audio signals passing through the master control, which include voice-overs and discrete audio tracks, such as Dolby-E encoded audio. In relation to Dolby-E encoded sources, it is beneficial to apply loudness control at the master control stage as the EMC allows audio handling to decode, mix and re-encode the audio data, while the loudness processor manages the Dolby metadata to correspond with the defined target loudness.

The automation capabilities of this loudness control technology allow the user to configure the loudness control engine so that gain control is only applied during commercials and interstitials and therefore does not affect the program segments.

Loudness control at transmission stage

The most common location for audio loudness control is at the transmission stage. (See Figure 2.) Any undesirable audio levels are identified here before entering the compression ring. Loudness control at this stage is beneficial because undesirable audio levels are dynamically adjusted to meet the target level before it reaches the end of the chain. IntelliGain technology makes loudness control simple at this stage because of its flexibility and availability on a wide range of automatic protection changeovers; integrated Dolby-E and Dolby Digital audio encoders; and professional MPEG-2 and H.264/AVC HD and SD-SDI encoders. The loudness control processor enables backup protection and performs real-time automatic loudness control on the program output.

If a facility wants to maintain specific target loudness or perform real-time monitoring to keep records for future recall, it is good practice to apply loudness control at the transmission stage. At this stage, the user can also employ the loudness control processor to confirm that the dialnorm level is programmed correctly. The loudness control processor is capable of transmitting audio trending information samples over SNMP to VistaLINK, which enables loudness calculations to be logged and analyzed for compliancy.

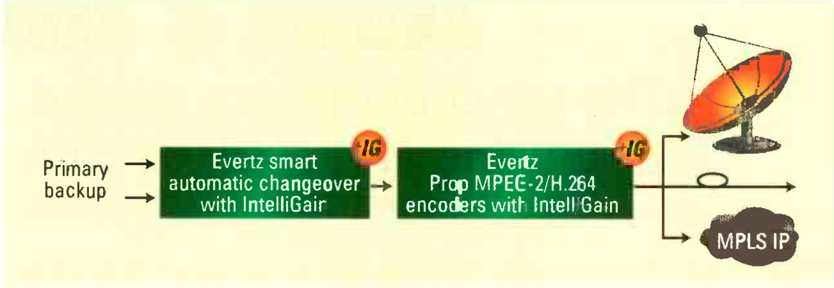


Figure 2. The most common location for audio loudness control is at the transmission stage.

Managing audio loudness for an entire system

The IntelliGain option for VistaLINK NMS provides the capabilities necessary to manage the audio loudness for an entire system. Because the FCC is responsible for ensuring that facilities are complying with the loudness guidelines and therefore must police the average loudness levels over time, it is crucial that the recorded audio levels are accurate. To prove compliancy with the CALM Act, it is essential that facilities log and track audio levels with the ability to datamine the necessary information. IntelliGain provides a central location to configure, store and analyze all signal metrics including loudness throughout the plant. Therefore, the system is completely accessible with the ability to extract the necessary logs.

The modular core technology of this processor allows control to be added as a soft ordering option on a module-by-module basis, providing advanced integration, flexibility and cost savings. **BE**

Tony Zare is product manager, modular products, at Evertz Microsystems.

Avid's IME

The concept offers a unified approach to repurposing and working with media assets.

BY PETER THOMAS AND SAM BOGOCH

Today's broadcast industry is undergoing profound changes, including proliferation of new distribution channels, rising costs and uncertain revenue expectations. To cope with these changes, broadcasters must find new ways to overcome two main challenges.

First, many facilities still rely upon a legacy of fragmented technology strategy, systems strung together without the ability to operate outside specific workflow parameters. Second, they are dealing with workflows encased in a compartmentalized technological environment.

Through consultation with a wide range of media producers and broadcasters, Avid has developed a new concept called the Integrated Media Enterprise, which effectively describes the vision for a new technology strategy. Avid's Integrated Media Enterprise, or IME, is capable of adapting quickly to new distribution models, finding and repurposing the media it owns, and generally finding ways to be profitable and grow in a constantly shifting media environment. An IME can perform consistent repurposing of "raw" media assets into finished media products.

The IME framework breaks down the traditional broadcast production workflow into five well-known modules: acquisition, production, distribution, asset management and storage.

> **At the core of this program is an enterprise-level media asset management system.**

This framework affords content owners and broadcasters a unified, enterprisewide approach to working with all the media assets the broadcast organization owns or processes.

From a technical point of view, the goal is to integrate all existing and new digital production systems, for television, radio, image and subtitle archives, into a common, networked production platform. At the core of this program is an enterprise-level media asset management system that supports a wide variety of media. Key design components for such a platform include:

- Maintenance of all long-term media and metadata in the MAM module;
- Use of the MAM configurable data model to implement the diverging metadata requirements for the different content types and business processes;
- Integration, as seamlessly as possible, between the MAM data model and production asset management (PAM) subsystems;
- Modeling of all essence transfers and management of the overarching

business processes with the workflow scripting and business process management capabilities of the MAM;

- Employment of the MAM's service-oriented architecture to add capabilities as new services and integrate all third-party systems under its direct control;
- Integration with other business systems via an enterprise service bus (ESB).

An actual application might be structured thusly: Systems directly attached to the MAM system are connected either using Web service interfaces provided by these systems, by creating SOAP Web service wrappers against the respective systems native APIs, or, in more simple cases, file-based exchange of essence and metadata via watch folders. (See Figure 1.)

All business processes that require invocation of these directly attached systems are orchestrated by the MAM's internal business process engine. Users engaged in these processes employ the extensible, Web-based MAM graphical user interface to search, find and use metadata and media, and to initiate and monitor processes.

Business processes that start in, or require participation of, systems attached to the ESB use its message normalization capabilities to translate message formats where required. The ESB delegates subprocesses to the MAM where applicable, and the MAM uses the ESB to delegate tasks to other systems where required by the process. To do so, the MAM exposes a SOAP interface to the ESB that can be used to issue queries and invoke workflows. The ESB also provides a SOAP interface that the MAM's workflow engine uses to delegate tasks.

Using open interfaces and protocols, standard IT integration technologies and a high level of configurability, the IME can leverage a high level of integration and interoperability across a heterogeneous system landscape.

The result is a new level of cross-enterprise collaboration providing widespread access to corporate media assets. Efficiency can be radically improved, while still retaining the integrity of the individual systems and without compromising the integrity and consistency of metadata and media essence.

Media assets can now be handled in a streamlined manner, and be converted and repurposed for new platforms without a high degree of manual intervention. Profitability in handling valuable content becomes more of a natural outcome. **BE**

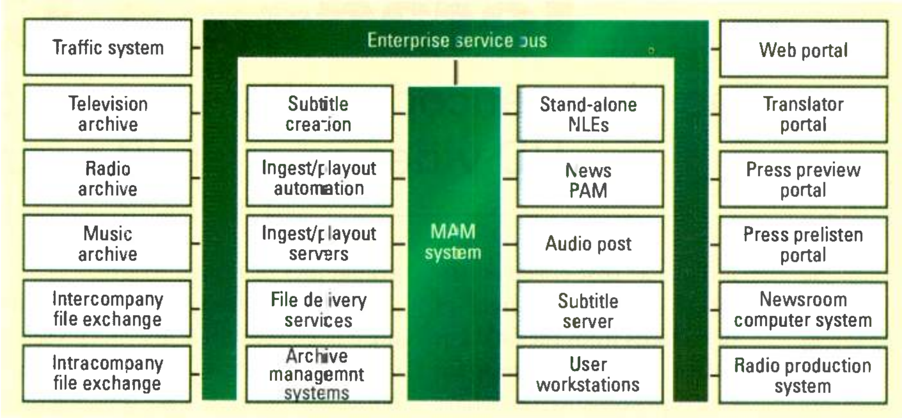


Figure 1. A high-level overview of the system architecture of a deployed system

Peter Thomas is senior director of IME strategy and Sam Bogoch is director of worldwide enterprise sales programs at Avid.

Teradek's Cube

The video encoder offers a solution for streaming HD video over an IP connection.

BY ROD CLARK

Finding a cost-effective solution for the backhaul of news feeds from the field has always been a challenge for broadcasters. News organizations have traditionally relied on expensive satellite or microwave-equipped ENG vans, but more recently, broadcast backpacks that aggregate the video stream over multiple cellular data networks have become a popular alternative.

With the release of Teradek's Cube video encoder, news organizations have a solution for streaming HD video back to the station over a single IP network connection. The camera-top, H.264 HD video encoder mounts easily to any camera using a 1/4-20 screw or hot shoe mount and streams HD video up to 1080p30 over IP. The unit is about the size of a deck of cards and uses only 3.5W of 9V-24V DC, so it doesn't impede in the mobility of even the smallest camera rigs. It features wired Ethernet plus USB and WiFi outputs, and buyers can choose either HD-SDI or HDMI inputs.

At the 2011 NAB Show, Teradek used its video encoder to broadcast booth coverage via Livestream.com to more than 33,000 unique visitors.

The encoder uses H.264 High Profile (Level 4.1) video compression and features a built-in scaler to convert from 1080 to 720 or 480 resolutions. Users can choose a resolution and target bit rate based on the availability of IP bandwidth.

Uploading video to and downloading it from the public Internet presents challenges, but this video encoder simplifies the process. The unit features RTSP announce to easily broadcast from behind firewalls, and on the receiving end, the station has several choices. One option is to simply host a computer with a public IP address and direct the video stream to it. Another option is to use the unit's native Livestream integration. Users with a Livestream account can simply log on to the unit's Web user interface and enter a user name and password to begin broadcasting via Livestream.com. Livestream users can choose between public webcasting and private, so the news can stream privately and discreetly back to the station for broadcast distribution.

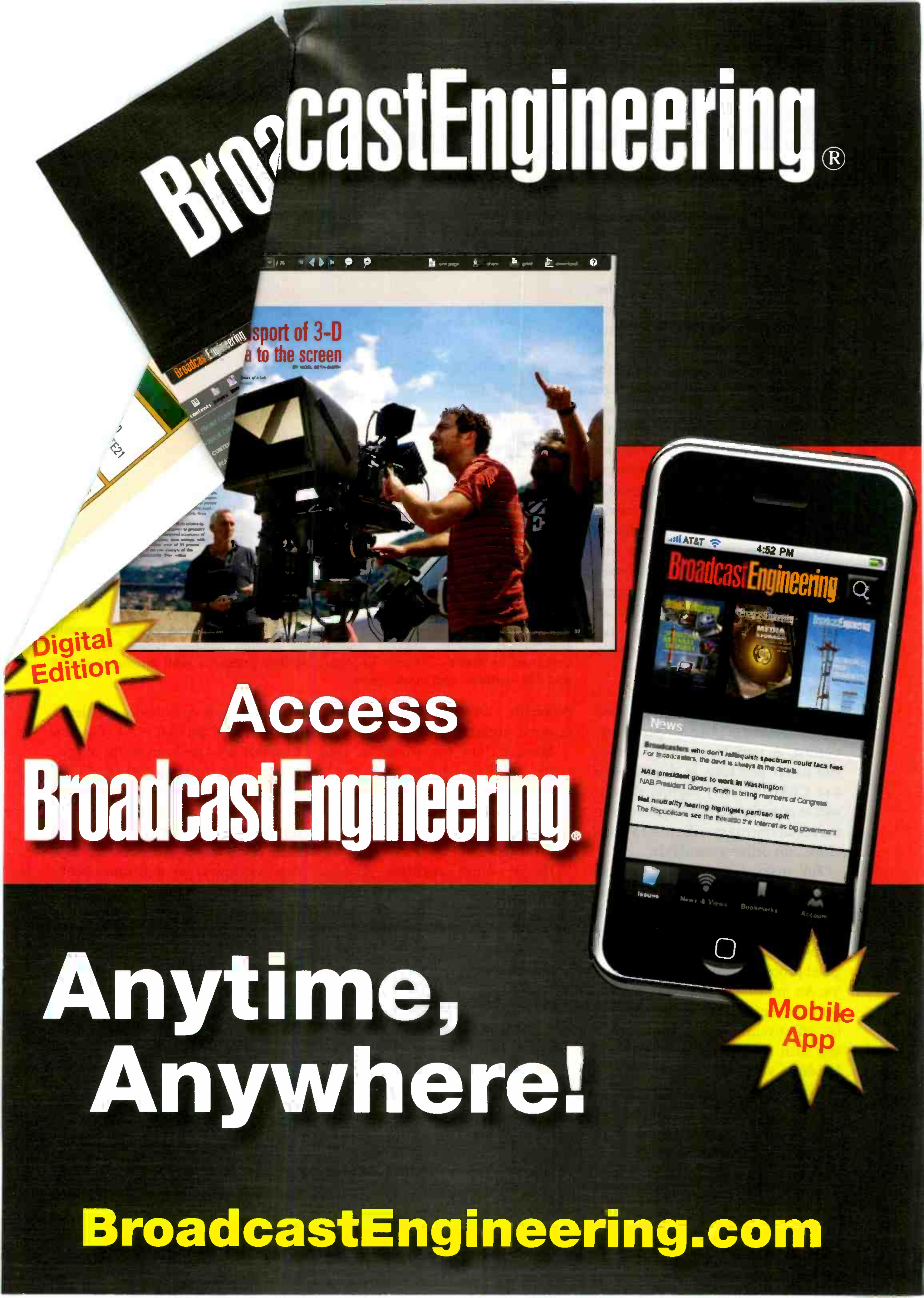
News organizations employing IP video solutions can have a competitive advantage in the market, with greater mobility, lower cost and the ability to put more feet on the street within the same budget.

The increasing implementation of 4G cellular data networks means that journalists can use a Sprint Overdrive, Verizon 4G LTE modem or similar 4G WiFi hot spot to bring along their own broadband WiFi access point. The ENG van was reduced to a backpack; now, it's been reduced again, and the data rates are high enough to provide Blu-ray-quality video over a single IP data connection.

The increase in mobility compared with a traditional ENG van means that, for the cost of a lift ticket, newscasters can report live from the summit of the local ski resort rather than the parking lot. One sportscaster has successfully tested a direct-to-Livestream connection from a large radio-controlled helicopter and plans to use the video encoder to broadcast aerial footage of professional surfing and automobile races when the 2011 season begins.

The low cost of the unit combined with the low cost of IP video over WiFi or 4G provides a significant cost savings over the ENG van using microwave or satellite. Compared with broadcasting backpacks, Cube is one-fifteenth the cost to acquire and uses one-fifth of the bandwidth. News organizations employing IP video solutions can have a competitive advantage in the market, with greater mobility, lower cost and the ability to put significantly more feet on the street within the same budget, or even for a profit. With pervasive WiFi coverage and 4G availability, IP is the future of backhaul. BE

Rod Clark is director of marketing for Teradek.



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EEG's Caption Legalizer

The software is designed to fix HD caption problems in file-based workflows.

BY PHILIP MCLAUGHLIN

File-based workflows are becoming increasingly efficient and refined in broadcast and video distribution plants, providing these facilities with all of the editing, storage and playout advantages inherent in working with data, as opposed to tape. When it comes to the closed-captioning aspect of providing programming for video on demand (VOD), however, many complexities remain: Video assets such as movies and TV episodes are ingested from a variety of sources, and can be mired with inaccurate, incomplete or otherwise faulty captioning due to a wide range of possible causes. When consumers are affected by these shortfalls, they may register a complaint that can be time-consuming and costly to resolve.

To minimize these occurrences, it is crucial to have an efficient and effective QC system in place for closed captioning. A well-designed QC system will detect problems in the CEA-608 and CEA-708 (HD) caption data, as well as compliance with caption packing requirements specific to ATSC and CableLabs delivery standards.

Full manual screening is a time-consuming and costly bottleneck, and most manual screening procedures are only set up to detect a few types of problems. Even some instances of targeted problems may get by the operator. An improved approach that pairs with screening to greatly enhance QC effectiveness is an automated system such as EEG's MPEG-2 Caption Legalizer, which is software designed specifically to fix HD captioning issues in file-based workflows. Manual screening is then required only to detect issues with the transcription itself, such as correct time sync, while HD/SD matching, delivery standards compliance and decoder compatibility problems can be detected and resolved automatically.

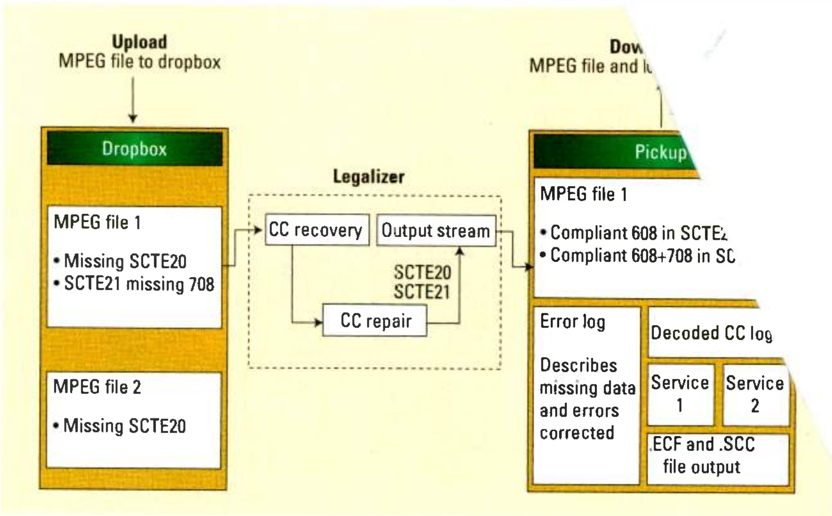


Figure 1. The EEG MPEG-2 Caption Legalizer's role includes fixing improperly constructed CEA-708 packets, normalizing caption window types that cause problems on many consumer decoders, solving problems with mismatched 608 and 708 captions, and other errors.

Inserted into the workflow tool chain, a software-based legalizer allows video distributors to rapidly standardize each file on ingest at up to 15 times real time and efficiently fulfill captioning requirements for VOD or future archival playout. Before the MPEG-2 Caption Legalizer was made available, there was no equivalent solution for efficient troubleshooting and fixes of captioning issues in the file-based realm. Instead, entire libraries would need to be run through a baseband caption legalizer, or even recaptioned, if they exhibited basic compliance problems. The role of an MPEG-2 Caption Legalizer is to perform, without generation loss, the tasks that an SDI legalizer such as EEG's CB512, handles in baseband installations, including fixing improperly constructed CEA-708 packets, normalizing caption window types that cause problems on many consumer decoders, solving problems with mismatched 608 and 708 captions, and resolving issues with inappropriate numbers of caption packets or incorrect placement of packets in the video frames.

A software-based legalizer allows video distributors to rapidly standardize each file on ingest at up to 15 times real time and efficiently fulfill captioning requirements for VOD or future archival playout.

In addition, the legalizer also addresses new issues specific to MPEG-2

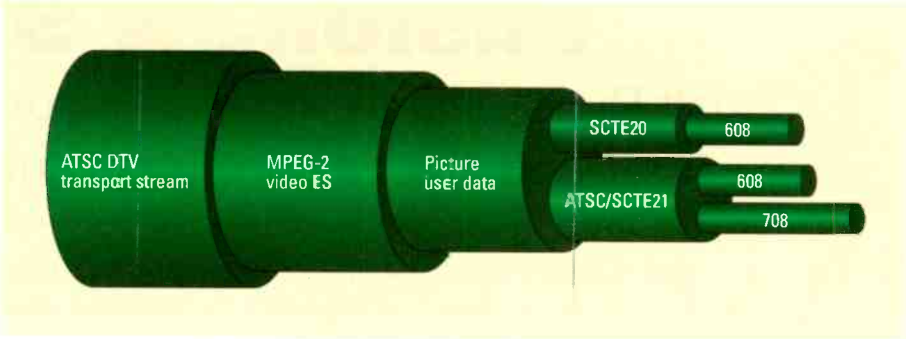


Figure 2. This diagram shows the location of closed-caption data within the ATSC transport stream hierarchy.

workflows. These include noncompliant use of the SCTE-20 or SCTE-21 constructs, and matching problems between CEA-608 V-Chip data and MPEG content advisory metadata. More general problems with the MPEG stream are also fixed in a data-preserving remultiplex. This is important because insertion of any additional essence or metadata, including captioning, can affect the timing of the entire MPEG stream. Any tool modifying data in the compressed stream must be fully fluent in these rules, examining PCR data to create an accurate fixed-rate stream matching the desired ATSC profile; given a compliant or even "near-compliant" input, the EEG Caption Legalizer will always produce an output stream fully compliant with the CableLabs and ATSC A/53 specifications.

Interface to the legalizer is handled through an FTP dropbox. The advantages of FTP are that it tends to be easily scriptable and universally supported on both specialized video servers and general-purpose computer workstations. The dropbox is monitored for new transfers, and files are processed in a queue and output to a designated FTP pickup box. With 15 times real-time capability, the legalizer can process a feature-length HD movie in 10 minutes or a TV episode in two minutes. For distributors who need to control caption quality on thousands of archived shows prior to monetizing via VOD, this time savings compared with real-time processing can be key, and even more so when the only alternative would be out-of-house recaptioning. The accelerated processing time also means that a single caption legalizer server can often handle the throughput of even large distributors who ingest many hours of new programming daily.

With file-based workflows moving at ever-higher levels of sophistication, it is essential that captioning not stand out as a bottleneck. For providers of VOD who must QC and distribute a growing supply of valuable content daily, a system designed to eliminate as many captioning bugs as possible is critical for saving time, money and manpower. By inserting the EEG MPEG-2 Caption Legalizer into the signal path, video distributors have a tool designed specifically to ease the captioning difficulties commonly associated with today's systems. **BE**

With file-based workflows moving at ever-higher levels of sophistication, it is essential that captioning not stand out as a bottleneck.

Philip McLaughlin is president of EEG.

Fusion3G 9985

Cobalt Digital's loudness processor enables KTVN-TV to deliver a consistent audio level.

BY ALAN NICHOLS

With the launch of HD, KTVN-TV in Reno, NV, also wanted to improve its audio chain. The station wanted to deliver HD images along with Dolby surround sound and a consistent audio level. It also needed to ensure that during Emergency Alert System (EAS) messages, the program audio was ducked and, finally, that EAS tests aren't run during commercial breaks. The solution was a Cobalt Digital Fusion3G 9985 loudness processor.

The processor was a perfect match for both current and future needs. It handles either an AES or embedded audio input, and it enables the upmixing of news and other sources to Dolby 5.1 surround. The result is consistent loudness without transition noise that some processors may produce in a viewer's surround decoder or satellite STB.

KTVN-TV uses the upmix function of the Fusion3G 9985 to create 5.1 surround-sound audio from news and other non-surround sources.

The software control of the 9985, which is mounted in an openGear frame, permits the station to easily make configuration changes as desired. The menu structure of the processor's software allows instant switching from AES to embedded audio inputs. The upmix feature adds flexibility in combining the audio channels to create a Dolby 5.1 surround sound. The result is a high-quality center channel, which often has important dialog that would be lost without the upmix feature.

One of the other important features is the ability of the device's closed-caption detector to move any captions that are not on line 9 to the correct line for transmission. Also, the unit includes a built-in frame synchronizer, which eliminates the HD-SDI switching glitches the station sometimes previously encountered. The result is a higher-quality feed to its 54 translators and the cable headends.

Managing EAS

Viewers need to hear the EAS message, and the Fusion3G 9985 can easily be set up as a program ducker that drops the program audio by 15dB upon activation. The feature ensures viewers get program reference level audio for the EAS message.

The processor is LAN-connected to a stand-alone control panel in MCR. This permits operators to view and change settings when required.

The station combined the loudness processor with a Dolby 568 loudness monitor, which results in sophisticated control and monitoring of TV station's audio channels. It can now both control and monitor loudness, measure and log discrepancies, and monitor the audio from any IP, AES, analog, HD-SDI embedded or SD-SDI sources.

Sophisticated audio processing

The 9985 provides 16 audio channels that can be used to route and process AES or embedded audio signals. KTVN uses the upmix function to create 5.1 surround-sound audio from news and other non-surround sources. (Monaural content on a stereo LR feed then appears in the upmix 5.1-channel Center channel.)

The 9985 was a perfect match for both current and future needs.

The station easily matched the volume levels of other stations in its market by comparing the off-air signals using the processor's output gain control. Using the general setting as a starting point for audio control, it was then easy to utilize the unit's other presets to sample the other audio configurations to find the best settings for different programs.

KTVN worked through the same process with the auto cross-fade speed functions for upmix, 5.1 detection threshold, center width and surround depth. The remote control panel is IP-controlled and is located in master control, so weekend operators can change levels for live sports or other shows.

In summary, the Fusion3G 9985 loudness processor is a sophisticated and versatile audio, surround-sound and caption controller. BE

Alan Nichols is the chief engineer for KTVN-TV.

Blackmagic Design's UltraScope

When used with HDLink Pro, the waveform monitor allows LUTs to be adjusted in real time.

BY TYSON BIRMANN

As a digital image technician (DIT) in the film industry, I recently wrapped production on a prairie western. The main set of the made-for-TV movie was a farmhouse and barn in the middle of golden fields and hills about an hour north of Los Angeles. It was a beautiful setting, but I quickly realized it wasn't an easy setting to shoot in. As long as the characters were outside in the sun or inside the barn or house, things were fine. When there was any combination of the two, however, that became an issue. Because the story took place in the mid-1800s, the interior lighting had to seem natural, or from a candle or flame-based lantern.

The range of digital still hasn't reached that of film. This was most apparent when we were shooting in the barn or cabin with the bright sunshine bouncing off the wheat in the background. Trying to find a balance between the subdued foreground and the explosive background was a constant challenge. Before I get into the solution, I need to talk a little tech.

Monitoring an HD signal directly from a camera is often misleading. People are under the impression that what you see is what you get, but this isn't exactly the case. High-end digital cinema cameras are capable of recording more information than they are outputting to the on-set monitors. The chip can see more than what we know as broadcast legal. This is what look-up tables (LUTs) are for. They allow us to manipulate areas of the image we send to the monitors in order to best simulate the final result. In post production, the colorist will finalize this process. It is the DIT's job to do this on the fly on set.

Digital image technician Tyson Birmann uses the UltraScope 3Gb/s SDI waveform monitor on location for a prairie western. Plugging the UltraScope PCI Express card into any compatible Windows PC in combination with a 24in monitor gives access to six live HD or SD scope views.

Meanwhile, back at the ranch ...

On set, we were shooting actors in a dark cabin with a bright field through the windows. Ideally, we want them both to be within the limited range of the digital sensor. Normally, we would cover the windows with ND or netting, which would bring the exposure of the two areas closer together.

The problem is that there was no glass in the windows. This, combined with wide depth of field of the 2/3in chip, meant that anything we put in the window would be seen, and we were forced to shoot it clean. At this point (like most things in production), it became about compromise — finding a happy medium of both exposures so that the post-production colorist had the most to work with.

My workstation is almost exclusively Blackmagic Design products. At the heart is the UltraScope. The PC-based waveform is about 80 percent of what I look at in a day on set. In this case, however, I was also relying heavily on the HDLink Pro (also from Blackmagic Design). The HDLink Pro not only converts the HD-SDI signal into DVI so that I can monitor it with low-cost computer monitors, but it also lets me implement and adjust LUTs in real time. For the shots that required a higher dynamic range than the monitors could show, I could adjust the LUTs to show only the top or low end of that range while leaving the recorded image unaffected.

As a result, I was able to explore the full range of the recorded image, meaning I could feel confident that the information recorded to the tape would contain everything the colorist would need to finalize the image effectively. Without using LUTs, this would have been a guessing game — a game that I would rather not play when my job is on the line. **BE**

Tyson Birmann is a digital imaging consultant based in Los Angeles.

TV sync and timing

Today's sync system is nearly the same as it was 72 years ago when television was in its infancy.

BY JOHN LUFF

Because television started as an analog medium, timing has always been a prerequisite for combining or switching pictures. The cameras that RCA deployed at the 1939 World's Fair at Flushing Meadows scanned in perfect synchronization with the beam scanning the CRTs in the displays across the Hudson River. Cameras, switchers and film chains had sync inputs that effectively guaranteed that the composite program could be delivered without interrupting the timing of the beam in the consumer display.

In the 72 years since that happened, it is quite remarkable that nearly the same sync system is in place. While color burst has been added to make color black into a reference with much higher precision, fundamentally the same horizontal and vertical sync used in early commercial television exist today. As our needs for more complex systems and the timing needs of digital video and digital audio systems have evolved, we have found ways to keep the legacy system in place while facilitating multiple frame rates, progressive scan, AES and compressed audio systems, and compression systems.

What's different is that in some ways we have *less* precision today. It is often said that buffers change everything, and digital systems don't require the kind of rigid precision that the color subcarrier in the NTSC (or PAL) system require. Think about that for a moment; we used to time signals to subnanosecond precision so that errors in color phase would not accumulate. With digital switchers, timing to plus or minus a full line, or more, is sufficient. That is because of buffers built into the switcher, buffers large enough to allow in some cases nonsynchronous signals to be handled freely. This does not remove the need to carefully design systems to avoid issues that poor timing creates. Routing switchers don't have buffers to effectively retime the output with mistimed inputs. When switching (on line 10 in HD systems normally), one cannot automatically correct when the second signal is lines away from correct timing, causing potential processing errors in downstream devices.

In analog systems, there was no requirement to "time" audio to video. Unless you put delay into the video path, audio processing had so little latency that it was hard to make lip sync problems happen. As soon as you digitize audio and add audio processing — such as embedders, sample rate converters, or any device with local buffers or storage — the need to manage audio sync becomes just as critical as video issues. There are, however, some inconvenient facts about syncing audio. Our need to use 59.97Hz as the vertical frequency gives rise to a disparity in syncing 48kHz audio tracks with video. There is a five-frame cadence to the matching of audio access units and video frames. In addition, there is a definitive need to lock both AES reference and video reference to the same clock. Most modern sync generators will do that, but the need for AES reference is sometimes forgotten when system designs are drafted in-house without careful thought (and perhaps a lack of experience).

With all of the emphasis on audio sync these days, it is also wise to be careful about the reference signals to audio and video encoders. In addition, equal care should be taken in setting offsets in Dolby and MPEG-2 encoders. A good practice is to lock the master sync generator to GPS, which gives both a stable and accurate frequency reference, but also allows time code to be derived with higher precision. Time can be referenced in some software-based products to NTP time servers, but GPS is preferred if it is available.

With HD systems there is often a need for trilevel sync. (See Figure 1.) TLS is defined in SMPTE 240M

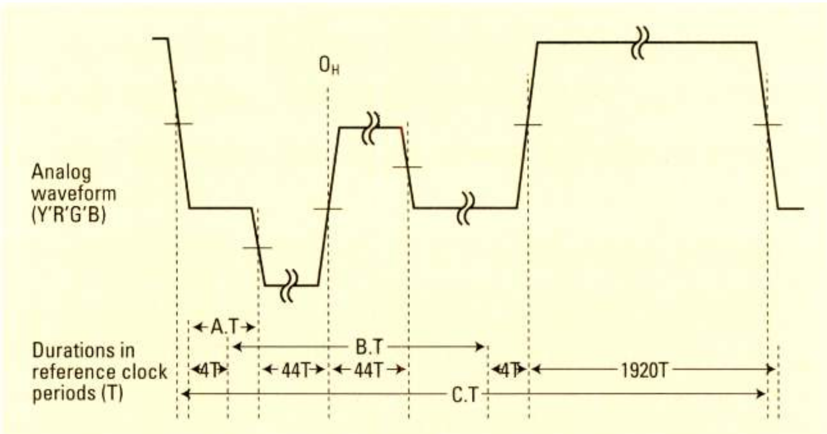


Figure 1. Trilevel sync. Courtesy SMPTE (from SMPTE 274M – 2008)

(1035-line HD), SMPTE 274M (1080-line HD) and SMPTE 296M (720-line HD). It is used by a relatively small number of devices, but often is critical in HD systems.

At one time it was thought that TLS would provide a replacement for color black in developing HDTV systems. That has not turned out to be true, in part because digital systems seem to work just fine with existing reference signals. Also some manufacturers, to remain nameless here, worked against having new reference signals for many years, successfully I might add.

Our industry would not be as simple as it is without time sponges.

A new reference signal

There is now work (well advanced) on a new reference signal that would provide rich information as well as a timing reference for all signals without regard to frame rate or sampling structure. The premise is by using GPS as a frequency standard and by defining an "epoch" when all signals are deemed to "start." All HD, SD, audio, MPEG and other reference signals start at that epoch, and by using math that is easily derived, one can calculate the exact state of each signal at any future time. For instance, using the 5MHz GPS reference, one could derive the NTSC color subcarrier frequency by using the following formula:

$$f_{sc} = 63/88 \times 5MHz$$

or

$$f_{sc} = (3^2 \times 7)/(2^3 \times 11) \times 5MHz$$

If the subcarrier starts positive at the epoch, you can calculate the state of an NTSC signal accurately by knowing the current time, which is the reason GPS is used.

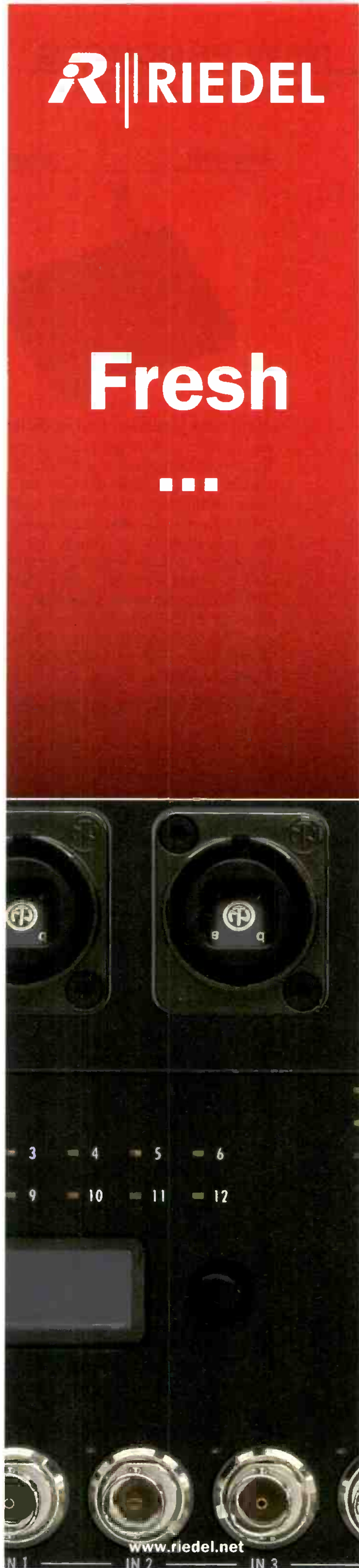
Though not obvious, one need not distribute an actual 5MHz reference to make this a workable scheme. You can use a network to send the time accurately as a time stamp, much as MPEG clocks are sent as time stamps. If the latency of the network is known, or can be discovered, any reference signal could be generated by using a digital phase-locked loop to establish the 5MHz reference from the time stamp and then use simple arithmetic to get the current signal status. Though not yet in use, this approach could lead to precise references for all manner of devices that generate or use video with only network cabling required. As a bonus, accurate time signals are generated as well, which makes the use of existing time code seem a bit anachronistic.

Time sponges

Lastly, our industry would not be as simple as it is without "time sponges." Frame synchronizers, which used to include as a class "time base correctors," allow free running sources to be retimed into any system. Today they offer a multitude of other features like embedding audio, shuffling tracks, down- and crossconversion, and proc amp-like controls. They seem to be a sort of Swiss Army knife for television content. When dealing with satellite and terrestrial feeds, there is no better tool. They solve the timing problem and allow resyncing audio in many cases. I suspect we will see these capabilities built into many more devices over time. Much of the capability is simple today with software-defined devices. BE

John Luff is a broadcast technology consultant.

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



Autoscript — CountPlus

Time code generator, time code inserter and up/down count generator is designed for use in conjunction with Autoscript's ClockPlus time code display; users can preset and store 10 different combinations of start and stop times, addressing the requirements of many live studio presenters to have separate countdowns and program sections; embeds SMPTE/EBU Vertical Interval Timecode (VITC) into the NTSC and PAL prompt video; provides two video outputs, which can be distributed to all prompt monitors and ClockPlus units in a studio.

203-926-2400; www.autoscript.tv

Shotoku — SP series

SP pan and tilt/tripod series includes four new models; SP80 and SP60 are compact 75mm ball tripod systems; the SP80 features a maximum payload of 22lbs, making it ideal for ENG camcorders; the SP60 offers a maximum payload of 15.4lbs, making it ideal for handheld camcorders; the SP40 75mm ball tripod system is designed for handheld cameras; it supports a load range of 4.4lbs to 8.8lbs; the SP20 is suitable for handheld cameras weighing less than 4.4lbs.

310-782-8491; www.shotoku.tv

Clear-Com — HME DX210

Wireless intercom system operates in the 2.4GHZ band; designed to enable interference-free communication for highly demanding productions; its wired intercom interface is compatible with Clear-Com's or RTS' two-wire systems, and provides two separate two-wire and four-wire interconnections; 1RU base station supports up to 16 full-duplex and 44 half-duplex beltpacks and/or wireless headsets by linking four base stations; a digital auto-nulling circuit allows users to eliminate the return audio of the wired two-wire intercom automatically.

510-337-6600; www.clearcom.com

Belden — Brilliance HD Connectors

New line of connectors is designed for use with Belden Brilliance precision video coaxial cables; provide better than -20dB return loss performance through 4.5GHz, exceeding the SMPTE specification requirements; comprised of one-piece BNC compression connectors with an optional patented locking feature, optimized three-piece BNC crimp connectors, and connector tools for both one-piece and three-piece connectors.

314-854-8000; www.belden.com

Panasonic — AG-HPX250

P2 HD handheld camcorder offers 10-bit, 4:2:2 independent frame, full 1920 x 1080 resolution AVC-Intra recording; also records in DVCPRO HD, as well as SD recording in DVCPRO50, DVCPRO and DV; supports international HD and SD standards; equipped with two P2 card slots; can record for up to 320 minutes in AVC-Intra 100 at 720/24pN, 160 minutes in AVC-Intra 100 1080/24pN and 128 minutes in other AVC-Intra 100 or DVCPRO HD formats on two 64GB cards; in AVC-Intra 50, the recording time is twice that as AVC-Intra 100.

877-803-8492
www.panasonic.com/broadcast

Telecast Fiber Systems — Python 3G

The latest release of the company's Python multichannel fiber-optic HD/SDI transport system; offers a broad range of digital transmission rates while maintaining the signal quality and reliability required in demanding studio and OB environments; designed to enable broadcasters to reach hundreds of times further using a cable that is a tenth the size of equivalent coax; allows fiber-optic transport for up to four groups of HD/SDI channels, in a compact 1RU frame.

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

Blackmagic Design — ATEM Camera Converter

Converter allows consumer HDMI or professional SDI cameras to use optical fiber for low-cost connection to live production switchers up to 25mi away; designed to let users get more cameras closer to the live action at a lower cost; includes professional local microphone inputs for high-quality audio from the camera location; also includes talkback, on-air tally and an internal battery for remote use when cameras are located far away from power sources.

408-954-0500; www.blackmagic-design.com

Integrated Microwave Technologies — Nucomm Passive Tracker

12-way Passive Tracker receive system is an autonomous COFDM central receive system designed to simplify mobile-to-fixed and mobile-to-mobile signal acquisition; consists of an array of antennas, adaptive signal processing and maximum ratio combining techniques; requires users to set the operating frequency to work the system; the unit analyzes the RF landscape and identifies and eliminates unwanted signals before they can impair reception, allowing for spatial separation and frequency reuse; this isolation is done electronically using adaptive signal processing.

908-852-3700; www.imt-broadcast.com

JVC — GY-HMZ1U

ProHD 3-D camcorder features an integrated 3-D twin lens design; simultaneously records each left and right image in full 1920 x 1080 resolution; offers dual 3.32 megapixel CMOS sensors — one for each lens; delivers 34Mb/s AVCHD recording in 3-D or 24Mb/s in 2-D; video can be recorded with time code at 60i to provide smooth motion for sports and other fast action or 24p for a film-like effect; can capture 3-D time lapse and 3-D digital stills.

973-317-5000; www.pro.jvc.com

Hamlet — 9K series

Preconfigured, entry-level monitoring systems are based on the DS9000 DigiScope and MS9000 MonitorScope platforms; available in 12 configurations — six for the MonitorScope, where users need the half-rack width form factor, and six for the DigiScope, where users need to be able to route the output to a convenient monitor; the configurations cover common combinations of signals to be tested, including analog video as well as SD, HD and 3Gb/s HD digital streams.

+44 1494 729 728
www.hamlet.co.uk

Grass Valley — 3G Transmission

Camera transmission system can carry uncompressed 3Gb/s signals over both triax and fiber; this allows any choice of transmission cable to carry either uncompressed 1080i, 720p or 1080p50/60 video, while being prepared for multiplexed pairs of 720p or 1080i HD signals for stereoscopic 3-D applications; extends the range of triax coverage by 25 percent to a conservative minimum of 4921ft (1500m); in addition to the camera's digital video output, it carries four digital audio channels back to the base station as two AES/EBU pairs and as an embedded signal within the digital video signals itself.

530-478-3000; www.grassvalley.com

Jünger Audio — C8586/C8582

Combo cards are designed for the C8000 processing system; C8586 is a dual combo board that provides two SDI streams, each with four channels of audio; enables users to process up to 32 channels in dual stereo and in one frame; C8582 is an eight-channel analog and DSP card that can handle four stereo pairs, enabling cable headends to process four television programs per board.

+49 30 677721 0
www.junger-audio.com

Tektronix — WFM/WVR5200

Waveform monitor and rasterizer can monitor up to four 3G-SDI signals simultaneously; designed for use in OB vans, studio control rooms and post-production houses doing editing, special effects and color correction; offer a comprehensive set of color gamut monitoring features, as well as multirate color bar and pathological signal generation for basic installation and maintenance applications; other key features include closed captioning, subtitles, AFD decode/display and full ANC data support for quality control applications.

800-833-9200; www.tektronix.com

Utah Scientific — UTAH-400 series

Digital routing switchers now feature embedded-audio signal processing; new capability comes courtesy of a new line of I/O boards that rely on advanced field-programmable gate array technology to perform signal processing; the enhanced routing systems also incorporate a virtual control panel to provide an easy-to-read display of the video signals and their associated audio positions.

801-575-8801
www.utahscientific.com

Alteran Technologies — ViTaDi Digikit

Portable plug-and-play digital migration capture system uses standard computer components and connections; available in two- or four-channel, and SD or HD versions; features ease of use and quick setup; portable desktop design is ideal for modest libraries, but also appeals to companies with larger collections that need reliable on-the-fly automatic video ingest as an alternative to less productive as-needed manual migrations; adapts to a content owner's pre-existing architecture and integrates with any pre-existing tape library systems.

818-998-0100
www.alterantechnologies.com

Anton/Bauer — QR-DSLR

Power solution is designed for the Canon EOS 5D Mark II, EOS 7D and EOS 60D DSLR cameras; provides 7.2V power to the camera via the Canon DR-E6 Coupler and 14.4V power via the PowerTap for accessories such as the Ultralight2, onboard monitors and external hard drives; can mount to most third-party support rigs, such as Red-Rock Genus, Micro, Zacuto and Cinevate; Logic Series Batteries Real-Time LCD indicates remaining run time for all items being powered.

203-929-1100
www.antonbauer.com

Gepco — V-Light Active Fiber Cable System

Designed to offer a convenient, reliable and durable interface for high-speed serial digital video transmission over single-mode fiber with data transfer rates up to 1.485Gb/s; inside each weather-tight V-Light connector shell, the fiber is sealed and isolated, while the electrical signal is converted to an optical one (or vice versa); custom-length V-Light active fiber cables are available in two- or four-path versions with either unidirectional or bidirectional signal transmission.

847-795-9555; www.gepco.com

Wheatstone — ALP-1000

Loudness processor designed to help stations ensure compliance with the CALM Act legislation; manages loudness in compliance with the ITU BS.1770 loudness standard, as well as processes program material with stereo and 5.1 surround audio processing technology; features SD/HD-SDI inputs and outputs with de-embedding and embedding; 2.0 to 5.1 upmix and 5.1 to 2.0 downmix capabilities are also included; dedicated, separate inputs are provided for EAS audio and for ancillary program channels; RS-485/RS-422 connectivity is provided for metadata input.

252-638-7000
www.wheatstone.com

Volicon — Observer Scout

A/V monitoring, logging and troubleshooting system allows broadcasters and networks to perform proactive content-based monitoring and quality checks at A/V handoffs with over-the-air and satellite downlinks, pay-TV operators, content contributors and other partners; can capture up to three days of full-motion SD or HD content; provides continuous recording of video and audio to local storage; enables browser-based remote viewing of stored media by multiple simultaneous users; supports media exports for sharing of select content; offers centralized management.

781-221-7400
www.volicon.com

Chyron — BlueNet

Graphics creation and playout system leverages Chyron's suite of graphics tools and streamlines ordering and graphics asset management, collaborative graphics creation, and real-time playout; integration with AXIS, Chyron's cloud-based services offering, extends the power of BlueNet workflows in speeding even the most sophisticated graphics to air; gives broadcasters an array of tools that can be configured to meet the specific needs of their graphics workflows as well as their budgets, while providing seamless integration into newsroom systems.

631-845-2000; www.chyron.com

Canon — FK14.5-60

PL-mount lens addresses emerging 4K production standards; features a new Canon optical design that virtually eliminates focus breathing; wide-angle lens maintains its T2.6 maximum aperture over the entire focal range; these attributes combine to help ensure contrast under a wide range of scene-lighting conditions, helping to maximize the image-creation capabilities of single-sensor digital cinematography cameras.

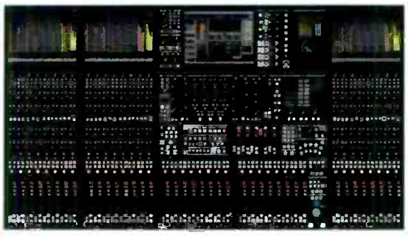
516-328-5000
www.usa.canon.com

Harris — NEXIO AMP

Enhances the ingest density for production applications, provides 1080p (3Gb/s) format support and improves energy efficiency; cost per channel is improved, with twice the number of physical ingest channels and a choice of up to four bidirectional HD channels or eight SD-only channels (four in, four out); ideally suited for ingest and playout in multichannel broadcast and media operations; incorporate a single-link 3Gb/s-capable I/O card (as opposed to dual-link); supports all codecs in a single chassis.

800-231-9673
www.broadcast.harris.com

Lawo — xtra Faders



New surface layout option for the mc²66 MKII production console; the Screen Control Module in the console's Central Control section is replaced by the Short Fader Control panel; in addition to the control elements commonly associated with this section, the new surface layout incorporates eight additional faders; this new arrangement provides more faders in the first row and less administrative buttons, facilitating greater control over crucial mix elements assigned to this area; the Extra Faders layout also provides a new Screen Control panel that provides for a variety of essential functions requiring dedicated hardware buttons.

+49 7222 1002 0; www.lawo.de

LYNX Technik — Series 5000

Fiber, receive and transceiver cards provide an electrical-to-optical and optical-to-electrical conversion solution for the transmission of SDI content to fiber over long distances; consists of the OTX 5844 four-channel fiber-optic transmitter with integrated 4x6 router, ORX 5804 four-channel fiber-optic receiver with integrated 4x4 router, and OTR 5842 dual-channel SDI to fiber-optic transceiver with integrated 4x4 router; all three modules offer CWDM support for up to 18 wavelengths.

661-251-8600
www.lynx-usa.com

Front Porch Digital — DIVArchive V7.0

Content storage management system now implements Front Porch Digital's open Archive eXchange Format technology, which is designed to protect, preserve and facilitate the exchange of content among storage systems; supports complex DPX packages with as many as 1 million individual files per DIVArchive object, frame and path-based partial restore-operations, and desktop browsing of DCP and IMF-formatted files; also supports Oracle T10000C tape drives with 5TB of native data-tape capacity and 240MB/s throughput.

303-440-7930; www.fpdigital.com

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NEW PRODUCTS

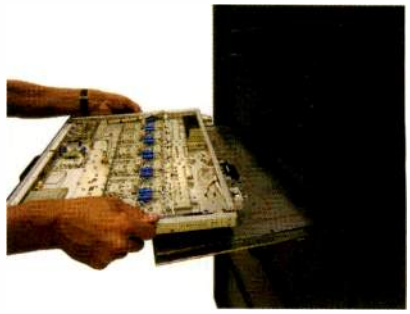
NEW PRODUCTS & REVIEWS

Digital Rapids — MediaMesh TX

Content contribution appliance provides flexible, easy-to-use content packaging and sending capabilities; scales from point-to-point delivery to global distribution networks; combines robust, scalable transfer technology with full-featured, easy-to-use sending and receiving solutions; provides efficient transfer of digital media files between content providers, contributors, aggregators and distribution partners; optimizes the transfer of HD, SD and Digital Cinema media over terrestrial IP networks and satellite.

905-946-9666; www.digital-rapids.com

Larcan — Oasis



Series of liquid-cooled solid-state transmitters features Cool-dock technology, which is designed to lower maintenance costs by eliminating potential for leaks; using building-block design, power levels of up to 10kW in a single 24in cabinet are possible; higher power levels are available in multiple cabinet configurations; lightweight, hot-pluggable modules can be safely removed without waiting for cooldown.

905-564-9222; www.larcan.com

Harmonic — Omneon MediaGrid

New version of active storage system is the combination of the ContentServer 3000, new scale-out storage hardware, and a new version (v3.0) of the Omenon MediaGrid file system software that features integrated software RAID for efficient and smart data protection; ContentServer 3000 hardware comes in a 3RU form factor, houses 16 3.5in SATA2 hot-swappable hard disk drives and has dual active-active controllers for high availability; offers both RAID 6 and RAID 4 options, enabling users to balance storage capacity with performance based on their workflow needs.

408-542-2500
www.harmonicinc.com

Miranda — Axino

A multiprogram, IP transport stream loudness control processor; can perform high-quality automatic loudness control across dozens of HD/SD programs carried over IP; ideal for cable, satellite and IPTV operators; addresses excessive channel-to-channel and program-to-program variation; when installed downstream of the advertisement insertion equipment, it will prevent excessively loud commercials and will improve the quality of service for subscribers.

514-333-1772
www.miranda.com

Dalet — Media Life

Manages the complex media management requirements of high-volume, multiplatform program producers, such as broadcast networks and thematic channels; combines the company's media asset management platform with specialized tools covering the complete programming chain — from ingest, QC, compliance and content enrichment to playout, distribution and archiving; natively integrated task-specific tools address specialized areas of program preparation, while Dalet's advanced workflow engine orchestrates resources, assets and tasks to efficiently manage program and promo preparation across the entire production chain.

212-269-6700; www.dalet.com

Ericsson — Multiplatform Stream Processor

Processor is a high-density video and audio processing solution for telco and cable operators — enabling the launch of additional services, migration to MPEG-4 AVC and time-shift TV ingest processing; enables cost-efficient disaster recovery sites for business continuity; is a multiformat dense transcoder, enabling support for up to 24 HD or 72 SD MPEG-4 AVC or MPEG-2 services with concurrent PIP outputs; can serve as a re-encoder for MPEG-2 services, allowing for lower overall bit rates or VBR to CBR conversion for applications like time-shift TV.

678-812-6300; www.ericsson.com/television

Employment

TVIS Support Manager

KTRK-TV, the ABC O&O and number one station in Houston, TX, is seeking an experienced Television Information Systems Support Manager. Extensive knowledge and experience in desktop computer support, Cisco layer 2 switched environments, and management required. Operating, troubleshooting and repairing computerized television broadcast equipment and systems including, but not limited to, broadcast automation, graphics systems, signal distribution and routing; along with newsroom automation is also necessary. Experience with Non-Linear Editing Systems such as Avid, Aurora, Edius, and Final Cut Studio is desirable. Candidate must have a proven track record managing people and projects. Night, weekend and holiday work will be required.

Interested candidates must apply on-line at www.disneycareers.com by uploading a resume file. Please reference Job ID: 294156 on all materials submitted. No phone calls please, no third parties.

Equal Opportunity Employer M/F/D/V.

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Help Wanted

GOLF CHANNEL

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The qualified candidate must possess ACSR Certification and demonstrated progressive career growth in broadcast engineering. Golf Channel utilizes some of the most state of the art technology in its broadcast operations including a 300TB AVID ISIS, Interplay, AVID ARCHIVE, AVID HD Multistream, AVID HD Nitris Systems, AVID Streaming, INews, ASSIST and more.

The successful candidate will be responsible for the technical operation, maintenance and evaluation of all AVID based functions in a dynamic environment. EVS understanding and technical maintenance on a multitude of server based platforms is a plus.

Requirements include: 4-6 years experience in a broadcast IT facility, AVID ACSR Certifications and a bachelors degree in either CIT, Computer Science or the demonstrated equivalent in work experience.

Competitive salary, full company benefits. DFWP / AA/ EEO

To apply please send resume to:
tbaker@golfchannel.com

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3-D HDTV predictions

3-DTV is overhyped and not ready for prime time — yet.

BY ANTHONY R. GARGANO

A market research firm in our industry, Insight Media, focuses on emerging display technologies. Its market coverage ranges everywhere from e-paper to OLED to 3-D displays, and it produces newsletters and market reports on this entire range of technology. "Large Display Report" and "Mobile Display Report" are the two monthly newsletters. Following this year's CES show, the company also released a special report on 3-D HDTV titled "3D at CES 2011 Special Report."

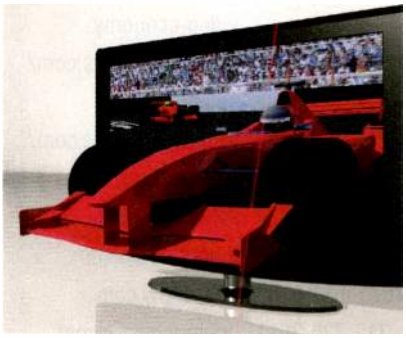
My conviction continues to be that 3-D HDTV will remain very much a niche vehicle for entertainment television.

In February 2010, in the midst of wildly aggressive market forecasts for the sales of 3-D HDTV sets by manufacturers and industry pundits alike, Insight Media sailed against the tide. For example, at the 2010 CES, the Consumer Electronics Association (CEA) projected sales of 4 million 3-D sets for the year, a forecast it subsequently lowered significantly. Insight Media, rather than succumbing to the unbridled 3-D enthusiasm of the time, forecasted sales at what then seemed a paltry 1.1 million sets for the year. In early 2011, when the CEA started to release preliminary data, it posted the sales of 3-D HDTV sets for 2010 at … yep, 1.1 million.

The 100-plus page special report covers 3-D products, content and technology not only gleaned from the CES show floor but also derived from off-floor meetings and follow-up discussions.

3-D displays

My conviction continues to be that 3-D HDTV will remain very much a niche vehicle for entertainment television until the advent of high-quality, large-screen, nonstomach upsetting autostereoscopic (AS-3D) displays. Given that, naturally, the first portion of the report I turned to was the section designated "AS-3D Displays & Products." I concluded that, no surprise, we're not there yet.



Acceptable AS-3D technology is basically still limited to small-screen and portable devices. Lenticular and parallax barrier are the primary technologies that are being used for small-screen devices and seem to be meeting with some degree of acceptance. At CES, there were some future technology large-screen prototypes on display, but the only thing that they convinced viewers of was that it really is future technology — well off into the future! No discussion of glassless 3-D can be complete without mention of fast-blinking technology, and the term technology, as applied here, is tongue in cheek.

Around the time of CES, Jonathan Post, a small post house in Brazil, circulated a video on the Internet demonstrating 3-D viewing without glasses by using a display that had a 120MHz refresh rate and having the viewer blink at the appropriate rate, thus creating a faux shuttered lens viewing experience. Some of the technical cognoscenti were even sucked in by this scheme. The video went viral on the Internet, actually creating arguments in technical circles over the veracity and viability of the concept! Can there be any more convincing argument than this that 3-D is way overhyped today?

Insight report

For more information about 3-D technology, subscribe to *Broadcast Engineering* magazine's "3-D Technology" e-newsletter at *http://broadcastengineering.com/newsletters.* BE

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