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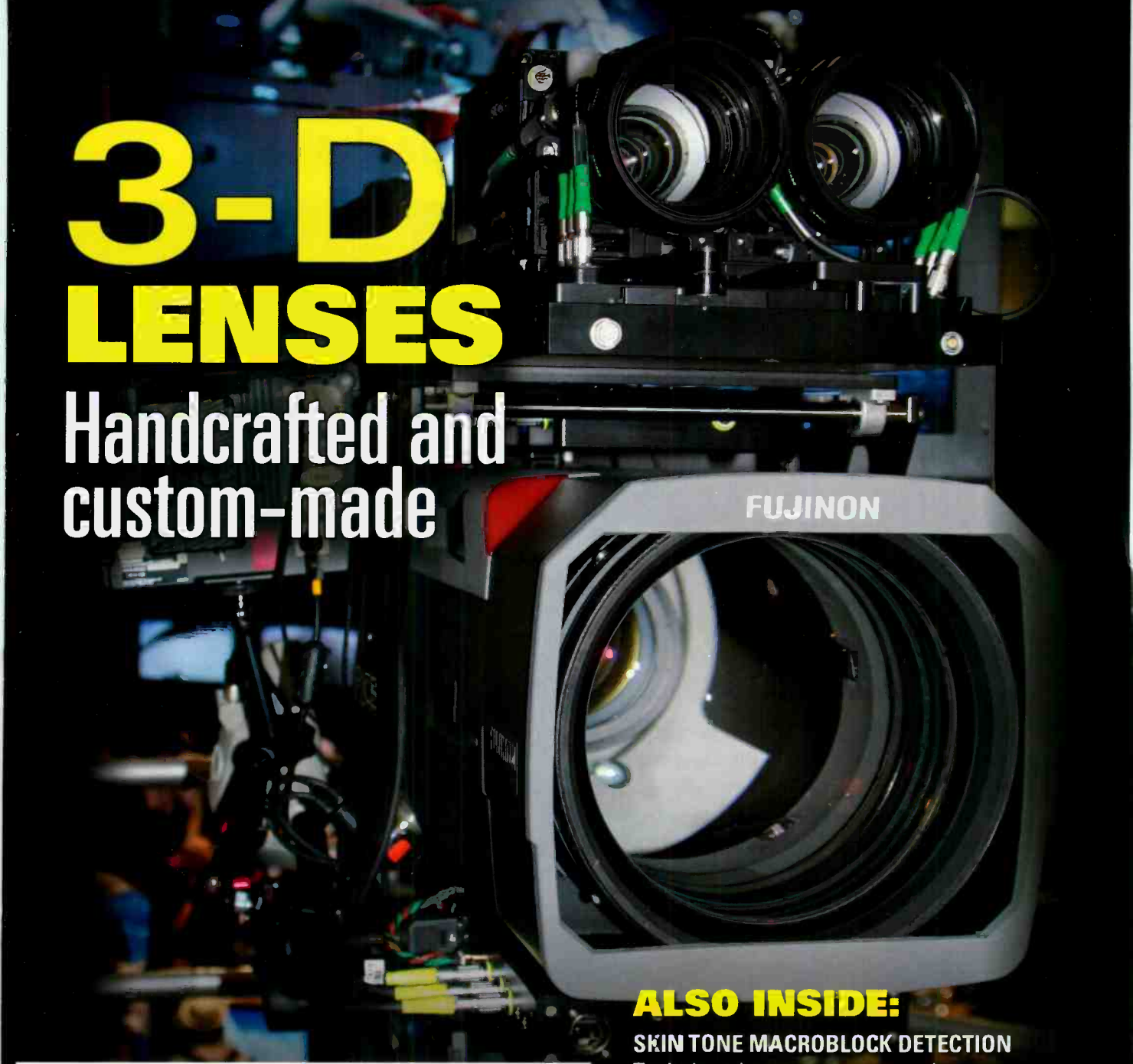

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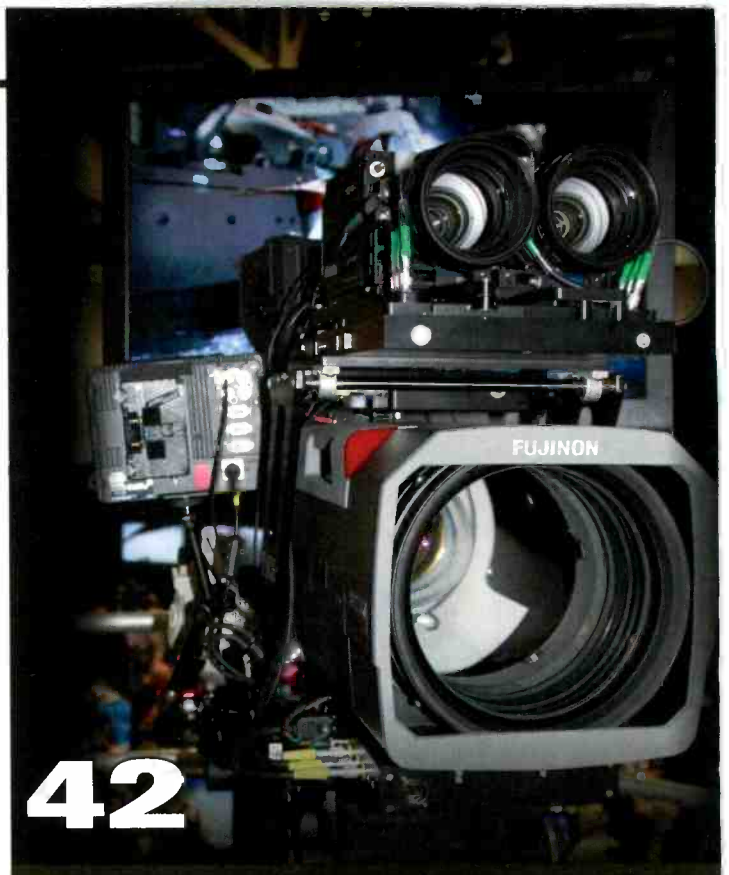

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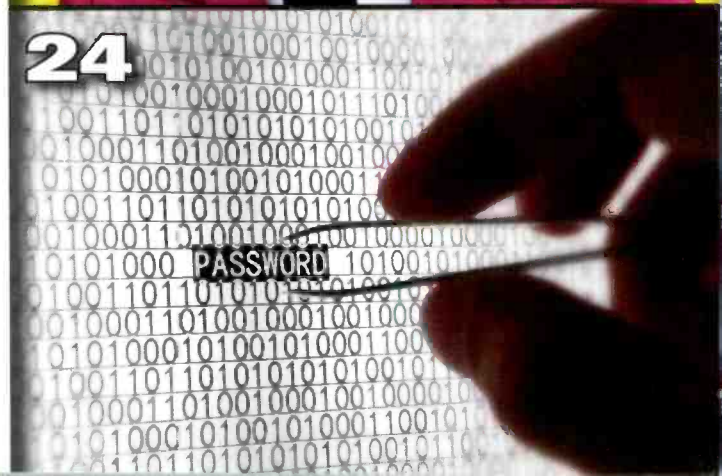

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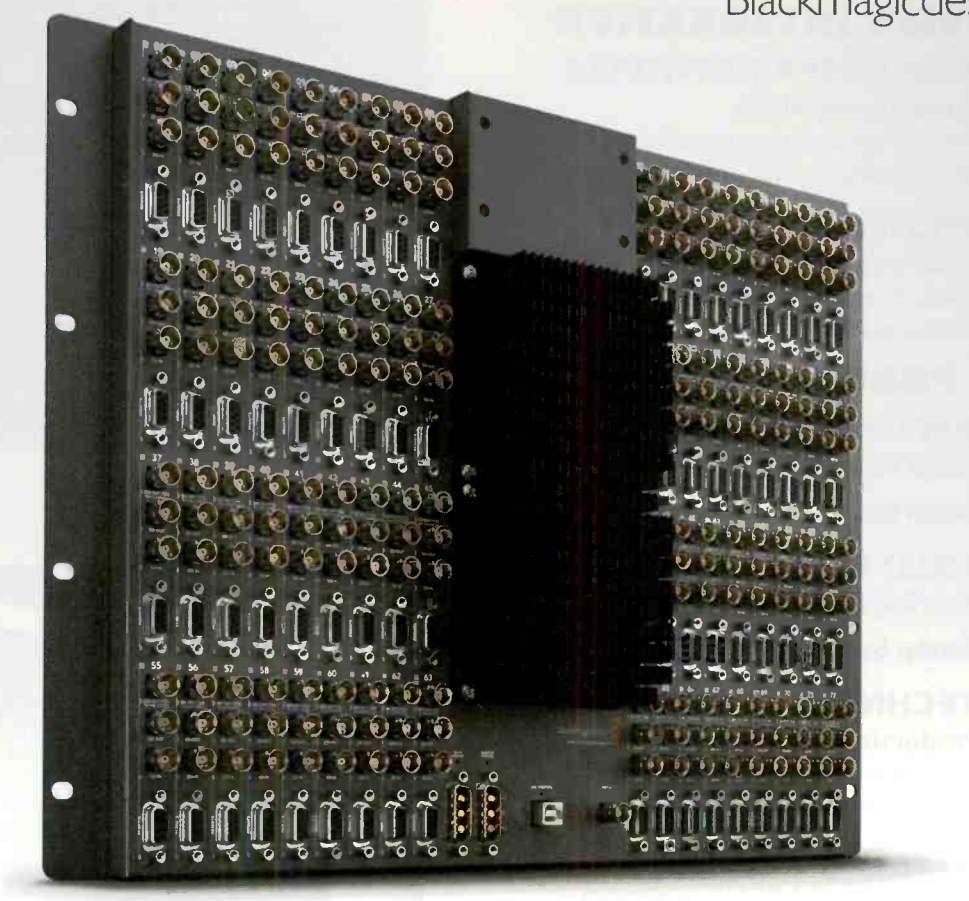

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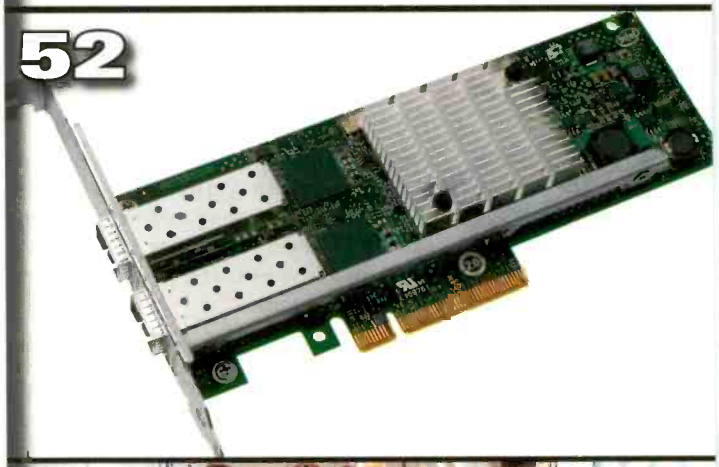

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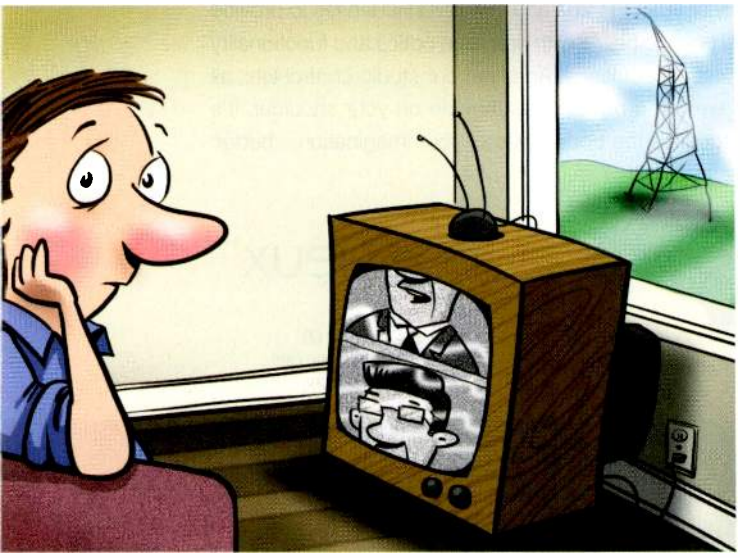
Let TV die

A May 2011 report titled "If a TV station broadcasts in the forest," written by Thomas W. Hazlett, a professor of law and economics at George Mason University and the managing director of Arlington Economics, crossed my desk last week. Given the title, I did not expect his report to be complimentary to television broadcasters, and it is not.

Hazlett says local broadcasters are little more than a "rusty transmit tower." He further claims, "The TV license continues to hold value not as a gateway to airwaves but as a toll booth for broadcast network programming."



The report goes on, this time calling over-the-air broadcast TV "a needless expense, propped up not by customer demand, technical efficiency or business necessity, but legacy regulation generations outdated." He calls for those broadcast regulations to go the way of "cavemen."

By now, it was clear what Hazlett had in mind, but I continued reading, as I wanted to see his proposed solution. He suggests government take three steps to "unleash" technology and innovation.

First, he says society will achieve enormous social gains by allowing stations to deploy bandwidth-allocated TV licenses to their highest-valued uses, supplying programs to customers via alternative distribution platforms — as done in 91 percent of U.S. households already. Basically, he's suggesting broadcasters sell their spectrum and go away.

But, what about the 10 percent of homes still relying on OTA broadcasts? Hazlett says at $300 per household, those viewers could be connected to broadband, cable or satellite, making the total transition expense about $3 billion. Selling broadcast spectrum would generate about $108 billion, "Hence, the net social gain of switching out off-air terrestrial broadcasting in favor of existing MVPD networks is at least $1 trillion, or more *than 300 times* the cost of the transition."

Second, Hazlett calls for the elimination of must-carry and retransmission consent, which he says are "trade barriers" favoring broadcasters over cable and satellite. Calling them "TV Bad Science" as first implemented and "absurd" today, he says they stifle consumer choice and market efficiency.

Finally, his report says the transition to OTT Internet-delivered video is already under way. Linear TV, he says, now competes with Hulu, Netflix, Apple TV and Google TV.

The report continues, "A Television Future without 1952-style TV stations is not a difficult world to imagine. It offers a promising vision: over $1 trillion in consumer welfare released for wireless services, elimination of large inefficiencies in the competition to create content bundles, new 'broadcast' programming coming to households via the pathway hundreds of other channels already do, through contracts with program networks and/or multichannel video bundle providers, and via the newly emerging over-the-top applications flowing to millions of TV sets, mobile handsets, notebook/netbook computers, e-readers and tablets."

Before one gets too carried away with Hazlett's research, it's always worthwhile to follow the money and ask, "Who paid for it?" In this case it was The American Television Alliance (ATVA), an organization described as, "an unprecedented coalition of consumer groups, cable, satellite, telephone companies and independent programmers to raise awareness about the risk viewers face as broadcasters increasingly threaten service disruptions that would deny viewers access to the programs they and their families enjoy. … The ATVA's mission is a simple one — to give consumers a voice and ask lawmakers to protect consumers by reforming outdated rules that do not reflect today's marketplace."

OK, now we better understand the foundation for Hazlett's viewpoints.

While *Broadcast Engineering* readers may find much with which to disagree in Hazlett's opinion piece, he makes one point with which we may concur: "There is every reason to prefer that government get out of the way, permitting markets to discover the structure that best suits customer needs given the options available."

Amen. BE

Brad Dick

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True-peak amplitude

The increased dynamic range allowed by new loudness measurement techniques is often overlooked.

BY SIMON PEGG

Thanks to the ITU-R BS.1770 multichannel loudness algorithm, audio is the new Cinderella. As broadcasters and content producers seek to comply with legislation such as the CALM Act in the United States, or implement the latest standards to enable material interchange or avert the imposition of new local legislation, audio is being thrust from comparative obscurity into the spotlight of the video world. What is less understood is that ITU-R BS.1770 also includes an algorithm for calculating the true-peak amplitude of a signal and now defines the peak program level delivery requirement in terms of this new true-peak measurement, dBTP (dB relative to digital full scale, measured as true-peak) rather than traditional PPM-type meters.

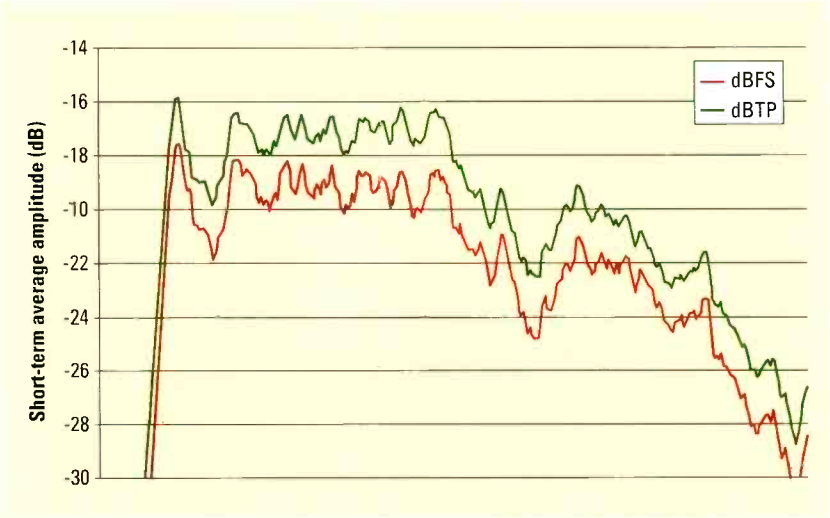

Figure 1. A comparison of the peak-sample amplitude vs. the true-peak amplitude, both averaged over a short period of time, shows that using peak-sample metering results in an average under-read of about 2dB.

The need for true-peak measurement

Before the development of ITU-R BS.1770, peak program level was used to control loudness, albeit far from perfectly. I stress the imperfection because content producers soon realized that peak program level and subjective loudness have a weak correlation, which can easily be manipulated through simple tools like audio level compression. In many cases, this has led to the introduction of variable peak program level limits depending on the type of audio content. Speech may be allowed to peak at PPM 6 on a BBC Type II PPM meter, for example, whereas pop music, which is usually subject to level compression, may be limited to PPM 5.

A limit of PPM 6 retains 10dB of headroom in the digital domain, not because 10dB of headroom is really necessary, but because it provided a degree of restriction on the subjective loudness of any material. Maintaining that much headroom means that a substantial amount of the potential dynamic range is being sacrificed, but with the advent of a subjective loudness algorithm, much of this excessive headroom can come back into use. ITU-R BS.1770 allows for a maximum peak program level of -2dBTP (dB relative to full scale, measured as a true-peak value) and the more recent EBU R-128 recommendations, which are due to be incorporated into ITU-R BS.1770, push this even further to -1dBTP, giving content producers incredible scope for dramatic use of audio dynamics.

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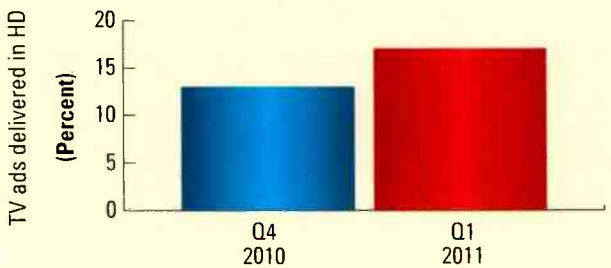

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Of course, there is a catch. When you are working with digital audio, you are not dealing directly with the underlying continuous time signal that will eventually be played out through the viewer's audio system; rather, you are dealing with just a discrete time (sampled) representation of it. Some forms of audio processing, such as sample rate conversion — which has to recreate the underlying continuous time signal at

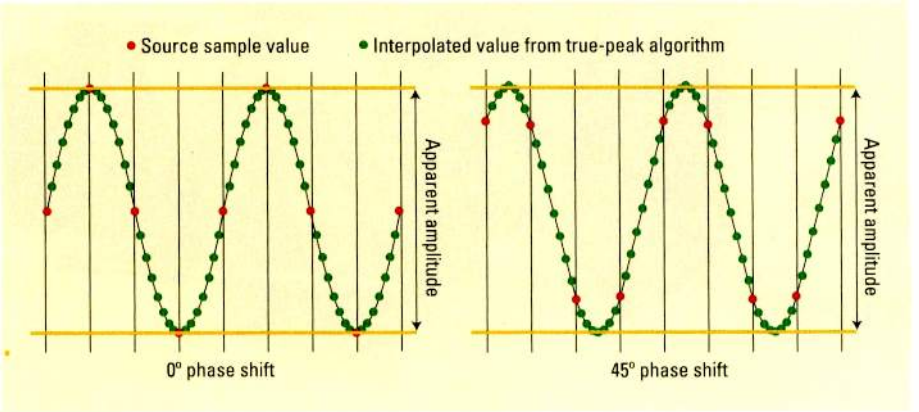

Figure 2. When given a test tone that is just off an integer division of a sample frequency (12,000.1Hz for 48kHz), a meter that uses a true-peak algorithm will show a steady level as the audio plays.

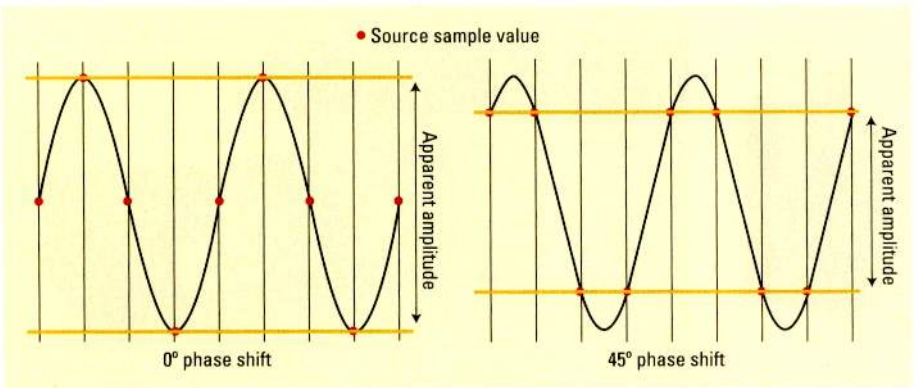

Figure 3. A peak-sample meter given the same tone as above (12,000.1Hz) will show the level dip four times every 10 seconds as the phase shifts, leading to an under-read of the level.

points between the existing samples — can lead to significant changes in sample levels.

When you have 10dB of headroom, you can get away with being a bit imprecise in your metering without it causing any significant problems. Real PPM meters are pseudo-peak meters that use specific meter ballistics to provide an approximation of the underlying continuous time signal. But many PPM-type peak program level displays are really peak-sample meters that are just displaying the maximum values of the discrete time audio samples rather than the maximum value of the continuous time signal the samples represent.

It's easy to find situations where peak-sample meters can display under-reads of several dB compared to the underlying continuous time signal. (See Figure 1 on page 12.) Depending on the spectral content, this can be significantly larger. While a couple of dB error is far from ideal, it may have been acceptable when you had 10dB of headroom. Start pushing your dynamics into the additional range available under ITU-R BS.1770 or EBU R-128 though, and even a couple of dB under-read is going to get you into a whole lot of trouble.

Identifying true-peak metering

There is a simple test that will check whether a meter is a true-peak meter or just a peak-sample meter, and it demonstrates how off the reading can be when using a peak-sample meter. You need a test tone that is just off an integer division of the sampling frequency. So, for 48,000Hz audio as is generally used in broadcast video, a good choice is 12,000.1Hz sine. The extra 0.1Hz means the audio sine wave will appear to shift, relative to the sampling clock, by a whole cycle every 10 seconds. This makes the result of the shift easy to view on the meter.

Now we know that the amplitude of our test tone should be constant irrespective of the phase shift, and you can double-check this either using a known true-peak meter or by attaching an oscilloscope to a good quality analog output of the audio system and viewing the output sine wave directly. Now play the test tone through your metering system and watch the peak program meters you want to check. If they are true-peak meters, you will see them hold a steady level as the audio plays. The additional intersample values created by the true-peak algorithm maintain the reading even as the phase shifts. (See Figure 2.) If they are peak-sample meters, you will see the reading dip four times every 10 seconds as the phase shifts, which causes the under-read. (See Figure 3.)

Ensuring true-peak compliance

One way of ensuring true-peak compliance is to ensure that all metering is true-peak and then manually mix to protect the true-peak limit. Unfortunately, this may not be possible within an NLE or DAW system and could well require suitable IO and an external metering system. Of course, you also probably need to meet loudness requirements so you

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would have to manually balance the needs of the loudness and true-peak requirements. As most loudness requirements are based on an average of the whole content, this can be time-consuming as you may have to repeatedly play the content through a loudness meter to check the loudness, particularly once the EBU R-128 recommendations are incorporated into the ITU-R BS.1770 specification because these reduce the loudness tolerance to 0.1LU (the equivalent of 0.1dB). Be aware that not all loudness meters offer true-peak metering.

An alternative option is to use some form of automatic true-peak correction, most likely coupled with simultaneous loudness correction, which may be available as an NLE or DAW plug-in, or as a stand-alone application. These typically scale the audio uniformly to achieve the required loudness, maintaining the full dynamic range of the source mix, and then, if they provide true-peak correction, apply level compression in the true-peak domain to ensure compliance with the true-peak limits. Because the true-peak requirements provide plenty of dynamic range relative to the loudness requirements, the compression usually only affects a small proportion of the audio and so is not generally noticeable. Be aware that, in the same way that standard normalization will not work for ITU-R BS.1770 loudness control, standard level compressors in NLE and DAW systems generally do not operate in the true-peak domain and do not provide a true-peak limiting solution. BE

An alternative option is to use some form of automatic true-peak correction, most likely coupled with simultaneous loudness correction.

Simon Pegg is research and development director at Eyeheight.

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CALM Act approved

The act requires TV licensees and MVPDs to police the airwaves against loud commercials.

BY HARRY C. MARTIN

The FCC has issued a Notice of Proposed Rule Making to implement the Commercial Advertisement Loudness Mitigation Act (CALM Act), which the president signed in December. The CALM Act, intended to lower the volume of TV commercials, did not itself change any rules. Instead, it instructed the FCC to make those changes. This activity follows the action of the ATSC during the DTV transition, when it devised a recommended practice for establishing and maintaining audio loudness (the ATSC A/85 RP). While the ATSC A/85 RP was initially just recommended, Congress stepped in — via the CALM Act — and ordered the FCC to impose that Recommended Practice (RP) as a mandatory standard.

Technical basis

The ATSC A/85 RP assumes that the transmission system includes audio compression capability consistent with the Dolby AC-3 DTV audio standard. Because that standard is included in ATSC Standard A/53 (the overall Digital Television Standard incorporated by reference in Section 73.682(d) of the commission's rules), DTV broadcasters are already subject to the standard. Some but not all MVPDs (e.g., cable and satellite operators) also use that standard, and that complicates things. Additionally, programming is often not produced by the broadcaster or MVPD operator that would ultimately be subject to the new rules. That, too, adds a level of complexity to the implementation of the CALM Act.

Further, the ATSC A/85 RP is based on a recommended measurement algorithm developed by the International Telecommunication Union Radiocommunications Sector. That algorithm (ITU-R Recommended BS.1770) provides a loudness measure standard, i.e., a numerical value indicating the perceived loudness of any particular audio content. That value is then encoded as a metadata parameter — called the dialog normalization or dialnorm — in the audio content of the programming. According to the commission, "the dialnorm value must correctly identify the perceived loudness of the content it accompanies in order to prevent loudness variation during content transitions on a channel (e.g., TV program to commercial) or when changing channels. If the dialnorm parameter is set properly, the transmitted signal (which includes the dialnorm metadata) instructs the AC-3 audio decoder in the consumer's home receiver to automatically adjust the volume to eliminate loudness spikes during content transitions such as commercial breaks.

Safe harbor opportunity

In applying these standards, TV stations and MVPDs will have to ensure that the dialnorm settings for their commercial content are set correctly. This can be done through loudness measurement devices and software, file-based scaling devices, or real-time loudness processing devices — as long as the chosen mechanism can measure loudness using the ITU-R BS.1770 algorithm. If such providers do install proper equipment — and use and maintain that equipment in a "commercially reasonable" manner — they will enjoy a safe harbor. That is, they will be deemed to be in compliance should any complaints about loud commercials be made against them. The cost of the equipment to provide this capability could cost between $5000 and $20,000.

Also, the FCC suggests that it might permit TV stations and MVPDs to demonstrate, in response to a complaint about loud commercials, that the dialnorm of the complained-of commercial did in fact match the algorithm-generated perceived loudness value for that commercial.

Burden on video provider

The CALM Act places that burden on the TV licensees and MVPDs to police the airwaves against loud commercials despite the fact those licensees and MVPDs rely on a variety of others to produce the programming that they transmit. To protect themselves from inadvertent commercial blasts, TV licensees and MVPDs may want to include contractual provisions (including indemnification clauses) in their programming contracts. Such provisions would not relieve the licensee/MVPD of legal responsibility for a loud commercial, but could force the provider to pay any fine that might be assessed. 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 Illinois and Wisconsin must file their biennial ownership reports by Aug. 1.
- By Aug. 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: California, Illinois, North Carolina, South Carolina and Wisconsin.

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An extension to the mobile DTV system enables use of increased channel capacity for mobile services.

BY ALDO CUGNINI

Mobile DTV is continuing to roll out in the United States. The Open Mobile Video Coalition (OMVC) recently projected that the new service will reach more than 77 million households in the next 12 months. Also, a new RF signal capture project by the group is designed to further enhance reception, by collecting and recording relevant signals for manufacturers to use when designing new reception devices. Meanwhile, ATSC M/H is already evolving to provide greater functionality. First, below is a summary of ATSC M/H.

ATSC M/H specifies MPEG-4 Part 10 AVC (Advanced Video Coding) and SVC (Scalable Video Coding). SVC offers a layered approach to encoding. The program is coded into different layers, and all layers are transmitted in a bit stream. The simplest decoder will only decode one service (the base layer) and form pictures at that associated quality level, while ignoring the higher layers. A more sophisticated decoder will decode multiple services (base and enhancement layers) and use the additional information to produce a higher-quality program.

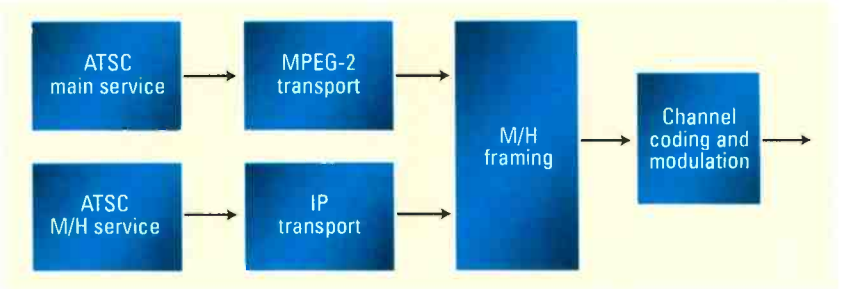

Figure 1. The ATSC mobile service works alongside the existing main service.

ATSC mobile has been designed to carry IP datagrams, network layer packets that contain data together with source and destination information. Intended for transmission over a network where a reception acknowledgment is not relayed back to the source, IP datagrams map the concept of an IP network onto a lossy medium such as broadcast transmission. IP-based delivery allows for the implementation of an interactive application software stack that is compatible with existing mobile delivery standards. IP-based networking forms the backbone over which the Internet operates, by means of TCP/IP.

A/153 includes a streaming delivery mechanism, including UDP encapsulation of real-time streaming data, RTP encapsulation of real-time streaming data, and a buffer model for real-time streaming data. Designed for real-time, end-to-end transfer of multimedia data, RTP/RTCP provides methods to achieve jitter compensation and to detect and compensate for out-of-sequence packet arrival — conditions that are common in an IP network. The payload type in RTP defines various codecs and allows for future codecs, but this is currently constrained for ATSC M/H.

Because the primary objective of the ATSC Mobile standard is to define the delivery of video and audio services, a specific method or middleware for handling "apps" is not currently described. The A/153 standard does, however, provide a framework for the delivery of auxiliary (graphical) components, based on the Open Mobile

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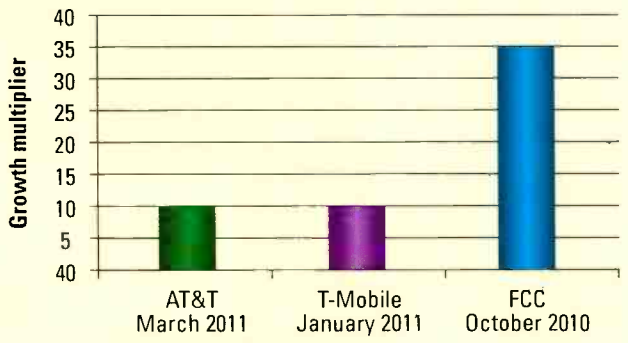

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Alliance Rich Media Environment (OMA-RME) specification, written specifically for mobile devices. ATSC M/H also supports A/65 captions and parental controls, and provides for graphical overlay support through a standardized Application (also called Presentation) Framework.

New addition to ATSC M/H in progress

ATSC has been developing a new Scalable Full Channel Mobile Mode (SFCMM), which provides an extension to the ATSC mobile DTV system that enables use of increased channel capacity for mobile services. Adding a new section to the existing standard, the new mode is described in ATSC A/153 Part 9. To conform with the specification, a legacy A/153 transmission (Core Mobile Mode, or CMM) requires a minimum of 4.7Mb/s to be allocated to main (i.e., non-mobile) services. SFCMM, on the other hand, can scale capacity up to the total available from the channel; it has capabilities compatible with existing A/53 receivers, and an incompatible extension capable of using the full 6MHz channel.

Because the total bit rate for an ATSC transmission is fixed at 19.4Mb/s, the M/H data stream must borrow bandwidth from the main channel, resulting in a main data rate loss (MDRL) that depends on how much payload data rate (PDR) is desired. The actual throughput efficiency depends on a number of variables.

In CMM, mobile DTV services are transmitted while reserving at least 38 of the 156 packets in an M/H slot for main A/53-compatible services. In SFCMM, mobile DTV services are transmitted while reserving fewer than 38 of the 156 packets in an M/H slot for main A/53-compatible services. SFCMM may apply to some or all of the slots in a mobile DTV transmission. As with CMM, SFCMM supports time slicing, providing a reduction in power consumption by "turning off" power-hungry portions of the receiver during irrelevant portions of the transmission.

Both CMM and SFCMM define two serial concatenated convolutional code (SCCC) rates (¼ and ½) that can be applied separately to different arrangements of "RS frames," which are selectable groupings of services providing the same quality of service (QoS), i.e., transmission robustness.

Payload data rate, Mb/s	Main data rate loss, Mb/s	Efficiency	QoS
CMM			
0.15	0.92	16.9%	highest
1.26	7.33	17.2%	
0.31	0.92	34.0%	
2.53	7.33	34.5%	lowest
SFCMM			
0.20	1.21	16.2%	highest
3.19	9.70	32.9%	lowest

Table 1. Exemplary ATSC M/H data rates and efficiencies

The actual throughput efficiency is a function of these rates and the bandwidth needed for overhead data, plus the fact that different services can be grouped together into the different RS frames.

To give an idea of the boundary conditions, the total PDR using CMM can vary from 152kb/s (at the highest QoS) to 2.5Mb/s (at the lowest QoS), while the MDRL using CMM can vary between 0.9Mb/s and 7.3Mb/s. Numerous combinations of PDR and MDRL are possible. (See Table 1.)

Note that each of the capacities listed in Table 1 pertains to a single M/H Parade, i.e., a collection of M/H Groups that have the same FEC parameters. An M/H Parade can carry one or two M/H Ensembles, which are logical pipes for IP datagrams, and an M/H Parade can be either a CMM Parade or an SFCMM Parade.

The highest PDR possible is thus 5.0Mb/s with CMM and 6.2Mb/s with SFCMM, if two parades are used in each case. Note that the MDRL in these situations is thus 14.6Mb/s and 19.4Mb/s, respectively. The latter case represents complete use of a 6MHz channel for mobile broadcasting, something currently outside of the FCC broadcast rules, providing an operating basis for a nonbroadcast licensee of spectrum.

There is one more special, dedicated, full-channel mode of operation with SFCMM, specified as Scalable Mode "111" within the standard. In this mode, the packet header and RS parity byte locations within the transport stream are repurposed to contain mobile data, resulting in the availability of all packets for mobile. In such a case, the transport stream no longer conforms with an ATSC A/53 service, as the comprising packets consist of only payloads.

The ATSC membership recently voted to elevate A/153 Part 9 (SFCMM) to Proposed Standard status. An Interim (prepublication) Version was released June 1. BE

Aldo Cugnini is a consultant in the digital television industry.

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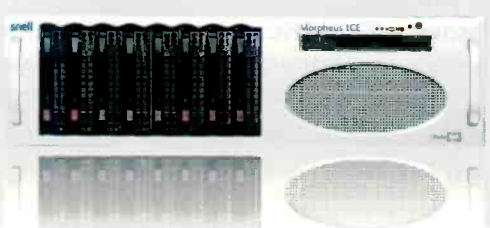

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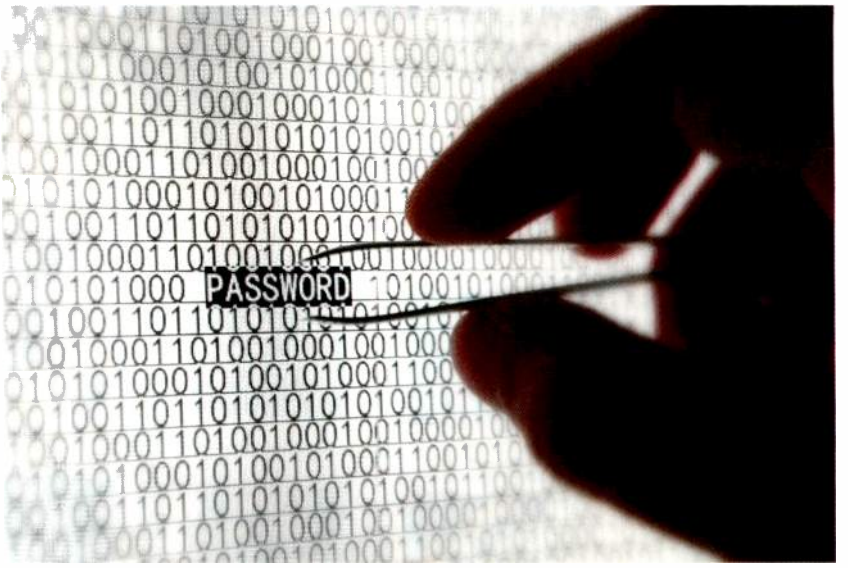
User authentication

Learn how to increase the security of your media servers.

BY BRAD GILMER

System security is like the weather; lots of people worry, but no one actually does anything about it. The January Computers & Networks column "Media network design" introduced network architectures that not only support the unique characteristic of media networks, but enhance security as well. The February column, "Media network hardware," emphasized that having the correct media network hardware in place increases security. This month's column will talk specifically about changes that will greatly increase the security of your servers.



One easy way to secure your media server is to stop using username/password combinations. Instead, consider using public-key encryption or Microsoft Authentication.

A not so secure situation

Let us start with an insecure configuration. Assume you are the administrator of a server used by news people in your station. This server is accessed by employees both internally and also while they are on the road. Users always interact with this system through a Web browser, and as an administrator, you have root log-in privileges (enabling full access to the server from wherever you are).

The server needs to be accessible to users inside the company and on the Internet, so it's dual homed, meaning there are two network interface cards (NICs) — one connected to the internal network and one connected to a port on a switch going directly to the Internet. A local IP address is assigned to the local NIC and a public IP address to the Internet NIC. Firewall software is installed on the server, and because the computer will be on the Internet, you move the Web service from Port 80, the well-known port number for Web traffic, to an obscure port, such as Port 3332. Then, you are off and running.

Unfortunately, hackers are off and running as well. Within minutes of installing the computer, the logs show that the server is being scanned by bad guys on the Internet. Shortly thereafter, port 3332 is being hammered, and hundreds of aborted log-in messages on Port 23 (Telnet) say that user Admin failed, user Fred failed, user George failed, etc. The Apache security logs show the same thing — hundreds of aborted log-in attempts.

The next day you are amazed to see more than 20,000 aborted log-in attempts. You also notice a few strange entries in the system logs. Given the situation, you realize there is a serious security issue, and the new server may have already been compromised. But what can you do? Users have to utilize this system, and they must have access over the Internet. There has to be a solution.

Specific recommendations

- *Do not rely on obscure ports to hide a server.* This is called security through obscurity. It is also called lame by both security experts and hackers. A great tool for showing just how poorly this works is Network Mapper (NMAP). NMAP can test thousands of ports on thousands of IP addresses in a very short time. Hackers run these tools constantly. No doubt this is why, in just a few minutes, hackers were pounding away at port 3332.
- *Get rid of the dual-homed situation.* Remove the NIC card with the public Internet address. Figure out how to configure port address translation (PAT) and network address translation (NAT) on the Internet router. This way any requests coming from the public Internet will be directed to the server without exposing the server directly to the Internet.
- *Consider putting the server in a demilitarized zone (DMZ).* Conceptually, this means that you grant access to the server by internal users but that the server sits in a separate area with tighter security. Users can still access it,

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but if someone compromises the server, they cannot then use it to launch attacks on other computers on your internal network.

Both of the latter two actions are intended to put a router/firewall between the server and the Internet, as well as protect the internal network from a server that might become compromised.

• *Have users access the server through HyperText Transfer Protocol – Secure (HTTPS) rather than HTTP.* Virtually all Web servers support HTTPS. HTTPS encrypts communications between the user and the server, making it difficult to sniff communications between the two. Why is this a good idea? Password crackers such as Cane and Abel can sniff hundreds of thousands of packets per hour looking for username/password combinations. They are specifically configured to recognize and record these combinations for use by hackers later.

If you are a network guru, you might point out that these sniffers are useless because on network switches, traffic is basically routed point-to-point. In other words, if a user and a server are connected on two separate ports of a switch and a hacker connects a sniffer to a third point, he will never see traffic going between the user and the server. This is correct in normal situations.

However, there are a number of tactics such as man-in-the-middle (MIM) attacks, which the hacker can use to redirect traffic through his computer for sniffing. Programs such as Cane and Abel come with built-in MIM utilities (how convenient). Using a protocol such as HTTPS means that, even if the hacker is able to reroute traffic through his computer, everything flowing through will be encrypted. Nothing is perfect, and encrypted traffic can be decrypted, but not without employing massive computing power.

Once you have moved users to HTTPS, do not forget to turn off HTTP on the server. If you leave it on, hackers can still perform successful brute-force attacks on the server through HTTP.

• *Stop using Telnet for system administration immediately!* Telnet is 100-percent insecure. Every command is sent in the clear over the Internet. Using Telnet for system administration means that every time you log in, your user name and password are sent in the clear. This is a bad idea. Instead, use Secure Shell (SSH) or a Windows remote desktop connection. Both transmit username and password information as encrypted data. Disable Telnet on the server; in other words, turn off the Telnet daemon so that hackers who attempt to log-in to the server using Telnet get absolutely no response.

Stop using Telnet for system administration immediately! Telnet is 100-percent insecure.

• *Stop using plain File Transfer Protocol (FTP) for public Internet transfers. Similar to Telnet, FTP sends everything in the clear.* FTP servers have some well-known vulnerabilities, so once an attacker identifies that FTP is running on the server, he can tailor attacks to the particular FTP server being used. Use Secure File Transfer Protocol (SFTP) or HTTPS for file transfers.

• *As an alternative to PAT and NAT, deploy virtual private network (VPN) technology for remote access to the server.* Disable all direct access to servers from the Internet. Once VPNs are in place, hackers trying to compromise a machine will be unable to access it on any port at any IP address. Users located remotely will have to first connect to the VPN. Once this connection is made, users are assigned to a secure network segment, and only certain types of traffic are permitted to traverse from the VPN network segment to the server in question. Once the VPN comes up, all traffic between the user and the server is encrypted.

These steps are all intended to keep users and administrators from transmitting usernames and passwords over the Internet in the clear.

• *Stop using username/password combinations for security.* Tools such as THC Hydra perform brute-force password cracking. Watching these tools work is akin to watching old footage of an atomic explosion. They are beautiful and horrific at the same time. When pointed at a target, these programs launch multiple threads (think of tens of simultaneous programs, all executed at the same time), attempting to break in to a system by using huge dictionaries of popular username/password combinations, trying them on as many open protocols as they can find (e.g. Telnet, FTP, HTTP, HTTPS, etc.).

Remember that the first day you saw more than 100 break-in attempts, but that on the second day you saw more than 20,000?! Hackers found your system and launched several Hydras, attempting to try as many username/password combinations as possible to find one that works. Now you know why almost all instructions that come with a computer device say to should change the default username/password combination. That combination is most assuredly already in a brute-force database.

Instead of using username/password combinations, consider using public-key encryption or Microsoft Windows Authentication. These systems allow for user authentication without transmitting username/password information over the network.

Conclusion

To implement any of these suggestions, you will have to do some digging. Space prevents me from going into any more detail. That said, the digging will be worth the work. BE

Brad Gilmer is president of Gilmer & Associates, a management and technology consulting company.

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Brand your channel

Mobile weather channel branding strengthens audience engagement.

BY EVAN SIROF

It is no secret that weather is a critical lure for local TV audiences. With that in mind, WRAL-TV in Raleigh-Durham, NC, has spent years strengthening that relationship by investing in increasingly sophisticated tools for creating and presenting timely and informative weather products, as well as branding those products for its market.

Last year, the broadcaster began researching the possibility of extending its weather brand to mobile devices, beginning with the iPad and iPhone. The goal was to provide viewers with instant access to the station's weather products.

The first question to answer was: Why a stand-alone app? The station already had a popular mobile site and a full-featured news app that includes weather. However, viewers wanted immediate, direct access to weather. The faster viewers could get to the information they needed, the happier they would be. Also, once in the app, people like to be able to dig into the forecasts and maps. A stand-alone weather platform would enable the station to build a targeted weather information platform that offered greater depth and immediacy.

The envisioned app would give viewers direct access to the current forecast. It would be quick and easy, with the type of interpreted data that people expect when they watch the station's meteorologists on-air. The broadcaster also wanted to embed the weather update video it had produced throughout the day. There had to be a close association between what people would get on-air, on the website and through the app. In addition, the solution would enable people to save favorite locations, which would make it easy for them to switch between, for example, their home and their work locations.

The standout feature was interactive radar. Radar maps are essential to engaging weather; people want to see where the weather is and where it is headed in order to plan their activities.

Branding was another important consideration. There is a lot invested in a station's identification. Therefore, it was critical that the mobile environment reflect WRAL's output on other platforms. While doing something new, the goal was not to reinvent the wheel. Rather, the station wanted to take advantage of the platform for its mobility and timeliness, but remain consistent across all platforms. Chief meteorologist Greg Fishel, who has been at the station since 1981, is a well-recognized face in the market and an important part of the trust that viewers put in the station. If the broadcaster was going to put Fishel's name on the "WRAL O-Fishel Weather app," then the product had to match the standards and look of what is delivered to air.

Viewers wanted immediate, direct access to weather. The faster viewers could get to the information they needed, the happier they would be.

Data key to the app

The station has a very capable technical team in house, which provided extensive expertise to evaluate the assets it had in place for the project.

Data was seen as the lynchpin to delivering the level of information the facility was after. Turning to its incumbent weather data provider, Weather Central, the station looked to see what would be required to reuse the data streams it already received for its on-air and Web presentations. Two options presented themselves. The first was for the broadcaster to simply purchase a specific data library tailored to its needs that would be packaged and delivered specifically for its Web app.

The second option, and what was ultimately chosen, was to take advantage of the weather provider's application programming interface (API). (See Figure 1 on page 30.) This would enable the station to establish a dynamic link between its app and a more comprehensive data set, giving it the flexibility to build a more sophisticated app environment. Using the API, the broadcaster gained access to a data set that includes 1km high-resolution forecasting models — essential for achieving the high precision or so-called "hyperlocal" level forecasts the station was after. That local-level data is essential to enabling the facility to distinguish itself from other weather apps on the market and enable it to personalize the app for its individual users.

The API also enables WRAL to maintain a real-time stream of updated data to the app, with a combination of forecast data from the weather service provider and the

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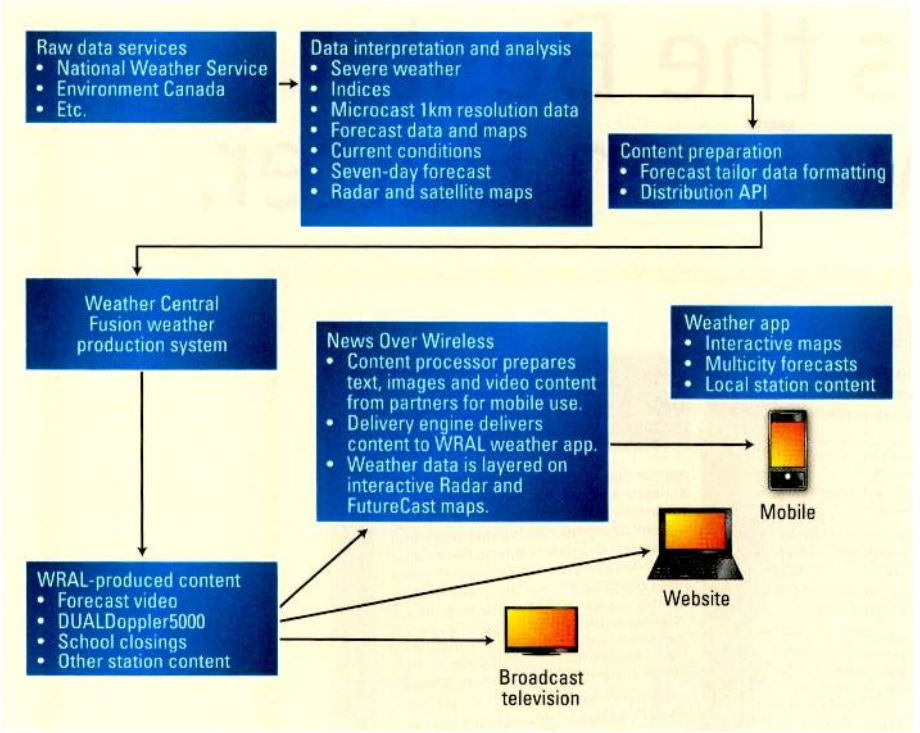

Figure 1. The workflow for WRAL's weather application takes advantage of the station's application programming interface (API) to provide a link between the app and a comprehensive data set.

National Weather Service, all of which can overlay a map that automatically centers on the user or to any other location the user requests.

One of the goals for this system is to enable meteorological staff to publish their forecast once and for the information to be available for all of the station's platforms without having to manually reformat or recreate elements for each. This eliminates much of the repetition.

An on-site server-based content processor ingests and manages all of the interactive weather content from the weather data provider and the station. The processor formats and optimizes the content for delivery to the client software end-user devices such as phones and tablets. The city forecast information and interactive mapping data come directly from live data. The station provides an abundance of other weather information, including video forecasts from station meteorologists, DUALDoppler5000 images, alerts, current conditions, inclement weather closings, storm tracker and a weather almanac.

The app offers a range of features to viewers such as geolocated interactive radar, which allows the audience to view weather down to the street level at their exact location.

Of course, WRAL is a TV station first, so integrating local station video is important. The broadcaster designed the solution so that it could take the on-air weather breaks produced by its Fusion weather system and push the most current weather break to the app for viewing.

The facility partnered with app specialists News Over Wireless to construct the app environment. The client software is a custom interface that enables dynamic content based on user location and preferences. Users can adjust the tab bar navigation so the app loads their favorite content first, be it video, city forecast information, interactive maps or other content. They can opt in to receive push notification alerts from the station, and users can also add, delete and sequence cities to build their own list of favorite forecast locations.

The app offers a range of features to viewers such as geolocated interactive radar, which allows the audience to view weather down to the street level at their exact location. Forward-looking radar and forecasting provides users with a visual representation of forecasted precipitation, temperature, wind and more over an interactive map.

In evaluating the weather app options available on the market, the station decided that the system needed to be "white label," meaning it would have 100 percent ownership of the screen real estate. Many systems co-brand the screen with their own bugs. The station had long since rejected such co-branding on-air and did not want it on any other platform. From the time a user downloads the app through its daily use, he or she only sees station branding.

The broadcaster launched its app through the iTunes app store this spring and has received positive feedback. The app continues to receive fine tuning based on feedback. By building an extensible app platform and taking advantage of a deep data set, the broadcaster can evolve its platform as needs change. BE

Evan Sirof is the president of MarComm-On-Call.

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Storage that can handle content creation and distribution can lead to new revenue opportunities.

BY BOB VASSAR

You don't need to look far in most TV stations and network facilities to find piles and drawers full of recorded video cassettes. Somebody saved them for something. This burgeoning accumulation of historic videotape in physical archives, often structured in someone's head, raises some important questions. For example, how long does it take one to find the exact footage they are looking for, and how fast can they ingest and prepare to edit the material into a new program, news or sports story, promo, or commercial? What event or crisis will propel the facility over the tapeless hurdle? How will managers recognize when it's time, and how does a facility prepare for it?

Any to any

The "end-to-end" systems broadcasters are accustomed to dealing with are devolving into "any-to-any" scenarios. More users and viewers are expecting content to be available from any source, at any location, in any format, to any device, anywhere, anytime. Today, broadcasters are building or investigating collaborative and distributed content storage infrastructure systems that deliver performance for real-time, multipurpose workflows to keep up with the demands of today's multiformat content strategy. To empower an any-to-any system, storage infrastructure must enable organizations to create, manage and reach a broader audience, anywhere, anytime.

Broadcasters have been watching the rapidly developing technologies of storage and recall of A/V and metadata with keen interest, and cloud computing seems to be at the forefront. It wasn't that long ago that storage and instant access to HD content was daunting and expensive. Time and technology has changed that for the better, and inter- and intra-facility private cloud computing is the model of the future. Interestingly, the cost of building an on-site cloud, based on a world-class storage infrastructure, can be less than the cost of a single new high-band 2in quad videotape machine, in 1970 dollars. Comparatively, in 2011 dollars, the price of a universal private cloud system is vastly lower.

Several manufacturers have specialized in designing and building world-record-setting file-based storage platforms for a wide variety of storage-hungry markets. However, few markets are more storage hungry or demanding of no-excuses quality than the professional broadcast, production and film industries. If there is one thing the news and entertainment industries agree on, it is that nobody has time for lingering hour-glass icons, dropped frames or digital artifacts, in formats up to 4K and beyond.

Vision to reality

The broadcast and film industries are looking for new revenue streams and ways to enhance existing revenue streams. As dreamers, consultants and visionaries recognize and agree that active storage is necessary for progress, it will be the broadcast engineers' duty to make it reality.

Active storage solutions for the electronic media industry have split between those who develop and build video server control software and hardware and those who build world-class mass storage systems. Mass storage systems are not actual servers, but rely on products such as Apple's Final Cut Pro, Avid's edit systems, and numerous master control server and traffic systems. (See Figure 1 on page 34.) Some manufacturers are finding a better and more cost-effective business model by focusing on the functions and parts of the system they do best. This allows them to take advantage of mass storage systems manufacturers to provide the functions and parts only a highly-specialized technology company can design and build, using the economy of scale in the larger world of petabyte-scale storage to keep prices reasonable. A growing number of well-known manufacturers serving the professional broadcast industry have developed partnerships with massive storage infrastructure suppliers to fulfill the demands of not only file-based broadcast servers and editing systems, but to prepare for new business opportunities based on repurposing and on-demand revenue streams.

Users of massive storage file infrastructures can be categorized in three groups: production and post, air play, and on-demand. Ideally, regardless of the user group, a mass storage system must be as accessible and simple to operate as an external hard drive. Operators and users should not have to browse through endless partitions and drive letters to find the content they want.

Mauro Cassanmagnago, deputy general manager and engineering director of Videotime SpA Mediaset Group, shared some of his groundbreaking experience in the preparation of this tutorial. He says, "At the most basic level, the specifications of massive file storage infrastructures are size in bytes, I/O speed, response time, and average and worst-case read, write and read/write times." Features such as scrubbing and network infrastructure such as Cat 5/6/7 or Fibre Channel will vary by facility.

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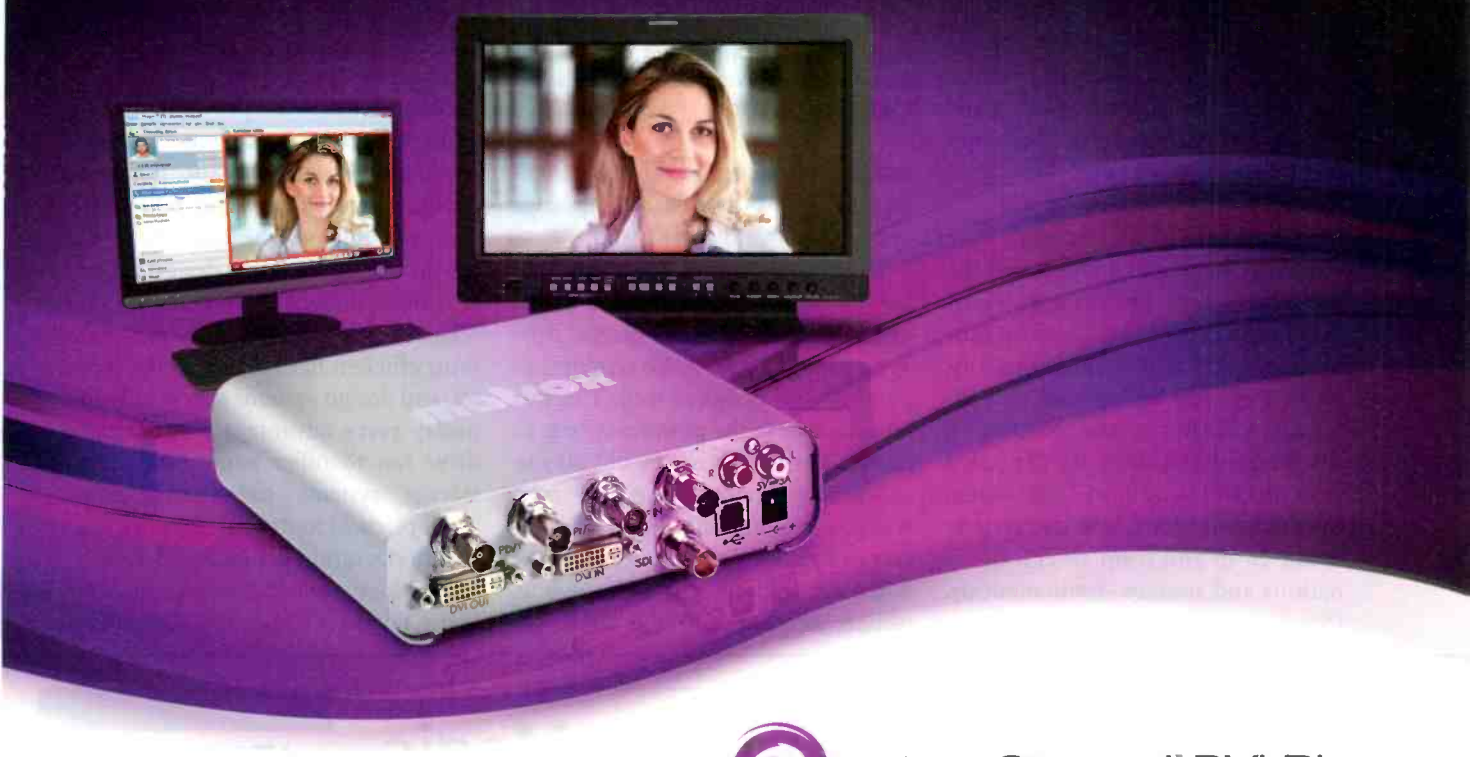

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Every facility and content provider is unique, so no universal standards for a one-size-fits-all storage infrastructure exist. Typically, the number of I/O channels is more a function of external equipment and cards than the storage system, provided the storage infrastructure has the size and speed to handle the aggregate I/O.

More channels require more speed. Higher resolutions require more speed and storage. Other due diligence questions managers must answer are often more about the control systems, demands and predicting the need, in x-bytes, for online, nearline and offline storage. Answering these questions will guide managers in determining the size and speed their facility demands. Not only must managers carefully identify and document their present requirements, but also they need to do as much research and deduced reckoning as possible to predict future requirements.

Not the usual suspects

Before servers and mass storage, many bottleneck problems in television facilities could be solved by adding more VCRs. In a tapeless facility, bottlenecks can be resolved by adding more I/O to a central location. To determine the amount of I/O needed is to identify workflow. Once media material is ingested into the system, it can go to and from several destinations and sources simultaneously. (See Figure 2.)

While most broadcasters are used to thinking in terms of source to antenna, the new environment demands more flexibility and a new way of thinking. Some, such as mobile DTV, may still end at the antenna, but others will be streaming to multiple locations on the Internet or across private networks. Some users may be logging and previewing. Others may be editing or cuing for air play. Still others may be streaming to viewers or other facilities

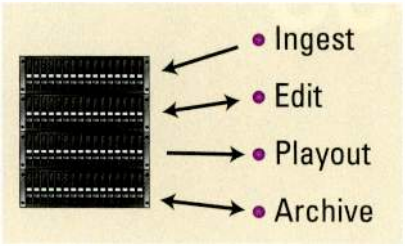

Figure 1. The heart of a content management system is an active mass file storage system.

needing the material. All these functions add up to overhead the storage system must handle flawlessly.

Over provisioning, meaning having too much online storage at the expense of offline and nearline storage, can be trouble if the system isn't planned and designed well. The system must have the power not only to handle day-to-day needs, but also to continue operating seamlessly even while it is rebuilding drives. The secret to successful system design is the balance of speed, channels, online, offline, nearline and the ability to transcode for distribution to a variety of viewing devices.

DIY?

Some broadcast engineers pride themselves in building systems from scratch, and building a mass storage system on a local workbench is not out of the realm of possibility. However, it might not be the best solution. Several factors should be considered before choosing the DIY option. Obviously, budget is a issue, and at first glance DIY may appear to be the least expensive. If you're considering DIY, you need to think redundancy and bandwidth, which are what people normally think of. You also need to come up with a solution for latency, or you may face the real risk of dead air. In the long run, this decision may prove to be the most expensive.

Manufacturers are providing large-scale solutions to a wide variety of markets, which keeps finished product prices down and reliability and invisible self-healing technology at the forefront of design. They also share the benefit of economy of scale. They buy the latest, largest and most efficient hard drives by the pallet, and design systems specifically to parlay every advantage a particular drive has to offer. Some new mass storage systems have remarkably small physical footprints, keeping the cost of operation per rack and square feet of floor space to a minimum. Another factor is redundancy. Similar

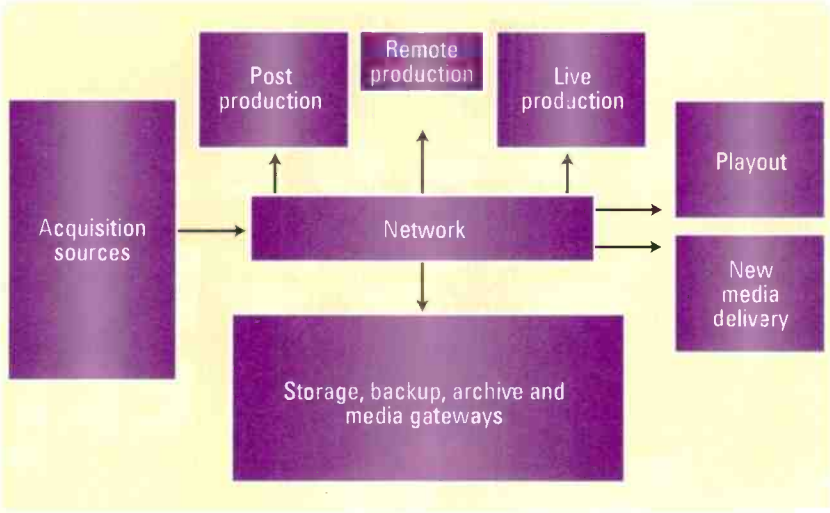

Figure 2. A high-speed network is the backbone of a content management system.

tapeless mass storage in multiple facilities, having similar systems with exchangeable parts, keeps things simple, speeding repairs and lowering spare parts inventories.

Over time, a mass storage system will pay for itself. It will lower the cost of replacement VCRs, electromechanical bench repairs, scanner replacements, alignment tools, fresh tape stock and other tape-related expenses. Better yet, tapeless facilities increase efficiency and expand creative opportunities. They also open the doors to new media opportunities and revenue streams, such as repurposing and transcoding services. Eventually, every facility will be virtually tapeless, but beware of putting all your eggs in one basket. All electronic equipment eventually fails, and in broadcasting it's not unusual for that failure to occur at the worst possible time. You don't see movie studios throwing out films that have been digitized, so don't forget the power of the VCR or VTR to save the day in a critical pinch. BE

Bob Vassar is senior manager, rich media, at DataDirect Networks. *The author would like to thank Mauro Cassanmagnago, deputy general manager and engineering director of Videotime SpA Mediaset Group, for his help in preparation of this article.*


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Creative PACKAGING

BY MICHAEL GROTTICELLI

TSG creates elbow room in new Univision HD production truck.

Spacious, roomy and warm are not terms used to describe the working environment onboard a typical HD mobile production truck, but virtually everyone that has been through the new Univision HD truck, built by The Systems Group (TSG) of Hoboken, NJ, has said the same thing: They all marvel at the "great sense of space."

Designed to handle entertainment projects almost exclusively, the new 53ft double-expando (60in on curbside and 24in street side for the production area monitor wall) rig was built for Univision/Telefuturo and hit the road in February, having recently completed its third HD telecast. The truck is mainly used for long-form series and various reality shows on the Spanish-language network, whereby the truck usually parks next to Univision's remote studio spaces in Miami and serves as a virtual extension of Univision's all-HD facility.

Under the leadership of Paul Rogalinski, director of project integration, TSG was tasked with completing the project under a tight 11-week build-out window that began last December. That's when Gerling & Associates delivered the finished chassis from its Specter series. TSG staff then integrated the technology at its facilities in New Jersey and delivered the show-ready trailer to Univision on Feb. 18. Gerling designed the truck's interior, with lots of input from Univision and TSG.

Univision's new truck features more elbow room for the production crew than they are usually afforded on a 53ft mobile unit. Images © 2011 Andy Washnik, CORPRICOM.

Single EIC control

For Univision, owning and operating its own truck is not a new strategy. To ensure success with this substantial upgrade, the network had a number of requirements that had to be incorporated in order to accommodate its in-house crew. One criterion was that a single engineer-in-charge (EIC) had to be able to control the entire equipment complement from a central location. The latest version of Evertz's Magnum Unified Control software, as well as Evertz VistaLINK and SNMP monitoring and control, make that happen.

Looking to future-proof the truck, its core infrastructure is entirely 3Gb/s compatible, including all of the video cabling, the Evertz EQX router (192 x 160 matrix, with a capacity of 256 x 256), modular terminal and processing gear, and the patch bays. This makes it suitable for all types of HD and even 3-D projects. The only things not 3-D ready at this point are the 11 Ikegami HL-79E cameras and the

Above: The truck's production area has a full-size Evertz monitor wall, a Grass Valley production switcher at the front, and accommodations for producers and graphics staff in a second tier. Upper right: The equipment area has compact racks and router frames to conserve space. Lower right: The Calrec audio console can mix stereo and full surround sound productions.

Grass Valley Kayenne HD production switcher and video monitoring. The truck is wired for 16 cameras, but it could easily accommodate 32 cameras with a bit of extra cabling.

One of the challenges was implementing new and existing equipment into a cohesive whole. The Calrec Sigma console onboard, for example, was taken from the previous SD truck Univision had been using and has now been upgraded and set up to mix 5.1 surround-sound telecasts.

IT-centric live production

The truck features a substantial IT equipment complement, complete with more than 190 Ethernet ports. There are three fully populated Extreme Network 4840 broadcast LANs and an additional 48-port Cisco switch for the enterprise LAN — which connects back to Univision, either over a 1Gb/s or 10Gb/s fiber hop — for the VoIP phone system. There is a 10Gb/s network backbone in each of the rooms onboard. This data network also accommodates IP connectivity for intercom functions, making the system seem like it is functioning inside of the Univision building.

The truck can also distribute a production when required, using four unique fiber transmission paths, each with its own proc amp and encoder. It can send signals as SD-SDI, HD-SDI, and 3G over dedicated fiber.

Above: The camera shading and engineering control area is dedicated to nearly a dozen Ikegami HD cameras and coordination of a number of the truck's sophisticated production systems. Right: Two six-channel EVS XT2 servers along with an EVS XFile and an IPDirector are used primarily for editorial, file record and transmission to master control.

The interior features four main areas. From the front there's the engineering and video control area, videotape and editorial, production control room (with two rows), and audio mixing (Calrec Sigma console) in the rear. There's also a green room outside of the audio area.

The engineering area includes six core equipment racks, the EIC workstation and the video shading console, complete with two Ikegami CRT monitors. Otherwise, the truck features all HD LCD panels.

Design team

Univision:
Bert Delgado, VP of production
Don Lamy, director of engineering
Nick Tejero, production technical manager
Simon Garcia, production technical supervisor

The Systems Group:
Paul L. Rogalinski, director project integration
Mitch Simchowitz, senior consulting engineer
Craig Tabler, integration manager
Rachel Pomerantz, project engineer
Jeff Rivera, project engineer

The tape and editorial area features a variety of tape machines as well as an Apple Final Cut Pro system, where some live show segments are sometimes cut on the spot.

Production room with a multiview

The production control area features a large virtual monitor wall, made up of 15 46in NEC LCD flat panels mounted on Parker Profile Extrusions. The wall is powered by Evertz VIP series multiviewers (VIP-X and VIP-A modules), which are driven by the EQX router. Additional VIP-A multiviewer boards provide monitoring at the audio control position.

The production area features two separate rows for the crew: a five-position front bench and a four-position left-rear bench for graphics, and a two-position, right-rear bench for prompter and clip replay operators. The benches are shorter than usual, but allow for six RU turrets for LCD monitors on the benches. Instead of using typical "doghouse" enclosures, they used extruded aluminum frames, Parker profile extrusions and TBC Consoles arms to mount LCD and VGA monitors. Due to the 60in expandable curbside wall, there's more than enough room for the crew to work.

HD graphics are created with a dual-channel Chyron HyperX3 and dual-channel Vizrt platforms. There are also four dual channels of HD replay (via Grass Valley K2 Summit servers), driven by a Kayenne HD production switcher. And there are four channels of Chyron XClyps. A full complement of EVS live production technology, in the form of two six-channel XT2 servers — along with an EVS XFile and an IPDirector — are used primarily for editorial, record and transmission to master control.

The audio mixing area is also steeped in Multichannel Audio Digital Interface (MADI) networking equipment. The audio router is an Evertz EMR, which mates to the EQX video router via a large TDM matrix. Also, to conserve weight and space, MADI is used as the link between the audio console and the audio router. There are 256 channels of MADI going from the audio console to the audio router and 256 channels of MADI between the EQX video router and the Calrec console.

Making weight

Of course, lots of room is one thing, but as anyone in the truck business knows, overall weight is a major

concern when transporting production vehicles over state highways. Mitch Simchowitz, senior consulting engineer at TSG, said meeting Department of Transportation (DOT) standards for weight was a key concern and was taken into account for all parts of the truck design. In fact, they went to great lengths to carefully select equipment and related technology that would not exceed the legal limits.

Simchowitz said he's most proud of the fact that the truck, with a full 100 gallons of fuel, comes in at 74,600lbs, or 5600lbs under the legal limit. He called that "extremely light," due to the voluminous amount of equipment and extensive use of Belden 1855A cabling inside the truck (as long as the distances met the 3Gb/s spec) and 1694A cable for every video cable that hit the curbside I/O. They also moved the audio router and audio terminal gear to the back of the truck, which saved roughly 400lbs.

In the end, Rogalinski said this was a challenging project to complete, not only due to the short time frame, but also the complex logistics of having to coordinate the reuse of legacy equipment and the installation of equipment ordered directly by the client, as well as additional new gear to complete the final design. It necessitated a lot of project management and client coordination. To help, TSG used a Web-based project management tool called AXIS, which allowed the company to share design documentation and project status remotely with the client as well as quickly getting approvals, saving a lot of time and effort during the project for both parties.

Getting back to the roomy feeling onboard, the truck's internal space is really an illusion made possible by the creative use of space, making it feel larger. It's not any bigger than any of the other recent HD trucks that have hit the road in the past year. That use of space is so well articulated that TSG is now readjusting the front bench to allow it to slide up and back 6in-8-in to give the director, TD and producer a better view of the entire wall. This moveable front bench is unique among most production trucks. BE

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

Technology at work

- Avocent KVM switching system
- Belden coax, network and fiber-optic cabling
- Calrec Sigma audio mixing console
- Canon HD lenses
- Chyron
  - HyperX3 graphics system
  - XClyps clip server
- Cisco switch
- Evertz
  - EMR audio router
  - EQX HD video router
  - Magnum Unified Control software
  - VIP multiviewer software
  - VistaLINK and SNMP monitoring and control
- EVS
  - IPDirector
  - XFile file storage system
  - XT2 HD servers
- Grass Valley
  - K2 Summit HD servers
  - Kayenne HD production switcher
- Ikegami
  - CRT and LCD monitors
  - HL-79E HD cameras
- NEC 46in LCD flat panels
- Parker Profile Extrusions
- Vizrt graphics platform

The making of a stereo 3-D lens

PACE Group's 2-D/3-D integrated camera rig, Shadow D, with Fujinon lenses, was used by CBS Sports at the 2010 U.S. Open Tennis Championship. The event marked the first live, 3-D sports broadcast. Photo courtesy CAMERON | PACE Group.

BY THOM CALABRO

Despite the impressive number of movies and TV sports events produced in stereo 3-D, stereoscopic 3-D production remains a specialized, niche application. All of the 3-D stereo lenses are handcrafted and custom made. The glass must meet strict technical and quality control standards. Telephoto lenses for stereo 3-D need to perform according to precise tolerances at every focal length.

During the manufacturing process, the best HD lenses are selected and further modified for stereo 3-D. Many stereo 3-D cinematographers have been using custom-modified versions of Premier HD lenses on such live stereo 3-D productions as the 2010 World Series, the 2010 U.S. Open tennis tournament and the 2010 Major League Baseball All-Star Game. Performance standards and characteristics have been developed in collaboration with directors of photography on the cutting edge of stereo 3-D, such as James Cameron, as well as with stereo 3-D camera rig manufacturers, such as Vince Pace.

As part of the manufacturing process, user feedback is carefully considered from those who have used stereo 3-D lenses in the field to further perfect the lenses or modify them for specialized applications. For example, lenses have been modified for stereo 3-D aerial camera rigs, such as "cablecams" that fly over a stadium during a sporting event. HD ENG long-barrel lenses are typically modified for use in conventional stereo 3-D camera rigs. And specialized camera rigs intended for aerial or underwater use require much smaller lenses due to space constraints.

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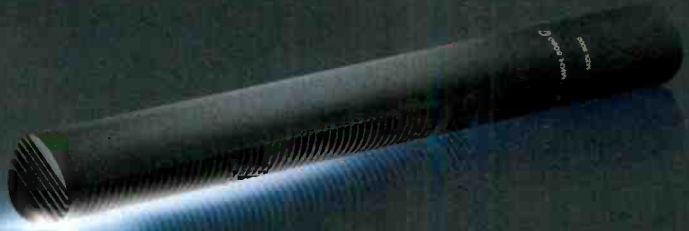


SENNHEISER

First and foremost — lens design

When addressing the best practices for 3-D lens production, it all comes down to making the best possible 2-D lens. The most important part of this process is the design. The design must be sound. The optical and mechanical elements of the lens have to meet strict design criteria. Once the design is finalized, it's turned over to the factory. Once work starts in the factory, the goal is to manufacture the product to the strictest possible standards of the design.

The HA14x4 3-D lens features an electron beam coating (EBC) process, which provides greater light transmission.

With lens design, there are significant challenges at every step along the way. Manufacturers combine optical, mechanical and electrical components, expecting high performance from the complete package. No other product in our industry is as complex.

One of the more important steps in lens construction is the coating process. Multilayer coatings are comprised of minerals that are deposited on each element of a lens. Considerable care must be taken when coating a lens. The coatings produce a number of effects. They allow for greater light transmission than an uncoated element, thus providing the lens with a lower T-factor number. They also reduce the amount of flare and ghosting, giving the lens greater clarity, contrast and depth.

Made to order

While stereo 3-D lenses are 100-percent handmade, there are some preliminary manufacturing processes that are automated. For example, robots handle the processes of coating and grinding the lenses. Once all of the mechanical and electrical components have been assembled, selected HD lenses move on to a specialized workbench where the glass is further refined and polished.

It takes many man-hours to handcraft a single stereo 3-D telephoto lens, with technicians who are experts in optics handcrafting them. Most of the time is devoted to repeated analysis and testing of the lenses, and then putting them back on the workbench for further refinement until tight tolerances have been met.

In the early days of design, manufacturers relied on slide rulers; next came calculators and then computers. Each step allowed lenses to be

Fujinon's HA23x7.6 is an HD ENG long-barrel lens that is ideal for 3-D productions.

built with tighter tolerances. Recently, Fujinon developed a software program called Global Optimization (GO) Technology. This program is a tool that simultaneously monitors many design parameters, affording designers the ability to build a lens that is better optically as well as lighter and smaller. A couple of years ago, the company introduced the XA88x8.8 field lens, a replacement for the XA87x9.3. The XA88x was not only longer and wider optically than the XA87x, but it was physically lighter and smaller. The design of the XA88x field lens was a direct result of the GO Technology program.

Some lenses are not ideal for 3-D production. Very long lenses would not be well-suited. The images that these lenses shoot are from a distance, which would make the image appear very flat or compressed. Thus, a 3-D image would be hard to capture using a conventional rig. It is possible to do, but the lenses would have to be mounted far apart from one another. Recently, a 3-D production was made using long lenses, shooting subjects very far away, namely the moon and distant stars. The 3-D effect was only realized because the lenses were mounted hundreds of feet apart.

Many technical challenges

While the lenses are typically mounted on two cameras within a specialized stereo 3-D camera rig, stereo 3-D lenses are not typically manufactured or sold in pairs. Since each lens is manufactured according to strict tolerances, they are virtually identical and interchangeable, providing the precision performance stereo 3-D requires. Production companies and rental houses do not have to worry about mismatching lens-pairs,

3-D Synchronous Control enables the operation of two lenses in tandem, automatically.

which makes it easier if they are deploying a large complement of lenses.

With stereo 3-D lenses, the optical centering has to track at every focal length. So when a telephoto lens is zoomed from the tight end to the wide end, or vice versa, the center point cannot vary.

In standard production, when a camera operator zooms in on an object such as a face to get a close up, it's

possible to experience a slight optical shift where that object shifts away from the center of the frame — maybe up or down, or left or right. The operator compensates for this, shifting the camera slightly to recenter the object.

But if this optical shift happens with the lenses in a stereo 3-D camera rig, one might cause the centered object to shift to the left, while the other lens shifts it to the right, or any combination of misalignments ultimately detracting from the 3-D illusion. Proper alignment and centering at every focal point must be set at the factory.

Innovative applications

Stereo 3-D lenses are also configured to allow for automation, such as a Synchronous Control box that can synchronize the operation of two lenses in tandem, automatically. If the user needs to know the precise lens position in order to accurately repeat a shot, that information is available as an output. With a RS-232 port on the Synchronous Control box, this system now allows operators to adapt any brand of serial controller they like.

Wireless controllers eliminate cable connections so operators can control lenses from 100m away.

There are also instances where stereo 3-D camera rigs are mounted on jimmy jibs or cranes, or positioned in hazardous locations, such as alongside a racetrack to capture a high-speed race. By adding a wireless controller, all cable connections are eliminated, such as those running from the hand control up to the 3-D camera rig atop the crane. Operators can then control the lenses from a distance of up to 100m away, including from inside a nearby mobile unit.

In the future, expect to see increased demand for stereo 3-D lenses, especially for events like the Olympics and World Cup. Stereo 3-D is also proving especially beneficial to such sports as boxing and on golf putting greens, where the action is confined to a relatively small area. During the 2011 Masters Golf tournament, there were more than 20 3-D camera rigs with lenses on the greens, enabling viewers to detect how the contours of the course might affect the way the ball would travel. BE

Thom Calabro is director of marketing and product development at FUJIFILM North America, optical devices division.


FACE
time

Skin tone macroblock detection for video coding can improve the perceptual quality of human faces.

BY PAULA CARILLO AND AKIRA OSAMOTO

In video compression algorithms, the quantization parameter is typically adapted based on overall bit usage and relative complexity of the region in the picture. However, such complexity-based rate control algorithms do not emphasize the fact that certain objects, such as human faces, are more sensitive to the overall perceptual video quality. To improve overall perceptual quality, it is important to classify human faces as regions of interest (ROI) and preserve as much detail as possible. The challenge is to develop a reliable algorithm that works in real-time implementations. This article will explore a low-complexity system that can run on a single-core DSP as part of an encoder implementation.

The proposed system is a low-complexity, color-based skin tone detection, which classifies skin tone macroblocks (MB) as ROI MBs and non-skin tone macroblocks as non-ROI MBs (MB; 16 x 16 block of pixels). The classification is based on some empirical thresholds applied to the mean of the color components. The empirical threshold values were defined after an extensive training using material that covers all kinds of races. According to this classification and a modified rate control (RC) that permits smoothly assigning different levels of quality, we can increase visual quality in human faces. The new RC assigns a lower quantization parameter (QP) to ROI areas compared to non-ROI areas, while maintaining the overall bits budget per frame.

To reduce false positives and missed MBs, a detection refinement is applied using erosion and dilation algorithms. These morphology algorithms use classified neighbors' information to fill holes (missed MBs) and find isolated blocks (false positives). False positive ROI MBs lead to an erroneous allocation of valuable bits, while missed ROI MBs create a non-smooth region perception.

Erosion helps to find false positives and mark them as non-ROI. Dilation does the opposite; it finds holes in skin regions (like eyes or mouth in faces regions) and marks them as ROI. (See Figure 1.)

Two versions of erosion and dilation were implemented — one for preprocessing, in which all the MBs of a frame were previously classified

Figure 1A. Detected skin regions without applying morphology algorithms are shown in pink, and as a result, the eyes are not part of the ROI. Figure 1B. After applying morphology algorithms, the complete face is marked as ROI.

Figure 2A. Shown here are the results for an ROI detection merged inside the encoder. Figure 2B. This example uses all MBs neighbors' information to return a final ROI classification.

as an ROI or non-ROI before being encoded, and one that was merged inside the encoder. In preprocessing, we use all neighboring MBs' skin information to decide if an MB skin classification is a false positive, a hole or if it is correct, and accordingly make the correct ROI/non-ROI classification. When the erosion and dilatation algorithms are immersed in the encoder, only top, left, top-left and top-right skin MB neighbors' information are available for making refinement decisions, but this version is suitable for low-latency applications. (See Figure 2.)

In addition to the erosion/dilation algorithms, an MB activity gradient threshold is used for reducing the number of false positives, especially when videos have many small faces (e.g. faces in a crowd). Background faces in a crowd are not subjects for ROI treatment.

An implementation based on 8 x 8 pixel blocks detection for luma and 4 x 4 pixel blocks for chroma components (in case of 4:2:0 video format) helps to improve the algorithm precision comparing with 16 x 16 pixel block detection. The logic used is if two or more of the four blocks from an MB are classified as skin blocks, then the complete MB is marked as skin MB.

Also, we implemented another preprocessing decision to eliminate frames that have too many MBs marked as ROI, in which case it is pointless to do frame bit redistribution. If more than 30 percent of a frame is detected as skin, then all the MBs are remarked as non-ROI.

Finally, to reduce processing cycles and increase channel density per core, a decimation process was implemented. In this process, we skip some pixel values to get the mean of the color component blocks. For luma components, instead of getting the mean value of 64 8-bit pixels, we decimate in steps of four and get the mean of only four 8-bit pixels per 8 x 8 block. In the case of chroma 4 x 4 component blocks, the decimation step used is four. Decimation decreases ROI classification precision. However, it results in a fair tradeoff in case of preprocessing multiple HD channels in a single core.

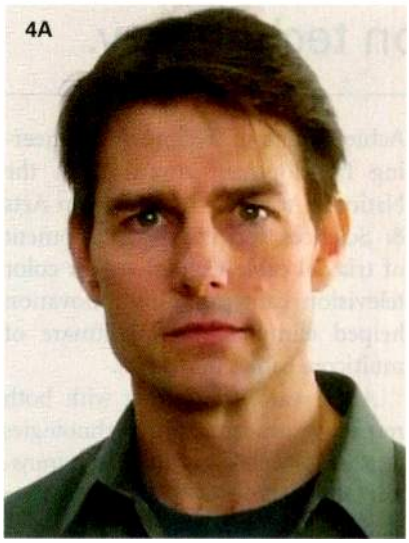
Figure 3 and Figure 4 show a visual quality (VQ) comparison of using/non-using ROI detection as part of H.264 encoder. Figure 3 was encoded at a low bit rate in order to stress the VQ difference. This sequence has many small objects in movement (i.e. water drops), which drain rate control's bit budget. This results in a notorious visual degradation of the face in front when ROI RC modification is not

In addition to the erosion/dilation algorithms, an MB activity gradient threshold is used for reducing the number of false positives, especially when videos have many small faces.

Figure 3A. This shows an H.264-encoded chroma key sequence without ROI applied. Figure 3B. This illustrates the sequence with ROI applied.

applied. Figure 4 shows content similar to that found in video conferencing, in which the background is usually static and faces are the critical information to transmit.

For better user perception, a low-complexity implementation of skin tone detection algorithms with a highly accurate classification is currently desired in the video market.



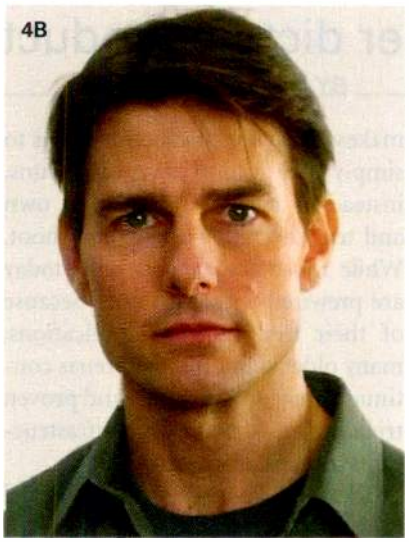


Figure 4A. This shows video conference content without ROI RC applied. Figure 4B. This shows the same video conference content when ROI RC is applied.

ROI detection could be implemented in a video frame preprocessing stage, or with less accuracy, it could be merged inside a standard video codec. A low-complexity implementation gives the advantage of fast decisions (fewer cycles) when deciding if an MB is part of an ROI area. Fast decisions with a low-complexity classification algorithm permit a real-time ROI detection implementation on low-power processors for high channel density scenarios. Additionally, a low-complexity ROI implementation helps encoders to improve overall video quality in numerous applications, such as video broadcast, video conference, video security and smart cameras, among others. BE

Paula Carrillo is a video applications engineer for multicore and media infrastructure group, and Akira Osamoto is a software engineer specializing in video compression algorithms and video processing at Texas Instruments.

Grass Valley's 3G Transmission

Venues no longer dictate production technology.

BY MARCEL KOUTSTAAL

In most live sports and entertainment productions, transmitting camera signals from designated camera positions (either fixed or roving) back to the on-site production truck has always been a major challenge, given the amount of signals that need to be transported and the extreme conditions that production crews face on a daily basis. Triaxial, or triax, cable is still the most often used cable due to its durability, and is often dictated by the fact that many older venues are prewired with coaxial video cabling.

Most sports stadiums are still wired for triax.

However, with the demand for bandwidth-intensive, HD productions (up to the full native 1080p/60 resolution) has come a need for a better way to send these larger (more data) signals farther than is possible over traditional HD triax. Therefore, fiber-optic cabling has been configured for live production and has helped solve logistical issues involved with live single- and multi-site projects.

Venues that host television productions will usually have triax or fiber running from the location of the mobile truck to common camera locations throughout the building. This makes it easy for production crews to simply plug into existing cable runs, instead of having to run their own and tear them down after the shoot. While most new venues built today are prewired with dark fiber because of their multipurpose applications, many older stadiums and arenas continue to rely on the robust and proven triax cables — with some infrastructures more than 10 years old.

Today, these two types of signal transmission systems have more or less split the market into two segments — similar to the 1080i and 720p HD format debate. This has forced mobile production companies to have to maintain trucks in their fleet that are compatible with either triax or fiber and then send out the appropriate truck as the venue dictates. It's also required them to buy separate transmission systems for their cameras, at considerable expense, to be able to accept high-profile projects they didn't want to lose.

Grass Valley offers the option to use either a triax or fiber back with the same HD camera head.

3G Transmission solution

The camera engineers in Breda, The Netherlands — where Grass Valley cameras are designed and crafted — have been developing different technologies for sending camera signals (and related control commands) since the early 1990s. In 1992, the camera excellence center development team received the Outstanding Achievement in Technical/Engineering Development Award from the National Academy of Television Arts & Sciences for its co-development of triaxial cable technology for color television cameras. This innovation helped eliminate the nightmare of multicore cables in studios.

After years of working with both respective transmission technologies (e.g. Grass Valley was the first to transmit 1080p50/60 to the camera base station natively), the company has created a solution that takes away the limitations and differences between triax and fiber connectivity and merges the benefits of both into a single digital transmission platform, called 3G Transmission. "3G" stands for the third-generation transmission system. After transitioning multicore to triax and triax to HD triax, we're now making available 1080p50/60 transmission over fiber or triax with the same flexibility and number of available return signals. Available in either triax or fiber versions, 3G Transmission can accommodate any 1.5Gb/s and 3Gb/s format, while allowing users to utilize the same LDK 8000 Elite or LDK 4000 Elite camera heads for either of the two infrastructures.

Bandwidth-intensive HD signals travel farther over fiber cabling.

The 3G triax or fiber module simply snaps on the back of the camera's head, and the operator is ready to work.

The system allows any choice of transmission cable to carry either 1080i, 720p or 1080p50/60 HD video (along with a full set of transmission features and diagnostics). The system is also ready for multiplexed pairs of 720p or 1080i HD signals for stereoscopic 3-D applications. As an added benefit, it extends the range of triax coverage by 25 percent, to a conservative minimum of 4921ft — closely replicating the performance of SMPTE hybrid fiber while getting more out of those preinstalled cables. 3G Transmission also stands up well under various weather and other environmental conditions, which is equally important to signal support.

In addition to the camera's digital video output, the system carries four digital audio channels back to the base station as two AES/EBU pairs as well as embedded within the HD-SDI digital video signal. Two independent HD video returns can be sent to the camera for operator monitoring and, for example, a stage-floor monitor, at the same time. The solution also provides talkback and a data channel for camera control, communication with robotics, real-time graphical overlay processing data channels or remote alignment of a stereoscopic rig.

For production companies, the system makes sense because it protects the investment in a camera transmission system by allowing operators to work in virtually any venue and have the comfort of knowing they can work with all types of SD, HD and even 3-D clients — today and tomorrow. It's important to future-proof the equipment as much as possible because broadcasters will continue to demand an ever-wider variety of production formats. A 3G Transmission system safeguards the initial investment by offering the maximum flexibility possible so that users can produce different jobs on different days with the same equipment.

It's often been said that technology should not dictate the project — the creative vision should. As the production industry continues to meet the challenges of the latest advances in video production, it needs systems that are as flexible as possible so that the barriers to successful project completion are minimized. By introducing 3G Transmission solutions into the live production industry, we're moving closer to a transmission-agnostic world — one with fewer limitations. That's good for signal quality, wide-ranging client demands and capital investment. BE

Marcel Koutstaal is senior vice president, cameras, Grass Valley.

Small Tree's ST-FCoE

Ethernet's ubiquity leads to implementation of cost-effective workflow technology.

BY STEVE MODICA

For many broadcasting entities and creative agencies with multiple users moving large files across a network, Fibre Channel was a sensible alternative. Originally created as a better network for storage, Fibre Channel was meant to be lossless and redundant, as well as offer features that Ethernet did not. This was critical because storage doesn't do well when commands or packets of data are dropped, which causes problems with the operating system. Fibre Channel's biggest drawback, however, has been cost to implement, due to infrastructure requirements associated with installation.

Since the introduction of Fibre Channel, Ethernet has continued to grow and "suck in" more technology, such as switching, flow control and better congestion management. As a result, the cost and difficulty in continuing to make faster and faster Fibre Channel chips has been magnified, especially when taking into consideration that the FC protocol can run over Ethernet to achieve similar performance at a fraction of the cost. Ethernet is on every motherboard, and 10GigE will begin to appear on motherboards within six months. Thus, the shift to Fibre Channel over Ethernet (FCoE), which enables professionals to run FC over inexpensive, ubiquitous, standard Ethernet.

Circumventing TCP

Taking advantage of 10GigE's robust throughput capabilities, Small Tree's Leaf Host Bus Adapter running ST-FCoE — a stand-alone initiator with one to six 10GigE ports — will offer maximum efficiency and ease in handling 10-bit HD uncompressed video or next-generation 8K video.

FCoE rips out the physical layer — the chips, cable, lasers, etc. — and replaces it with the Ethernet layer. This circumvents having to use TCP, which is the standard protocol over Ethernet to move data around. TCP makes sure data packets are correct and arrive in order and on time. For years, network vendors have tried to bury the TCP stack down in the network card to make it go faster, and it's never been easy.

The beauty of FCoE is that the stack doesn't have to change. Using Direct Data Placement (DDP), Small Tree's 10GigE network card takes data sent from the remote card and dumps the data right into memory. The card doesn't have to communicate with the CPU via TCP before the data appears in the user's space. This reduces the CPU workload, enabling the system to run much faster and the network card to perform like a storage card.

Converged networking

While working on a 10GigE driver for Intel and its latest 82599 chip, it became clear that we should add a storage driver to the card. Leveraging our previous experience with the AoE and iSCSI protocols, we created a storage driver and GUI for Mac OS X. This allows Mac users as they are moving to newer, faster storage to purchase an open 10GigE switch that will support FCoE and old-fashioned Fibre Channel over one plug. This is converged networking.

What impact will this have in the broadcast industry? Users on the new Westmere Mac Pros will be able to put a six-port 10GigE card in the machine, dedicate three of the ports to storage and dedicate three ports to broadcast. In just one 16x PCIe slot, you will have 60Gb/s of bandwidth, one way, that can be used to broadcast MPEG, or whatever format you're broadcasting, with low latency because it's all offloaded with no TCP involved.

Small Tree's 10GigE FCoE network card takes data sent from the remote card and dumps the data right into memory.

Ethernet features a new flow mechanism that makes it lossless so that FC packets are easily passed over the network with no loss of performance. QoS capabilities, ensuring important storage data is prioritized ahead of less important data, are also available with FCoE. In fact, unimportant traffic is dropped by the new flow control mechanism, helping to assure FCoE storage packet arrival to the user.

Fibre Channel loses the war

With the increasing shift to 10GigE and the ubiquity of Ethernet, Fibre Channel has lost the war. It's too expensive and is not easily scalable, making it an unattractive alternative to companies expecting to grow in the future. FCoE takes advantage of technology that already exists, eliminating the need for reconfiguring your entire infrastructure. FCoE systems, with one cable handling both storage and networking, will simplify the physical cabling layouts and storage purchasing decisions. BE

Steve Modica is the CTO of Small Tree.

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NewTek's TriCaster

MTV leverages streaming video from movie awards to complement overall production effort.

BY PHIL KURZ

Over the past few years, MTV and the MTVN Music Group have leveraged online video streaming and social media to complement linear programming and further engage viewers with shows. But producing these streams — whether they're complementing TV coverage of awards shows or giving fans of shows like "The Hills" a way to connect with each other as they dish about an episode that's just aired — comes with a unique set of constraints. The most obvious is a return on investment equation that puts a sharper pencil to the production budget. Where the music network's audience for a TV event and the revenue it generates likely justifies rolling a production truck and incurring all of the associated expenses, the metrics for a streaming presentation probably don't. That doesn't discourage Jeff Jacobs, vice president production planning and strategies at MTV, however. It just makes the challenge all the more interesting.

Such was the case at the MTV Movie Awards June 5 from the Gibson Amphitheatre in Universal City, CA. MTV tasked Jacobs' Emerging Technology Group to develop an alternate production workflow in which three separate streaming video productions would complement its linear coverage. First, the network wanted to tap the excitement building prior to the show with live Sneak Peek Week coverage on MTV and MTV.com every night from the Silver Screen Theater at the Pacific Design Center in West Hollywood. Second, the network aimed to give its audience a streaming video VIP perspective on backstage happenings and from the red carpet to complement its linear TV coverage. Third, it wanted to give journalists who couldn't attend a way to view winners after receiving their awards presentation and interact with them via the Internet.

To meet the network's objectives, Jacobs put three NewTek TriCaster video production switchers to work: a TriCaster 300 for the three-camera production of Sneak Peek Week; a TriCaster 850 for the 14-camera red carpet/backstage show; and a TriCaster 300 for the three-camera production of winner interviews for the press. Both models deliver live switching of HD sources, HD effects and titling, as well as on-site video encoding for Internet streaming — all of which are critical features for MTV. Where they differ is in size, portability and number of video inputs. The 20lb TriCaster 300 is more portable but offers just three camera inputs, while the TriCaster 850 is an eight-input switcher in a bigger, 4U rack-mount form factor. Both can encode Adobe Flash Media and Microsoft Windows Media, as well as support HD and 16:9 streaming.

Sneak peek

The goal of Sneak Peek Week coverage was to give viewers a taste of this summer's blockbuster movies and a way to interact with their favorite stars. A short show would air live on the network's linear channel, followed by a longer, 30-minute show streamed live on MTV.com. Every night, 300 people gathered at the Silver Screen Theater to get a sneak peek of the movies. Afterwards, stars from the films would do a Q&A with MTV entertainment reporter Josh Horowitz. During the streaming show, fans in the theater could then ask questions in person, and because the network was live streaming, fans at home could IM, Facebook and Twitter in questions to the celebrities

In the MTV Movie Awards press tent, Dimitry Grekov operates a NewTek TriCaster XD300. The video production switcher enabled MTV to stream content from a press room live, while accepting questions from the press via IM and Twitter.

and watch their responses via the live stream.

MTV's red carpet and backstage coverage illustrates how linear TV and streaming video can complement each other to give viewers a richer experience. During the live stream, viewers can focus their attention on the linear program, and during acts they can look online at what's happening backstage.

To support the red carpet and backstage production, the network relied on the eight-input version of the production switcher, as well as a small router to handle the 14 HD camera feeds. Jacobs, who has developed alternate production workflows and produced streaming red carpet coverage from the Oscars and the Grammys for MTV, was confident viewers would flock to the stream from the network's movie awards because a million people a day have logged on to watch the other awards shows. For the MTV Movie Awards, streaming coverage of the red carpet started two hours prior to the show and ended an hour after its conclusion.

Similarly, streaming video played an important role for the nation's press at this year's movie awards. Typically at awards shows, winners receive their trophies onstage, walk about 100ft to a tent or adjacent hall and answer questions from the press.

Jacobs says, "That's beautiful, delicious content that the Grammys doesn't show you, the Oscars never shows you and the VMAs at MTV never showed you. But we thought this is great stuff. Why don't we put a camera there and put it into a TriCaster and stream this?"

Streaming the content gave financially strapped media outlets a way to cover the awards without actually having to send reporters to the show. Reporters from around the world watched from the press room live. In addition, hundreds of questions were submitted by reporters via IM and Twitter and were answered by the stars.

Fade to black

Live streaming events like the MTV Movie Awards are a reflection of a commitment the network made four years ago to take advantage of the changes its viewers were making in how they watch television. It's common for MTV viewers to come home, flip on the TV and turn on their laptops.

Delivering streaming content to enrich this viewing approach had to be done right, however. The network knew that live streaming did not have the ROI and the planning ability from a time and logistics point of view to produce content similar to how its done via linear TV technology.

Looking for a multicamera production switcher that could meet its unique streaming requirements led MTV to NewTek. Encoding onsite was important for the network, as was the ability to input its own graphics and call them in live. The ability to preload video clips and play live was also vital. The TriCaster delivered those creative tools, the portability to get to within feet of the red carpet and cost efficiency the network needed to deliver the ROI and production quality to make live streaming coverage successful. BE

Streaming the content gave financially strapped media outlets a way to cover the awards without actually having to send reporters to the show.

Phil Kurz regularly reports on the broadcast industry and is the writer of Broadcast Engineering's "OTT Trends & Technology" e-newsletter.

Biamp Systems' AudiaFLEX and Sona

The systems helped fans watching basketball in a football stadium experience courtside sounds.

BY BOB LEDO

When the NCAA decided to move the Final Four portion of its national collegiate basketball championship to Ford Field in Detroit three years ago, the world watched as basketball was elevated to an even bigger stage. Yet while the change offered more people the chance to see the games live, it presented some unforeseen challenges in trying to preserve the feel and spirit of the games that fans nationwide had come to enjoy in arenas half the size of Ford Field.

So the NCAA enlisted the help of Coffeen Fricke & Associates to develop a system to meet the different acoustic challenges that the larger football stadiums presented, specifically acoustic intimacy.

In a basketball arena, fans typically sit on the floor, at the same level as the game. A football stadium the size of Reliant Stadium in Houston — with a capacity of more than 77,000 — doesn't have the same audio coverage because fans are sitting below the floor and further back, much more spread out. So those who attended the initial games in these larger venues commented that the games lacked the same feeling as a typical basketball arena.

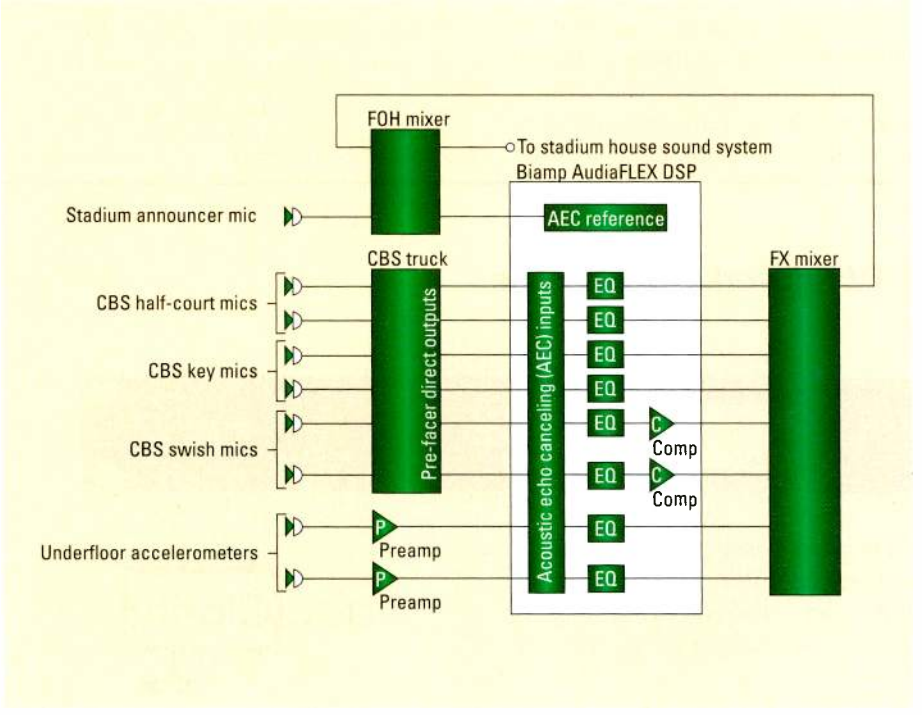

Figure 1. For the NCAA college basketball tournament, Coffeen Fricke & Associates used a Biamp Systems AudiaFLEX to send on-court sound to spectators in the farthest reaches of several football stadiums. The company added a SONA acoustic echo cancellation (AEC) card to remove a distracting echo that interfered with the CBS broadcast.

The plan devised by Coffeen Fricke called for a single Biamp Systems AudiaFLEX with a SONA acoustic echo cancellation (AEC) card. (See Figure 1.) The fix combined taking live feeds from the CBS live broadcast — the one that picks up the live court sounds such as shoe squeaks, hoop swishes and rim rattles — and mixing those inputs with microphones that sit on the court. These "sound effects" were then mixed back in to the house sound, so that audience members sitting in the farthest seats would still get an experience that sounded as though they were sitting courtside.

Stephen Solberg, a senior associate with Coffeen Fricke, said the firm had used AudiaFLEX previously, but this setup was different. The distance between microphones and speakers was approximately 35ft, rather than 8ft-10ft as found in a boardroom setting. They also had to compensate for much more powerful speakers, Electro-Voice line arrays in this case. In the end, the system worked wonderfully.

The concept had been tested and applied in tournament finals games the last two years. However, in each instance, the remixed sound was causing echoes in the CBS broadcast mix. This was due to the announcer's voice being picked up a second time, creating a distracting echo in the CBS feed that prompted CBS producers to ask that the Coffeen Fricke microphones be switched off to eliminate the echo. This year, with Biamp SONA applied, the team was able to eliminate any echo and still provide the sounds of the game to the live crowd.

To solve the echo problem, a single AudiaFLEX was programmed with

The bandwidth of the SONA handled the acoustic demands of the stadium and its speakers.

SONA acoustic echo cancellation to remove the announcer's voice from the feed back to the arena. The system received 10 mic feeds on the court, six from CBS and four of its own, and two additional inputs from the house feed to serve as reference points for what SONA should subtract from the court mics. It handled echo cancellation only and then sent all signals straight out to a Mackie console for a full mix. AudiaFLEX processing also performed some band limiting to isolate the desired effects from other things happening in the arena. The tuning of the arena was done on the actual arena house system.

The bandwidth of the SONA handled the acoustic demands of the stadium and its speakers. The AEC was run all the way out to 20kHz, and it handled the extremes well.

The raw feed that was being sent back to the house, with the long reverb time and the long distance between the mics and speakers, sounded strange acoustically. The direct announcer's voice that was being fed in to the PA was missing completely, but all of the reverberant tail in the room — approximately 7 seconds worth — was still there, because it was never there in the reference. When the team fed it back in to the arena, it actually sounded good. BE

Courtside sounds were mixed back into the house sound so that spectators in the farthest seats could still hear them.

Bob Ledo is senior vice president of Coffeen Fricke & Associates.

Production switching

IT developments are making their way into broadcast switchers.

BY JOHN LUFF

Product categories evolve over time, not unlike the natural world. Things that make a product distinct and useful tend to show up in similar ways in other manufacturers' products. Patents notwithstanding, it is easy to understand that one company's success breeds sincere copying. What is perhaps most interesting is when a feature becomes generic and expected. Then all subsequent products have little option but to incorporate the good ideas that may have started elsewhere.

Switcher innovations

I am specifically thinking about the periodic introduction of small switchers as game changers. In another century, and in the analog domain, Grass Valley introduced the Model 100 switcher. I'm not sure what market the company thought it was addressing, but I would be willing to bet Grass Valley was astounded at the places it ended up — edit suites, production controls rooms in broadcast, education and industry, and surprisingly major mobile units where it became a key element for split feeds and in truck editing. It spawned the IPS-100 with an automated audio console and character generator integrated into one product. But would the original designers be surprised that periodically over the last 26 years, since the Model 100 took hold, there have been copycat products, first component analog, then digital and most recently with built-in multiviewers, frame syncs and even digital effects?

The answer is yes, in some respects. Imitation is the sincerest form of flattery. Innovation in production switchers is all about imitation and differentiation. Grass Valley created a memory store for panel recall in the 1600 series of production switchers, and like Kleenex, EMEM has become an accepted part of the lexicon, even if other manufacturers were obliged to find another name for it. The key point is that it changed the way the product is used and therefore became critical to competitor's products.

Other instances of such invention and imitation are all over the production switcher market. Many of today's switchers have built-in multiviewers, from modest to grand. And in every case they solve particular problems in the integration of switchers into complete production systems. A large switcher might include a multiviewer to allow an easy upgrade to a control room, including the monitor wall, instead of buying stand-alone products. A small switcher may have a multiviewer because it drops the cost of installation dramatically, or makes a portable system with its own monitoring quite practical and easy to deploy in the field from a suitcase.

Another example is the integration of multiple formats in one switcher. It may have begun with onboard aspect ratio conversion to allow the use of 16:9 and 4:3 pictures in one SD production system without having a slew of outboard conversion

Virginia's Fairfax County Public Schools system produces high-quality live and recorded productions utilizing two Ross Vision 3 production switchers located in the studio control room and production truck.

Product categories evolve over time, not unlike the natural world. Things that make a product distinct tend to show up in similar ways in other manufacturers' products.

products. Over time, the concept has evolved to include integrating HD and SD in one switcher. A few years ago, one manufacturer, who also built high-quality up/downconverters, integrated software and hardware to do up/down/crossconversion in the switcher, including the ability to author an SD and HD output from the same switcher. This seems totally logical because at the time the industry was deep in the conversion from SD to HD. That strategy now looks more like the integration of legacy SD content into current productions without having an SD infrastructure around to support the past. How perfectly logical ...

Imagining the kind of innovation that might bring, and the further drop in development cost that could accrue, is intoxicating.

Where innovation originates

Increasingly, these innovations are software running in GPU hardware or other generic IT and consumer-based hardware developments. On the scale of the long-term sweep of technology, nothing could be more important to the industry. We are a small business. At one time, we could expect RCA to develop a vertical product line that started in acquisition and continued through post, broadcast and finally ended in the consumer display. Now the reverse is more likely to happen, where a development that makes a new consumer device possible filters into the professional industry. Cameras are an obvious place where this happens with great impact on the manufacturers we know best. But consider the development of scalars for flat-panel televisions. Is that not in spirit if not in fact the origin of the multiviewers in production switchers I mentioned earlier? A capability that was developed to sell masses of chips in the consumer marketplace drifts into the corner cases in our industry and finally becomes critical to the feature set in a production switcher.

I am not concerned about the future of the production switcher market in the least. That is not to say that if I worked for a manufacturer I would not be struggling to find innovations that can be migrated into a switcher. Internal clip players, still stores, buttons that relegend themselves and magically change color, and touchscreen interfaces are not new, but the methodology of implementing them using generically available technology is critical to manufacturing cost. That kind of innovation provides features we have come to expect and offers the manufacturer reductions in cost to partially offset the design and development expense.

To date, few switchers use generic IT technology in the signal path. But in an era in which it is hard to justify developing complicated products for a tiny industry like ours, does it make sense to continue building special-purpose hardware and code software that can only run on hardware that might not be available in 10 years because parts have been discontinued? I suspect the obvious answer has pushed most manufacturers to look hard at the incredible processing power of six core processors, cell processors and GPU chips, and think about switching from purpose-built hardware to a rack of blade servers and a terabyte of memory. Imagining the kind of innovation that might bring, and the further drop in development cost that could accrue, is intoxicating. If my iPhone can rotate and scale images in real time, can this be so hard? The obvious answer is yes! BE

John Luff is a broadcast technology consultant.

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

Panasonic — AJ-SF110

Ingest software supports archiving P2 files to LTO, Blu-ray or other storage devices; features proxy creation, as well as metadata preview and editing; with LTO storage, operator can play back P2 content on the LTO directly and quickly retrieve partial images; transfer speed is up to six times faster than AVC-Intra 100 normal speed when using LTO5.

877-803-8492
www.panasonic.com/business-solutions

Radial Engineering — H-Amp

Speaker-to-headphone converter allows two sets of headphones to be driven directly from a speaker connection or amplifier output; equipped with two Neutrik Speakon fittings; speaker signal is converted to a safe mono-adjustable output for headphones; multiple H-Amps can be used in series by adding more Speakon NC4 cables.

604 942-1001; www.radialeng.com

Shotoku — SX300

Pan-and-tilt head has a maximum payload of 83.8lbs for portable cameras with viewfinders and prompters; robust structure and wide range of balance supports a versatile variety of camera configurations; mount can be either flat base or 150mm ball.

310-782-8491; www.shotoku.tv

Avid — Interplay Central

Web-based/mobile workflow tool enables individuals in different media production functions to access the tools they need to complete tasks with greater visibility to assets, team collaboration and workflow agility; available to users through a lightweight, intuitive Web-based portal and a mobile app; users access a self-contained, individualized view designed for tasks associated with different parts of the media production process; users can browse, create and edit content directly from anywhere — even when they are offline or out of network range — and changes will be reflected in projects as soon as they have regained network connectivity.

978-640-6789; www.avid.com

Linear Acoustic — AERO.calm

Audio loudness manager combines sophisticated audio analysis and metadata control; can process audio in a reversible manner, permanently for noncritical material or anywhere in between; features smooth and consistent operation; users can choose to hear the full range of the original content; available in versions to handle baseband AES/SDI audio, DVB-ASI and transport stream over IP.

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www.linearacoustic.com

Optical Cable — Secure LC

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540-265-0690; www.occfiber.com

Streambox — Streambox Live Pro

Enhanced version of the company's IP-based video contribution Streambox Live Service; enables remote reporters and citizen journalists to upload compressed live video streams to broadcast studios through Internet-based Streambox Live Data Centers located at multiple points around the world; features uncapped bandwidth, Advanced Audio Encoding and full D1 resolution, taking advantage of emerging 4G cellular networks and allowing more video content to be transported, and at a higher quality.

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www.streambox.com

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Eight-drive RAID 5 desktop storage system features Thunderbolt technology; includes a high-performance internal RAID controller that supports RAID 0, 1, 5 and JBOD; drive configuration is managed through a simple-to-use application; available in 8TB, 12TB, 16TB or 24TB configurations; suited for HD video editing; achieves data transfers up to 800MB/s read and 730MB/s write — fast enough to handle a single stream of uncompressed 10-bit 1080 4:4:4 HD, or multiple streams of ProRes 422, uncompressed 8-bit 1080 HD, DV, HDV and DVCPRO video.

949-587-3500; www.sonnettech.com

Sony — MVS-7000X

A multiformat, native 3G production switcher at a more cost-effective price; easily configured from 1M/E to 6M/Es, with Multi Program 2 (split M/E) capability; scales up to eight keyers per M/E each with a 2.5D resizer; up to four channels of internal MVE-9000-level effects; can be configured with up to 80 inputs and 48 inputs in a compact 8RU frame.

201-930-1000; http://pro.sony.com

Vizrt — Virtual Window

3-D broadcast solution adds depth extension to studio to create a real-world user experience by changing object perspective as the camera moves between different positions; features immersive graphics that add another layer of depth to 3-D environment; provides viewers with the opportunity to directly influence the live presentation through companion apps for iOS and HTML5 on iPads and tablet computers.

212-560-0708; www.vizrt.com

Sound Devices — MixPre-D

Portable audio mixer serves as a flexible, class-compliant USB audio interface; features two studio-grade mic/line-switchable inputs with limiters, high-pass filters and selectable phantom power; offers analog output options, including mic/line-switchable balanced XLR, dedicated consumer mic level on a locking TA3 connector and an aux-level output on 3.5mm connection; digital outputs include balanced AES3 on XLR and USB audio connectivity for Mac, Windows or Linux; complements larger mixers with its MS stereo matrix, tone oscillator, internal slate microphones, return monitoring of both analog and USB audio, high-gain headphone output, and two AA battery or external 5-18VDC powering.

800-505-0625
www.sounddevices.com

Crystal Vision — ARC-20MC

Bidirectional digital aspect ratio converter offers features designed for easy automation of the aspect ratio conversion, including full AFD support and the ability to change the aspect ratio live on-air without picture disruption; provides presets for the six commonly used aspect ratio conversions between 4:3 and 16:9; three of these conversions allow 16:9 sources to be shown on a 4:3 monitor with the geometry preserved, while the other three allow similar easy conversion of 4:3 to 16:9.

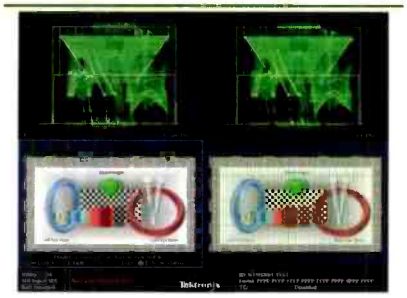
+44 1223 497049
www.crystalvision.tv

Sony Creative Software — Z Depth 2.0

Stereoscopic 3-D production application enhances the ability for 3-D authoring companies to easily create required disparity metadata files for positioning of subtitles and interactive graphic menus in 3-D Blu-ray Disc production; displays a new visual queue in the preview window during recording of the disparity value being applied to the subtitle or menu event; new adjustment options for offset data values allow for subpixel precision when outputting file formats compatible with digital cinema 3-D productions.

608-203-7620
www.sonycreativesoftware.com

Tektronix — WFM8300/WVR8300



3-D video monitoring capabilities are now available as standard with all new waveform monitors and waveform rasterizers; these new capabilities also are available on the WFM8200 waveform monitor and WVR8200 waveform rasterizer with the purchase of the Option 3D; existing instruments can also be upgraded with the new features free of charge through the new firmware upgrade available on the company's website.

800-833-9200; www.tektronix.com

Apantac — SDI-to-fiber extension set

Set includes an SDI-to-fiber transmitter and receiver for transmitting multirate SDI up to 18mi over fiber using a single-mode or multimode fiber-optic cable with ST connectors; supports all SDI formats up to 3G, including SMPTE-424M (3G-SDI), SMPTE-292M (HD-SDI) and SMPTE-259M (SD-SDI) protocols; to prevent signal loss, input signals are equalized and outputs reclocked to 120m for 3G-SDI and 140m for HD-SDI.

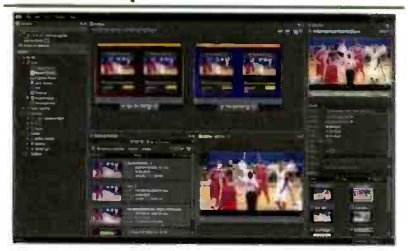
503-968-3000; www.apantac.com

Bridge Technologies — VB242

ASI input option card for real-time, high-density monitoring for remote head-end applications; offers up to 13 ASI inputs in a single 1RU chassis in combination with the VB220 or VB120 controllers; functioning either in continuous ETSI TR 101 290 analysis, or in sequential round-robin monitoring, each VB242 card offers full-time monitoring of two inputs or sequential monitoring of six; a chassis fitted with two VB242 cards offers full-time monitoring of up to five ASI streams.

+47 22 38 51 00; www.bridgetech.tv

Grass Valley — STRATUS



Tightly integrated modular software platform supports every part of the content creation and distribution lifecycle through a common graphical user interface; its scalable service-oriented architecture helps program producers and providers streamline their workflows; allows producers and managers to make specific tasks fast and easy to perform by virtually any preauthorized member of their staff; is designed to ingest, manage, edit and play out assets stored on the K2 Summit or K2 Solo servers or a K2 storage area network.

503-526-8100; www.grassvalley.com

Litepanels — H2 Hi-Output

LED fixture is capable of throwing illumination over a 6.1m to 7.6m distance; is 5600°K color balanced, using an array of 72 1W daylight LEDs that are focused to a 10° angle; the 100W H2 fixtures provide light equivalent to a 1000W legacy lighting fixture, using just 10 percent of the energy; generates no noticeable heat; provides dimming from 100 percent to zero with no noticeable color change.

818-752-7009
www.litepanels.com

Cobalt Digital — 9086

Embedded loudness processor is designed to provide an unmatched ease-of-use and integration for embedded audio environments requiring loudness processing; features Linear Acoustic's AEROMAX technology; 9086-SD offers stereo loudness processing for embedded audio on SD-SDI.

217-344-1243
www.cobaltdigital.com

XOS Digital — Hurricane HD Replay

Live event production system relies on eight raw production camera feeds; allows production editors to select video highlights for recall and broadcast instantly in slow motion; the multichannel, multispeed system records continuously, regardless of the playback state; features a user-friendly interface and a custom controller that allows the operator to control all functions from one device; expandable up to eight channels; provides flexible input and output configurations.

877-967-3444; www.xosdigital.com

Rohde & Schwarz — R&S ETL

New capabilities give the TV analyzer the functions necessary for measurements for installing, commissioning and maintaining ATSC MDTV networks using a single instrument; makes broadcast drive tests possible; offers the analysis tools needed to optimize ATSC MDTV single-frequency networks; using the R&S ETL-K320 software option, the analyzer determines whether transmitters function in conformance with the ATSC MDTV specifications and whether network coverage is complete; the R&S BCDRIVE software option is designed for coverage measurements in the field.

410-910-7800
www.rohde-schwarz.com

Apple — Final Cut Pro X

Video editing software is built on a 64-bit architecture with up to 4K resolution file support; uses multithreaded processing and the GPU on a graphics card for fast background rendering and real-time playback performance; provides native editing from a wide range of formats, including DVCAM, DVCPRO, Panasonic's AVC-Intro, Sony IMX, XDCAM HD, Canon XF MPEG-2, AVCHD and HDV; includes tools for audio editing and color correction; is complemented by two companion apps: Motion 5 for professional motion graphics and Compressor 4 for advanced media encoding.

408-996-1010; www.apple.com

Shure — Axient

Wireless microphone system can automatically change frequencies — undetected by the user — to avoid interference; detects RF interference and moves to a clear and compatible frequency in milliseconds; has frequency diversity, which transmits full-bandwidth audio on two separate frequencies to ensure seamless, uninterrupted audio for mission-critical channels.

847-600-2000; www.shure.com

Lectrosonics — HH

Handheld transmitter is newest addition to line of digital hybrid wireless microphone systems; accepts standard thread-on capsules from a number of manufacturers; two capsules are available from Lectrosonics, the HHC cardioids condenser and the HHS supercardioid condenser — giving users the freedom to select the microphone capsule best suited for their particular application; offers 44dB of input range; is equipped with a membrane switch control panel and high-resolution LCD display.

505-892-4501
www.lectrosonics.com

Motorola Mobility — Motorola High Definition Digital Terminal Adapter

Small, cost-effective device helps service providers deliver HD content to their basic subscribers; one-way device converts an operator's digital signal in the home so subscribers can view HD content without the need for a set-top box; unit can be mounted out of sight; delivers HD content to additional outlets in the house; includes a 1GHZ, all-digital tuner, as well as HDMI and RF outputs; a Radio Frequency for Consumer Electronics remote-control interface enables control of the unit from anywhere in the room without line of sight to the device.

847-523-5000; www.motorola.com

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NBCUniversal is seeking a Director of Engineering to manage the support of our Multi-Channel Broadcast Operations facility in New York, NY. The position will manage a 24 x 7 engineering operation including maintenance, projects and initiatives. Interested candidates can apply at **www.nbcunicareers.com**, **reference job number 855BR**.

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TV: the original social network

Television promotes the ultimate in interactivity.

BY ANTHONY R. GARGANO

Welcome to yet another installment of what I refer to as *Broadcast Engineering's* "Andy Rooney segment." It's fun to be given the final page of this great magazine each month and the opportunity to write about virtually any topic related to this wonderful industry of ours. In keeping with the title on the magazine's masthead, I normally write on technical issues, although I have touched on business issues in our industry from time to time. But this month I stray. I am compelled to applaud our industry and all of those who participate in it, who contribute to it and who enable it. As a reader, it is highly likely you fall into one of those categories, and so dear reader, I applaud you.

The inspiration for this month's column came as a result of joining the estimated 2 billion viewers to watch a live fairy tale — the recent royal wedding of Prince William and Catherine Middleton. As an aside, I must admit to an emotional connection to the fairy tale; the date of the wedding, April 29, was my own wedding anniversary date before my wife of 42 years succumbed to a long-term illness just two years ago. But back to the wedding; it was an event watched around the world as virtually the entire world paused to view this magical ceremony.

Think about it: 2 billion viewers. The world population today is more than 6 billion. Fully one-third of the entire world viewed this single event! It was viewed by Americans, Brits, Europeans and Asians; by Israelis and Palestinians; by Iraqis and Iranians; by North Koreans and South Koreans. For a few moments, the world was brought together to share in a dream, to perhaps fantasize what it might be like to have this experience or maybe for your child to have the experience. It was a brief pause in time from worry, from work, from war, for the joy of this event, and it was our industry and all who comprise it that enabled its delivery so the world could view it. It was our technology and all those who create it, support it and somehow utilize it that allowed the world to come together to share a moment in time.

As I viewed the event along with so many others, I couldn't help but to feel pride in this television business of ours and to be thankful for having the good fortune so many years ago to enter this business and make a career out of it. Indeed, once you enter this truly rewarding television industry, it gets into your blood. It becomes more than a career; it becomes a passion. And, it is a passion that can have a profound effect on the world around us. Television can not only deliver the fairy tale of a royal wedding, but it can also deliver the horror, the riveting images of collapsing buildings and of people falling out of the sky as happened a decade ago in lower Manhattan. And it can sadly deliver the pathos of a tsunami halfway around the world and a tornado here at home. But it can also create a singing sensation from a rather plain looking Scottish spinster. And it can unite sports enthusiasts around the world with Super Bowls, World Cups and the more than 1 billion viewers in Asia of the most recent Cricket World Cup.

It is said by some that we live in a new age of emerging social networks. The leader, Facebook, now claims to have more than 500 million users. But I would posit that it is television that is the original social network and continues to be far and away the largest. But Facebook has imminent interactivity and television does not, you say. Really? How many comments and discussions did you have with friends and family about that royal wedding you watched? About that Super Bowl you viewed? About those 9/11 images that brought tears to your eyes? No, I would suggest that it is television that promotes the ultimate in interactivity.

It is said by some that we live in a new age of emerging social networks ... I would posit that it is television that is the original social network and continues to be far and away the largest.

In the pressures of day-to-day activities and responsibilities, we typically don't have the time to take a step back, consider the business we're in and to think about our contribution, no matter how small. So, take pride in your television industry, and be proud of your role in it. BE

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

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

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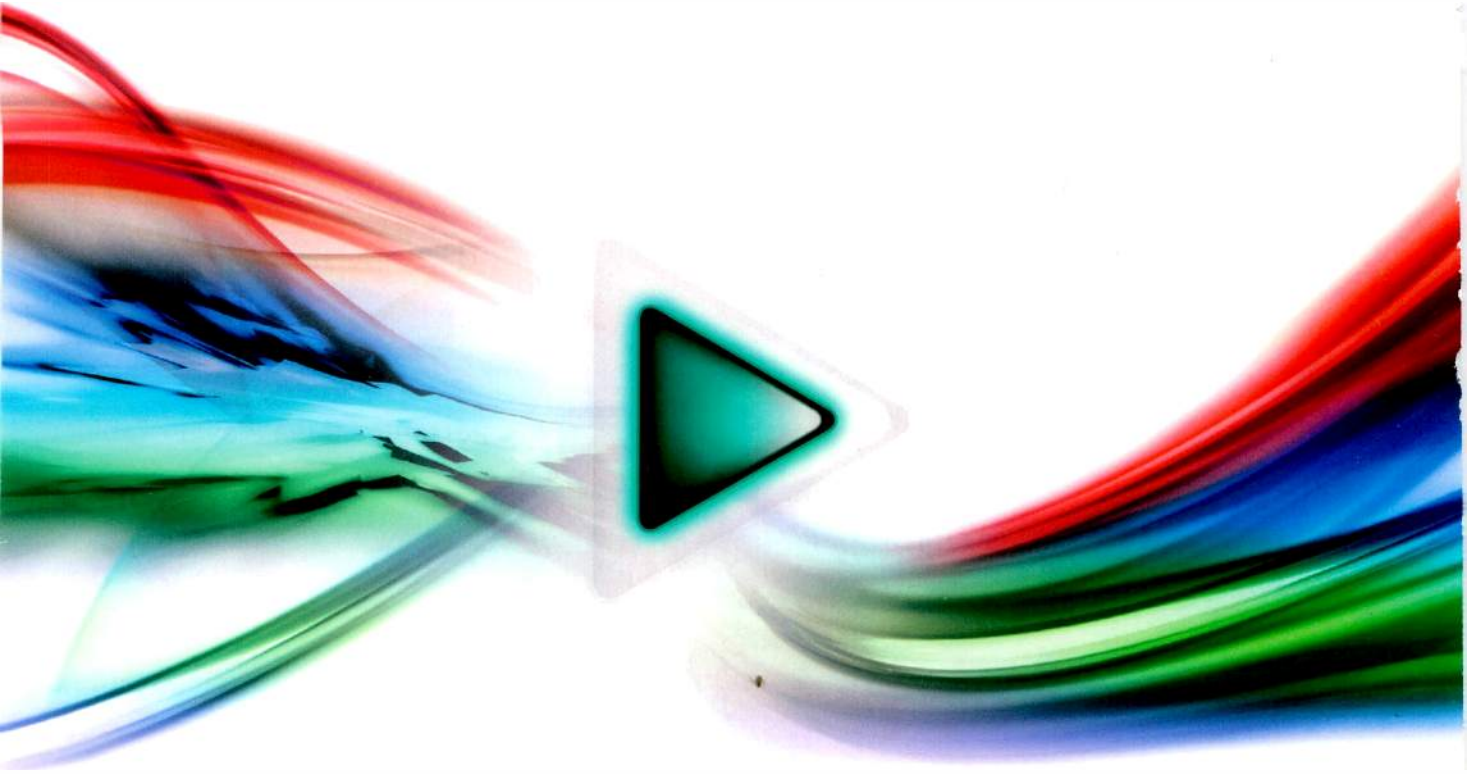

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