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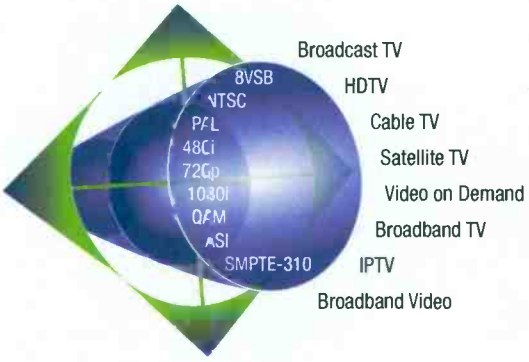

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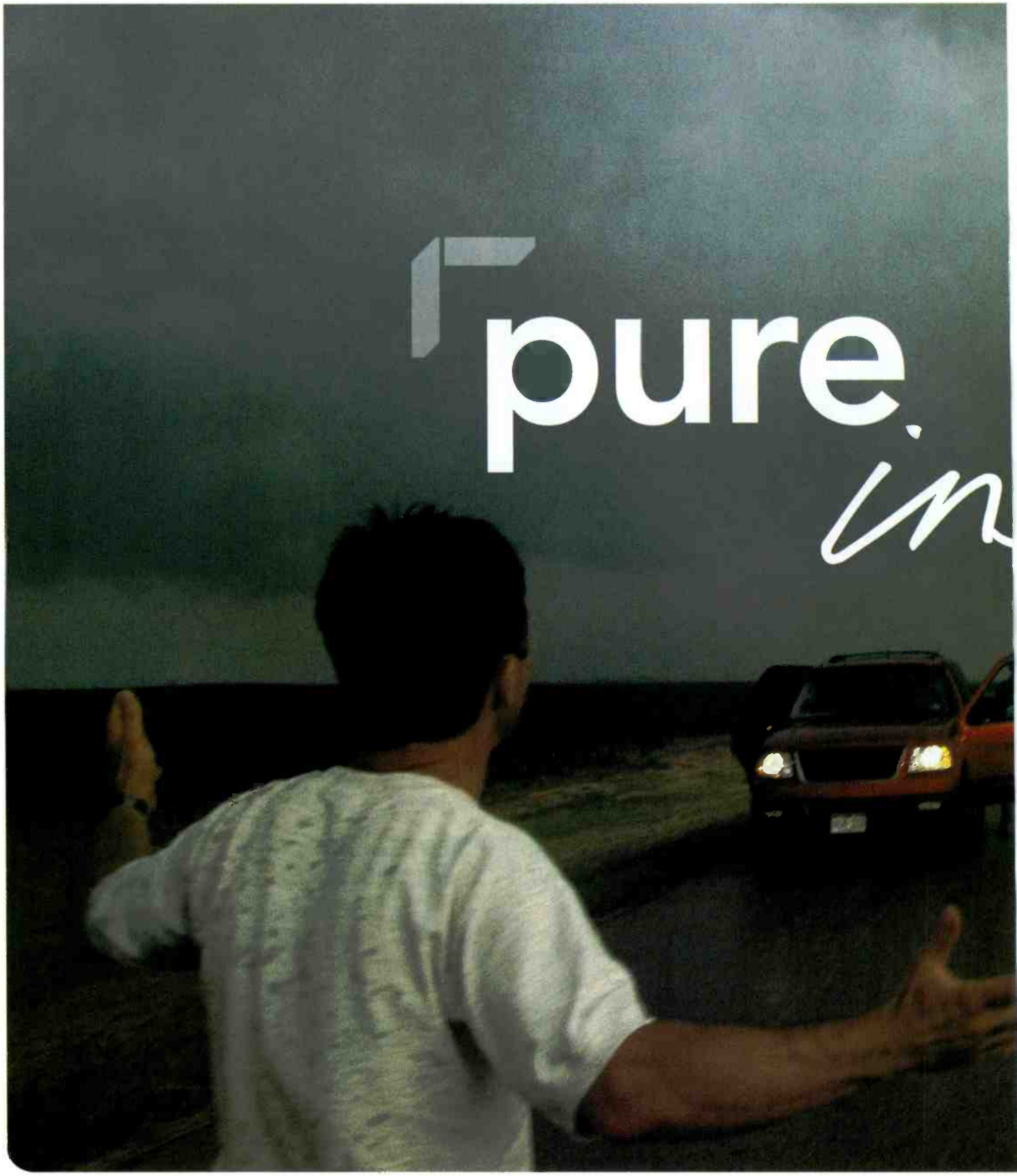

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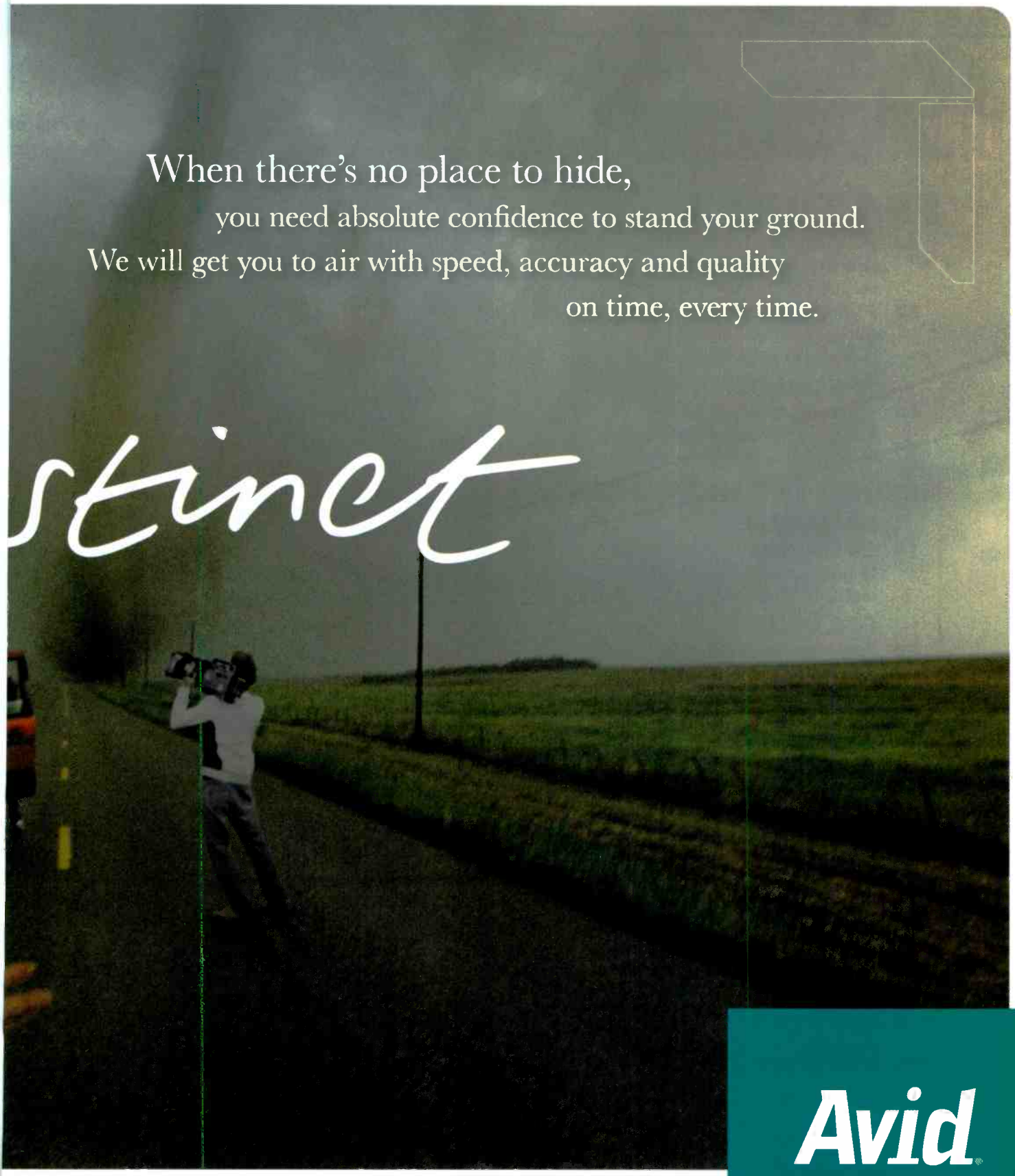
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Broadcast Engineering®

FEATURES

BEYOND THE HEADLINES

DIGITAL HANDBOOK

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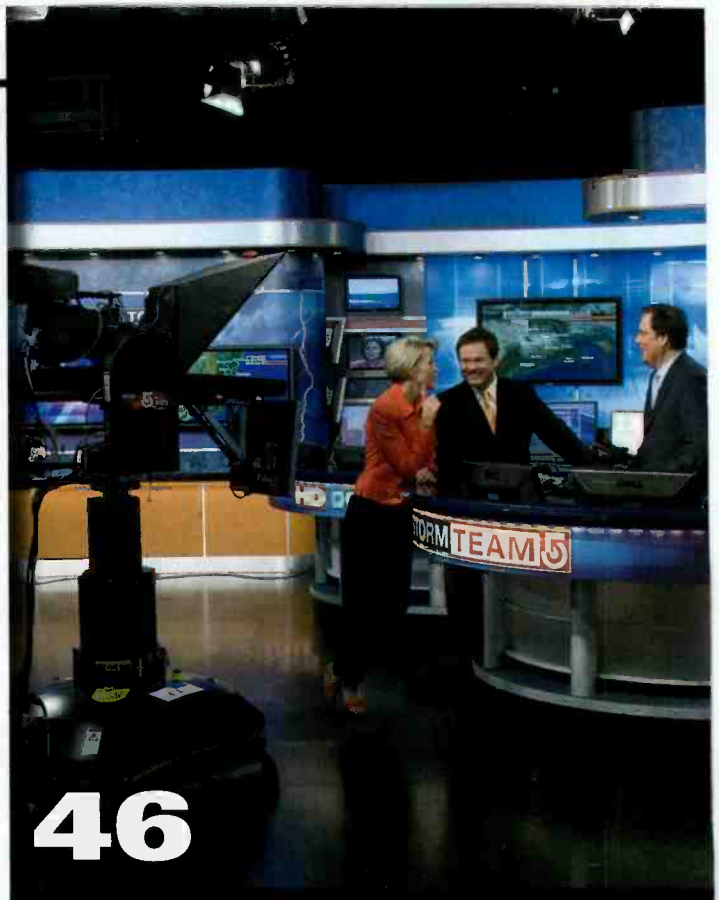
THIS MONTH'S FREEZEFRAME QUESTION

Video server one has an MTBF of 10,000hr and an MTTR of 1hr. A second video server has an MTBF of 1000hr and an MTTR of 3.6 seconds. Which video server has the higher availability? Provide its average. This question was taken from Al Kovalick's book "Video Systems in an IT Environment," available from Focal Press.

Readers submitting correct entries will be entered into a drawing for Broadcast Engineering T-shirts. Enter by e-mail. Title your entry "Freezeframe-August" in the subject field and send it to: editor@broadcastengineering.com. Correct answers received by Oct. 1, 2007, are eligible for the drawing.



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ON THE COVER:
WCVB-TV broadcasts HD news to the Boston market. Photo courtesy FX Group.
Photo by Wayne Gunnell.

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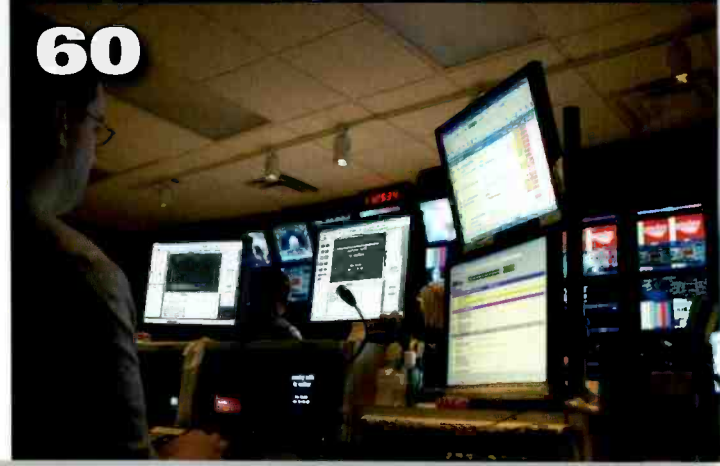

60

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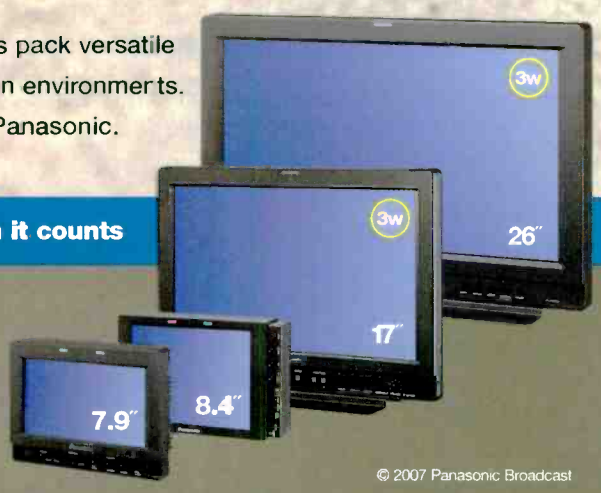
Built production-tough with a die-cast aluminum frame, Panasonic's lightweight BT Series monitors deliver exceptional color reproduction and contrast with no motion blurring – and without the bulk of a CRT. Both the 26″ BT-LH2600W and 17″ BT-LH1700W feature a split-screen freeze frame for scene comparison and color matching, built-in waveform monitor, two HD/SD-SDI auto-sensing inputs and 176° off-axis viewing. For productions, the 1700W is AC/DC capable, while the 2600W offers features like Pixel-to-Pixel mode for critical focusing and superimposed audio level meters.

The rugged, portable 8.4″ BT-LH900A and 7.9″ BT-LH80W monitors pack versatile features in a compact design, perfect for field or studio production environments. In the studio or on the road, when your image counts, depend on Panasonic.



Panasonic ideas for life **when it counts**

3-Year Extended Warranty Program - To demonstrate our confidence in these production-tough monitors, Panasonic is pleased to extend its one-year warranty for an additional 2 years to customers purchasing the BT-LH1700W and BT-LH2600W production LCD monitors between June 1 and December 31, 2007. For more information, please visit us at **www.panasonic.com/broadcast**.

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NEW PRODUCTS & REVIEWS

APPLIED TECHNOLOGIES

TECHNOLOGY IN TRANSITION

NEW PRODUCTS

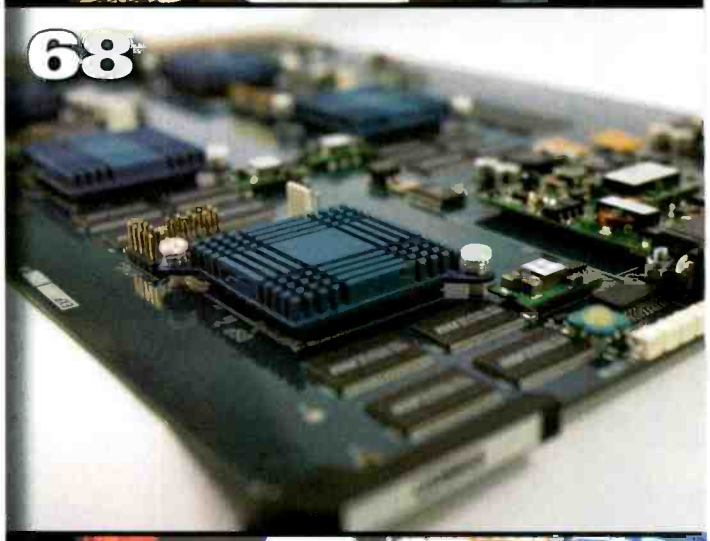
DEPARTMENTS

JUNE'S FREEZEFRAME ANSWER

Define the following acronyms as they relate to IPTV technology:

IPTV Internet Protocol Television
CLEC Competitive Local Exchange Carrier
FTTP Fiber to the premises
FTTC Fiber to the curb
HDCP High-bandwidth Digital Copy Protection
EPON Ethernet Passive Optical Network
DMIF Digital Multimedia Integration Framework

JUNE WINNERS:
Chuck Condie, Andrew Levine, Patrick O'Brien, Al Van Dinteren, Roberts Yent



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Could going digital be a snoozer?

Pressure is building toward the Feb. 17, 2009, analog shutoff. TV set makers, broadcast associations, and cable and satellite vendors are all gearing up. Congress has assured plenty of money will be spent — or wasted — advertising the turnoff and free STBs for everybody. Broadcasters are ready. The FCC says 1600-plus DTV stations are on the air. (See Figure 1.)

So it's full steam ahead. We can expect a clean break from analog, and off we go into the wild blue yonder of digital television. Right?

Not unless broadcasters become active in helping their viewers get behind the transition. Without an industry-wide education effort, the analog turnoff could be (to borrow an NAB phrase) a train wreck.

Why? Because most local viewers have no idea the end of analog is coming. A recent NAB survey of TV households showed that 56 percent of those relying on OTA reception had "seen, read or heard nothing" about the transition. Only 10 percent knew that the cutoff date was in February 2009, meaning 90 percent of OTA viewers don't even know that you are about to turn off their televisions!

A 2007 study by CENTRIS for the Association of Public Television Stations reinforced this data, predicting that a majority of the 22 million OTA homes in the United States would move slowly to adopt DTV technology. The survey showed that, measured over the past three years, fewer than 13 percent of OTA households per year purchased a TV set. Cable and satellite-equipped homes buy new TVs at an 18 percent per year rate.

Echoing this faster conversion rate for non-OTA homes, the data showed that the number of DTV-equipped cable/satellite homes grew from 4.49 percent in 2005 to 23.5 percent in the first quarter of 2007. Measured over that same period, OTA homes with DTV sets grew from just under 2 percent to barely over 7 percent.

Some communities are just now beginning to recognize a potential viewer problem. A February article in the "Chicago Defender" newspaper claims 20 percent of Chicagoans rely on OTA television. Mitchell Szczepanczyk, organizer for the activist group Chicago Media Action, claims that the change to digital will be especially hard on low-income viewers. He says low-income families may view the purchase of a converter box as an unnecessary expense. "It's forcing people to make a Catch-22: 'Do I need food, or do I need a TV set?' We could potentially be dealing with people's lives," Szczepanczyk said in the article.

Despite the Chicagoan's doom and gloom scenario, there are some positive indicators that OTA viewers recognize the need to go digital. A Eureka, MO, company, Antennas Direct, manufactures external TV antennas for digital reception. While people first laughed at Richard Schneider, the company's president, he claims the company had $1.4 million in 2006 sales and predicts twice that for 2007.

Broadcasters all recognize the door on analog is closing. Even so, our future depends on helping our OTA viewers successfully make that transition with us. If we can, then the analog turnoff could be a big snooze for everyone. And that would be a good thing. BE

Station category	Number of DTV stations on air
Top 30 market, network-affiliated	119
Other, commercial	1141
Non-commercial, educational	350
Total	**1610**

Figure 1. DTV stations authorized to be on the air as of June 12, 2007. Source: *www.fcc.gov/mb/video/files/dtvonairsum.html.*

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

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Dear editor:

On its Web site, NBC Sports provides TV viewers with an e-mail address (*feedback@nbcsports.com*) for feedback, but the e-mail inbox is full — full of complaints about the network's lack of HD cameras during the U.S. Open golf tournament. Has *Broadcast Engineering* ever investigated why NBC Sports does not employ all HD cameras during its HD sports broadcast? I have noticed TNT has the same problem. Watching a director cut from HD to SD is piercing to the eyes. It can't be the money, because CBS does not have this problem.

I don't understand why NBC can't get its act together technically. I've seen pages and pages of complaints, so it seems that enough people care to warrant an answer from NBC.

Frank Blacklocke

Brad Dick responds:

I contacted both NBC and NEP, the truck company that handled the actual field production and supplied much of the equipment for the golf tournament broadcast.

A press release about NEP's involvement with the golf tournament broadcast can be viewed at *http://guardian.nepinc.com/newsUSopen07.php*. That press release states that the NEP ND4 truck used during the broadcast was equipped with Sony HD cameras.

When I asked NEP representatives about the intermixing of HD and SD cameras, NEP told me to check with NBC. I contacted NBC, but I have not received a response to my inquiry.

It seems you've identified a chink in NBC's HD armor. One could interpret the network's lack of response to say it doesn't think viewers can tell the difference between images from an HD camera and an SD camera. It may take a few more complaints from viewers like you to change that errant viewpoint.

Debugging DTV

Dear editor:

Where were the congressmen when the digital TV broadcast standards were set, passed into law and Feb. 17, 2009, was determined the date to end analog signals?

Broadcasters have been forced to spend millions of dollars upgrading their studios and transmitters with overpriced DTV equipment. In addition, the equipment was full of bugs, requiring broadcasters to spend time and money debugging it.

Just look at your digital cable or digital satellite reception for a preview of what is in store for the average working population that can't afford a digital receiver, converter box, digital satellite or digital cable.

This has nothing to do with congressional politics, party affiliation, the FCC, NTIA or any funded or nonfunded "education program." It has everything to do with the TV equipment manufacturers, TV set industry, cable companies and the digital satellite companies lobbying Congress to pass a law without anyone in Washington considering the consequences.

How did the television industry ever let this happen, and what can we do about it? I am open to suggestions as I can't afford to buy a digital TV set, digital converter, digital cable or digital satellite system, and I should not have to.

Frank Anderl
Senior Engineer
University of Minnesota

Brad Dick responds:

The bottom line is that analog television will go dark in February 2009.

Over-the-air viewers like yourself will be provided with two coupons that can be applied toward the purchase of a set-top box. This box will convert DTV signals back into analog ones your older television can handle.

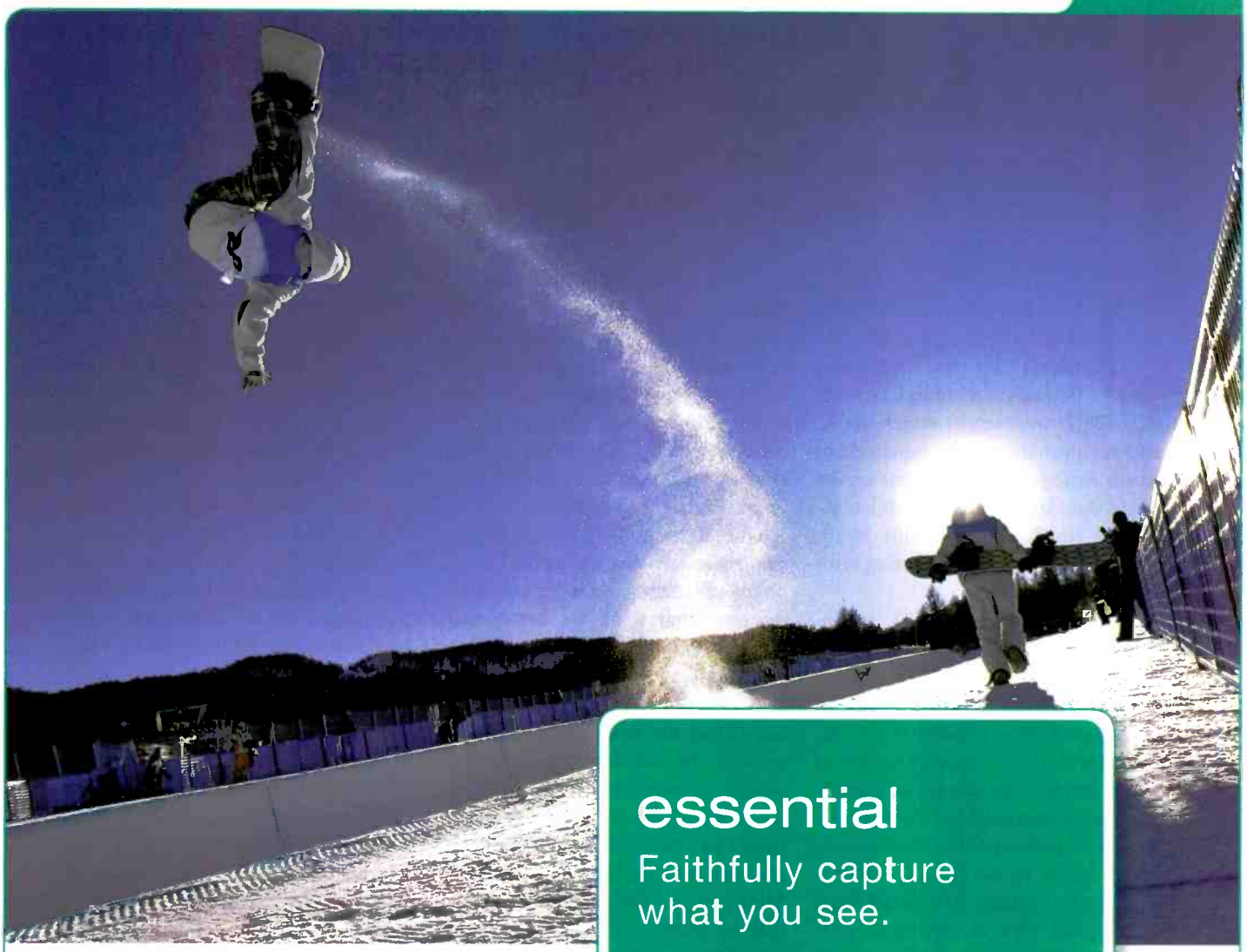
Your out-of-pocket expense will be minimal, if anything, and, you'll receive many more channels from your local DTV stations.

Is this the best solution? Probably not. After all, it was conceived and implemented by politicians. BE

Test Your Knowledge!

See the Freezeframe question of the month on page 6.

Send answers to editor@broadcastengineering.com



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Life after NTSC?

Broadcasters are jumping on the mobile DTV bandwagon.

BY CRAIG BIRKMAIER

Just a few years ago, the DTV standards created and maintained by the Advanced Television Systems Committee (ATSC) were under attack. ATSC efforts to proliferate the standards in North America to other parts of the world were largely unsuccessful. Outside of North America, only South Korea is currently broadcasting with the ATSC standard.

The inability of early ATSC receivers to deal with dynamic multipath, the ability of the DVB and ISDB standards to serve mobile and handheld devices, and the impression that ATSC is all about HDTV were perceived as major barriers to adoption outside the United States. Add to this the reality that 85 percent of U.S. homes have largely given up on the OTA television service in favor of multichannel subscription services, leaving many to believe that the future of ATSC, not to mention free-to-air broadcasting in the United States, looked dim.

Thanks to several recent developments, however, interest in the ATSC and its efforts to develop enhancements to its standards is growing. More to the point, U.S. broadcasters, who have done little to promote their new DTV service, are now looking toward Feb. 17, 2009, as an opportunity to reinvigorate a medium that has been in decline.

One of the most encouraging developments is the widespread availability of inexpensive integrated DTV receivers that work far better than earlier generations of ATSC receivers. Driven in large part by FCC mandates that require an ATSC receiver in any device that also incorporates an NTSC receiver, the consumer electronics industry appears to have put most of the old "8-VSB doesn't work" arguments to rest. Integrated CRT-based sets can now be found for just over $100. And the flat-panel displays coveted by most new TV buyers can be found for less than $300. The average price point for a 32in flat-panel display with integrated receivers is now less than $1000. But making 8-VSB work for fixed receivers is not the big news here — it's long overdue.

Delivering bits to things that move is the big news in a world where Apple is now expected to sell 12 million iPhones by this time next year, and a variety of broadcast competitors are starting to use recovered 700MHz to deliver video services to cell phones.

One development that has broadcasters jumping onto the mobile DTV bandwagon was the demonstration of working mobile ATSC systems at this year's NAB. With two proposed systems being tested at the show, the ATSC issued a request for proposals (RFP) for its mobile and handheld standard (ATSC-M/H). On June 22, the ATSC announced that it received 10 responses to the RFP and that it plans to develop and test the standard, with the goal of launching the service in February 2009, as the NTSC service is shut down.

There is much irony in the fact that this renewed interest in DTV is based largely on the concept of developing wireless services for mobile and handheld devices. This could lead analysts, such as myself, who have been encouraging broadcasters to develop new businesses in the DTV spectrum to proclaim: "What a concept: using the broadcast spectrum to deliver services to things that move."

Perhaps the TV guys could have gotten a clue from the thriving radio industry, which is spending more than half a billion dollars to promote its new HD radio technology.

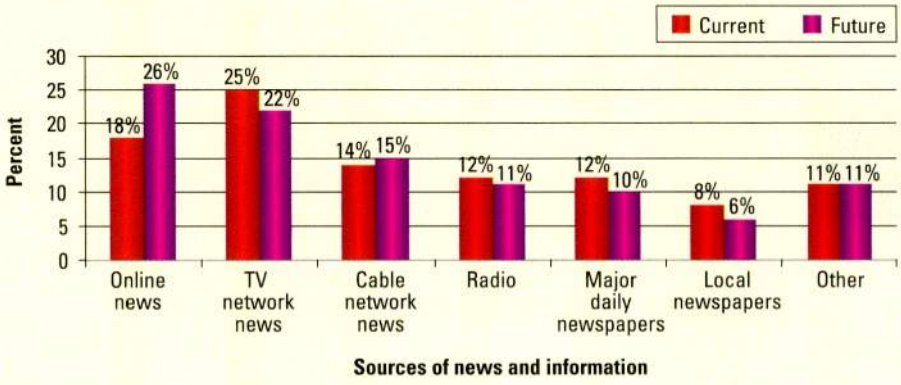
If in doubt, join an alliance

The mobile video space is now cluttered with alliances of industries and companies that seek to develop the standards for mobile and handheld receivers. Some are pushing specific standards, while others have been formed

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

Online to be top source of news in five years

By 2012, 26 percent of consumers will get their news online.



Note: Percentages may not add up to 100 percent due to rounding.

Source: Harris Interactive *www.harrispollonline.com*

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to help guide the development of appropriate standards for mobile DTV broadcasting and the potential harmonization of multiple systems via devices that support multiple standards.

At the international level, the Open Mobile Alliance (OMA) is attempting to develop open standards that will allow many competing technologies to be interoperable. In June, the OMA announced the public availability of Mobile Broadcast (BCAST) Version 1.0 Candidate Enabler Release. The specification is an open global standard for interactive mobile television as well as on-demand video services, and is adaptable to any IP-based mobile content delivery technology.

In the United States, several groups have formed and are discussing the harmonization of mobile DTV standards. The Mobile DTV Alliance is an open industry consortium that focuses on promoting the best practices and open standards to deliver premium-quality broadcast television to mobile TV devices in North America.

The alliance includes companies from across the mobile business system and entertainment value chain, including Disney, HiWire, Intel, Microsoft, Modeo, Motorola, Nokia and Texas Instruments. The Mobile DTV Alliance is one of the organizations that responded to the ATSC-M/H RFP. This appears to be a liaison activity with the goal of harmonizing the efforts of broadcasters and system operators that will be using OFDM-based technologies for services targeted at cell phones.

At NAB, the Open Mobile Video Coalition was announced with member broadcast TV stations that reach 95 million households. The members include the broadcast television station groups of Belo, FOX, Gannett, Gray, ION Media, NBC Universal, Sinclair and Tribune. In June, the NAB announced its support for and participation in the efforts of the coalition and the ATSC to bring broadcast DTV service to mobile and handheld devices.

Qualcomm, a company that works with cellular operators in the United States and around the world to promote its OFDM-based MediaFLO service, is also participating in the ATSC-M/H standardization efforts. The company manufactures chips for cell phones and is interested in developing chips that could support both MediaFLO and the ATSC-M/H standard.

The high level of interest in the potential mobile handheld market, together with the willingness of diverse business interests to work together to develop standards, is an encouraging development. It remains to be seen whether these interests can work together to develop and deploy a viable standard within two years.

Ramping up other ATSC standards efforts

While the ATSC-M/H efforts are garnering most of the attention, several related standards are currently being addressed by ATSC working groups. Perhaps most important is the work on advanced video codecs, which will likely be used by mobile and handheld devices. The H.264/MPEG-4 AVC codec is likely to be adopted. However, like desktop computers, next-generation mobile and handheld devices may support multiple video and audio codecs.

A larger question for broadcasters looms in the future. Now that millions of MPEG-2-based DTV receivers are being sold, will it be possible to migrate the main programming of broadcasters to newer and more efficient codecs? The allocation of a significant percentage of the available bit rate for new mobile and handheld services will mean that fewer bits will be available for traditional programming, thus making more efficient codecs an attractive proposition.

Efforts are also underway to develop a standard for non-real-time delivery of audio and video content. This may encompass downloading programs (including premium movie content) to digital video recorders, as well as services targeted at mobile and handheld devices.

Work is also underway on the Advanced Common Application Platform

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Web links

Read these past *Broadcast Engineering* articles at *www.broadcastengineering.com*:

- "Mobile TV," by Craig Birkmaier, June 2007
- "Pinning Down Mobile TV," by Anthony R. Gargano, June 2007

Elsewhere on the Web, check out:

- ATSC Press Release on Mobile and Handheld proposals *www.atsc.org/news_information/press/2007/MH_Proposals_07.html*
- Open Mobile Alliance *www.openmobilealliance.org*
- Mobile DTV Alliance *www.mdtvalliance.org*
- Open Mobile Video Coalition *www.openmobilevideo.com*
- The Flo Forum (Qualcomm) *www.floforum.org*

(ACAP), a standard for interactive TV middleware that is compatible with the cable industry's OpenCable Applications Platform (OCAP) standard. In addition, work is underway on a standard for an ENG data return link that will use spectrum that is part of the Nextel ENG relocation project.

Chickens, eggs, carts and horsepower

While there is widespread interest in developing the standards for broadcasting to mobile and handheld devices, it is less clear how interested consumers are to buy products that support these standards. To date, consumer interest in paid video subscription services through cell phone providers has been minimal. Most of these services do not offer localized content, an area that local broadcasters may be ideally suited to develop.

Many handheld devices, such as Apple's iPhone, support Wi-Fi and other data networks that can be used to access much of the content available via Internet connection. These devices can also sync with computers on home networks to download video content that can be viewed at any time. Then there's the potential markets for delivering content to vehicles, many of which now come from the factory with car theater systems and GPS, data and satellite radio services.

So the real challenge will be the creation of services that people will actually want to use. Next month's column will discuss the opportunities to create content that can be broadcast to mobile and handheld devices. BE

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

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

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Expletive policy blocked

The U.S. Court of Appeals rejected the FCC's policy.

BY HARRY C. MARTIN

In a 3-1 decision issued on June 4, the U.S. Court of Appeals in New York struck down the FCC's fleeting expletive policy, which was adopted in 2004.

What is the fleeting expletive policy?

The fleeting expletive policy provided that any broadcast of the words "f---" or "s---", in almost any context, would be deemed indecent.

Historically, the commission had been far more restrained, acknowledging that the occasional slip up resulting in the broadcast of an isolated expletive should not warrant censure.

In the wake of the public uproar over the Janet Jackson Super Bowl incident, however, the commission, under political pressure, reversed course and took an exceedingly hard line on indecency and the use of those two words in particular.

Why it was struck down

The court's decision invalidated the FCC's fleeting expletive policy as "arbitrary and capricious" and thus inconsistent with the Administrative Procedure Act (APA). However, the court went beyond the APA to strongly suggest that the policy would not survive First Amendment analysis. (As a matter of practice, courts generally decline to delve into weighty constitutional issues if a case can be resolved on other grounds, such as the APA violation found here.)

The court majority said the FCC's profanity policy, which also emerged in 2004, overlaps the indecency policy. Because the court found the indecency policy arbitrary and capricious, it is likely the court would find the profanity policy fatally flawed if a case involving that policy came before it.

The fleeting expletive policy provided that any broadcast of the words "f---" or "s---," in almost any context, would be deemed indecent.

Weighing the options

The case has been remanded to the commission for further action consistent with the court's decision, but any attempt to shore up the fleeting expletive policy is not likely to pass further court review.

Some commentators have suggested that the FCC could appeal the ruling directly to the Supreme Court. This seems unlikely because the Supreme Court normally does not, absent a split in opinions among the lower circuits, take cases decided on the basis of administrative law, as opposed to constitutional law.

In addition, the Janet Jackson case is still pending before a separate federal court of appeals in Philadelphia. If that case is decided in the FCC's favor, the commission would be in a stronger position both in terms of supporting its indecency policies and in getting the fleeting expletive case heard by the Supreme Court.

Another option for the FCC would be to request an en banc hearing by the full court of appeals in New York. This may be a more attractive option for the FCC. As noted above, the decision was made on a 2-1 vote. The dissent characterized the case as "a difference of opinion between a court and an agency." Additional votes could sway that opinion in the FCC's favor. Moreover, in the time it would take to receive an en banc hearing, the court of appeals in Philadelphia may have decided the Janet Jackson case, thereby giving the FCC clearer direction.

Another option would be for the FCC to do what the court suggested and reformulate its indecency rules and policies. However, it would be difficult for the FCC to articulate clear standards that both protect the public and stay within constitutional bounds.

While waiting for more news on this legal front, broadcasters should note that the FCC's underlying indecency standards are still in effect, including the new, increased fine of $325,000 per utterance. BE

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

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

Dateline

- October 1 is the deadline by which TV stations in Iowa and Missouri must file their biennial ownership reports with the FCC.
- October 1 also is the deadline for TV and Class A stations in the following states and territories to place their annual EEO reports in their public files and post them on their Web sites: Alaska, Florida, Hawaii, Iowa, Missouri, Oregon, the Pacific Islands, Puerto Rico, the Virgin Islands and Washington.

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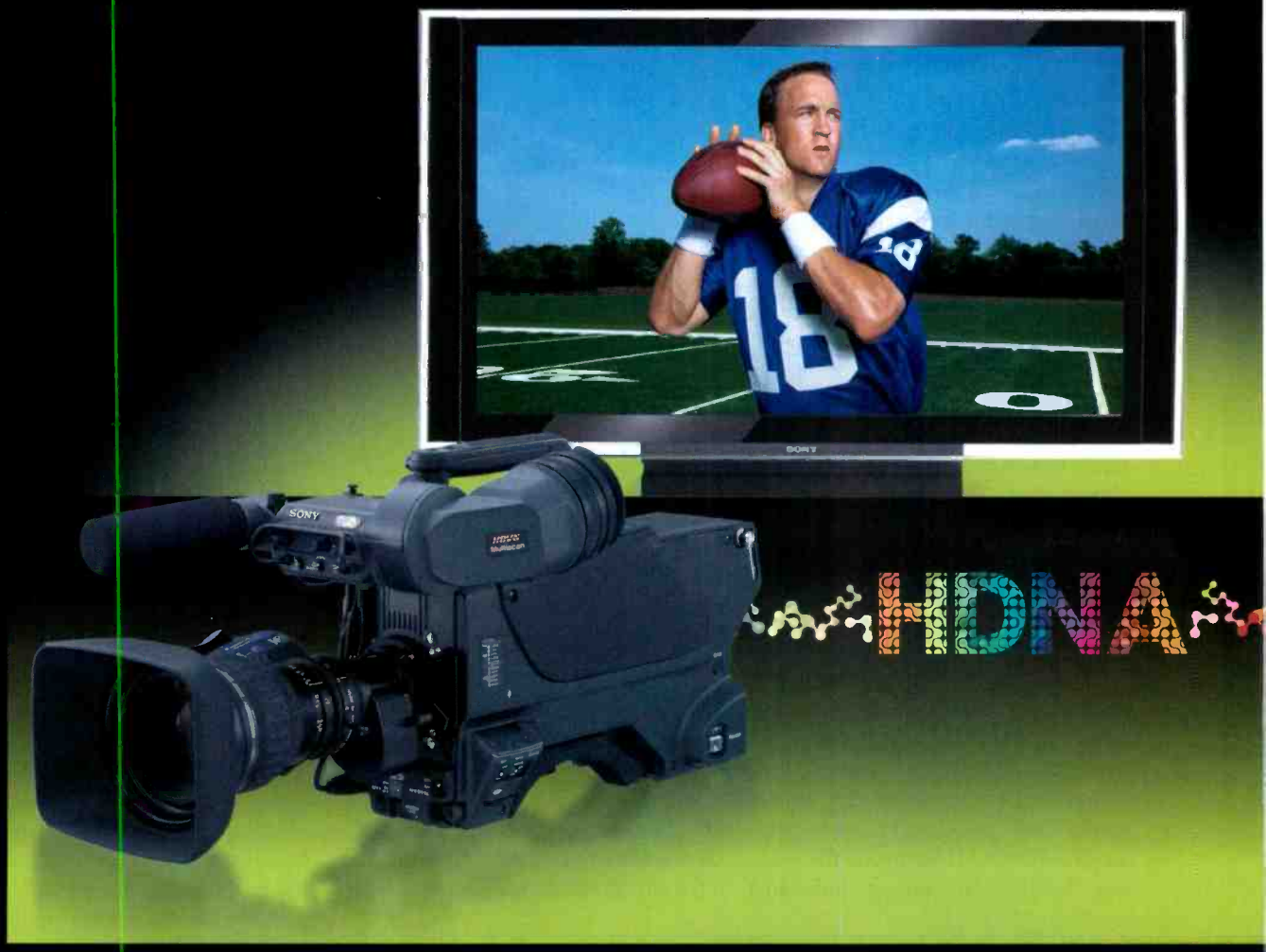

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The IPTV picture

The format has quickly emerged as a viable medium for remote delivery of TV programming to viewers.

BY ALDO CUGNINI

IPTV is said to be "what you want, when you want it," or essentially video on demand. It evolved as a way for owners of the telephone system infrastructure to compete with terrestrial, cable and satellite service providers. To see how it is changing the competitive landscape, we'll examine various technical and business aspects of the medium.

The infrastructure

IPTV is made possible by the maturity of two technologies: digital subscriber line (DSL) modems and the advanced video codec MPEG-4 Part-10. The first is a high-speed modem that can operate on existing telephone lines, and the second is the state-of-the art in highly efficient video compression.

The IPTV system architecture is similar to a digital cable system. (See Figure 1.) Content is aggregated at the headend and then sent to the telco central office (CO), the latter being unique to IPTV. At the CO, a DSL access multiplexer (DSLAM) performs the routing function to connect individual programs with subscribers. In essence, this is a switched-video service that functions like a switched-voice (wired telephone) service, allowing unique programs to be delivered to a subscriber one or two at a time. An asymmetric DSL (ADSL) modem delivers the video the last mile and supports a bit rate of between 512kb/s and 6Mb/s, depending on the distance between the CO and the customer premises equipment. All modern installations of ADSL are based on the discrete multitone (DMT) modulation scheme, essentially orthogonal frequency-division multiplexing (OFDM), similar to the modulation used in Wi-Fi modems. The final connection relies on the embedded copper twisted-pair local loop.

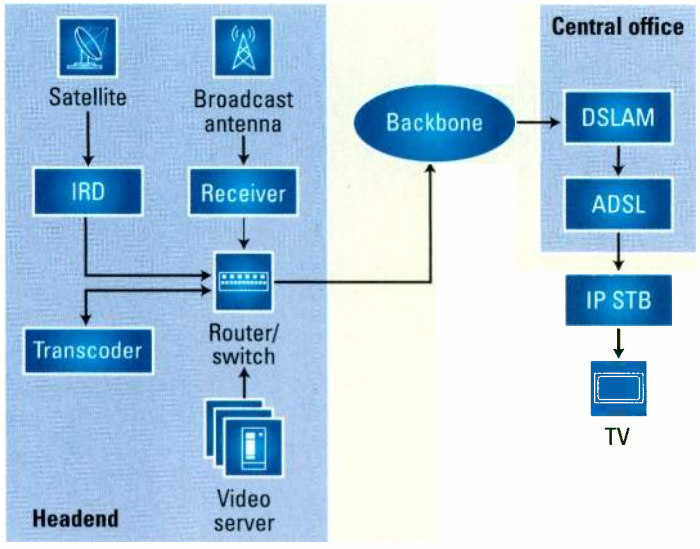

Figure 1. IPTV system architecture is similar to a cable TV plant.

A newer technology, very-high-speed DSL (VDSL), supports bit rates from 10Mb/s to 40Mb/s. Such a system typically delivers 155Mb/s to 622Mb/s streams over fiber to a neighborhood network node, which in turn, uses a very-high-speed DSLAM (VDSLAM) to relay a lower speed signal over twisted pair to the customer premises.

Another IPTV variation using fiber-to-the-home (FTTH) delivers 155Mb/s to a network node, typically within a multifamily dwelling. The node then distributes video over a

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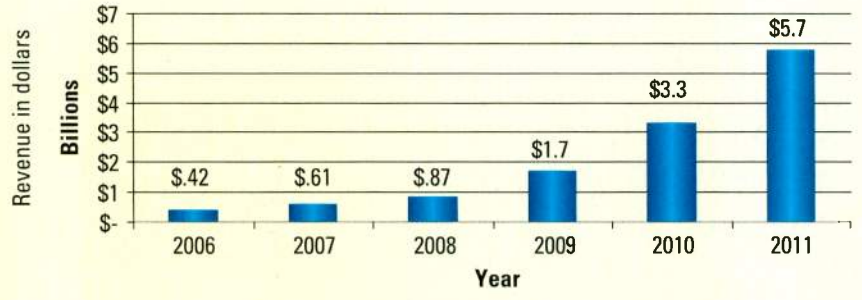

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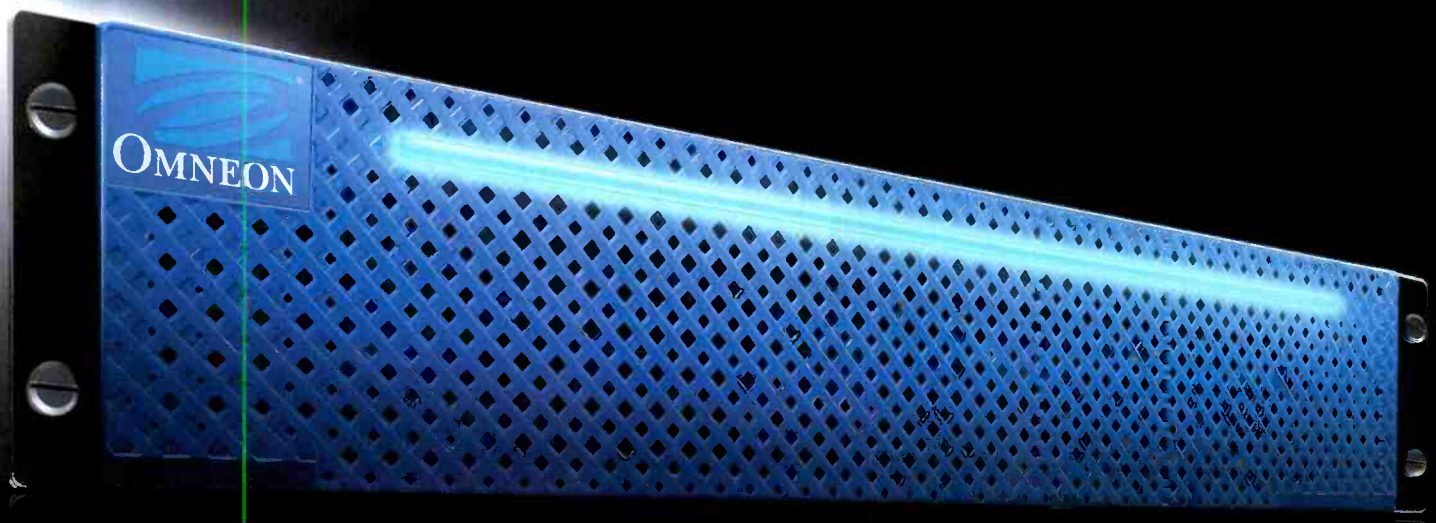

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100BASE-T in-house digital network. Because of the high bandwidth all the way to the home, such a system is capable of simultaneous multiple-channel delivery to each subscriber.

IPTV uses existing Internet protocols to transport the video and audio streams. Real-time Transport Protocol (RTP) and Real-time Transport Control Protocol (RTCP) are both used to relay packets over the IP connection. RTP uses a standardized packet format for the encoded content, and RTCP allows quality-of-service information to be sent upstream to provide trouble-free program reception. IPTV uses these standard Internet protocols, so it can also be used to deliver video anywhere that Internet service is available. In fact, IPTV can be used to send video — over a cable modem — through an existing cable TV system to homes equipped with Internet service, a situation that can (ironically) allow competition directly with the cable provider's intrinsic TV services.

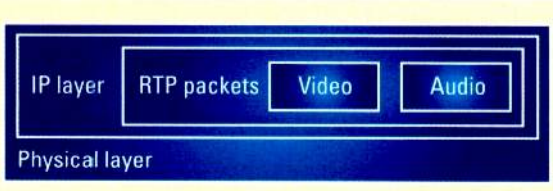

Figure 2. IPTV uses a layered transmission.

The attraction

Telcos are a powerful force driving the implementation of IPTV, as the service providers are faced with growing competition for the delivery of voice and Internet services. Therefore, they are looking for ways to maintain the value of their legacy infrastructure, as well as to provide compelling reasons for consumers to keep their copper landline phone service. Cable TV providers have already positioned themselves in the same way, by providing the triple play of TV, voice-over-IP and Internet services.

A big advantage to IPTV is that the infrastructure is less expensive than broadcast or satellite, as there are no broadcast towers, transmitters or satellites (transponder space) to purchase or maintain. For the consumer's equipment, manufacturers can almost develop and build a single set-top box (STB) for the entire worldwide market. (The video output interface is different for TVs specific to local standards.)

Chip development for IPTV is also proceeding at a growing pace, lowering STB costs. Firms have created a single-chip set-top solution for IPTV services in China, where market research firm In-Stat pegs China's IPTV subscribers at 6.3 million by 2010, generating annual revenues of $888 million.

The STB — whether for IPTV, or even cable or satellite — takes some functionality out of the TV receiver. The tuner is the most obvious of these functions and represents a certain redundancy, and that means more cost overall.

Not so well appreciated, however, is the program guide that must reside in the service-specific hardware. For these reasons, TV manufacturers have already tried to take back control of the TV by integrating digital cable-ready features. The success of this can be debated, however, with such loss of control not in the best interests of the cable service providers. In fact, there have also been satellite-integrated tuners in TVs, most notably by RCA, perhaps due to its business relationship with satellite service provider DIRECTV. Similarly, we might eventually see IPTV functionality integrated into TV receivers — most likely where there can be a tight coupling between the manufacturers and service providers.

For the headend, various manufacturers provide partial or complete hardware solutions. Servers, routers and streamers move the content around. Transcoders convert from one compression format to another, and provisioning systems handle all of the ordering and entitlement processes.

The challenge

The telcos must make a huge investment to provide this service. As one example, SBC (now AT&T) and Verizon are committed to $10 billion in upgrades, including for IPTV, by 2010. The equivalent of a new nationwide television network must be built, not only from the hardware standpoint, but also from the service, content acquisition and distribution sides. Another hurdle is the fact that content providers have historically been extremely guarded in their deals with service providers, and have an entrenched pecking order that they use for release of content.

However, various types of plant infrastructure could reduce costs, increase reliability and maximize revenue. Also, because both unicast (one-to-one) and multicast (many-to-many or one-to-many) routing are possible, the service providers have different operational scenarios to consider.

The trade-off is in how many subscribers one can service profitably. Think of it as choosing from one of many business models, with (local) cable at one end, and (national) satellite at the other. Although a large number of subscribers sounds attractive, the increase in complexity is sobering, especially considering that the transport protocols have inherent limits on how quickly they can respond to dynamic changes in subscriber loading. Nonetheless, technological progress is being made in advanced technologies and the optimization of real-time RTP/RTCP for large-scale deployment of IPTV.

Conclusion

IPTV is allowing large telcos and other operators to offer services that can directly compete with existing service providers. As the delivery of video and audio to the home continues to push new business models, the playing field is evolving toward more features for the consumer and more possibilities for instant (entertainment at least) gratification. BE

Aldo Cugnini is a consultant in the digital television industry.

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WAN security

A WAN linked with the Internet is a cost-effective and secure solution for broadcasters.

BY BRAD GILMER

As broadcasters deploy networking throughout their facilities, security is a constant concern.

Many facilities have developed comprehensive security policies and installed technology to protect their facilities from attacks. In many cases, the security policy includes the proviso that the broadcast LAN is sacrosanct. This means network designers and engineers have not permitted any connection between the broadcast LAN and any other network in the facility.

Transfer of program logs, as-run logs and other data between the on-air network and other systems occurs via removable media such as floppy disk or USB drive. The interface is typically through a dedicated computer that is meticulously maintained with the latest antivirus scanning software. Content is not allowed to enter the LAN from any other source, and connection of laptops and other unauthorized computers to the broadcast LAN is prohibited.

But times are changing, and security policies will inevitably have to change as well. Gone are the days when master control sat in isolation, only accepting videotapes and printed logs, returning marked-up copies of the logs to traffic at the end of the day.

We may have secretly enjoyed the sight of a dejected commercial salesperson being banished from master control after showing up with a spot 15 minutes before airtime. However, now it is our responsibility to deploy the best technology and to develop the best policies to get every piece of programming and commercial on the air — even if that content arrives at the last minute. Furthermore, as station consolidation proceeds apace, management demands more visibility and control over what is happening in on-air facilities.

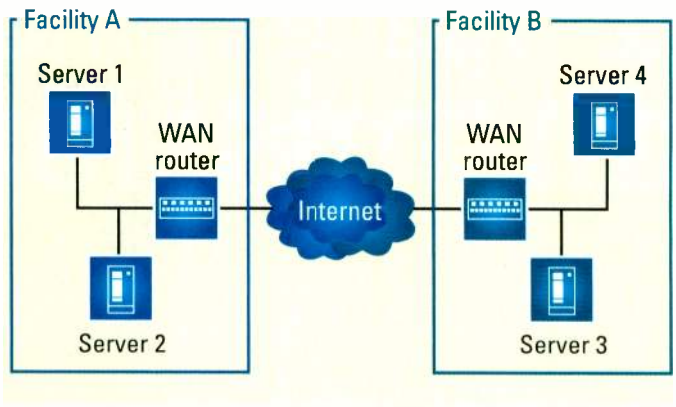


Figure 1. A WAN connects two facilities so that computers in a remote location act as if they were connected to the local network. Traffic across the WAN is strongly encrypted.

When you put all of this together, the inevitable conclusion is that the broadcast LAN will be connected to other LANs in the facility. Not only that, for many broadcasters, it means the broadcast LAN will need to be tied to the outside world as well. This is not an altogether comforting thought to those whose continued employment is tied directly to the ability to keep a signal on the air.

WAN vs. the Internet

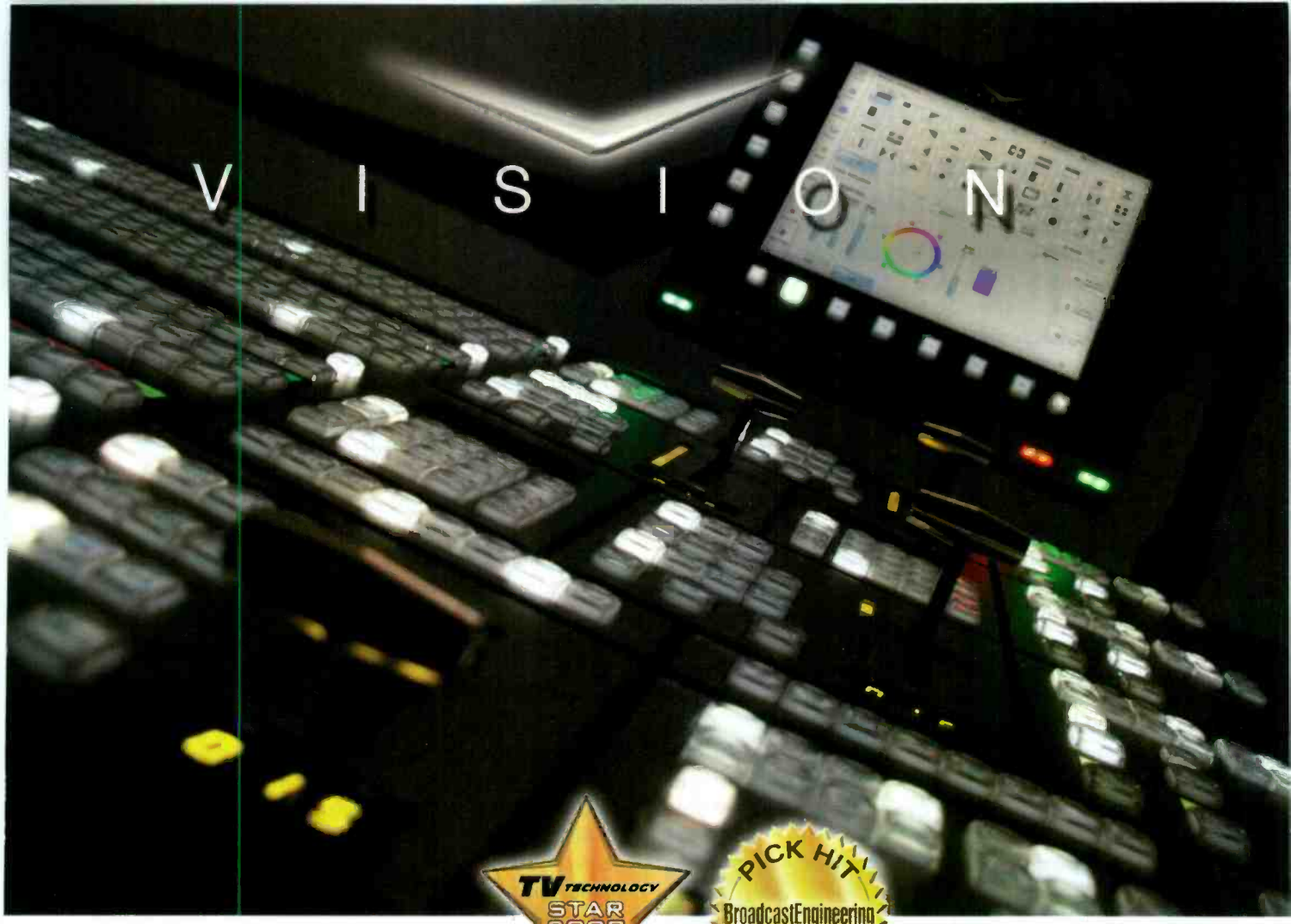
The prospect of connecting the broadcast LAN to other networks inside a facility causes engineers concern. The idea of connecting that LAN to the Internet may cause even more concern, and with good reason. The Internet is downright terrifying.

I maintain several servers on the Internet, and on an average day, I get about 2000 break-in attempts. This is probably not comforting news to someone who has just been told that the company is establishing a WAN so they can hook all remote automation systems to a central traffic system.

As Figure 1 shows, a LAN is a local area network, and a WAN is a wide area network. A LAN exists within your facility, while a WAN extends beyond your facility. Simply put, network equipment at the edge of a LAN communicates with network equipment at a remote facility to tie these facilities together.

WANs have many uses in broadcasting. For example, a WAN might allow a centralized traffic system to distribute logs to several remote automation systems, or it might be used to deliver audio voice-overs from a production facility to any number of network affiliates. WAN traffic travels over a link layer network, whether that is Ethernet, frame relay or another packetized transport mechanism.

A secure but expensive way to interconnect LANs is with a WAN using dedicated leased lines. To do this, a company purchases dedicated lines for use between its facilities. No outside traffic is permitted. If access to the WAN is controlled, this results in a secure way to connect mission-critical equipment.



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Of course, most service providers charge more for dedicated leased lines because they cannot run other traffic over them. Unfortunately, because they are expensive, few broadcasters use dedicated leased lines anymore. The Internet is much less expensive.

Security techniques

So what is the alternative? Many corporations transfer private data over WANs every day. How do they do it? Why would a bank or other financial organization be comfortable transmitting highly personal information over the Internet, especially when they know that crooks are deliberately trying to gain access to this information?

The answer is that they use proven security techniques, they actively audit their security systems, they employ active detection to proactively determine if a break-in has occurred, and in some cases, they hire security firms to attempt to hack into their systems. Broadcasters can use a similar approach when developing WANs that transport data over the Internet.

The following are things you can do to secure your facility.

• *Encryption.* Use strong encryption on all WAN traffic. What constitutes strong encryption changes over time, so you should talk with your equipment vendors and potentially talk to an independent security consultant when deciding what encryption to use.

• *Authentication.* Use strong authentication mechanisms, not only on your WAN, but on servers on your LAN as well. Most security consultants recommend abandoning the old username/password authentication mechanism. It has been proven over and over that this system is easy to crack.

Many organizations use two-factor authentication. Usually two-factor authentication consists of something you have and something you know. An example of this is the badge system at all federally controlled airports. The badge is something the employees have, and the code they enter after they swipe the card is something they know.

In the computer world, you may have a private key (a long randomly generated sequence) stored on your computer (something you have). This is used along with a passphrase (something you know) to verify that you are who you say you are.

• *Audit.* Conduct an audit of your security policy and security systems. Think about the security policy and whether it makes sense. Put yourself in the position of someone who wants to gain access to your network or disrupt it. No one knows your processes better than you do. Before you talk to an outside consultant, think through the security policies yourself.

• *Monitor.* Consider installing systems that monitor your network for suspicious activity. When these systems see something out of the ordinary, they send out notifications by e-mail, SMS or telephone. In some cases, these systems can take steps to shut down the WAN or other link without human intervention.

One word of caution: Be sure you know the total cost of using these systems. It takes an expert to configure and maintain them.

• *Update operating systems.* Run the latest versions of operating systems in all servers and network edge devices. Have a system automatically notify you when updates are available. Check for upgrades before you perform an initial installation. Do not assume that just because a device arrived from the manufacturer that it has the latest software upgrades.

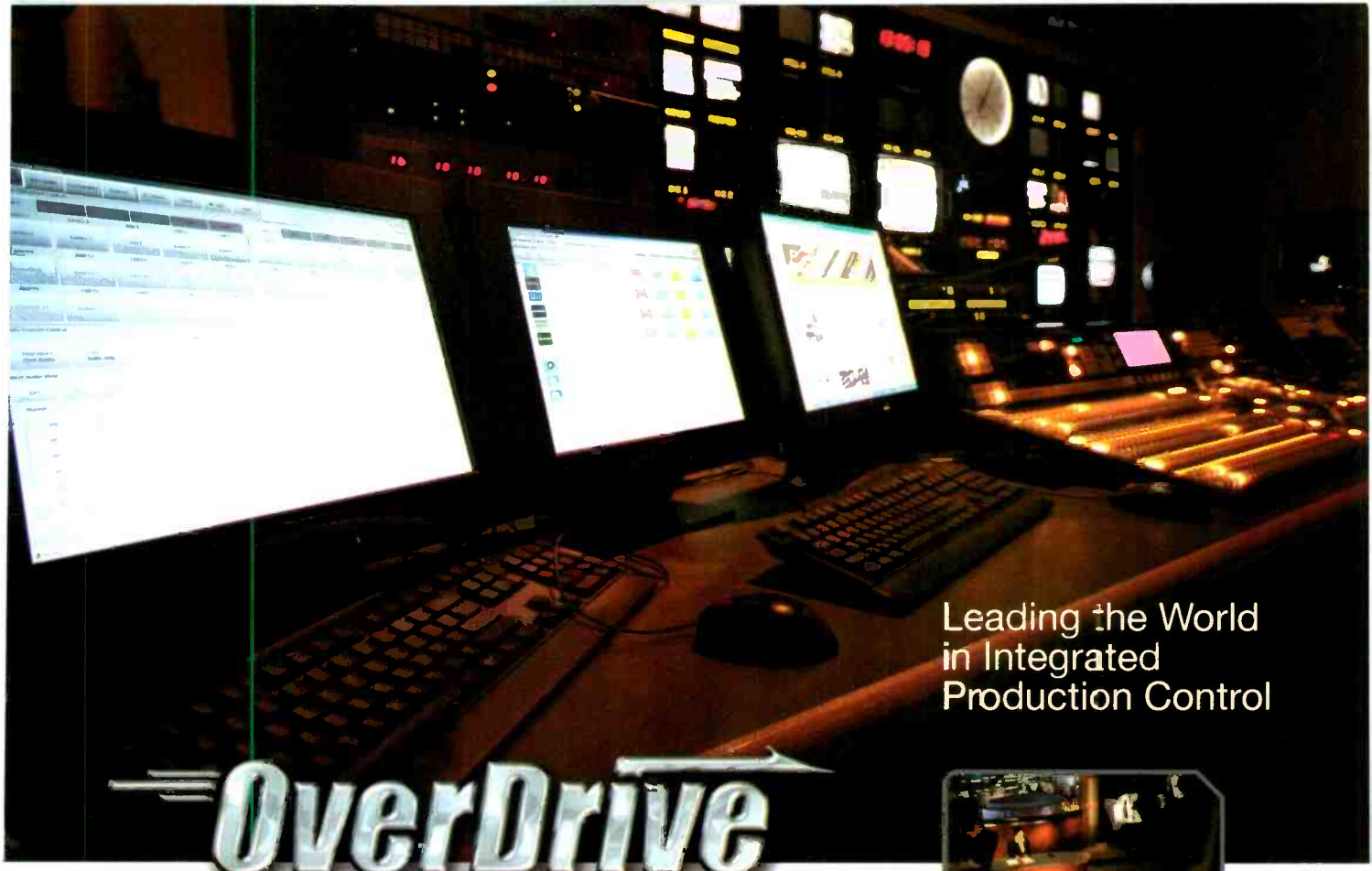
• *Hire a security expert.* Hire a security expert to analyze your network and to make recommendations. When you hire someone from outside your organization, do not turn everything over to him. You will get much better results if you engage in a partnership with your consultants.

Conclusion

A WAN linked with the Internet can be a cost-effective and secure solution to the dilemma many broadcasters face in connecting critical systems that are geographically separated. BE

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

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



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Streaming video

Broadcasting has become a multimedia environment for both business and consumers.

BY ALDO CUGNINI

Today, content producers no longer have a captive audience of local TV screens. Their content is likely to be viewed by anyone with an Internet (or even cellular) connection. The content owners that use these resources will wisely open up their audience to a truly global reach.

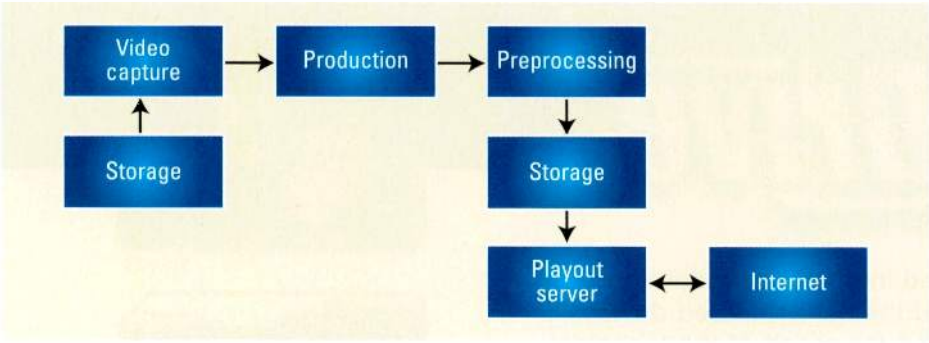

Figure 1. Steaming video is managed in an IT infrastructure.

Providing streaming video to a user requires several unique elements, including the use of special formats, compression and associated metadata. Ideally, the studio asset management system will do most of this automatically. (See Figure 1.)

First, video material is selected or queued for streaming. If the segment is archived on tape, a tape-to-file capture must be made. An edit decision list is assembled that essentially sets the in and out points for a segment. Furthermore, ads and promos are added. One major difference from nonlinear editing is that these bumpers can be added as an actual video edit or as a playlist item that is retrieved at streamout time. The latter is more frequently used and has the advantage of saving production time and storage space.

The desired video material must be repurposed for the target device, be it a computer or a mobile device such as a cell phone. Next, a change in resolution is needed (format conversion), and the material must be encoded (compressed) to meet the bandwidth constraints of Internet service providers or mobile service. Given the typically smaller display size of these devices, video noise reduction should also be applied to maximize the efficiency of the encoding.

Types of packaging and video codecs

Many of the file formats used today are actually multimedia containers that multiplex the various video, audio and data components into one package or file. (See Figure 2 on page 32.) The file wrapper does not always uniquely define the type of video coding that is used. Thus, AVI, ASF, FLV, MOV, MPEG-2 Systems, MP4 (MPEG-4 multimedia), MXF and 3GP (for mobile phones) all define the format of the container (or transport layer) that, in turn, includes the compressed audio and video essence, and other data. Note the distinction between data and metadata. Data could include subtitles or other text or information. Metadata is information about the file itself, such as a description of the content, the author, the copyright holder, and archiving or indexing keywords.

The producer's choice of file and video format is a function of compression quality and efficiency, product support at the user's side, and possible licensing terms for the encoders. Each of the following streaming video technologies combine compression, file formats (containers) and streaming protocols. Many of the codec providers claim their codec exceeds the performance of the others. In reality, comparisons are exceedingly difficult, as there are many different encoding parameters that can be used, resulting in varying degrees of playback performance.

Some of the most common formats are:

Many claim their codec exceeds the performance of the others. In reality, there are many different encoding parameters that can be used, resulting in varying degrees of playback performance.

• *Clipstream.* Destiny Software's streaming technology uses streaming video encoder and server technology on standard Web servers. As such, a

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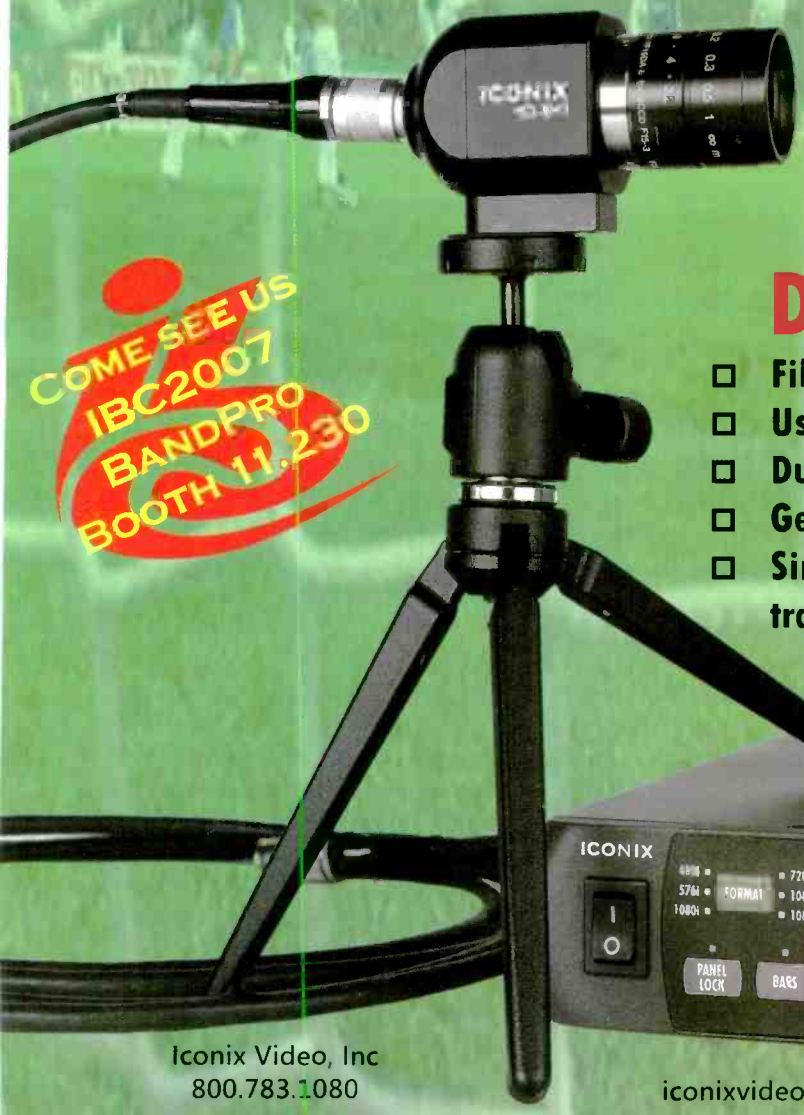

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transport protocol (e.g. UDP) is unnecessary. The player is implemented by a small Java applet running on the viewer's device — meaning that the service can also run on a Java-enabled cell phone.

• *Flash.* It uses On2 Technologies' proprietary Truemotion VP6 video codec. On2 (originally known as The Duck Corporation) claims that VP6 offers better image quality and faster decoding performance than Windows Media 9, Real 9, H.264 and QuickTime MPEG-4. VP6 is based on traditional spatial, temporal and entropy coding techniques, including discrete cosine transform (DCT) and motion compensation, with extended (long range) motion vectors and quarter-pel motion estimation. The On2 VP6 Simple Profile encoding is said to play back HD resolutions on a 2.5GHz Pentium-4 PC and 3/4 HDTV on a slower 405MHz platform. VP6 is also used in the On2 Flix Live application, which enables encoding of live video feeds.

• *QuickTime.* Apple's file format functions as a multimedia container file that stores audio, video, effects or text. QuickTime 7 is compliant with MPEG-4 H.264/MPEG-4 AVC and the 3GPP standard for third-generation high-speed wireless networks. The decoder supports Baseline, Extended and parts of Main Profile. QuickTime Streaming Server enables delivery of live or prerecorded content in real time over the Internet.

• *RealVideo.* RealNetworks based the format on H.263. However, it is now a proprietary video codec. RealVideo is streamed using the proprietary protocol Real Data Transport (RDT). The connection, however, is set up and managed using Real Time Streaming Protocol (RTSP). While RealVideo can use both constant and variable bit-rate encoding, the latter is generally unusable over streaming networks, as the available channel capacity is not dynamically known.

• *SHOUTcast.* Nullsoft recently implemented video streaming using the Nullsoft Streaming Video (NSV) format that encompasses the VP3 codec developed by On2. The codec is now in the public domain. It is similar in quality and bit rate to MPEG-1.

• *Windows Media Video.* Carried within the ASF container format, Microsoft's now-proprietary WMV codec has been standardized as SMPTE-421, also called VC-1. Having evolved from MPEG-4 AVC, VC-1 now employs an adaptive block-size transform and a modified deblocking filter that reduces artifacts in areas of high detail. VC-1 also has a special mode for handling interlaced video.

As the Internet is a variable-bandwidth medium, with no guarantee of packet arrival, UDP cannot be used if reliable video transmission is desired.

Streaming protocols make it happen

In order to stream audio and video over the Internet, various stream and transport protocols have been developed. The first of these was User Datagram Protocol (UDP), which sent the data in a series of small packets. The problem with UDP is that errors must be corrected, concealed or tolerated; there is no possibility of retransmitting lost data. As the Internet is a variable-bandwidth medium, with no guarantee of packet arrival, UDP cannot be used if reliable video transmission is desired.

The existing TCP/IP suite, with core protocols being the Transaction Control Protocol and the Internet Protocol, is already mature from years of Internet service. It guarantees reliable and in-order delivery of data from server to client. However, it does so by means of a series of timeouts and retransmissions, which renders streamed audio and video choppy when errors are encountered.

Developed later, the Real-time Transport Protocol (RTP) and Real-time Transport Control Protocol (RTCP), which both run on top of UDP, address these issues. RTP defines a standardized packet format for the audio and video data, and RTCP allows quality-of-service information to be sent back to the originating server. RTCP can thus send information on lost packets back to the server, which in turn can modify the encoding or streaming process. RTSP was then added, allowing the user (client) to control remotely a stream by means of VCR-like controls.

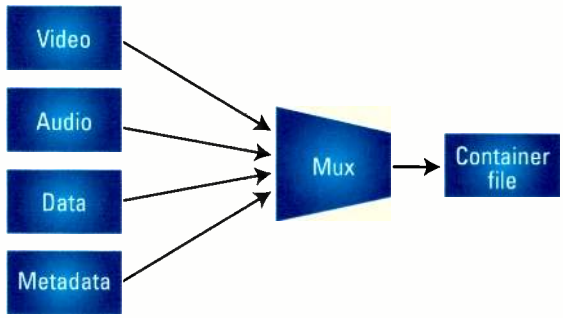
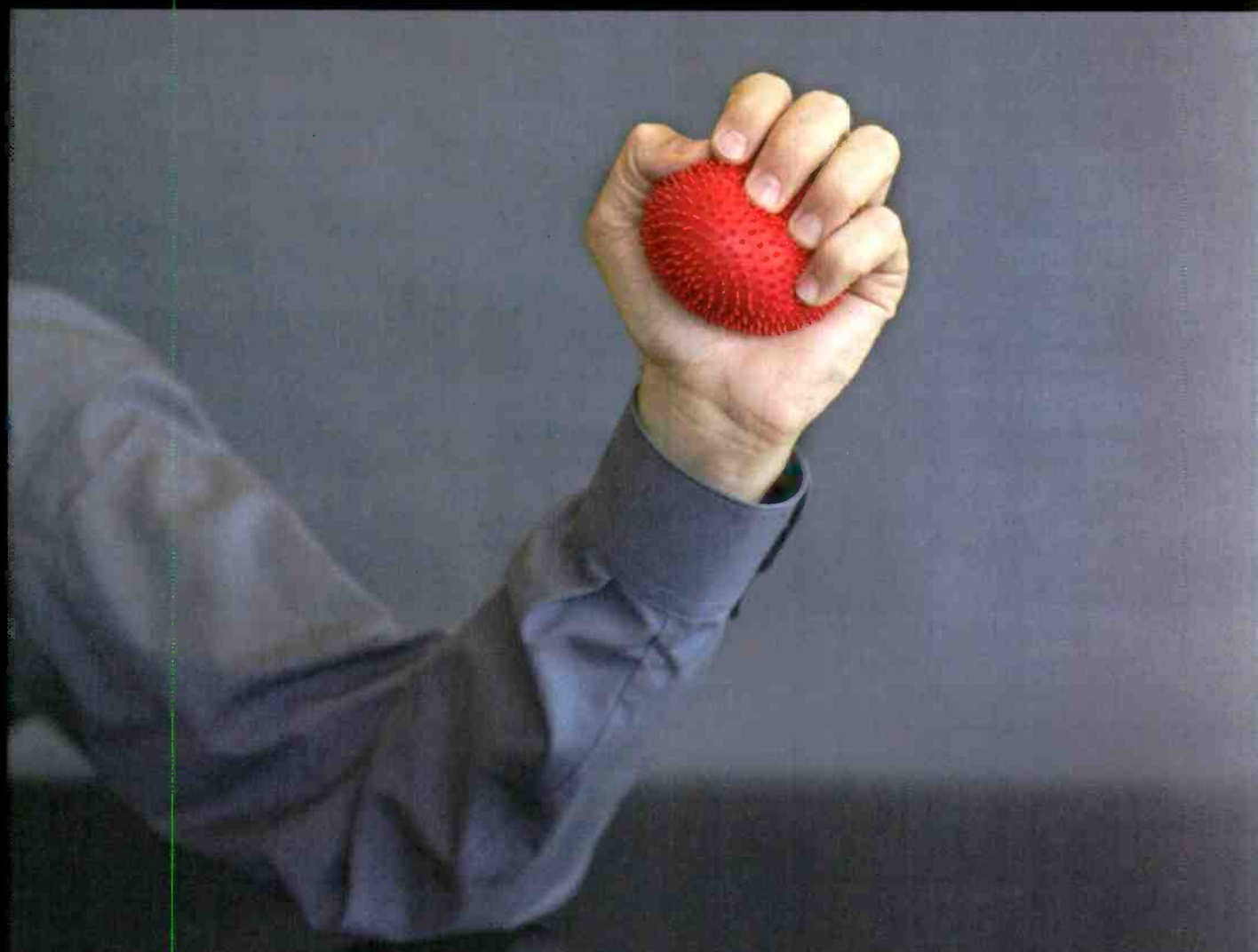


Figure 2. Container files hold the various elements of a streamed presentation.

Adobe, Microsoft and RealNetworks have proprietary protocols

SONY



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— Real Time Messaging Protocol (RTMP), Microsoft Media Services (MMS) and RDT to stream video using Flash, Windows Media (earlier versions) and RealVideo, respectively.

Video can be streamed over unicast or multicast connections, essentially one-to-one (on-demand) vs. broadcast. Unicast connections require large server horsepower and connection bandwidth, as the stream is duplicated for each client. The most efficient broadcast is IP multicast, where the source sends each packet only once, and intermediate network nodes have the duty of replicating packets as needed. However, this means that all nodes must support the protocol, a situation that is not currently in place. (Peer-to-peer protocols have also been developed by various entities, but these all share the problem of rampant copyright abuse.)

Content mastering

Video (and audio) that will be streamed is often derived from content that was originally targeted for another use, such as broadcast. In order to make for the best presentation on PCs or other devices, the content must be repurposed for the specific use.

An extreme example of this is streaming to a cell phone, where the screen is often not more than an inch in size. A simple downconversion of the scanning format (resolution) can often result in illegible graphics and unsatisfactory content. Production tools and services are available that can greatly improve the appearance by intelligently cropping talking heads — even automatically — to allow for a better presentation. Graphics can also be recreated to display better on a smaller screen, and audio may require reprocessing as well. For efficient workflow, repurposing can be done in parallel with the original content production.

Summary

Streamed content is becoming every bit as important as conventionally broadcast programming. With digital storage of program assets, it is relatively straightforward to develop an infrastructure that makes the most use of content by repurposing for streaming applications. BE

Aldo Cugnini is a consultant in the digital television industry.

? Send questions and comments to: aldo.cugnini@penton.com

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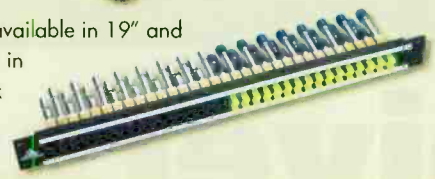

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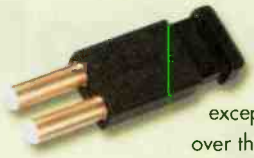

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SYSTEM DESIGN SHOWCASE

NBC Universal institutes global control and monitoring

BY MICHAEL GROTTICELLI

NBC Universal's (NBCU) seismic shift away from the manual handling of digital video and audio signals began in the mid-1990s. To take the process to the next level, the broadcaster implemented an IT-centric remote control and monitoring system that allows access to thousands of individual production and distribution equipment from a single PC. This enables NBC's staff to be more productive and to support new initiatives such as digital media.

The highly sophisticated system is based on an infinitely scalable IP-based iControl system and hundreds of signal conversion cards from Miranda Technologies. The iControl architecture is based on an Element Management System design that uses telemetry probes to provide advanced facility monitoring over an in-house IP network. This replaces a system of checks and balances that

NBC Universal uses Miranda's iControl system to achieve three main goals: failure monitoring, operations control and encoding of a variety of file types for the network's different distribution platforms.

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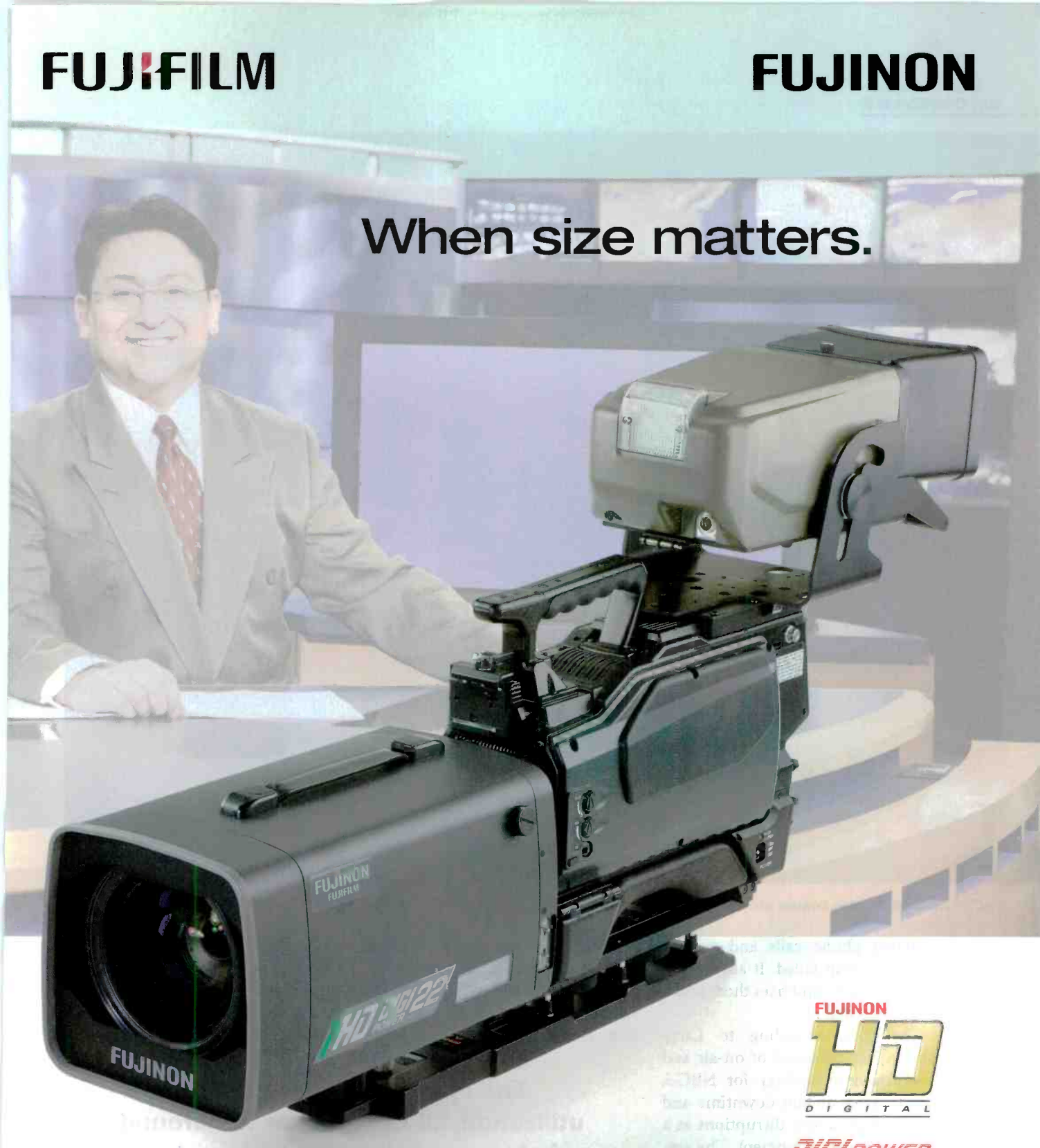

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NBCU's main production control rooms monitor more than 2000 devices within the network's New York City headquarters alone.

included phone calls and e-mails when a system failed. It also recognizes problems and fixes them much faster than before.

The goal, according to Larry Thaler, vice president of on-air and production technology for NBCU, was to avoid system downtime and to minimize on-air disruptions as a result of failed equipment. The system also increases facility utilization, allowing faster turnaround between productions and quicker assessment of technical problems.

Monitoring across the board

Thaler and his team began deploying the SNMP-based iControl system in March, and it now monitors NBCU's main broadcast facilities and production control rooms. The system currently supervises more than 2000 devices within the network's New York City headquarters alone. The headquarters building is home to "The Today Show," "NBC Nightly News," "Saturday Night Live" and "Late Night with Conan O'Brien," which share the same computer network and, in some cases, the same control rooms. The rebuilding of these shows' infrastructures was part of a company-wide migration to a serial digital infrastructure that supports both SD and HD production efficiently. Remote monitoring was always part of the plan.

The system increases facility utilization, allowing faster turnaround between productions and quicker assessment of technical problems.

The system will eventually support the entire network headquarters facility as well as all 10 NBC

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The network's IT-centric remote control and monitoring system can access thousands of individual production and distribution devices from any PC.

owned-and-operated stations and 16 Telemundo stations, giving the technical staff the ability to access and adjust the settings on specific devices in cities acrross the country, if necessary. The system can also diagnose a problem with a production switcher before it actually occurs. It monitors the network's transmission facilities, routing systems, control rooms, editing suites and new media operations.

Design team

NBC Universal
- Larry Thaler, vice president, on-air production and technology
- Marcus Saxton, director on-air technology
- Ed Cohen, project engineer
- Peter Maiorino, maintenance engineer
- George Thompson, engineer

Technology at work

Evertz
- MVP virtual monitor software
- 9725LG logo inserter
- 5600MSC sync generator
- 500ACO2 HD emergency 2x1 changeover unit
- 7760CCM-HD closed-captioning encoder

Miranda Technologies
- iControl monitoring software
- AMX, Densité, Symphonie and XVP series signal conversion modules
- Kaleido-K2 multi-image display processor

Sony
- MVS-8000 HD switcher
- SRW-5000 HDCAM SR VTR

Thomson Grass Valley Encore and 7000 series router control systems

Keeping systems operational and online

Thaler had three main goals for deploying the iControl system:

- *Failure monitoring.* When an SNMP monitored device fails, a signal is sent to the technical staff via Internet connection as well as wireless pagers to alert them of a problem.
- *Operations control.* The technical staff can quickly reconfigure systems to handle any type of audio and video signal. A 720p signal coming into the network's transmission facilities is automatically converted to 1080i with the push of a button. The capability also comes in handy for NBC's dubbing activities.
- *New media.* The system gives the staff a low-resolution proxy of incoming material as it's being ingested into the company's stream servers. Team members can remotely monitor these streams from anywhere NBC has a network to ensure the highest quality video images.

The system combines IP monitoring with SNMP to allow the collection of third-party equipment status and providing multivendor interoperability. This, combined with streaming media for highly visual feedback, enables staff to create highly customized graphical representations for the different departments. This makes individual device and overall system diagnosis fast and easy. A Scripted Macros feature provides automated reactions to alarm conditions and guides operators through complex diagnostics.

Getting a handle on signal attributes

One of the tricky parts of the implementation was that each one of the conversion cards the network monitors has hundreds of parameters. Multiply that by the thousands of pieces of gear in use, and you can see what a challenge it was to figure out which specific parameters were priorities and how to establish alarms

for those signal attributes.

Once NBC determined which specifications it wanted to implement, Miranda helped develop a software tool that allows Thaler's team to blast that monitoring configuration out to all of the cards without affecting their signal parameters. This avoids having to reprogram every individual card in order to monitor and adjust settings remotely.

As the year rolls on, the network will continue to implement additional interfaces to new types of equipment, such as multiviewers, encoders and other types of compression equipment. Many of the vendors supplied SNMP interfaces to allow the iControl system to accurately and reliably access their respective gear. The plan is to deploy iControl software across the entire infrastructure as quickly as possible.

The network's Englewood Cliffs, NJ, facility (home to all of NBCU's cable distribution) is next on the list to deploy the software and hardware systems from Miranda, followed by the stations sometime in 2008. The NBC Olympics team will use the system in some of its transmission systems as well.

In the last two years, as NBC has converted its plants to HD, the need to monitor these systems has become more important than ever before. That's why all new HD-capable equipment must be SNMP-compatible. This allows the system to send and receive alerts via IP over a high-speed Internet connection. BE

In the last two years, as NBC has converted its plants to HD, the need to monitor these systems has become more important.

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

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Arc flash safety

Perform the necessary calculations, or your station could come under fire.

BY DON L. MARKLEY

In a typical television transmitter installation 30 years ago — at a time when big power was coming into play (three-phase, 460VAC) — power was fed from a transformer located just outside of the building. To design the building's internal power system, the station generally hired an electrician — not an architect or engineer. If the station was fortunate, the electrician contacted an engineer to discuss the system, but this was not likely.

Back then, the transmitter manufacturer stated the value of the fuse or circuit breaker desired to protect the equipment in an instruction manual. Too often, the next step was a trip to the electrical supply house to see what could do the job. That equipment was installed and would work fine for the next 30 years, as the transmitter would not develop a fault calling for the main disconnect to function. As a rule, smaller breakers connected to the individual circuits pick up most transmitter faults.

After 30 years, there's a problem. A short occurs in the power lines going to the high-voltage power supply. In essence, two of the individual phase lines short together. The transmitter goes down, but a greater problem rears its ugly head.

When the staff enters the transmitter room, smoke is coming from the main disconnect and from the wiring into the high-voltage power supply. The fuse or circuit breaker did not shut down the voltage as it should have. In a flurry of excitement, the technicians head for the main disconnect switch to kill the power to the transmitter.

When the engineers open the front cover, there is a huge flash of flames. Molten steel and copper spew from the disconnect. The force from the explosion knocks the technicians to the ground and scatters everything in the transmitter room. Both technicians receive second- and third-degree burns. The technician closest to the explosion may be blinded and will be lucky to survive.

An arc flash is an electrical explosion that produces a large amount of energy. Photo courtesy EWB Engineering.

Breaking down an arc flash

This phenomenon is called an arc flash. An arc flash can occur when insulation or mechanical characteristics break down, letting one or more power line phases short to the ground or to each other. The resulting short circuit produces a large amount of energy.

The results are amazing. Engineers have calculated the energy from 10,000A at 480V. This is comparable to 8MW instantaneously dumped into surrounding metal, wiring or people. It's roughly equivalent to the energy from eight sticks of dynamite.

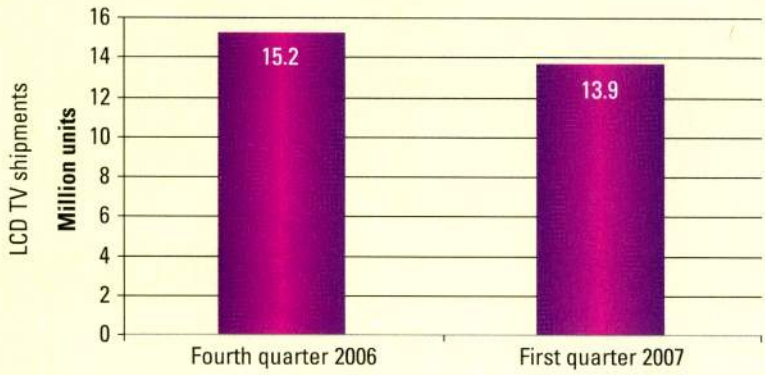
To understand what happens during an arc flash, let's break down each step. When the transmitter's power system was originally installed, calculations should have been performed to determine the value of the short circuit current available at the primary disconnect. This involves physical parameters, such as the size of the feed conductors from the power company source, the material used, the physical placement of the affected components and the reactance values for the transformer feeding the building.

FRAME GRAB

A look at the consumer side of DTV

LCD sales declined in first quarter of 2007

Shipments were down 8 percent from the previous quarter.



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Calculating the short circuit parameters is a detailed process and should only be done under the supervision of a licensed engineer. This is not something your typical electrician can or should try to do.

The purpose of determining the short circuit current is to assure that the primary disconnect device is sufficiently rated to handle the possible current value. You need a device that provides normal overcurrent protection but also has the ability to interrupt the circuit in case of a failure. The reason the fire occurred in the earlier example is because the main disconnect didn't have the ability to break the circuit.

The determination of the short circuit current, sometimes called the *bolted fault current*, is part of the required work to perform a complete hazard analysis for possible arc fault situations. IEEE Standard 1584 establishes measures that can be taken to prevent arc flash. (See "Key steps to prevent arc flash.")

The incident energy is expressed in calories per cubic centimeter squared. The flash protection boundary level is 1.2, which equates to a second-degree burn. As one gets closer than the boundary, the injuries increase.

The bottom line of this month's discussion is that arc flash calculations need to be performed on the electrical service to your building. That analysis should become part of a broadcaster's training program for technicians and part of its safety meetings. The proper safe area needs to be marked, and protective gear should be made available on-site and ready for use. All this is spelled out in NFPA Standard 70E. Finally, a professional engineer must make those calculations. Don't try this yourself.

Calculating the short circuit parameters is a detailed process and should only be done under the supervision of a licensed engineer.

Key steps to prevent arc flash

- Collect system and installation data.
- Determine system modes of operation.
- Determine bolted fault current.
- Find protective device characteristics and arc duration.
- Document system voltages and equipment class.
- Determine arc fault current.
- Select the working distances.
- Calculate the incident energy.
- Calculate the flash protection boundary.

Resources

Thankfully, there is a lot of information available on the Internet. One helpful Web site is *www.easypower.com*. The site contains free literature that explains both the problems and the solutions. Broadcasters should also obtain a copy of "NFPA 70E" and the "IEEE Guide For Arc Flash."

If you don't think arc flash is serious, Google "arc flash photos." One photo that is shown on many sites shows three guys looking into a main disconnect cabinet. Then it blows up on them.

Everyone in this incident went to the hospital. One person was placed into a coma to help him survive the burns, but he died. OSHA issued a huge fine to the company in this incident because the company knowingly sent the engineers to work on the switch without protective gear. The company's two supervisors face possible prison sentences.

It's estimated that arc flash injuries send five to 10 people a day to hospitals with burns. Direct and indirect costs to companies have run as high as $15.75 million for a single incident. These injuries can be avoided by the use of proper equipment and training. Even providing something as simple as a long pole that can be used to push the door open can save someone's life.

Now you know better

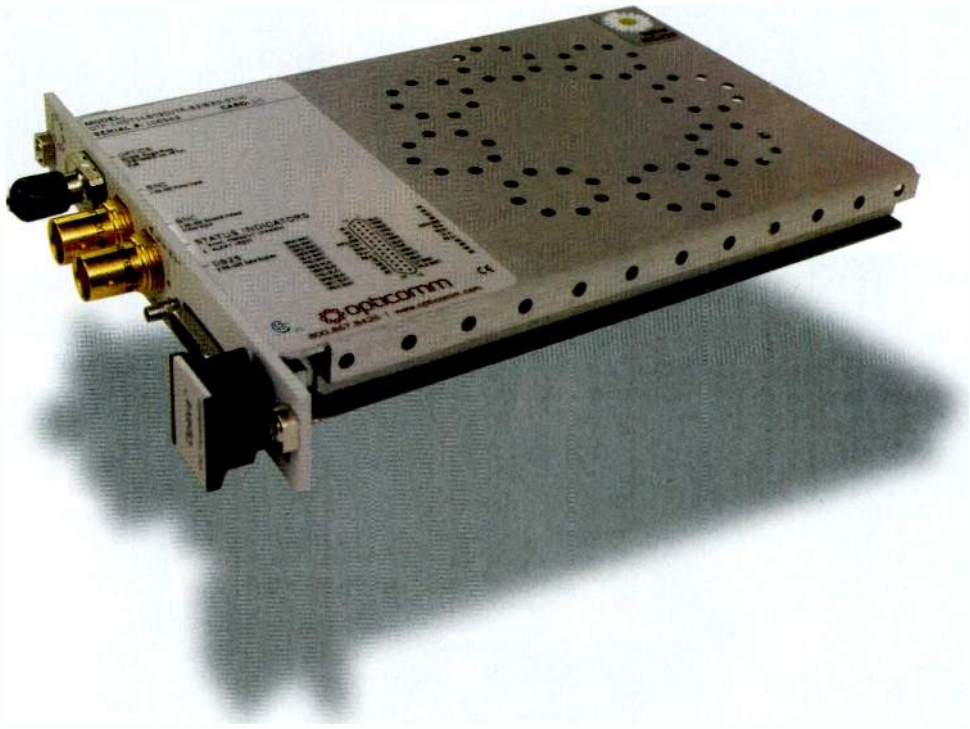
Now, it's time for the kicker. As a chief engineer, you can never again send someone to work on the electrical supply equipment unaware of the arc flash dangers and standards.

You have been informed about the necessary calculations, safe areas to be established, and the need for safety meetings, and protective tools and clothing. If you send someone to work on such equipment now and you don't provide the above resources, you would be doing so while knowing the possible dangers. The fine could be huge, and you could end up in the slammer. Sorry; I'll miss you as a reader.

Don't let this happen to you or your station. Hire a good electrical engineering firm that specializes in electrical power work. Determine the possible fault current and the arc fault problems. Then, take the measures necessary to protect your staff. While we joke about the cost of such studies, the real issue is the protection of your workers. No one wants his career tarnished because he failed to properly protect the staff. **BE**

Don L. Markley is president of D.L. Markley and Associates.

? Send questions and comments to: don.markley@penton.com



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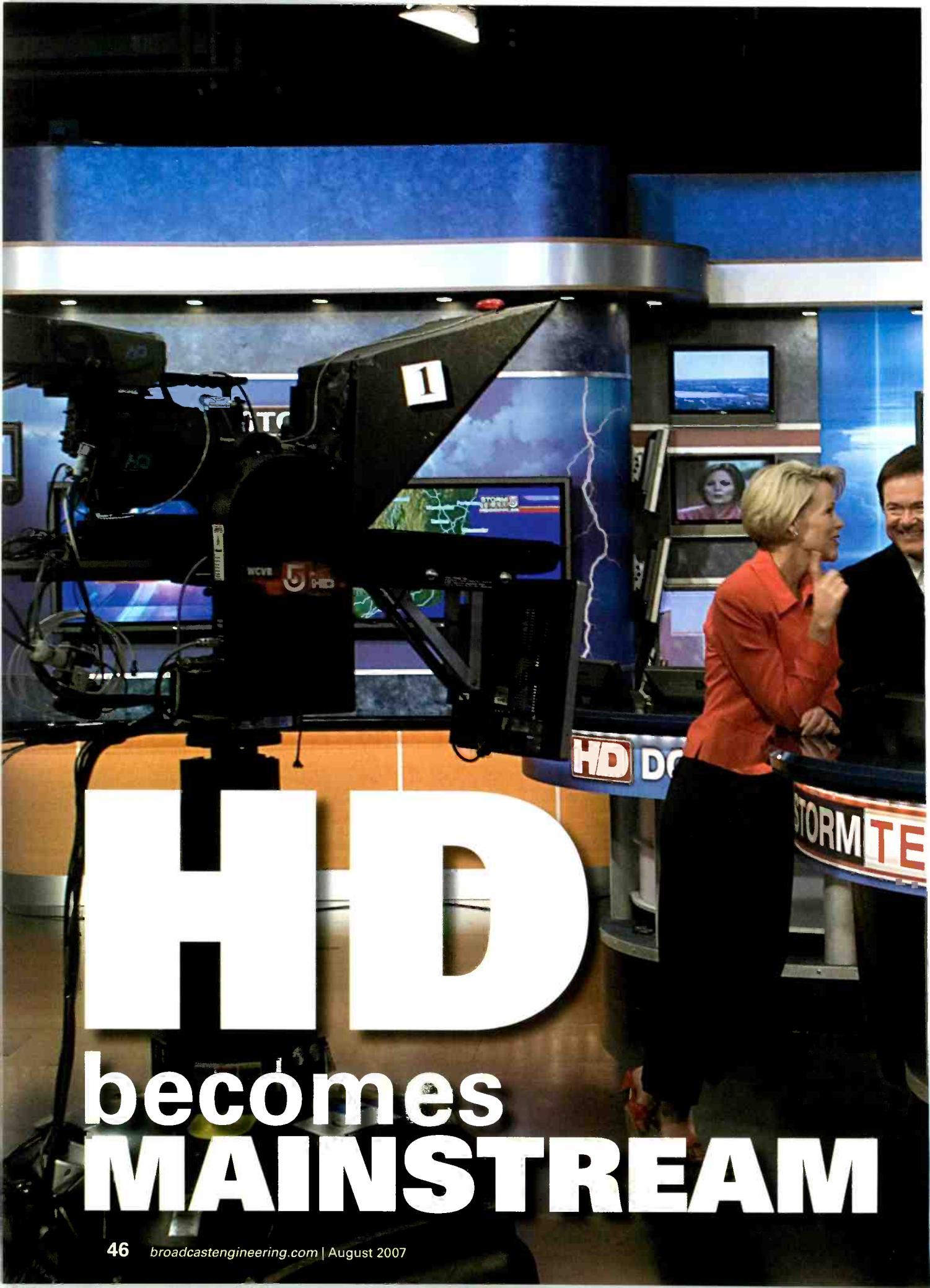


HD becomes MAINSTREAM

WCVB-TV in Needham, MA, was one of the first stations in the Boston market to broadcast high-definition news. The station's transition to HD in May resulted in a new 4000sq-ft studio equipped with more than 40 HD DLP, LCD and plasma screens, as well as a state-of-the-art rear projection system. Image courtesy FX Group. Photo by Wayne Gunnell.

BY JOHN LUFF

Complex market dynamics have dramatically changed the production landscape in the last few years. Since the late 80s, pundits have repeatedly painted each year as the year of HD's breakthrough. Repeatedly, they have been off the mark. It has taken more than time to get this all sorted out, but this year HD became real. We'll take a look at what has happened, what tools are available to producers and where the near term is likely to lead our industry as HD penetration in the consumer market continues its solid climb.

HD explosion

One might argue that the looming FCC DTV deadline, which at the end of this month is only 577 days away, has pumped up the market for consumers and increased the demand for production and the tools needed to support it. That, however, seems to be an exaggeration — no matter what Wall Street thinks. Consumers still appear to be confused about the transition to DTV and even more confused about how to receive HDTV broadcasts without satellite or cable service.

But clearly the explosion in the number of HD channels available nationally has fed the consumer marketplace. Beginning with Discovery HD, which has been highly rated by HD adopters, and the sports broadcasts on ESPN HD and ESPN2 HD, consumers have been treated to stunning pictures and great sound, better than anything they had before. It is hard not to covet a large set with a great picture, and that is precisely what CE suppliers are counting on as they shift more display space to HD product.

The perception and reality that HD meant higher production cost initially held back HD adoption. In the first years of HD delivery, the hardware cost significantly more than equivalent SD products. A camera cost $250,000 a decade ago, and even in 1998 as stations prepared to go on the air with HD for the first time, cameras

were 30 percent to 100 percent higher in cost. Lens, VTR, switcher and terminal equipment prices were high by similar margins.

But as the volume has ramped up, the costs for practical HD gear have plummeted, making the differential in complete systems closer to parity, but still with a premium of perhaps 10 percent to 20 percent. At those prices, however, it is easy to see how one might make a financial case for investment in HD capability so long as SD delivery using the same assets is not precluded. With the useful life-

With a unique use of scenic video insertion and light-changing capabilities, the HD set at AOL's headquarters in Dulles, VA, can be reconfigured at a moment's notice. Image courtesy Devlin Design Group.

time of television hardware traditionally being six to 10 years, one can find the arguments less specious, especially when reading the long-term prognosis for SD-delivered hardware and the content it is capable of producing.

Producers are always concerned about shelf life of the content, and that is a major issue in situations where the differential in production cost is demonstrable. That is the case when renting a production truck, or studio, for a complex production that one hopes will have "legs" far into the future. If the production product's useful lifetime is limited by the fact that it is only available in SD, the accountants will recommend an HD shoot, even if the release in the short term is SD. But with the number of release channels almost exploding, it is clear that HD is ascendant and available. For instance, DISH Network now has 33 national feeds. Without taking into account the multiple feeds available in premium sports packages like NFL Sunday Ticket, there is significant upward growth in the number of channels available to consumers.

Recent announcements illuminate market trends. HBO plans to convert all 26 of its distribution feeds to HD by the second quarter of 2008. In September, Turner's TBS HD will join TNT HD, which has been on the air for two years, and in the fall, CNN HD will launch. In January at CES, DIRECTV announced the pending launch of 60 new HD channels, including the Turner properties, the Sci-Fi Channel, FX, USA Network, Speed and Turner's Cartoon Network, among others.

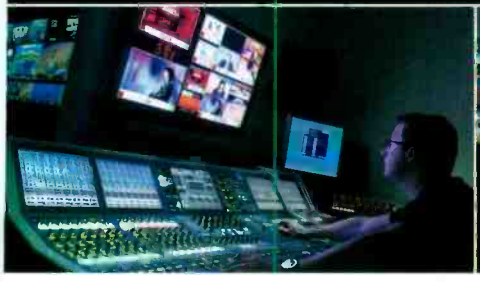
HD newscasts

Broadcast HD content has also continued to expand. The NFL will require all broadcasts to be in HD in the future, which is part of rights-holder contracts now. In addition to CNN HD this fall, broadcast networks are converting to HD. FOX News is in the process of converting its main New York headquarters to HD, and NBC Nightly News has been on the air in HD since March.

In a significant change in industry-wide plans, the addition of local HD newscasts has created quite a stir. WRAL-TV in Raleigh, NC, has been broadcasting news in HD since 2001, and this year many stations in large and small markets have converted studio facilities to HD. Like other competitive forces in news, when one station in a market converts to HD, it is hard for the others to avoid eventual conversion for fear of market share loss.

But the conversion to HD presents special challenges for news operations. News is unique in the amount of file footage used on a regular basis, and the potential to have jarring transitions in an HD news broadcast gives producers heartburn. But with the need to use existing footage, choices are hard. Many HD broadcasts use the "pillar-box" approach, and NBC has done that with both file and field footage (which is not native 16:9), as have many local stations. Converting a large news station to HD requires a significant number of new cameras, which can be extremely costly. Holding back until costs come down has actually worked in this case, as HD news cameras have dropped significantly in price in the last year.

Some stations have chosen to use 16:9 SD cameras for news, with upconversion in the control room for playout. In truth, the quality of upconversion from a clean source has become so good that it is tempting to use SD source cameras. Playing into that decision is the lower bandwidth needed to transmit an HD story from the field. With H.264 (MPEG 4 AVC), compression field footage in HD is much more practical, and some stations have chosen to use the advances in compression to allow "full HD" field acquisition. The introduction of HDV cameras will have the effect of making HD production for news



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much more affordable. Networks and local stations have almost universally chosen to use HDV for at least some field acquisition assignments.

New cameras, including those using memory recording systems, such as the Panasonic AG-HVX200 and Sony XDCAM EX series cameras, have particularly resonated due to the instant access to content that memory recording systems feature. Panasonic's increase in capacity to 16GB per card removes much of the argument about limited recording capacity. With five cards, an HD camera can record 80 minutes, and 32GB cards are expected in the future. Panasonic also has embraced a variant of H.264 that it calls AVC-Intra, which will increase recording time significantly. Sony's recent introduction of XDCAM EX will use a new memory card (SxS) housed in an ExpressCard slot. (ExpressCard will replace Cardbus in the future for portable computing.) At NAB2007, Ikegami and Avid brought back the Editcam line, with both hardened disk packs (FieldPak2) and memory recording module options.

Of course linear editing for HD news would be hard to explain in these days of robust nonlinear editing systems capable of the increased bandwidth of HD production. Again, the advance of technology has tipped the balance in the last year, with lower cost and more complete nonlinear news editing solutions available. Inputs from HDV, XDCAM HD, P2HD, Editcam, Grass Valley's Infinity REV PRO and other sources are compatible with essentially all modern edit systems.

1080p60 production

At the high end, interesting developments have the potential to create a second HD industry just as the first is really catching fire. For years, many have sought the Holy Grail of HDTV — 1080p60 production. But both technology and economics have kept it from the marketplace. In the last year, cameras and other infrastructure elements of a 1080p60 system have become available, and at prices not much above standard HD products. SMPTE has standardized a gigabit interface that supports the higher data rate of 1080p60. (The serial link standard, SMPTE 424, supports the 2.97Gb data rate, and SMPTE 425 defines the source image format mapping.) Routing switchers supporting the new interface standard are on the market, and it seems logical that production switchers will follow as the cost of silicon drops. Though much of what makes up a complete system is not yet available, it seems likely that the future will allow producers to deliver stunning pictures.

Live 1080p60 channels could be on the air by the end of the decade.

But how could that be delivered to the consumer? As it turns out, the progressive scan nature of the image compresses about 30 percent more efficiently than interlaced pictures. Because there are twice the number of frames, that still leaves an increase of about 40 percent more data delivered to the consumer, assuming MPEG-2 coding. But if a service like IPTV, DBS or cable could use H.264, it might be able to deliver a "premium HD" channel without expending any more bits than HD requires today. It is useful to note that all three of those businesses are using advanced coding today, which might make a premium channel consisting of film content simply a matter of time. In addition, live 1080p60 channels could be on the air by the end of the decade. BE

John Luff is a broadcast technology consultant.

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Modern newsroom designs enhance ongoing SD operations while putting in place infrastructures that are ready to meet the demands of HD. Photos courtesy Harris.

Format-transparent news

Stations find three steps key when migrating to HD news.

BY FRED SCHULTZ

Despite the fact that all U.S. television broadcasters are now transmitting with one or more digital program streams, until recently, few undertook the additional challenges of producing local news in HD. Consequently, rather than providing end-to-end HD production solutions, technology vendors have focused on updating SD offerings to incorporate advances arising from the IT sector.

These advances include the plummeting cost of digital storage, the rise in networking bandwidth and the widespread availability of high-speed connectivity. The result was a new generation of file-based server and editor systems targeted at enhancing SD operations while incorporating infrastructures adequate for the inevitable demands of HD.

The broad shoulders of news

A successful and well-run news department usually provides a television station with the lion's share of its revenue. Therefore, ownership and management regard news as key to present and future profitability.

In prime time, many of the commercial slots for a given program are prefilled by the networks. Slots in syndicated programming may also be prefilled, or otherwise the show itself must be paid for. In contrast, during local news, all commercial time belongs entirely to the station.

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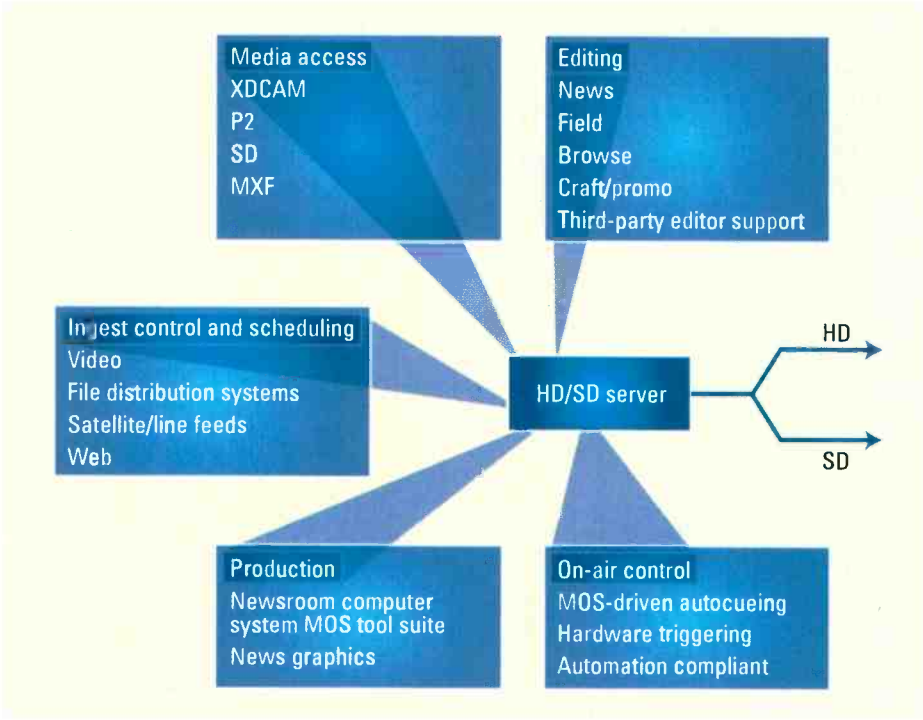


Figure 1. An example of a format-transparent newsroom workflow

In addition to the revenue that news programming generates, it also provides a station with a public face and brand identity. One thing television succeeds at far better than any other media is to extend a feeling of community into the lives of people who otherwise may share little but geography. The humanizing face of television news can uniquely evoke a sense of belonging and membership across its community.

Therefore, the competitive challenge each television station faces is creating a sufficiently compelling and engaging experience to drive regular viewing of its news. HD is a high-profile tool with immense power to optimize that experience.

HD expectations, legacy reality

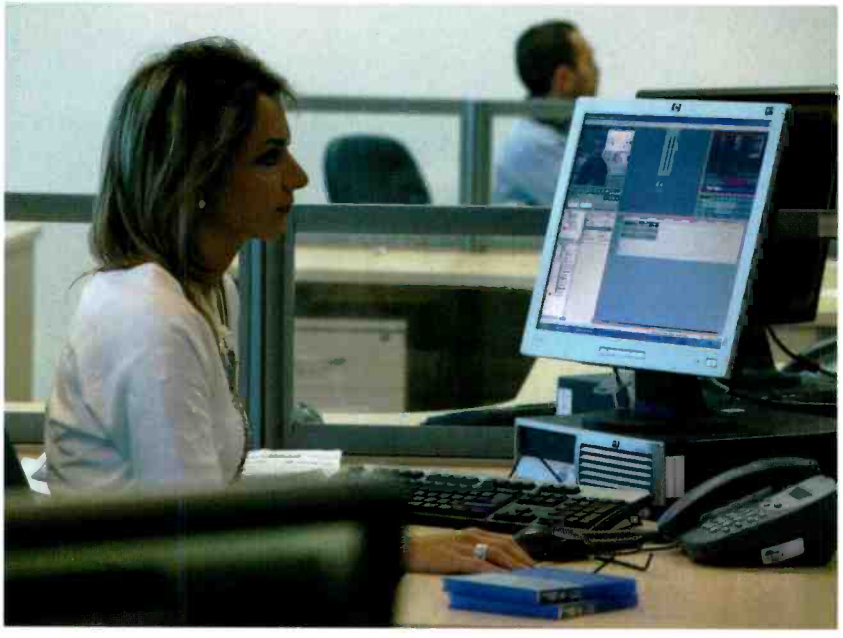
Much of a station's revenue is attached to the performance of its news. And because any technical errors or problems during a newscast are so visible and potentially costly, the managers of news operations view change conservatively. While a substantial number of stations have moved from tape-based to file-based SD news operations, many stations have postponed the cost of conversion until the need for local HD production forces an unavoidable rebuild.

Feb. 17, 2009, is the day when all over-the-air broadcasting in the United States must be digital. While this regulation does not mandate broadcasting news or any other content in HD and legacy TV sets may continue to be used via cable boxes or other adapters, the HD penetration already underway will likely spike leading up to that date. This effectively creates the deadline by which all stations that want to remain competitive must have their HD news operations in place and up to speed.

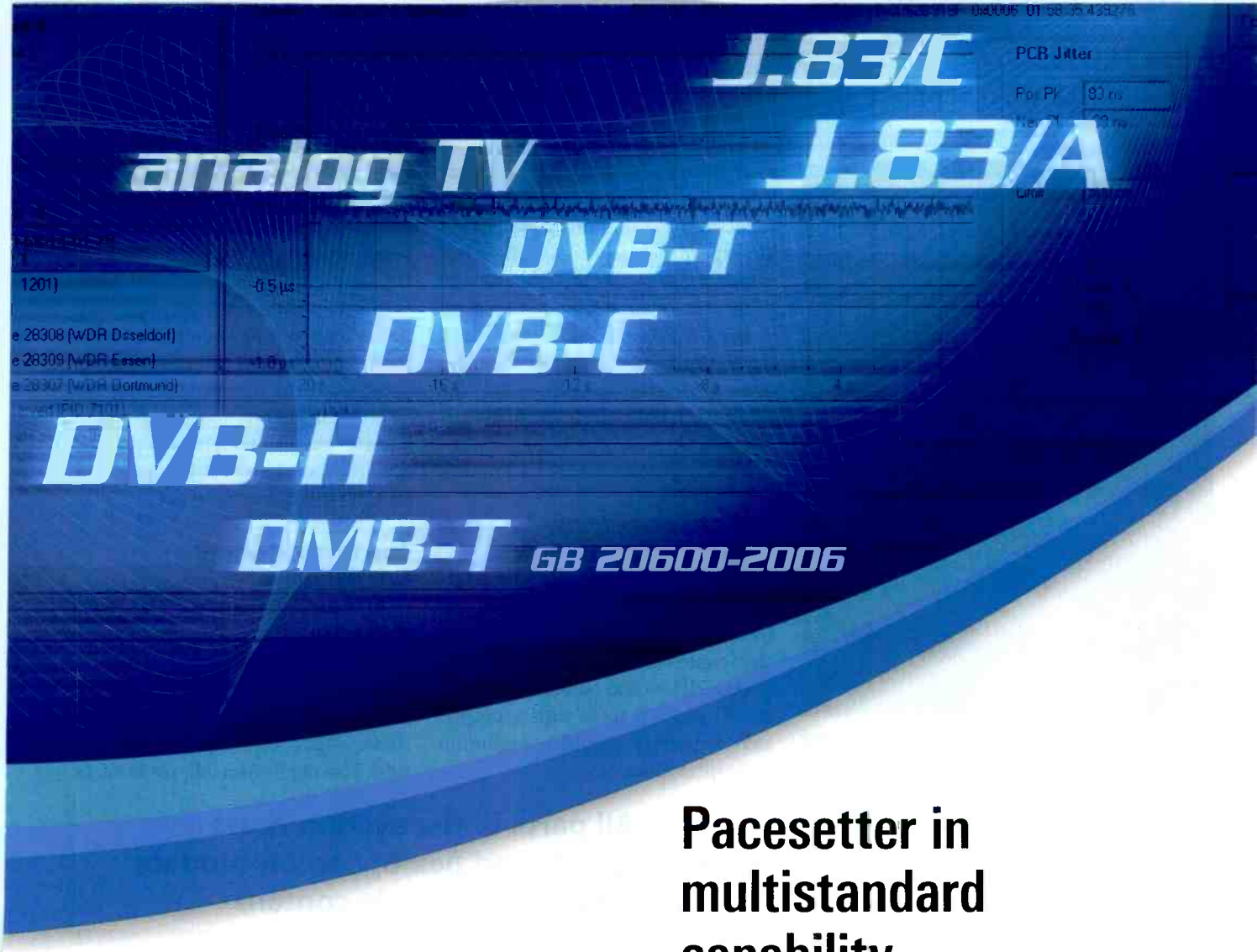
The appeal of HD for consumers is fast becoming a cultural expectation. Consequently, for all stations, irrespective of whether their news is currently tape-based or file-based, each new HDTV set that enters a home creates an opportunity for seizing or losing that viewer's loyalty. Each new set is a challenge to the status quo of a station's ratings and a threat to its bottom line.

The reality today is that the hardware used by stations for news ranges from color-under analog tape to HD-ready server and editor systems. In an industry that acknowledges how rarely anything is done the same from station to station, clearly no single build-out pathway can fit every circumstance.

Yet despite straddling this wide variety of legacy technology, market



Browse editing from the journalist's desktop will help speed the workflow in HD-enabled newsrooms.



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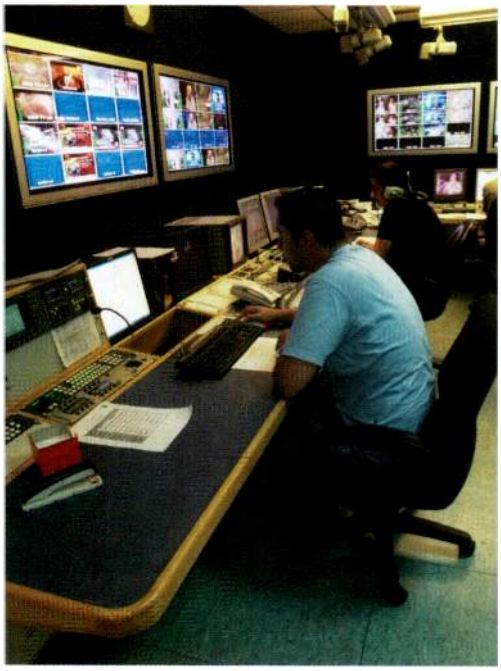


Broadcasters expect affordable solutions for HD that will support straightforward, format-transparent news operations.

size and capital budgets, broadcasters expect affordable HD solutions that will support straightforward, format-transparent news operations. (See Figure 1 on page 54.) For years, most manufacturers have been pushing their core product line in that general direction, and in the process, they are increasingly striving to meet two key benchmarks.

Smooth transition

The first benchmark is that operators want to create all news elements once — in HD — using the best content available at the moment, without any added steps or effort.

The fact that HD is destined to become the viewers' standard for news underscores the role of HD as the domain in which all news will be shot, produced and edited. SD viewers will be well-served by this process because SD derived from HD masters can be as good as, and often better than, content created from equivalent SD-only processes.

Broadcasters expect their technology to accommodate the growing range of content transparently. Ingest must be simple, and editing must be straightforward, with clear and flexible options for handling scaling and aspect ratio. Additionally, broadcasters expect that neither workflow nor system performance should be slowed to accommodate any kind of content.

Furthermore, broadcasters need news production systems that are open to technology built outside the traditional tight circle of broadcast vendors. One example is the full integration of Apple's Final Cut Pro into news workflows.

Transparent workflow

The second benchmark is that during on-air operations, the system will transparently output the best available content — principally, but not always, HD — and automatically create SD and HD feeds with appropriately templated graphics, resolution and aspect ratio.

ment comes to air a story, the system needs to play the HD edited content, story graphics, SD content from the library, download from the Internet, or clip or still from a mobile phone. Then it must perform all upconversion, downconversion and automatic aspect ratio conversions without needing input from the operator. The system should also accommodate linked SD and HD graphics templates so that the same text content will be optimized for both 4:3 and 16:9 playout.

The three steps to full HD news

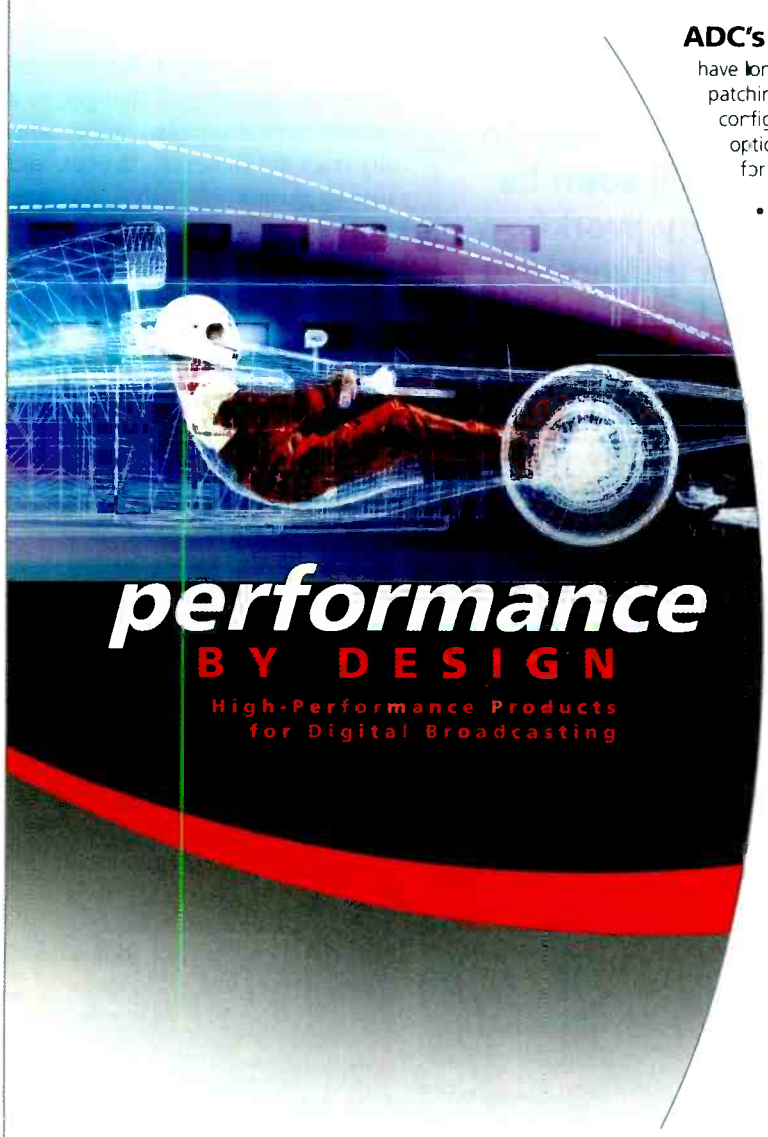
As stations bring their HD news production online, they usually encounter and accommodate a natural three-step rollout.

The initial step is to shoot HD in the studio while continuing with SD in the field. This requires an HD-ready set, as well as HD studio cameras, graphics, cabling and switcher. The SD content from the field can remain 4:3, though

All parts of the system must intelligently and flexibly accommodate the best available content.

All parts of the system must intelligently and flexibly accommodate the best available content. When the mo-

HD is destined to become the domain in which all news will be shot, produced and edited.



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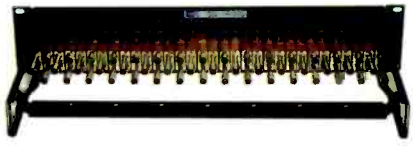

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increasingly, cameras enable shooting 16:9 SD. Both SD aspect ratios link back to the station without presenting a bandwidth problem, where the SD field footage can be cut on existing editors and upconverted.

The second step is deployment of HD field cameras. Editing systems that handle HD will then be needed both in the newsroom and in the field. Moving HD, with its increased bandwidth, back to the station is a serious challenge for legacy analog microwave units. Links based on Wi-Fi and cellular service will be exploited when possible for non-real-time transfer of files, but most content will simply be driven back to the station. Live shots will remain in SD, although increasingly in 16:9.

The third step is completing the 2GHz spectrum exchange with Sprint Nextel. After this step, stations will have complete digital field capability, supporting both HD live shots and feeds.

HD is on track to become the transmission format by which everything will soon be judged. No single HD technology, workflow or build-out pathway can be a universal fit for the diverse needs of news broadcasting.

Somewhere within each build-out, individual stations will determine the most appropriate time and process to upgrade their weather system and support feeds, including tower cameras and helicopters.

The next move

HD is on track to become the transmission format by which everything will soon be judged. No single HD technology, workflow or build-out pathway can be a universal fit for the diverse needs of news broadcasting.

The viewing public is the ultimate arbiter for justifying all changes, so a station's migration plan must carefully track its audience's desires, and more importantly, its behaviors. After all, at the end of the day, this entire technology changeover is so you can deliver a news experience that will bring viewers back tomorrow. BE

Fred Schultz is senior marketing manager for news solutions at Harris. He has written for the SMPTE Journal, is the author of a series of white papers on server technology, has won a prime-time Emmy Award and holds a Ph.D. from Vanderbilt University.

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SPECIAL REPORT

11 questions to ask before investing in news automation

BY SCOTT BLAIR

How much have you thought about automating your station's local newscasts? Most stations already use a newsroom computer system to provide automated text and cues for teleprompters, character generators and studio cameras.

To stay competitive, however, more broadcasters are relying on increased automation to add and control more devices without adding headcount, increase control and accuracy during newscasts through dedicated news device playout automation, and streamline routine operations through a common rundown-driven control point. When considering news automation, make sure you're asking the right questions so you get the ideal amount of automation for your needs.

1 Why would I want automation?

By providing common control points for video playout and graphics servers, news automation gives the producer and the control room staff access to both the program rundown and an interface to the devices. Automation systems can handle routine rundown-based tasks as well as rapid-fire and unscripted events, such as news teases and breaking news. With less need for coordinating and monitoring distinct systems, news automation tracks all events in the newscast and is a key component to reducing on-air errors. In addition to fewer errors and improved efficiency, automation can help broadcast stations reduce or redeploy staff to editorial, craft or other operations positions.

2 How much automation do I need?

This is the question to ask yourself — and also to ask your vendors. You certainly don't want more automation than you'll ever need, but you also don't want to cut corners and find that you are unable to meet your goals for improved efficiency.

At its most basic, news automation

provides production-assist tools that simplify playout of video clips, stills and animations, and graphics. At the other end of the spectrum, full-blown automation systems integrate control of video switchers, audio consoles and camera robotics.

Assess your goals and expectations realistically: Do you want to reduce errors? Repurpose the CG operator? Or automate the entire newscast?

Measure your goals against your budget requirements. Production-assist systems will enable you to meet many of your goals more affordably than full automation. However, you may find the return on investment provides rationale for full automation. An important consideration is how new systems will interface with your existing equipment, as well as planned future technology and device acquisitions.

3 I have a mandate to add newscasts but not staff. How will automation help me?

Automation should be one of the first things you consider in this case. With central control of multiple playout devices — in addition to routine rundown-based control — production-assist can be the solution to affordably add programming without additional operator needs.

Depending on your immediate needs and budget, automation will help you repurpose or replace your graphics playout staff, for example. If you are transitioning from tape to file-based systems, automation will easily replace the tape operators, freeing them up to edit more stories.

Production-assist automation is scalable, meaning that the size of the crew can be adjusted based on the needs and intricacy of the show. For example, the noon show may have a smaller crew and use more automation than the 6 p.m. show, which has more breaking news and requires more involvement from the crew.

A full-blown news automation system can have a significant impact on your bottom line by enabling a single operator to handle all of the control room functions. All of this can be accomplished regardless of show-by-show differences. Now your morning and noon show can have the same look and feel as the evening shows because the same prebuilt moves and complicated effects are automated.

4 How will this affect the quality of the newscast?

News is obviously a highly competitive operation, and viewers vote on quality — both editorial and production. Viewers don't care that the station is saving dollars by reducing control room staff by one, two or four people. Viewers want the quality they have come to expect, and they will move on if they don't get it.

With or without automation, the producer is constantly rearranging the show to accommodate time, behind-the-scenes changes or breaking news — while making sure that viewers at home see nothing but a smooth, error-free show. Maintaining this kind of flexibility under stressful situations is absolutely essential in considering automation products, and it can make or break the quality of the show.

News automation in the production control room can reduce the number of hands that touch each element in the on-air process — thereby reducing the chance for human error. By automating rapid or repetitive elements, complicated events, such as multi-clip news teases can be executed successfully by all newsroom crews, not just the 5 p.m. and 6 p.m. staff, providing a more uniform performance across all shows.

5 We do a lot of breaking news. How does this play into automation?

Think flexibility when considering how news automation systems handle

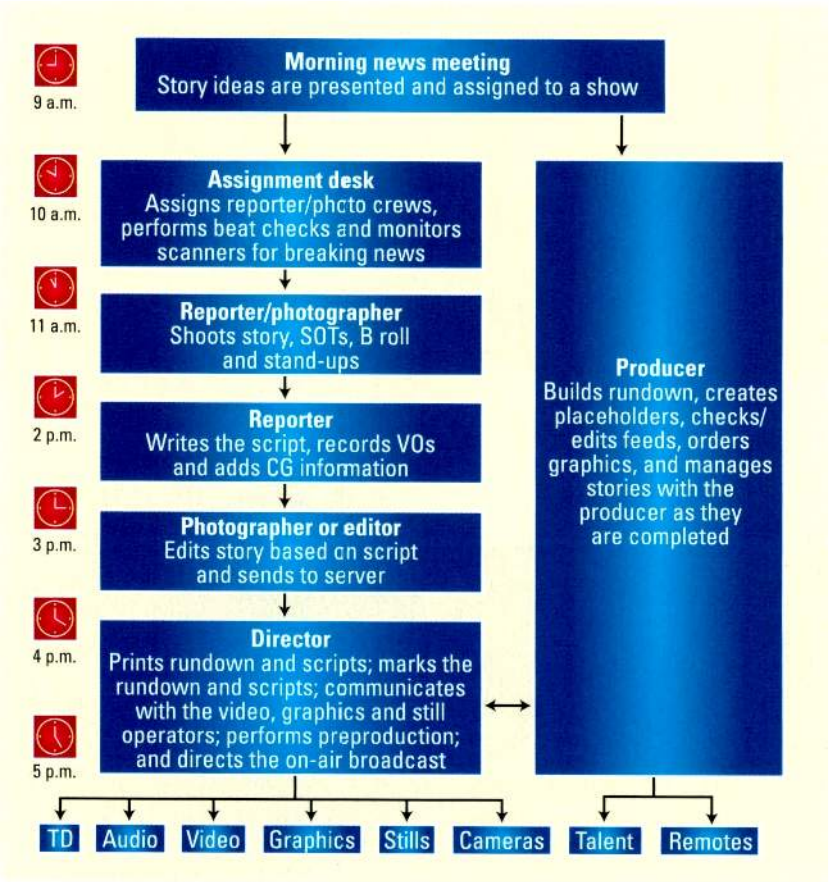

Figure 1. A basic control news workflow without automation

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breaking news. As you consider your system choices, make sure you look closely at how well each option handles an unscripted breakaway to live, breaking news and then how easily they resume normal automation and rundown playout. The control room will want the ability to drive the devices manually during the breaking news story.

News automation should take the crew seamlessly to the point of the breaking story — controlling devices based on the script and then, just as effortlessly, relinquishing device control so the director and technical director can control the show in manual mode to accommodate the late-breaking story. Rejoining the rundown after the breaking news should be just as smooth.

6 How will automation affect my news workflow?

Every station is different, but a typical newsroom workflow usually follows a fairly standard sequence of events. (See Figure 1 on page 62.)

Functionally, news automation should not significantly change your newsroom workflow. Stories still need to be produced, and in order to be produced, they need to be assigned. To put them on the air, they'll need to be placed in a rundown and have the proper device elements triggered at the appropriate times.

But consider how automation can affect other parts of the newsroom workflow. The rundown will be tied in with the devices, so whatever changes are made in the rundown will be automatically reflected in the instructions for device activation. Your vendor should be able to tell you whether changes in both directions — inventory on devices and events on rundowns — will update bilaterally so that background communication is continual and accurate. For example, when a new clip is complete and ready for air, you want it to appear in an updated inventory on the video server and trigger an indication to the producer or technical director that it's ready in the playlist.

In addition, automation can streamline the control room workflow. Without automation, the director is orchestrating a wide range of simultaneous actions — video switching, audio, cameras, graphics, stills, video playout and talent. With automation, the director has fewer parts to manage because the automation system is coordinating the other devices based on the script. It's a fully functional workflow, with fewer moving parts and a reduced chance for error. (See Figures 2 and 3.)

Automation should cut the number of steps it takes to deliver a high-quality on-air product so that the producers, TDs and other members of the staff don't have the distraction

of triggering device playout and can focus on their responsibilities. The most common first reaction to the pending introduction of news automation is, "We can't do it that way because we've always done it our way." But, with good training and rehearsal practices, the staff will become comfortable and embrace automation's step-saving features.

7 What kind of training will my staff need?

The training required to get your staff at a readiness level appropriate for on-air operations will depend on the complexity of the system that you purchase. If the system is a full automation solution that is integrated with a new switcher, audio control and robotics, then the amount of training should include sufficient instruction time and rehearsal time to ensure that the staff

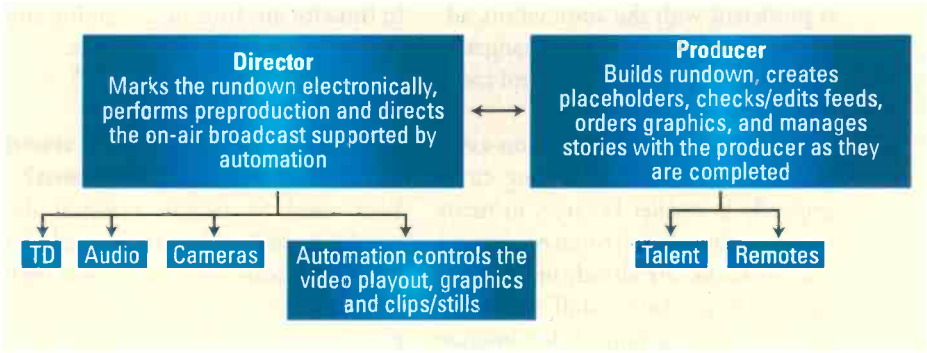

Figure 2. Production-assist automation offers error reduction

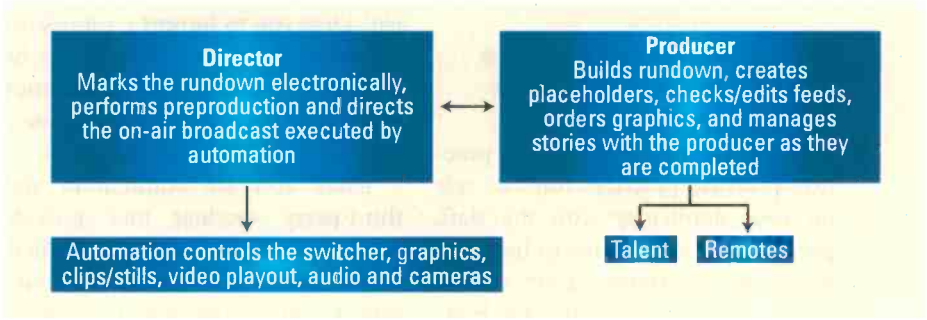

Figure 3. A streamlined news workflow with full automation

is proficient with the automation, additional hardware and any changes in workflow — both in the control room and the newsroom.

If the system is a production-assist type system, then the learning curve generally is smaller because, in many cases, existing control room equipment and workflows are already in place. Involving the newsroom staff in the process from the beginning is key because they will be integral to the success of news automation implementation.

8 How do I migrate from my current workflow?

One way to migrate is through practice, practice, practice! You can rely on your familiarity with the staff, program and operations to help you make this transition. Your vendor should also be able to provide best-practices guidelines or even develop the workflow alongside you.

If the system is full automation and is replacing most of an existing control room, stations will often stage it offline and rehearse shows, with talent, until everyone is comfortable. If you are buying a smaller system, you can rehearse shows offline between the real shows by moving device control between shows and reconnecting in time for air. Your own training and common sense will prevail here.

9 What about archiving? Do I need a separate system?

Your need to archive material depends on what your station needs for future newscast use, library and legal requirements. If your station simply wants to archive "keeper" news stories and purge the rest, there are newsroom automation systems that will allow you to import a completed rundown, parse out the clips to be deleted, play the "keeper" list to your storage medium, and then generate a text or ASCII file for your records.

There also are automation and third-party vendors that provide more enhanced features as needed. In any case, archiving can be a significant consideration and should be investigated as its own investment, rather than as a tag-on to your other operational requirements.

10 How does redundancy work?

A sound backup plan is a major factor in choosing an automation system. Nothing is more painful than going to black or extending a commercial break during the "A" block of the 6 p.m. newscast while you reboot your automation.

Here are the questions to ask about any automation system: Is there a failover provision? How is it architected? How fast is the failover? Is it fully automatic? How fast is the recovery? What can the control room still do manually?

You cannot pay too much attention to redundancy and failover in your on-air automation operations.

11 Is it worth the money?

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Scott Blair is a product manager for the on-air products management group at Avid Technology.

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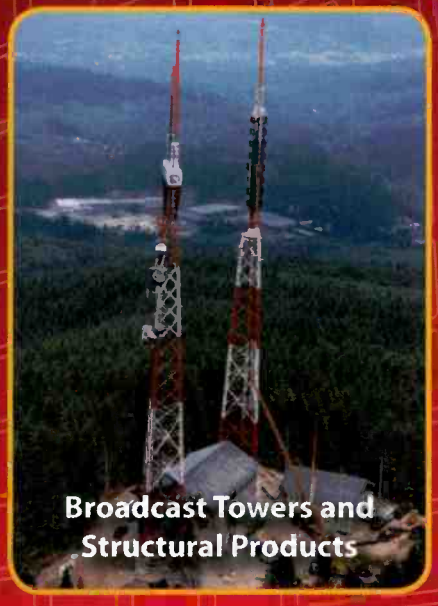

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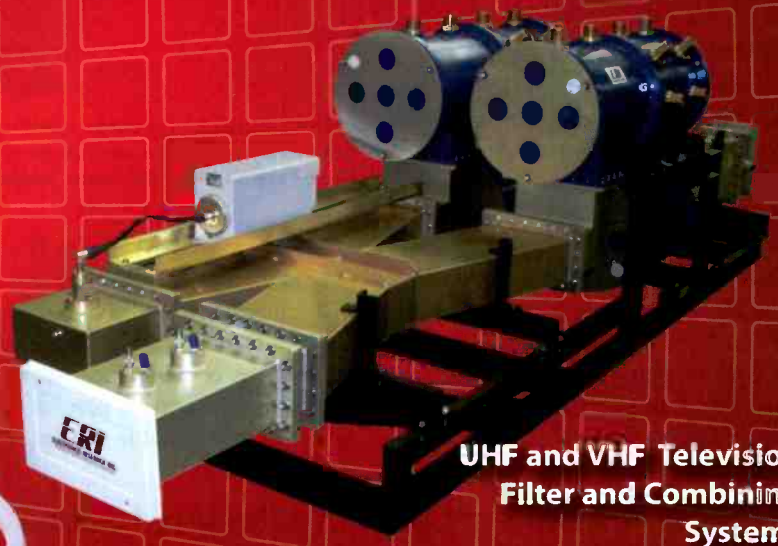

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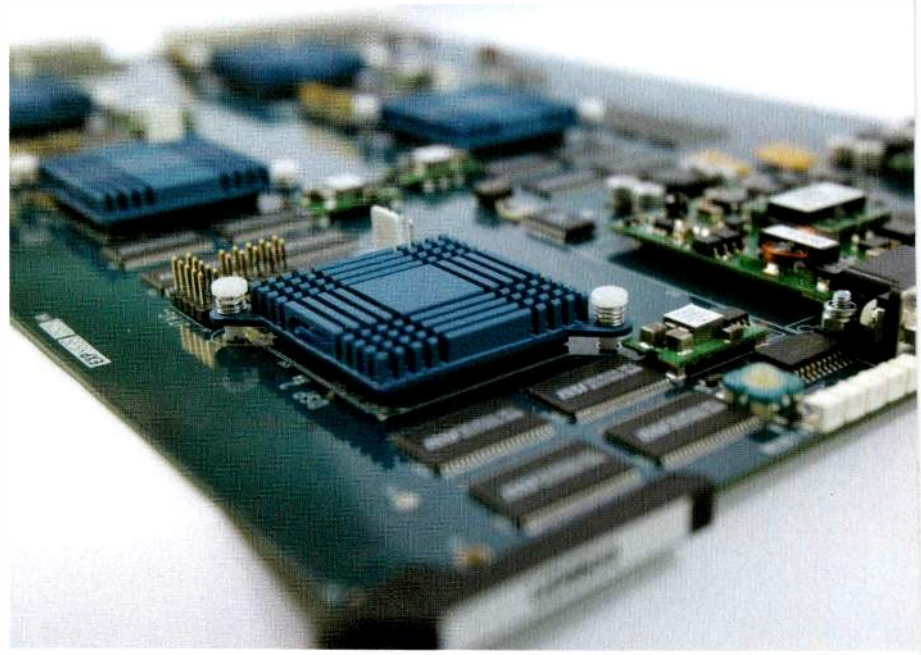
Calrec's Bluefin

The company's high-density signal processing system delivers 5.1 surround sound.

BY PATRICK WARRINGTON

The advent of HD broadcasting introduces a problem for users and manufacturers of sound mixing consoles: how to deal with 5.1 surround sound. Fundamentally, surround sound requires at least three times as many channels as conventional stereo.

Channel capacity has traditionally been increased by adding commercial off-the-shelf DSP chips arrayed on more cards to perform the large number of math operations — billions every second — that sound delivery requires. This approach dictates that consoles use more energy, emit more heat and, of course, cost more money.



Calrec's Bluefin condenses signal processing onto one card. The system enables the company's Alpha console to provide 480 channel processing paths, packaged as 162 stereo plus 156 mono, enabling 78 x 5.1 surround channels.

Power in a single chip

Calrec's Bluefin high-density signal processing system addresses the 5.1 challenge by condensing all signal processing onto one card. Processing for just 226 channels used to require 25 cards on the company's largest Alpha console. Adding the system to that console provides 480 fully equipped channel processing paths packaged as 162 stereo plus 156 mono, giving the user the ability to use up to 78 x 5.1 surround channels.

On the company's Sigma console, the signal processor provides 320 fully equipped channel processing paths packaged as 108 stereo plus 104 mono. This gives the user as many as 52 x 5.1 surround channels.

Finally, adding the system to Calrec's Omega console provides 160 channel processing paths packaged as 48 stereo plus 64 mono channels, allowing up to 24 x full 5.1 surround channels.

The advantages of Bluefin are obvious. A single card measures 8in x 10in, so it only takes up 10 percent of the space of a comparable system. It cuts the cost per channel in half so broadcasters producing HD programming can handle all the required 5.1 surround-sound signals cost-effectively.

The system's single-card design, backed by 100 percent redundancy on a spare card, means greater reliability.

Furthermore, broadcasters with existing Alpha or Sigma consoles can easily retrofit their desks with minimal disruption simply by replacing their existing cards with the new ones. The system's single-card design, backed by 100 percent redundancy on a spare card, also means greater reliability.

Increased audio delay, more control

In addition to DSP, the processor incorporates increased audio delay facilities, which are often required for HD production, especially when both SD and HD equipment are involved. Upconversion of SD video signals inevitably introduces delays for which audio must compensate. The high-density processor incorporates more than 19.6 minutes of audio delay divided into 432 mono legs of up to 2.73 seconds each. This delay can be positioned where needed in the audio path.

The processor also enables other

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Dave
Operations and Engineering Manager, independent station, top-50 market

A hands-on workaholic, he's building his way to HD out of a mix of analog and SDI. How will he get there in little steps, without wasting any money along the way?

Bill
Chief Engineer, independently owned station, small market

Doubles as an engineer for the AM/FM radio stations. How will he move to digital on a micro-budget. Hint: he plans to exploit his suppliers.

JW
VP of Engineering, major TV network

He led his network's move to HD. Now it's time for his 20 network-owned stations to convert to digital, but they can't agree on one set of suppliers. Who will see it JW's way? Who gets axed?

processes that were impossible in the more traditional DSP core. The pre-fader monitor is in full surround, and the mix-minus return feeds for surround sources can be a mix-minus of the surround signal, entirely at the operator's discretion. The processor also allows full control of the surround main outputs' stereo downmix levels, which, again, is often necessary when doing simultaneous surround and stereo mixes.

How it works

In its raw state, a field-programmable gate array (FPGA) is a silicon chip that contains a disconnected array of logic resources such as gates, arithmetic units and RAM. Equipment manufacturers make use of FPGAs by organizing and connecting their resources to perform the specific functions required.

Audio processing requires a large amount of math, but on a silicon chip, it's simple and repetitive math. In comparison, off-the-shelf DSPs satisfy a variety of uses, so they are a lot smarter than is necessary for audio signal processing. The company customized its FPGA programming to perform only the functions relevant to audio processing, thereby putting more dedicated computing power on each chip.

It sounds simple, but creating the high-density signal processing system was a difficult engineering task. A core team of five engineers constructed highly targeted circuits in the FPGA and modeled all the math calculations, which must be performed to high precision, in the console. The team discovered it could put an entire mixing console onto a single circuit card. This enables one card to replace 25, which greatly increases efficiency.

The processor allows full control of the surround main outputs' stereo downmix levels.

By putting all the digital signal processing into the FPGA domain, Bluefin allows broadcasters to realize advantages in cost, power, reliability and size. As Moore's Law continues to deliver improvements in FPGA density and speed, signal processing will continue to evolve. **BE**

Patrick Warrington is the technical director for Calrec.

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The Vision MD/X series

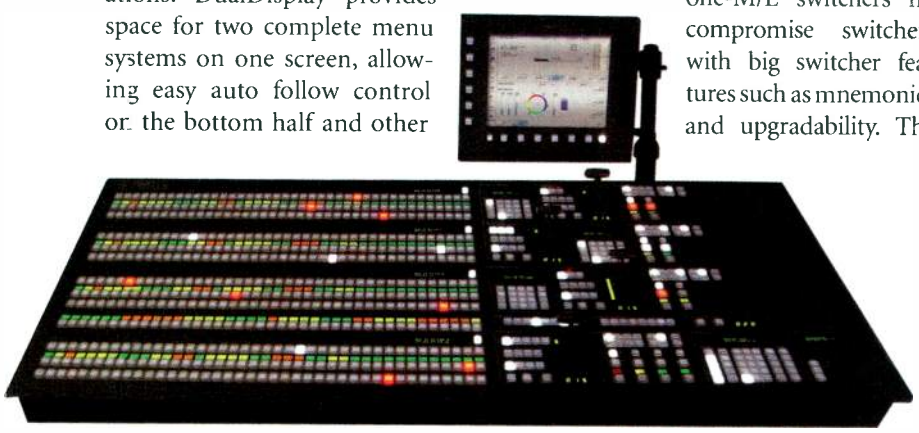
Ross Video's production switchers introduce new operational concepts.

BY DAVID ROSS

Production switchers are loaded with more operational power than ever before. This added power often comes at a cost — a highly complex UI. A complex UI can be difficult to learn, and often only a few elite technical directors are able to access the power of some systems. This was a challenge tackled in the development of the Vision MD/X production switcher series.

Enhanced menu system ergonomics

The new menu system offers operators increased speed for live situations. DualDisplay provides space for two complete menu systems on one screen, allowing easy auto follow control or the bottom half and other tasks such as DVE box building or external device monitoring on the top. This can make building in preproduction more than twice as fast as single-menu systems by eliminating menu navigation steps.



A DualDisplay color touch screen allows operators to view and control two menus simultaneously.

Customizable quick-launch icons are always available on the left side of the screen to provide direct links to frequently used menus. Web browser-like back and forward buttons make it easy to get back to recently used menus.

In addition, smart haptic knobs have been added that allow the user to actually feel list items as they tick by. This enables TDs to get to their selections faster.

Finally, touch screen, mouse and dedicated physical menu buttons are available at the same time to support every user preference.

Product line modularity

The same control panel modules, rack frame boards and software are shared across the product line. This makes it easy for operators to confidently move between all switchers in the series without retraining.

Full modularity makes the small one-M/E switchers no compromise switchers with big switcher features such as mnemonics and upgradability. The switchers also act as working spares in case of a need for emergency parts for larger switchers in critical applications.

Four-M/E support

The fully modular approach in the hardware and software allows every panel size easy access to up to four M/Es in the rack frame. This can free up space in some mobiles and tight control rooms where panel space may be reduced but additional M/Es would be advantageous.

A one- or two-M/E control panel with full access to four M/Es is also useful for automated OverDrive applications, where the panel is often primarily used as a backup control surface but also needs to be able to build four M/Es.

Customizable RGB buttons

The buttons used in Vision were in development for more than four years. It was important to have just the right kind of feel. The buttons are equipped with RGB LEDs and are driven with 30-bit color. Any M/E can be configured to any user-defined color scheme.

In addition to allowing operators to customize their system, there is a practical application for the colors. The rack frame has up to 16 M/Es, with the combination of four main M/Es and 12 more mini M/Es called AuxKeys. Color-coding helps to distinguish the output M/E currently assigned to an M/E row on the control panel.

Integrated manuals

Product manuals never seem to be available when needed. Possibly the most time-saving aspect to the system was the integration of the 1500-page manual set into the switcher software. Using the DualDisplay menus, a tutorial can be read on the top menu and executed on the bottom.

After all, what good is a powerful switcher if the operators don't know how to take full advantage of its power? BE

David Ross is CEO of Ross Video.

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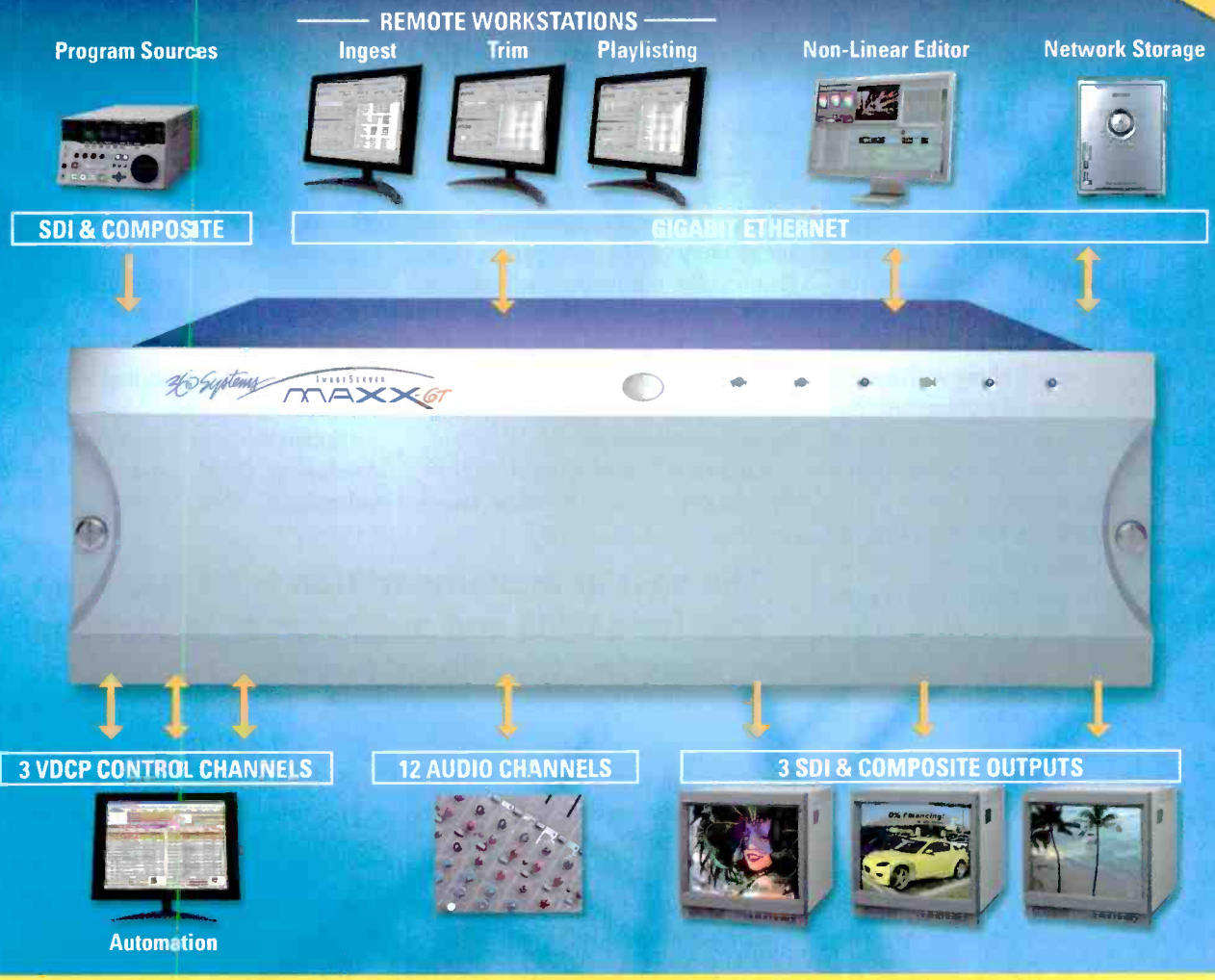

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Globalstor's servers

ExtremeStor-iTrax servers allow multiuser access to consolidated, centralized and fully searchable data.

BY SCOTT LEIF

In the course of the last decade, professional audio has migrated from magnetic tape to ubiquitous digital storage. As Moore's Law quickly accelerated DAW functionality and speed, along with a steep decline in the cost of storage, tape has been relegated to a narrow niche in favor of Pro Tools-based recording and FireWire storage.

With regard to the adoption of new technology, however, professional audio recording has lagged behind other segments of the entertainment technology industry. But the infrastructure of the modern facility is now rapidly evolving. Analog consoles and outboard equipment remain in many studios, but with few exceptions, they coexist with software-based recording platforms, processing plug-ins and digital storage. Many more studios, particularly producer-owned private environments, are fully digital.

As the DAW has allowed greater speed and a vastly increased volume of work to be accomplished, the storage element has become problematic. Historically, audio professionals are notorious for their use of FireWire drives. FireWire is costly, and managing data on numerous relatively low-capacity drives is both time-consuming and cumbersome.

Further, a lack of redundancy creates serious data protection issues. For a professional working on an important, high-profile project, a drive crashing or otherwise not performing properly is catastrophic. Not only is time and effort wasted, but inspiration and unique moments in time are irretrievably lost as well.

The cost of implementation is far less than that for a SAN and much easier to manage than the traditional FireWire method.

Streamlining workflow

Many facilities have explored SAN options. But the workstations in most higher-end audio implementations are already loaded with audio cards. Adding a Fibre Channel host bus adapter is impossible, thus making the workstation dependent on external FireWire devices.

Globalstor Data has experience in developing iSCSI- and NAS-based technology. That, combined, with our observation of this evolution in professional audio, led us to develop a streamlined tool for this market — the ExtremeStor-iTrax series.

Globalstor Data's ExtremeStor-iTrax is available in various configurations, ranging from an eight-drive system with RAID protection to a 36-drive version with multiple levels of RAID redundancy.

Improving flexibility and security

The range of servers features a file system tuned specifically for the professional audio industry. It offers multiroom facilities flexible, secure and competitively priced equipment that allows multiuser access to consolidated, centralized and fully searchable data. These systems are designed and derived from our digital intermediate servers — the ExtremeStor DI series.

In the professional audio industry, the servers are used in conjunction with Pro Tools and other DAW software on both Macs and PCs. Like the ExtremeStor-iNAS, these servers are built on a 64-bit iSCSI and NAS operating system, on a solid-state hard disk.

This system offers facilities flexibility through configuration with drives ranging from 250GB to 1TB hot-swappable SATA hard drives for

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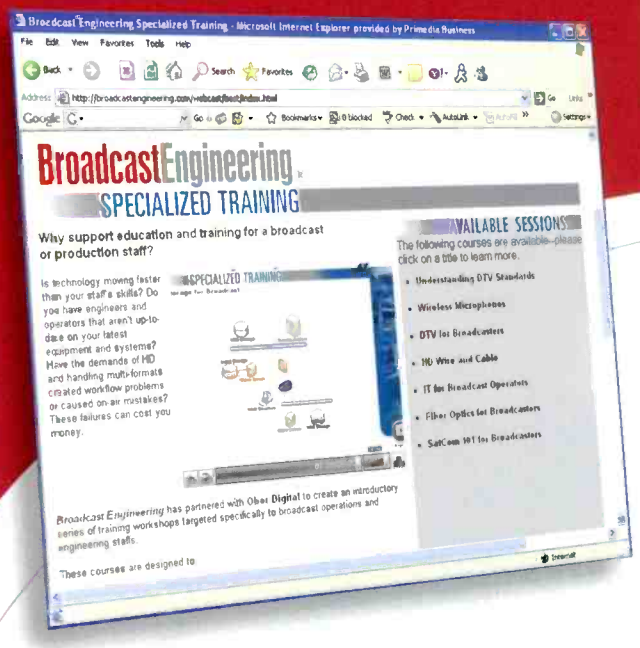

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scalable capacity ranging from 3TB to 18TB of raw storage. Globalstor additionally offers 750GB drives with raw capacity of up to 36TB in the chassis.

The larger units feature dual Opteron CPUs for maximized 64-bit computing power, while the lower-end equipment employs a single Opteron. In addition, the servers feature internal RAID controllers and SATA II disc drives.

Fibre Channel host bus adapters and support Fibre Channel RAID arrays can also be implemented, so facilities with existing storage can attach the storage directly into the box and centrally manage it.

Mixing NAS with iSCSI

Using an iSCSI initiator, the server appears as a local disc drive on any computer. A pair of iSCSI initiators for Mac is bundled with each product, while Windows users can download the free Windows iSCSI initiator offered by Microsoft. Globalstor's systems can also be used as NAS servers in conjunction with iSCSI.

Once iSCSI initiators are loaded, every host system on a network can see and share all stored data. Engineers on separate workstations can simultaneously edit and mix different sessions stored on any iTrax server. These servers offer audio professionals the ability to have centralized storage. A key benefit is that it places the retrieval of multiple sessions at their fingertips. In addition, users can remotely log into sessions from anywhere using the unit's IP-based GUI.

Available in various configurations, ranging from an eight-drive component featuring one RAID controller to a 36-drive/three-RAID controller unit, this series does away with the sneakernet of removable FireWire or USB hard drives. It also bests a cumbersome, expensive Fibre Channel infrastructure, both in terms of price and ease of implementation; the equipment is up and running in less than 15 minutes.

Further, the cost of implementation is far less than that for a SAN, and it is much easier to manage than the traditional FireWire method.

The value of having it network-attached is that the content is always online, whereas one is always busy plugging and unplugging FireWire drives. The series eliminates the need to physically get a drive and plug it into a system.

Finally, the servers enable clients to mix NAS with iSCSI, allowing shared pools for content in conjunction with and at the same time taking advantage of iSCSI. **BE**

Scott Leif is president of Globalstor Data.

The Opera and Ovation

Echolab's live production switchers accommodate a variety of video formats.

BY NIGEL SPRATLING

Today's advanced camera systems can be set to operate in different pixel formats and at different frame rates. Accommodating these video formats in live production typically requires a complex system with many different components to make conversions. Making any change in the system creates challenges, including physical reconfiguration, which is time-consuming and tedious. Change also introduces the potential for error or failure. In addition, the requirement for additional components adds investment, maintenance and operational expense.

Simplifying production

Echolab's Opera SD and Ovation MD live production switchers accommodate different video formats, simplifying the production system. The switchers can work with different formats by incorporating many of the conversion, synchronizing and scaling functions that typically must be accomplished by peripheral hardware components. (See Figure 1.) The switchers feature new technology that uses high-speed shared memory blocks in conjunction with advances in the size and power of a field-programmable gate array (FPGA).

The switchers feature new technology that uses high-speed shared memory blocks in conjunction with advances in the size and power of a field-programmable gate array.

These new, large FPGAs have five times as many gates as those of the previous generation and six times the speed. Specifically, the underlying chip architecture incorporates two 32-bit PowerPCs running at 270MHz, embedded directly in the fabric of the FPGA and using Micrium's µC/OS-II, a real-time multitasking kernel. The hundreds of embedded high-speed multipliers within the FPGA fabric allow users to perform video effects such as wipes, mixes, DVEs and keys.

The design topology also grants the flexibility for these programmable effects and key layers without the need for additional internal components. This provides flexibility for efficient operation when source types or output destinations vary.

The use of large-scale FPGAs allows additional unique features to be added that were previously unavailable in traditional switcher designs. While digital storage for keys, fills and backgrounds are common within a modern switcher, the architecture of the Opera and Ovation systems provides the ability to associate independent storage of keys, fills or backgrounds to every input on the switcher. This provides the user with instant access to as many as 32 stores in addition to the central storage vault. As a result, a technical director can load these stores before an event and access them instantly without the need of preset recalls and reloads during live productions. This adds speed and efficiency to the task at hand.

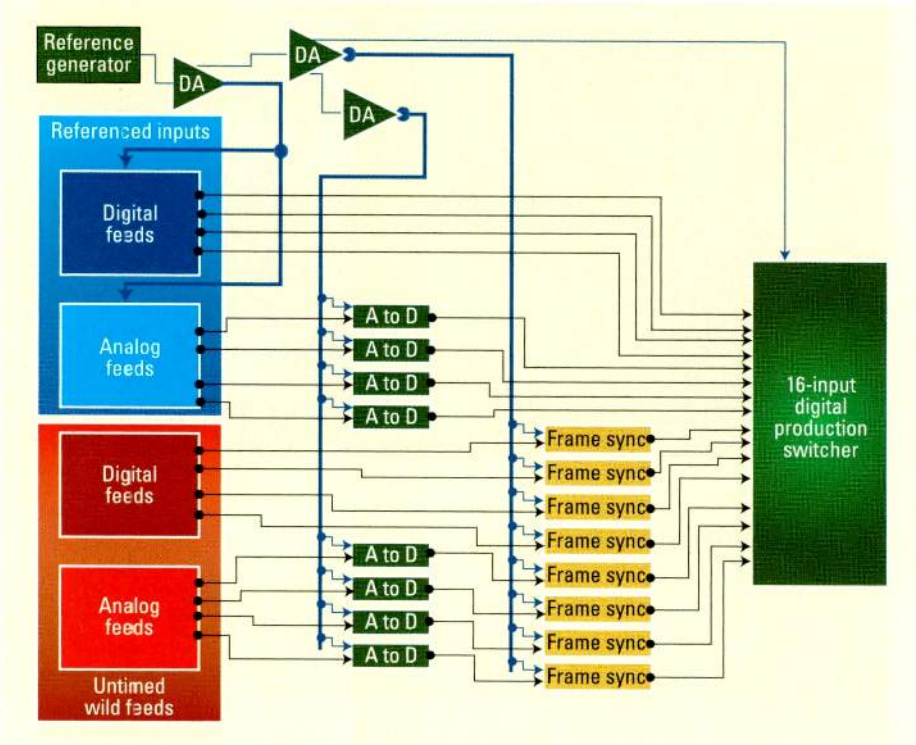

Figure 1. A typical production switcher requires secondary hardware components to perform conversion, synchronizing and scaling functions.

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Easy reprogramming

Echolab's FPGA technology offers another advantage as well. The architecture does not rely on fixed signal and data paths, so the platform can be reprogrammed as needs change or upgrades are needed.

While the inside of the switch has changed, control interfaces appear intuitive and familiar to the technical director. This is particularly crucial in a high-pressure video production environment. The need to reconfigure hardware to accommodate different formats adds time, complexity and staffing, not to mention undue stress, to the equation. A switch that can convert, synchronize and scale formatting means fewer hassles in production itself.

The Opera switcher handles both analog and digital inputs, internally crossconverts signals and synchronizes timing, and outputs composite and digital video. (See Figure 2.) This enables stations to eliminate external processing equipment from the production flow. Simplifying the process also enables broadcasters to focus on making production and video quality better by taking advantage of sophisticated features on the switcher.

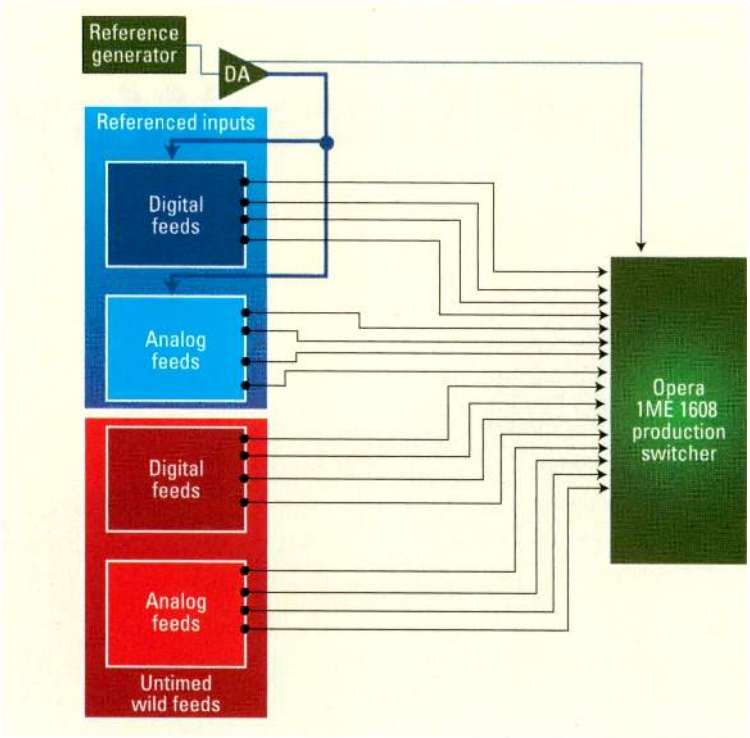

Figure 2. Echolab's Opera 1ME 1608 input switcher handles both analog and digital inputs. It also internally crossconverts signals, synchronizes timing and outputs composite and digital video.

Mix and match formats

With so many formats commonly in use, producers need increased flexibility in their system operations. Creating a multiformat production system, however, can be costly in terms of money, as well as time and complexity. The Opera SD and Ovation MD live production switchers allow users to mix and match formats, offering format independence. Additionally, their full feature sets help them reduce production costs and complexity. BE

Nigel Spratling is the president of Echolab.

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Transmitter power

Bird Technologies' square-law-based diode meter and thermal power meter provide accurate measurement.

BY TIM HOLT

Broadcast network systems are planned and integrated, and predictions of coverage and cochannel interference are made based on several factors, including geographical terrain, antenna gain and directionality, and transmitter output power. The measurement of transmitter output power has always been an important consideration in the operation of broadcast transmission systems. However, new digital modulation formats necessitate rethinking the methods used to measure transmitter power.

The accuracy and reliability in which these measurements may be made is related to our understanding of the limitations of conventional power measurement methods, as well as to our understanding of the proven techniques that have been developed for use with digital broadcast systems. In this article, we will review some of the characteristics of conventional measurement methodologies and develop a foundation for understanding new techniques.

Conventional techniques

Instruments used through the years for the measurement of transmitter output power can be categorized as follows:

- *In-line power meters.* These have been the most popular instruments, owing to their simplicity, ease of use and ability to measure both forward and reflected power. First-generation instruments of this class were developed in the 1950s and use simple point contact diode detectors. Within the past five years, versions have been developed using up-to-date diode devices and low-noise amplifiers, more appropriate for the measurement of signals incorporating complex modulation.
- *Terminating power meters and their associated directional couplers.* Also used extensively, power measurement techniques developed around these instruments are adaptations of power meters designed for laboratory use. They can provide high-quality measurements in broadcast applications when paired with the appropriate directional coupler.
- *Radio frequency calorimeters.* These provide measurements that truly represent heating power, as their definition would imply. These devices also provide the advantage of responding to the aggregate power presented to their input, as they are typically broadband devices.

New digital modulation formats in broadcast necessitate rethinking the methods used to measure transmitter power.

First-generation in-line power meters

These power meters are comprised of a short length of precision transmission line fitted with either a single or a dual directional coupler. The output of the directional coupler is typically 40dB to 60dB below the main transmission line level. The coupler output is connected to a simple diode detector and then scaled and displayed on a meter movement. (See Figure 1.)

Most of these power meters measure the peak power of the signal while the meter scale is calibrated in average power. While this approach has served the broadcast industry for many years, the use of simple in-line power meters in complex modulated signal systems is limited by the inability of simple diode detectors to respond to signals with high peak to average power characteristics common to digital modulation formats.

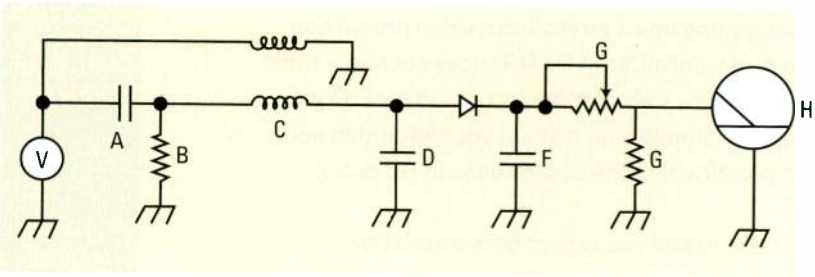

Figure 1. Conventional power meter circuit diagram

One might argue that terminating-type laboratory power meters would also provide this advantage, in that these instruments are also typically broadband in nature, but they are limited to measuring low power levels and must be used with a directional coupler. These couplers are useful only over a relatively narrow band.

Diode detectors in conventional in-line power meters are operated largely

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over the nonlinear portion of their dynamic range with their accompanying meter scales calibrated to read average power, even with the diode operating in a nonlinear fashion. This approach works fine, so long as the power meter is used to measure a single defined waveform or a closely related signal, such as FM or CW modulation.

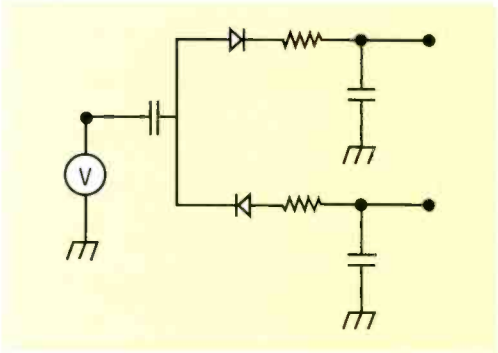


Figure 2. Square law detector schematic

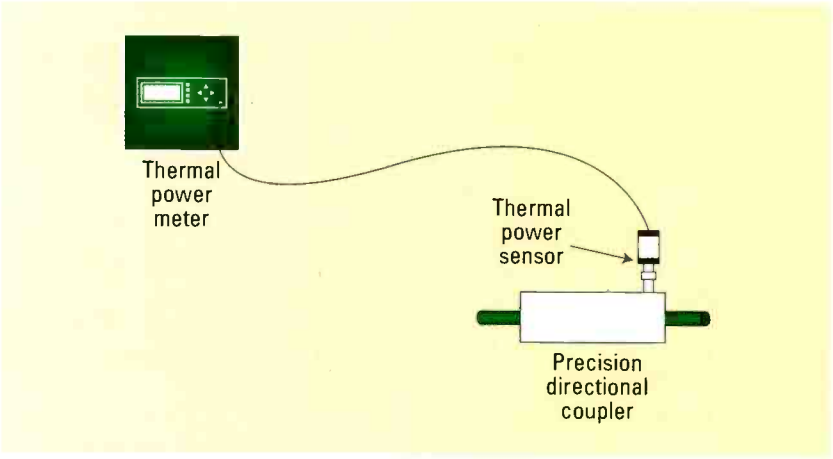


Figure 3. Directional coupler and thermal power meter

In-line power meters with square-law detectors

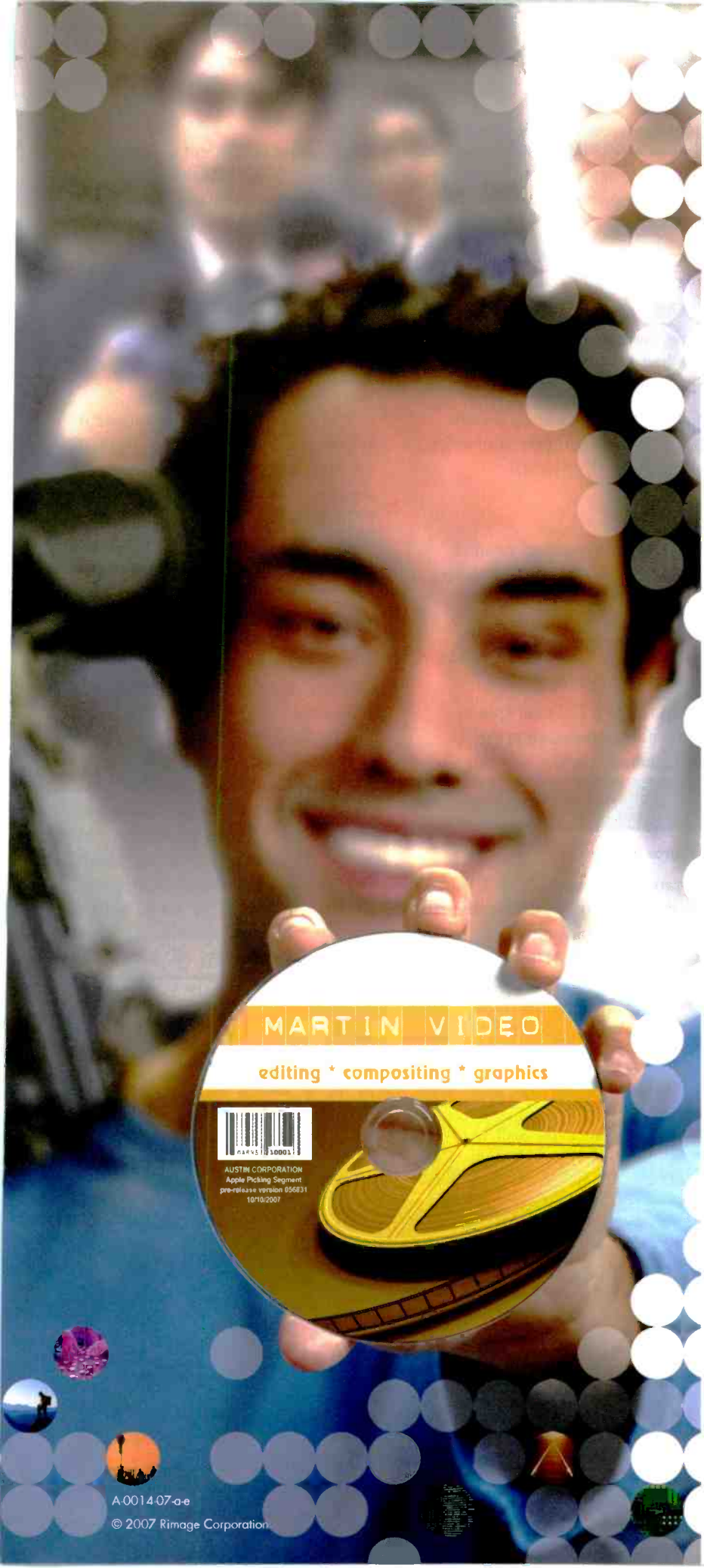
This latest generation of in-line power meters is configured in much the same manner as the first-generation instruments, with the important difference in the detector technology. (See Figure 2.) An alternative approach is to operate detector diodes below -20dBm in an area known as the square-law region of the diode's dynamic range. This works well in systems carrying complex modulation. In the square-law region, diode detectors behave in much the same manner as thermal detection devices at low signal levels.

The diode's rectified output is a function of the square of the root mean square input voltage. The transfer function for a full-wave square-law diode detector is about $V_{out}=(V_{in}/5.77)^2$, where all voltages are in millivolts.

This relationship holds as long as the total excursion of the signal is contained within the diode's square-law region. The theoretical bounds for this range are from about -20dBm on the high side to the noise floor as determined by the bandwidth of the measurement at the lower end. Measurement ranges of 50dB are possible in most systems.

Terminating power meter and directional coupler

These wide frequency and dynamic range instruments, generally used for laboratory applications, may be used in conjunction with high-power directional couplers for making high-power measurements. (See Figure 3.) They may use either thermal converter technology or diode detector measurement approaches to power detection. They are generally more difficult to use, as they require frequent calibration and are more expensive than the above choices. Like the square-law-based instruments, they work well in cases of



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	Error component	Error value	Explanation
1	Instrumentation uncertainty and noise	±1.5%	Typical instrumentation drift mechanisms and noise.
2	Power reference uncertainty	±1.2%	Thermal power meters require the use of a reference oscillator. This is typically a 50MHz, 1mW source.
3	Calibration factor uncertainty	±3%	This is the accuracy to which specified sensors calibrations are known.
4	Mismatch uncertainty (based on a source VSWR of 1.5 and a load VSWR of 1.2)	±4%	This is based on a source VSWR (directional coupler side arm) of 1.5 and a sensor VSWR of 1.2.
5	Attenuation factor uncertainty	±1%	Using a 50dB directional coupler and an HP8753D network analyzer, the best possible attenuation measurement is ± 0.05dB.
6	Linearity	±1%	Deviation from linear performance over usable dynamic range.
7	Temperature drift	±1.6%	This assumes a 7°C total spread in ambient temperature at the measurement point.
Worst case error		**± 13.3%**	
Probable error		**± 5.5%**	

Table 1. Directional coupler and thermal power meter error budget

complex modulation, as they respond to the heating power of the signal.

The error analysis of a typical implementation for this power measurement approach appears in Table 1. While the analysis is fairly self-explanatory, there are a few notable points:

- The accuracy of power meters in this class are dependent on many factors, one of which is the accuracy of the instrument's internal reference. Also, the internal reference should operate at a single frequency and power level.
- Operation of the power meter at frequencies other than the internal reference frequency requires the use of calibration offsets. These offsets carry their own uncertainties.
- The effects of mismatch uncertainty between the input to the power sensor and the output of the directional coupler are significant. Because the VSWR characteristics of the sensor input and the coupler output change with frequency, the magnitude of the mismatch uncertainty will also change with frequency.

RF calorimeters

These meters have formed the foundation for high-power measurements for many years. This power measurement method remains in use today as the means by which the National Institute of Standards and Technology (NIST) establishes primary RF measurement standards. As mentioned above, calorimetric systems measure the true heating power of a signal, including the fundamental frequency, all harmonics

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and sidebands, and other modulation related contributions.

The calorimeter measures the total aggregate power contained in the signal. It responds to heat and measures the heating power of a low frequency (50Hz or 60Hz) or DC energy in exactly the same manner in which the calorimeter responds to RF signals. This characteristic enables the calorimetric system to be highly accurate, as the low-frequency AC or DC energy used to calibrate the calorimeter may be known precisely.

This calibrating energy is also useful in the establishment of a path back to NIST primary standards. Typical field calorimetric system accuracy is ±4 percent, but accuracies of ±1 percent are possible using the substitution calibration methodology. Although calorimetric power measurement methods yield highly accurate results, calorimetric systems have limitations. These include:

- Calorimeters are generally difficult to use. This is especially true in field settings, with typically uncontrolled environments.
- Best results with calorimetric methods are obtained with highly trained operators.
- Calorimeters are terminating devices and are not suitable for directional power measurements leading to antenna match measurements.

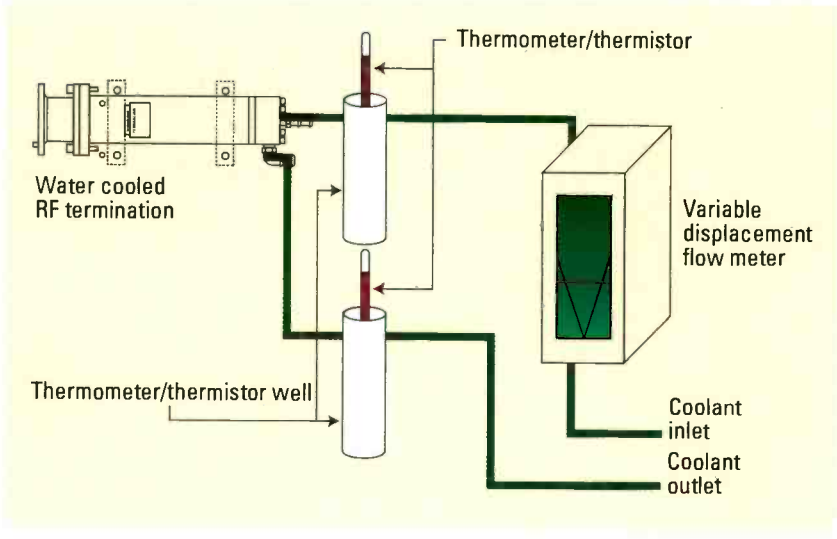


Figure 4. Conventional calorimeter block diagram

A diagram shown by a typical calorimetric system is described in Figure 4. In this system, a water-cooled, high-power RF termination is used as a means to convert radio frequency energy into heat, with the constraint that this must be done in a highly efficient manner so as to capture the majority of the energy dissipated in the load.

Load efficiency is also important for proper calibration, as the heat flux from the load in areas other than the coolant path cannot be easily captured and will also behave as a function of the ambient temperature. In other words, if the calorimeter is calibrated at 25°C and the ambient temperature changes to 15°C, this additional gradient will result in more heat escaping from the load in areas other than the coolant path. This will shift the calibration point of the calorimeter.

Such a calorimeter must also be able to measure the mass flow rate. While spinning fan-type flow meters have been used in field calorimeter instruments, more precise turbine-

type instruments are available.

Finally, the system contains two temperature-sensing elements, one placed at the input to the RF load and the other placed at the output. Most modern systems use thermocouples or thermistors because of their improved accuracy and repeatability.

Calorimetric systems measure power in accordance with the following equation: Power(kW) = 0.263 x ΔT x Flow, where temperature measurements are in degrees centigrade, and the flow rate is in gallons per minute. While this formula will provide an indication of the power dissipated in the load, it is necessary in most cases to compensate for the physical changes to the coolant used in the system, both in terms of changes due to temperature, as well as coolant mixtures such as ethylene glycol and water.

For example, the specific heat of pure water has a value of 1.0 at a temperature of 15°C, but this value drops to 0.998 at a temperature of 35°C. Modern calorimetric instruments will automatically compensate for these changes.

The measurement process

As mentioned above, one important attribute of the calorimetric system is that the system will respond essentially the same for DC or low-frequency AC energy as for RF energy. This "substitution" calibration procedure may be characterized as follows:

1. Low-frequency power reference. This reference measures the actual power used for calibration. Low-frequency energy is used for calibration, so inexpensive, highly accurate instruments are available. Inexpensive digital multimeters, are typically accurate to within ±1 percent for low-frequency voltage and current measurements.

2. Low-frequency source. In many cases, 60Hz energy may be used. A primary consideration is the stability of the energy source.

3. Perform calibration. The calibration should be performed at or near the power level where the RF measurement will be made in order to avoid linearity errors. Connect the low-frequency source to the calorimeter, along with the reference standard, and calibrate.

4. Perform substitution. Connect the RF source to be measured to the calorimeter in place of the low-frequency source, and perform the measurement.

Digital modulation

The measurement of RF power in digitally modulated signals presents a challenge due to high peak to average power ratios (crest factor) found in 8-VSB, COFDM and similar signals.

In general, the average power of signals using complex modulation is constant, whereas the peak power is data dependent. In practice, crest factor values of 7dB are typical for these systems, with crest factor values as high as 12dB, especially in multiple carrier settings. Conventional diode detector power meters, being peak reading instruments, tend to follow the envelope established by the peak power value of the signal.

Conclusion

While there are several ways to measure transmitter output power, a best choice often comes down to a trade between cost and accuracy. Few broadcasters need a laboratory-grade calorimeter to adjust the output power of their DTV transmitter. Likewise, that 25-year in-line power meter that has served well on an analog transmitter may not be the best choice when it comes to measuring today's 8-VSB signal.

The bottom line is that a square-law-based diode power meter and the thermal power meter/directional coupler combination can accurately measure 8-VSB transmitter power. In fact, when properly calibrated, these devices provide accuracy that approaches the more complex (and expensive) calorimetric power measurement. BE

Tim Holt is director of applications and systems engineering for Bird Technologies Group.

Widevine's Mensor

The system offers scaling and watermarking for IPTV.

BY REZA RASSOOL

Video and audio watermarking is a relatively new technology that is used in post production to mark movie content and could be used in digital cinema applications. There are significant challenges of scalability, performance and economy in adapting the same technology to today's home entertainment content delivery networks.

Session-based watermarks

A session-based watermark marks each instance of access to content with who — the ID of the accessing device — and when — a timestamp denoting the time of access. The watermark is designed to be invisible and indelible, in that it will survive in copies of the content despite significant distortions. Should a copy of the content appear in an unauthorized location, then the watermark may be used to identify the origin of the copy. (See Figure 1.)

A content delivery network is essentially a multinode network for distributing content. A source node (content owner or aggregator) transmits content to several hundred operators, or intermediate nodes, around the country. Each operator then serves up the content to its community of subscribers for viewing on a variety of consumer devices or terminal nodes.

The biggest problem for session-based watermarking lies at the edge. Low-powered STBs, PVRs and mobile devices can't spare 100 million instructions per second (MIPS) of CPU. This is the power required to perform the entire watermarking computation. It is a problem that cannot be solved by traditional watermarking architectures. Widevine Technologies' Mensor solves this problem by inserting a 64-bit payload with less than 1MIPS of CPU processing.

Low-powered STBs, PVRs and mobile devices can't spare 100MIPS to perform the entire watermarking computation.

Analysis

Watermarking can be separated into analysis and insertion. The analysis involves the intense signal processing of A/V data to determine the locations at which payload data may be hidden in the content. This is performed at the source node. The insertion process can be made lightweight — little more than a controlled byte copy. In many watermarking products, the analysis and insertion are performed as an

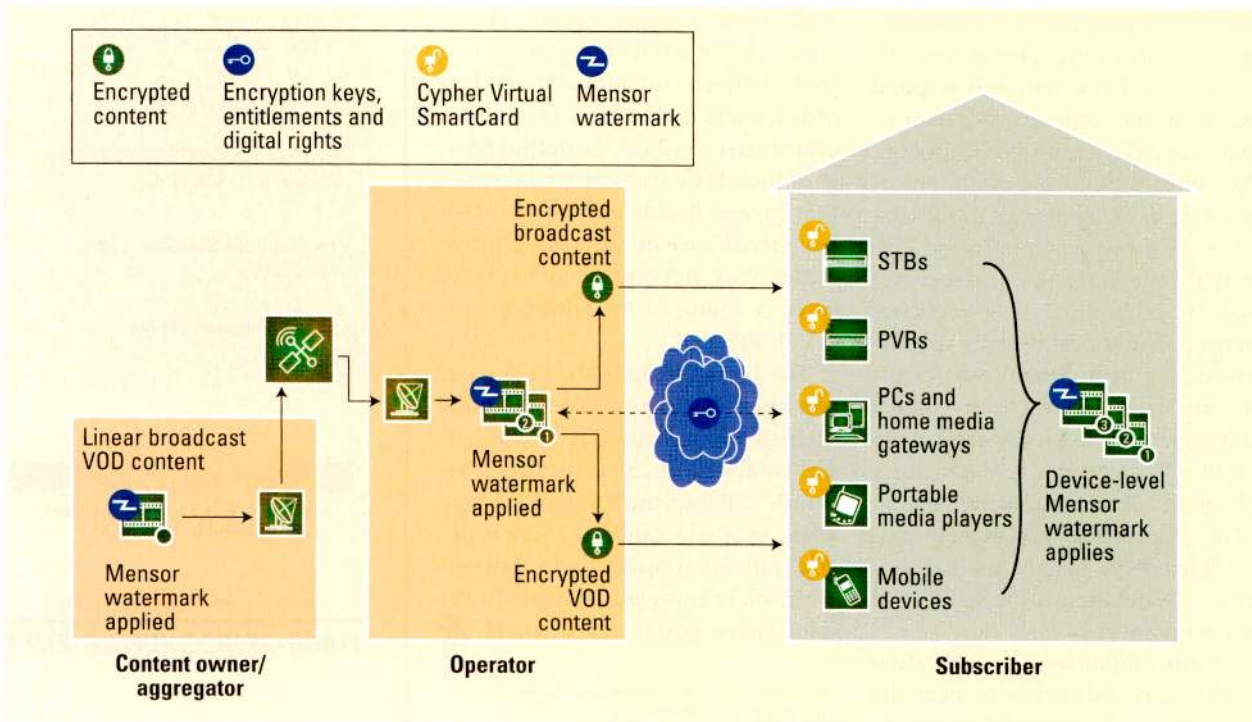


Figure 1. IPTV network

atomic process. This is because many of these are derived from technologies meant for high-end or single-stream applications where scaling is not a consideration. In the Mensor solution, the analysis process performed at the server generates watermarking metadata. (See Figure 2.)

Metadata

Watermarking metadata is packaged, secured and multiplexed in with the encrypted content, imposing a negligible bandwidth overhead. The metadata is accessible only by the insertion process that is part of the Widevine Virtual SmartCard client that resides securely within the receiving device.

Insertion

The inserter reads the metadata with the instructions of the byte offset and code needed to insert a one or a zero. It then computes the payload to write from the unique device ID and the timestamp derived from a secure clock.

When insertion is performed on an intermediate node, the metadata is modified, allowing downstream insertion. When insertion is performed on a terminal node, the metadata is removed from the content. Then the system inserts a 64-bit payload with less than 1MIPS of CPU processing.

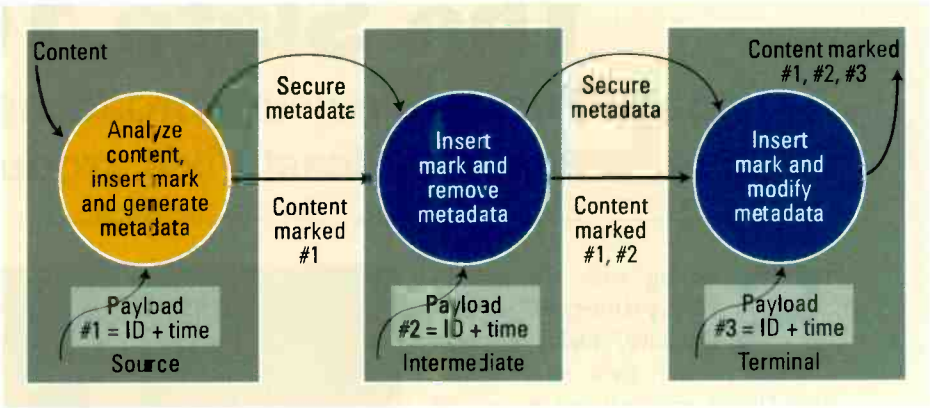


Figure 2. Client server separation of the watermarking process

Further benefits

Watermarking is a target for hackers. The architectural split, introduced for scaling, means the essential signal processing know-how is operated in a secure environment, on a headend server. Only the relatively trivial insertion code is exposed to hacking on a client device.

Metadata exposure could aid an attack on the analysis algorithm. Watermarking must be integral to the content security system with one client providing both decryption and watermark insertion, uniquely marking content each time it is decrypted.

Renewability, portability

If the watermarking algorithm is defeated, then renewals will only affect the server at the headend and should not require client changes. As with encryption, the watermarking algorithm is a pluggable module. Widevine has licensed watermarking technology from three industry suppliers after an extensive RFP process.

The simplicity of the insertion code means that it does not rely on DSP, special instruction sets or large memory resources. This makes it possible to port the insertion client to client devices already supported by the Widevine Virtual SmartCard. BE

Reza Rassool is chief engineer for Widevine Technologies.

The Slate 1000

Idaho Public Television broadcasts "Legislative Live" using Broadcast Pix's production switchers.

BY KEN SWANTON

Starting with the Jan. 8, 2007, premiere of "Legislative Live," Idaho residents could view state Senate and House proceedings on two of Idaho Public Television's OTA DTV channels, as well as on digital cable channels and by accessing streaming media via Internet or cell phones.

Idaho Public Television, a PBS member station serving the entire state, offers the coverage as a public service. To make "Legislative Live" available to anyone, anywhere at anytime, Idaho Public Television used a $350,000 appropriation by the Idaho Legislature in 2006 to buy broadcast equipment for the project. The purchase included two Broadcast Pix Slate 1000 digital production switchers.

The Slate switchers in the "Legislative Live" control room at the capitol building allow one person to manage switches, call up graphics and work other gear.

Integrated functionality

These two switchers share an identical configuration and operational workflow. They reside side-by-side within a 15ft x 9ft production control room in the basement of the capitol building.

The space constraints required the station to select a small-sized production switcher with all the functionality, quality and reliability afforded by high-end production systems. The two Slate 1000s met all of those requirements.

The switchers are part of a family of products that includes the Slate 100 and Slate 2100. All three models reside on a single Windows XP PC and offer the same functionality found in a television production control room, including a CG, effects, still and clip store, and the digital production switcher itself.

Streamlined monitoring

Two Viewsonic 17in LCD monitors display all the camera and source signals. This dual monitor configuration helps keep size requirements down. Each of production switchers also has an Ikegami TM-9DRM2-1 dual 9in color QC monitor.

Dedicated control panel

Operators can make camera selections by pointing and clicking with the mouse or using a computer keyboard. The broadcaster, however, opted to employ the Broadcast Pix dedicated hard control panel. The control panel gives this Windows-based workstation the feel of a traditional production switcher.

The switchers' control panel offers immediate access to everything the operator needs, including the DVE, CG, wipes, keyers, chroma keyers, still store and camera switching. The switchers are mounted on a Winsted desk. A Harris Videotek VTM-150 waveform and vectorscope with SDI inputs is used for quality control.

Camera signals

Both production switchers are similarly configured to accept three SDI wide-screen inputs from three PanasonicAW-E860A2/3in3-CCDSDcameras. The House and Senate each have three cameras equipped with Fujinon A20x8.6BMD 20X professional motor drive zoom lenses and Panasonic AW-PH36ON indoor pan-and-tilt systems. While there was some concern that the motorized pan-and-tilt systems would be disruptive within the chambers, they have been extremely quiet.

The system is also equipped with a GigE network card, but the engineers decided not to connect the production switchers to the outside world for fear of introducing an Internet virus.

Still and clip store

The switchers have an integrated still store, configurable for up to four hours of clips playback. This installation

opted for two hours of storage. A longer storage capacity was needed, so the control rooms have a 360 Systems Image Server 2000B-120 video server with more than 40 hours of storage capacity.

CG, graphics and effects

The internal graphics system is a Harris Inscriber CG. The speakers' names can be recalled from memory using preprogrammed hot keys on the switchers' Pix pad.

Production graphics, using different color templates for the House and Senate, provide on-screen text. A CD-ROM drive uploads the graphics files. The production switchers' easy workflow allows one person to switch the cameras, while calling up the right slates to identify each person and activity, all while working the DDR and other gear in the room.

Audio signal processing

The audio from the in-chamber audio mixers is muxed and embedded within the switchers' SDI outputs downstream. The two audio feeds (one for each chamber) are then fed into two Adtec edje 2000 MPEG-2 IP streaming encoders with MPEG audio, which converts the embedded SDI signals into an IP-based signal for backhaul to the station at 3.5Mb/s over a dedicated Ethernet VLAN.

Back at the station, a decoder turns the IP-based signals into SDI with embedded audio. The signals not demuxed because the entire facility is already SDI throughout. From there, the signals are sent to the five statewide transmitters as an SD subchannel.

Multiple broadcast outlets

Anyone with an Internet connection can view the same live broadcasts of the House or Senate proceedings by accessing streaming media, playing at either 56K or 200K broadband, at *http://idahoptv.org/idreports/legislaturelive.cfm*.

AT&T Edge customers can access the same Web-based streaming media from any Windows Media 5.0-compliant mobile device.

Dependable operation

"Legislative Live" started providing live coverage of the legislative session in early January and ran through the end of March 2007. However, beginning April 1, the Idaho state capitol building is undergoing extensive renovations and repairs through 2009.

The temporary move will eliminate any public seating in the chambers. This means Iowa's PTV network will become the state's primary public access to the legislature's work. The Broadcast Pix Slate 1000s are destined to a long workout, but they are clearly up to the task. BE

Ken Swanton is president of Broadcast Pix.

Production switchers

Today's systems need to accommodate both SD and HD material simultaneously.

BY JOHN LUFF

Over time, most technologies evolve to support the changing needs of the marketplace they serve. Television, in all of its incarnations, is no different. Nowhere is that more obvious than in the control room, where production switchers take center stage.

Revolutionary effects

When digital effects first burst onto the scene with Vital Industries' Squeezoom around 1980 (the patent application was dated April 1979), production changed forever. Until then, it was not possible to manipulate the size of a frame, let alone the dynamic effects that Squeezoom, Ampex ADO and their progeny of today can do.

Imagine the revolution digital effects represented to the directors and technical directors of that era. Previously, the contents of a picture could only be composed of layered elements, principally keys and backgrounds. Digital technology, however, enabled the active picture to be resized and repositioned. Full 3-D manipulations could be done quickly, including page turns and mapping onto solid objects.

Today, we take these capabilities so much for granted that we fail to recognize just how revolutionary they were. Now if pictures are shot incorrectly framed, we simply reframe them. As late as the 1970s, however, that was unheard of. Digital effects were outboard devices that processed analog video and delivered it to analog production switchers as a key and fill. A four-channel DVE — an astounding piece of hardware at the time — filled a rack and cost in the mid-six figures, which is more than an entire switcher today. These units were considered so high-tech that the U.S. State Department would not allow the ADO to be exported to the communist block. Apparently, it was being used in military flight simulators.

Today, it's more than just a switcher

Contrast that complex situation with what we can expect today. Over the last 30 years, effects memory has evolved into complex control systems. Out of necessity, switcher manufacturers have incorporated sophisticated systems at the core of production switcher design. Some switchers feature a production automation application on the front end, controlling outboard video servers, character generators and even remote controllable cameras.

The power in modern switchers includes still stores and clip stores, color correction and, in some cases, aspect ratio conversion, upconversion and downconversion. Until recently, switchers were designed for a single production standard, with software configuration possible for support for 525/30 and 625/25 standards.

With the introduction of HDTV looming, manufacturers designed a generation of switchers with sufficient memory and flexible I/O ports to allow conversion of the hardware from SD to HD. This allows a switcher purchased today to have utility into the future, which of course makes the finance whiz in a broadcast facility easier to tame. With longer product life cycles, it is easier to achieve an acceptable ROI.

WOIO-TV in Cleveland uses Snell & Wilcox's Kahuna for live news production. The switcher offers simultaneous SD/HD operations in the same mainframe.

Accommodating SD and HD

In the last three years, it has become increasingly important for production systems to accommodate both SD and HD material at the same time. There are three main strategies for making that happen.

In the first, content can be processed in two parallel chains, with SD and HD segregated into systems intended for only one format. This is obviously complex and expensive. In principal, it allows the best application of graphics elements that don't need to be unisex, or equally appropriate for both 16:9 and 4:3 frames. One switcher panel may control two electronics frames as long as inputs are carefully mapped to each frame.

A second approach involves converting all content to one format, usually HD in the interest of improving quality, with the SD picture being derived from the HD picture after production switching. This is quite appealing from a cost standpoint, but choices must be made on how to handle graphics to protect both frames. Engineers must also consider what happens to the aspect ratio of SD content in the process, so the output media will be appropriate to intent in both aspect ratios.

Such an approach may lead to graphics compromises that are equally inappropriate for both release formats. It is, however, easy to understand, and upconverter manufacturers love this approach because it sells products.

A third approach takes advantage of the ability of production switcher systems to accomplish upconversion as part of normal video processing. In some cases, this amounts to providing tie lines to external converters so that any incorrect source is converted before use.

In this manner, it is similar to the second approach. If the switcher has converter capability embedded within it, however, input flexibility does not hinder system design or burden the approach with excessive hardware for the sake of ease of use.

Some hardware will do the required conversions and, as a bonus, can accept essentially any common SD or HD standard at the input. In addition, it can output multiple standards directly from the switcher electronics. This approach provides the most flexibility for production staff because they don't have to spend extra time planning to make sure they can handle the input and output formats.

If one does a cost analysis on this method, it is easy to see how dollars can be equivalent or lower than an approach with multiple format converters. This also simplifies latency planning, leading to less complex audio delay matching issues.

We are approaching an era when multiple processors in a blade server will have the raw processing power needed to replace special-purpose video processing engines in video production switchers.

Image processing

You may be asking what this has to do with the Squeezoom. All digital processing of picture content first showed up in digital video effects. That grew in capability to allow hardware processes that are now tightly integrated into production switchers.

So what does this mean for the future? We are approaching an era when multiple processors in a blade server will have the raw processing power needed to replace special-purpose video processing engines in video production switchers. When that happens, there will be some stunning advancements in image processing. BE

John Luff is a broadcast technology consultant.

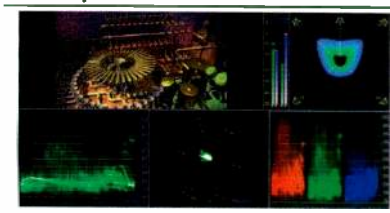
? Send questions and comments to: john.luff@penton.com

Evolution 6 — Wheatstone

Console features event recall, bus-minus, four mix-minus and four aux mixes, four monitor outputs and standard EQ, dynamics, panning and mic processing on all channels simultaneously, real-time graphic displays, production tools, and password-protected set-up screens.

252-638-7000; www.wheatstone.com

VidScope-vx — Hamlet



A range of video test and measurement systems running entirely in software for Windows PC users; assesses video and audio via capture cards and files imported to a computer; runs from a USB memory stick, so users can freely move their software from computer to computer if required; the software provides comprehensive real-time or automatic monitoring tools, including waveform monitoring, vectorscope and color gamut error checking and logging.

866-442-6538; www.hamlet.co.uk

HVR-DR60 — Sony

Lightweight (8oz without battery) portable HDD recorder for use with the new HVR-V1U HDV camcorder; records 4.5 hours of continuous HDV, DVCAM or DV content; features 14-second cache recording function; can run continuously up to 5.5 hours and up to 18 hours with the larger NP-F970 battery.

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

NewsForce — Harris

Optimized, collaborative newsroom environment; built on NEXIO XS shared storage server architecture; uses open XML API in Apple's Final Cut Pro to provide tight integration with SAN; MOS-enabled; supports SD and HD content.

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

Time Tailor Broadcast — Prime Image

Automatically time-reduces programming as it is downloaded, and sets up the automation system for insertion and commercial breaks; supports scheduling of time compression jobs for multiple downloads of different programs; allows automatic launching of scheduled jobs; features timeline reporting of processed programming with times and spot durations; auto saves reports into an automation system.

408-867-6519
www.primeimageinc.com

AG-HSC1U — Panasonic

Compact, lightweight, 3-CCD HD camera; uses SD/SDHC memory card for storage; camera provides an AVCHD (MPEG-4, AVC/H.264) recording platform with a tough, shock and dust-proof body; a 4GB memory card provides 90 minutes of HD at 1080i recording.

800-528-8601
www.panasonic.com/broadcast

DaletPlus Enterprise Edition — Dalet

Software-based media management system features an open integration platform, flexible workflow engine, multi-format conversion, automated media migration and a modular toolset; includes a comprehensive set of digital production and media management tools that spans the workflow from ingest, edit and scheduling to broadcast and distribution.

212-269-6700; www.dalet.com

Digital Content Manager — Scientific Atlanta

Video stream processor allows users to simultaneously process 2000 video streams in one device; delivers needed video processing horsepower for multiple channels of SD and HD programming, ad and local program insertion, and switched digital video service.

800-433-6222; www.scientificatlanta.com

DSP5D — Yamaha

A DSP expander for the PM5D digital sound reinforcement console; the stand-alone unit expands the capabilities of the PM5D to 96 mono plus 16 stereo input channels, includes two additional card slots, with more effects and dynamics processing, and can be used with a PC and Yamaha Studio Manager software; if using ADK's new 4RU LYVE Tracker (which is available in three models and based around a Steinberg Nuendo 3 or Cubase 4 audio engine) it can also provide a recording solution capable of up to 192 simultaneous tracks.

714-522-9011; www.yamahaca.com

Isilon IQ Accelerator — Isilon Systems

Platform extension node enables Isilon clustered storage users to independently scale aggregate throughput up to 10GB/s; automatically joins an Isilon IQ storage cluster in 15 seconds, with no manual provisioning or system downtime; adds processing power, memory bandwidth, and parallel read and write access to a single file system and fully symmetric storage cluster.

877-247-4566; www.isilon.com

StreamZHD — Digital Rapids

Server allows users to capture, encode, transcode and deliver content in multiple formats ranging from uncompressed HD video to high-quality streaming media, all from a single, intuitive interface; the format-agile system can capture HD or SD video in its native format, or format convert it on-the-fly from HD to SD, SD to HD, or between HD resolutions and frame rates; supports 8-bit and 10-bit uncompressed video and hardware-based JPEG2000 compression, plus a broad range of encoding formats.

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

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For information on the Video on the Net Conference, please visit www.videoonthenet.com

QuMax-2000 — K-WILL

A/V-quality monitoring device supports video formats including SD and HD and analog systems in NTSC and PAL, as well as analog, embedded, AES/EBU digital and SDI/HD-SDI audio formats; detects A/V errors automatically in real time on a single stimulus frame-by-frame basis, and quality degradation such as compression strain and audio noise (including lip sync errors) by a double stimulus process; features 12 input channels for multichannel quality monitoring.

310-512-6910
www.kwillcorporation.com

Genetic Engineering — Quantel

An infrastructure for post and DI; works with new or existing eQ, iQ and Pablo systems; interoperable with all major post systems; allows jobs to be moved between suites in seconds; GenePool host guarantees multiple video streams from an up-to 80TB RAID storage system; Sam data server provides open network access to managed media via CIFS; Max assist workstation controls backroom tasks.

703 448 3199; www.quantel.com

ENDURA ELITE — IDX

Li-Ion V-Mount battery system for ENG/EFP productions features a 142Wh capacity, a twin power cartridge design that doubles its shooting capability for operation of up to 3.5 hours using a 40W HD ENG/EFP camera and replaceable cartridges; complies with RoHS and aircraft security regulations; works with existing ENDURA V-Mount chargers.

310-891-2800; www.idx.tv

POINT-HD V3 — e-mediavision.com

HD telestrator allows presenters to annotate, draw, place and move animated graphics over live video using a touch-screen monitor; features outputs genlocked to the SDI input, 16:9 and 4:3 touch-screen HD video display support, a real-time HD video zooming tool, an animated tool for highlighting objects within the video and tool transparency, allowing visible video underneath graphics.

+44 208 755 2014
www.e-mediavision.com

MassStore federated architecture — Masstech

Archive and asset management system gives broadcasters the ability to centralize storage, move data, distribute people and processes, and search for content across multiple broadcast facilities; allows asymmetrical propagation of assets between multiple MassStore systems; enables decentralization or centralization of storage with storage shared dynamically among all facilities; offers simplified asset searching of all locations, including tape libraries, nearline cache or video servers from a Web browser.

905-886-1833; www.masstechgroup.com

Panorama monitors — Wohler

Color 8.4in and 17in LCD video monitors; unit available as standalone or rack-mount; features composite video, 4:3 video, S-video, DVI, PC and optional dual HD/SD-SDI video inputs with buffered loop-throughs; 8.4in LCD has 1040 pixels with 768 lines; 17in LCD provides 1920 pixels with 1200 lines of resolution.

510-870-0810; www.wohler.com

Quattro SE — Vinten Radamec

Manually operated pedestal features an ergonomically assisted lifting column, small doorway width and high-quality precision encoders to provide real-time digital electronic positioning over the floor and during elevation; includes a base processor and head processor electronic modules and PDA for configuration and user interface.

845-268-0100
www.vintenradamec.com

ProXchange — Omneon

Transcoding system runs on MediaGrid active storage system; provides a scalable and efficient grid-based transcoding platform; handles a wide variety of audio and video formats including H.264; conversion and rewrapping between wrapper formats supported with preservation and accurate placement of all metadata through all conversion operations.

408-585-5000; www.omneon.com

Carbon Coder 2.5 — Rhozet

Transcoding system supports SD/HD Panasonic P2, Sony XDCAM, Avid MediaStream, Dolby Digital (AC-3) audio and the import of IMX or HDV files in a QuickTime wrapper, which can be converted for broadcast playout, Web and mobile; includes Quantel HD and the long-GOP version of LXF for Leitch servers support, as well as the ability to import and export MPEG video with SMPTE 302M audio.

408-246-3338; www.rhozet.com

7710ARC — Evertz

Motion-adaptive video aspect ratio converter converts 4:3 SD sources to properly configured wide-screen aspect ratio; the 7710ARC-F version can also add a fill input for side-panel keying; supports WWS and Vi; modules can be configured through SNMP.

905-335-3700; www.evertz.com

DTS — JDSU

Digital video test platform offers six different combinations of MPEG-2 (DVB, ATSC) transport stream generation, capture, stream creation and analysis; enables operators to precisely capture stream data and conduct trigger stream report generation; features SimulTrack, which performs simultaneous analysis and monitoring of up to 256 MPEG transport streams contained within a GigE pipe.

408-546-5000; www.jdsu.com

Oasis — BitCentral

Digital distribution and archiving system connects with existing news production systems (whether proprietary or tape-based) and saves stories as digital files on commodity storage devices, which can be instantly and automatically shared over existing bandwidth; allows newsroom groups to share content between HD and SD stations; advanced search features tie scripts and slugs to the video.

800-214-2828; www.bitcentral.com

SBT3-5200 — Streambox

Video transport system for use over IP and satellite links; ideal for use in live news and distribution to cable headends; composite SD-SDI I/O and AES audio; uses Streambox ACT-L3 coding technology; leverages store and forward options to enhance signal management.

206-956-0544; www.streambox.com

WxVision.net — Weather Metrics

The digital, HD-quality tower camera system is designed specifically for the broadcast industry and Web applications; provides live broadcast-quality video; archives 48 hours of timelapse images in the system; allows users to display a timelapse for any given time period in the previous 48 hours.

800-869-6629
www.weathermetrics.com

Protus Ph.C — Snell & Wilcox

Video image conditioning system for mobile and broadband TV services; supports increased picture quality with reduced bandwidth requirements; features noise reduction, motion-compensated deinterlacing and scaling; modifies video for correct output scanning format, picture size, aspect ratio and required frame rate.

212-481-2416; www.snellwilcox.com

DK-727 — Ikegami

Native 720/60P full digital HD studio and portable companion camera; full-digital process ASIC's provide 14-bit A/D conversion with sophisticated digital image-enhancement features; CCD image sensors feature an additional 2dB more S/N than previous models; portable HDK-727P camera offers additional performance advantages for ease of use and convenience with improved smaller, lighter, lower-power-consumption design.

201-368-9171; www.ikegami.com

PolarChoice — Electro-Voice

Low-profile, multipattern microphone; allows for a wireless transmitter; features multipattern microphone providing one nondirectional and three directional polar patterns; provides up to 3dB reduction in ambient noise.

952-736-3901
www.electrovoice.com

VS57000 — Gepco

The five-channel RG7 HD video snake provides multichannel transmission of serial digital, uncompressed HD video over long distances; each coax element is constructed from Gepco's VHD7000 16-gage HD coax, which features a gas-injected foam polyethylene dielectric and a 3GHz bandwidth; for broadband noise rejection, the cable is shielded with both a tinned copper braid and foil shield.

818-569-5222; www.gepco.com

OPUS 2 — OmniBus

Content management system delivers soft-XML support for customized logging and annotation, frame-accurate proxy generation and viewing, full-text indexing and searching, seamless integration with production editing systems such as Avid and Final Cut Pro, and standardized Web services data exchange with adjacent systems; moves the content process from specialized hardware to a standard IT platform; Smart Client provides access from both Windows and Mac desktops.

303-237-4868; www.omnibus.tv

VD256256L and HD256256L — Network Electronics

The new routers are 256 x 256 versions of the VikinX modular range; the units provide fully hot-swappable module cards, built-in dual redundant power supply and fully redundant control architecture and controller functions; control features include a TCP/IP control interface and TCP/IP interconnectivity with VikinX modular control panels, SNMP agent, as well as a comprehensive surveillance of the routers' vital parameters.

800-420-5909; www.network-electronics.com

ViBE — Grass Valley

MPEG-4 encoder embeds Dolby Digital Coding into ViBE MPEG-4 encoder; integrated, simple, one box solution for digital broadcast encoding; simplifies systems integration.

503-526-8150
www.grassvalley.com

Avenue 7420 — Ensemble Designs

An HD/SD logo inserter for the company's Avenue modular signal integration system; the dual rate logo inserter can accept either an SD or HD video input and key still logos and animations over program material; can also supply separate fill and key outputs to a production switcher; the 7490 series sub module options provide HD upconversion, downconversion, crossconversion and aspect ratio conversion; with the 7490 installed, the 7420 can accommodate any input — SD-SDI or HD-SDI.

530-478-1830
www.ensembledesigns.com

Cheetah I/O — QuStream

A/D frame sync I/O cards convert analog NTSC/PAL to SDI at the input; extends life of a facility's analog gear; frame sync option on each input will correct and lock all signals coming into the router on this input card; also HD to SD downconversion/aspect ratio conversion output cards available in a single-card, which maximizes the output structure of the router.

631-912-1301; www.qustream.com

Tactical Fiber Optic Cables — Belden Brilliance

ENG camera cables are designed for use in mobile communications systems and digital camera transmissions in ENG vehicles; are small and lightweight for fast, easy deployment at outdoor events; feature an aramid yarn strength member and a tough, sunlight-resistant polyurethane outer jacket; offer a smaller bend radius capability, and improved flexibility and resiliency.

800-235-3361; www.belden.com

IPTV — Intelsat

Features more than 200 video and audio channels encoded in MPEG-4 and super headend and uplink facilities that package the acquisition, aggregation, encoding, formatting and encryption of licensed TV programming, re-encodes programming in MPEG-4, and multiplexes and encapsulates it into IP streams for uplinking and delivery to the last mile video service providers; uses C-band capacity on two satellites.

202-944-7546; www.intelsat.com

Arbalest — Sigma Electronics

Provides automatic, transparent detection and compensation for any delays between video and corresponding audio, eliminating lip-sync errors; system consists of a preprocessor unit and the transmission origin point and post-processor at the reception point that accept either HD or SD-SDI as video input/output and up to four audio transport streams.

866-569-2681; www.sigmaelectronics.com

LTO-3A drive — Quantum

New, higher-performance archive solution offering up to 400GB (30 hours of 25Mb/s HD) of removable networked storage capacity in a tape-based file system that is MXF-aware; features built-in GigE capability; network-attached drives permit direct access by workstations and servers on standard IT networks; drag and drop access by applications and operating systems such as Windows, Linux and Mac OSX.

408-994-4000; www.quantum.com

HD-STAR series — Harris

A series of low-cost options to HD-STAR portable HD/SD generator and test monitor and OPTO TEST optical test and measurement instruments; the battery-powered systems are handheld; the PDA-sized system performs multiple test and measurement functions, including video test signal generation; series includes color and waveform monitoring, serial data analyzer and audio analyzer/monitor.

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

SoftMetal — Ross

Production switcher provides multidefinition capability with on-the-fly scaling on every output; features graphics workflow support; client/server architecture for distributed control, IT server-class hardware and software-based codecs; provides up to 4.2TB of RAID 5 protected storage in a 3RU chassis; includes up to two HD-SDI inputs and four HD-SDI outputs.

613-652-4886: www.rossvideo.com

SRW-1800 — Sony

VTR supports 4:2:2 1080 50P/60P recording and 4:4:4 1080 HQ recording modes; 880Mb/s recording capability; designed to accommodate multiple distribution formats — 1080 50i/60i and 720/50P/60P; deck can accommodate up to two times off-speed playback of 25fps and 30fps content over 1080/50P and 1080/60P transmission lines; accepts large and small cassettes.

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

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Help Wanted

CHIEF ENGINEER

WTOL-TV, Raycom Media's CBS affiliate located in Toledo, OH is interested in reviewing resumes for consideration for the position of Chief Engineer. The Chief Engineer is a departmental management position and has the responsibility and authority over all studio operations, technical maintenance, and information systems. Demonstrated experience in a competitive News market is essential. The position entails hiring, training, and evaluating dept. personnel. Also resp. for departmental operating and capital budget preparation and review. Your background should include a minimum of 7 to 10 years experience. Microwave, transmitter, building, and information systems planning and management knowledge is essential. You should have a minimum of two years technical schooling with a preference for an ASEE or BSEE. Send resume and salary requirements to: **chiefengineerwtol@raycommedia.com** EOE/MFHV

MAINTENANCE ENGINEER

FOX Toledo has an opening for a Maintenance Engineer. Requirements: Formal electronics education, 2 years experience maintaining and installing broadcast equipment including, but not limited to DVCPro & Betacam VTRs, A/V routers, videoservers, switchers, cameras, studio and remote equipment and RF transmission systems. Must be familiar with computers and the Windows network environment. SBE certification preferred. Resume to Human Resources, FOX Toledo, 4 Seagate, Toledo, OH 43604 EOE

MOBILE UNIT ENGINEER

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

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

POSITIONS AVAILABLE

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

IT/BROADCAST SYSTEMS MAINTENANCE ENGINEER/TECHNICIAN

CPAC, the Cable Public Affairs Channel, is looking for an experienced IT/Broadcast System Maintenance Engineer/Technician with extensive experience in television production. For details visit our website: **www.cpac.ca**.

Help Wanted

ENGINEER

Remote Truck EIC : Sure Shot Teleproductions in Youngstown, Ohio is seeking an Engineer In Charge for our HD Production Ku Uplink unit. Previous experience is a must. Candidate must be familiar with HD cameras / switchers / routers / digital audio / broadcast equipment software and live remote sports broadcasting. Duties include Travel to site, setup for and interfacing with client, troubleshooting and on site maintenance. A Driver/ Maintenance Eng. will assist. Extensive travel and Holiday / weekend work is a given. A Passport is a must. See the truck at sureshotsat.com . Experience with Grass Valley products, Yamaha PM5D audio console and HD –Mpeg satellite Ku transmission is a plus! Send resume and references to employment@sureshotsat.com No phone calls please.

CHIEF ENGINEER

KULR-8 seeking Chief Engineer. Position is responsible for transmitter and studio operations, distribution system including translators, information systems, plant and technical maintenance, and building facilities. Oversight of personnel currently includes a staff of 8 FT and 6 PT employees. Other responsibilities include management of the department operational and capital expenditure budget. Accreditation should include college degree or equivalent experience with FCC First Class, General License, or SBE certification. Terrific opportunity with all the glory of Big Sky country in Montana. Cover letter and resume to General Manager KULR-8, 2045 Overland Ave., Billings, MT 59102. bcummings@kulr.com. EOE.

SATELLITE TELECOMMUNICATIONS CONSULTANT

The Corporation for Public Broadcasting (CPB) is seeking a consultant to provide engineering and/or telecommunications consulting services in connection with CPB funding of the satellite and interconnection systems used to support television distribution to terrestrial broadcast stations.

The consultant should be competent in analysing system designs, acquisition of satellite network space segments and cost-effective solutions that meet network design criteria. A working knowledge of satellite Network Operation Centres, broadcast automation systems and broadcast television operations are essential. Familiarity with public television distribution and broadcast requirements is highly desirable.

To obtain the selection criteria that should be addressed in your application, send an email query to consultants@cpb.org. Please include the following information in the email query: Name, company, mailing address, telephone number, email address, occupation and years of relevant experience. A confidential Request for Proposals will be sent only to applicants who demonstrate a significant level of experience.

Help Wanted

STAFF ENGINEER

ESPN - Charlotte, NC- We are currently seeking a Staff Engineer to join our ESPN Regional Television team. Install, maintain and perform preventive maintenance on all technical equipment necessary to support studio show production and postproduction editing. Assist in equipment and facility preparations for live television production, and serve as EIC when needed. Work with operating staff to educate and train on technical equipment operation and technical operational procedures. 5 years of experience as an engineer, EIC or maintenance technician. Must include experience at a postproduction or television broadcast facility. Apply online: www.espn.com/joinourteam, job ID: 84259. EOE.

BROADCAST ENGINEERING TECHNICIANS

Fast-paced 24/7 environment seeks candidates to maintain the technical integrity of a Long Island, NY-based Network Operations Center. Candidates should have appx. 5 years experience in broadcast TV with maintenance exp with VTRs (DigiBeta, HD-Cam, and Beta SP) and Server based video playout platforms (Pinnacle & Grass Valley), Master control video switchers (Miranda & Saturn), Video/audio routers, and Digital tape archives. Strong knowledge in Baseband Video/Audio is required, knowledge of RF infrastructures a plus. Certificates in Harris/Louth Automation, Sony VTR maintenance on DigiBeta VTRs, MCSE, A+ Certification, or SBE preferred. ***We have day and night crew positions.*** Please email all resumes to nocstaffing@mtvstaff.com, or fax to 631-300-3259

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An equal opportunity employer

SALES ACCOUNT MANAGER, BROADCAST MICROWAVE SERVICE, INC.

Lead the sales of portable microwave products to the broadcast industry throughout the Eastern US. Must be located in the Eastern US and travel to broadcast stations throughout the region to grow the sales of BMS products and ensure customer satisfaction. For more information, please go to **www.bms-inc.com**.

VIDEO MAINTENANCE ENGINEER

Rainbow Media, NYC, seeks a Video Maintenance Engineer for the 11 Penn Television Facility. Ideal candidate possesses a minimum of 5 years of studio/post engineering experience. Experience in VTR repair, including DVW and DVC Pro decks. Maintenance and operational knowledge of computer-based editing systems (Macintosh and PC based). Knowledge of file server and network infrastructure. Experience with building infrastructure services, a plus. (HVAC, power, etc.) Comprehensive knowledge of analog and digital television technology in both standard and high definition. Comprehensive knowledge of computer systems related to television technology. Must know CAD systems. Fundamental knowledge of audio/video design and engineering. Bachelor's degree in Electrical Engineering or equivalent experience. MCSE certification a plus. Valid NYS driver's license with good driving record. Please visit **www.cablevision.jobs** to submit a resume. Reference requisition ID 3900BR.

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Ad spots in the DVR era

Who is looking out for the local station?

BY ANTHONY R. GARGANO

The networks are happy because recently completed upfront ad sales for the fall season reversed a downward trend that began two years ago. How did the networks reverse this trend? They came up with tactics to help ensure they deliver the viewers promised to advertisers. That's fine for the networks, but what about the local broadcaster?

Today, broadcasters battle not only competing forms of media distribution for advertising dollars but also clever consumers who can apply inexpensive home technology for time shifting and time compression. At the extreme, savvy viewers with a DVR as inexpensive as $10 per month can reduce three hours of prime-time content into just two hours of viewing. All they need to do is fast-forward through the ads and promos.

Crunching the numbers

The ratings whizzes at Nielsen Media Research recently indicated that just over 17 percent of homes have DVR capability. DVRs are now so significant that Nielsen — which has provided TV audience measurement since 1950 — recently added a "live plus" stat to record viewers who don't watch programs when aired.

In a recent study, Forrester Research found that 92 percent of DVR users fast-forward through commercials while viewing DVR content. That means virtually all of the television households with a DVR are simply blowing right by an advertiser's message. Forrester went on to project that DVRs would penetrate 41 percent of households by 2009.

If anything, that projection could be on the low side. The Los Angeles and Dallas-Fort Worth markets are already in excess of 25 percent penetration.

In addition, cable providers have become adept at finding ways to balloon consumers' monthly bill. They have been increasingly successful with their "puppy dog" sales approach to DVR services: "Take this puppy dog home over the weekend, and if you decide you don't want him, just bring him back on Monday."

In any event, there are rapidly growing numbers of eyeballs using the fast-forward button on the remote instead of viewing the brief message that a sponsor paid tens or even hundreds of thousands of dollars for.

Live, local programming

The DVR era has motivated commercial creativity by the networks. Product placement, long used as a revenue-generating vehicle in Hollywood filmmaking, is now being used more frequently within TV program content.

Commercial messaging is being woven into scripts. Live commercials are being aired. For example, during a recent broadcast of "The Tonight Show with Jay Leno," a skit discussed mens' inability to ask for directions. The cure was a Garmin product, and the first commercial at the break was a Garmin ad.

But where does that leave the local station? How do local spots find a way to be viewed in the DVR era?

One answer, of course, is live, local programming. Content such as local news and sports share a unique common trait: the time value of the delivery of the content. No DVRs here.

News has long been a major ad revenue source for local stations. In recent years, the mainstay of free-to-air local sports has been slowly nibbled at by cable as more of a given team's schedule moves exclusively to cable airing.

It's up to you!

The continuing opportunity for local avails beyond live news and sports will increasingly be threatened. The broadcast networks and television syndicates live in a world where content is king, and at some level, it can assist the needs of one of their primary content distribution partners.

The most important factor in protecting the local avail revenue stream is the local broadcaster itself. Whether by increasing Web site tie-ins, creating unique real-time value program content or finding innovative ways to use excess DTV bandwidth, it is all in the hands of the local broadcaster to recognize the issue and strategically plan for it. Who's looking out for the local station? If you work for one, it had better be you. BE

It is all in the hands of the local broadcaster to recognize the issue and strategically plan for it. Who's looking out for the local station? If you work for one, it had better be you.

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

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

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