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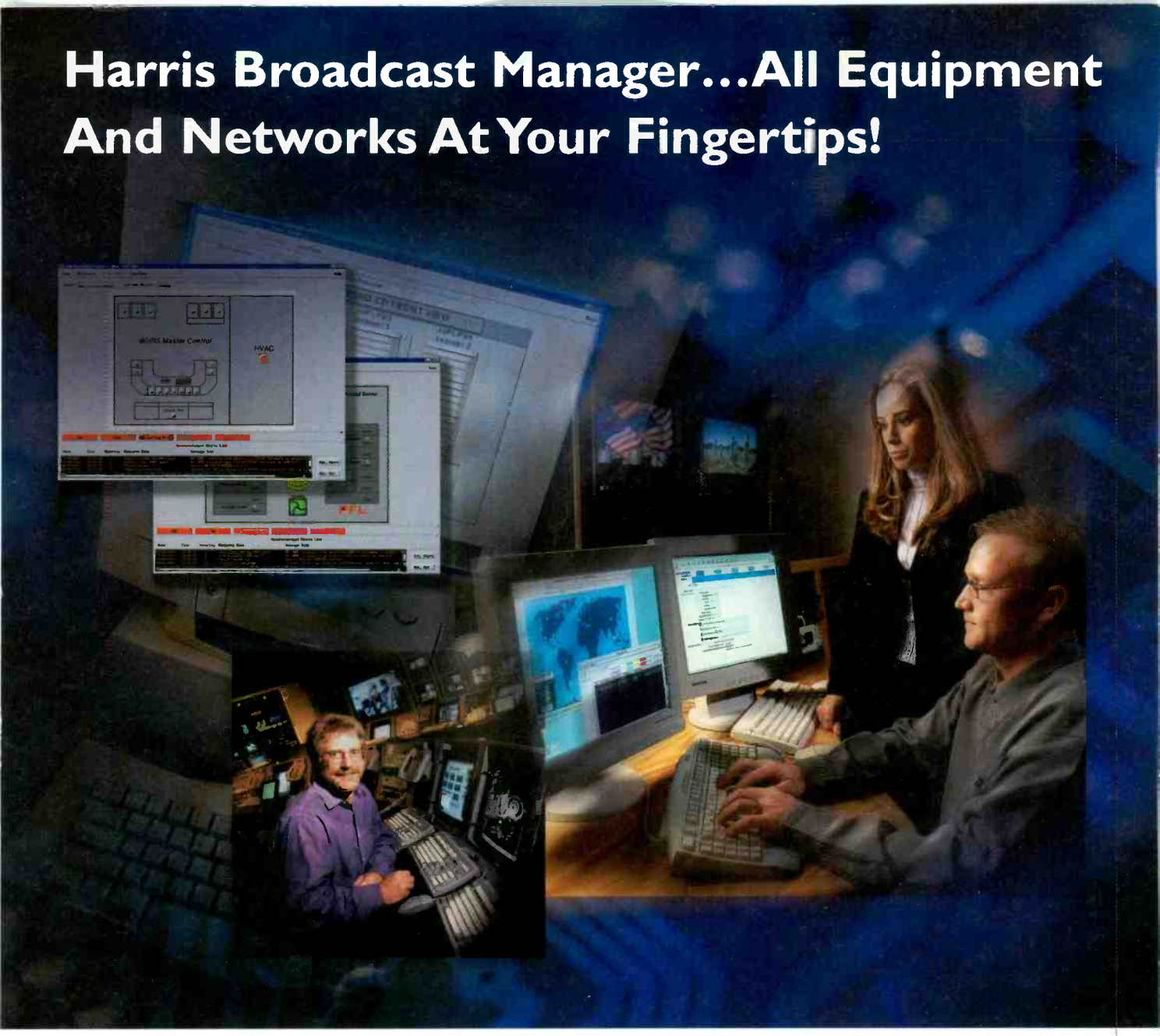

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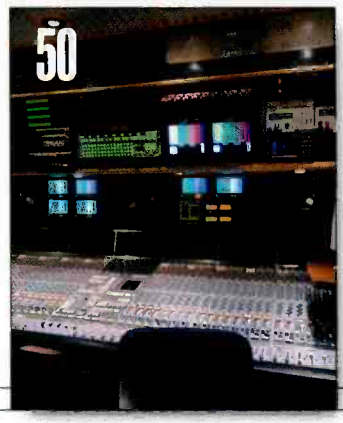

BEYOND THE HEADLINES

DIGITAL HANDBOOK

ON THE COVER: The audio room of National Mobile Television's (NMT) HD3 high-definition, double expando unit features a Solid State Logic Aysis Air Plus digital console with 48 faders (24 mono and 24 stereo), 60 AES pairs of digital I/O, and 96 analog inputs and outputs. NMT's newest truck HD4 will include SSL's MTP digital console. Photo by Dave King.

(continued on page 6)

Studio

Field

1080i

720p

480i

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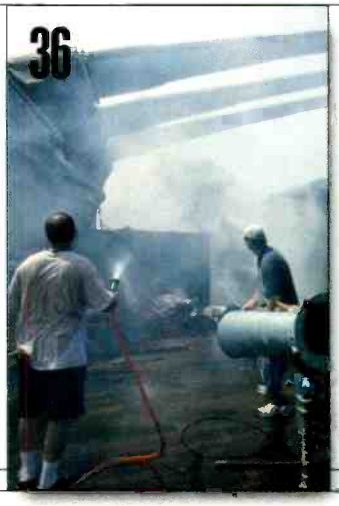

New Products & Reviews

Field Report

Technology in Transition

Departments

Who had the private suite?

A product was introduced in a private suite at the 1994 NAB convention. It may never have been fully successful, but it could be called the first of today's large-scale storage systems. Name the product and the company that introduced it. Title your entry "Freezeframe-January" in the subject field and send it to: bdick@primediabusiness.com. Correct answers received by Feb. 17, 2003, are eligible to win in a drawing of *Broadcast Engineering* T-shirts.

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Hollywood is dying – good!

Hollywood still doesn't get it, and the movie moguls are panicked! The guys who are used to $100, three-hour lunches and $10 million homes are horrified that new technology may require them to change the way they do business. That's the case with those companies involved in producing television programs and especially movies.

Under Hollywood's copyright plan, you would not be able to record a movie or television program at home and then take it with you. You couldn't record a TV program and then take it to Grandma's house or watch it in the car. Same thing applies to a CD. If you want to have a copy of Shania Twain's latest hit CD at home and in the car, Hollywood wants you to buy two CDs.

We consumers like (and expect) to be able to record, store and move content with us once we buy it. And "buy" means getting it over free TV, via paid cable or satellite, or from a DVD or CD. So yes, FOX, that means if I record "The Simpsons" for my kids, I expect to be able to play it in my car DVD player and at Grandma's house later without having to pay you again.

The latest copyright salvo was fired from Viacom (CBS) last month when the network threatened to withhold all HD programming unless the electronics industry agreed to its demand for a *broadcast flag*. The flag would allow the network to control home digital TV sets and recorders to prevent any recording or viewing on *non-protected receivers*. Another phrase for non-protected receivers is *your digital HDTV set*. In other words, you won't be able to record or view HDTV and other digital content without additional payments to these extortionists.

It's interesting that neither the CBS or Viacom Web site mentions the network's plans to withhold HDTV programs from affiliates. In fact, the Viacom Web site is replete with stories of how important and successful HDTV is for the CBS network. I suspect CBS affiliates may have a different viewpoint about HDTV programming than Viacom CEO Sumner Redstone. All of these efforts are merely window dressing on Hollywood's attempt to protect their outdated business model.

The bottom line is greed. Pure and simple. Viacom and Hollywood are playing "Chicken Little" – running around screaming that the digital sky is falling. This is the same thing we heard in the early 1980s when the movie companies said that Sony's Betamax and home recording would ruin the entire industry. It didn't happen then and it won't happen now, even with digital technology.

We're only two years away from an election. And while politicians love money more than life itself, they do pay attention to voters. When the general public finds that CBS or any other network is committing HDTV blackmail just to protect their "good old boy" system, there's going to be hell to pay. And if any other network or Hollywood mogul does the same, it will look like corporate collusion. Can you say Enron?

When Congress convenes, people like senators Tauzin and McCain may want to suggest Mr. Redstone appear before them to explain his HDTV threat. If I were him, I'd take my billions and retire first.

Brad Dick
editorial director

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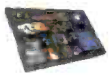
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Will Hollywood control your TV?

Dear Brad:

In regard to your editorial in the August 2002 issue, you're just plain wrong. Perhaps you should have checked the facts with knowledgeable folks in the broadcast and production communities instead of relying on the misrepresentations published by www.eff.org to provide the predigested fodder for your editorials.

When protection technology is properly implemented by CE manufacturers, the consumer will have absolutely no idea that it is working and in place. DVI (with HDCP content protection technology) is only one of the possible DTV receivers to display interconnection mechanisms, particularly appropriate for uncompressed component digital signals. Another is 1394 (Firewire) with DTCP content protection technology, which is appropriate for compressed digital interconnection applications and allows recording of broadcast content. There may even be more possibilities available in the future. As these interfaces are incorporated into products over the next several years and unprotected analog connections are gradually phased out, no current consumer expectations will be lost or modified in the least. The only effect will be a reasonable deterrent to piracy and looting. Perhaps you should direct your readers to a more accurate description of content protection capabilities at www.mpaa.org/home.htm, and the "Broadcast Flag" area of that site for correct information on broadcast content protection.

Content produced by the major studios in Los Angeles is indeed precious – it provides the reason that consumers continue to tune into the various forms of television delivered by broadcasting businesses – businesses employing many thousands of people from maintenance technicians to master control operators to DBS dish installers.

As a business – broadcasting – we should be very concerned with our ability to maintain the value of our only real asset: entertaining content. Without it, consumers have nothing to consume and the rest of us involved in its production and distribution have no profession. And you, sir, will have no audience for your magazine.

The world has proved itself fully capable of looting entertainment audio and video content to the detriment of the economic value of our businesses. To deny the industry the ability to protect content assets and ensure convenient enjoyment by consumers through invisible mechanisms designed only to thwart illegal looting is to promote and encourage the demise of the livelihood of the broadcasting and content production industries.

To advocate the positions of www.eff.org is to advocate the loss of the broadcasting profession in general. As someone within the broadcast industry you should be ashamed of yourself for even remotely suggesting that their opinions are tenable.

This represents the views and opinions of Fox Broadcasting, Twentieth Century Television and Twentieth Century Fox Film Corporation, all units of News Corporation.

SINCERELY,
SCOTT E. HAMILTON
VICE PRESIDENT, SOFTWARE ENGINEERING
NEWS TECHNOLOGY GROUP
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Editor responds:

First of all, Mr. Hamilton, consumers will know when the "protection technology" you so reverently espouse is implemented. The first hints will be when their current HDTV sets go dark, when the PVR won't record their shows, or their CDs and DVDs won't play in their computers or cars.

Perhaps the consumer will know Hollywood's protectionist practices have been implemented when their computer crashes because you have been allowed to secretly enter their computer and trash their files under the guise of anti-piracy. Don't tell me consumers won't be affected by Hollywood's desire to retain its power.

Your source problem lies in the way you want to do business. Your ilk simply want to continue the 1950s era business model where you raid consumers' pocketbooks, control the distribution channel and make billions, and you just expect consumers to comply.

Technology has moved on, Mr. Hamilton. The days of paying $13 million a year to perky TV faces like Jane Pauley or $25 million per movie to actors like Harrison Ford – whether or not their shows and movies make any money – are gone. Stop trying to turn back the clock. Hollywood will learn to produce content for less and remodel today's monopolistic distribution system – or it will die.

Change is coming and you'll either adapt and adopt, or you'll be seeing early retirement. Frankly, the latter would be good for all of us. The sooner we get rid of the Hollywood dinosaurs like you and Jack Valenti, who all claim the sky is falling because of piracy, the sooner consumers will see more innovative and available programming usable on their schedule, portable to their players and at reasonable prices.

The issues of your desired protectionist technology are merely window dressing on an industry that is dying, and you guys will grasp any straw to stay in business, even if it penalizes innocent consumers.

So I'll still be here, Mr. Hamilton, promoting my broadcast and production industries, while you, sir, will be sucking that dirty Hollywood air. Long live consumerism!

Your industry, as you'd "like it to be," is dead. You just don't know it yet.

BRAD DICK
EDITORIAL DIRECTOR

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1994

BY CRAIG BIRKMAIER

There have been many twists and turns in the past decade along the path that is supposed to be carrying us into the brave new world of digital television. We have become accustomed to delays and sudden appearances of deal-stopper issues that were not envisioned when the framework of the DTV transition was conceived.

Everyone knows that there are multiple digital transitions happening, and everyone knows that the broadcasting transition to DTV is seriously behind schedule. But it doesn't matter because everyone knows that that silly 2006 deadline is not real.

What's real is a high-stakes battle for control of markets that are being transformed by digital technology – the opportunity to profit from a new generations of devices that speak the universal language of bits via an intricate web of increasingly interconnected public and private networks.

What's real is the desire to protect that which is currently controlled, and the ability to influence regulation and legislation to extend control over markets in transition.

Any rational assessment of where the transition to digital television stands today could only conclude that it is totally out of control. There are success stories to be sure, but there are also roadblocks to market growth everywhere.

The CE industry is profiting from the HDTV experience, not to mention DVD and DBS. Broadcasters are not.

DBS is driving the evolution of subscription digital-TV platforms; cable is responding to minimize subscriber losses. HDTV is emerging as a premium niche market for both.

The PC is becoming a multi-function "Swiss Knife," a digital media hub. It is being portrayed as the "gateway drug" to hardcore media piracy. Consumers have become the biggest threat to the future success of Big Media; they are not to be trusted.

Any rational assessment of where the transition to digital television stands today could only conclude that it is totally out of control.

2004 may look a lot like "1984"

We sit near the midpoint of the government-mandated DTV transition, yet broadcasters do not appear concerned that their foray into digital has stalled.

Althought the CEA is projecting a sizable increase in DTV sales by 2006 (see Figure 1), the number of homes able to receive terrestrial DTV broadcasts right now is still too small to be statistically significant. Three-fourths of broadcasters missed the May 1, 2002, deadline to begin operating their DTV channels. At this writing, fewer than 700 stations are on the air; more than half of these are operating under temporary authority at a small fraction of their authorized power levels. And DTV interference into NTSC and public-safety radio bands is a growing concern as more stations begin DTV broadcasts.

FCC Chairman Powell used his bully pulpit to move things along a bit last year, but the year ended with many issues still log-jammed. Meanwhile, the FCC agenda for the new year is packed with high-profile issues like a digital-cable tuner standard and digital carriage of DTV broadcasts, media ownership caps and the Broadcast Flag (more about that later).

On the positive side of the ledger, the amount of enhanced- and high-definition programming available has grown substantially. CBS is delivering virtually all primetime dramas and sitcoms in HDTV. And the other major networks are offering an increased number of

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

Digital cinema gets a foothold

California leads the way

State	Number of digital screens	State	Number of digital screens
California	22	Michigan	2
New York	8	Nevada	2
Illinois	4	New Jersey	2
Texas	4	Ohio	2
Florida	4	Arkansas	2
Tennessee	4	Colorado	1
Massachusetts	3	Maryland	1
Arizona	2	Virginia	1
Connecticut	2	Washington	1
Kansas	2	Minnesota	1

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HDTV and EDTV programs. And there are multiple premium HDTV services entering cable and DBS lineups.

So why, given the realities of getting the transition moving, would Viacom, which owns CBS, file a warning in response to an FCC inquiry about the proposed Broadcast Flag?

Viacom said, "If a Broadcast Flag is not implemented and enforced by summer 2003, [CBS] will not provide any programming in high definition for the 2003-2004 television season." The comments continued: "Viacom believes that DTV sales and broadband subscriptions have reached the 'tipping point' at which it can no longer afford to expose its content to piracy. A Broadcast Flag regime is needed now to protect the value of our important assets or we must withhold our quality HD digital content."

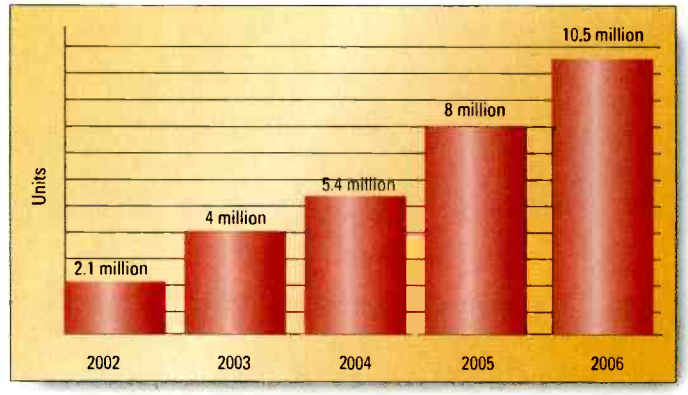

Figure 1. The digital transition is off to a slow start, but may be moving in the correct direction, as shown by the Consumer Electronics Association's projection that DTV sales will increase significantly between 2002 and 2006.

Viacom was certainly not alone in its concerns about implementation of a technology solution that would respond to a redistribution-control descriptor, the bits in a digital terrestrial broadcast bitstream that are being called the Broadcast Flag. But these comments were joined by more than 5000 comments filed in the FCC inquiry, a very high percentage of which came from private citizens who are increasingly taking advantage of the ability to file FCC comments electronically.

The comments of citizen Mark Ellis provide an interesting counterpoint to the position taken by the big media companies: "TV is, and will remain, ephemeral trash, rarely worth the storage space or cataloguing effort that its unauthorized capture entails. Even if every kid in America gets Internet access to sitcom episodes and butchered movies, the visual quality of these important works of art will be limited for years to come by bandwidth rather than by source quality. The effort required to control access to this material seems disproportionate to the value of the programs, leading one to conclude that the proponents of the Broadcast Flag scheme are primarily concerned with something other than digital broadcasting."

According to citizen Bryan W. Taylor: "A better question for comment would be, 'To what extent would the presence of a digital broadcast copy-protection scheme and the lack of guaranteed fair-use functionality delay or prevent the DTV transition?' Will the resulting dynamic threaten the viability of digital television? Why would anyone pay more to switch to a TV medium with less capability?"

Could broadcasters be left holding the "ephemeral trash" bag while big media companies like Viacom rely upon cable and DBS to deliver uncut, uncensored HDTV versions of their programs to paying customers?

At the moment, it appears that big media may have the political leverage to persuade the FCC and Congress to get into the business of regulating virtually all digital media appliances. Compliance with the Broadcast Flag is an important step in gaining the kind of Big Brother control over the flow of information and entertainment portrayed in the Orwellian visions of "1984."

Fortunately, those visions have not yet come to pass. But two presidential election cycles ago – in 1994 – an equally distressing vision took form. The vision is wrapped up in sweeping changes to the Telecommunications Act of 1934 – changes intended to stimulate competition.

There was the administration vision of Information Superhighways that would transform the way people lived and worked. And there was the vision of a newly elected Congress controlled by Republicans for the first time in decades; a vision of broad deregulation of the telecommunications industries.

The politicians and the special interests worked together to write the new legislation. The result was the Telecommunications Act of 1996.

It was supposed to create competition in the telephony markets and stimulate the deployment of a new broadband, digital-communications infrastructure. It was supposed to open up the cable market to CE industry competition for set-top boxes. It was supposed to facilitate a rapid transition from analog to digital television broadcasting, freeing up underused spectrum resources for more productive market-driven applications.

It didn't do any of these things. But it did help pay for the 1996 election campaign.

More logs for the fire

As always, there will be plenty of technical issues to keep things interesting while the politicians and the lobbyists hammer out the next deal in this seemingly never-ending story. But media ownership and control will generate most of the heat and most of the money that the politicians will need for the 2004 campaign. And broadcasters can take a little comfort in knowing that most of that money will be spent buying TV ads. BE

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

SEND Send questions and comments to: cbirkmaier@primediabusiness.com

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BEYOND THE HEADLINES

FCC tackles EEO for a third time

BY HARRY C. MARTIN

The FCC has adopted new EEO rules which closely resemble "Option A" of the FCC's prior EEO rules. The new rules will become effective 60 days after their publication in the Federal Register, unless there are postponements under Congressional or OMB review procedures. The projected effective date is mid-February.

The new rules again require broadcasters to disseminate notice of full-time job vacancies and to participate in a specified number of recruitment activities. Stations must maintain records of vacancies filled, the recruitment sources used for the vacancies, and the number of referrals received from the sources, with the information placed in station public files and on station Web sites.

Recruitment. The new recruitment rules require licensees to:

- widely disseminate notices of all full-time (30 hours or more) job vacancies, except for rare emergency hiring situations;
- provide notices of all full-time job vacancies to organizations that have requested to receive vacancy notices; and
- participate in a specified number of recruitment activities every two years, such as fairs, and scholarship and internship programs. Station employment units with five to 10 full-time employees, or ones that are located in smaller markets, must participate in two such activities, while station employment units with more than 10 full-time employees located in larger markets must participate in four activities. (A station "employment unit" is one or more stations operated by the same staff.)

Recordkeeping. In addition, under the new rules detailed records must be kept of:

- all full-time job vacancies filled, identified by job title;
- the recruitment sources used for each vacancy, identified by name, address, contact person and telephone number, with a separate list of the sources required to be notified because they requested vacancy notices;
- all advertisements, bulletins, letters, faxes and e-mails announcing vacancies, all with dates;
- documentation necessary to demonstrate participation in the required recruitment activities;
- the total number of persons interviewed for each vacancy and the referral source of each person interviewed; and
- the date each job was filled and the referral source of the person hired.

Reporting. Licensees must place in the station's public file and on the station's Web site reports containing lists of:

- all full-time vacancies filled during the proceeding year, identified by job title;
- all recruitment sources used for the vacancies, identified by name, address, contact person and telephone number;
- the recruitment sources that referred the people hired for each vacancy;
- the total number of persons interviewed for each vacancy and the total number of interviewees referred by each referral source; and
- the required recruitment activities in which the station participated, with a brief description of each activity.

Additionally, all licensees must:

- at renewal time, and midway through the license term, file with the FCC the reports (described above) placed in the station's public file for the past two years, and
- beginning in September 2003, file annually with the FCC a report on the gender and race/ethnicity of the station's employees. (The FCC says this information will be used only for statistical purposes and not to evaluate a station's compliance with the EEO rules).

By effectively adopting the former Option A, the FCC is hoping to avoid any further losses in court on the EEO front.

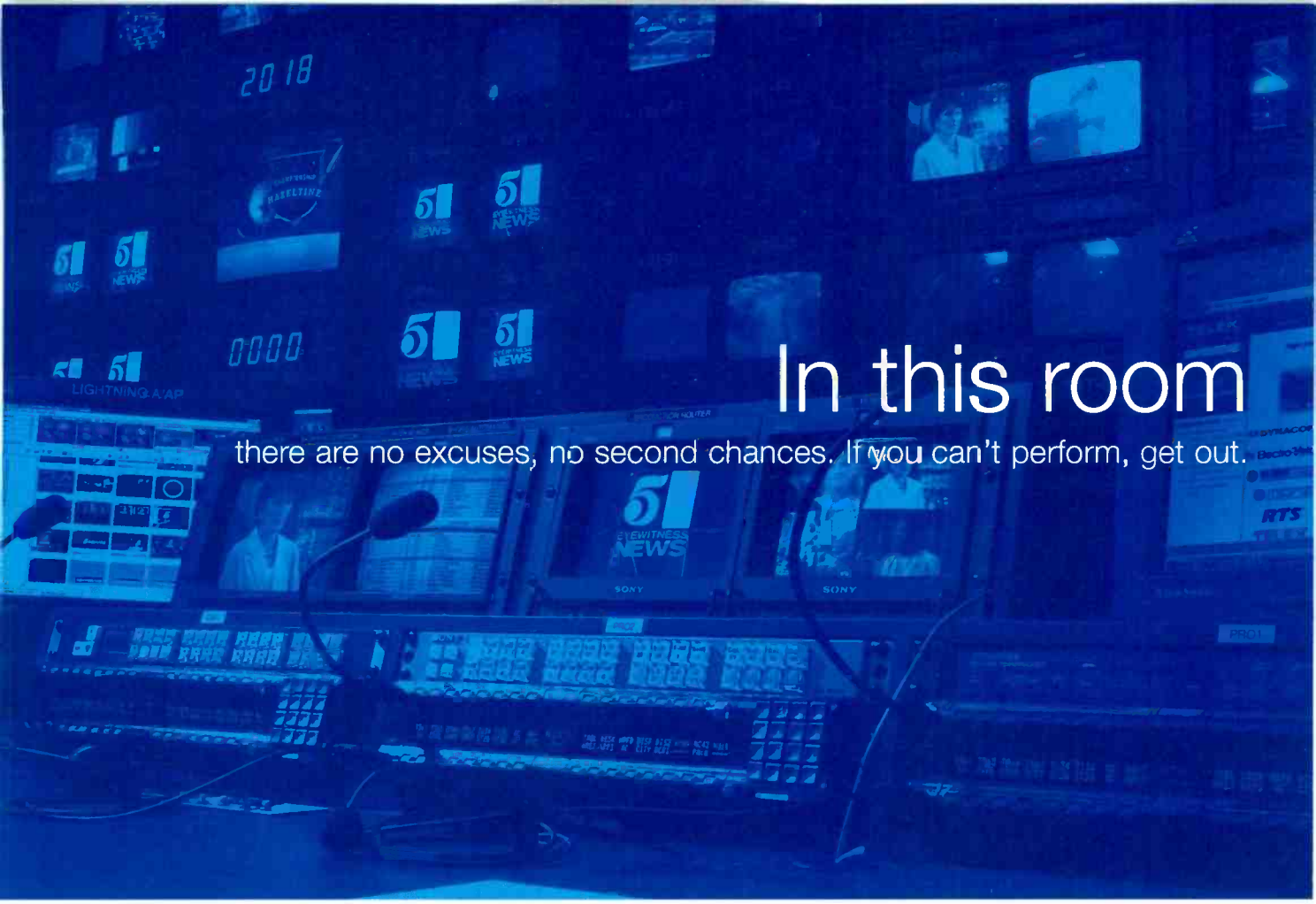
Commentary. By effectively adopting the former Option A, which had been approved by the D.C. Circuit, the FCC is hoping to avoid any further losses in court on the EEO front. Whether that hope will be realized remains to be seen. The fact that the Commission still plans to collect gender and race information will doubtless raise concerns about the constitutionality of the new rules. Critics of the EEO rules already are concerned that such gender and race data will give rise to petitions charging discrimination, which in turn will give rise to gender- and race-based decisionmaking of the type the courts have rejected. BE

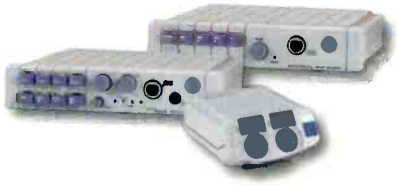
Dateline

The deadline for noncommercial TV stations to complete the buildout of their DTV facilities is May 1, 2003. Biennial ownership reports are due Feb. 1 for stations in the following states: Arkansas, Kansas, Louisiana, Mississippi, Nebraska, New Jersey, New York and Oklahoma.

Harry C. Martin is an attorney with Fletcher, Heald & Hildreth PLC, Arlington, VA.

SEND Send questions and comments to: harry_martin@primediabusiness.com





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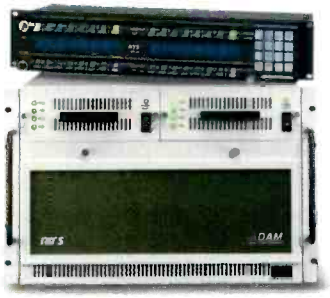

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New features
for STBs and receivers

BY MARK MASSEL

As the STB matures and technology gets faster, smaller, lower power and lower cost, the consumer reaps the benefits … or does he? This article will focus on two main growth areas in STB design: the software stack known as Multimedia Home Platform (MHP), which has now been adopted by Cable Labs in the United States, and the personal video recorder (PVR).

The main driving force behind MHP was to offer interactivity to the end user.

Multimedia Home Platform

Due to the convergence of technologies for reception at the home, the DVB branched out from their traditional role and looked at the commercial requirements for future interactive receivers. This culminated in the MHP definition, specifically the API. The main driving force behind MHP was to offer interactivity to the end user. The standard specifies the functionality of applications rather than the full detail of the middleware itself. Hence, the APIs are well-defined, but how these APIs are put together in a real architecture are not. The specification defines the following three profiles:

P1) Enhanced Broadcast – Enhanced middleware features, i.e., digital broadcast of audio/video services including downloaded applications for local interactivity, but very limited interaction with just an optional telephone or cable modem return channel. (MHP 1.0)

P2) Interactive – Ability to run more interactive applications across the return path, i.e., a more sophisticated interactive channel is needed. (MHP 1.0)

P3) Internet – Allowing HTML and other protocols to run via a direct connection to the Internet. (MHP 1.1)

The resources relate to the hardware functions and, therefore, the drivers associated with them. A resource could also be a pure software resource. There is no restriction in the MHP model of the number of hardware resources. Hence, more than one processor is possible. However, the resources must be seen by the layers as a single entity.

The system software is basically an abstraction layer. That is to say, any software above this layer is totally hardware-independent. This means the applications above can be ported to new hardware with no modifications. The function of the API is to offer a clean interface between the system layer and the ones above. It defines a list of function calls into the system layer. The system layer presents an abstract model to the API that consists of (i) streams played from different sources and pipes for connecting them; (ii) commands and events, (iii) data records or files and (iv) the hardware resources.

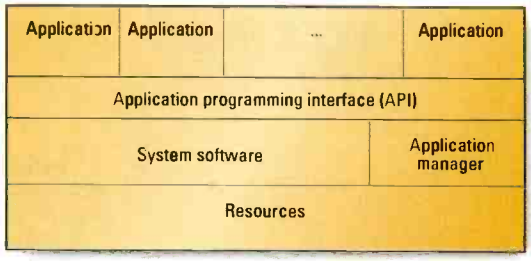
The application manager software manages the life cycle of all the applications. It is implementation-specific, that is to say it depends on the underlying hardware.

The application layer realizes the actual applications' functions, e.g., the code necessary for the user to have some interactivity with the system.

MHP doesn't define but allows plug-ins to enable older legacy software to be used within the MHP environment. The legacy system, when integrated into MHP, must work in exactly the same way as it did in its own legacy environment.

From the applications' point of view, the most important aspect of MHP is the API. For MHP, one of the most important APIs is the Java API, known as DVB-J. So all applications interfacing to this (other than type-B plug-ins) are implemented in the Java programming language. Java applications must run the Xlet interface to be DVB-J compliant. This allows the application and the application manager to communicate bi-directionally. Applications run on the Java virtual machine (VM) can either be resident on the STB, or more generally will be downloaded from the broadcast channel inside the transport stream.

This VM (first developed by Sun Microsystems) is essentially a software CPU. It has an instruction set and manipulates various memory areas at run time. Whereas a compiler of the C language, for example, would compile to produce a machine code specifically for the processor it must run on, Java source is compiled into byte-code, sometimes called J-code. This is a universal code, which is interpreted by a run time interpreter. Nothing regarding the Java specification is left undefined, hence, no implementation-specific cases exist. Java applications are therefore truly platform-independent and universal.



The Multimedia Home Platform architecture provides a flexible stable platform for both legacy and new applications.

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Personal video recorders

In my view, far more interesting than interactivity is the fast-growing market of PVR. Basically, a PVR is an STB with an integrated hard disc drive (HDD). In part due to the much-talked-about "TiVo" in the United States, many countries and manufacturers are now considering what to do about PVR solutions. There are really three types of PVR that can be purchased. The first is one that comes with a service provider. In this case the consumer will generally pay extra while the PVR is effectively under the control of the provider. The second type is the free market PVR, which can be for satellite or terrestrial (or for both). In this case the PVR can be freely operated to do exactly what the viewer wants. The third has CODEC technology on board. This means that an analog input can be brought in, digitized and MPEG-2 compressed, prior to input to the PVR main processor. The benefits of such a solution mean that even a consumer in a closed vertical market model can make use of such a product.

Many countries today are broadcasting digital terrestrial signals. The PVRs are starting to become available for these markets too. The low-cost versions have a single tuner for recording one channel, although another channel can be watched that has previously been recorded to HDD. (It is also possible to watch one channel and record another live one, provided both channels are being transmitted on the same multiplex). The cost benefit is due to the fact that the main demux processor does not need to have multiple demux engines onboard. The trend, however, will be to move to dual tuner systems, thus giving the full feature of recording one channel while watching any other one (even in time-shift mode).

Real combination STBs are emerging, proving the technology convergence is real.

Real combination STBs are also emerging, proving the technology convergence is real. More and more STBs are now implementing much more user-friendly features such as weekly program guides, program management lists, satellite databases for easy installation and USALS for the easy acquisition of satellites. Other additions include various games to keep both kids and adults amused. BE

Mark Massel works for Highgate World Wide, www.highgate.tv, in business development of STB software solutions and is author of the book "Digital Television, DVB-T COFDM and ATSC 8-VSB," available at www.Amazon.com.

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Analog video synchronization

BY MICHAEL ROBIN

The successful generation, transmission and reproduction of a televised scene requires a tightly controlled synchronization between the studio color camera and the TV receiver triple gun picture tube. In order to synchronize the receiver scanning circuits the video signal contains synchronizing information. Since the early days of television, the picture electrical signal and the synchronizing signal have been combined into what came to be called a composite video signal. The composite video signal is bipolar with a normalized signal amplitude of 1 V p-p. The 700mV (714.3mV on the North American continent) positive part of the signal conveys picture information. The negative 300mV part of the signal (285.7 mV on the North American continent) conveys synchronizing information.

Synchronizing the receiver

The horizontal sync information is transmitted as a short (4.7 µsec duration) pulse located in the horizontal blanking interval. The vertical sync signal is more complex. Essentially it occupies a space equivalent to nine lines in the vertical blanking interval (7.5 lines in the 625/50 format). The vertical sync signal is composed of six (five in the 625/50 format) short, 2.35 µsec duration pre-equalizing pulses, followed by six (or five) serrated vertical sync pulses (approximately 27 µsec duration), followed by six (or five) short, 2.35 µsec duration post-equalizing pulses. The serrations are needed to ensure continuing horizontal synchronization during the vertical blanking period. The pre- and post- equalizing pulses serve to unambiguously synchronize the vertical scanning in the receiver in order to maintain the interlaced scanning. The relative complexity of the vertical synchronization is the price to pay for the reduced bandpass afforded by interlace.

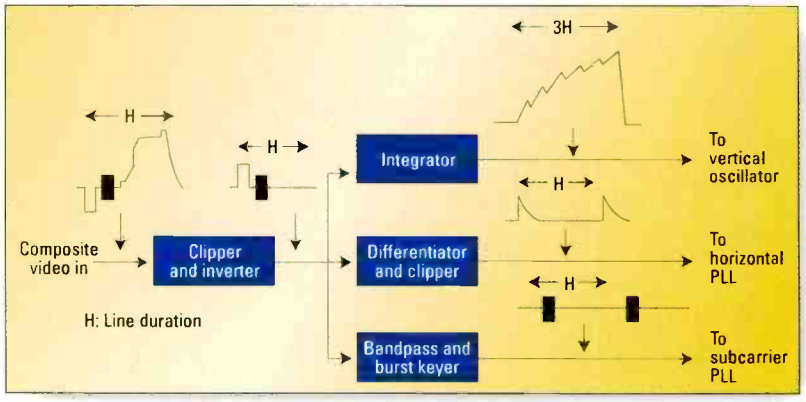

Figure 1. Simplified diagram of a sync separator

In addition to the scanning synchronizing information, chrominance subcarrier frequency and phase information is also transmitted as a burst of 9±1 cycles (at 3.58MHz in NTSC) or 10±1 cycles (at 4.43MHz in PAL). This information is required as a reference for the regeneration of the suppressed chrominance subcarrier used by the synchronous detector of the chrominance decoder.

The receiver extracts the horizontal and vertical scanning information through the use of a clipper with a threshold of 0V. Picture information is thus removed and only the sync information is passed. The horizontal sync pulses pass through a differentiating circuit that generates short pulses coincident with the horizontal sync leading edge. These pulses feed a PLL-controlled VCO to generate the horizontal scanning waveform. The vertical sync pulses pass through an integrating circuit that practically removes the short duration horizontal sync and pre-equalizing pulses. The serrated pulses charge a capacitor to the value required

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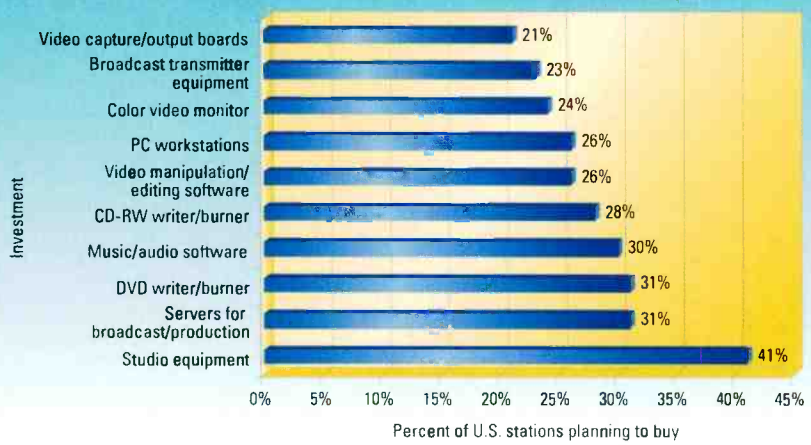

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to synchronize the vertical scanning generator. The bursty chrominance sync information is keyed out of the horizontal blanking interval and passed through a bandpass filter centered on the subcarrier frequency (3.58MHz or 4.43MHz). The filtered bursts feed the PLL, crystal-controlled oscillator part of the chrominance decoder. Figure 1 shows a simplified diagram of a sync separator.

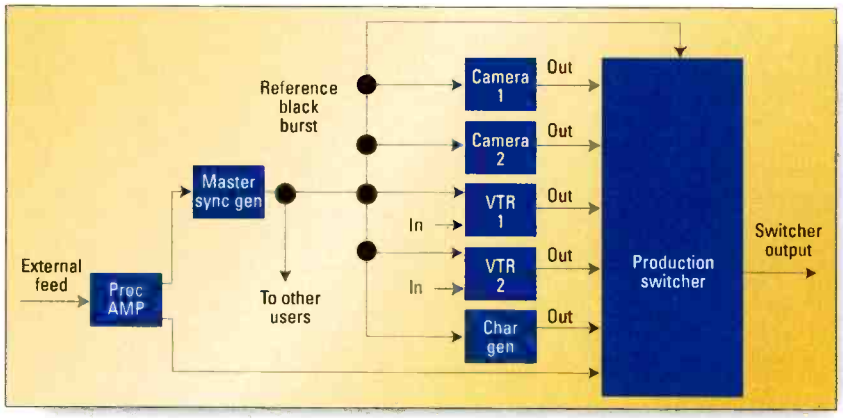

Figure 2. Simplified block diagram of genlocking to an external source

Synchronizing the signal sources

The process of combining video signals originating from different local sources requires perfect synchronism and relative timing of all the signals present at the input of a production switcher. The synchronization is obtained by locking all video signal sources to a common reference black burst signal generated by the master sync generator. Modern equipment provides adjustments to meet the specs.

External, incoming video feeds are non-synchronous. They can be recorded without difficulty as the VTR locks onto the incoming video signal. On-air switching of the non-synchronous external sources, such as may occur in regional affiliated stations, does not require synchronous network feeds if a temporary loss of vertical sync when switching from a network feed to a local program is acceptable. Some simple on-air switchers use "V-fade" switching, fading the signal to black before and during switching, thus masking the switching transient. Mixing the incoming feeds with the locally generated signals requires that the external and internal video signal sources be synchronous and meet the timing requirements.

Early operational methods used the concept of genlocking. This required that all local signals be locked to the incoming external feed. To achieve this the master sync generator used to be locked to the external feed. Alternately, various operational configurations, consisting of a studio, several cameras, VTRs and production switchers, were genlocked to specific external sources. This method is awkward but possible when dealing with a single external source. When dealing with simultaneous, multiple non-synchronous external sources this method simply does not work. Figure 2 shows a simplified diagram of genlocking.

Handling external video sources became simpler when digital frame synchronizers made their appearance in the mid-1970s. The frame synchronizer samples the incoming signal, stores it in a digital memory and reads it out at a rate controlled by the local master sync generator. Early frame synchronizers sampled the composite video signal at $3F_{sc}$ (10.7MHz in NTSC) with a resolution of eight bits per sample. Current technologies use digital adaptive comb filters to decode the composite video signal into Y and multiplexed C_B/C_R digital components with a resolution of 10 bits per sample. The Y and C_B/C_R signals are stored in separate frame memories that together store a full video frame. The two memories are read out at a rate controlled by the station master sync generator. The synchronized digital components are subsequently encoded into an analog composite video signal. The frame synchronizer usually provides for timing adjustments of the synchronized video signal to match the local requirements. In addition to synchronizing the external feed, frame synchronizers include additional features such as adjustments of video frequency response, composite signal gain, setup level, chrominance gain and chrominance phase with respect to burst. Figure 3 shows a simplified diagram of the use of a frame synchronizer. BE

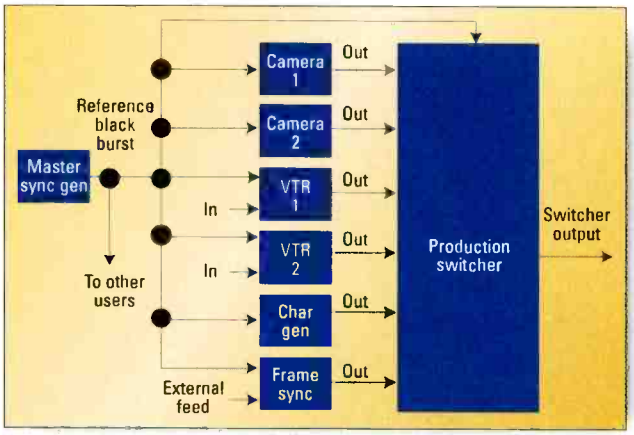

Figure 3. Simplified block diagram of the use of a frame synchronizer

Michael Robin, a fellow of the SMPTE, former engineer with the Canadian Broadcasting Corp.'s engineering headquarters, is an independent broadcast consultant located in Montreal, Canada. He is co-author of Digital Television Fundamentals, published by McGraw-Hill.

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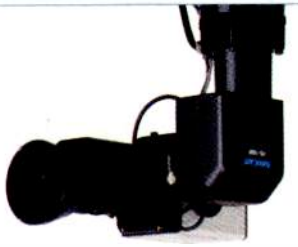

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Computer networking for beginners – Part I

BY BRAD GILMER

Let's begin our discussion of TCP/IP by using an example network composed of a small office containing five computers that are connected to the Internet using a router.

TCP/IP networks are built using a unique numbering system composed of groups of numbers separated by periods (e.g., 10.19.8.215). Collectively, this group of numbers is known as an IP address. Each device on a network (every computer, router, print server, etc.) must have a unique IP address. There is another group of numbers associated with the IP address called a subnet mask (e.g., 255.255.255.0). The subnet mask is common to a group of computers and networking devices and tells individual workstations the number of possible computers on the local network.

Before we build our network, we need to decide what IP addresses we will use. This decision has been partially determined for us by the governing body of the Internet (ICANN, at www.icann.org). In the early days of the Internet, developers realized that they needed documents to describe how the Internet was to function. This documentation is known as a request for comments (RFC). Currently, there are thousands of RFCs related to TCP/IP and the Internet. A good reference concerning RFCs is www.rfc-editor.org. One particularly helpful document is RFC 1918, which defines IP addresses for "private networks." This document sets aside three "blocks" of IP addresses solely for private networks – available IP addresses that we can choose to use in our example network. Table 1 shows the blocks of private network IP addresses set aside by RFC 1918.

Block	IP address	Subnet mask	Number of addresses
Class A	10.0.0.0 - 10.255.255.255	255.0.0.0	16,777,214
Class B	172.16.0.0 - 172.31.255.255	255.240.0.0	1,048,574
Class C	192.168.0.0 - 192.168.255.255	255.255.0.0	65,534

Table 1. Blocks of private network IP addresses set aside by RFC 1918

Connecting a network properly to the Internet requires knowledge of what happens globally.

Note that the "number of addresses" field is the total number of addresses set aside by each block. The useable range of numbers for each IP block is 1 through 254 (e.g., 10.19.8.1 - 10.19.8.254). These are the addresses that may be assigned to the PCs and networking devices in our example network.

For the purpose of our example network, let's choose from the Class A addresses the block of 10.19.8.1-10.19.8.254, with a subnet mask of 255.255.255.0. You will notice that the subnet chosen for our local network is different than the subnet shown in the table above. By using the subnet mask 255.255.255.0, we are using a small number of the Class A IP addresses set aside by RFC 1918. Table 2 shows how we can further divide the IP address block we have chosen depending on the number of devices on the network.

As you can see from Table 2, we can change the number of addresses in a network by changing the subnet mask. Any subnet mask from 255.255.255.0 to 255.255.255.248 will work in our sample network. The subnet mask in a small company network using "private addresses" is not that important; most use 255.255.255.0. Subnet masks become much more critical when dealing with public networks like the Internet.

Assigning addresses

For purposes of our example network, let's assign our first IP address in the block 10.19.8.1 to the router. A router is a device that will connect our local (private) network to the Internet. The LAN side of the router will use the IP address 10.19.8.1; the IP address for the WAN side is obtained from and assigned by our Internet service provider (ISP).

It is important to note that private IP addresses are "unroutable," which means they cannot be projected onto the Internet. If you want computers on the LAN side of the router to be able to access the Internet, you will need to use a "translator" that provides the capability commonly known as network-address translation (NAT). Most routers have NAT built into them. The router's WAN address is a public IP address, which means that anyone on the Internet can access the router by typing in the IP address. The NAT built into the router allows each of our workstations to access

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IP addresses	Subnet mask	Number of IP addresses
10.19.8.0 - 10.19.8.255	255.255.255.0	254
10.19.8.0 - 10.19.8.127	255.255.255.128	126
10.19.8.0 - 10.19.8.63	255.255.255.192	62
10.19.8.0 - 10.19.8.31	255.255.255.224	30
10.19.8.0 - 10.19.8.15	255.255.255.240	14
10.19.8.0 - 10.19.8.7	255.255.255.248	6
10.19.8.0 - 10.19.8.3	255.255.255.252	2

Table 2. Further dividing the example IP address block according to the number of network devices

the Internet, but the actual IP address of any of the individual workstations is never projected onto the Internet. If you were looking from the Internet into our sample network, the activity of any of our individual workstations would appear as if it were the WAN address of the router (i.e., 208.148.144.73).

Table 3 shows the IP addresses we're assigning to the computers in our example network.

Notice in Table 3 that each of our network devices has a "gateway address." This gateway address must be present if the users are going to access anything outside of our local network. The gateway address tells a workstation to send all network traffic not bound for our local network to the router. For example, if you are at a workstation and attempt to go to www.cisco.com (IP address 198.133.219.25), the computer looks at the IP address, sees that it is not on the local network, and forwards it to the gateway. The router then looks at the address, sees that it is not on either of the router's networks, and forwards the packet to its gateway address, 208.148.144.1. This process continues over and over again until the packet reaches 198.133.219.25.

This should get you started building a small office network. In the next article, we will apply these TCP/IP settings to the Windows PCs and related router to make our network function. BE

Computer name	IP address	Subnet mask	Gateway addresses
Router	LAN - 10.19.8.1 WAN - 208.148.144.73	LAN - 255.255.255.0 WAN - 255.255.255.0	LAN - 208.148.144.1 WAN - 208.148.144.1
WKSTN01	10.19.8.11	255.255.255.0	10.19.8.1
WKSTN02	10.19.8.21	255.255.255.0	10.19.8.1
WKSTN03	10.19.8.31	255.255.255.0	10.19.8.1
WKSTN04	10.19.8.41	255.255.255.0	10.19.8.1
WKSTN05	10.19.8.51	255.255.255.0	10.19.8.1

Table 3. Assigning computer IP addresses in example network

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

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NFL Films' expansion

BY TOM KENNY

NFL Films offers a range of audio services, including music composition, scoring, editing, mixing, location recording, dialogue cleanup, sound effects, transfer, live recording, audio for DVD-video, record production, re-recording, and archiving for clients like HBO, ESPN, FOX, History Channel, A&E, and Sony Music. NFL Films is a busy place, and they don't just do football.

It's hard to imagine that before NFL Films' new complex was completed in July, these activities took place in a patchwork collection of 1986-style rooms.

In 1995, Jerry Mahler, vice president of audio, approached the executive team and explained that he needed another mix suite. It was evident that both video and audio were outgrowing their space. The only decision was whether to tack on or build anew.

In addition to football, NFL Films offers a wide range of audio services. Photos courtesy Russ Berger Design Group.

NFL films hired The Staubach Company for project management and feasibility studies. After the building team garnered League approval, they began scouting locations and viewing possible floor plans. Nobody on the team could have foreseen the complexity of the four-year project.

Groundbreaking took place in Mt. Laurel, NJ, in July 1999. As it stands today, the 200,000-square-foot NFL Films plaza consists of a technical wing and an administration wing, bridged by a two-story glass-and-steel connector. The Russ Berger Design Group (www.rbdg.com), which has enjoyed a 15-year relationship with NFL Films, designed the entire project, interior and exterior.

It was evident that both video and audio were outgrowing their space.

Video and audio each occupy a leg of a T-shape, and each is based around a central machine room. Because it is cheaper to build up than out, it was determined early on that all rooms that demanded isolation, including the online video edit suites (which have identical acoustic specs as the audio premix rooms), would be on the first floor. Anything else, including telecine and the massive UPS system, would be bumped upstairs. Surrounding the audio central machine room are 14 rooms, all of which are isolated and have windows and floating floors (save Studio D, the dubbing stage).

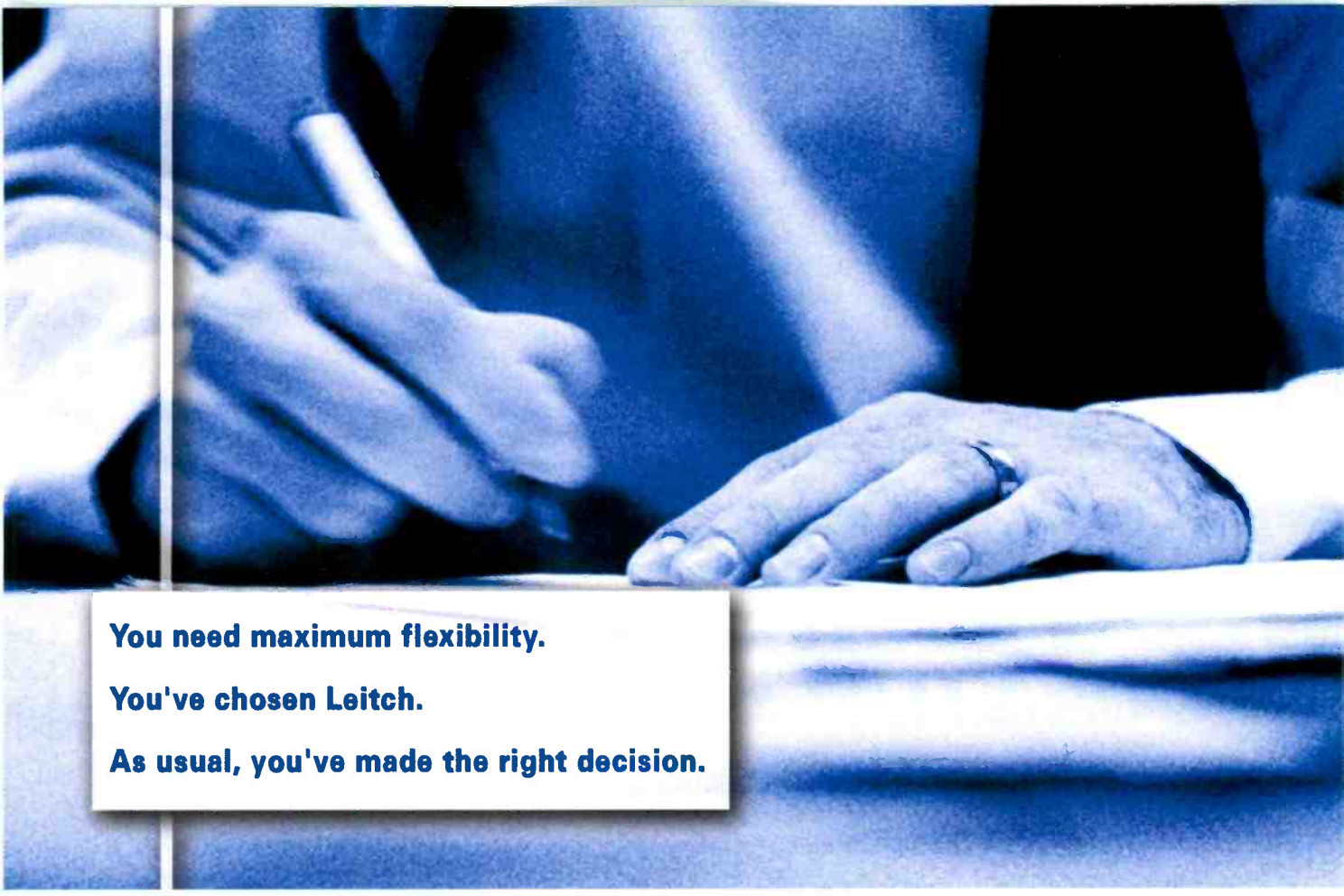
Wire management and CMR

Once NFL Films signed off on floor plans, construction began in earnest. Wire management was being developed as plans were being finalized. The only thing NFL Films knew at the beginning was that a central machine room was needed, if only for video laybacks. They wanted it soffited against the walls with a rear entrance for technicians. But after looking at the way they produce programs – where five rooms might be working on a project simultaneously and mixers might hop from an SSL Avant to a 9000 to an 8000 to a Sony DMX-R100 in the course of a single day – shared resources became paramount.

So NFL Films chose a central router consisting of an NVision NV3512 512×512 75Ω AES frame, an EnVoy 6128 128×128 serial digital video frame, an NV7256 256×256 time code frame and an NV3256 256-port serial control frame. All of the patch panels in all of the rooms are set up identically and mirror the CMR patchbay. In addition, the CMR houses a Fairlight Medialink server with just over half a terabyte of RAID 5 storage to accommodate 18 Fairlight QDCs and Audiobase, the library search system from mSoft.

The unique wiring scheme is essentially built around a system of pits, tubes and troughs. Six four-foot-deep pits were strategically placed to connect all 14 audio rooms, with access to the video wing across the hall. Through these pits runs a system of six 6-inch PVC pipes, which in turn lead into local machine rooms (all located in the hallways) and a series of troughs running into the rooms.

Floating floors were poured to flatness and tolerance levels that the contractors had never seen before, walls began going up and rooms were finalized. Meanwhile, an entire working facility was going full speed three miles away, and executives were trying to plan a piecemeal move that wouldn't interrupt their seasonal workflow. It was decided in summer 2001 to put all contractors into the administration building so the staff and producers could move in and leave post intact off-site. Later, all resources would be concentrated on the technical building.



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Then, last December, three months away from the move-in date, NFL Films took on the final stage of system integration – the off-site prep work was handled by The Systems Group.

Starting after the Super Bowl last January, the NFL Films audio staff began the wiring and cable pulling. First to go in was the CMR. It was to be followed by Studio A because that was all new equipment. But because of the need to get the previous season's highlight reels finished, plans flip-flopped and it was decided that the two premix rooms, two transfer rooms and four music editing suites needed to be up and running. Mixing would stay at the old facility. This meant no vacations for the crew. The advantage? The engineers knew every wire in the building.

The NFL Films control room pulls triple duty on tracking, mixing and re-recording dates.

Studio A

What was supposed to be the first room up, Studio A, turned out to be the final piece of the puzzle. With all due respect to Studio D, the theatrical-style, multiformat, SSL Avant-equipped re-recording room, Studio A is the crown jewel of NFL Films. Five custom-designed mic panels make for smooth and quick setup. And the sound of the space, while still being experimented with, is accurate and true.

Inside the control room, which must pull triple duty on tracking, mixing and re-recording dates, sits an 80-in SSL 9000 J Series console with an NFL Films custom scoring panel. There are 72 channels of Fairlight QDC, 64 channels of Pro Tools, a Studer analog 24-track and DLP projection with source switching among multiple video formats. Monitoring is through PMC BB5 mains powered by Bryston 7B and 4B amps. NFL Films had made the switch to Bryston power about eight years back. The PMCs are new, and either BB5s or IB1s now sit in all rooms, with the smaller speakers and the video displays on monitor lifts.

This discussion doesn't even include the video end of the operation, which dwarfs the audio side and includes a modern film lab, six telecine bays and a 60-seat Avid plant on a Unity server with 7TB of storage. BE

Tom Kenny is the editor of Mix *magazine.*

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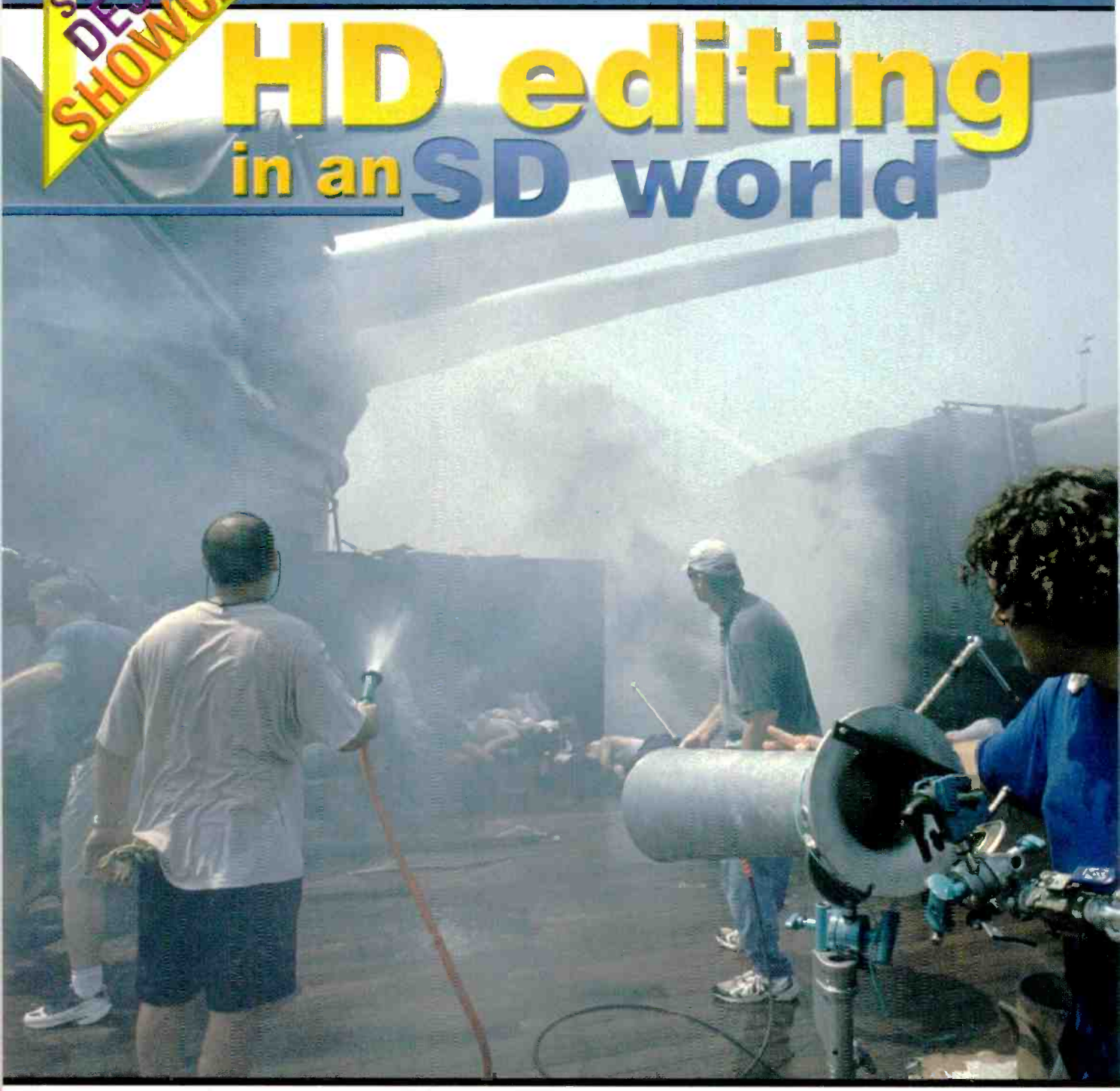
SYSTEMS DESIGN SHOWCASE

HD editing in an SD world

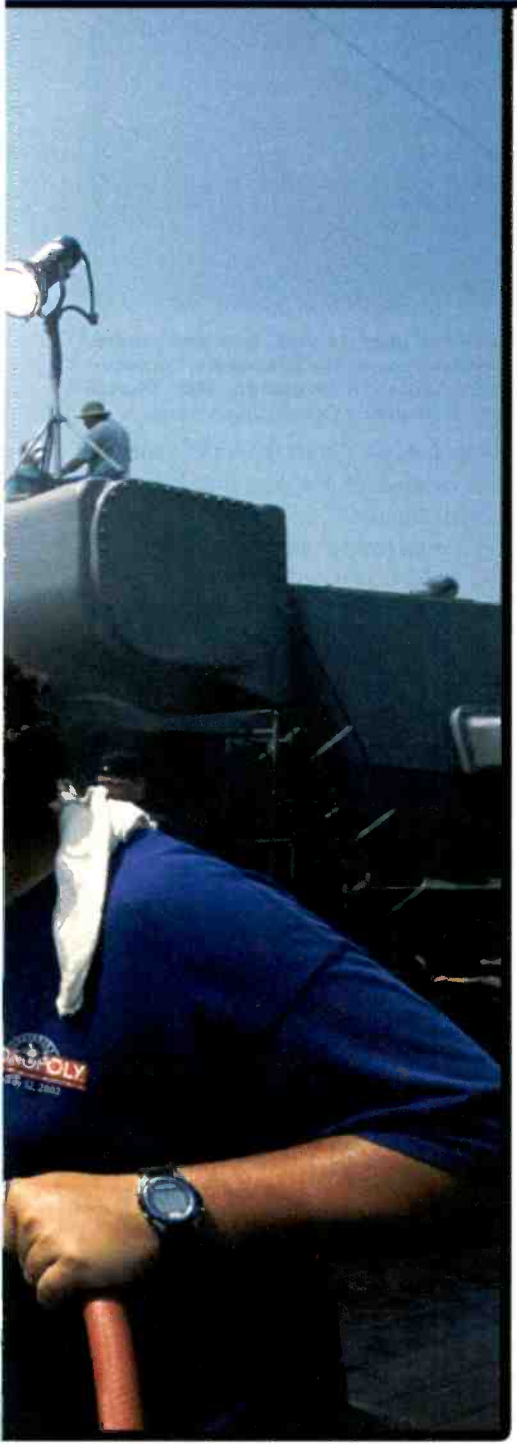


BY ERIC WENOCUR

Since the launch of the Discovery HD Theater network in June of 2002, Discovery Communications has begun to edit, mix and create high-definition programming at their technical center in Bethesda, MD. One of the first steps in preparing to process HD shows was design of their first HD nonlinear edit suite. The chosen platform was the Avid|DS HD. Aside from its own particular interface and operational quirks, and the massive amount of storage required, the DS is quite similar to other Avid products, so this article will focus on how it was integrated into an edit system that can accommodate both high-definition and standard-definition editing, and an assortment of complex audio requirements.

General suite applications

It was decided during the design phase that this edit suite should be able to function in three distinct modes:



This crew was on location shooting "James Cameron's Expedition: Bismarck" in high definition for the Discovery Channel.

1) Edit programs in standard definition with normal stereo soundtrack; output to Digital Betacam.

2) Edit new programs in high definition, with audio elements in place but not a final mix (mix to be done in audio post); output video to HDCAM master, audio tracks transferred via OMF or other means.

3) Modify existing HD programs, including 5.1 surround soundtracks (audio not changed); output to HDCAM master with 5.1 soundtrack encoded in Dolby E on two channels, plus stereo soundtrack on two channels.

Incoming material would be delivered on HDCAM (Discovery house format), D5 HD (some older programs), Digital Betacam (SD programs), DA-88 (audio stems for SD programs or 5.1 surround mixes), DAT and other miscellaneous formats.

Audio, in particular, would be quirky due to the requirements of bringing as many as eight tracks into the Avid|DS, from all the above formats, in a plant with a primarily analog audio infrastructure. In this case, it was decided to handle audio for SD production as embedded AES (which was already in use for 10 other nonlinear rooms) and to handle audio from DA-88 or DAT as analog into the suite mixer. Audio tracks from HDCAM or D5 tapes could be brought into the mixer as discrete AES.

Video strategy and signal path

The video portion of this system is surprisingly simple, and comparable to most nonlinear systems using serial component digital (SDI) signals. The Avid|DS has separate inputs and outputs for SD (SMPTE 259) and HD (SMPTE 292) signals, and a single input for reference. Since the DS was being integrated into a small HD "island," which includes VTRs and patching, signal paths were provided for SD and HD in and out of the Avid and to the monitors in the suite.

A video distribution amp supplies reference to all system devices. The input to this DA is patchable, which allows the system to be locked to various sync rates. The standard reference signal is NTSC blackburst, which is accepted by the Avid and other devices for editing in most 59.94 frame rate formats. (Discovery's house format is 1080/59i.) Also patchable is tri-level sync in 1080/23.98p and 24p flavors for editing in these formats.

Video monitoring in the edit suite is via a Videotek VTM-420SD/HD "rasterizing scope" (which displays waveform and metering on a standard SVGA computer display) and a Sony BVM monitor. The VTM unit has two SDI inputs, which auto-detect both SD and HD signals and change the display accordingly. The design intent was to give the editor a monitor input (and corresponding patch) to see an incoming VTR, and another to see the Avid. Although the Sony monitor has separate input cards for SD and HD signals, the Videotek has only two discrete, nonlooping inputs, so there could be only two patches to feed both devices. The simple approach appeared to be taking the feed from a patchpoint, passing (active loop) through the BVM HD card, then the SD card, then terminating at the VTM. Unfortunately, this proved not to be feasible because the Sony HD card would not pass SD signals, and vice versa. The problem was solved with some HD DAs from AJA Video, which will pass anything from 270Mb on up. So, each of the two monitoring patches was split with a DA and fed to the VTM and both types of BVM inputs. The BVM is programmed with two operator "channels" for SD and two for HD,

AES audio passes between the patchbays and the Avid via a Yamaha 01V mixer. A Martinsound MultiMAX was added to the suite to give editors a wide range of monitoring options. Photo by John Spaulding, Discovery Communications.

corresponding to whatever is plugged into the two patch-points.

Operationally, the editor must patch reference to the suite (or leave the normalled black) and patch the desired VTR into the Avid and the "A" monitor patch (the Avid output is normalled to the "B" monitor patch). The VTM is programmed with several presets that associate a video input (A or B) with the necessary audio to be metered (see below).

The Avid|DS HD suite is used to edit, mix and create high-definition programming at the Discovery Communications' technical center in Bethesda, MD. Photo by John Spaulding, Discovery Communications.

Audio strategy and signal path

The audio portion of this system is where things really get fun! Even though the room would not be creating "finished" surround audio, it was felt that the editor should always be able to listen to a mix in context – meaning stereo or surround – while editing the picture. It was also necessary to give the editor some control over audio going into (digitizing) and out of the Avid for building tracks or working on an SD project. This combination proved to be exceedingly difficult to accommodate with a modest-sized digital mixer and eventually required the addition of a "surround monitoring processor" to help manage all the options.

First, a very quick primer on surround audio. For the purposes of Discovery's HD Theater, the concern is only with surround in the Dolby Digital 5.1 format (also known as AC3 when encoded for consumer delivery). Dolby Digital specifies channels for left, right, center, low-frequency effects (LFE) and stereo surrounds. It also specifies a library of metadata information that can be carried with the audio stream and used to control functions in the viewer's home decoder. Typically, the audio mix is created in a conventional audio post room with the metadata added during this process, and then the final result is dubbed onto a pair of VTR channels using Dolby-E encoding (Dolby's format for "transport" of up to eight AES channels in a single AES pair). At the transmission end, the Dolby-E tracks are decoded back to discrete 5.1 and then re-encoded into AC3 for the consumer. The metadata is passed along in the AC3 stream and is used by the decoder at home. (Extensive information on all these topics is available on the Dolby Web site, www.dolby.com.)

In the Avid|DS suite, AES audio passes between the patchbays and the Avid via a Yamaha 01V mixer (many of which were already used in the facility). The 01V, with an optional card, can handle eight channels of AES input and output, plus 16 analog inputs, and has 10 internal buses for routing. This arrangement was sufficient to handle four channels of AES from patch to Avid (digitize), and four channels from Avid back to patch (output), and leave a pair of buses for monitoring stereo – which was fine for editing in SD. However, it would be impossible to also monitor six channels of surround audio since only two buses were available. In addition, there would be situations where it was desired to pass eight channels of audio from the Avid into the Dolby-E encoder and, again, this would preclude the ability to monitor in surround.

Compromise was needed. It was decided to limit some mixer functionality in certain cases and to add a Martinsound MultiMAX monitor processor. The MultiMAX provides a variety of "wide" (eight-channel) and stereo inputs that can be selected and routed to various multichannel speaker systems. Although it does not handle Dolby Digital metadata, it does provide the ability to audition a 5.1 mix "downmixed" to stereo or mono. It also provides speaker mute and solos, volume control and dim, thus becoming the clearinghouse for all listening audio in the room.

It was also important to keep an already complicated system as operator-friendly as possible. One way to help was to avoid changing the function of mixer faders whenever possible. Therefore, the first four mixer channels were designated as "From the VTR" (either AES or analog), the next four became "From the Avid" (AES), and the last eight were fixed as analog returns from the Avid used solely to feed the MultiMAX. By carefully arranging which buses fed where (and writing seven mixer scene presets), it was possible to handle all required functions with a minimum of variation or need for the editor to fuss with the mixer.

Once the room was put into operation it took several days to try various types of projects and debug the workflow process. Feedback from the editors suggested a few improvements to the original design, but it basically works the way it was intended. No question, though, it's complicated.

In another scenario it might be valuable to have a larger digital mixer in the system. However, this would probably not eliminate the need for a device like the MultiMAX for monitoring; the beauty of which is that it clearly delineates the available listening sources and makes it easy to verify that tracks have the correct content (such as by auditioning individual speakers). Unfortunately, there is no way to make working in HD much easier overall. And it is only going to get more complicated as HD becomes more mainstream, which will increasingly require engineers to find novel ways of solving peculiar problems! BE

Eric Wenocur is the owner/principal of Lab Tech Systems, a technical consulting and systems design company in the Washington, DC, area.

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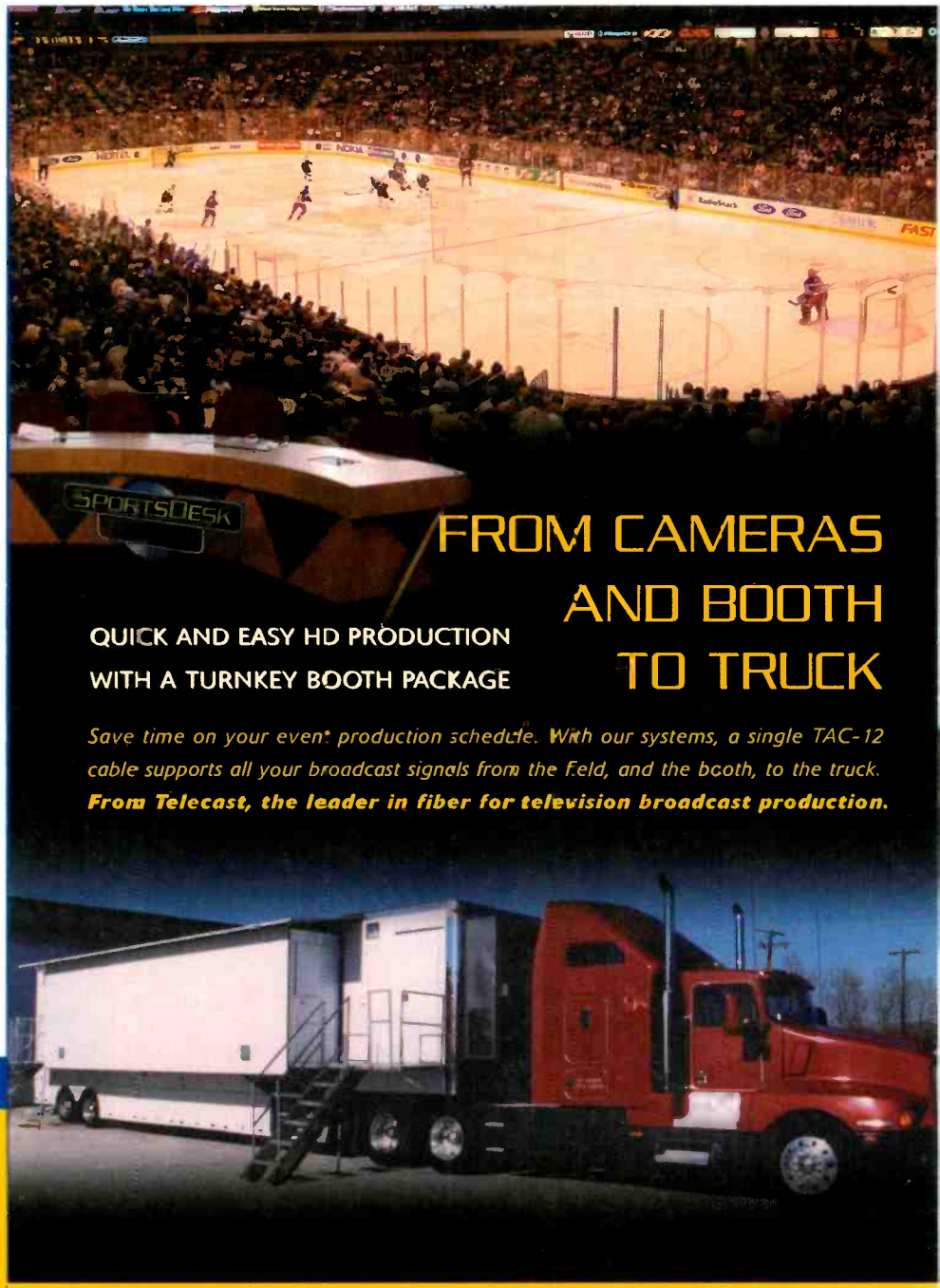

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Keeping the lights on

BY DON MARKLEY

During these winter months, especially with the dreaded onset of El Nino, storms have been causing enormous power outages in many areas of the country. No area is totally safe from power failures; even some of the most sophisticated transmitter sites are vulnerable. Therefore, standby power plants and power line filtering are highly recommended if not totally necessary.

The only exception known to the author is the Sears Building in Chicago. Two transmission lines coming in from two separate power plants feed a substation in the basement of the building. The building electrical system consists of multiple risers going up to the mechanical floors, where all the risers are connected in parallel. Failure of a riser simply causes fuses or breakers to trip, isolating the failed riser from the rest of the system. All loads can be accommodated, even with the failure of more than one riser. In the 30 years that this system has been in operation, no broadcaster has ever lost primary power. However, based on the cost of airtime in Chicago, that isn't enough. At least three of the stations still have standby power plants.

The advent of battery-powered uninterruptible power supplies at reasonable cost has solved the problem of short-term power failures for computers. This same technology has been applied at numerous locations in many stations to keep critical components online and ready for use when primary power returns. This avoids the reboots and loss of data or setups that can occur during momentary power failures.

High-power IOTs are best served by a smooth, uninterrupted source of high voltage power.

The same technology is applicable for the high-power end of things. The transmitting plant, while growing more efficient, has become even touchier about glitches in the primary power and, in obvious course, in the high voltage power supply. In other words, high-power IOTs are best served by a smooth, uninterrupted source of high voltage power. The concern here isn't only the situation where the power goes off for hours or days. That is a stable situation and not nearly as hard on transmitters as when the power is broken momentarily by lightning storms or glitches on the power line. A large UPS system will smoothly cover those short breaks and, when incorporated into a total system with a standby generator, will keep operations running smoothly when longer-term failures occur.

While it's hard to believe, five seconds is a long time for today's crop of standby generators. In critical applications, generators that are up to speed at all times can actually pick up the load in a few cycles, far less than several seconds. Such systems are far more than is needed or realistic for a broadcast plant with a UPS. Modern battery UPS systems will normally handle the full load of a transmitter plant for a minute or more, which is far more time than needed. Picking the right UPS is not a simple matter, and is beyond the scope of a simple article. The proper way to handle that problem is to work with a local dealer's engineering department or that of the manufacturer to select just the right

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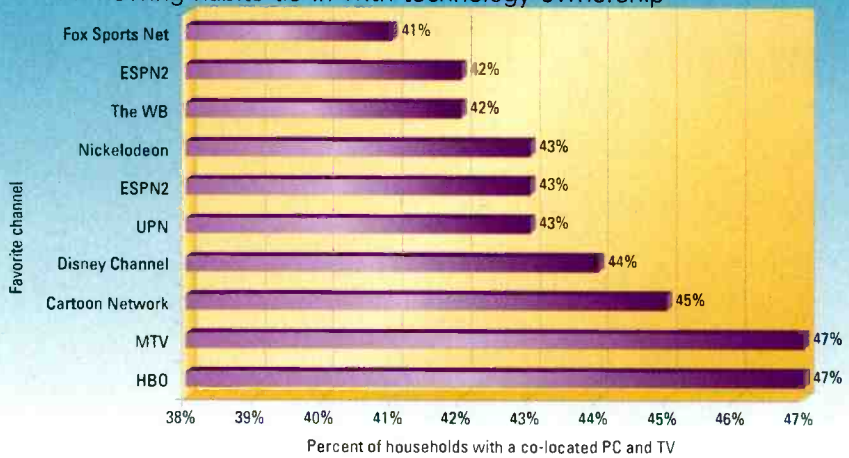

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Remember, IOT transmitters do have some unusual requirements. The crowbar circuit takes the high voltage power supply to ground to stop sensed arcs in the tube. That places an enormous load on the power supply, albeit for only a very small part of a second. Some UPS systems will handle this short-term load when properly set up by the manufacturer. The solution to the problem is simply to switch the load back to the power line for the period of the high current demand. When the current drops back to within limits, the load is again picked up by the UPS. Again, the UPS manufacturers are aware of this problem and can adjust their systems accordingly.

A great source of information on UPS systems can be found at www.powerware.com, through the Powerware three-phase UPS Engineering CD. While obviously weighted slightly toward their own products, the CD has an enormous amount of information about how the big UPS systems work and the pitfalls inherent in their use. It also shows how to select the right system and integrate it into a complete system.

So far, we've only discussed battery-operated UPS systems. Another option is an old technology that has been modernized and is now becoming popular again – a flywheel-operated UPS system. Large systems of that type were successfully used, primarily in Europe, over 40 years ago. Updated versions of these systems are currently available and offer some real advantages over battery systems, although with accompanying drawbacks.

For information on such systems, look at www.caterpillar.com. Under their products, standby power plants and UPS systems can both be found. There is a significant amount of information concerning the UPS systems as well as specification sheets on all available models and sample specifications for bid. Those specifications really tell a lot about just how the system works.

First, to the author's dismay, the flywheel isn't some giant thing

Flywheel UPS generators provide an alternative to battery-powered backups. This flywheel from Caterpillar features a 700lb. flywheel that turns at 7700 rpm.

threatening to destroy the transmitter site in case of failure. A reasonably sized UPS requires from 10 to 15 square feet of floor space – about the size of a large FM transmitter. Remember, that is everything for the UPS – motor, flywheel and generator – along with monitoring and control systems. The efficiency of these systems is well above 90 percent. The one drawback is that they can normally provide full rated power for about 15 seconds, although there are systems that will extend that to as much as 26 seconds. While this doesn't sound like very long, a modern standby generator is quite happy with five seconds or so, as was previously discussed.

Now, about that flywheel. The Caterpillar systems use a flywheel that is enclosed in a chamber that is evacuated. In that vacuum, the weight of the flywheel itself is 80 percent supported by a magnetic system, greatly reducing the problem of bearing wear and the associated reduction in system efficiency caused by bearing friction. Obviously, a magnetic suspension system is relatively friction-free. The only friction is in the bearings still needed to support the remainder of the weight and to keep everything in alignment. Oh yes, the flywheel operates horizontally, as opposed to some of the old systems that had a big vertical flywheel.

Despite having the disadvantage of a shorter period during which full power can be delivered, the system offers the real advantage of eliminating batteries with their associated mess. The high current demand of a crowbar trip is handled the same way as in the battery UPS – the load is simply switched back to the primary source for the few milliseconds that the unusual load exists.

The idea of Caterpillar making a flywheel system of this type conjures up a vision of a D-6 bulldozer revolving at a high rate of speed. Not so – the system is small and has full monitoring to allow the operator to keep track of its health. It is really intended to be incorporated into a complete standby power plant with an automatically synchronizing generator and automatic changeover switches. Again, this unit must be installed with a total bypass switch to take it out of the system for service or in case of failure. The front office would not be pleased if the station were to go down not because of power failure, but because the standby system blocked primary power from use. BE

Don Markley is president of D.L. Markley and Associates, Peoria, IL.

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BY JIM BOSTON

Initially, HD trucks were hybrid units, with most cameras and VTRs producing HD, but with other sources, namely graphics devices, outputting SD that was upconverted to HD. At the output of the truck, an HD-to-SD conversion was required for the main backhaul to the network or station. Another early drag on HD production was that most early HD-SDI equipment worked in only one HD format – 1080i, which meant that networks not using that format had to make an additional conversion.

To limit the amount of upconversion, early HD trucks used a dual-path approach. This used to consist of two trucks parked next to one another, with one truck producing the SD program and the other the HD counterpart. This was the case three years ago when Panasonic provided the HD version of "Monday Night Football," and ABC provided the SD version with what is now NMT's DX-10 unit. Separate sources and crews produced two separate and independent shows.

The next step in the evolution was to share sources. Most HD cameras produce HD and SD outputs, so the HD outputs fed the HD infrastructure while the SD outputs were sent to the SD truck. Graphics were generally SD, so they were sent from the SD truck to upconverters in the HD truck. That way, no downconversion had to be done at the output of the HD truck.

From there, dual-path production moved to a single audio infrastructure between the two trucks, with a single technical director (TD) controlling HD and SD switchers for both trucks from a single control panel (see Figure 1). Until a few years ago, a switcher's control panel was tightly married to its processing frame, and it took some heroics to get one panel to control multiple frames. Today many high-end switcher control panels control their corresponding processors via LAN connections, and a single TD can switch the HD and SD programs from a single control panel in one of the trucks. Inversely, multiple control panels can control a single switching frame. As switching matrices continue to get larger and more powerful, a single acquisition and distribution infrastructure might allow a central processing truck to handle the production capabilities of multiple productions at a single venue. In the future, a central infrastructure truck with only a control panel could command a number of trucks possessing only production capabilities.

In early switchers, effects buses cascaded from one bank to the next. By contrast, effects banks in today's switchers are in parallel and able to work independently of or in concert with other banks. The switcher serves as a bank of resources that can be commandeered by a single user, or allocated to multiple users.

Early adopters such as NMT built trucks that had HD infrastructures at their core with complete, separate SD infrastructures. In the HD show, SD sources were upconverted as necessary.

Core Digital Technologies/SWTV introduced another dual-path approach, with separate switcher processors for HD and SD in the same truck under control of a single TD. SD sources are upconverted for the HD switcher processor, and HD sources undergo downconversion for the SD side.

Another important development by equipment vendors that might make HD production ubiquitous is the ability of new equipment to produce multiple HD formats. Devices like routers can work in either 720p/60 or 1080i/30, and now sources and processing devices such as cameras and switchers are available that can be switched between the two formats. Because Disney/ABC/ESPN are entrenched in the 720p camp, and CBS and NBC in the 1080i camp, devices that work in both have made investing in an HD truck a bit more palatable.

Many new HD trucks will also use the Thomson LDK-6000 camera, which provides 720p and 1080i native formats through many sensors in its CCD array. The camera's CCD array has 9.2 million cells arrayed 1920 H by 4320 V. With massive oversampling, this allows for two sets of subsampling outputs to derive the desired HD format. The cells are grouped together to create pixels of the size needed for the chosen format. For instance, in the case of 1080i operation, four cells are grouped together vertically

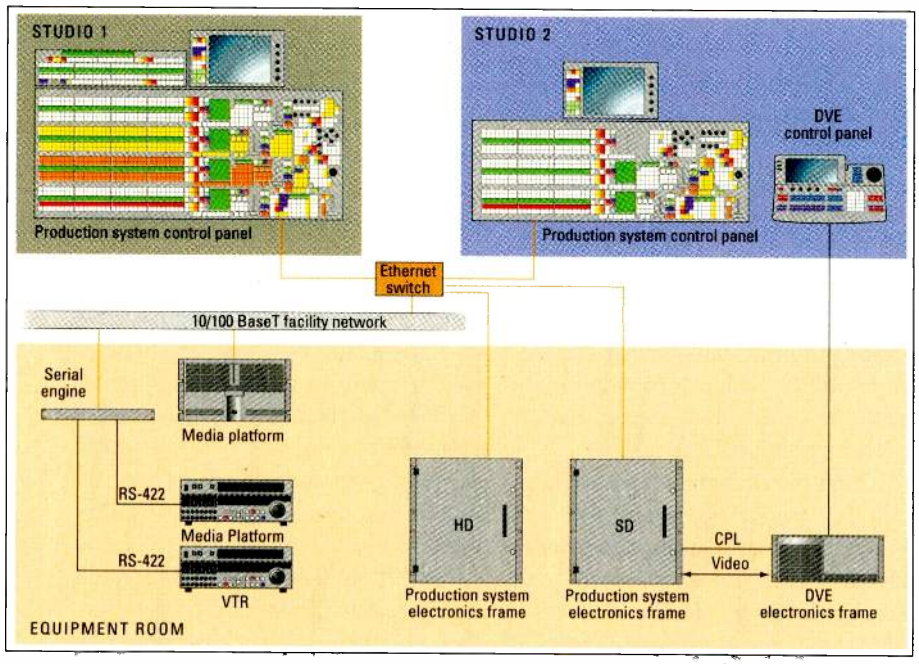

Figure 1. Today's switchers use LAN connections, making it possible not only for one control panel to control two processors, but also for multiple control panels to control the same processor. Image courtesy Thomson Grass Valley.

(4320/4) to create 1080 individual vertical lines. These elastic horizontal/vertical pixels provide the proper horizontal resolution in either mode. This approach also allows for the same lenses to be used in all operating modes.

The CG is another device that will one day facilitate a single-truck solution with multiple deliverable streams. Besides resolution, the obvious difference between HD and most SD is the aspect ratio. Graphics used in 16:9 vs. 4:3 usually have different composition and layout requirements. Typically, graphics are created for the SD show and then upconverted to HD, which usually means graphics are fattened up to fill the increased width of the 16:9 aspect ratio. Some CGs will output a core graphic specifically for each format. Most composite graphics today consist of individual objects that are put together only when the graphic is needed. This allows the elements of a graphic to be placed on the horizontal plane based on how wide the final picture will be.

A stopgap method of dealing with differing aspect ratios is a process called Dual-Layer by NEP. Thomson Grass Valley will implement this in the Kalypso production switcher by having M/E effects banks that operate in parallel with the exception of the key signal. In HD/SD production, the native source (HD or SD) could go through a DVE to position the graphics display for the non-native path. The Thomson HD 35 switcher has this capability also.

HD production is more complex both in live environments and in the post environment. Often a live cut of the show is recorded along with iso camera shots.

The weight of cable is often close to the truck's equipment weight.

Traditionally iso and the show cut recorded versions were synchronized via time code. With HD and all the accompanying processing that can occur, the propagation paths from source to various recording devices can vary. When this happens, the time code stamps for iso and main recordings are offset by the difference in paths.

At the Super Bowl last year, FOX unveiled what will likely also become the near-term solution for the 4:3/16:9 issue. They operate character generation and graphics systems in the16:9 mode, but frame the text for the 4:3 picture area, allowing them to provide graphic content that spans the 16:9 frame but leaves critical content in the 4:3 frame. This avoids the anamorphic distortion in the conversion from 4:3 to 16:9 or vice versa. It is highly likely that this is the approach that ESPN and ABC will adopt until technology catches up with production requirements.

The economics of HD

The multiformat capability of new equipment helps the economics of the HD truck business, but it's still not a business for the financially faint of heart. SD trucks can easily cost four million dollars, and HD trucks can range from 50 percent to 100 percent more than an SD truck of similar capability. Multiple-format HD equipment can put the cost of the HD truck closer to the high end of this range. HD trucks, even ones that do not go the dual-path route, still need SD layers – to make monitoring as economical as possible if nothing else. Design, construction and implementation of an HD vehicle are tougher, and thus more expensive, than an SD project.

Early HD trucks had other requirements over SD trucks. They consumed much more power – typically 50 percent to 100 percent more. Video bit rates for HD are more than five times higher than SD rates. Logic circuits therefore spend more time in transition states with HD bitstreams than with SD streams, increasing the amount of power required. Some early HD trucks drew upwards of 150kW. This higher power consumption meant more heat to cope with and necessitated much larger HVAC packages. However, newer HD

An HD camera with a Digi87 lens from Fujinon capturing action at the Army/Navy football game. Photo courtesy Core Digital Technologies/SWTV.

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The rear-screen projection wall in Core Digital Technologies/SWTV's HD601 remote unit

Weigh in

The engineering considerations of remote trucks are many. Full-service SD production trucks can easily push the 80,000 pounds bridge weight in this country, and HD trucks are heavier. Gear on an HD truck, especially a dual-path one, can top the scales at more than 15,000 pounds. The weight of cable is often close to the truck's equipment weight. To minimize this, mini coax is used wherever possible. This requires an engineering balancing act, as the mini coax limits path runs for HD signals between reclocking devices to a couple hundred feet. But the increased weight on an HD truck also requires that equipment be dispersed throughout the trailer so the weight doesn't end up over one axle. To help slim down the base weight of the HD trailer, which historically has been about half the overall unit weight, composite materials for flooring and walls, along with aluminum and even titanium ribbing, are often used for trailer construction.

Moving from SD production to HD requires a steep learning curve, even for seasoned veterans. The return on investment to be in the HD production business may still be in doubt. But the industry leaders understand that their clients have made a commitment to deliver DTV's full potential – including high-definition video and multichannel audio – and are stepping up to deliver the tools and expertise required. BE

Jim Boston is a West Coast consultant and the co-author of a book with George Hoover entitled Television on Wheels: The story of Remote Television Production, *due for release in February.*
The author would like to thank Jerry Gepner and Mark Brooks of NMT and George Hoover of NEP for their help with this article.

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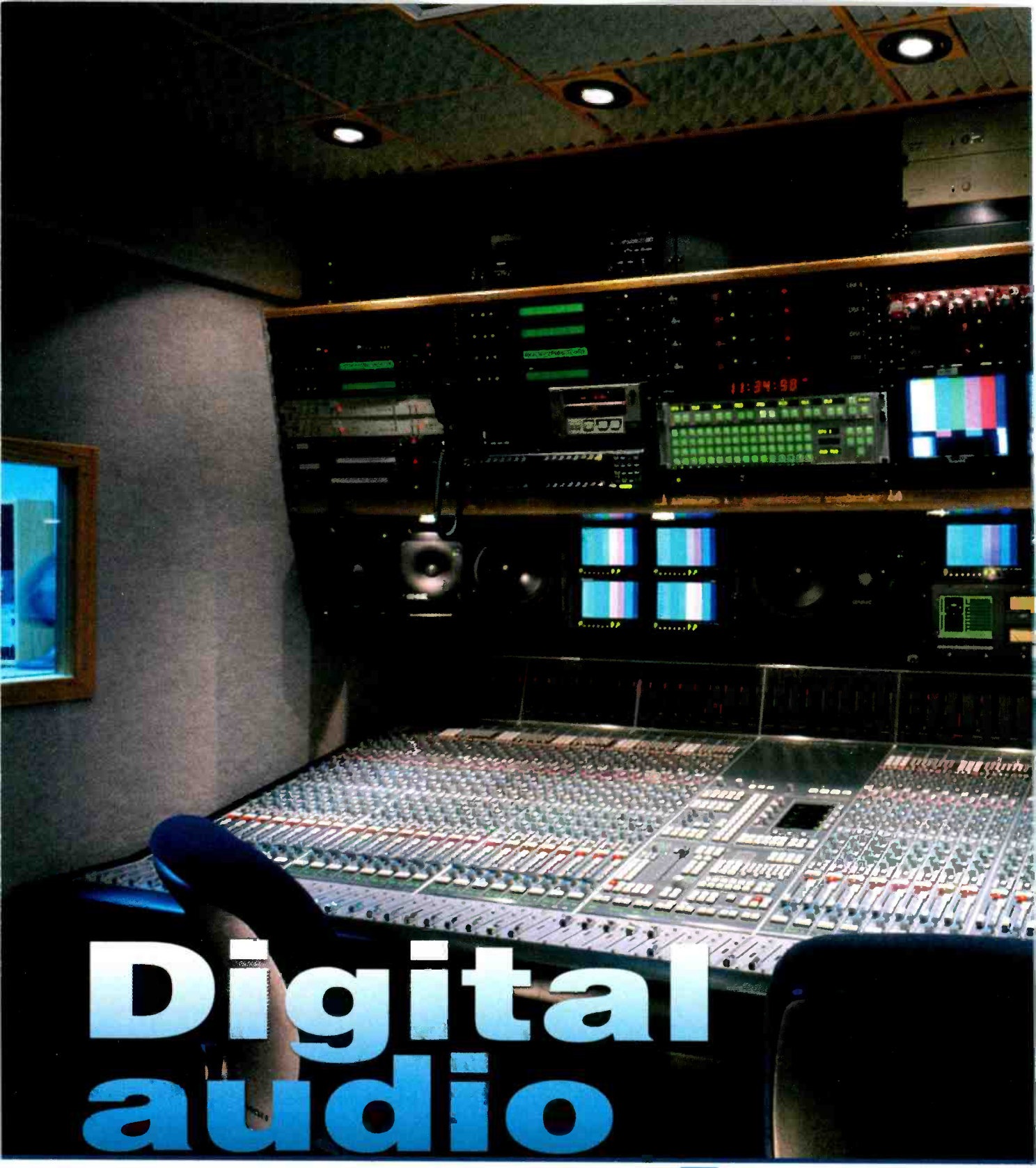


Digital audio consoles for mobile broadcasting

National Mobile Television's DX11 digital production truck uses the SSL MT digital broadcast console for FOX Sports NFL broadcasts in 5.1, Dolby Surround, stereo and mono.

BY STEVE ZARETSKY AND JOHN HERMAN

In years past, the major networks owned and operated their own fleet of trucks, mainly for live sports coverage. They designed, specified and built these trucks and manned them with network personnel. Fast-forward to 2002. Virtually no major network owns its own fleet of trucks today. The rapid development of new technologies, as well as the ever-changing shift in sports programming, has driven networks to contract out these events to independent remote broadcast companies that are better suited to respond to the changes in the market. The most important change has been the need for HD and surround audio for live events. This has created a tremendous growth in the number of mobile units operating in the U.S. market, and dramatic advances in the technology being used.

To meet these challenges and to support the demand for live HD programming, U.S. mobile broadcast companies are rapidly upgrading their equipment to offer digital and HD capabilities.

Digital advantages

Tightened budgets have squeezed the amount of time the mobile truck has to prepare at an event. Previously, there may have been two days for setup and rehearsal. Now, this time is often reduced to one day, with trucks arriving at the venue in the wee hours of the morning to hit the ground running as soon as they can gain access. In this situation, a digital audio console can save the day. Its ability to instantly reset and recall prior configurations speeds the setup process and allows the audio engineer more time to spend preparing and creatively improving the audio production. Digital consoles offer other benefits, including improved sound quality and signal processing, fiber-optic connection to remote-mic stage boxes for electrical isolation and interference-free transfer over long distances, and A/D conversion at the source to preserve the quality of the signal.

Although digital technology has not always provided the bulletproof reliability of analog systems, modern designs have overcome these challenges through intelligent use of redundancy, status monitoring, and schemes to replace or reset processing modules that suffer a problem. The result is impressive, with hundreds of digital mixing consoles working in on-air and live

Turner Studios' 53-foot production truck, Mobile Unit #TS1, uses Solid State Logic's Aysis Air Plus console.

applications without issue. Integration questions have also been answered with industry acceptance of such interconnection formats as MADI and AES for audio, and opto-isolated GPI circuits for signaling and switching.

There are many mobile units on the road today still using analog audio consoles and distribution equipment. The substantial benefits of today's digital console technology, along with compliance with the emerging HDTV market, should make the analog/digital decision easy for any company considering a console upgrade or a new truck construction project.

Size and weight

Size and weight are two limiting factors more applicable to trucks than other broadcast installations, as trucks tend to be built in a few fixed configurations, and every extra pound brings the truck closer to that expensive additional axle. With a large amount of video and satellite-communications equipment housed within the truck, the space and weight budgets for all the audio equipment are often tight. However, digital equipment tends to be relatively light and compact when compared to equivalent analog systems – mainly due to the reduction of internal and external wiring – so it is possible to outfit a more capable audio production area with digital equipment while remaining within budget.

Today's top mobile trucks need to be able to accept a huge number of audio sources, mix them to a variety of buses – sometimes in multiple formats – for simultaneous broadcast and recording, and generate the cue and communications feeds required for the sports and entertainment events they cover. In any live-production environment, two aspects of this process are vitally important: visual feedback and quick access to critical controls. To keep track of so many signals, the audio engineer needs to be able to quickly scan the console and see exactly which mic pre is a little hot, or check that the signal is present from a mic about to be called into play. If the control of those signals is buried in endless and confusing menus or levels of assignability, it is much more difficult for the audio engineer to perform effectively.

In any live-production environment, two aspects of this process are vitally important: visual feedback and quick access to critical controls.

Redundancy

In digital systems, there are three basic points of failure: loss of power, software error and hardware failure. To prevent any of these failures, or at least mitigate their effects, contemporary products provide several backup solutions. To protect against power-supply failure, some consoles use dual redundant power supplies that are fed from different sources (often including a UPS system).

Some consoles have software options that can maximize reliability. Some provide low-level diagnostics to constantly monitor the operation of all software routines and handle any errors in the least disruptive way possible. Some also offer control systems that are independent from the audio processing for interruption-free reset.

Consoles that offer hardware redundancy or the ability to quickly swap out components with minimum interference to the operation of the console score highly. Those that are well-engineered and use high-quality parts can also prevent simple faults like intermittent connector contacts. Obviously, this is important for mobile installations because they are bound to experience frequent vibration.

Nevertheless, it would be unwise to ignore the possibility of a catastrophic failure, and it would be wise to investigate a console's "worst-case scenario" performance specifications. Ideally, a console would recover in seconds to the exact state it was in when the fatal fault occurred. In reality, returning the console to its fully recovered state may take longer than headline figures suggest due to configuration variables or other conditions unique to that installation. With that said, today's digital console technology is no longer on the "bleeding edge," and carefully designed and well-supported systems are very capable of trouble-free operation.

I/O — stage boxes, signaling and foldback

Unless a mobile truck is used to provide cover for a studio installation that happens to be off-air (eg., for rebuild/upgrade), it almost never has the luxury of using installed tie lines at the venue. Instead, the truck crew must collect all the audio sources, preferably as close to their point of

Core Digital Technologies/SWTV's expandable Sundance truck sports a 96-channel SSL Aysis Air Mobile digital broadcast console.

A 192-input MT Production mobile digital console from Solid State Logic is installed in Corplex's 53-foot Expando flagship truck, Sterling.

origin as possible, and the truck must provide both signaling and cue/foldback lines. The obvious solution is to use a stage box that includes mic and line inputs, full remote control of their parameters from the console, plus a number of cue and GPI outputs. Fiber-optic connection is the best choice for this application. It provides complete electrical isolation between the truck and the acquisition area, it is lightweight, and can provide very long cable runs if necessary. Although the fibers themselves are fragile, armored military-spec cables and connectors are readily available to protect them. Ideally, systems should have automatic switching between redundant pairs to ensure continual operation if one leg is severed or (more likely) accidentally disconnected.

Due to the harsh environment in which these stage boxes are used, they should be robust, flight-case mountable and preferably light enough for one person to handle. The inputs and outputs should be immune to electromagnetic interference, and they should be tolerant of AC and DC voltages applied in error or through external equipment failure.

A status display on each stage box would be an additional benefit. This would allow the operator to check or alter settings, and would offer a local listen point for confidence monitoring of any audio input or output. GPIs allow signaling to and from the truck, and may be useful in triggering lamps or other indicators at both ends of the fiber connection. For entertainment events (eg., rock concerts) it may be advantageous to use a stage box with a high quality mic split output that can send a buffered pre-gain feed from each mic to other consoles while avoiding the degrading effect of passive transformer splitters.

Processing

Increasingly, mobile trucks are beginning to adopt audio mixing techniques more akin to long-form TV post. Several multichannel stems are derived from the console to allow music and effects (M+E) mixes for distribution to multiple broadcasters and to provide 5.1, stereo and mono outputs of each bus for local destinations and other needs.

To achieve this, the console must provide flexible internal routing, normally with 48 utility buses to create the stems, eight intermediate audio subgroups and possibly two final program outputs. In fact, dealing with complex shows in a small area is one reason that in-line analog consoles were so popular in trucks in the past. Adopting digital control surfaces has saved quite a bit of space because the control-surface size no longer represents the total channel count of the console. However, depending on the console design, the audio engineer might require a greater familiarity with the console to make the most efficient use of its capabilities.

Monitoring

The interest in 5.1 surround sound has multiplied the demands on the operator monitoring the output of the console. A show that's being output in 5.1 will also certainly have stereo and mono feeds from the console as well. A console must be flexible and capable of providing the engineer with the option of selecting a variety of types of monitor quickly and easily. Also, with the development of "metadata" systems and other forms of data encoding, it is useful to have flexible monitoring insert points to allow the operator to switch various processing devices in and out of the monitoring chain. This facilitates confidence checking the truck output over the full range of potential audio formats.

Operator essentials

The investment in the truck's equipment returns its maximum value only when used by a crew that is capable of extracting the most from it. The truck's audio console operator is often a freelance specialist. The pressures of the role demand that the operator regard the console as the means to the end, rather than another obstacle to tackle, so the console must be immediately familiar and intuitive. A console also reveals its value if the operator has a knowledgeable and qualified support team he can turn to when he needs help. This element is often overlooked, but it's as essential as the features of the console itself.

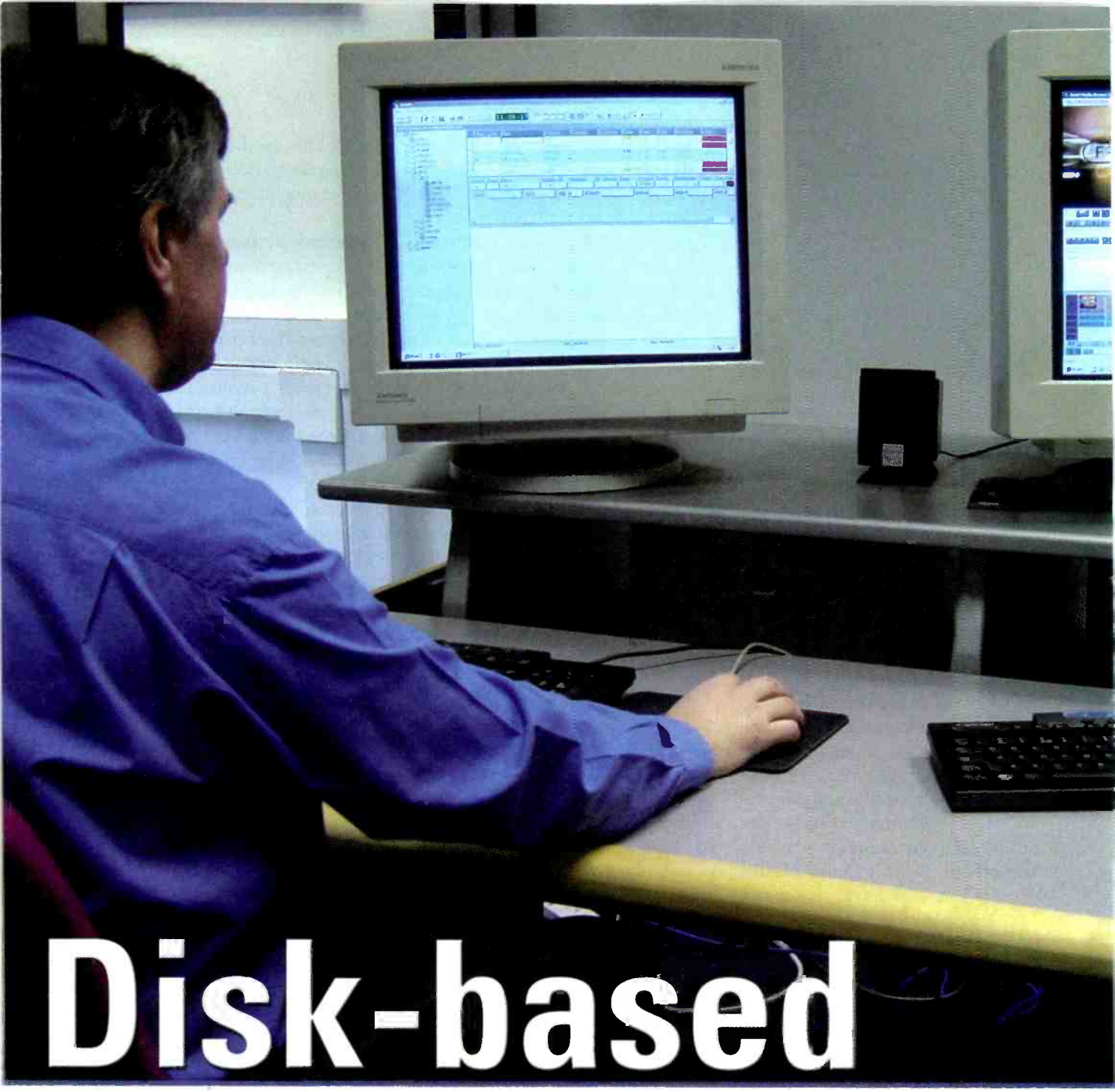
The future is now

While there is no substitute for a front-row seat at a concert or box seats behind the home team's dugout, there is no question that technical advances in recent years have brought the home viewer a lot closer to that "you are there" experience.

Record-breaking sales of DVD players have sparked home-theater system sales, as consumers look to recreate the movie-theater experience at home. A CEA survey of DTV purchasers said 87 percent watch their displays connected to home-theater audio systems. Even if your home-viewing setup isn't there yet, as an industry professional you still recognize that 5.1 surround sound is a major part of that experience.

This trend will continue as more broadcasters begin offering digital and high-definition programming. With the opportunity that digital broadcasting brings for multiple, specialized channels, being able to move the studio to the event becomes an increasingly attractive way to provide the content that these channels demand. BE

Steve Zaretsky is vice president of broadcast, and John Herman is a product specialist at Solid State Logic.



Disk-based news

BY BOB PANK

Digital technology has changed the landscape of news production. What started years ago with newsroom computer systems (NCS) giving a big helping hand to storing, writing and editing scripts has now expanded to all facets of operation. A second newsroom revolution, based around servers for video and audio, means newsroom systems can now be designed to meet a wide range of requirements. Today, news is big news. The ball is rolling, and we are in a period of rapid development that involves many manufacturers and vast software effort to supply newsmakers' needs.

News staff must produce several bul-

An operator uses Avid's Media Browse solution to control ingest at the company's new Pinewood Studios (UK) demonstration facility.

letins and put them to air daily, so workflow is vital. The lead into each bulletin is often a period of highly pressured work in which many staff members are each trying to put the finishing touches on their stories at the same time. Pushed by a constant flow of new stories and updates and pulled by competition, news seems to be on a ceaseless treadmill.

The thrust of today's newsroom technology is to improve workflow by providing reliable ways to meet many production needs – including speed, flexibility and lower costs. Given the pressures, improving workflow has been a difficult process that has led to some highly innovative and high-powered solutions.

Requirements

Modern technology makes efficient production processes possible. Certainly, the hectic scenes depicted in James L. Brooks' 1987 film "Broadcast News," with corridor dashes to deliver the tape for transmission, can now be consigned to the bulk eraser. Well, they could, but many news operations have yet to adopt the more modern technology. To a large extent, this refers to the "tapeless news" model in which media is stored on disks and transferred to the transmission area via wire.

However, "tapeless" is not an end in itself but a convenient method of providing more accessible storage that fits with today's technology. What really matters is achieving the desired requirements and workflow. The most significant changes are in the production of stories rather than what takes place in the anchor's studio. For news stories, certain fundamentals are set in concrete: the need for a camera and microphone to shoot the scene, a method to carry the information to the newsroom system, and a way to edit and prepare the material for airplay. There are endless variations and additions to these fundamentals, such as scale, the degree of journalist involvement, graphics, captions, voiceovers, reviewing, versioning, repurposing for other media and archiving. As a result, no two newsrooms are the same, so system designers and custom software writers will continue to be in demand.

The wide choice of facilities and tools means it takes some thought for newsrooms to narrow down what their real needs are against what technology has to offer. For example, a current hot topic is the ability to make voiceovers at the journalists' desktop. However, one remarkably honest salesman faced with this request had to point out that, with eight such desktops all crowded into a "shoebox" office, the chance of getting sufficient quiet for recording the voiceover was unlikely.

Pragmatism rules, despite the technology. Indeed, the technology itself is becoming increasingly invisible: melting into the background as development continues toward more empowerment for journalists.

Newsroom systems are multi-user and necessarily complex. They achieve their various aims in different ways. They comprise a number of key elements, nearly always from different manufacturers, that are made to work together in ways that define workflow and system performance. Success depends not only on the power of the individual boxes, but equally on the degree to which they integrate.

Server technology

The major technical breakthrough that shapes today's news systems is the broadcast-quality video/audio server, which enables work sharing. Viewing, editing, reviewing and transmission playout can, in some cases, all take place within one server. But workflow differs according to scale and the technology used. Figure 1 shows the elements and the workflow in a small or regional newsroom.

Newsroom systems do not directly scale; they must change with size. For example, in small news operations with just a few journalists involved, it is economic to offer everyone access to the broadcast-quality material directly from the main server. Here, all journalists can view material and make edit decisions while craft editors can add finishing touches and refinements. The story is then ready for transmission, which, depending on the newsroom's specification, might also be run from the same server.

As scale increases, this model becomes prohibitively expensive. So, in a larger newsroom, the more numerous journalists are provided with browse-quality video, which is cheaper to store and distribute. This allows video/audio editing on the same desktop PCs that journalists al-

ready use for script editing. Such functionality requires a browse server and distribution system – typically 100 or 1000Mb/s Ethernet – as well as basic PC editing software. Fortunately, IT solutions can economically provide this functionality. Figure 2 shows the elements and the workflow in such a larger newsroom. But the whole plan depends on the browse and broadcast servers being in step so that the browse function perfectly cross-references to the broadcast material. As more material is ingested, edited and deleted, keeping track becomes increasingly complex. For some news systems, this is a familiar headache.

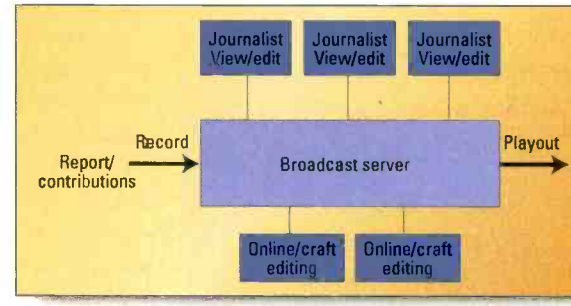


Figure 1. Newsroom workflow depends on the size of the operation. In a small or regional newsroom, it may make economic sense to offer everyone access to the broadcast-quality material directly from the main server.

A development from Quantel obviates this tracking requirement by putting both standards of material into one server operating under one database. In addition, this database can be expanded into any servers that are added to enlarge the system.

Editing

Generally, journalists can execute *cuts-only* editing at their desktops using browse video. *Craft editing*, (i.e., dissolves, DVE moves and more) is performed on a dedicated NLE workstation using broadcast-quality video from the server. One efficient form of craft editing is called *in-server editing* by Quantel or *edit-in-place* by Omneon. This process does not copy the material to the edit workstation from the server, but merely views it in the server and sets in and out points and the order of replay. The server then conforms the result. This model is even more attractive if the server is able to record and replay real-time material. In this case, it need only be recorded once to the server; the edited version can be replayed without further copying.

Note that the use of pure SAN-based storage, which is not able to offer real-time record and play, is bound to use at least a second server to connect with the video world. Using a second server has its attractions as it involves making a second copy of the material that can be used as a backup. But, if the edit server is able to replay real-time video, both it and the transmission server, often used as a dedicated output facility, can play simultaneously - thus offering a full on-air backup.

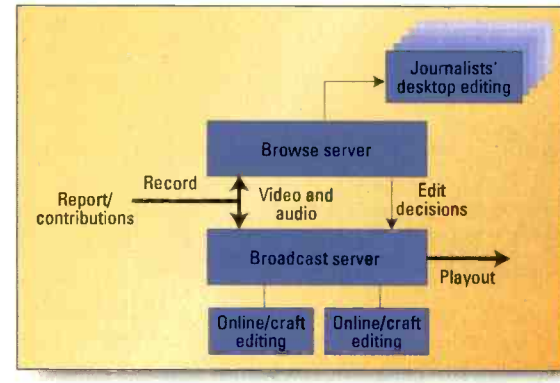


Figure 2. In larger newsrooms, it may not be economical to provide broadcast-quality content to everyone. These newsrooms may utilize browse-quality video for editing on journalists' desktop PCs.

The combination of in-server editing and real-time replay creates efficient support for the journalists' cuts-

only editing. The decisions made with the browse video can be conformed into the finished story and be ready immediately for transmission.

Another form of editing, referred to as the *content-transfer* model, depends on copying material from the ingest server to the editing store (which may be a shared SAN) acting as the store for an online NLE. When the work is complete, the finished result is copied to the transmission server. Clearly, this model lacks the sheer efficiency of in-server editing, but some prefer it nonetheless because, in making copies, they make the material more secure. It should be clear that there is no one-size-fits-all solution to newsroom technology.

Deletion

Deleting material on a server is bound to be a complicated process. Failure to take account of every user's needs may ruin work and result in on-air embarrassments – such as the dreaded on-air *black hole*.

These black holes are caused by deletion of server material that has been edited into a story. At first, this sounds careless. But considering that any one of many clients may have used the material, there is a considerable administrative process to go through to ensure that the material is truly no longer needed in the server. Manual solutions include employing a librarian to track usage and delete only the material that has no frames in use by anyone, or simply deleting only older material. Neither method is satisfactory or fully reliable.

One solution to this problem is to include in the server database an "in-use" tag for every frame used in any currently stored edit. If the server has direct access to every individual frame, then all unused frames can be deleted – even if others within a clip are still in use.

Automation 1

In the pressured world of news, any help is welcomed. Since modern newsrooms rely on digital technology, there is the opportunity to introduce any number of computer applications. For example, Avid supplies both NCSs and whole newsroom systems. They have delved deep into several areas – especially those relating to scripts. For example, on an Avid system, the simple act of pulling a script onto a timeline automatically measures out the

Newsroom systems do not directly scale; they must change with size.

amount of video required to run with the script.

Dremedia has taken this idea a step further. Its voice-recognition technology can make text from audio tracks, which has enabled a new automated way of finding material and cues. It becomes possible to search for words rather than relying on some other metadata inserted after the event. When hooked into a video server, this can instantly present the appropriate frames. In a similar way, it is also possible to take text processed from the audio and fit it to video.

Automation 2

Newsroom systems use many subsystems from various suppliers, and there is a need to tie these subsystems together to make the parts run as a whole. Automation systems, traditionally used to run on-air operations, are employed in a similar way for tapeless news, where demands vary according to the scale and technology employed – especially server technology. Actually, this is just the tip of the iceberg.

To implement the many and various operations required to run newsroom systems, operators need a whole array of server controls, checks and monitors. While some may base their system design on a selection of "best-of-breed" equipment, there is also considerable merit in going for combinations that are known to work well. IBIS has packaged some of its server applications into a single product. Its SprintTx product includes several server applications for such tasks as loading material (from scheduled contributions, tapes and live events, including sports), multichannel playout, cuts editing and management (including database management), search, and delete.

Integration

The newsroom market offers video servers, NCSs and subsystems of varying powers and sophistication, including highly developed disk-based technology. Tying together the numerous modules, applications and subsystems that comprise the disk-based newsroom is, perhaps, the biggest remaining challenge.

For integration to really work, there have to be open standards. One initiative from The Associated Press that has gained considerable ground is MOS protocol (www.mosprotocol.com). This is a communications protocol for NCS and production equipment aimed at enabling journalists to see, use and control a variety of devices from their

desktop computers, effectively giving them access to all their work from one screen. Such devices include video and audio servers and editors, still stores, character generators, and special-effects machines.

The future

Open standards and open systems are essential to the future success of newsroom systems. They will allow a greater degree of integration and make all controls available at the journalists' desktop. The more recent adoption of AAF, which carries both essence and metadata, has the potential to meaningfully assist in many areas, such as helping ingest, editing, playout and archive to work together. A significant step in this direction is Omneon's achievement of offering edit-in-place capability on an open system that can make use of ubiquitous software such as Final Cut Pro.

Much newsroom technology is IT-based. Systems comprise a large number of diverse applications and boxes working around the NCS and video servers. Some rationalization of this approach – bundling groups of related operations together and not having to rely on so much custom integration – should reduce complexity, improve "meaningful" integration and performance, and reduce overall costs. Examples are the IBIS SprinTx application package, and Quantel's sQServer with browse and broadcast video, frame-based database management and both networking and video connections.

Newsrooms will not always be dedicated only to television. As the multimedia world expands, the raw material that feeds television newsrooms is also appropriate for radio, the Web, mobile cell phones, in-car systems – wherever people want to pick it up. We can expect more applications to address these new trends. BE

Bob Pank is a television industry journalist and technical writer.

WLS-TV Chicago newsroom automation

BY KAL HASSAN

When we were looking for new automation technology for our newsroom, we decided early on that the selection criteria had to be determined jointly by the news and engineering departments. We had several requirements for the new system in order to improve workflow. It had to handle 12 record channels for microwave and satellite feeds, eight channels of tape ingest for tape-based acquisition, six channels of news playout and four channels of auxiliary playout for satellite uplinks. The system also needed to be able to accept file transfers of ABC NewsOne content delivered by Pathfire to servers in the facility, and provide journalists with low-resolution, browse-and-edit capability at their workstations.

In the end, we chose a Thomson Grass Valley system that incorporated an Avid layer for ingest and playout control and low-res edit/browse. Avid Capture Manager controls 20 channels of both low-res and hi-res record-

The transmission room at WLS-TV in Chicago functions as the news ingest and feed room for all microwave and satellite links.

ings. Twelve channels are used for general-purpose recordings, like microwave feeds and satellite feeds.

The hardware for the low-res side consists of 20 channels of IPV SpectreView 1.5MB encoders that feed 3TB of low-res SAN. Two additional channels provide scavenge operations. Three SQL database servers and three video playout servers form the core of the system.

The high-resolution side consists of two 13TB Thomson Grass Valley MAN systems for redundancy. There is an X side and a Y side. Each side is connected via Fibre Channel to 30 I/O channels of Profile XP spread over five XP units. Twenty of these channels are used for ingest.

More than 300 pieces of ABC NewsOne content are received each day via Pathfire and automatically sent to a Telestream FlipFactory transcoding server. The transcoder seamlessly and automatically converts the files to Thomson Grass Valley MPEG-2 format and deposits the media and metadata in a folder in the MAN, making them immediately available to the news editing team.

Desktop low-res editing is done via MediaBrowse. The high-res editing is done on 10 NewsEdit platforms. A typical edit room will have an SX playback/record VTR for tape-based acquisition. Rough-cut low-res material may be OMF'ed to a NewsEdit room for finishing.

News playback is controlled via Avid Control Air servers. We use six channels, with one of the channels left in reserve for late breaking stories. The system integrates with the rundowns, and a news show is "reserved " to a particular rundown. Changes in the rundown are then reflected in the Control Air display.

The new file transfer automation technology has enabled WLS-TV to replace cumbersome handling of tape with a faster, more convenient LAN-based media transfer solution. BE

Kal Hassan is director of engineering for WLS-TV in Chicago.

DTV
for the public

From sea to shining sea,
America's digital future

thirteen
WNET NEW YORK

ECB
WISCONSIN EDUCATIONAL
COMMUNICATIONS BOARD

knpb

KMOS
Missouri PBS

DTV for the public

BY LAURA COLLINS, ASSOCIATE EDITOR

For 33 years, a non-profit media enterprise, the Public Broadcasting Service (PBS), has provided a range of quality programming to the American public through 349 member stations. Ninety-nine percent of American viewers can receive a PBS signal, compared with cable's reach of 81 percent. From October 2001 to June 2002, nearly 85 million people watched PBS each week.

Delivering digital

PBS is expanding to serve an ever-increasing digital audience as well. So far, 58 percent of U.S. households can tune in to digital services offered by 82 PBS stations. PBS's digital schedule includes at least one HD program in primetime each month. PBS also provides several full-time channels, including the PBS National Satellite Service for C-Band and the PBS KIDS Channel, offered on DirecTV. Two more full-time channels, PBS National Satellite Service for DBS and PBS YOU, are available on both DirecTV and DISH Network.

Cover design: Robin Morsbach, Associate Art Director; Top left: WBBH tower in Punta Gorda, FL; Middle left: Sesame Street (photo courtesy PBS)

Contents:

Funding digital

Delivering digital programming costs money, and transmitting digital by the FCC's May 2003 deadline means finding sources of funding now. PBS stations are making definite progress in this direction, but more than 350 member stations still have some distance to go. One source of help for these stations is the Public Telecommunications Facilities Program (PTFP), a competitive grant program providing funding to bring public radio and television to unserved areas of the United States.

ATSC TRANSMISSION EQUIPMENT	PTFP allowance
ATSC television transmitter	$390,000 - $950,000
TV broadcast antenna	$20,000 - $400,000
Transmission line	$85,000 - $340,000
Tower	$1,800,000
NTSC TRANSMISSION EQUIPMENT	**PTFP allowance**
NTSC transmitter	$540,000 - $850,000
NTSC antenna	$225,000 - $300,000
Transmission line	$58,320 - $175,000

Table 1. PTFP funds can be used to purchase the transmission and distribution equipment stations need to meet the FCC's May 2003 deadline.

This year, PTFP awarded 59 grants totaling more than $36 million to 97 public television stations. Of these, 52 went toward digital conversion projects, while another seven were awarded for equipment replacement. Individual awards ranged from $21,447 to the $1.8 million each awarded to the Iowa Public Broadcasting Board and the Texas Public Broadcasting Association.

Getting the grant

Stations interested in applying for funding through the grant program were required to submit applications describing the objectives of the proposed project and justification of the station's need.

The stations were also required to supply a budget showing all project costs and types of equipment involved — including the amount of the requested federal share. The standard PTFP share is 40 percent of the project costs, but it may provide up to 75 percent in case of hardship. The PTFP encourages stations that can afford it to cover 75 percent of costs, and provides special consideration to those stations, although it balances this size grant with those requesting a larger amount.

Stations had to outline their overall plan for conversion and explain how the requested equipment fit in with that plan. They also had to provide a timeframe for the project, up to three years. In the case of multiyear applications, only one phase is funded at a time, with further funding depending on available funds.

Equipment covered by the program includes equipment necessary to digitally broadcast locally produced analog programs, as well as to broadcast digital programming from national sources. Transmission equipment (transmitters, antennas, STL, towers, etc.) and distribution equipment installed in master control (including routing switchers, video servers, PSIP generators and digital encoders) are covered by the award. Funds may also be used to replace obsolete equipment that a station needs to complete its digital transition. See Table 1 for some examples of equipment eligible for funding by the grant, as well as the amount the station can spend on each piece of equipment.

Now, with federal money to spend, this year's grant recipients are moving forward with their digital conversion plans. This special report follows the progress of four of these stations.

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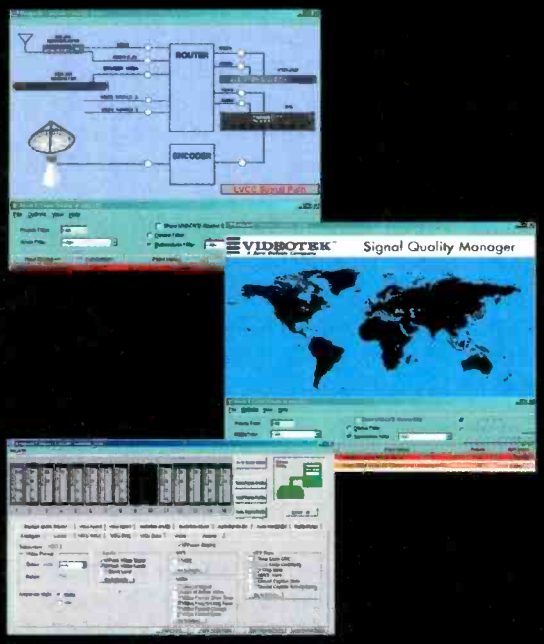

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KMOS

BY DON KELLER, TECHNICAL EDITOR

A new antenna location

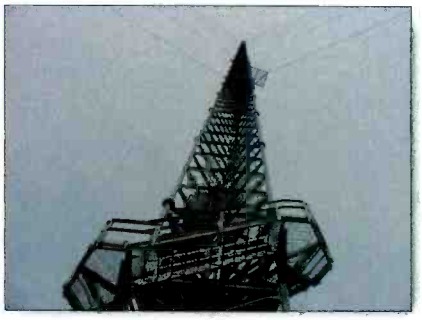
In 1978, Central Missouri State University, located in Warrensburg, MO, purchased bankrupt CBS-affiliate KMOS, located about 28 miles east in Sedalia. With PTFP assistance the station was put back on the air as a PBS affiliate in 1979. Today, KMOS-TV provides analog PBS service on Channel 6 to more than 800,000 people in 36 central Missouri counties.

In its migration to digital TV, the station has contended with several issues, including FCC deadlines, budget constraints, antenna location, and, of course, a nearly nonexistent DTV viewership.

To stay ahead of the FCC deadlines, the station made its case in 1997 for converting the station as soon as possible. In the latter part of 1998, the university initiated a $4.4 million bond debt service to fund the station's conversion. But, as often happens, increasing costs and other factors made it necessary for the station to seek supplemental funding. In 2001, the PTFP granted the station $778,000 to help purchase a digital transmitter. In 2002, the station received another $288,000 toward the purchase of a master control system. The plan is to beat the FCC's deadline for the station to duplicate at least 50 percent of its analog programming on its new digital Channel 15.

The first thing the station had to do was solve its antenna-location problem. The antenna tower was only 860 feet high and would have necessitated enormous amounts of power to duplicate the digital signal across the same area. Plus the tower was probably too old to support the addition of a digital antenna anyway. The obvious solution was to build a new, taller tower. But finding a suitable location was a challenge. Whiteman Air Force Base is located between Sedalia and Warrensburg. The FAA restricts the height of all structures within a radius of about 40 miles of the base. And the station couldn't build a tower 40 miles to the west of Whiteman because it would be too close to Channel 5 in Kansas City. So KMOS selected a site near Tipton, about 45 miles east of Whiteman and about 55 miles east of the studio in Warrensburg. The new tower is about 2000 feet high. The tower and the nearby digital and analog transmitters are connected to the Warrensburg studio through a microwave link at the old tower site in Sedalia.

Throughout this relocation and conversion process, the station has to maintain its analog service. It cannot shut down the old analog transmitter and antenna and move them to the new site. So, along with its digital purchases, the station had to purchase analog equipment for the new site, including a new analog antenna and a refurbished RCA analog transmitter.



KMOS's new 1925-foot tower in Tipton holds a digital slotted-line antenna at the very top and an analog three-faced panel antenna at 1860 feet.

The station switched its analog Channel 6 transmission to the new site in March 2002 and is ready to turn on digital Channel 15 in April of 2003.

knpb

BY LAURA COLLINS, ASSOCIATE EDITOR

Transmitting digital via repeaters

KNPB currently broadcasts its analog signal on Channel 5 in Reno, NV, and reaches the capitol, Carson City, through the use of an analog translator on Channel 15. The station serves more than 200,000 people in its coverage area.

The station recently began broadcasting a digital signal to Reno on Channel 15, necessitating a channel move for its analog translator. A channel search located Channel 29 as an alternative for KNPB's analog signal in Carson City, but the station's Thomson LGT Type 387/564 translator was old and no longer supported, and not suitable for retuning to the new channel. KNPB funded 75 percent of a $215,712 project to purchase a new translator and related master control and test and monitoring equipment. They received a PTFP grant for the balance of the project costs.

Making way for digital

The need for an analog translator dur-

ing the digital transition may not be readily apparent, but the new analog transmitter serves several important functions in the station's overall digital plan. First, it replaces failing analog equipment to continue analog service to an area unserved by another signal. Second, replacing the translator opens the door for KNPB to provide digital service to Carson City by making Channel 15 available for an on-channel repeater transmitting the station's digital signal. Carson City is within KNPB's Grade B contour, but is currently shielded from the station's primary transmitter by the mountains. Serving this area is especially important since Carson City represents 21 percent of KNPB's viewing audience.

KNPB is currently transmitting a digital signal to Reno using a borrowed low-power transmitter. The station is in the process of buying an Axcera transmitter. When the new transmitter goes on air in March 2003, the station will use the low-power transmitter as an on-channel repeater to extend its digital signal to Carson City.

As of right now, the FCC hasn't established any rules governing translators, so there is no way to get licensed for one. KNPB is testing the on-channel repeater to demonstrate that it's a suitable method for providing digital service to shadowed areas. The station will use the low-power digital transmitter until the FCC makes a ruling on the subject and then plans to replace the borrowed transmitter with a new digital transmitter to use as a permanent on-channel repeater for Carson City. Due to the shielding from the mountains, the Carson City signal would offer little or no interference to KNPB's primary signal in Reno. KNPB's experiment with an on-channel repeater may provide a new option for stations facing the challenge of extending digital service to shadowed areas.

BY LAURA COLLINS, ASSOCIATE EDITOR

Statewide digital conversion

ECB
WISCONSIN EDUCATIONAL COMMUNICATIONS BOARD

For 30 years, the Wisconsin Educational Communications Board (ECB) has been serving approximately 2.3 million people via five licensed television stations, six translators and selected affiliates.

The ECB technical operations center (TOC) in Madison, WI, serves as a programming hub where instructional and general audience broadcast signals originate, including programming for educational access channels on cable TV systems.

Statewide digital conversion

ECB applied for a grant to complete its digital conversion project in 2000, but didn't receive funding until 2001. The ECB will cover 75 percent of project costs, with help in part from matching state funds allocated contingent on ECB receiving the PTFP grant. The organization is currently in the second year of its two-year, statewide conversion to digital.

ECB is planning the purchase of Harris Diamond solid-state DTV transmitters, dual exciters, bandpass filters, remote control, power protection and test equipment for each of its five licensed stations. ECB formed partnerships with commercial stations in Wausau and Green Bay to share transmission equipment and tower space.

In conjunction, the ECB is also updating its technical operations center (TOC) in Madison, WI, to create a new combined master control for the five stations. The updated operations center will be able to program as many as 16 channels and transmit in high definition. A new statewide interconnect utilizing a SONET ring has also been implemented, bringing the five transmission sites together.

The need is pressing for new equipment to replace obsolete items that have been in service since the operations center opened in 1988. ECB is looking at Saturn master control and Jupiter routing systems from Thomson to maintain existing service and to provide for later expansion of its digital capability. To this end, funds will also be allocated for encoder/multiplexer equipment that can be activated later for multichannel transmission.

In the new TOC, ECB will be implementing a server-to-air concept to streamline program processing. A new ATSC encoder will be the heart of the system, converting incoming signals to digital. The new routing systems will allow incoming digital feeds to remain in digital format throughout the processing chain rather than being converted to analog for processing and then back to digital for output. All signals for air will be stored on and delivered from ECB's digital video file server. WHA-TV in Madison will also switch programming through the combined digital master control.

This tower-top photo was taken at the 1499 foot level of the WLEF-TV Park Falls tower during DTV-related tower strengthening.

thirteen
WNET NEW YORK

BY DON KELLER, TECHNICAL EDITOR

Rebuilding after 9/11

Thirteen/WNET is New York City's PBS station. It serves a coverage area containing more than 18 million people. Thirteen's studios and offices are located on Manhattan's West Side. And, until Sept. 11, 2001, its transmitters and antennas were located on Tower One of the World Trade Center (WTC).

The station raised the money to convert to digital, and had already launched its digital transmission service two months prior to Sept. 11. On that day it lost all digital and analog over-the-air transmission capabilities. The West Side studios and offices were unharmed, so the station was able to maintain service to the 70 percent of the region's viewers who receive the signal over cable. For the remaining 30 percent, however, the channel went dark that day.

It will take years for the station to fully recover from the disaster, and an estimated $16.5 million to even come close to restoring its pre-9/11 level of service. In the recovery process, the two most important and immediate issues the station faces are securing the money to rebuild its transmission facilities and finding a suitable place for them.

Much of the money the station needs to rebuild will come from insurance claims, with the PTFP making up much of the difference. In 2002, the PFTP awarded the station almost $2.5 million. But neither the station nor its insurance companies had anticipated that it might someday have to replace the WTC as an antenna-support structure. Even if it were possible to do this, the cost would be enormous. So, since 9/11, the station has had to make do by transmitting from a series of lesser, temporary facilities until it procures a permanent facility.

Immediately after the disaster, the station scrambled to find a broadcast tower with space available for its antenna. The mast atop the Empire State Building in midtown Manhattan would have been the ideal alternate site, but it is crowded with antennas and no space was immediately available there. The Armstrong Tower, located about 18 miles north of the WTC in Alpine, NJ, was the highest nearby tower available that could accommodate VHF television transmission equipment. Thirteen, along with several other displaced broadcasters, negotiated to secure space at Alpine. The station had a 1kW Larcan transmitter flown to the site and, by Sept. 16, established a minimal, low-power signal.

To improve the signal, Thirteen was allowed to commandeer a 10kW Thales transmitter that was on a truck en route to a different station. Thirteen also quickly acquired some panel antennas, trucked in diesel generators to power the transmitter and patched together a temporary studio-to-transmitter link (STL). By Sept. 26, the station was transmitting a respectable analog over-the-air signal from Alpine, achieving about 40 percent of its pre-9/11 coverage. But, as one might expect when establishing transmission facilities – even temporary, emergency facilities – in suburban New Jersey, the station ran into zoning issues that have led to litigation against it.

In the meantime, Thirteen and the other displaced stations are trying to establish transmission facilities in the Empire State Building. But this site has its own set of problems. The Empire State Building has been unable to supply adequate electrical power to its long-time tenant broadcasters, let alone the newcomers. Thirteen spent months and hundreds of thousands of dollars upgrading Empire's electrical power capacity. And it is very difficult for newcomers to secure transmitter and antenna space. Newcomers and existing tenants must achieve a high level of cooperation to make any changes. Thirteen negotiated with WNYE-TV to temporarily share its transmitter space and installed a 15kW Larcan transmitter there. The station is currently negotiating for permanent space in the building.

Thirteen initially coped with the lack of antenna space on Empire's mast by installing two panel antennas on poles attached to setbacks on opposite corners of the building's 81st floor. This provided a major improvement over the Alpine coverage, but it was still highly flawed.

The most recent improvement for Thirteen's signal came about when WABC-TV arranged for its sister FM station to relocate its backup antenna from the Empire mast to the Alpine site. WABC-TV then installed a single-layer panel antenna in the newly opened mast space. Soon thereafter, Thirteen installed transmission line and a four-port combiner so that it could share the antenna with WABC-TV, WPIX-TV and WNYC-TV, each operating at about 8kW.

Technicians install one of two panel antennas on the 81st floor of the Empire State Building.

Today, Thirteen continues to negotiate to improve its over-the-air analog signal coverage. It will be quite some time, however, before it will again broadcast a digital signal over the air.

WSMV uses PESA router

BY MIKE NICHOLS

WSMV-TV in Nashville, TN, is owned by Meredith Corp. and began operating in 1950. In the mid-1990s, the station began the process of finding a new routing switcher to replace its old one, in order to remain competitive and to meet FCC mandates regarding digital transmission. Although the original system had performed adequately for over two decades, advances in technology had made it practically obsolete. In addition, the company from which the router was purchased was no longer in business, creating a variety of product support and customer service problems.

It can be argued that a routing switcher is the heart of any broadcast station. Therefore, we needed to do some homework to make the proper purchasing decisions and protect our financial investment.

Flexibility and customer service were prime factors in WSMV's search for a new router. They chose a Tiger routing system from PESA, which includes the 112x112 stereo/audio router shown above.

Researching routers

The initial step was to obtain budgetary approval. The next step involved identifying our needs and finding a router that met our specifications. First and foremost, a router was needed that could help us meet the goal of being on-air in a digital format before Nov. 1, 2002.

It was crucial to find a flexible system, one that would allow for technological advances as well as provide room for growth. With the industry in such a state of transition, this flexibility is more important than ever. We wanted a system that would be adaptable to a wide range of requirements, one with a mixture of analog and digital cards, and a variety of input and output increments to make future expansion affordable and simple. Specifically, the system needed to meet the station's technical requirements. The station currently has one digital and one analog channel. In addition, it feeds inserts to a cable channel, and multiple fiber feeds run into and out of the station. All of this requires access to distribution feeds from several locations.

While price is often the driving factor in any major purchase, there are certainly other factors that need to be considered, including intangible qualities that can't be seen on a specification sheet. First, we were looking for a company with a strong reputation and a stable financial outlook. It was important for our engineers to have confidence in our supplier. After all, a new routing system, like any major technical investment, is a major change to the infrastructure, and it is the engineers who are most affected by this change. Then there was the issue of customer support — an especially sensitive concern since we were no longer getting support for our last router.

Finding a company with a knowledgeable and experienced staff was another important factor, as this would help make the transition to the new router as smooth as possible. One of our major goals was to keep the learning curve to a minimum.

It can be argued that a routing switcher is the heart of any broadcast station.

Selecting a router

After researching many companies, WSMV finally decided on PESA Switching Systems and its Tiger routing system. We purchased a 96x96 analog router, a 64x32 digital router and a 112x112 stereo/audio router. All three frames can be expanded to 144x144, and the system offers larger matrices to meet any potential expansion requirements. We will use 12 tie lines between the analog and digital router to accommodate cross-conversion.

While several companies had routers that met our technical specifications, we decided on PESA because it also met our intangible requirements. Dependable and experienced staff provided training and helped us resolve some of the initial timeline and configuration issues. They oversaw the configuration of our new software. In the end, the PESA Tiger system has proven to be stable and reliable, and the right router for WSMV. BE

Mike Nichols is the director of engineering for WSMV Channel 4 in Nashville, TN.

MPEG coding systems

BY JOHN LUFF

Things are not always what they seem. We routinely pass pictures around represented by only a couple of percent of the original picture data. It is a fortunate fact that we can use representations of reality to reconstruct what seems to be reality.

MPEG unleashed an industry that has improved the quality and reduced the cost of transmission, and has become the basis of the digital terrestrial television system worldwide.

Today, commercial implementations of MPEG can be found in DTV, consumer DVD, camcorders and hard disk recorders for consumer and professional applications, and transmission systems for satellite and terrestrial distribution. The range of quality and extent of features supported is similarily stratified.

SDTV MPEG hardware offers a wide range of features. (HDTV MPEG encoders are in use primarily in North America.) At the high end are efficient encoders intended to wring out the last possible bit of redundant information in the content. They may be installed in facilities using statmuxing to further increase efficiency. Full-featured systems often include interfaces for SMPTE 259M and AES audio, and embedded audio. They can accommodate multiple audio channels, which may be useful for multiple language requirements.

These "high end" encoders sometimes use a "two-pass" process to improve the efficiency. This works by doing a first encoding pass and looking at where the content was not challenging and bandwidth was unused. The uncompressed input signal is then passed through the encode signal again, using statistics gained from the first encode cycle to tell the second pass where it improved the picture. The results can be quite dramatic at low bit rates.

The same technique is used when coding for DVD release, though it may well be a two-pass, operator-assisted process. In a suite similar to a film transfer environment, a "compressionist" optimizes the bit rate for each scene.

The middle ground is filled with encoders optimized for program backhaul that work without intervention. Settings are typically determined for average content. One technique to optimize the results is to use preprocessing on the input signal to allow the encoder to act more efficiently. Preprocessing might include noise reduction and high-quality decoding for composite signals. The cleaner the video is at the input, the lower the effective bit rate can be for the same quality at the decoder.

The Leitch NEWSFlash-II nonlinear editor can edit multiple compression formats and render the output to the compression format of choice.

These mid-grade encoders are excellent for SNG and ENG purposes. They often offer optional internal RF modulators, and outputs for connection to terrestrial circuits as well (DS3, ATM, SONET, etc.). Packaging might include weatherproof cases and small size for use with wireless cameras.

The third tier of encoders is intended for very low cost and modest quality, including encoders built on PCI bus cards and small stand-alone encoders.

Commercial implementations of MPEG can be found in DTV, consumer DVD, camcorders and hard disk recorders.

These can be useful for low-bit-rate applications like remote monitoring, education, and streaming in corporate applications. They may well see application in the future in "barker channels" in a DTV multiplex where the moving video is restricted to a small portion of the screen, and text and graphics with no moving content surround. The restriction of moving video to one portion of the screen makes coding at low bit rate and low cost easily achievable.

A short word on the emerging MPEG-4 products is in order. Many applications we use today are closed loop, and compatibility with large universes of decoders is not needed. That is where the genius of MPEG-2 has provided huge benefits. However, when one seeks the most efficient compression possible, MPEG-4 should be considered if the application is narrow and controllable. Bit rates can be dramatically lower, or quality raised for the same modest bit budget. Look for MPEG-4 to seriously penetrate the professional market in the next year, including HDTV backhaul applications. BE

John Luff is senior vice president of business development for AZCAR. To reach him, visit www.azcar.com

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End
Of free spectrum?

BY PAUL MCGOLDRICK

There have always been "them" and "us" users of the RF spectrum. "Them" are usually government agencies that work with rulebooks the FCC doesn't seem to want to know about and has absolutely no control over. If you've ever been near a White House communications crew, for example, you will find that whatever spectrum you think you have been allocated has been commandeered for other uses.

The "us" users of the spectrum are the guys with licenses and the whole of 47 C.F.R. to obey, with the FCC at the ready to raise hell at any slipup. The inability to control piracy is more than matched by the fervor that sometimes accompanies a fine for being outside of your licensed power range. But there has, at least, never been a time when the whole idea of free broadcasting might be in doubt –until now.

The Spectrum Policy Task Force – with four working groups – recently reported its findings and recommendations to the FCC. No report is official FCC policy until/unless it passes through the commentary, reply and any rule and order phases, but a lot can be gained by the tenor of these particular reports. Also, the professionals who put the reports together are all employed by, or directly associated with, the Commission.

We all know that terrestrial broadcasting is really not free. Commercial broadcasting is funded by advertisers who build their on-air costs into the prices of the products they sell us. Public, college and religious broadcasting are nearly all paid for by begging money from us on regular occasions. But broadcasters have, at least, not had to pay for the spectrum they are using.

"The Commission has traditionally allocated spectrum specifically for broadcast use, based on statutory public interest considerations and the free over-the-air nature of broadcast services." In that sentence "public interest considerations" is Commission-speak mostly for "reasonable access" to candidates for federal elective office, but that word "traditionally" put in there really made my brain light up. It is nearly always followed by a "but" somewhere. And it was.

Reporting that some commenters (sic) favored continued access to broadcasters for spectrum on a "command-and-control basis," the task force also noted that "other commenters (sic) contend that the continued dedication of spectrum for broadcasters, and particularly for commercial broadcasting, is increasingly anachronistic as the public gains access to alternative sources of programming and information from cable television, satellite services, the Internet and other outlets." Phew!

The task force quickly backs down from that possible viewpoint "for the time being" but later notes that "the Commission should periodically re-evaluate its broadcast spectrum policies...in particular such reevaluation should consider the extent to which the public interest benefits provided by dedication of spectrum under a command-and-control regime can be provided through the application of more flexible, market-oriented spectrum policies." In other words, folks, expect to be paying for your spectrum in the future if you are a commercial broadcaster.

There is an almost implicit threat a little later in the report that commercial terrestrial broadcasting may not be needed at all if there is sufficient multiple source access to the "types of information and programming that commercial broadcasters provide." That would certainly make the must-carry rules more straightforward!

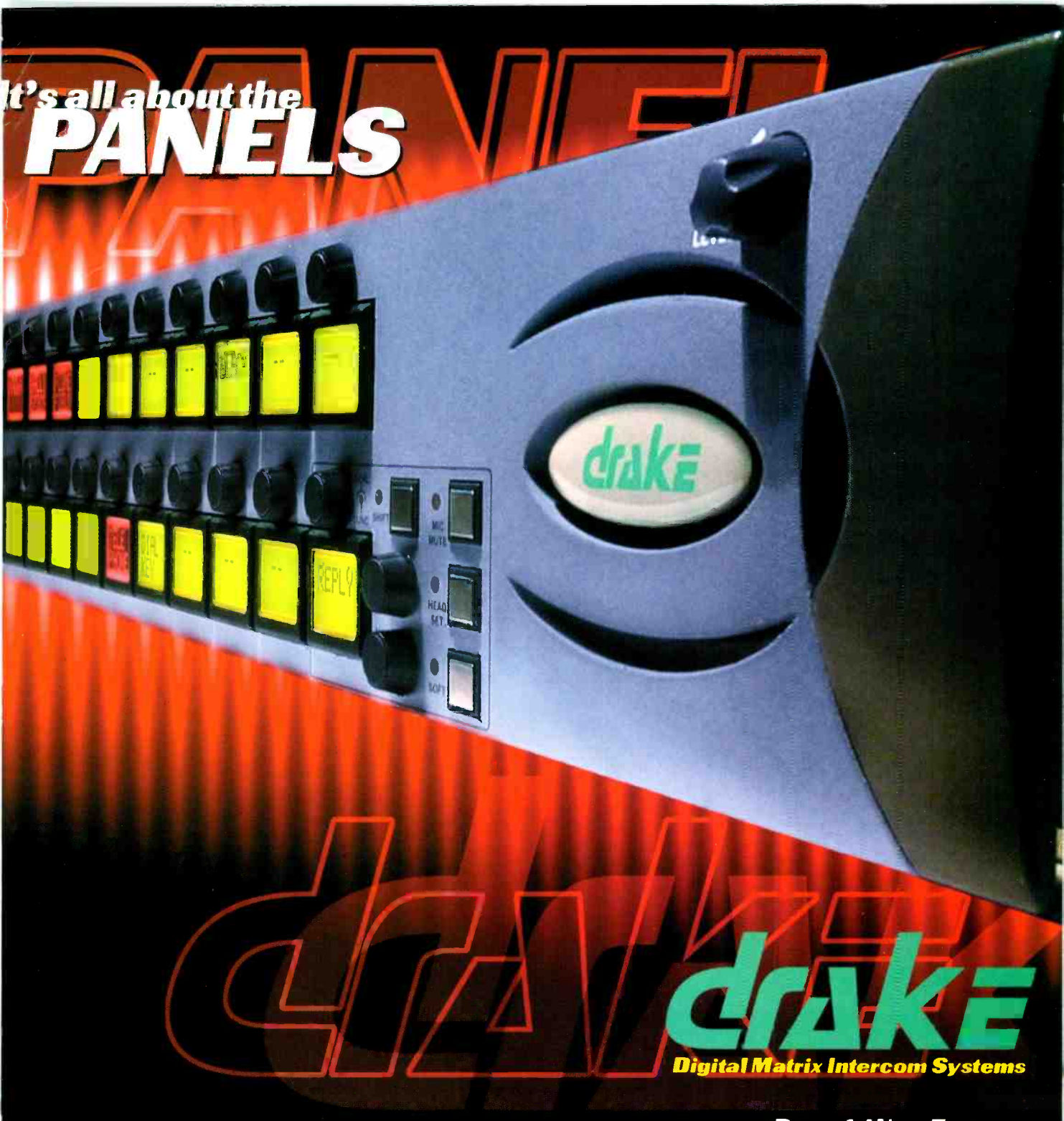
Does all this apply to radio and TV? The task force doesn't mention radio specifically at all in this section of its report, except in saying that "it is likely that there will be a continued need to set aside some spectrum for non-market-based broadcast uses, such as non-commercial and educational broadcasting."

The inability to control piracy is more than matched by the fervor that accompanies a fine for being outside of your licensed power range.

Don't call your Congressman yet; this would all have to go through FCC procedures when (did I say "when"? Sorry. I should have said "if," right?) it comes to pass, and any decisions will be the hands of the government, which may of course feel that "public interest considerations" are still worth a free chunk of bandwidth rather than the money it could rake in. After all, we know very well that the FCC is just there to administer the laws passed by Congress and has never had any political agenda. But broadcasters need to know that the mood out there in the "them" camp is set to be hostile to the "us" camp. The spectrum simply isn't a big enough sandbox for you all to play in together. BE

Paul McGoldrick is an industry consultant based on the West Coast.

SEND Send questions and comments to: paul_mcgoldrick@primediabusiness.com



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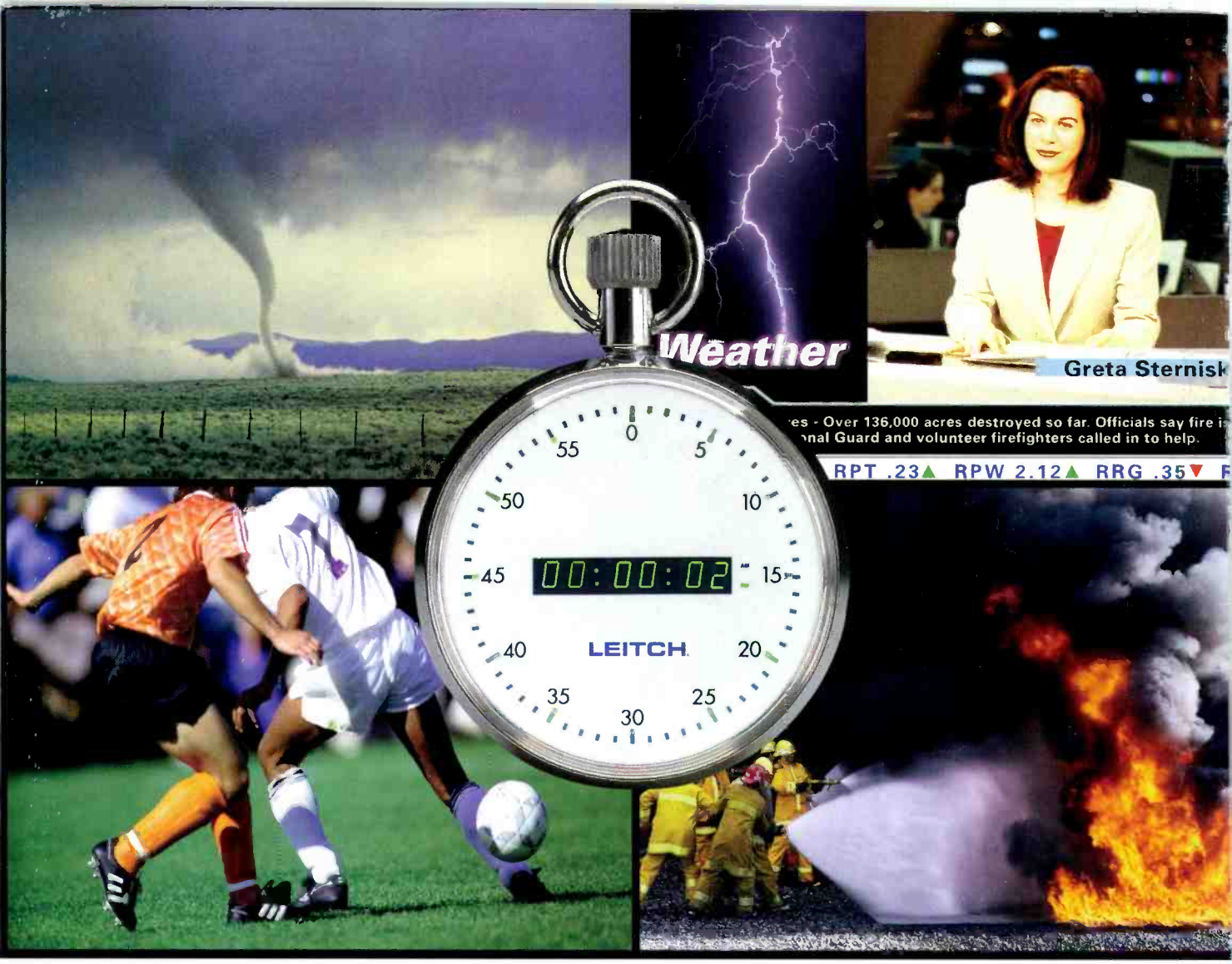

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