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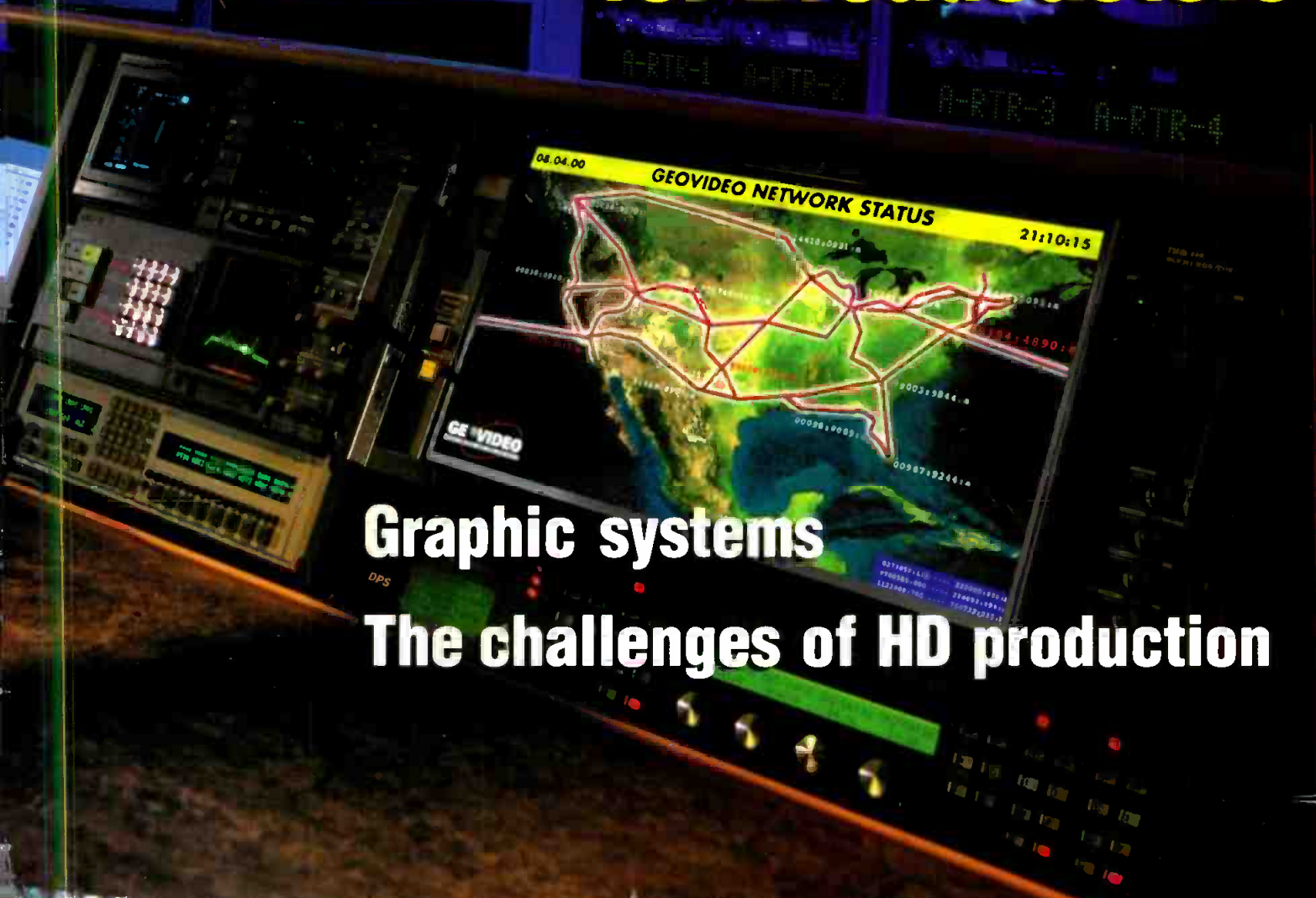
Streaming Media for Broadcasters



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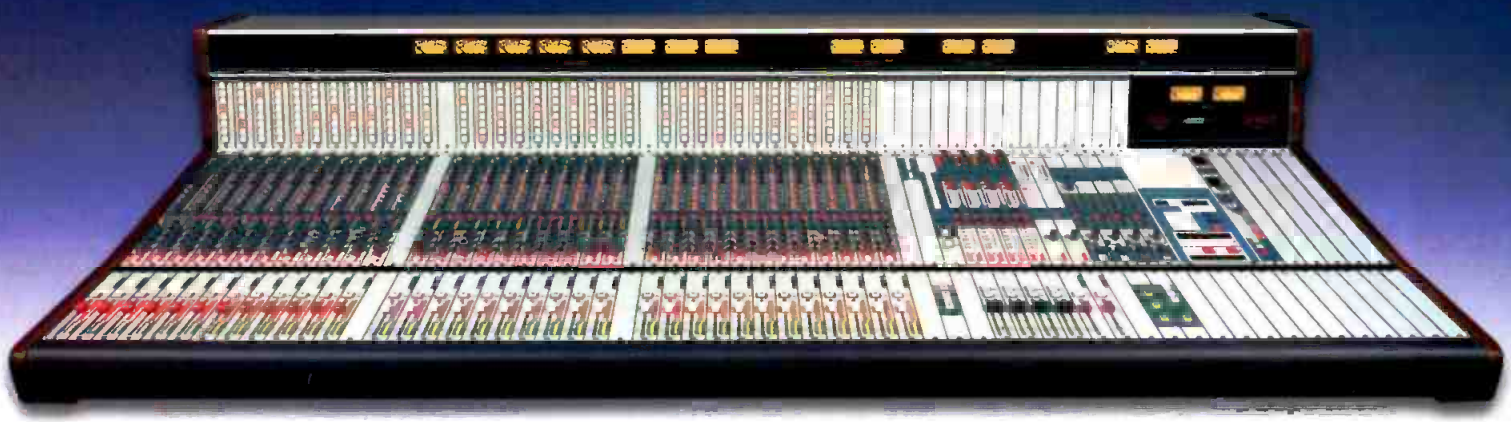
The challenges of HD production

LIVE AUDIO for TV



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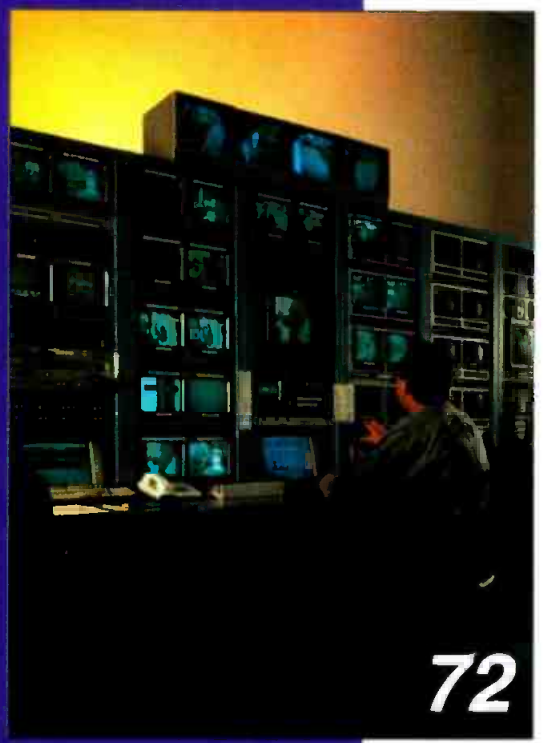

Features

Beyond the Headlines

Digital Handbook

(continued on page 6)

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ON THE COVER: *Traditional broadcasters, like Thirteen/WNET, New York, are beginning to adopt webcasting as a means to reach new audiences. GeoVideo Networks provides WNET with distribution services and a fiber backbone for delivering Internet content. Photo by Joseph Sinnott.*

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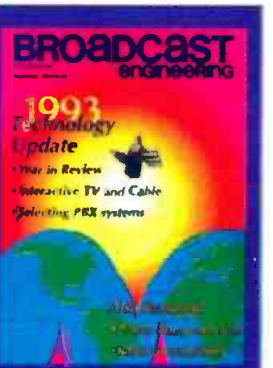
FREEZE FRAME

A look at the technology that shaped this industry.

The 100-year war



The FCC has a history of confusing the effective implementation of technology. In what year did the FCC issue this famous ruling (quoted, in part, below), which started what *Broadcast Engineering* called the "100-year war"?

"Contrary to the circumstances which motivated the rule amendments authorizing and standardizing stereophonic transmissions by FM broadcasting stations, there is little evidence of public need or industry desire for similar rule changes with respect to stereophonic transmissions by standard broadcast stations."

Submit your answer to: brad_dick@intertec.com. Selected correct entries received by Sept. 30, 2000, will be eligible for a *Broadcast Engineering* T-shirt.

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Editorial

Kill the 8VSB Frankenstein

8VSB technology is a Frankenstein, built from the scraps of other failed ideas. Angry broadcasters now march on the castle of ATSC. Chants of "Kill the beast!" get louder. Users pound upon the castle gate demanding verifiable performance while the monster's ATSC medical team frantically attempt to salvage the beast from its deserved demise.

The reality is that 8VSB deserves to be put to death quickly. It never worked well. Broadcasters don't want it. Consumers don't want it. It doesn't do what it needs to do. The fear, uncertainty and doubt (FUD) created by the technology's disappointing performance and the ATSC's refusal to effectively address these concerns have done more to derail the launch of U.S. DTV than even our FCC – and that's saying something!

About the only ones pushing to keep this laboratory mistake on life support are the technology's patent interest holder (Zenith), its chief PR flack (ATSC) and, of course, the CEA, which will say anything to generate a sale. Thanks to politics, this junkyard assembly of a technology continues to live on.

Way back in July 1994, *Broadcast Engineering* magazine practically begged this industry to pause long enough to allow the testing of COFDM technology. In an editorial, we stated the potential benefits of COFDM far outweighed the possible 15-month delay that would be incurred. Now look at the mess we're in.

I've heard lots of arguments for keeping 8VSB. Most center on three points:

- Next generation receivers will solve any reception problems;
- It will be too expensive to convert 8VSB receivers in the field; and,
- Changing to COFDM would result in an unacceptable delay in implementation.

All three statements are untrue.

Consider these key points:

- Broadcasters need flexibility with DTV technology to compete and develop new services and adapt to marketplace demands. Otherwise they won't support it. No one wants just a digital version of our analog system.
- 8VSB does not, today, provide for portable or mobile service. COFDM does.
- The conversion cost to COFDM is not the billions quoted by some 8VSB proponents. Given the few receivers actually in the field, we're talking relatively small change to convert. In a statesman-like manner, Sinclair has even offered to pay for replacement STBs for its current viewers. Bottom line: conversion will not be expensive.
- A delay in implementation is preferable to adopting an inferior system. Anyone remember the color wheel?
- STB manufacturers have stated COFDM products can be on retail shelves in 12 months.
- DTV is being delayed primarily because of the FUD factor. Dump 8VSB and you eliminate the key excuse to not implement DTV.

8VSB has had almost six years to make itself work and it still doesn't. We should not gamble on promised future fixes that *might* make tomorrow's 8VSB as good as COFDM is today.

The solution is to kill 8VSB now. God help us if the doctor (Kennard) is able to say, "It's alive. It's alive."

Brad Dick

Brad Dick, editor

Send comments to:
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Reader Feedback

Too scared to move

I agree with you a 100 percent. As engineers, we must be able to find out what are the advantages offered by new technology instead of looking in the other direction. When the CCD came to life everybody said it's good for newscast but it's not as nice as a tube. Where are the tubes now? Four years ago we barely could get a client in our Quadra (Philips) telecine room (flying spot vs. CCD). Now, The Spirit telecine (Philips) has swept the whole world, it became the best seller in less than three years.

Love your magazine!

FRANÇOIS BOURDUA
TECHNICAL MANAGER
VISION GLOBALE LTEE

Defining quality

Dear Sir,

After reading the article "Light compression for contribution-quality HDTV" by William Zou, I have the following question.

In case of a live HDTV broadcast event via satellite or fiber at 45Mb/s, which of the followings reveals the better picture quality MPEG 2 MP@HL at 45Mb/s or MPEG 2 4.2.2 Profile@HL at 45Mb/s?

Thank you for your effort for broadcast technology.

HEE YOUNG JUN
DTV PLANNING ENGINEER
DTV TASK FORCE
MUNHWA BROADCASTING CORP.

William Zou replies:

This is a good question and is a very subjective one as well. There is no published data available to my knowledge. The theory is that the first case of using MP@HL the bits saved from coding chroma components could be used for improving spatial resolution and/or reducing motion artifacts. The second case, using 4:2:2 @HL, available bits are used for improving chroma resolution. If using 45Mb/s is adequate (there are enough bits available) for specific material the use of 4:2:2 @HL is a better choice. Otherwise, one might want to use main@HL. To me this issue is also dependent upon applications, such as whether the received 45Mb/s to be edited or processed and re-encoded (the performance of the second encoder for emission will impact the decision as well). A wise selection should be based on subjective evaluation with various program materials to cover the all range of content.

ATSC (not so) simply explained

Dear Mr. Robin:

I'm studying Telecommunications Engineering at The Central University of Las Villas, Cuba, and there is some information that I urgently need for my term paper.

In calculating the symbol rate (Rs) in the ATSC 8VSB transmission system, the following formula is used:

Rs = 4.5/286 x 684 = 10.76 Msymbols/seg, where 4.5/286 corresponds to the NTSC horizontal scan rate (fh)

- Where does the value "684" come from?
- What does "Fh" have to do with the symbol rate of the digital transmission system?
- What is the relationship between Fh (analog system) and Rs (digital system)? I mean, why must "Rs" be derived from "Fh"?

HIRAM DEL CASTILLO
CENTRAL UNIVERSITY OF LAS VILLAS, CUBA

Dear Mr. del Castillo:

The ATSC source coding domain uses a family of frequencies based on a 27MHz lock. The frequency (27MHz) is a legacy of the CCIR 601 component digital standard. It is a multiple of the 525/59.94 Fh (27MHz = 1716 x 15734.25Hz) as well as the 625/50 Fh (27MHz = 1728 x 15625Hz). It results from the time-division-multiplexing of three bit-parallel datastreams: Y@13.5MWords/s, Cb@6.75 MWords/s and Cr@6.75 MWords/s, the ubiquitous 4:2:2 component digital standard.

The audio and video sampling clocks, fa and fv respectively, must be frequency locked to the 27MHz clock. This can be expressed as the requirement that there exist two pairs of integers, (na and ma) and (nv and mv) such that: fa = (na/ma) x 27MHz e.g. 48kHz = (2/1125) x 27MHz = (3432/1125) x 15,734.25Hz fv = (nv/mv) x 27MHz.

ATSC channel coding is represented by the FEC/Sync Insertion subsystem and the VSB modulator. The relevant frequencies in this domain are the VSB symbol frequency (fsym) and the frequency of the transport stream (ftp) which is the frequency of the transmission of the encoded transport stream. These frequencies must be locked. The expression for ftp is given by: ftp = 2 x (188/208) x (312/3130) x fsym.

Conceptually, the output from the transport system is a continuous MPEG-2 transport stream at a constant rate of Tr Mb/s. In an 8VSB system: Tr = 2 x (188/208) x (312/313) x Sr = 19.39 Mb/s

Sr is the transmission subsystem symbol rate, expressed in Msymbols/s it is given by the formula: Sr = (684/286) x 4.5 = 10.76Msymbols/s. 4.5MHz represents the old NTSC audio subcarrier, which is a multiple of the NTSC Fh. Alternately Sr can be expressed as: Sr = (684/1716) x 27 = 10.76Msymbols/s.

27MHz represents the bit-parallel data rate which is a multiple of the NTSC Fh. Somehow we can't get away from the old NTSC magic numbers!

MICHAEL ROBIN

News

Broadcasters comment on state of DTV

BY LARRY BLOOMFIELD

The comment period of the FCC biennial review of DTV has again sparked criticism of the chosen transmission standard, 8VSB. Citing reception problems, two networks, ABC and NBC, called the ATSC standard unacceptable and have asked the FCC to look for alternatives.

In addition to ABC/Disney and NBC, nearly all major networks, group owners — large and small, have submitted comments as well. As with anything of this type, some comments were politically motivated, allowing the submitter to say, at least, they had filed. The comments filed to date are the most representative of the broadcast industry in filings on any issue over the immediate past history of any FCC proceedings.

The key issues are portability and indoor reception. It is the latter issue that inspired Nat Ostroff, Sinclair Broadcast Group's vice president of new technology, to note prior to the congressional hearings on this matter: "If they can show it inside the House hearing room, we will congratulate them on having solved the problem."

Just when some thought the 8VSB/COFDM issues had played out, a major bombshell was dropped on the FCC in the form of a letter. There were no questions about the feelings of NBC and Disney (ABC's parent company) in a letter sent to FCC Chairman William Kennard by both the ABC and NBC networks. The two networks sharply criticized the U.S. 8VSB DTV standard, calling it "not appropriate for indoor reception." Another portion read, "Our real world experience in receiving the 8VSB signal from our DTV stations, as well as the other DTV stations in our markets, is that this method of transmission does not provide reliable reception to our viewers."

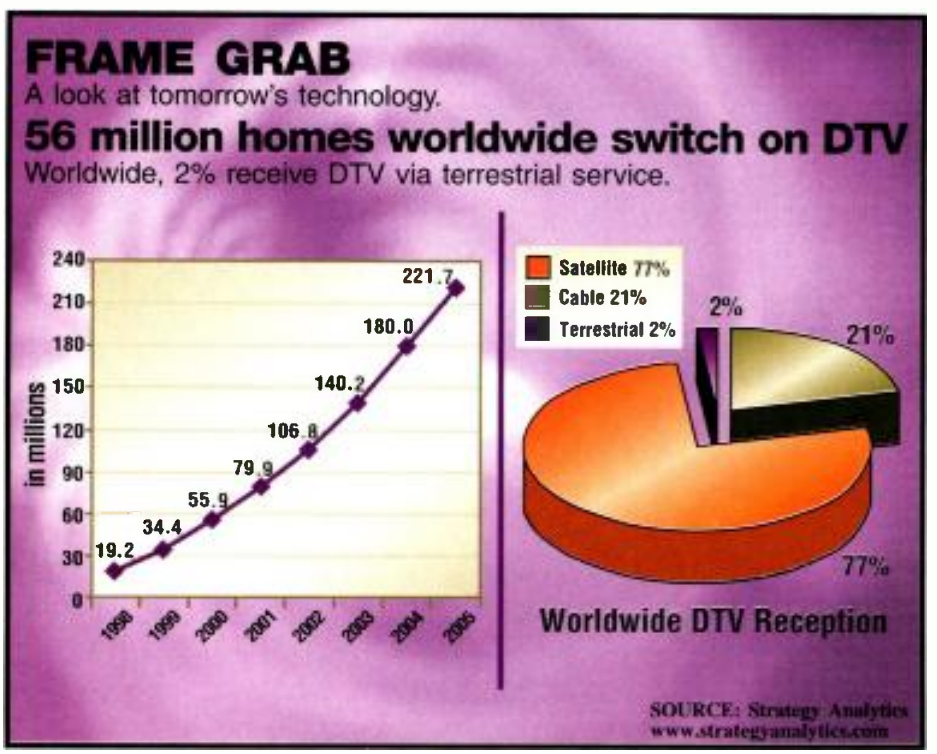
This is the first time major networks have registered an official complaint about the standard. Although NBC had determined 8VSB to be unsuitable, its audience with the FCC took place in February on the same day the FCC summarily denied the Sinclair petition for the addition of COFDM as an option to 8VSB.

This is the first time major networks have registered an official complaint about the standard.

On the other side of a coin, CBS reported positive test results at NAB 2000. NBC and ABC asked the commission to keep its options open, saying: "We believe we can find a solution that preserves the current table [of channel allotments] and provides the service to the viewing public that was expected to the beginning of the digital build out."

In addition to taking the current testing methods into serious question, the networks left no question as to their doubts that 8VSB will ever be able to match the capability of COFDM in the cancellation of dynamic multipath, a common problem of analog transmission systems. Key questions remain about 8VSB's ability to handle reflected signals received at different times, causing what would appear on an analog television set as "ghosting."

The letter stated, "It is difficult to envision a receiver employed with the ATSC standard performing comparable to one employed with the DVB-T



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standard for time-varying multipath fading channels. ...The new ATSC receivers, recently developed and made available for the tests do not present any performance improvement in practical conditions."

Others are taking a wait-and-see approach. iBlast Networks withdrew its earlier comments in favor of 8VSB in light of reception tests being conducted by Maximum Service Television.

WaveXpress noted the chosen transmission standard would have little impact on its datacasting services, but noted reception problems or the need for directional antennas stemming from any transmission standard would stymie consumer acceptance of DTV and new services. "Any standard that compromises ease of use or places limits on the range of applications also places limits on the size of the addressable market," the company noted in its comments to the FCC. "Naturally, limited markets meet with limited success. In order for DTV to succeed we believe the standards supporting DTV use in this country must have zero tolerance for such compromises." ■

Gateways, new technology and the Internet

STBs are not anything new. They've been around nearly as long as television itself. Of course most folks think of the cable gateway with its alphanumeric tuner, but remember the old downconverter from UHF to VHF before the mandated all-channel tuners? The wireless cable service boxes that operate in the 2- to 3GHz range are a close cousin to these old downconverters. Go a little higher in frequency and you enter the world of satellite communications and one more kind of set-top conversation device.

With the advent of digital distribution, a new kind of box has appeared: the integrated receiver–decoder or IRD. It not only receives the signal, but it also decodes the digital packets into something usable by the TV set. Probably the most familiar STBs of these genre are the more than 13 million IRDs associated with Dish and DirecTV that deliver near studio-quality NTSC and digital pictures to the backs of TV sets. One survey says that over half of the American viewing audience has access to local affiliates of the four major television networks via satellite.

Data transmission is not something new to television either. Whole newspapers, electronic program guides (EPG) and a host of other services have resided in the vertical interval of a number of television signals over the years. They, of course, needed an STB to both retrieve the information and display it.

America Online, the nation's largest Internet service provider, recently entered the television arena.

Until the FCC clarified the owner restrictions on cable STBs, they were pretty much the property and domain of the cable industry. Digital television extends the architecture possible with STBs even further with data capabilities, not to mention the many other services being contemplated.

Today's STBs come in a variety of features and flavors. When competing for that most valuable piece of property in the home, the top of the TV set, manufacturers must offer as many different features as the public wants and minds of the marketing types and engineers can conjure.

With more than 10 million STBs deployed worldwide, Pace is a leader in developing technology for interactive television services such as e-commerce and video-on-demand and many other types of services. STB manufacturers have also partnered with a number of companies so their STBs allow e-commerce services with such companies as Gameplay, Toyzone, Woolworth's, Carphone Warehouse, Domino's Pizza, Gadget Shop and First Call.

The success this kind of device brings to bear on the market can be found in many examples. Sales through STBs for mass merchandiser Woolworth's averaged $25 per shopper, compared to only $9 over the counter. Domino's Pizza claims the technology has generated new customers and that those customers order more often than regular phone customers.

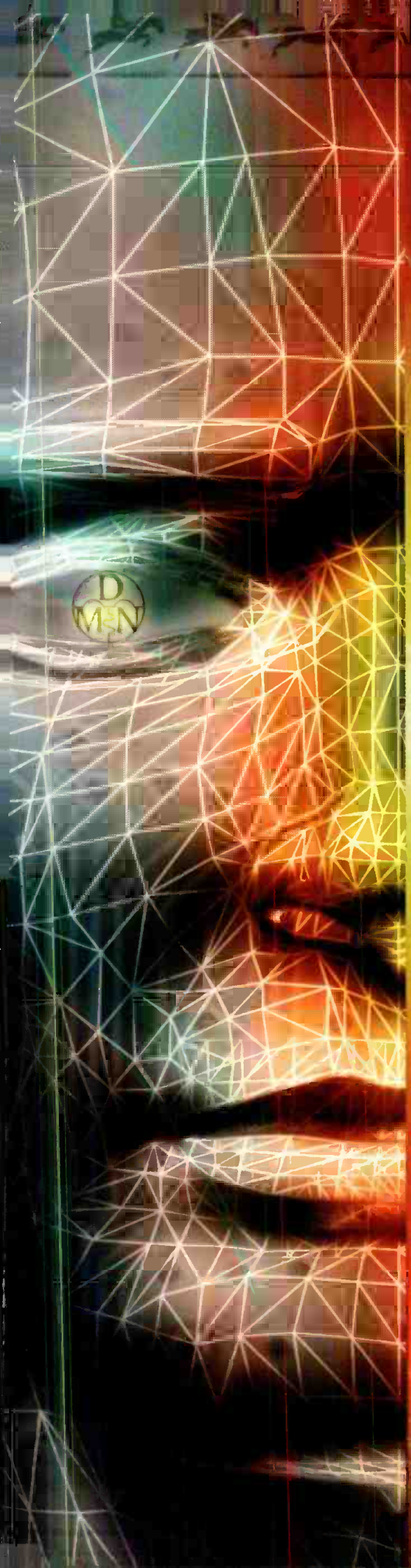
Another service STB manufacturers are interested in is DSL. Pace will be launching a fourth generation STB that will provide access to multichannel digital broadcast television, video-on-demand, high-speed Internet access and other interactive entertainment services over standard telephone lines.

If you think TV over the Internet has to be watched on a PC's monitor, think again. There is no reason why video and its accompanying audio cannot be fed from a PC to a large-screen monitor. In the past, it only made bad video look even worse. But with new technology on the horizon, the viewer will experience the "studio quality" video often touted by broadcasters.

Alliances and partnerships are essential to today's STB markets. According to a mid-June announcement, Microsoft, DirecTV and Thomson multimedia have joined forces "to make television more personal and interactive." The new system or service has been labeled UltimateTV. The union integrates DBS programming, digital video recording, interactive television and Internet access in one complete package. This STB will allow viewers to watch two Direct DBS shows at the same time with picture-in-picture, watch one show while recording another, and record over 30 hours of digital quality programming for later viewing on their own personal video recorders (PVR). Viewers will have the option to choose interactive television, respond to promotions with the click of a remote, and stay in touch with family and friends by e-mail.

The marriage of satellite bandwidth, two digital tuners and a large hard drive will allow viewers the convenience of accessing both traditional video programming and multimedia information on demand.

The integrated Internet access will allow subscribers to respond to offers with either a click of the remote or a



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quick e-mail. New e-mail messages are announced by a red light on the receiver. The system includes digital audio output capability, a standard V.90-capable modem for fast Internet communications and two USB ports. Future support is planned for printers, advanced peripherals and broadband network interfaces, such as external DSL modems.

The platform from Microsoft TV is a universal device that, by its very design, won't become obsolete should you move. It supports worldwide digital-TV broadcast standards, including DVB, ATSC and ARIB. It also supports commonly used Internet standards such as HTML, JavaScript and Dynamic HTML, as well as all interactive content authored according to the Advanced Television Enhancement Forum (ATVEF) specification.

America Online, the nation's largest Internet service provider, recently entered the television arena. As something of a late bloomer in a market that is already somewhat saturated, AOL has started to market a Web TV-type STB, called AOLTV. The key difference in this new service is that it features the AOL interface for Internet access, complete with interactive program guides, chat sessions and instant messages over TV programs.

America Online and TiVo have formed a three-year alliance in which TiVo will become an AOLTV programming partner, offering subscribers of the WebTV service access to the personal TV offering. AOL also plans to incorporate its service into DirecTV receivers.

The FCC issued an 11th hour stay on proposed Set-Top Rules, giving 45 more days after the July 1 deadline. Because of a growing number of waiver requests, the FCC caved-in and decided to freeze its competitive STB rules, but only for those MSOs that have already made filings saying they can't comply

Japan has proposed its own solutions. In a July 7 announcement, Panasonic, Sony, Hitatchi and Toshiba said they would jointly propose technical specifications for datacasting services using receivers equipped with hard-disk drives. The trio hopes its standards efforts, initially aimed at unifying multiple digital TV-based services in Japan, could ultimately be extended for use in DTV receivers and even home servers in Europe and the U.S.

The Japanese alliance has discussed ideas for an "e-platform" business model that would "unite the Internet and datacasting" to deliver new services to receivers that were defined by the trio.

Items to be discussed by the group include copy protection, encryption, online billing specifications for reproducing content and copyright protection. The group will also define external interfaces, including the 1394 high-speed serial link.

There is no question that broadband technologies are quickly gaining popularity as consumers demand high-speed Internet access and multimedia offerings. According to Forrester Research, over 27 million users in the U.S. will have high-speed access by 2003, creating $8 billion in revenues. Meanwhile, broadband access will

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represent half of all access revenues in Europe by the end of 2004, says International Data. Broadband technologies include cable modems, DSL and fixed wireless access. Satellites offer another means of high-speed access, and Hughes Network Systems will soon launch a new version of its satellite Internet service DirecPC that will provide two-way interactivity. Hughes expects that the 8.6 million users of its DirecTV satellite TV service will help DirecPC succeed, as customers upgrade to a combined TV and broadband Internet service.

Meanwhile, AOL is targeting the broadband market through its pending merger with cable giant Time Warner. AOL-Time Warner plans to offer broadband services that will provide multimedia content to 13 million cable households. With such names as WebTV, TiVo, OpenTV, iBeam and others, it is only a matter of time when many of the services and features that are found in today's array of boxes on the tops of TV sets will be combined into one. ■

Canada looks at DTV

A May story on the Canadian 8VSB tests stirred some controversy within that country's Communication Research Center. The center's research manager for television systems and transmission, Bernard Caron, asked to clarify the technical parameters under which the tests were conducted and the results obtained:

Early in 2000, CRC carried out tests in the laboratory and in the field to evaluate the performance of 8VSB digital television transmission in collaboration with members of Canadian Digital Television (CDTV) and support from Industry Canada. The results of the laboratory tests have confirmed that the performance of newer generation 8VSB receivers is improving. In particular, the best receiver could operate with multipath signals as high as the main signal (0dB ghost). The weaknesses identified were the sensitivity of the receivers to the phase of the multipath and the need to increase the robustness of their adaptive equalizers to pre-ghosts.

Outdoor tests were done at 50 sites using signals transmitted in Ottawa on Channel 67 for DTV and 65 for NTSC. The DTV signal could not be received at only four of these sites due to a combination of low field strength (Carrier-to-noise ratio between 9.1- and 17.3dB) and strong multipath. The NTSC reception was also very poor with an ITU-R rating of only 1 or 1.5 on the ITU-R quality scale of 5. No DTV signal could be received at 14 of the 46 indoor test sites when using an active antenna (32dB gain) and at 17 of these sites using a passive antenna. A combination of multipath and low field strength (Carrier-to-noise ratio between 4- and 20dB) was responsible for the reception problems at more than 75 percent of these sites. It should be noted that NTSC reception was also quite poor (ITU-R rating between 0.5 and 2.5) at these sites. Further tests are now underway at CRC to collect more information on multipath characteristics and on indoor reception problems. ■

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FCC Update

SHVIA update

BY HARRY MARTIN

The FCC is implementing the Satellite Home Viewers Improvement Act (SHVIA), which revises both the Communications Act and the Copyright Act to provide for direct-to-home satellite transmission of TV stations' signals in their local markets and the transmission of distant signals into "*unserved*" areas. The FCC's current SHVIA initiatives are:

- **Improvement of the ILLR predictive model.** The Individual Location Longley-Rice (ILLR) computer model was created to predict whether households are served or unserved for the purposes of SHVIA by determining their ability to receive over-the-air broadcast signals. The Commission claims the prediction technique in ILLR has been improved by taking into account vegetation and other land cover using the U.S. Geological Survey's land use and land cover database. It anticipates improving the predicted model further as additional data becomes available.
- **Designation of entity for signal testing.** Under SHVIA, broadcast stations may grant waivers to satellite subscribers who are ineligible to receive distant signals via satellite because they have been predicted to be able to receive local network station signals off the air. If their waiver is denied, consumers can request a test of the actual signal strength received at their homes. If the broadcast station and satellite provider cannot agree on who should conduct the test, the American Radio Relay League (ARRL) will make the determination. The ARRL was assigned that role because it has no commercial connection with the delivery of television services and its members are engaged in activities related to the measurement of radio field intensity.
- **Satellite "must-carry."** Through Dec. 31, 2001, satellite carriers may retransmit TV broadcast signals on a station-by-station basis, with the consent of the broadcaster. This is a transition period intended to provide the satellite carriers with time to begin providing local signals into local markets ("local-into-local").

However, as of Jan. 1, 2002, each satellite carrier carrying the signal of any television station in a market must carry upon request the signals of all television stations in that market.

The Commission seeks comments on a number of issues arising from the enactment of the satellite must-carry. While it appears to be Congress' intent to make satellite must-carry the equivalent of cable must-carry, there are differences between the actual operation of the two services. Cable operators distribute programming from local headends, while satellite operators tend to have fewer, more regional or national uplink facilities. Satellite carriers have no legal obligation to have a basic service tier, nor are they required to place broadcast stations in any particular channel position. However, satellite carriers are required to position local broadcast stations on contiguous channels. Thus, the Commission asks whether satellite carriers should be required to notify all local broadcast stations in a particular market of their right to must-carry once any local station is being carried. It asks whether markets for satellite carriage purposes should be identical to markets for cable must-carry, including markets modified by petition. The Commission also asks about the costs and locations of satellite uplink facilities and the nature of a high-quality signal to be delivered to such facilities. Another question is whether satellite carriers should be required to carry both the analog and digital signals of the same station during the DTV transition.

Facility identification numbers

The FCC wants broadcasters filing applications and reports with the agency to include the "Facility Identification Number" of each station.

A facility identification number is a unique number assigned by the FCC to each AM, FM, TV, translator and booster station. This number is being employed to provide an unvarying cross-reference between various databases at the Commission, and to minimize discrepancies caused by call sign or facilities changes. Facility ID numbers are now required on most FCC forms and on all correspondence.

To access your Facility ID, log on to the FCC's website (www.fcc.gov.), click on "Bureaus and Offices," then "Mass Media" (in the left-hand box), then "CDBS Public Access," and then "Search for Station Information." Only your call letters need be entered to access your Facility ID number. ■

Dateline

On or before Oct. 1, television stations in Florida, Puerto Rico and the Virgin Islands must file with the FCC their initial EEO Statements of Compliance (FCC Form 397). Sept. 30 is the deadline for all stations to file their annual employment reports (FCC Form 395-B). Annual regulatory fees will be due in mid-September.

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

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

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The great modulation debate?

BY BRAD DICK, EDITOR

The intensity of the debate between the 8VSB and COFDM camps has grown exponentially in the past few months. With claims and counterclaims, both parties have made their case, sometimes behind the closed doors of ATSC committee meetings and in forums where there's usually a lot more fluff than substance. So, this month we decided to pose a key question to both camps in an effort to bring some clarity to the question on what 8VSB's adoption would mean to consumers. What should have been an easy assignment for all parties, proved too big a challenge for the 8VSB camp.

Given first shot at the question was the father of the technology, the ATSC. After all, 8VSB was its recommendation in the first place. The group's executive director, Mark Richer, was contacted and asked to respond to the question. While he offered to "write a piece on the activities of the ATSC," he declined to answer the specific question. Then we asked Frank Emory, Motorola, a member of the ATSC subcommittee on 8VSB technology and intimately involved in its current re-examination. No response. Two other individuals involved with either the ATSC directly or publicly supportive of 8VSB were asked and both declined. OK, if the technology's main proponents won't respond, how about a manufacturer of 8VSB equipment?

Harris was asked provide a written response, but they too declined. It looks like someone sent word to the ATSC crowd to hunker down and shut up.

In an effort to provide readers with a sense of the 8VSB position, we have included comments from two witnesses' prepared testimony on DTV before the House Subcommittee on Telecommunications, Trade and Consumer Protection.

Noted COFDM and DVB advocate Dermot Nolan responded to *Broadcast Engineering's* request for a statement of the case for COFDM. ■

The case for COFDM

EXPERT
Dermont Nolan

The current U.S. DTV disaster has its roots in a fatally flawed commercial process and the earlier HDTV standards wars between Europe, Japan and the U.S. in the 1980s. In 1992, Europe's analog HDTV strategy lay ruined with the U.S. having proposed an all-digital HDTV system and Japan's Hivision analog HDTV system heading to commercial disaster. Europe dusted itself down, and the compass was reset for a market-led approach to digital television. The DVB (Digital Video Broadcasting) group formed in 1993, initially with European members, and later expanded to a global franchise. This sequence of events is critical to understanding the perilous position in which ATSC now finds itself.

What could be called a backstairs deal between the main U.S. DTV system proponents led to the ATSC standard. Zenith contributed the 8VSB transmission standard, selected in preference to QAM and a much more primitive version of COFDM than today's DVB-T system. U.S. voices arguing for COFDM commercialization were overruled by a cozy crony capitalism deal between the proponents and the FCC. All concerned in the ATSC assumed, without the benefit of real-world consumer-level testing, that 8VSB receivability would be relatively straightforward. This turned out to be a fatally flawed assumption and later proved central in assessing the commercial viability of ATSC. Without easy robust reliable receivability across all classes of antenna system (fixed outdoor, portable indoor and mobile) a DTV system is DOA at the consumer and commercial level. Simple DTV receivability is economically indispensible.

Work began in 1993 on the DVB-T digital terrestrial television system. The Europeans, having tested and discarded single carrier systems, were undaunted by the (at the time) perceived complexity in COFDM silicon instantiations. In 1993-1997, the DVB-T standard was defined, developed and implemented. Two years of real-world field-testing took place throughout Europe before finalization in December 1997. Around 2000 man years were required to commercialize the DVB-T/COFDM system.

There is a major structural difference between DVB-T and ATSC: DVB-T was designed against a set of flexible and extensible broadcaster requirements formulated in 1994 and subsequently extended in a backwards compatible manner. This is ironic given that the ATSC RF Group only began defining broadcaster requirements seven years after the system was chosen. The ATSC Broadcasters Requirements, now circulating in the public domain, are a subset of those used in the implementation of DVB-T six years ago.

Attempts to retrofit commercial requirements against preselected technologies usually end in failure, as opposed to the relative successes of a bottom-up design to meet the requirements. This fundamentally explains why the DVB-T/COFDM system has been an instant commercial success: it meets the requirements for 21st century DTV broadcasting including HDTV, reliable

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Initial perceptions widely held in 1997-98, that ATSC would dominate globally, were shattered when Australia threw out ATSC in a straight shoot-out with DVB-T. Australia's main reason for the choice was COFDM's famously robust reliable receivability. Three further ATSC defeats followed around the world in straight shoot-outs with COFDM in Brazil, India and Singapore.

Sinclair Broadcasting Group's U.S. DTV receivability campaign initiated in 1998, initially viewed with irritation by ATSC, exploded in ATSC's face with several very public demonstrations of 8VSB's shortcomings. The sheer firepower of the DVB-T COFDM system was demonstrated in the U.S., in 6Mhz channels, on several occasions in the period 1999-2000 with ever more devastating effect. This culminated in the NAB2000 hierarchical indoor HDTV/mobile DTV demonstration by DVB and Sinclair, showing the operational DVB-T system towered over ATSC as a broadcaster and consumer-friendly DTV system for this century.

Defection of ABC and NBC from the 8VSB camp in their (in)famous letter to the FCC in which they stated "8VSB does not provide reliable reception for our viewers" was almost the most devastating attack of all. This was topped by the Brazilian ABERT/SET final report on ATSC and COFDM DTV, which observed clinically, "The ATSC system does not fulfill the technical requirements for the continuity of the television broadcasting service."

Internationally, these developments have shattered the commercial prospects for ATSC/8VSB. Argentina, originally an ATSC adopter, cancelled the decision in April 2000 and now joins the COFDM camp. Brazil, having thrown out 8VSB, is now choosing between DVB-T and the upstart prototype ISDB-T system — essentially a Japanese DVB-T copy with some added bells and whistles. In South America there is a DTV certainty: the future is COFDM.

Globally, DVB-T now addresses markets of over 50 percent of all television households worldwide. It enjoys unprecedented economies of scale and scope, fully supports 6-, 7- and 8MHz RF environments, and over 1 million DVB-T/COFDM chips have been shipped, compared with perhaps 35,000 8VSB chips. The DVB-T system has critical economic mass and is positioned for a grandslam victory over its rivals.

Pressure for adoption of an Americanized DVB-T system will intensify given the choice is between a pragmatic, practical and proven DVB-T system and the undelivered, unquantified and uncertain future promises of ATSC. Economics and technical superiority dictates that COFDM, exiled for almost three decades, will in all probability return home to its U.S. birthplace to a hero's welcome from broadcasters and consumers. Thereafter, I fully expect American entrepreneurial ingenuity will relaunch DTV as a viable commercial, competitive and consumer proposition.

Dermot Nolan is a director of Telecommunications and Broadcast Services in the UK.

The case for 8VSB

From written presentations at the July 25 House subcommittee hearings on DTV:

• Matt Miller, president and CEO, NxtWave Communications:

"DTV broadcast signals already reach 60 percent of American households. 143 broadcast stations serving 50 markets are broadcasting over the air digital signals...

DTV manufacturers already have introduced a wide variety of DTV products. More than 100 models of DTV products — including fully integrated HDTV receivers, high resolution DTV monitors and digital set-top converter boxes — are currently available at hundreds of retail outlets across the country. Importantly, prices for DTV consumer equipment have decreased by up to 50 percent in the past year...

Delay harms consumer Interests... Delay engendered by a standards debate will confuse the marketplace and impede the provision of improved and new services to consumers and chill further DTV innovation and cost cutting efforts...

Concerns regarding the capabilities of the DTV standard are misguided and do not warrant reopening the decade-long standard-setting debate. The FCC, when unanimously *rejecting* Sinclair's Petition to permit the use of a second, non-compatible DTV transmission standard, correctly found that difficulties with respect to indoor reception reflect deficiencies in early generation DTV receiver technology, not the DTV standard itself. This is the critical distinction to be made. Recent field tests conducted by, among others, CBS, NxtWave and the FCC all have shown that these technical issues have been largely resolved. Reopening the DTV standard debate would delay rollout by years. ...

Although many broadcasters are transmitting a digital signal, unfortunately much of the programming is not digital high definition. ...The dearth of free, over-the-air HDTV programming is perhaps the greatest threat to the DTV transition, as it threatens to dampen consumer interest and investment in DTV, slow DTV equipment penetration, and delay the reclamation of broadcasters' analog spectrum."

• Dale Hatfield, chief, office of engineering and technology, FCC:

"The Commission's Advisory Committee on Advanced Television Service, a group selected to represent the interests of broadcasters and others in this matter, chose the 8VSB system as the modulation method that would best allow achievement of these goals. This choice was made after a long and thorough process of laboratory and field testing and subsequent evaluation that found 8VSB superior to other modulation technologies, including COFDM. ...

I believe that a mid-course change to introduce a new modulation technology at this late date could lead to lengthy and unacceptable delays in the DTV transition process and could undermine the service replication and interference goals on which the DTV transition is based. Notwithstanding the arguments and claims of the COFDM proponents that allowing optional use of COFDM could be accomplished quickly, any changes to the DTV transmission standard that would necessitate revisions to the DTV Table of Allotments could result in

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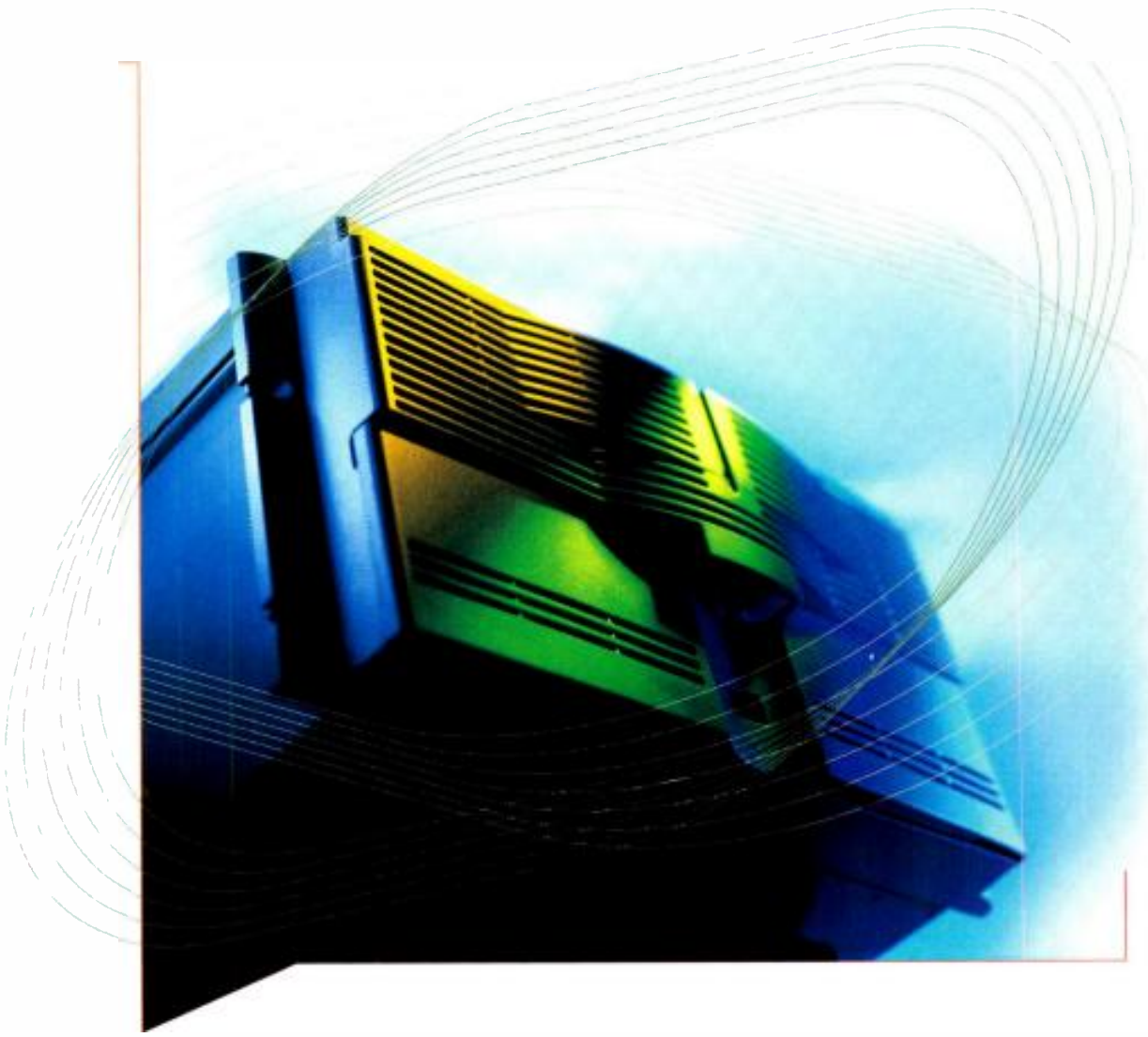

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years of delay in the DTV transition process. Such a delay would, at best, be unfortunate for broadcasters and the viewing public, and could lead to uncertainty that might jeopardize the ultimate success of the transition.

As you know, in February the Commission denied the Sinclair Broadcasting Group's request that that we modify our rules to allow broadcasters to transmit DTV signals using COFDM modulation in addition to the current Advanced Television System Committee (ATSC) 8VSB modulation standard. Sinclair had raised questions regarding the adequacy of 8VSB reception with simple indoor antennas in a station's core business area under complex multipath conditions. The Commission noted that it believed that what Sinclair had highlighted was a shortcoming of early DTV receiver implementation, rather than any basic flaw in the ATSC standard or an indication that replication of existing analog service is unachievable with the 8VSB standard. ...

I am also concerned that one of the primary motivations behind this review of the DTV standard by some members of the broadcast industry appears to be a purported advantage of COFDM to provide portable and mobile services — rather than any ability of COFDM to provide improved or enhanced television broadcast service. I believe that this raises fundamental issues regarding the intent of Congress and the Commission's rules providing broadcasters with a free second channel for DTV operations.

Consistent with the direction of Congress, the Commission gave each broadcaster temporary use of an extra 6MHz of spectrum for the DTV transition and it is intended that stations use this resource principally for television broadcasting...

It is the mandate of Congress and the desire of the American people that the principal service of broadcast television remain the provision of free video programming to television viewers, and broadcasters need to plan for the digital transition in accordance with this purpose. To the extent that some broadcasters may desire to enter the market for the provision of mobile services, they can do so by acquiring licenses in the newly reallocated spectrum at 700Mhz or some other spectrum that is allocated for mobile services.

Any efforts by broadcasters to reallocate their spectrum to new mobile data services at the expense of free, over-the-air television raises serious questions as to whether broadcasters would be operating in a manner consistent with the purpose for which Congress made available to them a second digital license for free...

I do not oppose efforts to reconfirm that 8VSB operates as designed to replicate NTSC. Nor do I oppose efforts to improve the 8VSB standard to permit reception even where NTSC service is not available today. However, these efforts should be focused on performance attributes that are relevant to digital television broadcasting and are consistent with the goals established by the Congress and the Commission for DTV. In particular, any efforts by the broadcast industry should ensure that no changes would be required to the DTV Table of Allotments. In addition, they should adhere to our service replication and minimum interference goals to ensure that the American public will not be deprived of free, over-the-air television service. ■

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Sampling

BY MICHAEL ROBIN

The world around us is analog. Our perception mechanism, be it of light or sound waves, is also analog. Light perception by humans occupies only a single octave in the wideband electromagnetic spectrum. Sound perception by humans occupies about 20 octaves, extending from 20Hz to 20kHz. Analog video and audio transducers transform the original analog information into an electrical signal, e.g. voltage, with a bandwidth related to the fidelity of reproduction of the original analog information.

A transmission medium can be used to carry out the transmission of the electrical signal from one point to another. The simplest point-to-point signal transmission medium is an electrical cable. Inherent cumulative losses and signal distortions introduced by the cable limit the length of cable that can be used to transmit electrical signals.

The need for long distance as well as wide-area electrical signal distribution has resulted in the development of the modulation concept. Modulation consists of varying certain characteristics of a high frequency carrier, such as its amplitude or frequency, in proportion to the electrical signal amplitude. The carrier frequency is considerably higher than the original baseband signal. A direct consequence is the fact that the modulating (baseband) signal now results in a modulated carrier and its sidebands, with a total bandwidth which is a small percentage of the carrier frequency (i.e. 6MHz bandwidth vs. 500MHz carrier).

Modulation consists of varying certain characteristics of a high frequency carrier.

The two popular analog modulation concepts are amplitude modulation (AM) and frequency modulation (FM). AM is a relatively efficient transmission method. Its transmitted bandwidth is equal to 2Fmax, where Fmax is the maximum baseband frequency. AM is vulnerable to noise as well as linear and nonlinear distortions. FM is superior in terms of SNR and distortions but requires a transmission bandwidth equal to several times 2Fmax.

Many analog signal distribution difficulties can be eliminated if the analog signal is digitized prior to modulation and transmission. The robustness of the digital signal is offset by the extremely wide bandwidth required for signal distribution and transmission. However, unlike analog AM and FM, bit-rate reduction techniques, such as MPEG, can be used to substantially reduce the digital signal bandwidth. This article examines some of the basic analog-to-digital conversion concepts with an emphasis on the sampling concept.

The conversion of an analog electrical signal to its digital representation involves two inseparable processes: the periodic sampling of the analog signal and the digital representation of the sampled waveform.

The sampling concept

The sampling of an analog signal consists of checking signal amplitude at regular intervals (T). Shannon/Nyquist stipulates that the sampling frequency, Fs = 1/T, be at least twice the maximum baseband frequency Fs≥2Fmax.

Figure 1 shows the sampling mechanism of a sine wave. The amplitude of the sampled sine wave is measured at constant time intervals (T). The amplitude of the samples is modulated by the sampled frequency resulting in a process of pulse amplitude modulation (PAM).

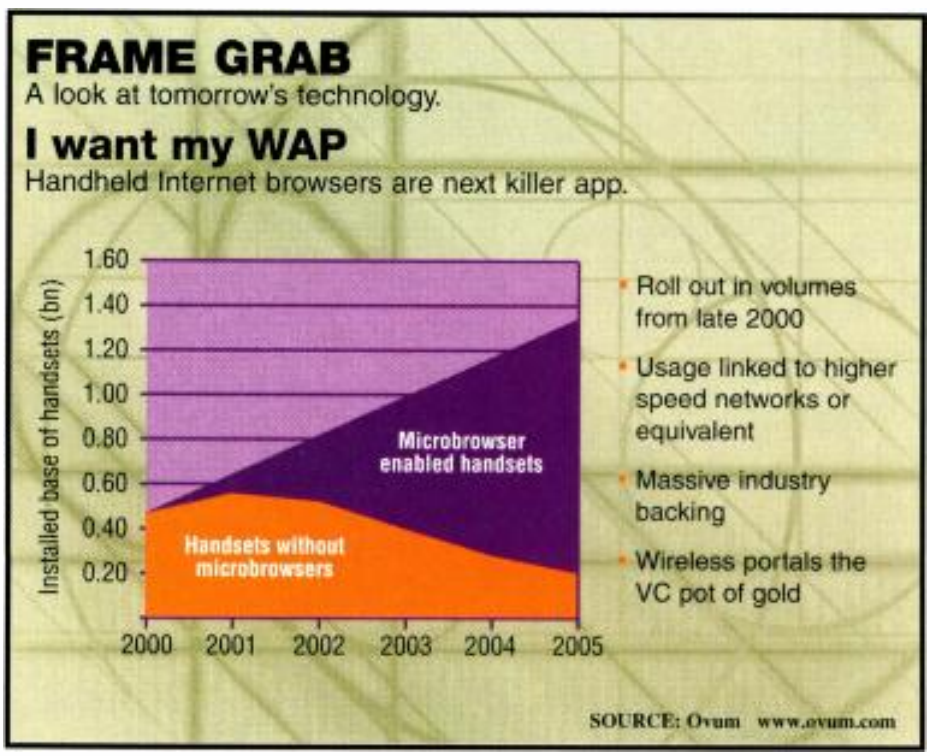

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Figure 2 shows an ideal spectrum of a PAM process where Fs = 2Fb and Fb is the baseband spectrum. The PAM spectrum resembles an AM spectrum except that, in addition to the Fs carrier and its sidebands, there are spectral components at multiples of Fs. In the real world the baseband spectrum exceeds 1/2Fs. To avoid the generation of spurious responses, known as aliasing, the baseband spectrum has to be limited to less than 1/2Fs through the use of a well-designed, brick-wall low-pass filter. A good low-pass filter features a sharp cutoff while avoiding passband ripple effects and high frequency group delays, which degrade the analog signal characteristics resulting in unacceptable performance.

Figure 3 shows an example of a sine wave F sampled at 1.33 times its frequency. This results in an insufficient number of samples and the original waveform cannot be reconstructed. The dotted line represents the reconstructed sine wave with a frequency of F/3.

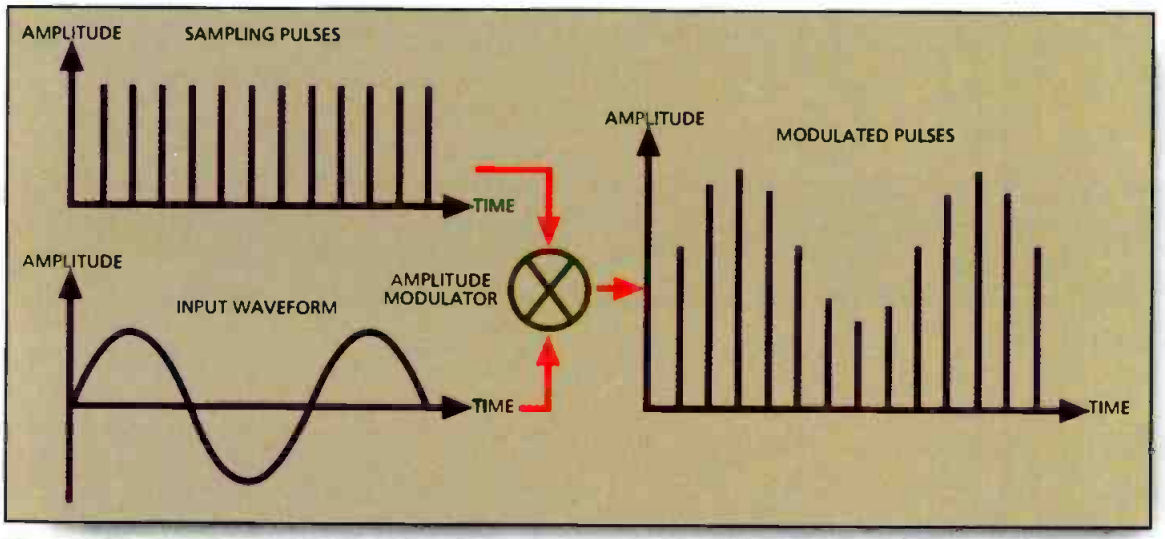

Figure 1: The sampling process results in pulse amplitude modulation (PAM).

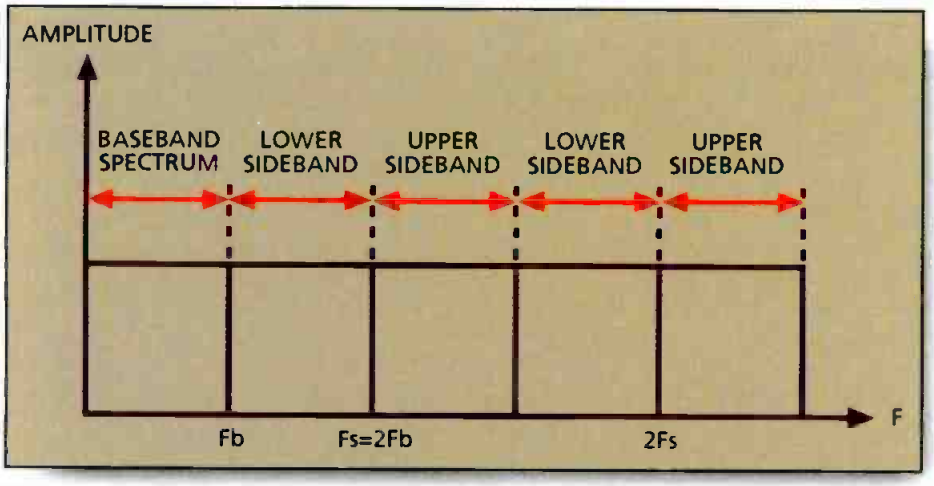

Figure 2: The ideal spectrum of a sampled baseband signal includes the baseband spectrum as well as upper and lower sidebands around 2Fb and 2Fs.

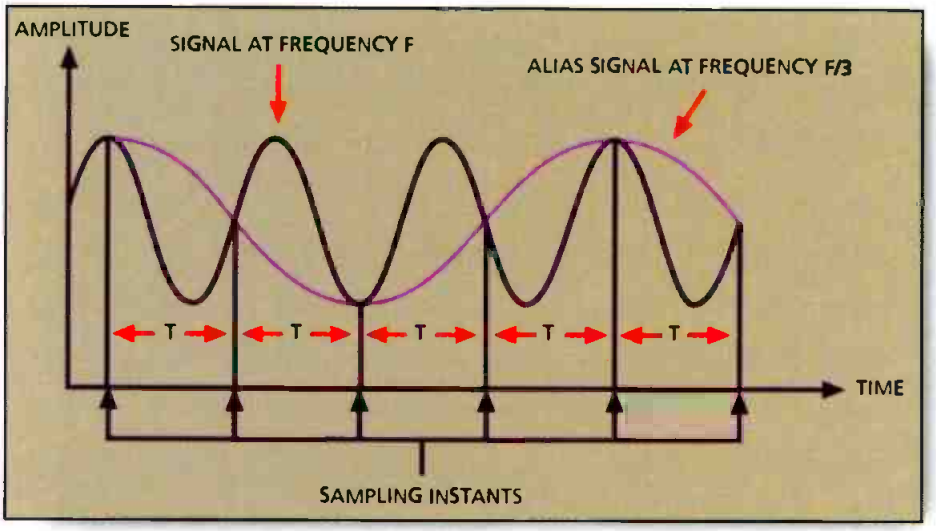

Figure 3: Sampling a sine wave with a sample rate of 1.33 times its frequency (F) results in an alias signal at F/3.

Figure 4 shows the PAM spectrum where Fs<2Fb. The result is the lower sideband of Fs overlaps the baseband Fb resulting in aliasing. A similar situation exists with the harmonics of Fs and their sidebands, which are also overlapping. The aliasing components of the PAM spectrum result in audible or visible (as the case may be) spurious low frequency spectral components, which cannot be eliminated.

Figure 5 shows the PAM spectrum of a sampled filtered baseband signal. Note that Fs>2Fb to allow the design of realizable and cost-effective low-pass filters with minimum ripple and high frequency group-delay.

PAM results in a sequence of pulses whose amplitude is proportional to the amplitude of the sampled analog signal at the sampling instant. The process of pulse code modulation (PCM) helps represent the amplitudes of the successive samples of the analog waveform with binary integers. Thus an infinite number of possible pulse amplitude values are converted to a finite number of discrete levels, Q according to the expression $Q = 2^n$, where n is the number of bits per sample. Video signals are sampled with a resolution of eight or 10 bits per sample. Audio signals are sampled with a resolution of 16 bits per sample (CD format) and between 20 and 24 in studio productions. Once in binary form, the numbers are transmitted as on (1) and off (0) pulses. Each sequence of pulses is a code for a sample amplitude, hence the name pulse code modulation.

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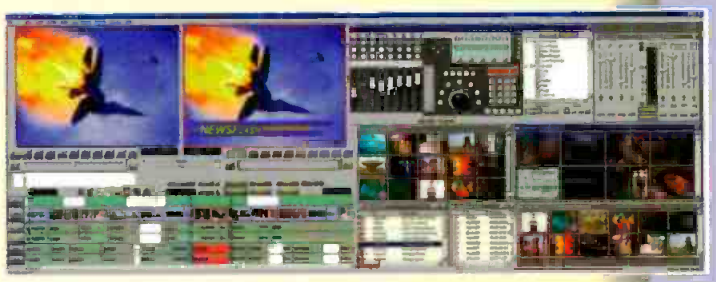

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Sampling video signals

The sampling of analog video signals requires that the sampling frequency be a multiple of a significant analog video frequency such as Fh (horizontal scanning frequency) or Fsc (chrominance subcarrier frequency). This allows the easy generation of the sampling frequency. Early digital video equipment sampled composite NTSC or PAL video signals using a derived sampling frequency of 3Fsc (10.74MHz in NTSC and 13.29MHz for PAL). Later approaches sampled composite video signals at 4Fsc (14.3MHz in NTSC and 17.7MHz in PAL). Some composite digital videotape recorders such as the D2 and the D3 digital videotape format enjoyed some popularity, mainly in North America, as black box replacements for obsolete quad and helical analog VTRs.

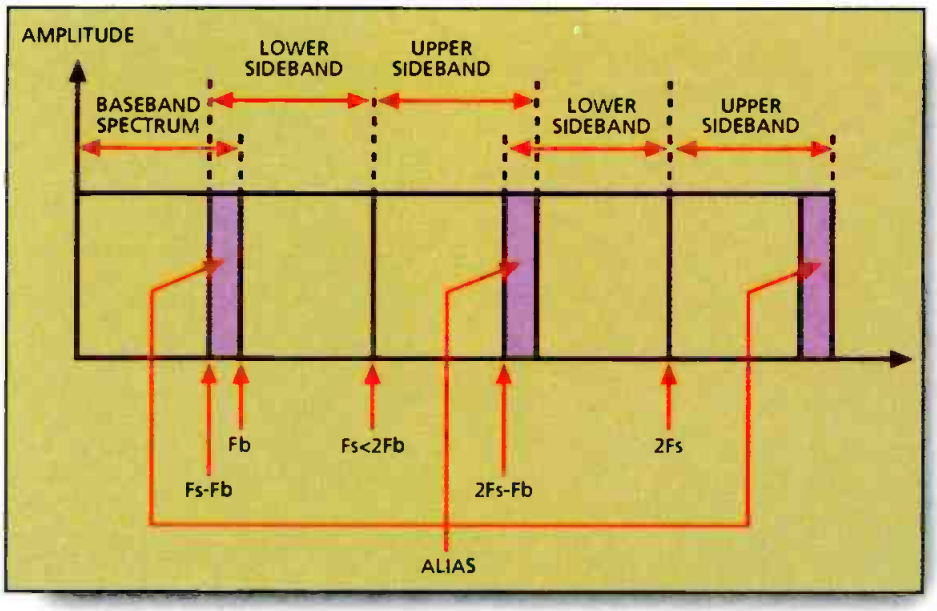

Figure 4: Spectrum view of aliasing caused by the use of a low sampling frequency. Aliasing occurs when the sidebands overlap.

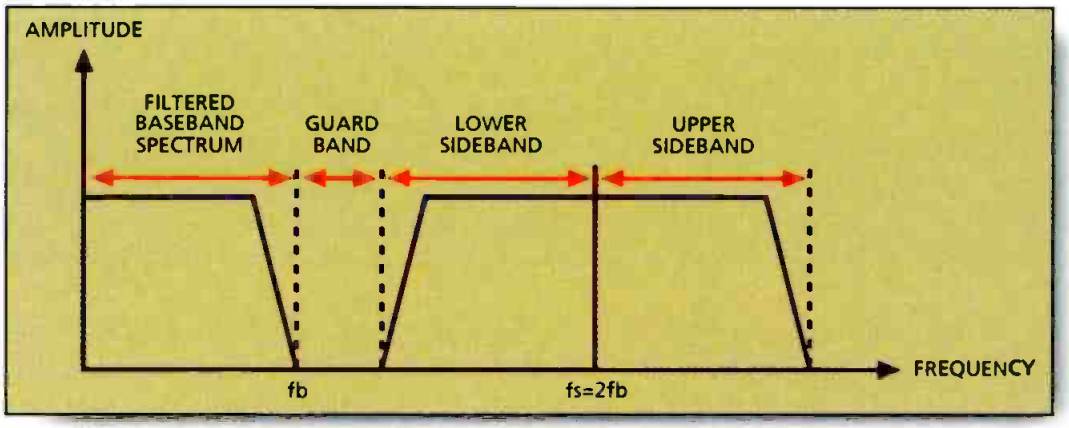

Figure 5: The spectrum of a sampled and filtered baseband signal.

An international effort towards digital video standardization resulted in the ITU.B R601 component digital standard. Here analog luminance (E'Y) and scaled color-difference (E'CB and E'CR) are separately sampled to generate Y, CB and CR digital signals. The chosen sampling frequencies are a multiple of the horizontal scanning frequency Fh of both the 525/60 and 625/50 scanning formats as well as of 3.375MHz, the lowest sampling frequency. This resulted in a family of standard definition (SDTV) component digital formats known as 4:4:4, 4:2:2 and 4:1:1, where the 1 factor identifies the lowest sampling frequency of 3.375MHz. The most popular studio equipment sampling strategy is 4:2:2 resulting in Fs = 13.5MHz (4 x 3.375 MHz) for Y and Fs = 6.75MHz (2 x 3.375 MHz) for each of the color difference signals. The characteristics of the low-pass anti-aliasing filters are tightly specified and controlled resulting in superior performance. A component digital VTR, the D1 format, was the first practical application of the component digital standard, which, incorrectly, is sometimes referred to as the D1 standard.

The chosen sampling frequencies result in an integer and equal number of sample periods during the active line interval for both SD scanning formats. A similar approach is used for the high definition formats. Here the sampling strategy follows the SD concept of sampling the Y signal at twice the sampling frequency of the CB and CR signals. The HD sampling strategies are colloquially, and incorrectly, referred to as 4:2:2. In a future series of articles the characteristics of the various HD scanning formats will be examined in detail.

The HD sampling strategies are colloquially, and incorrectly, referred to as 4:2:2.

Audio signal sampling

There are two preferred sampling frequencies: 44.1kHz used for CDs and 48kHz used for studio productions. The use of both sampling frequencies in a studio environment requires sample-rate converters. In addition, the audio sampling frequency has to be coherent (derived from the same master clock) with the video sampling frequencies. Unlike digital video, the audio low-pass anti-aliasing filters are not specified but left at the discretion of the equipment manufacturer. Among the methods manufacturers used to reduce the possible occurrence of aliasing is oversampling of the analog audio signals at multiples of 48kHz.

We have examined some of the aspects of sampling of analog signals. Because sampling is the first step in the analog-to-digital conversion, its performance directly affects the performance of the whole digital system following it. ■

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

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Fibre Channel storage

BY BRAD GILMER

The promise of Fibre Channel storage is, that by using a high-speed networking technology, you can easily connect a wide variety of storage devices to your server and you can share content stored on these storage devices. Much of this promise has been delivered, but there are still some issues to be resolved.

For many years, storage devices were an integral part of the server itself. Typically, servers were connected to disk drives using IDE or SCSI interfaces. On very fast computers, Ultra Wide SCSI was used to increase transfer rate. The problem with this approach was that it is limited by the constraints of either IDE or SCSI (limited cable distance and a limited number of available drives), and that it did not allow efficient sharing of high-bandwidth data such as video.

Fibre Channel leverages off existing technology. It allows manufacturers to continue using SCSI software commands while replacing the limited IDE or SCSI physical layer with a new architecture. Before we get into a discussion of Fibre Channel storage, let's review some basics. The Fibre Channel Association defines Fibre Channel as follows:

"Fibre Channel is a one gigabit per second data transfer interface technology that maps several common transport protocols including IP and SCSI, allowing it to merge high-speed I/O and networking functionality in a single connectivity technology. Fibre Channel is an open standard as defined by ANSI and OSI standards and operates over copper and fiber optic cabling at distances of up to 10 kilometers. It is unique in its support of multiple inter-operable topologies including point-to-point, arbitrated loop and switching and it offers several qualities of service for network optimization. With its large packet sizes, Fibre Channel is ideal for storage, video, graphics, and mass data transfer applications."

Within this definition you will find several key concepts. First, Fibre Channel allows three common topologies; point-to-point, arbitrated loop and switched. Second, it allows designers to employ two very common protocols, IP and SCSI. This allows manufacturers to easily migrate existing products that are either IP- or SCSI-based to Fibre Channel. Finally, unlike ATM, Fibre Channel block sizes are quite large, providing a good match with the large file sizes typically found in video.

Fibre Channel block sizes are very large, providing a good match with the large file sizes typically found in video.

Topologies

Point-to-point is the simplest and least expensive topology to implement. It is also self-explanatory. In an equipment pair, the Fibre Channel Gigabit Linking Modules (GLMs) are connected back-to-back. No hubs or other control devices are needed. Costs are low, installation is simple, bandwidth on the network is well defined and control/interoperability issues are limited, so resolving technical issues is a breeze.

The next step up in Fibre Channel topology is the Fibre Channel arbitrated loop (FC-AL). (See Figure 1.) FC-AL has several advantages. As with point-to-point, it is low cost, and external hardware is not required. In small configurations it is simple. For that reason, it is easy to troubleshoot. It is also expandable, with up to 126 devices per loop. Single-loop FC-AL does have some problems though. First, it is prone to failure. Because it is a single loop, a break anywhere in this loop crashes the entire network. Second, in a single-loop

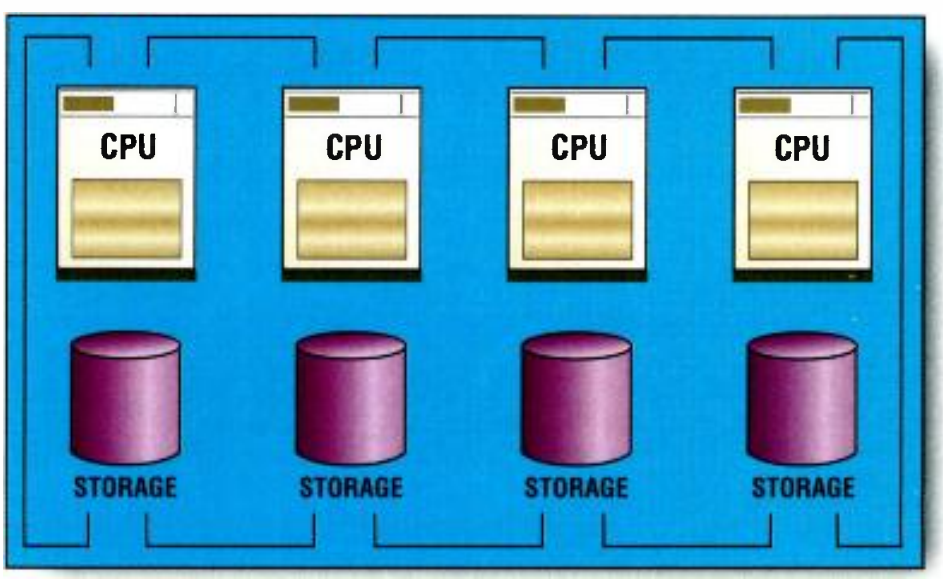
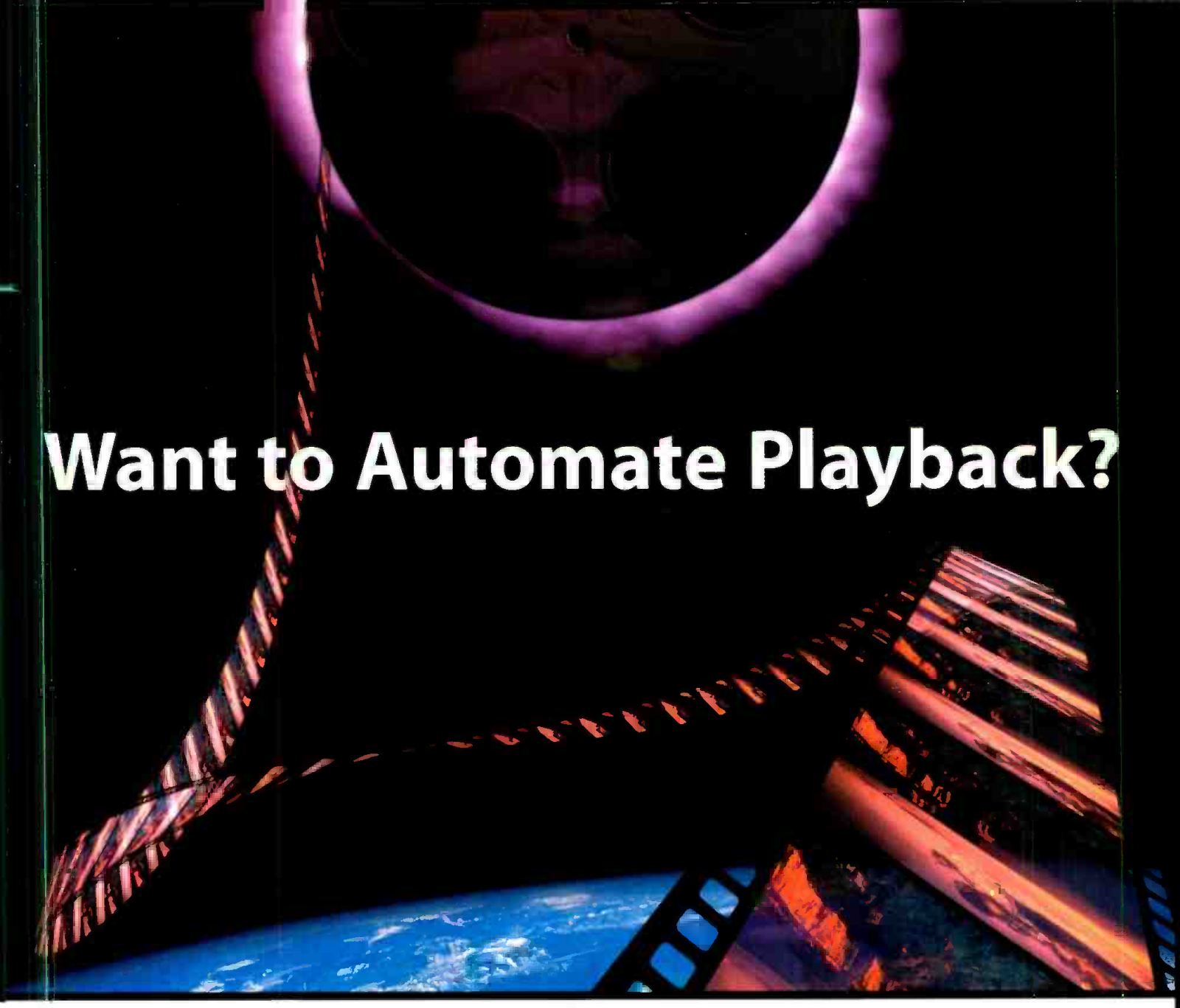


Figure 1. Fibre Channel Arbitrated Loop (FC-AL) systems can employ a single- (shown) or double-loop. Single-loop systems are low-cost and easy to troubleshoot. Dual-loop configurations are more complex, but also more robust.



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configuration, Fibre Channel does not support simultaneous communications, seriously limiting network bandwidth.

Broadcasters will find that most vendors employ a dual-loop configuration. The dual-loop FC-AL eliminates the single loop failure mechanism. If one of the loops fails, the other assumes the load. A dual-loop FC-AL also allows simultaneous communications between devices, greatly increasing available bandwidth. While the cost of dual-loop topology may be greater, for most applications, the security and performance increases are worth the increased costs.

The third common Fibre Channel topology is switched fabric. If you are familiar with switched Ethernet networks, you understand the basic premise behind switched Fibre Channel.

Fibre Channel and SANs

One way to think of SAN is that it is a high-performance network on the other side of a server (see Figure 2). Many networks provide connectivity between a server and remote workstations. A SAN provides connectivity between servers and storage. The leap with SAN is to separate computing (host) functions from the storage itself. Once the storage is separate from the processor, multiple processors or servers can access a pool of common storage.

One benefit of a large SAN system is that many workstations using multiple processors can have access to the same data at (almost) the same time. This allows users to improve workflow, create collaborative workgroups and improve efficiency. SAN applications include news environments, where multiple editors can access the same raw footage, creating different packages from the same material, and in broadcast playout applications, where the same content can be played out of multiple servers to multiple channels.

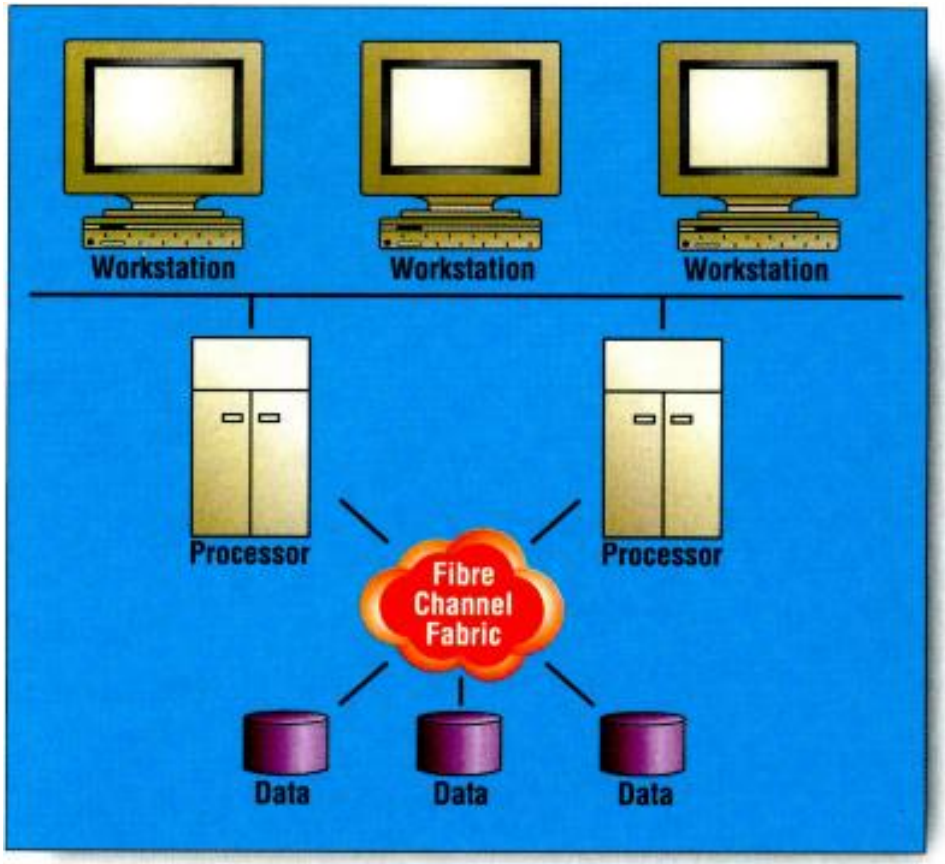

Figure 2. SANs offer a high-performance networked connection between storage systems and servers. This allows more than one server to connect directly to storage, reducing processor overhead and bottlenecks.

Generally, applications are not SAN aware. Applications make storage requests of the operating system (OS) and the OS handles the details. When an application makes a storage-related request, the OS communicates with the storage device through a Fibre Channel switched network typically referred to as Fibre Channel fabric. The OS talks to the storage controller using standard SCSI commands. The SCSI drivers referred to are the drivers responsible for generating SCSI software commands, not SCSI physical connections. This is an important distinction. SCSI commands are still sent across the network. However, using Fibre Channel switched fabric eliminates the limitations of SCSI hardware.

The GLU, Fibre Channel switch and Fibre Channel storage (typically RAID) controller comprise the SAN. If you are familiar with Ethernet systems, the GLU is similar to a network interface card or NIC. It provides the physical and electrical interface to the Fibre Channel fabric. Once the SCSI commands are delivered to the storage controller, the data is saved to or retrieved from the storage system based upon the configuration of the controller itself. From this point on, typical communication between the controller and the physical drives is either SCSI or IDE. Because the controller is usually co-located with the disk drives, SCSI and IDE limitations are generally not a problem.

As with any multi-user system accessing shared storage, conflicts can arise when two users request to write to the same record at the same time. Locking systems resolve these conflicts by allowing one user access to the data while temporarily locking access to the file for other users. These systems typically do not lock an entire file, but instead lock a particular record, row, or even byte of the disk data while it is being modified. Once the write operation is finished, the lock is removed.

One benefit of a large SAN system is that many workstations using multiple processors can have access to the same data at (almost) the same time.

Fibre Channel — Key benefits

- Data rates up to 100MB/s for single loop and 200MB/s for dual loop.
- Distances of up to 10km over fiber optic cabling. Recent advances can extend this to over 100 miles.
- Distances up to 47m over coax.
- Protocol independence – support for ATM, SCSI, IPI-3, IEEE 802, SBCS, HIPPI and IP.
- May employ point-to-point, loop and switched fabric topologies.
- Requires SCSI-like bus arbitration with non-simultaneous I/O unless dual loops are employed.
- May be used as either a storage interface or a network topology.
- Limited to 127 devices in a FC-AL, and 16 million devices in switched fabric.
- Uses absolute addressing.
- Performance remains constant as distance increases.

In very large SAN systems, redundancy becomes an issue because all of the material is stored in one large system. There are a number of strategies for dealing with the risk, but the most common approach is to provide two SCSI storage systems. This is relatively easy to implement because almost all Fibre Channel SCSI devices are dual port.

One note about SAN hardware: If you purchase a SAN solution, you might be surprised to learn that your installation does not use fiber optic cable. The Fibre Channel specifications allow networks to be built with copper or fiber. Non-optical Fibre Channel (non-OFC) implementations are fully supported using coax.

Fibre Channel compatibility

As a user, it seems logical that Fibre Channel would allow the mixing of different hardware and software applications on the SAN network. Unfortunately, this ideal has not been realized. Because of fundamental differences in the way low-level communications, locking and other issues are implemented, it is unlikely that you can build a SAN using a wide variety of SAN hardware and software. Generally, if you build a SAN for one application, you will have quite a challenge accessing that data using a different hardware and software configuration.

Fibre Channel seems well suited to meet the needs of the broadcaster. Its high speed, extensibility, large block size, low-latency components and promise of SAN all are well matched to the task of transporting program content. Traditional serial digital routing systems will likely carry data using the Serial Data Transport Interface (SDTI). However, it is clear that Fibre Channel will find its place in our facilities. ■

Brad Gilmer is president of Gilmer & Associates and is executive director of the Advanced Authoring Format Association.

SEND Send questions and comments to: brad_gilmer@intertec.com

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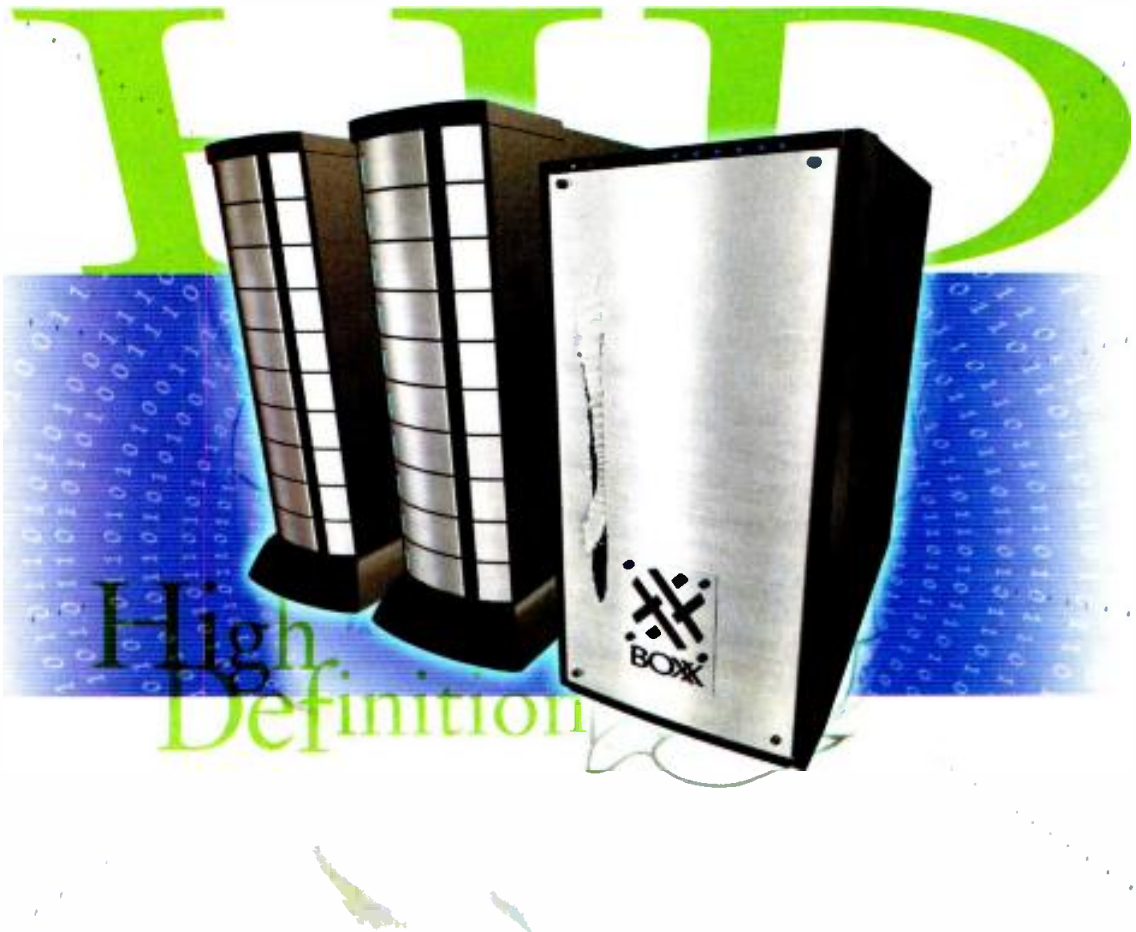

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Ask Dr. Digital

VBI cues and switches

BY STEVE EPSTEIN, TECHNICAL EDITOR

I am researching a project for our television network in the Philippines. It is composed of a central station in metro Manila, as well as 30 provincial stations in different cities. Programming and national commercials are all uplinked and sent to the provincial stations via satellite, where they are rebroadcast throughout the individual service areas.

For marketing reasons, we want to insert local commercials at each of the provincial stations, instead of airing only the national spots. We would like to seamlessly switch from the received programs to the locally inserted commercials and vice versa, automatically. What cueing options are available for these applications? I am thinking of attaching a playlist and multiplexing it with the video and audio signals. With this, our operators would know when the commercials would start and end. Will this be possible or is there a better method? Is VBI an option?

Richard V. Akia
Broadcast engineer
Studio 23
Manila, Philippines

Some time ago we ran a sidebar about the Turner Entertainment Network (TEN) doing much the same thing with the programming it sends to South America. The piece appeared in the April 1994 issue and was written by Tony Mancari, who was at TEN and built the encoders that were used. According to the piece, VITC user bits were used to signal switch closures for custom automation systems. TEN used bumpers before and after the breaks rather than encoding the information into the actual programs. At the beginning of the bumper, a VITC encoded cue tone signals a break eight seconds later. The cue tone also spins the heads on the machine that will be used to cover the break. Three seconds later, another tone triggers play. A third tone switches the router. At the end of the break a tone switches the router back. The main unit consists of a VITC reader and encoder. The reader has six switch closures available. For more than six functions, the switches can be encoded in combinations, allowing 64 functions. Modified timecode comparators are used to give longer contact closures. As far as I know, the system is still in use.

We would like to seamlessly switch from the received programs to the locally inserted commercials.

Alternately, tones on a second audio channel could be used, or some type of automation tied to a central clock via the Internet could also be an option. You could also use the Internet as a WAN to control the various automation systems directly, but there are numerous issues such as system security, the sophistication of the various automation systems involved and the reliability of the Internet connections in your area that must be carefully considered.

Odds and ends

On another note, Bob Suffel at KBTV-LP asked for a copy of the transistor modification for the Tektronix 529 scopes. I dusted that off and faxed him a copy. I sure would like to get that kind of lifespan out of some of today's computer equipment.

On the matter of frozen operators (May 2000), I received some questions/concerns about humidity and condensation. Humidity and condensation will only become a problem if outside air is introduced into a cold control room. If you consider a working AC system, the coldest point in the airflow path is the AC's evaporator coil. Most, if not all, condensation will take place there once the system stabilizes at the desired air temperature. If the system quits working, the overall air temperature will rise. Relative humidity will actually go down, simply because the warmer air will hold additional moisture. This also reduces/eliminates the likelihood of condensation. Once the AC system is repaired, condensation will again occur at or near the evaporator coil because of its temperature. There is no reason to introduce outside air unless the room temperature exceeds the outside air temperature (otherwise the outside air heats the room). If that is the case, there is no longer a danger of condensation.

Also, several observant readers caught a mistake I made in the June issue regarding old newsreels. There are 240 frames in 10 seconds of film, not 10 minutes. Ten minutes of film is 14,400 frames. Storage requirements also increase. Sorry about that.

If you would like more information on the VITC cue tone encoder, or would like a copy of the 529 modification, let me know. As usual, if you need help with a technical problem or have a comment, you can reach me at drdigital@compuserve.com. ■

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SYSTEMS DESIGN SHOWCASE

Main equipment racks at The FeedRoom contain satellite and fiber receivers, Leitch router, Sony DSR-40 tape decks and a Q/C station to stream news content over the Internet. Photos by Andy Washnik.

The FeedRoom

broadband with vision

by Craig Thomas

The FeedRoom, located in New York City, has assembled a group of traditional broadcasters who are providing video services in a non-traditional manner. As a new media company, The FeedRoom provides streaming news content delivered over the Internet at broadband speeds through a browser or a set-top box interface. Through the use of inventive hardware and software tools, news stories are collected from a variety of local, national and international partners, such as CBS, Reuters and USA Today. Website viewers access stories within a video-on-demand (VOD) framework. As the product evolves, users will be able to customize their online news experience and tailor the site for a given set of stories or topics. The FeedRoom launched the first iteration of VOD services in mid-July.

Conceptually, there are hundreds of compelling news stories produced daily by the television networks and their affiliates, but not all of them make it to air through traditional broadcast pathways. As the concept was developed, the design team saw an opportunity to offer these stories to the public in a high-quality format and eliminate the constraints of the networks' half-hour evening news format.

If The FeedRoom adopts a new project that involves 601 or MPEG, it can be handled easily because the facility is not designed around a format-specific workflow.

Because compression technology improves yearly and broadband is gaining prominence as the next video distribution mechanism, The FeedRoom is positioned at the proper point of convergence for success in the Internet marketplace.

Hybrid components and tools

From an engineering standpoint, there are both traditional and non-traditional aspects to The FeedRoom. On the traditional side, much of the content arrives over conventional paths, such as satellite or fiber loop. On the non-traditional side, not all of the video assets exist as files, and a mechanism was required that allows the transition from tape-based video into file-based assets — the basic requirement for streaming media. The output path is strictly new media and, as such, all of the video assets are encoded for 200kb/s streams.

The FeedRoom's workflow from input to output appears simple, but there are many layers of complexity. When a story reaches the facility, it is digitized and stored as a file. It is then edited, encoded as a streaming asset and placed within the video asset management system where it is distributed on the website.

The facility backbone consists of Solaris running on Sun servers with a switched Gigabit Ethernet foundation and switched 100Base-T protocol to the desktop. For ingest, material arrives via tape, satellite or a Williams Vyvx loop direct from our content providers. Recording, if required, occurs in the DV 25 format using Sony DSR-40 decks.

The FeedRoom uses Omneon's Video Area Network (VAN), an IEEE 1394-based infrastructure that is both format independent and scalable, for storage and asset management. The Omneon system is comprised of the following components:

- The Director: A powerful server with sophisticated file system and disk controller;
- The Store: An array of high-capacity and high-performance disks; and,
- Four MediaPorts: Each is a codec that provides conversion between the multiple supported formats and the IEEE 1394 network.

Using the VAN, serial 601 streams are imported, assets are dropped as DV 25 files on the Store and edited as required. A crucial aspect is that files can be "read" by a software-encoding tool that turns the DV assets into streaming assets. Because the Store is an NTFS volume, it can be used as a file server and managed by TEAMS asset management software from Artesia Technologies.

A Miranda Symphonie is used for transcoding in and out of the Omneon MediaPorts. A Leitch router is used for basic routing, and ServPlay Express software from Computer Engineering fulfills automation requirements between the Omneon VAN and the tape decks.

Final Cut Pro running on Apple Macintosh G4 systems is used for the editing stage. Currently, files are pulled directly from the Omneon Director's Ethernet port. However, when "1394 over IP" arrives and is fully implemented, a direct 1394 connection from the MediaPorts to the G4s will be utilized. The overall advantages of the G4 include the 1394 port, an extremely capable and low-cost editing package (Final Cut Pro) and a codec that works with standard DV files – not proprietary file formats.

For our output stage, two primary software tools are utilized for the conversion to streaming media: RealProducer Pro from RealNetworks and Media Cleaner Pro from Terran Interactive. Completed assets are transferred via FTP to the websites, which are hosted by either Enron Broadband Services or iBEAM Broadcasting. These companies

Desktop edit stations utilize Apple Final Cut Pro and Sony DVCAM tape machines with IEEE 1394 digital I/O technology.

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have created a cached distributed architecture for streaming media across the Internet, and their primary goal has always been to place their servers as close to the client as possible. The resulting benefit is less buffering, less latency and fewer dropped packets. Globix is also used for co-location requirements between web servers, and FreeFlow by Akamai Technologies Inc. is used for edge distribution of static content.

The FeedRoom is positioned at the proper point of convergence for success in the Internet marketplace.

Design criteria for new media

At a traditional television broadcast facility, the design factors are standard because the primary focus is on automation and the ability to route signals from point to point. At The FeedRoom, however, an entirely new set of design criteria for the output side was needed.

Initially, the design team had to overcome several intake hurdles, particularly the problem of bringing "editable" files to New York by encoding them remotely. Within this "file backhaul" framework, the difficulty was achieving a balance between file quality, degree of compression, bandwidth and transfer time. Even though this "emerging" transfer technology improves daily and new companies (and methods) are being evaluated, this aspect of our workflow is still undergoing refinement.

On the output side, the traditional television broadcast output is typically component analog, serial 601 or composite. But at The FeedRoom, the output is broadband, which is defined as a communication speed of over 128kb/s, including DSL, cable modems, wireless, satellite broadband and others. The FeedRoom's audience is Web-based and, as a result, perspectives must change. Ideally, in order to accomplish a broadband output, rich video assets must exist in a common and flexible format.

This is where the Omneon VAN helped us realize our design goals. Using the VAN, assets can be stored as DV 25 files and easily expressed through the Media Ports. More importantly, each file is readable by a computer and each has an information technology (IT) tag. Not only is each file accessible by an editing system, but each can be accessed and encoded for streaming and each can be managed as an asset in a complex database, with far more flexibility than can be realized with traditional tape-based assets.

From an upgradability and scalability standpoint, the Omneon system was also critical toward achieving the design goals. As the system grows larger, it becomes inherently fault tolerant. It can also grow to the terabyte sizes that are needed when dealing with these kinds of video assets. More importantly, Omneon (as a company) understands where they are headed in streaming space, and their implementation is intelligent. Because the Video Area Network is a multiformat system, it gives the flexibility to input 601, DV 25, DV 50 or MPEG, without the need to reconfigure equipment. If The FeedRoom adopts a new project that involves 601 or MPEG, it can be handled easily because the facility is not designed around a format-specific workflow.

Edit stations and media conversion servers are used to create online broadband news content.

With The FeedRoom's newly launched website and VOD services, it has successfully combined the best of traditional and new media components in an environment that provides an in-depth, high quality and compelling web news experience. Visit The FeedRoom at www.feedroom.com and evaluate for yourself the effectiveness of aggregated video distribution at broadband speeds. ■

Craig Thomas is director of information and technology for The FeedRoom, New York.

The FeedRoom uses Omneon's Video Area Network as the infrastructure for its newly launched website and VOD services.

Design Team

Craig Thomas, Director of Information and Technology
Jonathon Klein, CEO and President
David Lazecko, Director of Operations and Engineering
Jay Fine, Chief Technical Officer
Evan Geffner, System Architect
JJ Marshall, Chief Editor
National Teleconsultants, System Integrator

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Transmission & Distribution

Preparing towers for winter

BY DON MARKLEY

The shorter days and, for many of us, cold weather of winter will soon be upon us. Now is the time to take care of those outside repair projects while they can be completed in favorable conditions.

The station tower is often ignored in lieu of more pressing needs. After all, it doesn't send memos complaining of problems and doesn't complain when attention isn't paid. As a result, problems that develop are largely ignored until they become major. It is assumed that the station has completed a quarterly tower and lighting inspection and entered the date of such inspection into a log. It is also assumed that such an inspection is perfunctory and only involves seeing that the tower is still there and that the lights come on at night.

Inspections

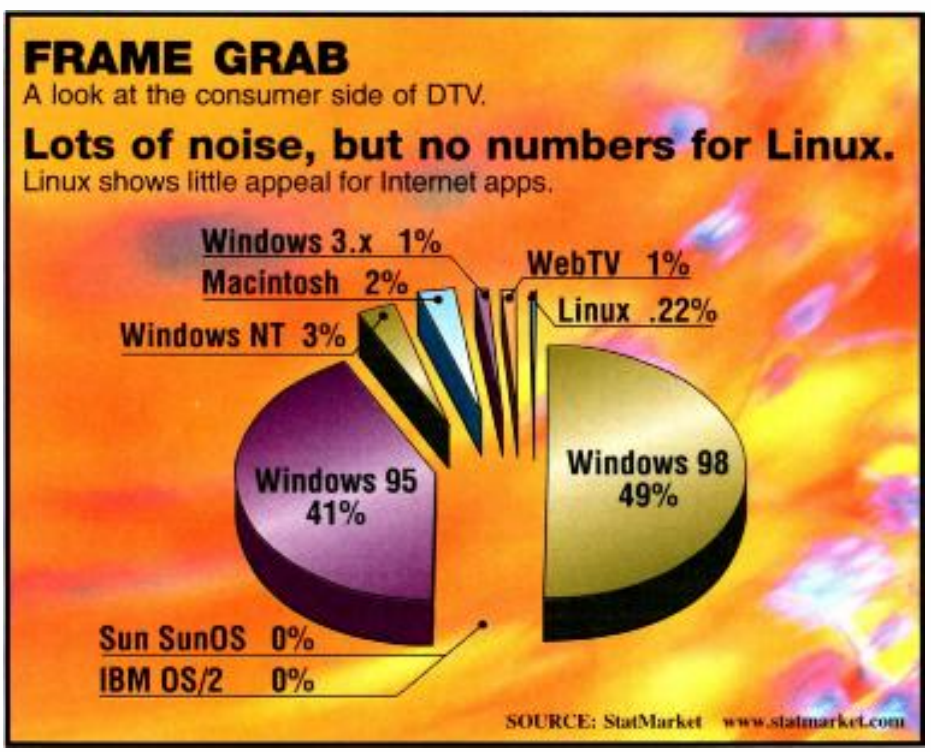
Before ice covers the tower members, it is recommended that a reputable rigger perform a complete and thorough tower inspection. The applicable standard for towers is ANSI/EIA/TIA 222F. While the station probably doesn't have a copy of the standard (and really doesn't need one), all good riggers will have a copy. An appendix to that standard contains a recommended outline for tower inspections. Have your rigger complete an inspection that is at least as rigorous as that contained in the standard.

Have your rigger complete an inspection that is at least as rigorous as that contained in the standard.

The inspection starts with a check of the tower's plumbness along with the associated guy wire tensions. The initial guy wire tensions are shown in the original calculations and data for your tower. If you do not have that information, contact the tower manufacturer and obtain the data for the station files. If the tower manufacturer is no longer in existence, have a registered structural engineer do the necessary calculations so you will have the correct data on file. Remember, the original tower design and load calculations were based on proper guy wire tensions to keep the tower stable in high winds. If the tensions are wrong, the load distribution on the tower will change with a probable reduction in the actual wind loads that the tower will withstand.

The rigger will be much more aware of the structural considerations than most stations' technicians. Suffice it to say that all rust should be removed from structural members with spot painting or spraying with liquid galvanizing. The ground wires and rods at each guy point and at the tower base should be inspected and repaired as necessary. Have photographs taken of any structural problems, cracked or broken tower members, severe rust conditions, holes in structural tubing, etc. Those problems should be immediately corrected if possible. For the more severe problems, submit the report (with the pictures) to a registered structural engineer for analysis and recommendations.

For towers with elevators, the inspection should include evaluation of the emergency braking system, control circuits and the hoisting equipment. The brakes should operate freely and not be painted into the free fall mode. The control circuits should operate consistently and dependably. Having



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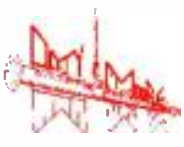

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a transmitter technician hold down a relay or apply a clip lead to run the elevator is not acceptable, although it is common. Remember, if it stops at the top, the problem is more severe than if it never moved. If it doesn't move, most technicians won't go up the tower. If it stops at the top, they must walk down which is almost as bad as the climb. As a personal favor, have the elevator working right before having your consulting engineer, who probably doesn't really want to go up in the first place, climb aboard.

In addition to the structural considerations, have the rigger feel all along the transmission lines for any hot spots. This is especially true at flanges and elbows. Existence of hot spots is a good indication of either failing connections or damage. This indication can show up before the reverse power or VSWR meter might draw attention to a problem and can definitely allow corrective action to be taken before a burnout occurs. The rigger should also note the condition and adjustment of all the spring hangers on the transmission lines. If several of the hangers slip, the load on the other hangers and on the top rigid hanger is increased, which can lead to a really spectacular system failure with all kinds of neat arcing and flying pieces of copper.

The tower paint itself can be of significant concern. If inspected by the Commission, the station can plan on having the color of the paint evaluated by use of a chip card. If the paint is faded past a certain point, the Commission will probably cite the station and a significant fine may result. International Orange is meant to be a highly visible color. Fading to a nice pastel may be pleasing to the eye but irritating to the Commission. By the way, those paint chip cards are available from the manufacturers of tower paints. Get one from your riggers or one of the tower manufacturers.

Lights on for safety

Now for those lights. Having corroded connections or faulty hardware replaced now is much better than doing such work in bitterly cold weather. It will also cost much less. In addition to inspections by riggers, all owners of lighted towers registered with the FCC are required to inspect the lighting at least once every twenty-four hours. The inspection may be either visually or by an automatic system. Owners also must maintain an alarm system that will provide an indication of tower light failure. In the case of such a failure, notification must be made to the Federal Aviation Administration if the failure cannot be corrected within 30 minutes of the time it is observed. This is a good idea even if only one side light is out, as it gets the information into the official record.

To notify the FAA, contact the nearest Flight Service Station (FSS). That office can be found in the telephone book under United States Government, Department of Transportation, and Federal Aviation Administration. It will be either a local or toll free number. Before the call is made, get your ducks in order. You will need the seven-digit tower registration number. You will also need to explain the number of lights involved, the reason for the failure (if known), the probable date for the completion of repairs and the height of the tower above mean sea level and ground level. You will also have to provide the name, title, address and telephone number of the person making the report.

If there is a problem with the lights and you have notified the FAA properly, the station's liability is limited.

On your side of the issue, when making the call, get the name of the person receiving the report. Then record that name, the name of the office called and the date and time of the call into the station log. This covers the situation where it is claimed that no notification was made when an accumulation of aircraft aluminum appears around the tower base.

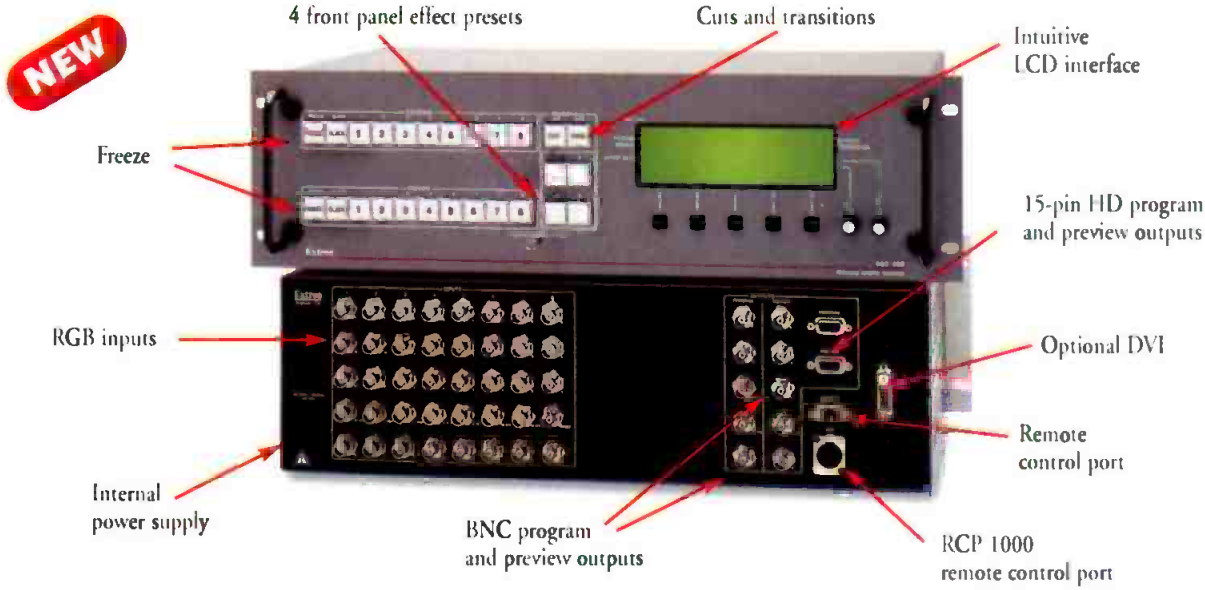
When they receive the notification, the FSS will issue a Notice to Airmen (NOTAM). Whenever a pilot calls for a weather briefing, normally prior to filing a flight plan, the briefer will give him all NOTAMs that apply to anything close to the planned route of flight. A pilot flying to or from an uncontrolled field and not obtaining a briefing is responsible for his own actions (and stupidity).

The FAA will continue giving out the NOTAM information for 15 days unless you notify them that the lights have been returned to normal operation. At the end of the 15-day period, the NOTAM will automatically be cancelled under the assumption that the repairs are finished. If they didn't take that action, some NOTAMs would go on forever. If the repairs have not been completed, it is your obligation to notify the FAA, They will then re-issue the NOTAM and notify the FCC that you have a problem. Needless to say, this is not a notification that you want to have in your file in Washington.

The notifications concerning tower lights are critical to you and the station. If there is a problem with the lights and you have notified the FAA properly, the station's liability is limited if an aircraft hits the tower. Any attorney will tell you that you are never really bulletproof from damage lawsuits. Even if you are totally in the clear, you can still be the victim of a lawsuit and a lot of money will have to be spent to prove that you are clean. With luck, those costs should be covered by the station's insurance.

That is the good side. If you think that the suits up front complain about the costs of tower repairs, just think what you would hear if they looked out the front door and found their Beemers covered with aluminum and AV gas and found out that you hadn't notified the FAA. First, the station's insurance company would probably take a walk because you were operating illegally. There would be no question as to the station's liability and the lawyers would come over the horizon like a giant cloud of locusts. When it was all over, you not only wouldn't have a job, you might not have a house. On the other hand, the suits wouldn't have a station. (They would probably lose their Beemers, too.) ■

Don Markley is president of Markley and Associates, Peoria, Il.



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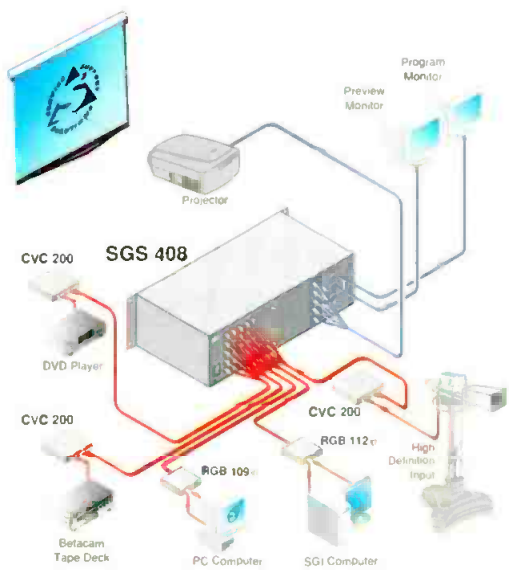

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Real-time systems, webcasting and the future of virtual scenery

BY ANN LATHAM CUDWORTH

With many television broadcast and Internet webcasting studios considering a virtual set system for the first time this year, this is probably a good time to review a list of factors to consider when purchasing.

This purchase decision should involve the three key users of the system: the set designer, the director and the video engineer/technical director. Each has valuable information regarding their work techniques and will be able to spot a "bad fit" immediately. The set designer needs to find a system that, with a minimum of fussing, will load their virtual set intact with textures into a real-time engine. The systems should also allow for the infinite number of tweaks and adjustments with little down time. The director requires a system that fits with their directorial methodology. The system should also allow the greatest latitude and creativity in camera positions and support script demands. A video engineer/technical director is looking for ease of use, low maintenance, and the possibility of plug-in programming and expandability.

Engineers, set designers and program directors must be involved in choosing an appropriate virtual set system for their facilities. KKYK-TV, Little Rock, AR, shown here, uses its virtual set, developed with Orad's CyberSet, for daily newscasts. Photo courtesy of Orad.

Of course, there will have to be some compromises made as a facility adjusts to using a virtual system, but those should be determined before choosing a system. Otherwise, the virtual set system will be a very expensive paperweight on the desk of the control room, and everyone will go back to doing things the old-fashioned way.

Furthermore, a wise buyer must consider the type of programming that will be presented. Not every show needs to be done in full-blown 3D. In situations where there is no walking and talking, a 2-1/2D system would be a better solution. Perhaps the best choice for a broadcast group is a hybrid system that allows for the use of both 2-1/2 and 3D on an as needed basis.

Survival of the biggest

Two of the major players in the virtual industry, RT-SET and Orad, have recently purchased their competitors and are expanding their product lines.

Earlier this year, RT-SET bought Evans & Sutherland's Mindset system. This acquisition of the E&S Digital Video division also included the E&S development team, worldwide customer base and distribution system.

In a parallel move, Orad purchased the ELSET virtual system from Accom, providing themselves with a broad range of new virtual products. This opens up the PC market for Orad as well, since ELSET has been developing along these lines for several years.

Options

With no two virtual projects ever the same, designers need an arsenal of options. Better designs, faster development and more visual detail cannot be achieved without taking advantage of multiple platforms and applications.

Having a PC-based system opens up the development end of virtual scenery, providing access to many 3D modeling applications that run on the more affordable Windows NT boxes, such as 3D Studio Max and Lightwave. Virtual sets that do not require real-time 3D during the production process and that can take advantage of compositing processes will be a good fit for these systems. Shows with talent in a stationary position seated at desks don't necessarily require a full-blown 3D real-time system and can take advantage of the PC-based systems. If the designer is clever, the set can be moved up to the real-time system without a rebuild.

NAB2000 and virtual scenery

With the focus on content, branding and Internet webcasting at NAB2000, several new opportunities for virtual scenery have appeared on the horizon. With broadcasters and Internet dotcoms seeking more and more collabo-

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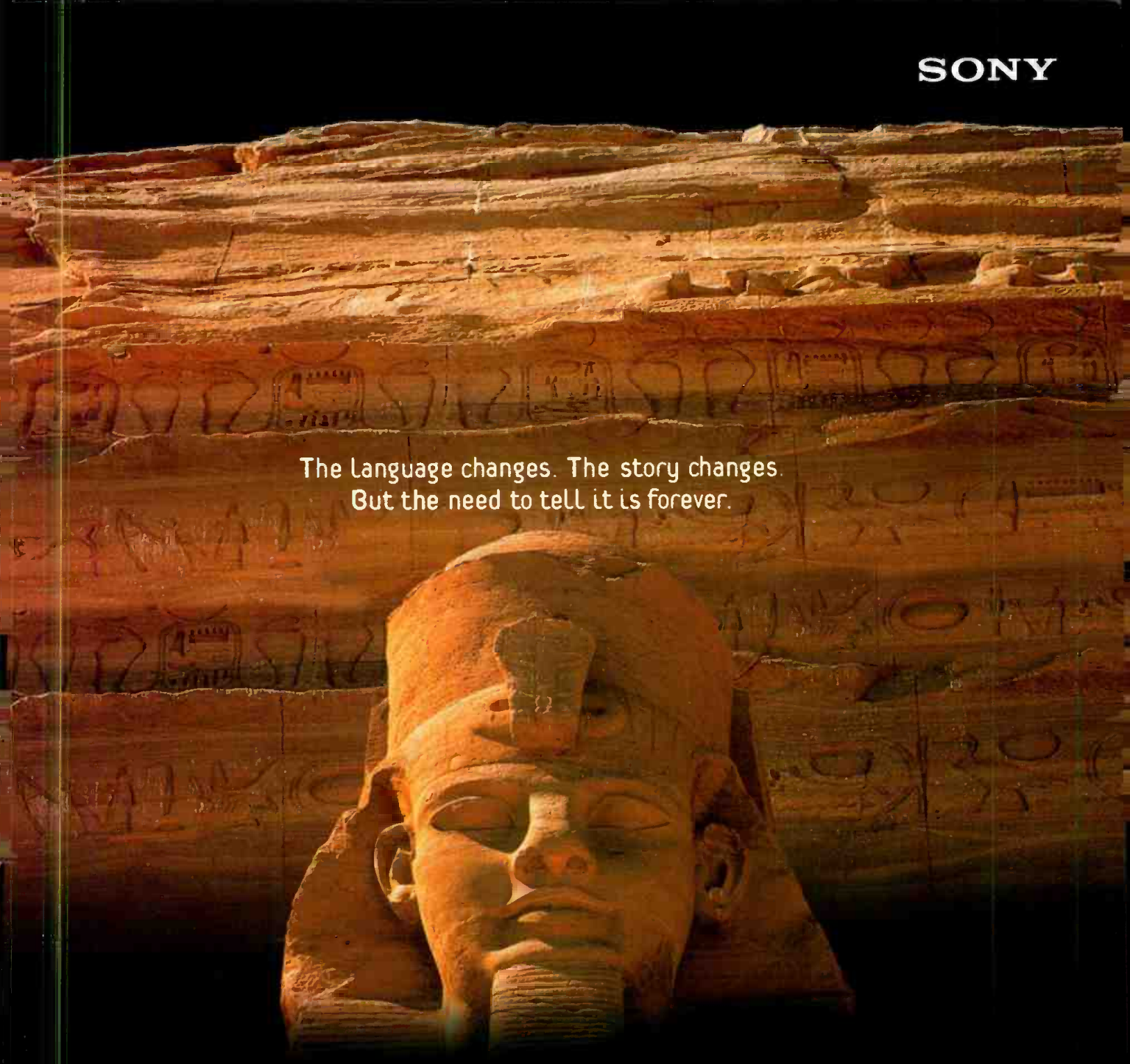

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Virtual sets offer broadcasters more flexibility in studio space and additional graphic options. Shown here is a CNBC Asia virtual set developed with Radamec's Virtual Scenario system. Photo courtesy of Radamec.

ventures, there is a burgeoning need for graphics coordination and virtual set creation.

Products such as 3DV System's Z-Cam, non-blue screen systems like Trinity's Holo-set, and 2-1/2D systems like Discreet's Frost and French-based Getris Images' PSYset all showed continued promise with their latest developments displayed.

Micro changes, rather than macro changes, were the standard in most systems. Users' applications and feedback drives development of these systems. So far the user base is still too small and too new to these technologies to put much of a strain on these systems. Until the economics swing in that direction, there will probably be no great strides in development.

There has been a consolidation of tasks in many of the systems. Play's Trinity, for example, can provide most of the virtual needs — graphics, switching control, animation and real-time compositing — in one system. As 3D graphics developments mature, they are being compressed into the basic platform of the system rather than being sold a la carte. Hopefully, in the near future we will be able to purchase virtual systems that can function on multiple platforms, be accessed by all sorts of graphics and 3D modeling software, will accept tracking data from a variety of sources, and will function with or without a blue screen.

Webcasting and virtual set design

With the increasing use of streaming media on the Internet, designers are being challenged to create appropriate backgrounds for the 2-inch streaming media box that appears on a website. Due to its very small size and square shape, the usual rules for design just don't apply anymore. It's the "Reader's Digest" of set design, needing simple, non-moving, clean backgrounds for maximum clarity. The challenge inherent in this growing venue is to create virtual sets that work for 720x486 as well as 200x200, and possibly high definition.

Just as the advent of cable broadcasting did, the development of webcasting will broaden the job opportunities for all content providers, including designers, in the industry. The success of such ventures as Yahoo's Finance Vision, (Monday through Friday 9-5 EST) and extremely successful special web events such as Victoria's Secrets' Fashion Shows indicate this trend will continue and expand. Several highly successful websites such as CBS Market Watch and ESPN Sports are aligned with engaging television programming that promotes increases in their popularity.

Additionally, the playing field that has leveled itself and possibly tilted itself downhill for the upstarts in the webcasting arena is providing new competition for the traditional industries in advertising.

The way things are going it will soon be possible to produce a day's worth of broadcasting from one floor of a mid-sized building. Just don't let them paint your office blue.

Are virtual systems still viable?

Like two nerds at a high school dance, webcasting and virtual scenery have found each other. For the quick kaleidoscopic visual qualities of websites, using a virtual system in either 3D or 2-1/2D is a very good fit. These shows can be produced under extremely limited physical conditions, and they can change on a daily or weekly basis unlike any real hard set. Certainly, as this medium gains popularity, this type of design will come into its own. As movie scenery resembled theatrical scenery for a good portion of its early life, web scenery will resemble television scenery for a good long while, especially if the program is presented on both venues. However, we should look forward to the day when web scenery is a "world" unto its own. When we can enter the world of our program on the web, when we are immersed in a 3D real-time world as we watch and participate in our program.

Virtual will continue to be linked into the production chain of broadcast television without taking center stage. There is still a great untapped use for virtual scenery as backgrounds and real scene extensions. Hybrid productions are developing as producers and designers seek to exploit all the positive qualities of virtual in their real set scenes. Broadcast engineers seeking to provide greater flexibility in their physical studio, additional graphics options and webcasting options would be smart to look into what the virtual systems can provide them. ■

Ann Latham Cudworth is the principle of Ann Cudworth Designs and a production designer for CBS Television in New York. An Emmy winner for Art Direction in 1999, her work can be viewed at www.vsets.net.

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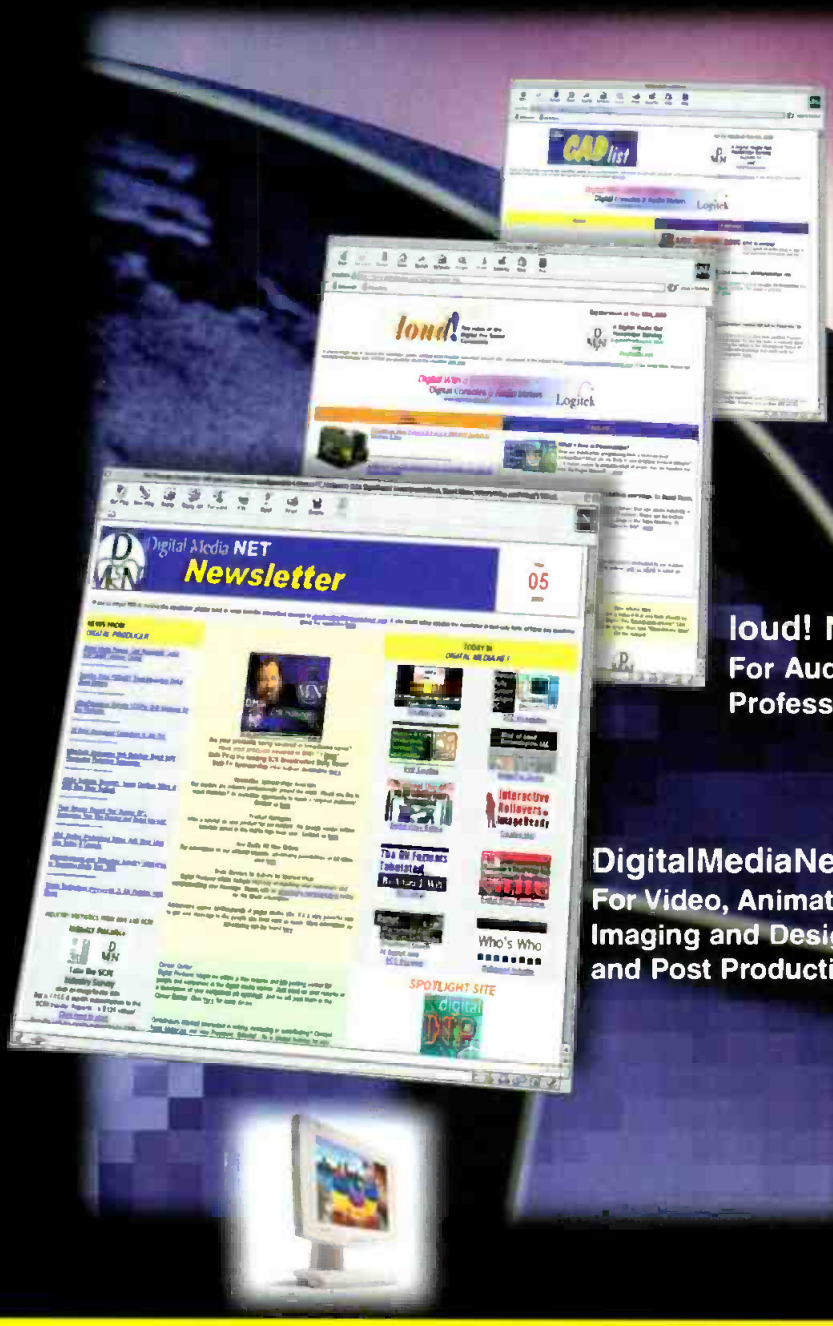

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Streaming

Broadcasters need to consider streaming media as another way to distribute content. The Network Operation Center for iBeam, an Internet video distribution service. Photo courtesy of iBeam.

Media

BY STEVEN M. BLUMENFELD

Streaming media allows your content to be seen by a larger, global audience. If you consider the cost of your content and traditional distribution methods, streaming can be accomplished for much less.

Some time ago I wrote an article about MPEG that started off with all the usual dreck about new industry, revolution - you know change the world stuff. The truth is the world continues to go on, but in our small part of it MPEG and compression technology has had a significant impact. Streaming media has the potential to do the same thing.

Streaming Media

What is streaming media?

Haven't we been "streaming" media since the dawn of the media age? Quite frankly, the answer is yes. Streaming media is not new, it has been around since the inception of the radio (Guglielmo Marconi 1897 - inventor of the radio). We just called it broadcast.

A few years ago the industry was enamored with interactive TV, which introduced the idea of audio, video and other mixed media. Rich media content was born. Broadcast, in its pure form, does not easily allow for rich media. Much of this is due to broadcast's very efficient one-to-many technology.

Enter the Internet. No long history lesson here but the Internet was developed by BBN (now Genuity) as Arpanet. It was a place for university and government scientists to share information across a broad geographic region. (For a great history of the Internet read "Where Wizards Stay Up Late: The Origins of the Internet" by Katie Hafner and Matthew Lyon.) In 1993, Marc Andreesson created a program called a browser that took this once text-only environment and made it capable of sharing rich media. The rest is history and we now have the World Wide Web.

Streaming media is content that contains audio, video and other media types.

Doesn't it compete?

Industry pundits keep telling us that broadcast TV and radio is dead. (I never believe people who cry wolf.) Did faxes reduce the need for the post office? For that matter did FedEx kill the post office? Of course, the answer is no. The post office is stronger than ever, making more money, carrying more mail and adding more services. The post office had to make some changes but did not go away. The same is true for the broadcast industry.

We need to stop crying wolf and look at the opportunity in front of us. For years we have been confined to an audience by frequency, wattage, terrain and our ability to market to this limited region. One hundred miles in any direction is large, but the world is much larger. With the Internet, and the coming of additional bandwidth, our market is now global. I continually listen and watch broadcasts from all over the world both at home and at the office, and it is truly amazing. As broadcasters we need to start looking at the Internet as a new transmitting device. Instead of companding and modulating before transmission, this new network device requires compression and packetizing (see Figure 1).

Based on Figure 1, I think you can see where this article is going. Streaming media is nothing more than a new method of transmission and a lot less costly than a new klystron.

Streaming specifics

For the most part, your production process stays the same. Sure there are some tricks you can do to make the streams look better, but (this has been written about in many other articles about video compression) your current program output is fine.

The type of streaming you want to do determines the changes you need to make. First you have to decide what audience you are after. I break these down into three groups: narrowband, midband and broadband.

Narrowband can be defined as an end user (receiver) with access to bandwidth only up to 56kb/s. While this is the largest population today, a rich broadcast media experience is hard to achieve in this environment. For streaming media, users with 56kb/s modems can be equated to viewers who own black-and-white TV sets.

Midband users are those who have access to 128kb/s to 256kb/s pipes. There is a growing population of end users, especially in the home, who are able to access this bandwidth. At last report, cable modems and DSL users are growing faster than the systems can be deployed. So we start here. The sweet spot for many of today's codecs is 220kb/s. At this bit rate near-VHS quality rich media can be achieved through compression.

There are a variety of compression systems used today. Let's start with MPEG, which is by far the most open of the standards. Three flavors are available for streaming.

MPEG-1, originally developed for VHS quality video on CD-ROM, has its sweet spot just below 1.5Mb/s. Many people have pushed MPEG-1 to its lower limits and have achieved great results, especially a group out in San Diego - Digital Outpost (www.dop.com). In the past MPEG-1 has mainly been used for storage.

Integrating streaming media into current broadcast operations can be rather straightforward, as many operations already employ networked storage and automation systems. Photo courtesy of GeoVideo Networks.

MPEG-2 is something broadcasters are familiar with. Much of today's modern digital video equipment is based on this standard. From hard disk recorders to digital spot machines to DVD, nearly everything is MPEG-2. The problem with MPEG-2 relative to streaming is that it was developed for higher bandwidth than almost anyone has today.

The standards committees skipped right over MPEG-3 and went to

MPEG-4, which is a new standard, ISO/IEC 14496, that was just ratified in 1999. There is still a lot of work to be done on this low bit rate standard but a number of groups are putting some heavy research and development efforts behind making this the standard on the Internet. Today a codec is available from Microsoft and Apple (Quicktime), but I am not aware of any hardware manufacturers that have built this into real-time streaming hardware.

Next is Quicktime with companies like Sorenson Labs developing phenomenal codecs and companies like Pinnacle incorporating them into production hardware that can even do HD. Today's Quicktime streaming is arguably the highest quality for a given bit rate.

Real Networks in conjunction with Intel have recently collaborated on the new System 8 codecs that look excellent and will give Quicktime a run for its money. The new Real System 8 encoders claim that significant reductions in bit rate are achieved through the use of high accuracy motion estimation and block sizes tuned to Web video resolutions. They also claim VHS quality at 500kb/s and near DVD at 1Mb/s. Real's No. 1 advantage is its reach. They claim that over 70 percent of all streaming media content on the Internet today is in the Real format. The Real player is by far the leading media player today.

Last is the new Windows Media 7 codec, which results in higher quality output for high motion content (320 × 240 × 60fps from an interlaced source using unique processing capabilities), as well as improved quality at 640 × 480 × 30fps. The new format supports processing for de-interlacing, which improves video playback quality of TV-sourced content by reducing the flicker effect of progressive scan displays (computer monitors). It also supports inverse telecine, which improves playback quality for film-sourced content.

As for broadband, the codec choices are pretty much the same, but at the higher bit rates all rich media begins to shine, giving the user an enhanced viewing experience over standard broadcast.

For years we have been confined to an audience by frequency, wattage, terrain and our ability to market to this limited region. One hundred miles in any direction is large, but the world is much larger.

How do you stream?

How do you incorporate professional streaming into your production and transmission chain? First you have to choose your favorite flavor of codec. Do this very carefully based on a strategy of being codec agnostic. It really doesn't matter because your content looks great and can reach as many people as possible.

One way is to use a system like e-studio live (www.e-studiolive.com) that is a production switcher with a Real Media encoder built in. The e-Studio systems are easy-to-use live Webcasting studios that enable you to create high-quality, sensory-rich broadcasts and simulcast them on the Internet, Intranets and/or television.

The e-Studio 5900 is a live Webcasting system with traditional switcher control panel with independent M/E control sections, one Commander M/E for 2.5 total, and up to six keyers. The streaming comes in with these added Streaming Server features: an integrated Web server and a RealNetworks G2 Server. Additionally, the e-Studio G2 producer and e-Studio Show Producer with centralized live show control and content creation tools round out the package.

A new division of Avid (www.Edgestreme.com) has shown the Edgestreme Cluster. Edgestreme Cluster configurations are available from entry level systems supporting 250Mb/s bandwidth all the way up to enterprise-class systems delivering 5Gb/s streaming bandwidth. It can be deployed at any point on the Internet — from an origin server all the way to the very edges of the physical network.

Another system is the Anystream Agility Enterprise Encoding Platform. These guys have built a rock-solid encoding system, not just hardware but a whole process, for both real

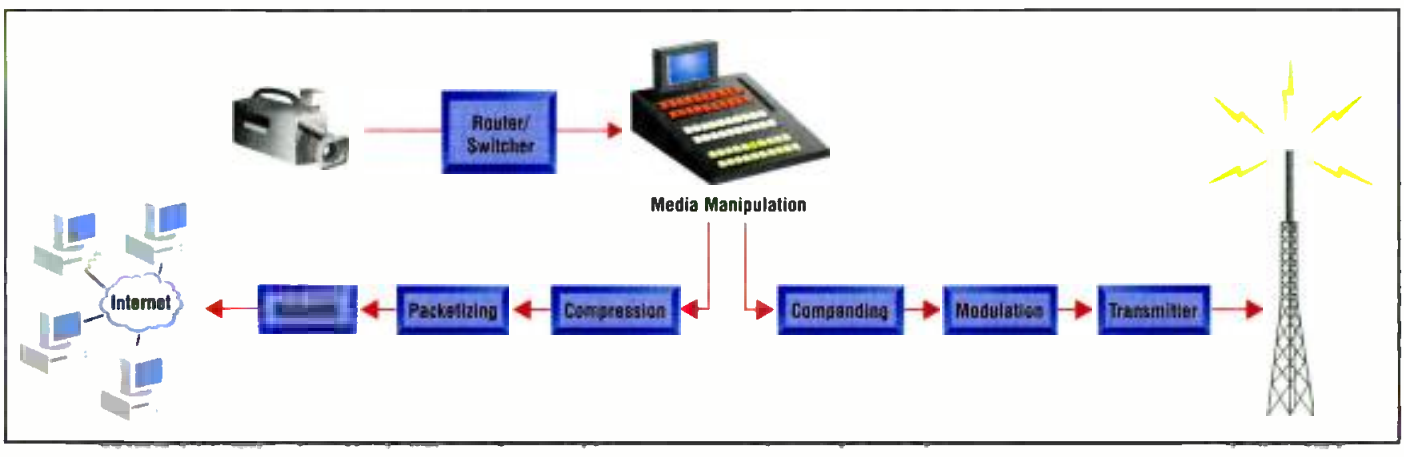


Figure 1: Streaming can be viewed as simply another way of transmitting produced content to an audience.

time and storage. Anystream has built what I believe is the first end-to-end professional web broadcast system.

The system automates the creation and distribution of Internet streaming media to any platform or device, regardless of connection speed or media format. It is a scalable platform built on open Internet standards such as XML, HTTP and TCP/IP, and is platform-, codec- and device-independent. Agility is 100 percent based on XML for programmable automated control.

The platform can be customized for any environment, including user interface, security, enterprise databases, legacy applications, advertising insertion systems and third-party codecs. It enables automated, simultaneous creation of streaming media in multiple formats and bit rates, programmable insertion of metadata, and real-time preprocessing and prefiltering for optimal media quality regardless of format or bit rate. It supports serial digital (SDI), DV, component and composite analog video inputs and accepts commonly used broadcast-input video formats, including live capture and tape sources. Lastly, it integrates with existing broadcast control and automation systems via external triggers including: DTMF tones, GPIs, contact closures, timed events, IP-based triggers and RS-422 deck control.

Pinnacle Systems' (www.pinnaclesys.com) StreamGenie supports Real Networks and Windows Media formats, and the dual encoder version allows users to stream both formats at different formats. The StreamGenie also includes a DVE engine, graphics still store and Pinnacle's TitleDeko character generator.

Network and transmission

You now need to make another decision. You need to select a provider to stream your content. Here are a few of the players in that arena:

Burst.com (www.Burst.com) is not your usual host, network or transmission company. What they do offer is a very efficient way to achieve the best quality video at a given bit rate. Also their system allows the network tighter control over the servers, thereby increasing the number of user streams per server.

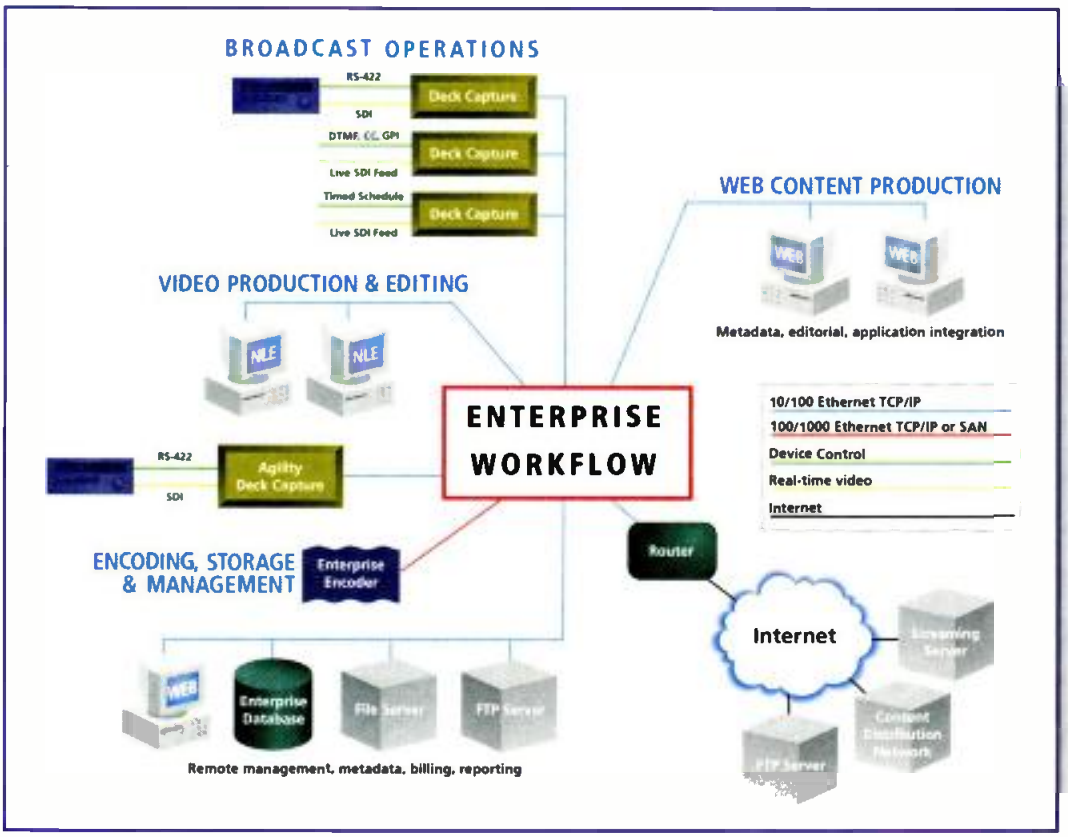
The Burstware delivery system consists of three components: the Burstware Server, the Burstware Conductor and Burst-Enabled Players. This multitiered architecture provides a highly scalable and reliable platform for multimedia delivery and management.

Here is a brief description of the process: A Burst-Enabled Player sends a new multimedia request to the Conductor. Conductor continuously monitors and tracks available bandwidth, the number of connected servers, the number of clients being served and the status of all requests over multiple servers to provide centralized management capabilities. Conductor then intelligently connects Player to an appropriate server based on network conditions at the time of request. The server then delivers data in faster than real-time bursts ensuring uninterrupted, jitter-free video and audio. The Burst-enabled player's VCR-like functionality allows full control over media playback.

In a similar vein, Odetics' (www.odetics.com/broadcast) eDetics manages content with cache servers. The platform allows users to execute on-air and Internet broadcast schedules simultaneously and integrates with Odetics' Roswell, Microstation and Airo. eDetics is designed for live webcasts and video on demand and allows broadcasters to insert ads into the webstream, providing an additional revenue stream.

Akamai's (www.akamai.com) FreeFlow service is built upon Akamai's proprietary technology for the reliable delivery of Internet content. Akamai's service enables Internet users to experience less packet loss and lower latency for higher quality and reliable delivery of Webcast content.

Digital Island's (www.digitalisland.com) initial service offering, Footprint, gives leading e-businesses the ability to deliver websites more efficiently while dramatically improving site performance. Footprint ensures the delivery of



Moving content assets throughout your facility is a complex task that can be automated. Understanding workflow issues can make it relatively simple to add streaming media to an existing broadcast facility. Drawing courtesy of Anystream.

fresh web content of all types, while providing management statistics.

Digital Island claims their content delivery network speeds website performance up to 10 times by distributing content from a worldwide network of servers to put web content closer to the consumer and shorten the delivery path.

Cidera has designed a broadcast backbone for the Internet, which provides an infrastructure platform using a high-speed satellite network to transport bandwidth-intensive content. Cidera Streaming Media works with video or audio streams of any bit rate. It is designed to broadcast encoded streams efficiently to any media server equipped with Cidera downlink equipment.

Here's how it works: The customer sends a copy of each encoded stream to the Cidera uplink facility. The Cidera Service Adapter prepares the stream for satellite broadcast. A satellite broadcasts the stream, which is then received by a customer-supplied media server at each applicable downlink. Supported streaming formats include Native IP multicast, RealSystem G2, Windows Media Technologies and Apple QuickTime 4.

iBEAM's (www.ibeam.com) network architecture resembles that of traditional broadcasting systems. Cable and broadcast television are distributed by satellite to a network of cable head-ends located in local areas. iBEAM uses satellites to broadcast streaming media to "Internet head ends" located at Internet access providers' locations. The iBEAM Network combines the fidelity, scalability and efficiency of traditional broadcast with the interactive power of the Internet.

The iBEAM Network consists of three main components:

The MaxCaster media serving systems are located in access provider points-of-presence (POPs) around the world to serve content as close to the end user as possible.

iBEAM's proprietary Broadcast Platform coordinates a network of servers. Proprietary software determines the best place to serve content to the end user and provides real-time reporting on streaming broadcasts. The Network Operations Center (NOC) uses this platform to continuously maintain and monitor the network.

For streaming media, users with 56kb/s modems can be equated to viewers who own black and white TV sets.

Communication with the MaxCaster servers are by satellite. The network can serve more than 500,000 simultaneous streams and will be capable of serving millions of streams in the future. Fiber optic communications have been added for redundancy to the network and to link different components of the Internet broadcast network.

Pan Am Sat (www.panamsat.com) is a division of Hughes. They are the world's leading commercial provider of satellite-based communications services, operating a global network of 20 state-of-the-art satellites and seven technical ground facilities.

Their new IP service, NET/36, uses this satellite-based IP broadcast network capable of broadcasting IP video, audio and data simultaneously to thousands of digital subscriber line providers, cable headends, Internet service providers and broadband wireless providers worldwide.

How do I make money on it?

How to make a profit with streaming media is the million dollar question, literally. Advertisers are the centerpiece of just about every Internet business plan. Advertisers are important and your content can deliver more qualified eyeballs. These can translate into an important source of income. Not to be crass but we call it "monetizing" your users. There are other ways: Merchandising for one. Instead of asking the advertiser to pay you directly on a CPM style model, have your users/viewers bring in an Internet coupon and take a piece of the sale. Everyone wins. The user gets some reward for being your customer, the merchandiser makes a sale and you make a percentage.

So how do they find you?

You have to reserve some of your ad budget to be represented on the web. You have two areas in which you can invest your ad dollars.

With portals, you pay for position and access to the aggregators' eyeballs. Many portals tie to search engines. You can also pay for position within the search depending on the database engine's business model.

The other choice is banner ads and carriage. These are paid for either on a flat fee or on a CPM model where you pay for each impression or actual click through. On our site, www.winamp.com, we get millions of unique views a month and have over 30 million users. How would you like to have access to an audience that size?

Winamp is the leading high fidelity audio software player on the market. It supports video as a plug-in—absolutely free. We are owned by America Online. You can get it at www.winamp.com. Go download it and tell me how you like it. By the way check out our Audio Homesteading at www.SHOUTcast.com.

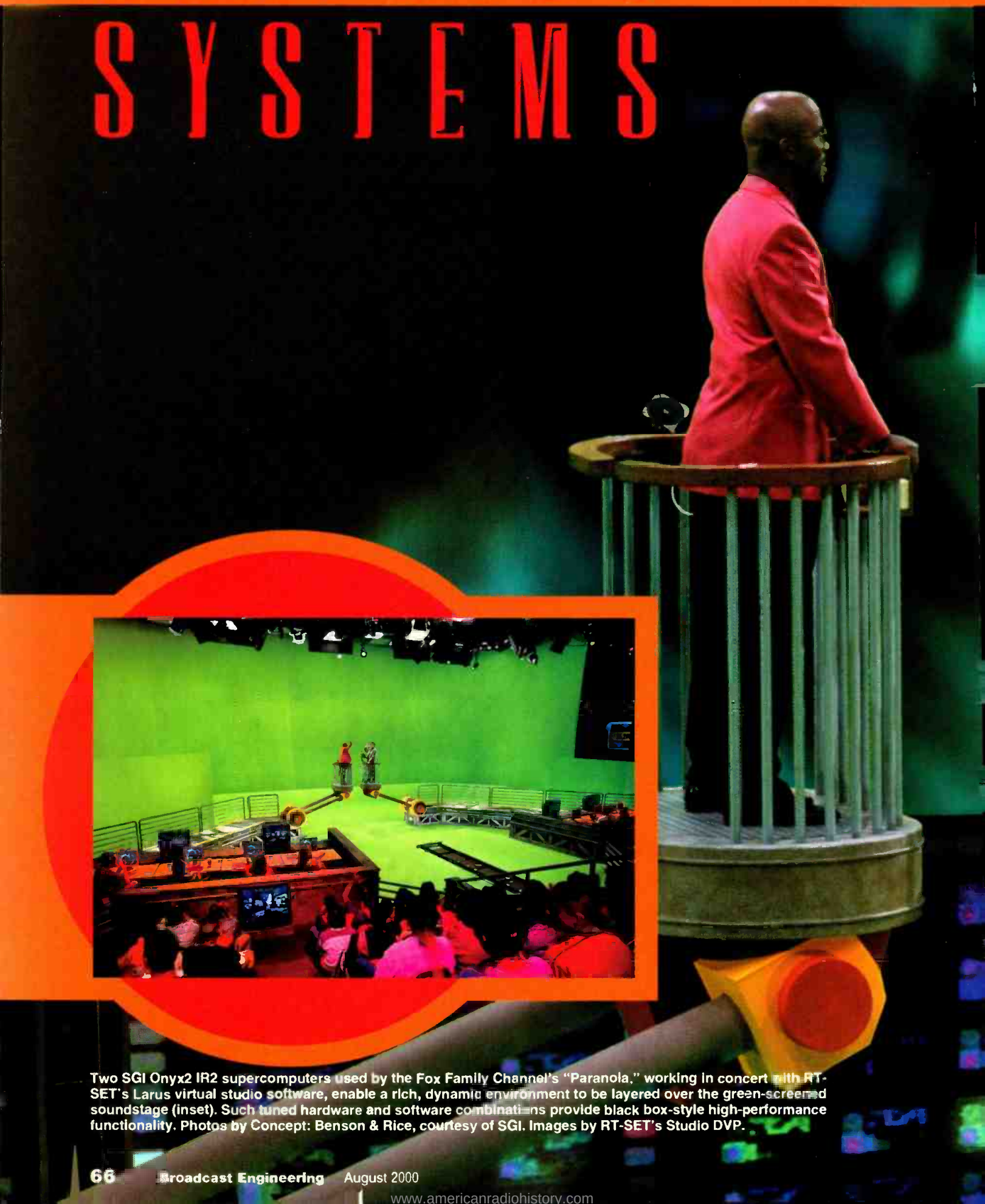
Where is it going?

Remember Interactive TV? The lofty promises of the early 1990s when we all thought by now our viewers (users) would be pointing and clicking their way to our profits. Well we ran into a major problem: The cost of deploying interactive TV technology using the cable/broadcast models was staggering. With the Internet all that has changed. Now anyone can actually become a broadcaster. Amateur radio broadcasters are popping up all over the place. Our own SHOUTcast.com hosts many thousands of would be international MP3 jays, could Internet V-jays be far behind?

Content will always be king and as broadcasters we have the ability to make some of the best quality content available, whether it is over traditional broadcast or over the Internet. If we focus on our audience, wherever they are, and supply them with content they need and want, everyone wins. ■

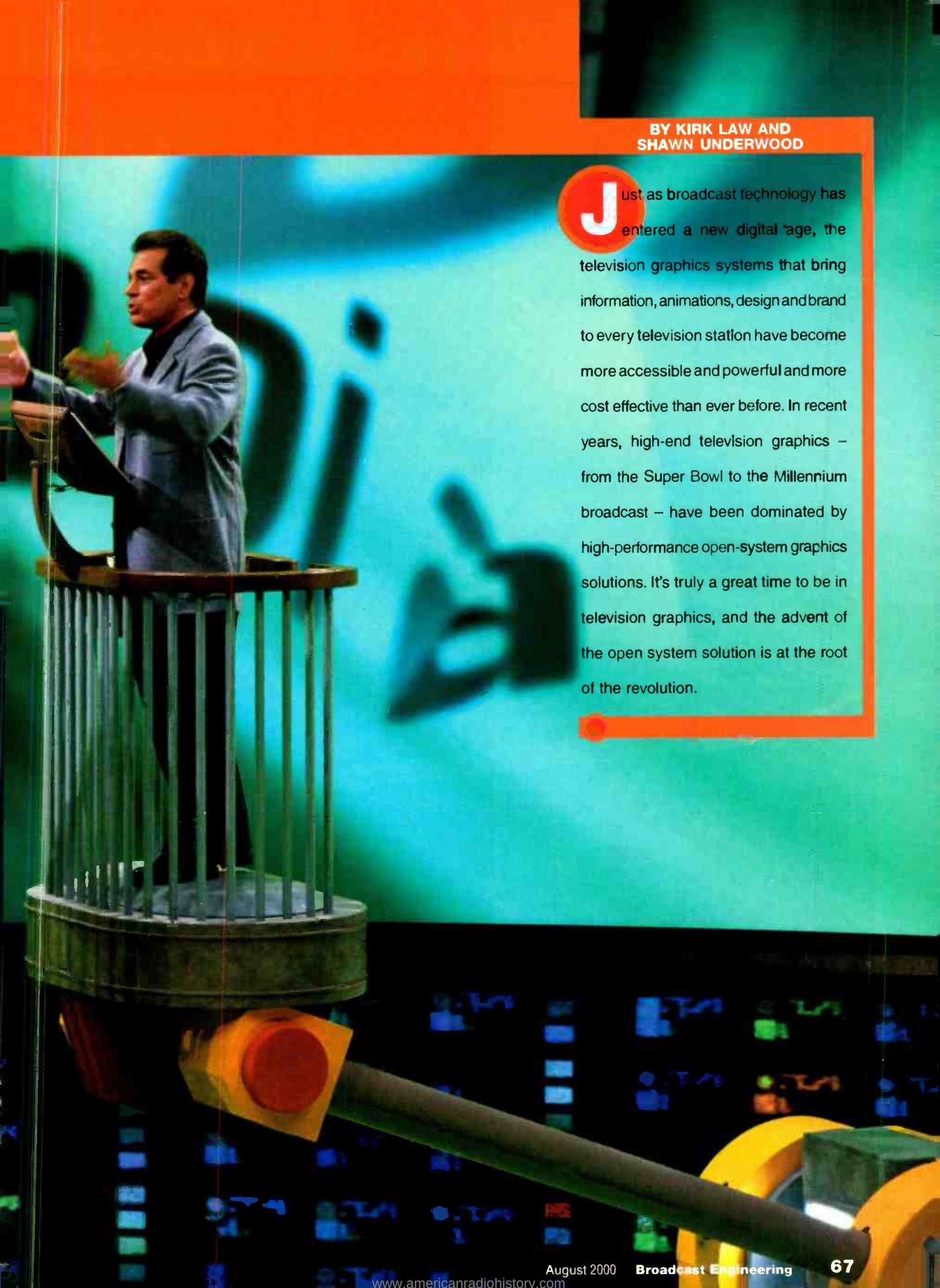
Steven M. Blumenfeld is the general manager and chief technical officer for AOL's Winamp, San Francisco.

GRAPHICS SYSTEMS



Two SGI Onyx2 IR2 supercomputers used by the Fox Family Channel's "Paranola," working in concert with RT-SET's Larus virtual studio software, enable a rich, dynamic environment to be layered over the green-screened soundstage (inset). Such tuned hardware and software combinations provide black box-style high-performance functionality. Photos by Concept: Benson & Rice, courtesy of SGI. Images by RT-SET's Studio DVP.

BY KIRK LAW AND
SHAWN UNDERWOOD



Just as broadcast technology has entered a new digital age, the television graphics systems that bring information, animations, design and brand to every television station have become more accessible and powerful and more cost effective than ever before. In recent years, high-end television graphics – from the Super Bowl to the Millennium broadcast – have been dominated by high-performance open-system graphics solutions. It's truly a great time to be in television graphics, and the advent of the open system solution is at the root of the revolution.

GRAPHICS SYSTEMS

Not too long ago, television graphics were a more unwieldy, expensive proposition. Television stations relied on black box technology from a wide variety of providers — Quanta, Dubner, Chyron, Abekas, Grass Valley, Quantel and Sony – offering a range of solutions. In the pre-open system era, a proprietary box was the only solution available for essential character generation, graphics and animations, and stations were limited by cost. Whereas a top market station could afford a Quantel Hal and a more sophisticated graphics look, a 100 market station had much more limited resources, therefore a constrained graphics look.

Open systems have shaken up television production and broadcast in general, but perhaps nowhere more noticeably than in graphics. Now top market stations and networks are capable of real-time 3D graphics and, though high-end applications still require high-performance solutions, the smallest market station can create amazing graphics with nothing more than a Mac and Adobe Photoshop. Only five years ago, few could have predicted how fast and nearly complete the switch from black box to open systems would be.

From today's vantage point, we can survey the graphics landscape and make some predictions about where it's going. Black box technology hasn't gone away entirely and won't for some time. Though the low end of the market has pretty much vanished, the high end endures. Now ensconced in the middle tier, some of these black box providers have responded to the new open system environment by integrating values of open systems into their proprietary systems. Others have fully embraced an open systems approach.

A large number of graphic artists and operators familiar with only a particular interface also help to give those few black box providers continued success. A trained workforce is an advantage, but more and more artists are overcoming the limitations of black box systems and learning new tools because of the inherent values of open systems.

Open systems have increased in capability as increased computer capacity and speed have begun to enable layered application systems on a single open system box. The high-end of the marketplace is dominated by high-performance open system solutions such as the Unix-based platforms. Typical examples would be SGI Onyx and Octane platforms, with software solutions from companies like Discreet, Orad, Peak and RT-SET. Looking worldwide, TV networks that need spectacular graphics — whether it's a virtual set, such as the one Fox Family Channel used for "Paranoia" or coverage of major sporting events or elections — rely on high-end systems because the network is able to achieve a look that's so unique that it's identified with the event.

That's not the only reason that networks usually rely on a high-end graphics platform. High-end platforms are constructed from the ground up for 3D graphics and, likewise, the software applications are designed to take advantage of the hardware to extract a high-end performance.

Open systems have shaken television production and broadcast in general.

That close relationship between application and hardware "tunes" the system and gets the best performance out of it. In many ways, this tuning is what provides the black box-style functionality and more from the open system. A television producer faced with creating graphics for a big event is much less likely to simply put together a computer and a software package and hope for the best.

Moving in real time

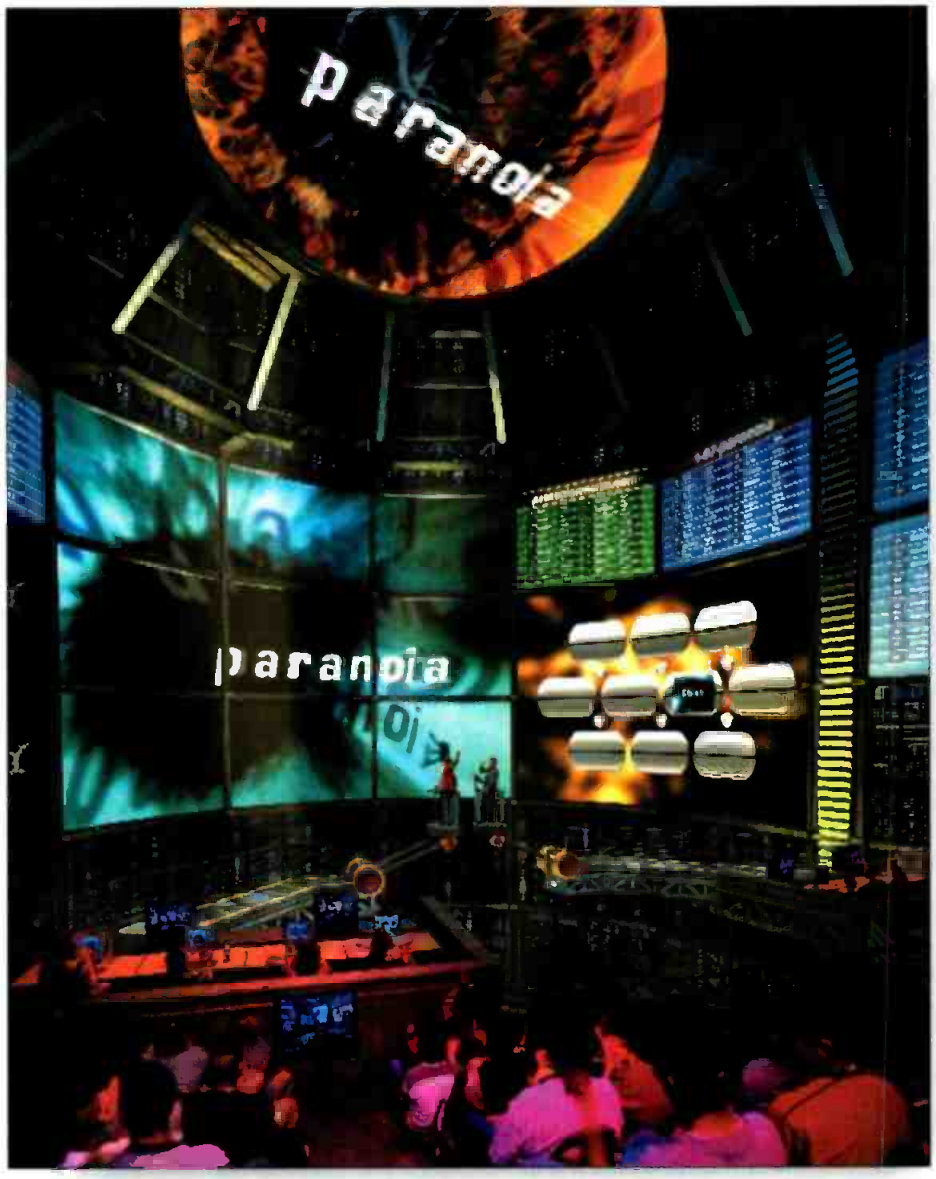
The newest and most exciting arena within high-end graphics is real-time graphics. In the post production arena, real-time is associated with the user's ability to get real-time compositing and color correction from, for example, high-end Unix systems that routinely offer this functionality. But now, television stations can take advantage of real-time templates to instantly display exciting 3D graphics based on information that is not predetermined. With template graphics, the artist designs elements for a graphic in an offline environment in advance of the broadcast. The artist can include charts, animations and so on – all of which, when the information (say, election results) is known, can be instantly updated and sent to the hardware to be rendered in real-time as part of the live graphic. Because the hardware and software automatically reference and scale the data, the elements retain their proper relationship with each other in the final graphic.

Remote satellite and Internet contestants are graphically fed into Paranoia live using RT-SET's Antero software running on six SGI Octane visual workstations.

As broadcast, cable and the Internet converge, stations have instant access to a wealth of data — from stock prices to weather conditions — and the ability to provide that extra data, in a graphics template, to their viewers. The potential is tantalizing. Graphics in 3D can go a long ways toward enhancing coverage of news and sports. With template graphics, the station can create a stronger link between its on-air coverage and its website, opening the door to personalized news for local viewers or customized information for local businesses.

Template graphics are also rendered in a resolution-independent format, which means they are ideal for the station's inevitable transition to digital. For last season's broadcast of NFL and NCAA football games, CBS, using Peak Systems' Everest template graphics software, got its HD graphics to air quickly by modifying the output parameters of standard definition to generate the new aspect ratio and resolution.

Though the use of template graphics may currently be limited to high-end high-performance graphics systems, Moore's Law would suggest that in the not-so-distant future, real-time template graphics will be within reach of television stations further down the food chain.



While lower-end systems cannot yet match the real-time output of Paranoia's RT-SET Studio DVP on SGI Onyx2 IR2s, systems with enough power and agility exist to provide effective and eye-catching looks for smaller stations.

The rise of NT

The middle tier of graphics platforms has had its own revolution in the recent past with the rise of the NT operating system. Despite the handful of black box providers that have managed to partially adapt to the open-system landscape, the middle range still favors the open-system, layered-applications solution over canned solutions. NT-based software, which was largely responsible for putting the lower-end black box manufacturers out of business, is based on hundred-fold gains in performance and toolsets enabling information-rich graphics solutions. As PCs and the OpenGL graphics cards have become more powerful, graphics products continue to usher in the open-system style of products. Companies like Pinnacle Systems, Chyron and Inscriber Technology are providing the kind of flexible mid-range solutions that middle-tier stations gravitate towards.

NT has continued to make inroads in the graphics platform marketplace. Although the top market stations still choose Unix-based solutions for the best performance possible, the cost factor is harder to justify for a Top 20 market station. But NT is migrating up the chain as its performance increases. Whereas two or three years ago, the use of NT was relegated to Top 100 market stations, the Top 20 market station is now faced with a hard choice between the two operating systems. Nonetheless, when it comes to performance, everybody would rather have a Unix machine. Despite the powerful gains that NT has made — a progression that isn't likely to stop — NT is reaching a plateau.

The main contributor in NT's levelling off is Linux. Linux can bring the benefits of the higher-end Unix systems to the price/performance sensitive real-time graphics markets and many companies have embraced it in their product offerings for various marketing and technology opportunity reasons. The open-source nature and ability to improve the base of the operating system at a quicker pace provides the opportunity for enhancements in a variety of areas. Enhancements in the file system, graphics device support for OpenGL, process scheduling schemes, processor isolation, device support and digital media technologies will eventually allow high-end digital media applications on the cost-effective Intel platforms.

Linux is a good balance between those Unix features so important to mission critical applications like broadcast and the cost benefits of Intel-based platforms. NT's popularity can be pegged to the fact that it resides on the cost-effective Intel platform rather than any inherent benefits of the operating system itself. With Linux, users can get the cost benefits of the Intel platform without sacrificing

the robustness of Unix. The maturity of NT and its applications has progressed quite a bit, but it still has its shortcomings with respect to real-time performance guarantees.

Linux programmers are adding OpenGL hardware acceleration to workstation-class Linux platforms. In professional-class graphics systems, this feature would have the characteristics of having accelerated OpenGL graphics functions such as hardware transform and lighting, texture mapping, and anti-aliasing for increased 3D realism. This would be the case with SGI's Intel-based VPro Graphics workstations. In general, one should look for systems that offer up to 64MB of high-speed, double data rate (DDR) graphics memory or higher, and can deliver geometry performance with over 17 million triangles per second and up to 540 megapixels/second or higher. Ideal platforms are those designed from the ground up to accelerate OpenGL 3D graphics in hardware on the Linux O/S, making the platforms well-suited for graphics software developers and users.

Does this mean that present day Unix is headed for the operating system graveyard? In a word, "No." Network executive producers — people whose work is seen by 50 million people a day — will not leap blindly into a new operating system. It makes sense that when a $2 million spot is at stake, they'll rely on the proven performance of Unix until they're convinced that a new technology isn't just as good but better.

NT has continued to make inroads in the graphics platform marketplace.

High quality on the low end

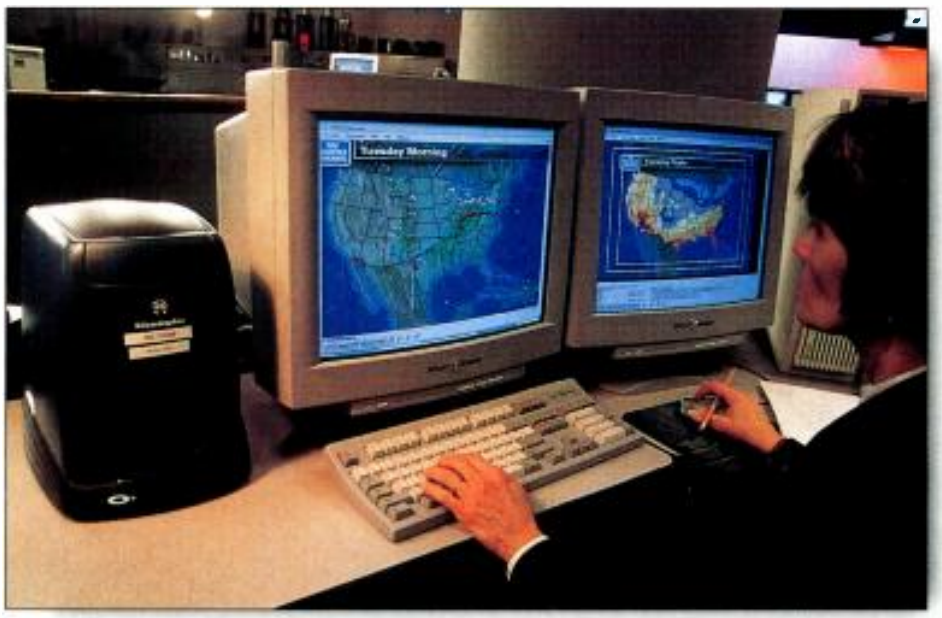
There is another tier of graphics platforms for the broadcast industry that has had its own quiet revolution. Five years ago, you had to be a big station to afford big graphics. $10,000 would buy only the most primitive text generator; a fraction of that price can buy an iMac with Photoshop – and the ability to do graphics that look as good as any major market station. That means the quality of graphics in small-town North Dakota is just as good as in Chicago, a development that's raised the graphics bar.

That's not to say there is no difference. In the small market station, a talented graphics artist working on an iMac, for example, can turn out six to eight graphics for the evening news. At a major market station, faster equipment and more artists can translate to four graphics for every story. What differentiates a network from a small station is graphic quantity and informational quality — the iMac/Photoshop route doesn't lend itself easily to last-minute changes for the latest information.

Quality of information brings us back to real-time graphics. The network that has a real-time template graphics system can design graphics around those last-minute bits of information, feeding in stock prices, for example, at the last moment. That's the kind of graphics coverage that the small market station, which created the graphic that morning, simply can't provide.

The latest news

Template graphics and the arrival of Linux are major events in the arena of graphics platforms, but there's one more worth noting. At NAB2000, the Khronos Group, an industry consortium made up of 3dfx, 3Dlabs, ATI, Compaq, Discreet, Evans & Sutherland, IBM, Intel, S3 and SGI, unveiled a collective vision to develop a standard application programming interface for graphics, video and audio media devices. Creation of a standardized API will allow digital content application developers to more easily integrate video and graphics capabilities and to make their applications more portable over multiple operating systems, CPU architectures and add-in hardware devices.



The Weather Channel's forecasting system includes two SGI Origin 2000s, 35 SGI O2 and seven SGI Octane workstations running Weather Services International's WxPro software. Photo by Tim Olive, courtesy of SGI.

Similar to OpenGL, the current industry standard for professional 3D graphics, the Khronos Special Interest Group plans to develop OpenML, a new specification for innovative media technology, through the combined contributions of its members. With OpenML, professional application developers won't need to develop different and proprietary programming interfaces for various media input and output devices, and the implementation of the API across multiple operating systems will ensure portability of software applications.

Coming to terms

Having taken a look at the graphics platforms available, the station GM and chief engineer still have to make a decision that has to include an exami-

nation of performance and features. Table 1 outlines the performance and feature factors that are most crucial. For sheer graphics, what's needed is a high polygon fill rate, anti-aliasing, fast texture download and a configurable frame buffer, with regard to different raster sizes and pixel depth (for example, an eight-bit per pixel RGB alpha versus 10-bit per pixel RGB alpha). A graphics sub-system that allows for external genlock and framelock to a variety of master signals is also important. Another feature that will be crucial for use is the ability to take graphics data or color planes (RGB) as well as the alpha or transparency channels and convert these to an output format such as some professional video formats, i.e., SMPTE 259M or 292M.

A graphics solution that can output an alpha channel to a video format is not very common today. However, many graphics chips/chip-sets will support alpha planes internal to the graphics framebuffer itself to be used in the generation of 3D graphics images. The lack of external alpha access conversion to video can relegate high-performance graphics solutions to only certain kinds of on-air graphics applications. These are mostly pre-rendered type on-air graphics effects.

A system description like we are talking about here will generally consist of:

- Computer system components (processor, memory controller, I/O controller, operating system),
- Video I/O subsystem which is typically an option card like PCI,
- A graphics subsystem typically an AGP card.

Application vendors are able to deliver higher-performance, media-specific applications when they have more control over the event timing and event synchronization within the computer. Note that the computer system, graphics subsystems and the video domain generally operate asynchronously, or unsynchronized to one another. The ability to synchronize the system, video and graphics elements in the frame buffer allows the user to synchronize events based on video timing references. Orchestration between the graphics, computer system and the video interfaces is a crucial feature, especially for the user putting together higher-performance real-time graphics solutions. Though higher-end systems make sure that you don't get a graphics glitch on top of the video by synchronizing the video, graphics and the system itself, that's not always the case in the less-than-high-end market. Over time, this will change and efforts like OpenML will help usher in new capabilities in the marketplace.

As might be imagined, there is a bit of rocket science here depending on the type of application being targeted; that's why every vendor has a recommended configuration list. In the TV industry, synchronization is do-or-die, so be sure the graphics platform in question will meet the specifications for a broadcast environment solution. For the operating system, the most desirable one has good latency management and real-time hooks to be able to lock down the processor for specific tasks, and has a file system that has deterministic scheduling and high throughput. For the I/O system, the ideal is high throughput, some form of guaranteed bandwidth, and the ability to carry any synchronization signals from the outside world into the domain of the computer system.

Real-time template graphics are a reality for networks and large market stations. Though not all systems are created equal, the rise of open systems solutions has opened up the floodgates for an unprecedented era of creativity in television graphics. The promise that lies ahead spells opportunity broadcasters. ■

Kirk Law is senior director of engineering and Shawn Underwood is product line manager for SGI Telecommunications and Media Group.

Graphics Computer Specs

Feature	Description	Comments
OpenGL HW Acceleration	Required	
Genlock or framelock Support	Required	Should support standard broadcast-style genlock sources of analog or digital video signals (SMPTE 259M, 292M, etc.)
Professional video out Support	SD and HD support	Should support standard broadcast style analog or digital video signals (SMPTE 259M, 292M, etc.)
HW anti-aliasing	Desired	Requirement depends on application target, but the most versatile HW would support this.
Texture mapping support	Required	The larger the better.
Graphics frame buffer size	>64MB	
Reconfigurable frame buffer size and timing	Required	Must have the ability to support multiple raster sizes and a variety of video timing signals.
Geometry performance*	>10 M tris/sec (@25 pixel triangles)	Note that geometry performance indicated is typically indicated as the number of triangles/sec that can be processed through the graphics system.
Pixel fill rate	>400 MPixels/sec	The more fill rate performance you have, typically the richer looking the final scene can be.
Color depth support	Eight-bit RGBA minimum	
Alpha out as video	Required, based on target application	

(*) Some vendors will indicate their peak number as the advertised number and this may, in some cases, indicate unrealizable performance in real applications. For example, small triangles, made up of, say, five pixels, may have good geometry performance in graphics architecture "A" while that same architecture may have poor performance at larger triangles of, say 25-50 pixels. This performance could fall off at a rate of 50 percent as the triangle size increases. If the application typically uses larger triangles, the performance may not be as much as anticipated.

Important features to consider when evaluating a computer-based graphics system.

displaying video in the digital era

As broadcast television has changed, so too has the number and type of signals that need to be monitored. With the introduction of HDTV, signal monitoring will need to be examined further. Photo courtesy Globecast.

By Joe Kane

In December 1953, specifications for the NTSC color television system were set out as the system standard. The amount of time it has taken to make those specifications work properly is a part of its extended life. Using a comb filter decoder was described in 1953, but wasn't implemented in the consumer world until the late 1970s. It was the 1990s before 3D adaptive comb filters showed up in consumer products. We have yet to reach the original NTSC system goal for the colors of red and green.

The idea of NTSC colors was officially dropped in 1979, substituting SMPTE-C phosphors as the recommended practice

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for program production. (See Figure 1 for a comparison of the NTSC and SMPTE-C color gamuts.) The new colors weren't universally accepted in the program production community for at least another 10 years and have yet to see the light of day with most consumer product manufacturers. In midst of the chaos that is NTSC, we've managed to obtain a reasonable level of consistency of program production quality. While all sorts of technologies have made that possible, improvements in broadcast grade monitors have made a significant contribution.

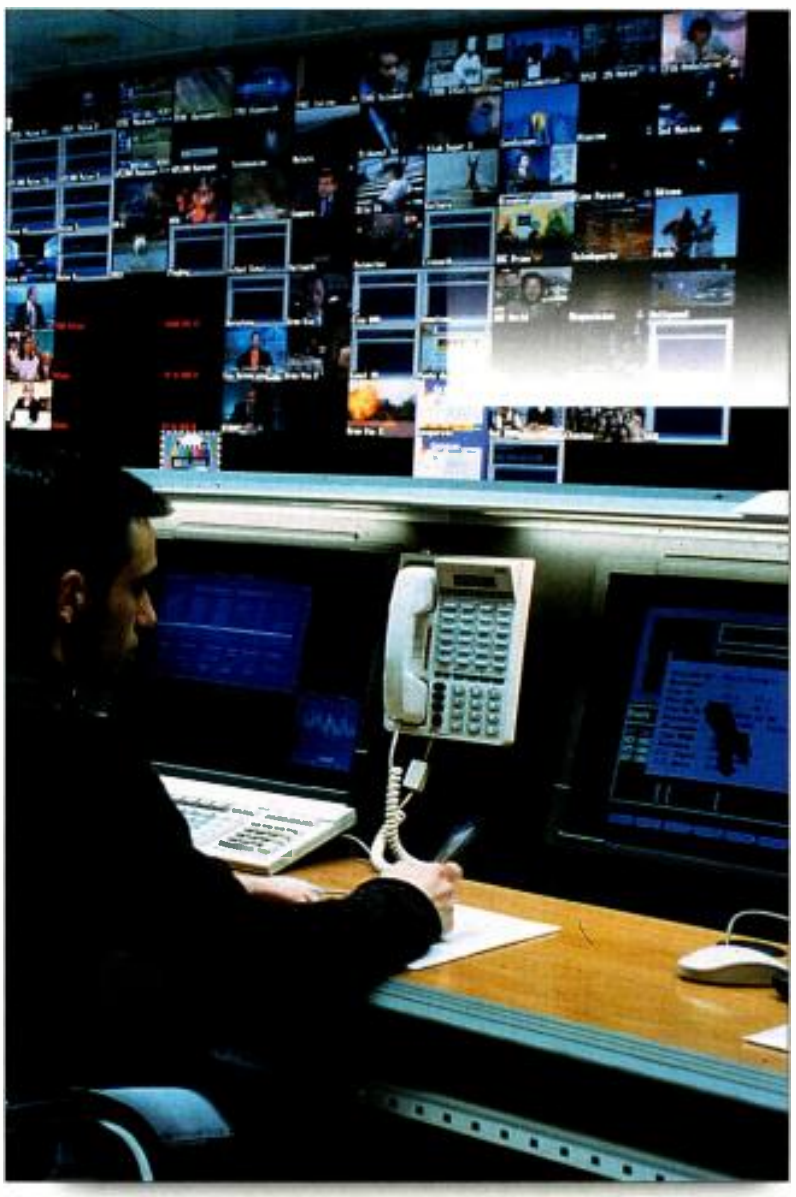
It is the monitor that is used to judge the quality of program material. The consistency of that product, from a single manufacturer or from one manufacturer to another, accounts for much of the stability seen in program production. Yet, no sooner have our NTSC monitoring problems been solved when along comes a new system and new requirements. Once again the display device takes on the critical role.

Are today's products up to the task of accurately displaying HDTV video material? No. More work is needed to bring monitoring up to the capability and specifications of the HD system. Some problems stem from having to deal with several display standards, while others are rooted in the fundamental differences between analog and digital technology.

Ideally, one might think that a display device would at least perform at all of the ATSC Table 3 rates. The analog approach to building that monitor would have it scan at each rate and aspect ratio. In reality, the difference in these rates is beyond the capability of a single display device. If it is optimized for 720p or 1080p it won't look good at 480i.

In addition, there are two different standards for colors of red, green and blue and two sets of equations for decoding YPbPr to RGB. The set must accommodate at least two aspect ratios, 1.33:1 and 1.78:1, if not letterboxing material in the 1.33:1 edge-to-edge format. Making all of this happen in a single display device will require a new approach to building monitors.

Sets with full bandwidth video amplifiers look much better than the ones with limited bandwidth capability.



In an effort to manage size/depth constraints, as well as heat load, rear-screen projection products like BARCO's I-Studio are proving effective. In larger control rooms, multiple units can be combined in order to monitor dozens of signals. Photo courtesy BARCO.

Narrowing the field

What should a facility engineer be requesting when purchasing new monitors? Basically everything called for in the system specifications for each rate.

The color of red, green and blue is a good place to start. In HD monitoring it must be the new color gamut. The colors should be called out as SMPTE 274M or SMPTE 296M. They are the same. Good luck finding them. They do exist but are few and far between. EBU colors might be a good fallback position, if it weren't for the longer persistence time in the green. (You can get away with that at 50Hz but not at 60Hz.) Table 1 lists the SMPTE-C colors to illustrate the larger differences, which make SMPTE-C the wrong choice for HD work. They are the specification for standard-definition viewing and will continue to have their place in the video facility.

How much difference are there between SMPTE-C phosphors and SMPTE 296 colors? When they are placed side-by-side, the difference is easily noted. Red and green are much better

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in SMPTE 296. The color quality of the new gamut is excellent when compared to SMPTE-C.

If a monitor serves both SD and HD functions, it should have the HD colors. A matrix can be incorporated to properly display SD colors on the wider color points. While it should be part of the set, such a matrix has not been implemented in broadcast-quality monitors.

Staying with the requirement of the monitor to display all standards, you'll want to make sure it has the SD and HD matrix decoders in place for conversion of YPbPr to RGB. (That is a different matrix than required to display standard definition on HD color points.) Most sets automatically select the decoder based on the frequency of the incoming signal. A manual override of this capability is absolutely necessary. Signals being converted from SD to HD or HD to SD often do not change the matrix in the process of the cross conversion. You will therefore need to be able to select the matrix of the original signal at its different rate.

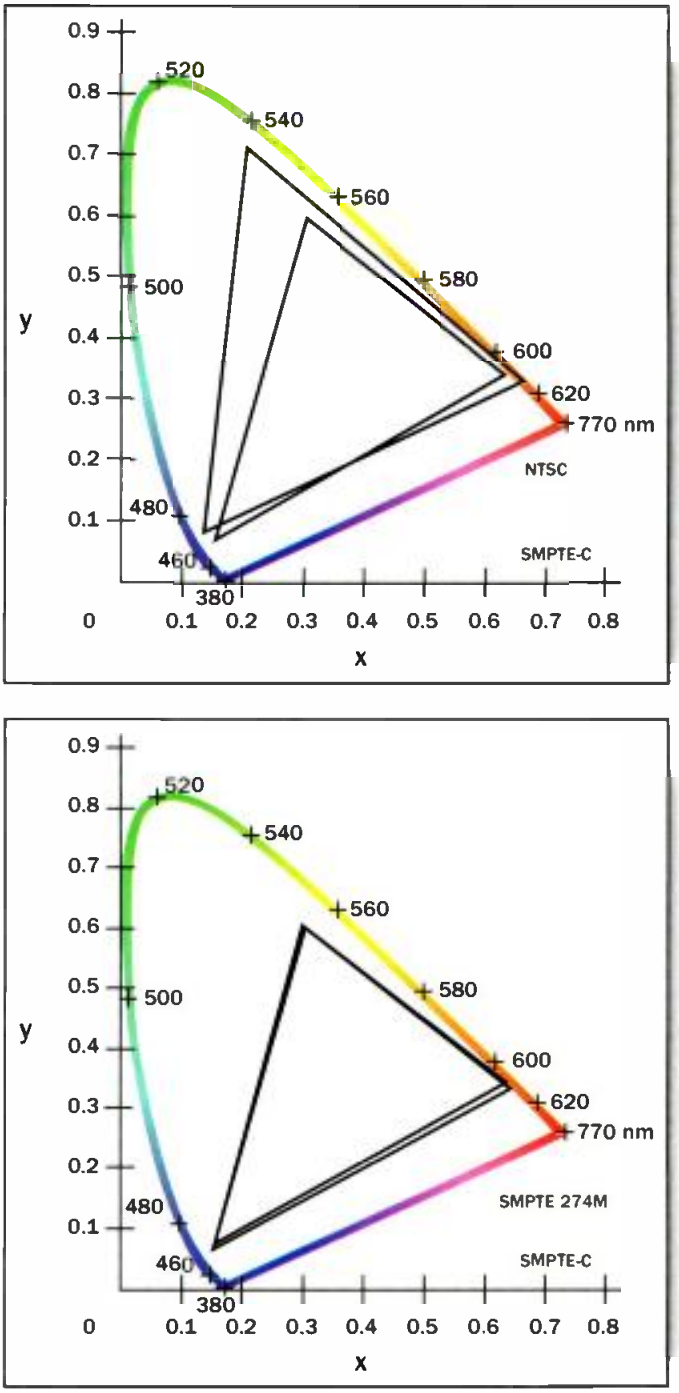
While on the subject of component input signals, analog or digital, the set should have the capability to shut the Pb and Pr signals off. This is just as important as the blue-only capability for setting up the decoder in a standard definition monitor. You must be able to display Y only. The slightest offset in Pb and Pr will throw off the gray scale setting. Ideally, the DC offset of Pb and Pr should be zero, but that hasn't always been the case. In some HD work, the DC shift in one of the chroma channels wasn't spotted until after the error in the picture was detected by disconnecting Pb and Pr. It was only after seeing the shift on the monitor that the error was spotted on the scope.

It is the monitor that is used to judge the quality of program material.

Gray scale calibration is another issue. In every monitor tested there has been a shift in the color of gray while switching among rates. That means that the monitor must have the ability to memorize at least one gray scale for each scan rate.

The most common method of setting up multiple aspect ratios on a CRT display device is to change the area scanned by the raster. Because image brightness goes up as the raster gets smaller, there must be individual memories for brightness and contrast at each aspect ratio setting. This is in addition to geometry memory for each aspect ratio at each rate.

Light output capability of a direct view CRT monitor goes down as resolution goes up. Many broadcast monitors are limited to about 15-foot Lamberts before blooming. SD monitors can usually provide 30-foot Lamberts before blooming. That issue can be partially resolved, but usually at the expense of picture quality. At least one expensive HD monitor partially recovers this loss by selecting high light output phosphors, they just happen to be the wrong colors. Another approach is using phosphors with long persistence times. This provides better color capability and more light output, but at the expense of blurred detail for images in motion.



Comparison of the phosphor colors used by various standards, NTSC vs. SMPTE-C (above), and SMPTE-C vs. SMPTE 274/296 (below). Because of these color differences, images may not appear correctly when when shown on the various monitors involved.

Another possibility is trading resolution for light output. It's been done in at least one industrial grade monitor currently on the market. As you step back away from this lower resolution monitor, it begins to look better than the expensive high-resolution set because it has the right colors and a much higher contrast ratio. That approach works in the utility application. The lower resolution monitor looks better at about two or more picture heights, but that is not to say that it won't always show its weakness

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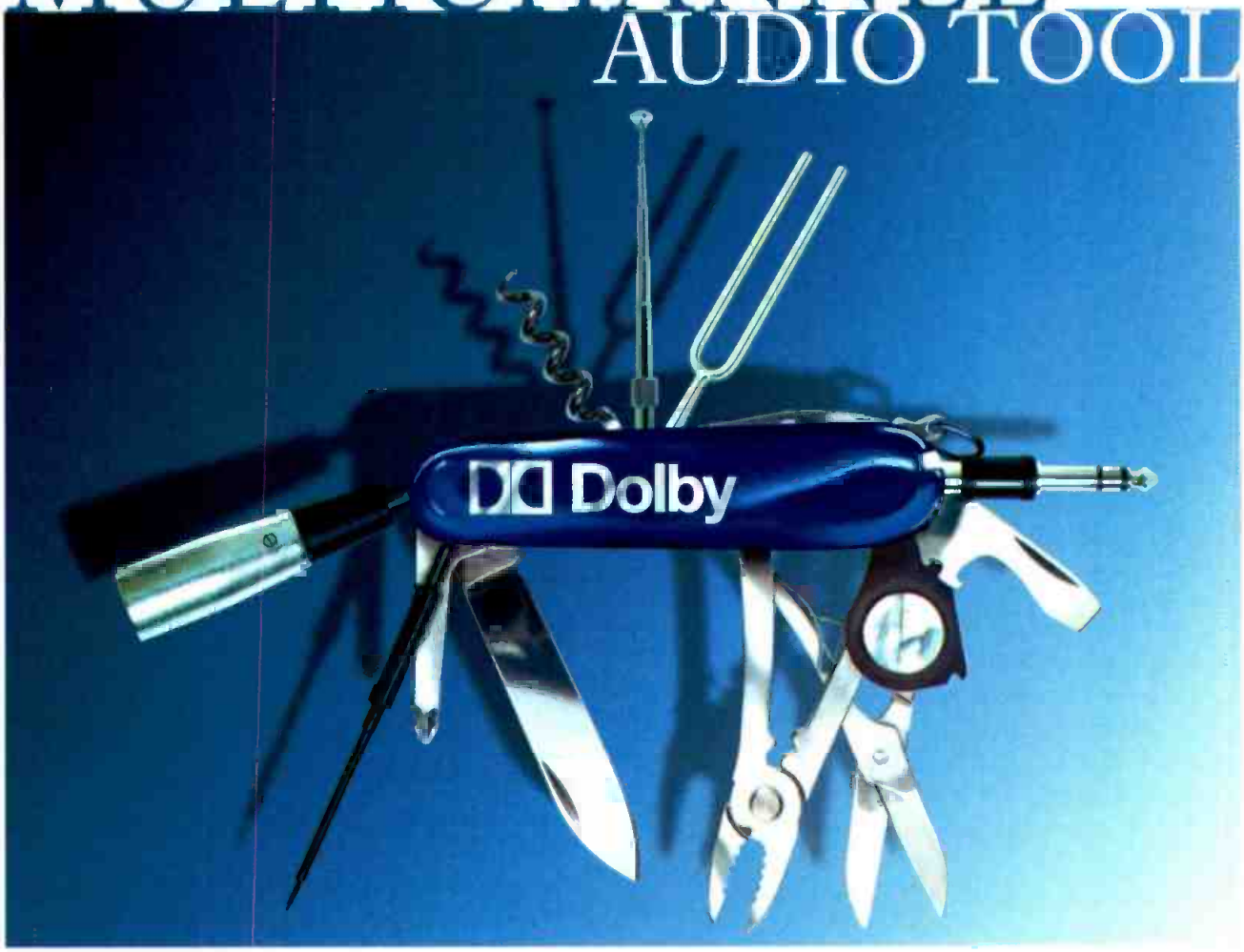

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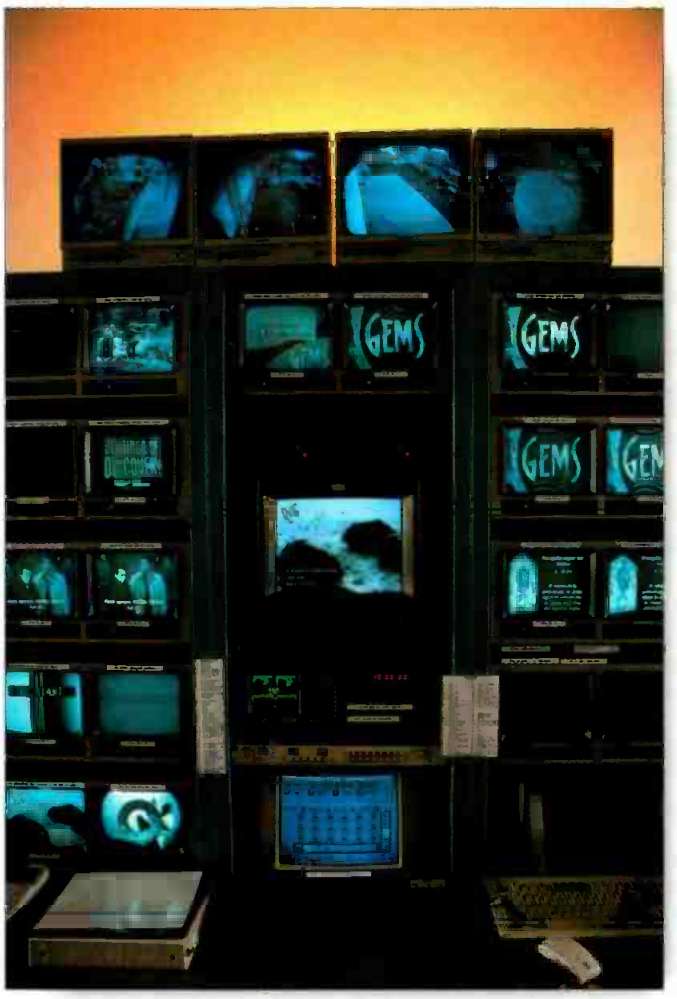
if you display resolution test patterns.

While on the subject of HD utility monitors, watch out for video bandwidth capability driving the tube. A number of manufacturers have cut the bandwidth of the video amplifiers in anticipation of the set not being able to display full resolution. In side-by-side comparisons, sets with full bandwidth video amplifiers look much better than the ones with limited bandwidth capability. HD system bandwidth for both 720p and 1080i go out to about 33MHz, therefore the video amplifiers should be absolutely flat in phase and frequency response beyond that point. Our utility monitor goes out to a 3dB point of 45MHz.

Is it time to replace your control room lighting?

Larger displays are required to show the kind of resolution in high-definition signals. As the front surface of the monitor gets larger, so should the depth of the picture tube. If the picture tube becomes larger than the opening of the room door, you won't be able to get it into your facility. As tubes get larger all around and wider to accommodate the 1.78 aspect ratio, the deflection angle increases, translating to a drop in picture quality. We should soon come to the realization that the set has to go through the door, picture height-wise, rather than using the depth of the tube as the limiting dimension. In other words, the face of the picture tube would be towards the floor or ceiling to bring the monitor into the room. That would allow the depth of the tube to be increased, potentially improving the picture quality.



Computer monitors, test equipment, systems status and video signals all need to be networked in today's master control environment. Photo courtesy Globecast.

An HD monitor should be able to scan at 720p and 1080i, if not 1080p. Such a monitor should not include any rate below 480p. Compromises needed in beam spot size and yoke design to make the set function below 480p are beyond reasonable expectations in a high-quality display device. How should such a set then deal with PAL and NTSC? Those rates should be upconverted to at least 480p or 576p. If they are further converted to an HD rate, which would be better for the monitor, there is a concern for the matrix of the encoded signal. Is it SD at an HD rate or was it changed to HD?

As much as we might like to look at other display technologies for HD, 9- or 12-inch electromagnetically focused CRT projectors are the only other option currently available. Limitations in gray scale tracking and focus over the entire area of the picture have certainly ruled out a number of products in this category. None of them can properly create an image larger than six feet wide. Most of these sets won't go much below six feet in their image size capability, limiting installation options.

Finding the right combination of features in a single monitor is difficult. Eventually, scan rate and aspect ratio converters will solve many of these problems. A number of companies are working on this digital approach to improving monitoring capabilities. A digital processor will convert any incoming rate and aspect ratio to the best possible display capability of the imager. That approach will become standard in the professional, industrial, computer and consumer worlds. Other fixed array display technologies will follow as converters reach maturity. ■

SMPTE 274M and 296M HD Color Points		
	x	y
SMPTE 296 Red	0.640	0.330
SMPTE 296 Green	0.300	0.600
SMPTE 296 Blue	0.150	0.060
EBU was agreed upon in 1969		
	x	y
EBU Red	0.64	0.33
EBU Green	0.29	0.60
EBU Blue	0.15	0.06
SMPTE C colors		
	x	y
SMPTE C Red	0.635	0.340
SMPTE C Green	0.305	0.595
SMPTE C Blue	0.155	0.070

A comparison of SMPTE 274/296, EBU and SMPTE-C colors. The variation between SMPTE 296 and SMPTE-C colors makes it impossible for one monitor to accurately display both standards. SMPTE-C is the wrong choice for HD work.

Joe Kane is the former chair of the SMPTE Working Group on Studio and Professional Monitors and is currently a consultant on high-definition display devices. He can be reached through his website at www.videoessentials.com.

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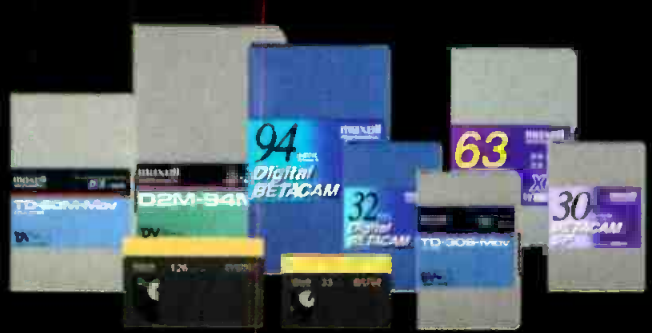

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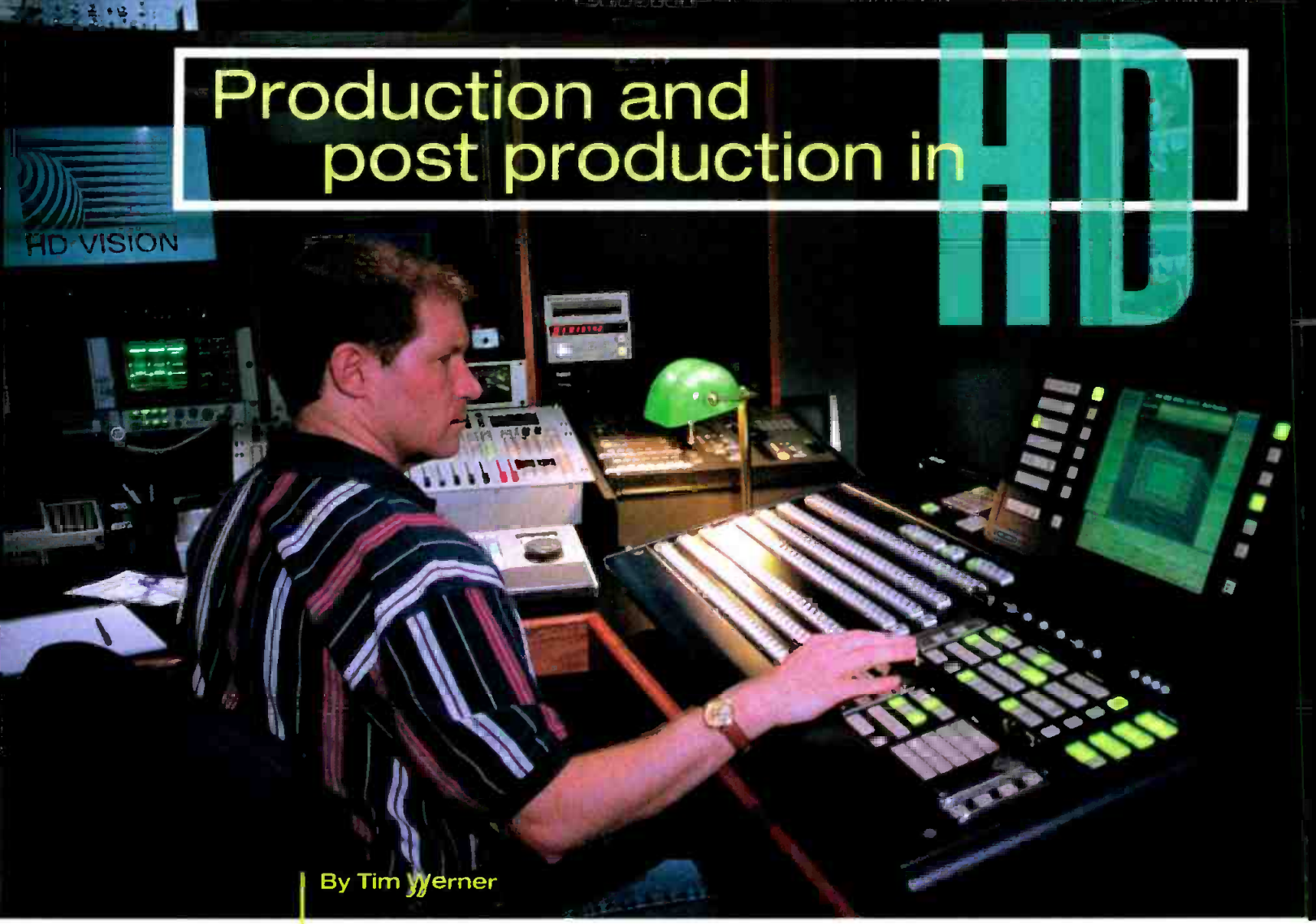
Production and post production in HD



By Tim Werner

HD is not the same old ballgame. While many of the skills acquired in standard-definition production are translatable to an HD environment, there are several new skill sets that must be mastered in order to make a smooth and effective transition. Mastery of those differences, be they subtle or sweeping, will define your facility and drive your future business.

Capture

Focus, focus, focus. Like the "location, location, location," mantra of real estate the absolute necessity of perfect focus cannot be overemphasized when recording images in high definition. Because of the remarkable clarity of HD, there is no margin for error here.

Unlike NTSC video, the HD image cannot always be judged accurately through the camera viewfinder. Use a video engineer on an HD shoot to ride levels and keep the camera operator informed regarding focus. An experienced engineer will also more easily see any burned out pixels in the HD image. In high definition, bad pixels can quickly and easily be eliminated by performing an adaptive pixel restoration (APR). The important thing here is having someone at the shoot who can spot and easily avoid these possible problems.

If budgetary considerations or other circumstances do not allow for a video engineer, seek a camera op/DP with HD experience. Allow the shooter ample time to get used to the HD camera so an out-of-focus or bad pixel(s) scenario does not occur. The black and white viewfinder in an HD camera, like the Sony HDCAM for instance, will show you when you are in focus if you take the time to get used to it. If possible, do some test recordings and check them on a portable color monitor. Better yet, use the analog YPbPr output of the camera to feed a color monitor while shooting so that someone other than the camera operator can also check the focus and quality of the HD images being recorded.

The HDCAM in production

Experience has taught that the Sony HDCAM is a good HD EFP camera, but care must be taken to ensure the highest quality recordings.

If you are using a timecode DAT in conjunction with an HDCAM on a shoot and feed the same timecode to both, make sure that both devices are video locked and set to the same clock reference. An HDCAM operates at 60Hz or 59.94Hz with regard to clock reference. If it is set at 60Hz and the timecode DAT is set at 59.94Hz

HD Vision's main HD suite includes a Snell & Wilcox HD 1024, a Graham Patten ESAM 612, a Yamaha O2R recording console and a Sony 9100 editor. Photos courtesy HD Vision.

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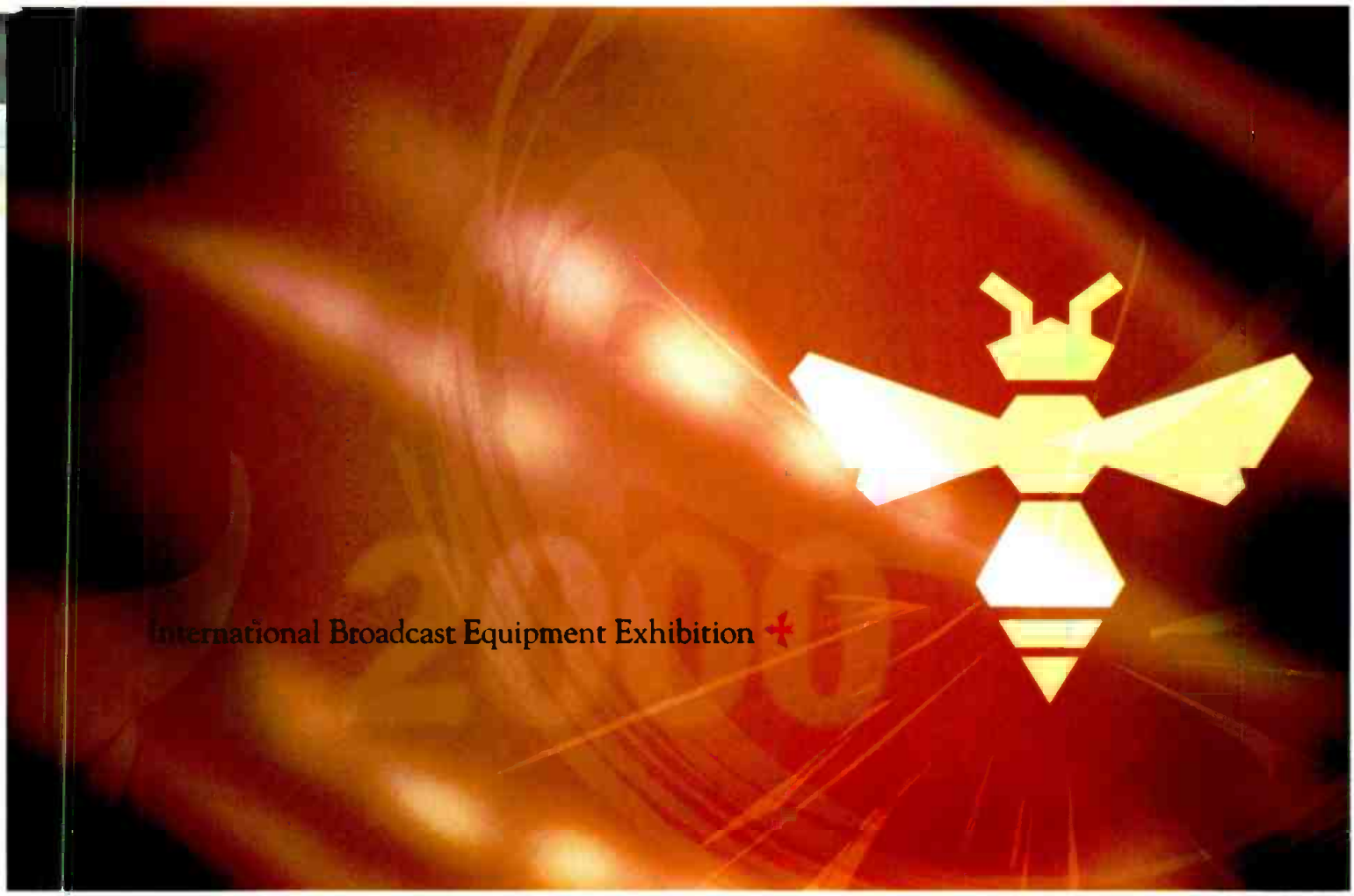

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(29.97), or vice versa, you'll have a steadily increasing sync problem the further you go into every 40 minute HDCAM cassette you record to. To avoid audio problems in post production,make sure that the HDCAM operates at the same clock reference as the timecode DAT. In most cases, this will be 59.94Hz.

The HDCAM can record in many formats of HD depending on the specific model number and its age. If you are renting a Sony HDCAM, make sure that it is set to and can record the specific HD format you require. The latest Sony HDCAM model, the HDW-F900, can record 1080p 24, 1080p 25, 1080p30, 1080i50 and 1080i 60. The model HDW-700A and the HDW 700/1080 record at 1080i60. Some — by now very few — of the HDW-700A HDCAMs purchased in 1998 only record at 1035i60 and have not yet been modified to record at 1080i60.

Downconversion

At the completion of an HD shoot, the next step in most cases is downconverting the HD footage to NTSC for offline editing on a nonlinear NTSC system. We downconvert in letterbox format to Betacam SP with timecode on the address track and timecode burn-in positioned just below the bottom edge of the letter box image.

Some clients will opt to have us downconvert HD footage for an NTSC edit only, preferring to do an HD online later. In that case, we downconvert without visual timecode burn-in in letterbox or 4:3 edge-crop format, depending on client preferences.

During downconversion we replace HD reference bars with NTSC reference bars from the downconverter. This is because HD reference bars have a chroma reference level that is over-saturated for NTSC. The NTSC reference bars will provide a more accurate tape setup for an NTSC online of HD-originated material.

It takes time for the downconverter to process the HD video material to NTSC. We delay the audio and timecode by 33 milliseconds (approximately one frame) to account for the downconverter's processing time. This keeps the audio and timecode in sync with the downconverted NTSC video.

Someone — the director, production assistant, offline editor, or offline edit assistant — should view the footage as it is downconverted. Image focus is the reason. Sometimes a downconverted NTSC image looks in focus, but the HD shot is soft. Someone viewing the HD footage during downconversion can make note of these soft shots so that out-of-focus images can be avoided in the online edit. If you aren't on top of focus discrepancies, an efficient, money-saving autoassembly can slow down quickly and become more costly if you're having to stop and find replacement shots for soft HD images.

Posting in HD

Over the last 18 months, linear and nonlinear HD editing systems have quickly become more and more like their NTSC counterparts. What kind of system to use depends on the length of the project and how complex it might be. Nonlinear HD editing systems are best suited for short projects that require a lot of layering and complex keying. Linear HD systems are better suited for program-length material. Render time and storage are the issues here. Each frame of a composited HD image requires more render time and four to six times as much hard disk storage space as a frame of NTSC video, which makes it awkward to work nonlinearly with program length projects. Because of this, linear and nonlinear HD editing continue to coexist, and probably will for the foreseeable future.

What kind of system to use depends on the length of the project and how complex it might be.

If a client requires more than three or four video layers to complete, recommend using a nonlinear HD edit system or a combination of both linear and nonlinear. For example, a program's storyboarded open, close, and bumpers can be more efficiently composited nonlinearly and then transferred to tape for a linear online of the entire project.

We work primarily on program-length material, so the online editing we do, via the Sony 9100 editing system, is linear. The Snell & Wilcox HD 1024 component high-definition video switcher is the backbone of our editing system. The switcher has seven color correctors, two DVEs, a chroma keyer, a border generator and a timeline function. The HD 1024 will work in

Although current HD editing is done in a linear fashion, a hybrid suite using dual processor Macs is planned.

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The linear HD suite is connected to Sony HDD 1000s, Panasonic D-5 HDs, Sony HDCAMS, and even a Sony UNI-HI for recording and playback.

many of the HD formats. We use the HD 1024 to edit 1080i and 1035i. Our facility has a large library of 1035i HD footage. The HD 1024 correctly modifies the exising 1035i material so that it can be used with 1080i HD footage to edit a 1080i master.

In HD there is no color subcarrier and no such thing as color frame, so a vectorscope is not necessary. We use HD waveform monitors set to display the three component RGB primaries to monitor levels and do color correction. This method of monitoring is more convenient and less complicated than monitoring an NTSC signal. Pedestal — reference black — is at 0 ire units instead of NTSC's 7.5. Reference white is the same — 100 ire units.

Because HD images contain many more pixels per frame than NTSC, there are certain switcher functions that are easier to do in HD than NTSC. Luminance and chroma keys have more range. The "standard" white-on-black mattes most often required when doing clean keying of graphics in NTSC are sometimes not necessary in HD. I've done several self-keys of graphics and logos that have dark red or blue colors on a black field and they keyed very easily over HD footage without the need of a matte.

Text insertion

HD graphics files are much larger than NTSC. Whereas NTSC graphics files produced in a pixel-based program, like Photoshop, are 720x486 pixels at 72 dpi with a file size of around 1MB, 1080i HD graphics files are 1920x1080 pixels at 72 dpi with a file size of 5- to 6MB. HD permits the use of a much greater range of thinner, more complex fonts and graphics than is the case with NTSC. However, most graphics done in HD do not downconvert very well at all.

It is best to edit a textless or "generic" master of an HD program first and then add graphics to a digital clone of the textless version. If you are going to downconvert the HD master to create an NTSC version, it is much better to downconvert the textless HD master to NSTC and then add NTSC-resolution graphics in an NTSC edit bay. There are some fonts used in HD that will downconvert to NTSC without problems. However, this might restrict what your graphic artist can to do with regard to a look for the HD master.

Prior to any HD online edit, maintain close, consistent communication with the facility you have chosen. Go over every aspect of what you want to do in editing an HD project at least twice. Be redundant. Don't be afraid to ask questions concerning the HD format, color correction, graphics and audio when planning what you want for the final master and the audio it will have. These questions sometimes determine the kind of tape format the final master will be edited to.

If, for example, a client wants to edit a half-hour 1080i HD program that will ultimately have both a stereo mix and a 5.1 encoded mix regarding its audio, then the master usually has to be edited to a Panasonic HD-D5. You cannot relay a 5.1-encoded audio stream to the audio channels of a Sony HD-CAM. There is no way to bypass the bit rate converters on the Sony deck and those converters disrupt the encoded 5.1 audio data, making it unusable. Most of the Panasonic HD-D5 machines allow you to bypass the bit rate converters so that the encoded datastream can be relayed to one of the audio channels.

If you want to use pre-read to increase the efficiency and speed of an HD online edit, you have to use the Sony HDCAM, because it is currently the only HD tape format with preread capability. If you want speed and efficiency in the online edit, you can master to HDCAM, then do a digital clone to an HD-D5 so that an encoded 5.1 audio mix — with the bit rate converters bypassed — can be relayed to one of the audio channels of the HD-D5 clone.

The two previous examples illustrate why it is so important to review every aspect of a high-definition project. Proper planning minimizes the number of surprises you encounter, and it becomes a much more enjoyable experience.

Allow the shooter ample time to get used to the HD camera.

Production and post production are more complex in HD than in NTSC. In the near future, many of the more complicated aspects of HD production and editing will disappear because of ongoing improvements to HD hardware and software. Engineering and production professionals will adapt quickly to the nuances of HD, and it will no doubt offer opportunities for production that do not exist with NTSC. The real "Golden Age" of television is about to begin. ■

Tim Werner is a linear online editor at HD Vision in Irving, TX.

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Applied Technology

RTpeak: Template-based graphics systems

BY ISAAC HERSLY

Given the inclusive production paradigm within today's television news operations, elections graphics systems should be included as part of the larger day-to-day news operations. A station's system should use the management database to keep track of all assets, such as text, stills and audio-visual clips, displaying their location and retrieving them for repeated use.

Elections, while they occur infrequently, can be handled in exactly the same manner. Information such as a candidate's head shot, video clip and party affiliation, as well as projected winners, can be stored in a database for immediate access to air. The database manager and graphics system can be still be utilized for day-to-day applications.

Template-based graphics systems can communicate with the database manager and provide a link between it and the graphic display device. They provide the ability to determine the physical layout of the video display from the graphics side. All of the image's aesthetic features (font style, speed of animation, audio clips, and 2D or 3D animation) may be developed in advance by the artist. Template-based systems also allow users to access the databases of images, predetermined text and video clips.

Pilot's template-driven systems provide an approach to graphics that can be used by anyone at any time.

With RTpeak's Pilot News, graphic artists can create a "look" in 2D or 3D space that includes a selection of fonts, still or video window sizes, position, dynamic backgrounds, video clip playback, digital video effects of live camera or recorded material and audio under selections. This look is stored as a template within the Pilot system. Any number of templates may be stored and grouped for different programs.

Any designated person, without specific technical knowledge, may use the Pilot asset management software and Oracle databases to select the proper template for the preparation, storage and sequencing playback of the graphic modules. Pilot then assembles the final product for real-time 2D and 3D display at the touch of a button. Pilot also controls real-time renderers such as the Peak Everest system.

Pilot Live Event software is specially designed to handle fast-changing live events including sporting events, elections and other programs that rely on rapidly changing external data feeds. Data from external sources may be automatically entered into templates and displayed upon request.

Pilot ObjectStore is a user-friendly, streamlined way of managing stills and graphics. The Oracle database provides for quick key word search and library functions. It eliminates the need to manage multiple sizes and positions of stills for archiving. Still images are entered once and then automatically sized and positioned according to the template's graphical requirements. The object library is independent from the on-air look.

While most of this software works within the day-to-day news, sports and financial presentation system, the same tools and procedures can be used when working with election data. The database

Template-based graphics systems can be used both for day-to-day news operations and for special election coverage. To broadcast results during the recent upset election in Mexico, Televista in Mexico City used graphics created with RTpeak's Everest software on six SGI 540 visual workstations.

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can be arranged to contain information for all candidates. The artist can create a look for the election information and build animations and displays around it. New templates can be incorporated into the system and automatically updated with new information.

With news organizations often in different locations within a geographic market, the availability of Web-based templates delivers additional editorial exposure. Templates may be accessed securely on the Web for preparation or editorial updates, allowing significant election data to be viewed prior to air. The need for last minute phone calls to gather information before going to air is eliminated and production values are greatly enhanced.

Users may simultaneously access graphical elements, prepare templates, create rundowns or "playlists" and make last minute changes in the data or alter the rundown sequence on the desktop or the browser. Multiple users can simultaneously make templates for different shows or show segments or prepare graphics for many networks.

All of the image's aesthetic features may be developed in advance by the artist.

Both the broadcast feed and a broadcaster's website can also receive identical up-to-the-minute election data without the need for duplicate data delivery systems, giving the broadcaster's brand image the same quality on the website as at the broadcast site.

While the perception has always been that it takes IT specialists to program and maintain systems, today's off-the-shelf products provide easy-to-learn-and-use operation. Most station staffers can add new information, such as a candidate's vital statistics, to a database, or quickly import photos and logos into the graphic element database for a late-breaking story.

Pilot's template-driven systems provide an approach to graphics that can be used by anyone at any time. Often the creation of graphics for live news becomes a bottleneck. Many graphics are created, revised and re-revised from scratch. Previously, the only way to quicken that process was to use generic, pre-fabricated shots rather than story-specific graphics.

No longer does the number of graphics artists you have determine the quantity and quality of your news graphics. The artist is now able to spend more time on larger scale projects and less time on more mundane tasks such as putting text in the appropriate style.

Using each news department's specific templates, reporters can extract their own graphic images in the appropriate style, with the color, animation and design of the graphic driven by the content the user enters.

When looking for a graphics system for elections or day-to-day display applications, stations can utilize off-the-shelf hardware. Key elements to evaluate when selecting a hardware system are based on the desired results: the level of graphics' speed and sophistication and the display quality.

To the extent possible, off-the-shelf software will also serve stations well. The software must be interoperable between a variety of hardware and database types, and any proprietary graphics programs should have the ability to import and export graphics data files from many of the most commonly used desktop programs. ■

For more information on Peak's graphics systems, circle (451) on Free Info Card.

Isaac Hersly is vice president of worldwide operations for RTpeak.

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Field Report

The Sony DSR-2000 digital videocassette recorder

BY ED FRATICELLI

As the world of digital video technology continues to expand, we find that high-end features start to appear in lower priced equipment. Such is the case with the Sony DSR-2000 DVCAM digital video recorder/player. With the professional features of its "big brother" format, Digital Beta, the DSR-2000 rivals its high-end kin. It definitely brings the DV format into the professional video production system.

The DVCAM format utilizes a 1/4-inch-wide cassette tape and was developed by Sony from the consumer recording system called Sony DV. The format records component digital video with a 4:1:1 sampling system (4:2:0 in PAL). The format also allows for four channels of PCM-encoded digital audio and professional SMPTE timecode.

The DSR-2000 utilizes the Sony DVCAM recording format, which has found its place among television stations and professional video production companies. While footage continues to be originated on film and video formats, the small format, 1/4-inch digital tape origination systems are making inroads. They are doing so by offering high-quality video and audio recording, advanced features and even features that do not exist in other formats, such as ClipLink and 4x real-time transfer.

The DSR-2000 is right at home in a component digital editing environment. With standard SDI connections for video and AES/EBU digital audio connections, the unit can fit directly into an existing Digi-Beta editing configuration. With a full complement of analog inputs and outputs, composite, and both YUV and S-Video component for video and balanced audio, the unit can be adapted to just about any other configuration as well.

In addition to common video and audio connections, the DSR-2000 offers several other digital media connections. The SDTI connections carry DV digital data for direct DV dubbing between two DSR-2000s or with other DV systems, such as a DSR-85 or the Sony DV editing system ES-7. With the optional DSBK-190 plug-in board, the i.Link feature can be used to facilitate 4x real-time transfer of DV data between similarly equipped devices, such as the Sony EditStation.

The serial remote control port connects easily to any standard editing system or other VTRs. I have tested the unit with an Accom Axial editor, Avid Media Composer and Softimage DS systems. A specific interface file has not been developed for the Axial, but the standard Digital Beta (DVW-500) interface worked well. The Avid automatically assigned a "generic deck" interface, and the DS's DSR-85 driver controlled the deck adequately for the limited use requirement of a nonlinear editing system.

Easy, multifunction playback and editing in a professional environment are made possible with the DSR-2000.

In the linear component digital editing suite, though, the VTR was terrific. The DSR-2000 features pre-read editing capability, a staple feature in a linear digital editing system. This feature worked flawlessly, but the documentation only specified connections to Sony-brand edit systems, so some reference experimentation was necessary. Once properly configured, the unit went right to work. The VTR also features dynamic motion control for slow motion reverse and forward motion, although I found the 1x speed

The Sony DSR-2000 DVCAM digital video recorder/player is useful in television stations and professional video production companies for its DVCAM format, which allows for component digital video recording using a 1/4-inch cassette tape and the ability to play back other DV format tapes.

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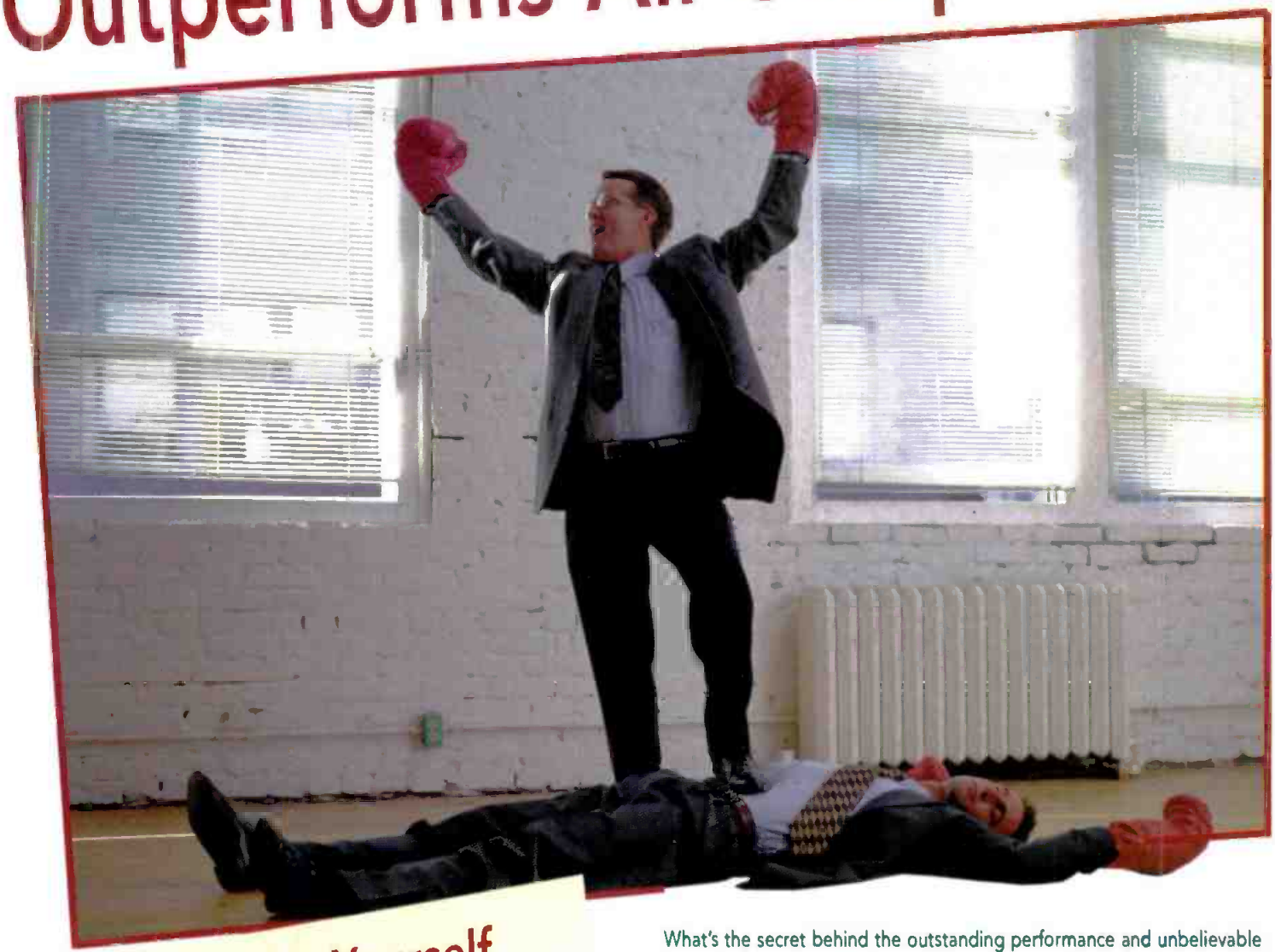

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maximum in each direction a bit limiting. The unit handles split audio/video edits with no problems and searches at a full 60x speed, although the picture's blockiness at this speed made recognizing pictures somewhat difficult. I also found a lack of TBC or process controllability (video, setup, etc.) through the serial remote port, which I am used to with D-Beta.

But I found the unit provided excellent quality, interpolated slow motion video and seemingly flawless digital pictures. Responses to "speed curve" commands were as good as any VTR I have used. The digital audio from the unit was excellent also. One odd discovery was that the unit uses a full 48kHz sample rate only in the two-channel audio mode, but is limited to 32kHz in the four-channel mode. While four-channel audio is not a concern for most of the work I deal with, I know it may be a concern to others. Full audio scrub in the jog mode makes audio cueing and searching easy. The unit uses a special memory buffer to accomplish this feat.

The DSR-2000 is right at home in a component digital editing environment.

By far, though, I found one of the unit's most desirable features to be its ability to play back other DV format tapes, as well as DVCAM 25Mb/s tapes. Tapes from Sony DV consumer recorders and cameras can be played in the unit, and the small-sized cassette is mechanically accommodated automatically upon insertion, with no cumbersome adapters needed. Speaking of tape sizes, the standard, larger DVCAM cassette holds a maximum of 184 minutes and the smaller, "mini" cassette holds 40 minutes. Tapes recorded using the Panasonic DVCPRO25 format can be played as well. While playback from the SDI and analog connections is fully implemented from these formats, recording and editing are not possible, and a clear indication is made of this on the front panel of the machine.

This capability makes the DSR-2000 quite useful in a facility that finds itself faced with having to play back many different tape formats for any given job. DV consumer and "prosumer" cameras are being used for both commercial and corporate video productions, as well as in television newsgathering. The format's low cost and high-quality pictures are being discovered by many video content producers. Easy, multifunction playback and editing in a professional environment are made possible with the DSR-2000. ■

For more information on Sony's DSR-2000, circle (450) on Free Info Card.

Ed Fraticelli is the director of engineering and post production for Production Masters Inc. Pittsburgh.

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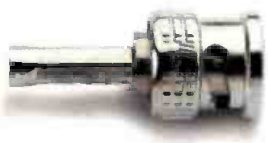

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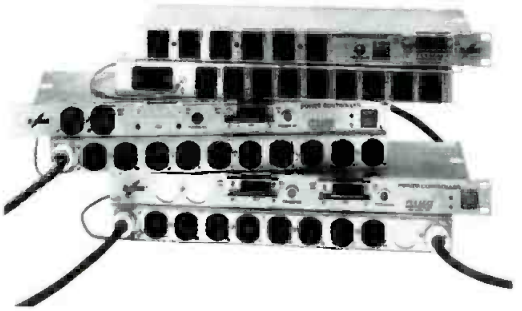

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Media 100 iFinish 3.2: new version offers enhancements including unlimited file size support, dual-head graphics support and Windows 2000 compliance; 800-773-1770; 508-460-1600; fax: 508-624-9384; www.media100.com.

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SURGE PROTECTOR

New Frontier SX2120-SEQ: provides surge protection and power conditioning for up to 14 pieces of audio, video, broadcast and computer equipment; new model can power electronic devices in a group up and down sequentially; rear panel features 14 standard grounded AC receptacles; features programmable functions and time delays and a Phoenix terminal block connector for remote control via momentary switches or applied voltage; rated for 20 amps at 120 volts; 215-862-9344; fax: 215-862-0270; www.frontierelec.com.

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BROADCAST AUTOMATION SOFTWARE

Video Design Software GameTrak: client/server application designed to allow broadcasters to generate live out-of-town scores and statistics from an external data source; operates on the Chyron iNFiNiT! family and Chyron Duet products; can be used with a SportsTicker data feed to show schedules, clocks and scores; can display statistics on the Chyron by using a SportsTicker premium feed; server interfaces with the SportsTicker feed to show the user all slugs and data errors; 631-249-4399; fax: 631-249-4341; www.videodesignsoftware.com.

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REEL LOADER

Roll-A-Reel Company Style C Roll-A-Reel: space saving model of the reel-loading device; CEMA-rated at 3000 pounds; two platforms are placed behind the reel flanges for roll-on loading of reels of any width; features a built-in steel loading ramp and spring-loaded front roller lock, eliminating the need for jacks or cranes; keeps the reel no more than four inches from the floor; 513-761-8500.

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ISOLATOR

Jensen Transformers ISO-MAX VB-1BB: neutralizes ground loop problems to eliminate "hum bars" and associated artifacts for maximum fidelity in home theater and professional video applications; offers an isolation spec of 120dB common mode rejection ratio at 60Hz; other features include wide bandwidth of -3dB at 10Hz to 10MHz, with a low insertion loss rate of .55dB; can withstand transient voltages exceeding 350 VRMS from I/O and 500 VRMS from I/O to case; 818-374-5857; fax: 818-763-4574; www.jensen-transformers.com.

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IP CONTROLLER

Knox Video NetControl2000: headend hardware converts IP commands to RS232 to communicate with Knox routing switchers and other remote control devices; controls all video, audio and computer signals on a LAN or on the Web; private control site is created on the Web, with Knox proprietary software, allowing for increased security; control sites for single or multiple routers can be created, featuring a graphical interface; ideal for educational applications, teleconferencing and cable headend control; 301-840-5805; fax: 301-840-2946; www.knoxvideo.com.

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WAVEFORM/VECTOR RASTERIZER

Magni Systems MM-400: converts waveform and vector display information to a standard video signal for display on a picture monitor or routing through facility; display can be switched between pictures and waveforms at the touch of a button; allows users to set camera levels before a shoot, check time base correctors and color fidelity, and identify problems including hue shift, smearing, muddy contrast and loss of detail; offers three loop-through inputs to accept three composite signals or one Betacam, MII or RGB signal; 800-237-5964; 503-615-1900; fax: 503-615-1999; www.magnisystems.com.

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ELECTION GRAPHICS PACKAGE

Orad Election 2000 Package: package contains MobileSet portable virtual set system, customized graphics for each station and free installation and training; a full elections graphics package from EGAD! and multiple CG backgrounds for results and promotional trailers is included as part of the Election 2000 package; requires minimal hardware for operation consisting of an SGI O2 workstation, chromakeyer and an A/D converter; 212-931-6723; fax: 212-931-6730; www.orad-ny.com.

Circle (381) on Free Info Card

HD PLASMA DISPLAY PANEL

Panasonic TH-50PHD3U: 50-inch, 16:9 wide aspect ratio display features 1366 x 768 UXGA resolution, a panel brightness of more than 500cd/m2 and a contrast ratio of over 2000:1; can produce 16.77 million colors, with 1024 shades of gray scale; has a horizontal/vertical viewing angle of more than 160 degrees; 800-528-8601; 323-436-3500; fax: 323-436-3660; www.panasonic.com/broadcast.

Circle (382) on Free Info Card

DVD-RAM

Panasonic 4.7GB/9.4GB DVD-RAM: new drives and bare disc media provide higher capacity, increased recording speed and broad compatibility; allows users to develop theater-quality DVD videos, as well as downloading from the Web; ASACA, LaCie, Pinnacle Systems and VERITAS assisted in creating applications for the DVD-RAM drives, including creating libraries storing 18 days of continuous-play video for streaming video, Web video and broadcast production; USB, FireWire PC and notebook 4.7/9.4GV subsystems provide almost unlimited storage capacity; 800-528-8601; 323-436-3500; fax: 323-436-3660; www.panasonic.com/broadcast.

Circle (383) on Free Info Card

DISK RECORDER

EVS Broadcast Equipment 6-channel Live Slow Motion: users can choose from two configurations; the "four record + two play" allows users to record four cameras and simultaneously play back two channels for replay and editing; remote control panels allow one or two operators to control the unit and assign any of the four inputs to any output; internal keyer and mixer board enables the operator to chain two or several replays with dissolve/wipe transition; the "three record + three play" configuration allows three operators to control the unit, recording on three cameras; +32 41 22.00.70; fax: +32 42 22 22 98; www.evs-broadcast.com.

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ultimatte 9

Specifically designed for virtual studio applications, the Ultimatte 9 offers features that produce a polished virtual production where visual improvements can be seen on the screen while bottom line production costs are reduced.

DEPTH OF FIELD with BACKGROUND DE-FOCUS
Automatic background defocusing that requires no software programming or physical hookup to the camera or computer.

AMBIANCE and COLOR CONFORMANCE
Analyzes the background and automatically adjusts the foreground color in real-time.

EDGE CONTROL with AdvantEdge
Produces a flawless edge and can be used alone or in conjunction with sub-pixel matte sizing and positioning controls.

OVER-EXPOSURE CONTROL
Corrects problems with over exposed blue screens with no loss in detail.

EIGHT-INPUT ROUTER
Configurable so that any of the inputs can be used for Foreground, Background or Matte signals, providing enhanced versatility.

The new Ultimatte 9 and Ultimatte 400 are part of the third generation of Ultimatte's all digital compositing devices. They feature the Emmy and Oscar winning technology that has gained Ultimatte Corp. a reputation for the best blue- and green-screen compositing in the world. Both are fully linear matting systems, producing totally realistic composites even when the foreground contains smoke, shadows, soft edges, and other translucent and transparent qualities.

PROGRAMMABLE REMOTE CONTROLS
Both the Ultimatte 9 and the Ultimatte 400 feature advanced remote controls which can control up to 4 Ultimatte main units. "On Air" tally lights, reduced menu layers and programmable menus give you easy access and control.

ULTIMATTE 400
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Now Shipping

42" PLASMA DISPLAY

Panasonic TH-42PWD3U: features peak panel brightness of 650cd/m2 and 2300:1 contrast ratio; other features include a Real Black Drive System, adaptive brightness intensifier, false-edge predictor filter and UXGA/HDTV compatibility; offers a 16:9 aspect ratio and 160-degree viewing angle; displays VGA, SVGA, XGA, SXGA and UXGA resolutions; is equipped with component video (YPbPr) inputs and enables viewing of DTV broadcasts in 1080i, 720p, 480p or 480i; 800-528-8601; 323-436-3500; fax: 323-436-3660; www.panasonic.com/broadcast.

Circle (389) on Free Info Card

REVERB PLUG-INS

Kind of Loud Technologies RealVerb Stereo Plug-ins: high-quality reverb for Pro Tools and Digi 001, now shipping from Kind of Loud Technologies; allows users to control audio room shape, size and texture, as well as morphing and blending in real time, with no pops, clicks or distortion; also allows panning within the stereo spectrum; 831-466-3737; fax: 831-466-3775; www.kindofloud.com

Circle (391) on Free Info Card

NETWORKING AND STORAGE INFRASTRUCTURE

Omneon Video Network Video Area Network: now shipping from Omneon; stores HD HDCAM, DV, DVCPRO 50, MPEG-2, uncompressed 601 and streaming files; also features IEEE 1394 connectivity with leading industry interfaces; users can transparently share access to the same stored assets through a single file system; 408-585-5000; fax: 408-585-5090; www.omneon.com.

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From the 20-year industry veterans who forged the development of the early analog routers ... who led the way into digital routing ... and HDTV ... now comes ... a very clever little box: the UTAH-200. Handling both analog and digital signals, both video and audio signals, the UTAH-200 gives you the routing flexibility you need in today's environment. And all in the space of a bread box.

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AUTOMATION SYSTEM

Odetics Micro Station: now shipping from Odetics; designed for smaller market stations, to automate video programming and the insertion of interstitial material; includes digital disk storage, machine control, and software; plug-and-play device comes complete with software suite, including applications for media preparation, database management and on-air playlist management; 714-774-2200; fax: 714-780-7594; www.odetics.com/broadcast/.

Circle (351) on Free Info Card

GRAPHIC FILE CONVERTER

Inscriber C2i: an NT-based, stand-alone application now shipping from Inscriber that converts Chyron message files to fully editable Inscriber layouts; recognizes and reads Chyron message files within a Windows NT file system; allows broadcasters and post production professionals to connect directly to a Chyron device via FTP protocol; converted files retain backgrounds, logos and other resources that were originally used to render the pages; 800-363-3400; 519-570-9111; fax: 519-570-9140; www.inscriber.com.

Circle (352) on Free Info Card

LAPTOP EDITING SYSTEM

Panasonic AJ-LT95: now shipping from Panasonic; a DVCPRO50 4:2:2 laptop editing system; video production capabilities include 525/625 and DVCPRO/DVCPRO50 switchability, 4:2:2 component video quality; 16:9 widescreen monitors and four digital audio channels; includes two 4:2:2 DVCPRO50 VTRs, an editing controller, two 16:9 seven-inch LCD monitors and two speakers; 800-528-8601; 323-436-3500; fax: 323-436-3660; www.panasonic.com/broadcast.

Circle (356) on Free Info Card

30" VIEWABLE HDTV MONITOR

Princeton Graphics AF3.0HD: now shipping from Princeton Graphics; supports all ATSC HD formats, video and VGA, SVGA and XGA resolutions from computer sources; includes six preset memories for the most common DTV resolution formats — 480p, 720p and 1080i — and for VGA, SVGA and XGA; also features a horizontal scanning range of up to 50kHz and custom memory settings for black level, contrast, geometry and masking; 800-747-6249; 714-751-8405; fax: 714-751-5736; www.princetongraphics.com.

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Business Wire

Business highlights from broadcast and production

BY LAURA COLLINS, EDITORIAL ASSISTANT

Doyle Technology Consultants recently completed Loudeye Technology's Santa Monica office. The new facility allows Loudeye to meet its clients' encoding, management and digital media distribution needs.

Panasonic, the prime contractor for the 2000 Olympic Games, recently selected Videotek to provide test and measurement equipment for the Games.

The company is also working with the Post Group on a new HD cinema process that allows filmmakers to view dailies in high definition. Negative film is delivered to the Post Group and transferred to Panasonic's D-5 HD full-bandwidth, 10-bit format for viewing on the movie or television set using Panasonic's DLP-based digital projector. The process has recently been used on the feature film *Return to Me*.

Several facilities recently took delivery of Vecta Multistandard DTV Stillstores from Avica, including Pacific Data Post in Santa Monica, CA, East Coast Post in New York, and International Video Conversions and VDI Multimedia in Burbank, CA. Laser Pacific Media Corp. in Hollywood purchased two of the stillstores, marking Avica's first 1080p/24sf installation for HD mastering.

QuVIS' QuBit digital motion image recorder was used in the digital premiere of *Titan AE*, the first movie to be delivered and distributed via the Internet, at the SuperComm trade show in Atlanta. The movie was digitized using QuBit, transported from Los Angeles to Atlanta on a high-speed Cisco network and then shown using a digital cinema system incorporating the QuBit.

The QuBit is scheduled for installation in seven digital cinema theaters worldwide, including the Cinemex Mundo E in Mexico, Seoul Cinema Town in Korea and AMC Tokyo Disneyland in Japan.

There are currently 30 digital cinema theaters, and all use QuBit for digital recording, storage and playback.

Harris Corp. provided CBS affiliate WRDW-TV with a new multichannel digital master control, a FlexiCoder MPEG-2 encoding system, and other equipment to enable the station to broadcast the 2000 Masters golf tournament in HD.

The station's digital channel, WRDW-DT/31 provided HD coverage of the tournament to close to 600,000 area viewers and patrons at the Augusta National Golf Club.

UPN station KXTU-LP in Colorado Springs chose an Itelco 5kW transmitter to reach its audience in southern Colorado.

Screen Shot

Accom produces golf tournament effects

ESPN and NBC used Accom products in their coverage of the 100th U.S. Open Golf Tournament in Pebble Beach, CA, including Dveous Digital Video Effects systems, APR Attache Digital Disk Recorders and Abekas 6000 Multiflex DTV Servers. ESPN utilized three dual twin Dveous systems in its production and edit trucks to produce effects, including fly-in screen graphics and bar wipe transitions, score boxes, and boxes showing two golfers on different holes simultaneously. ESPN also used the Abekas 6000s to pull clips from recorded material and create edited pieces quickly.

NBC used two dual twin Dveous systems and two Attache DDRs in its production trucks for transitions, bumpers, rejoins and "fax" checks on the cameras, as well as for building score boxes.

yU + co layers images for MI2 title

yU + co produced the main title sequence for *Mission Impossible 2*. The sequence begins with the trademark image of a match head lighting a fuse and continues with layered images of rotating glass-textured 3D letters spelling the word "mission," images of cells dividing and an etched drawing of a Greek warrior battling a chimera provided by Paramount

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Plus8Video added two 11.5 x 5.3 HD Cine Style lenses from Angenieux to its inventory of HD equipment.

Australian Broadcasting Corporation (ABC-TV) in Perth, Australia, purchased the first Postation II from DSP Media.

Pictures. These last two elements of the sequence refer back to an integral element of the plot, a virus called "Chimera." yU + co artists modeled and animated the 3D letters and colorized and digitally treated the cell imagery, as well as manipulating the etching of the warrior and chimera.

Panasonic records Vietnam War memoir

Panasonic's AJ-PD900WA 2/3-inch DVCPRO50 progressive camcorder was recently used to shoot a Vietnam War memoir, "Flight Line: The Army Helicopter Pilots of Vietnam," for broadcast on PBS. The tentative air date for the memoir will be Nov. 11, Veterans Day. Producers Chris Fetner and Jeremy Wood used the AJ-PD900WA to shoot 100 hours of interviews with more than 20 veterans for online mastering to Panasonic's D-5 full-bandwidth, 10-bit recording format and delivery to PBS.

The equipment was chosen because a digital, 16:9 acquisition format, upgradeable to HD, was needed for later preservation and easy manipulation of the footage at the National Vietnam War Museum.

Prime Image routes video for Pope's visit

Prime Image provided its digital time base corrector/frame synchronizers for the Pope's visit to Israel. Prime Image set up the transmission sites in many of the places the Pope visited, including Bet-Lechem, where the main event took place. External video inputs from Sony and Philips cameras were linked to control suite equipment by cable and then routed through Prime Image's F/S.

The frame synchronizers eliminated timing and color correction problems and reduced the cost of production by $10,000 over renting OB trucks with multicore cables.

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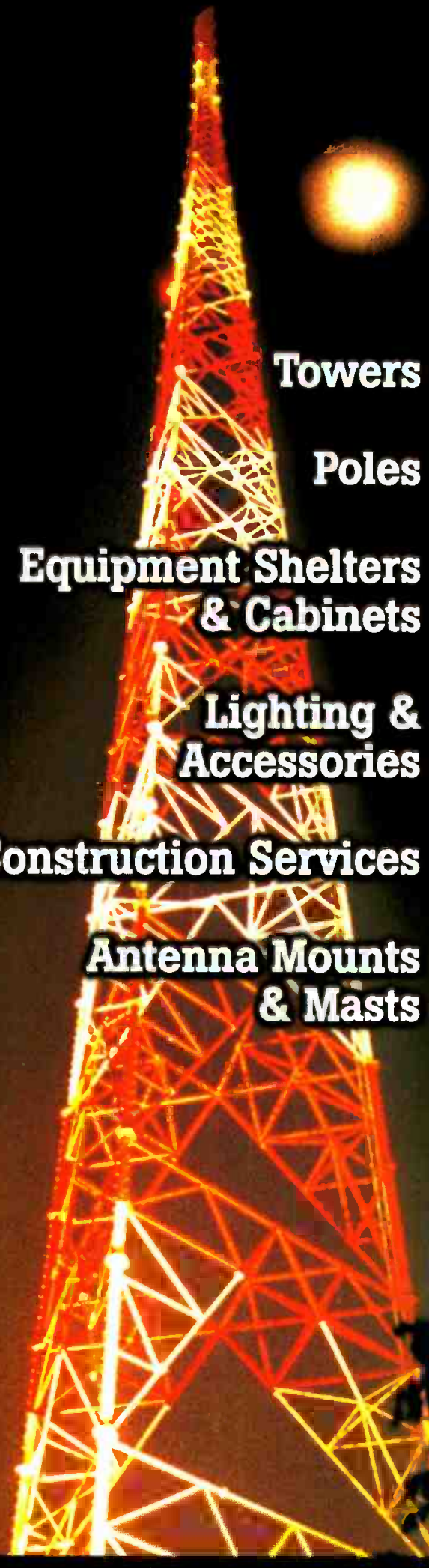

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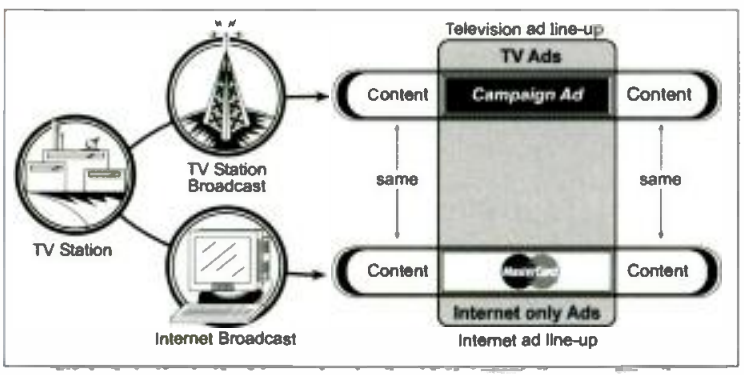
JVC is working with 3DV Systems to integrate 3DV's ZCam Depth Camera with JVC's KY-D29 digital signal processing camera to allow for real-time capture and manipulation of 3D data.

JVC is also working with C-Cube and DiviCom to develop the DM-D4000 HD MPEG-2 decoder, offering a choice of HD and standard-definition formats.

Turner Studios recently purchased the first Aysis Air Mobile from Solid State Logic for use in its 53-foot network production truck. The truck is used primarily for sports production, including live NBA and NHL broadcasts.

DST recently won the Philips' Systems Integrator of the Year award for the quantity of equipment purchased and the quality of its work in installing Philips equipment.

DST was also chosen by the Real Broadcast Network, the Internet broadcasting services division of RealNetworks, to provide equipment for the insertion of customized Internet ads for WOKR-TV, New York.



Real Broadcast Network/DST terrestrial/Internet ad insertion

SGI has installed more than 1300 broadband media servers, gaining a 25.3 percent market share. SGI Intranet video servers are installed in public and private networks, intranets and Internet, and LAN and DSL for applications such as corporate communications and distance learning.

NBC and its mobile production contractor NEP Supershooters have named GEPCO as the exclusive provider of audio and video cabling, connectors, and interface boxes for their 2000 Olympic coverage.

WTWN-TV in Miami, FL, chose a SoftSet-Lite virtual set from Devlin Design Group to improve the look of its newscasts.

Avid launched a new division, Edgestreme Systems, to provide Internet infrastructure technology to assist service providers and content hosters with the distribution of streaming media and other high bandwidth content over the Internet.

Quantel's management team is now the majority shareholder in the company, after a successful buyout of the company from former owners Carlton Communications. The buyout was valued at approximately $77 million, and was secured with backing from Lloyds TSB Development Capital.

New India-based software solutions company Celstream Technologies recently announced strategic partnerships with Tektronix, Grass Valley Group and ContentGuard for the deployment of Celstream's software products.

PEOPLE

Terrence Montgomery

GeoVideo Networks, a Lucent Technologies venture, appointed Terrence Montgomery to business development director for digital cinema.

QuVIS named David Ripp national director of sales for the Themed Entertainment and Display Group.

PESA Switching Systems recently promoted David Montgomery to vice president of international sales.

David Montgomery

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QUICK DIAL 74

SONY

DSR-200A

3-CCD Digital (DVCAM) Camcorder

Combining a compact and lightweight body with the superior picture quality of DSP (Digital Signal Processing) and the DVCAM format, the DSR-200A is the ideal acquisition tool for video journalists, event and wedding videographers, Stringers and production houses. 500 lines of horizontal resolution, 48kHz or 32kHz digital audio, three hour record time, and minimum illumination of 3 lux is only the beginning. Other features include 16:9/4:3 capability, Steady Shot, time code operation, time/date superimposition and an IEEE 1394 interface for direct digital output.

- **Variable servo 10X optical power zoom lens** goes from 5.9 to 59mm in 1.7 to 24 seconds. The manual zoom rocker is continuously variable right up to where the digital 20X zoom kicks in.
- **Sony's Super Steady Shot** reduces high frequency camera shake without compromising image quality. SteadyShot uses horizontal and vertical motion sensors that allow it to work accurately while zooming in, moving (even shooting from a car), and shooting in low light conditions.
- Has **digital effects** including audio and video fade, overlap and Slow Shutter.
- **Automatic and manual focus**, iris, shutter, gain and white balance. Iris is adjustable in 12 levels from F1.6 to F11, shutter from 1/4 to 1/10,000 of a second in 12 steps, Gain from -3dB to +18dB in 8 steps. • **Zebra Pattern Indicator** built-in ND filter.
- **Custom Preset function** lets you Preset, store and recall custom settings for color intensity, white balance (bluish or reddish), sharpness and brightness.
- Stores Photo Date/Time, Shutter Speed, Iris, Gain and F-stop for easy recall. So if you have to re-shoot, you know your original settings for every scene and frame.
- **Records Drop/Non-Drop Frame time code.** Time code can be read either as NDF time code or as SMPTE time code.
- Has a **large 1-inch B&W viewfinder** with 550 lines of resolution for easy focusing even in low contrast lighting situations. Separate information sub panel displays time code, battery time, tape remaining and other camcorder functions without cluttering up the viewfinder.
- Records **16-bit/48kHz audio on one stereo track** or 12-bit/32kHz with two pairs of stereo tracks (L1/R1, L2/R2), so you can add stereo music or narration.
- **Automatic & manual** (20 step) **audio level record controls.** Monitor audio with headphones or from the LCD panel which has an active VU meter.
- **XLR input connectors** for mics and audio equipment.

DSR-300A

3-CCD Digital (DVCAM) Camcorder

Inheriting many of the same features and functions as the DSR-130, the affordable DSR-300A actually extends operational convenience with a range of new features and peripheral products. Remarkably compact and lightweight, the improved DSR-300A provides high mobility without compromising picture quality and can be held comfortably on your shoulder through the longest shoots and gives videographers the ability to acquire their footage quickly and easily.

- The DSR-300A has three 1/2" IT Power HAD CCDs to deliver 800 lines of horizontal resolution, 62dB S/N ratio and high sensitivity of F11 at 2000 lux.
- Power HAD CCDs also gives you a low Smear level of -110 dB (DSR-300) allowing more freedom to shoot highlighted subjects.
- With built-in 26-pin VCR interface, they can feed composite or S-Video output signals to an external recorder for parallel or back up recordings. VCR recording modes including Parallel, Interval (only) and External (only) are selected via the trigger switch positioned on the operational panel.
- With the DSR-300A, a picture previously recorded on tape can be superimposed on the viewfinder screen (Freeze Mix Function), allowing you to easily frame or reposition the subject just as in the previous shot. Combined with the SetupLog function, the retake shot becomes a breeze.
- LSI Digital Signal Processor (the very same one used by the DXC-D30 cameras) for a high signal-to-noise ratio of 62 dB.
- Both mini cassettes (PDVM series) and standard cassettes (PDV series) can be used with the DSR-300A. With PDV-184ME (standard), a maximum recording time of 184 minutes can be achieved. They can also play back tapes recorded in the consumer DV format.
- For operational convenience while shooting, the Time Code is superimposed on the viewfinder screen or MONITOR OUT screen, even during playback.
- DXF-801 viewfinder featuring variable peaking, 3 level tally light and a white LED light with 2 levels of intensity to illuminate the lens setting. • IEEE1394 i.Link (out only).
- Color Temperature Shift allowing the operator to manually shift the white balance either towards blue or red to compensate for conflictive (color temp mix) and because of the wide range it also provides creative artistic painting.

DSR-20/40 DVCAM Player/Recorders

The DSR-20 and DSR-40 are versatile DVCAM VCRs with compact chassis and a variety of convenient functions for recording, playback and simple editing. They feature Auto Repeat Playback, Power-On Recording/Playback, multiple machine control interfaces and i.Link (IEEE 1394) input and output. And, of course, they offer the stunning image and sound quality inherent to the DVCAM format.

- **i.LINK** They both offer i.LINK (IEEE1394) input/output. In addition to the digital dubbing including TC Copy" mode, full information of video, audio and time code of the original tape can be copied to another tape. Especially useful when making working copies of the original.
- **Inputs and Outputs** They provide a full range of analog video inputs and outputs for integration into current analog-based systems. They both offer composite and S-Video input/output, while the DSR-40 (only) offers a component output as well. The DSR-20 is equipped with analog audio inputs and outputs (RCA), the DSR-40 with RCA inputs and XLR-balanced output. These connections in combination with their i.LINK interface allow a smooth transition to an all digital system in the future.
- **Record/Playback Functions** Automatic repeat function for repeated playback. After reaching the end of the tape, the DSR-20/40 automatically rewinds the tape, then starts playing back the segment again.
- They are capable of searching for Index Points, which are recorded on the tape as "in-point" marks every time a recording starts. They can also search for photo data recorded on a DVCAM cassette by the DSR-200A/300/PD-100, or where the recording date has been changed.
- **Reference Input** External sync input enables synchronized playback with other VCRs. Especially important in A/B Roll configurations. In addition, the DSR-40 only allows adjustment of H-sync and SC phase via the menu.
- **Control S Interface** The DSR-20/DSR-40 have a Control S input allowing control via the optional DSRM-20 Remote Control.
- The DSR-20 adds a **Control S output** connector allowing two or more (up to 50) DSR-20s to be daisy chained and controlled from one DSRM-20.

DSR-20 Only • The DSR-20 can be powered by AC or DC.
- Equipped with Control L interface, the DSR-20 can perform simple Time Code-based editing when connected to another DSR-20 or other similarly equipped VCRs/cameras.
- In addition to Control L, the DSR-20 also incorporates an RS-232 interface for remote control of basic VCR functions from a PC.
- Supplied with the RMT-DS20 Wireless Remote for control of basic VCR functions.

DSR-40 Only • Equipped with an RS-422A interface, it can perform as the editing player in A/B roll or cut editing system.
- It also has a simple recording function which can be controlled either manually or via its RS-422A interface.
- The DSR-40 is not equipped with a synchronization capability; the editing accuracy is performed by pre-roll and play.

DSR-30 DVCAM Digital VCR

The DSR-30 is an industrial grade DVCAM VCR that can be used for recording, playback and editing. DV standard 4:1:1 sampling digital component recording with a 5:1 compression ratio provides spectacular picture quality and multi-generation performance. It has a Control L interface for editing with other Control L based recorders such as the DSR-200A DVCAM Camcorder or another DSR-30. It also has a continuous auto repeat playback function making it ideal for kiosks and other point of information displays.

- Records PCM digital audio at either 48kHz (16-bit 2 channel) or at 32kHz (12-bit 4 channel).
- Equipped with Control L, capable of SMPTE Time Code based accurate editing even without an edit controller. Built-in editing functions include assemble and separate video and audio insert.
- By searching for either an Index point or Photo Data recorded by the DSR-200A camcorder, the DSR-30 drastically cuts the time usually required for editing. The DSR-30 can record up to 135 Index points in the Cassette Memory thanks to its 16K bits capability.
- Audio lock ensures audio is fully synchronized with the video for absolute precision when doing an insert edit.
- Built-in control tray has a jog/shuttle dial, VCR and edit function buttons. The jog/shuttle dial allows picture search at ±1/5 to 15X normal speed and controls not only the DSR-30 but also a player hooked up through its LANC interface.
- DV In/Out (IEEE 1394) for digital dubbing of video, audio and data ID with no loss in quality.
- Analog audio and video input/outputs make it fully compatible with non-digital equipment. Playback compatibility with consumer DV tapes allows you to work with footage recorded on consumer-grade equipment. Tapes recorded in the DSR-30 are also compatible with Sony's high-end DVCAM VCR's.

SONY

DCR-VX1000

3-CCD Digital Camcorder

The DCR-VX1000 records 500 lines of horizontal resolution, and has a higher S/N ratio than cameras costing ten times more. Also records audio digitally, using PCM technology, the same as used in CDs for a breathtaking dynamic range of 96 dB. Most important though, since video and audio signals are recorded digitally, you can copy or edit multiple generations with no loss in quality. Analog tape artifacts like color bleeding, dropouts and generation loss are all a thing of the past.

B&H SPECIAL $2795

- Eight-speed 10X optical zoom lens goes from 5.9 to 59mm in 4.1- 20 secs. Also provides a digital 20X zoom.
- Records 12-bit/32kHz audio with two pairs of stereo tracks.
- Automatic and manual audio level record controls.
- Built-in time base corrector (TBC) delivers jitter-free playback and dead-perfect stills.
- Digital effects include audio and video fade (to black), overlap and slow shutter • Time-lapse recording.
- Sony's Super SteadyShot reduces high frequency camera shake without compromising image quality.
- Records "extended data codes". Automatically stores date/time, shutter speed, Iris and other data for easy recall.
- Records drop-frame time code for accurate editing.
- Record still image pictures with audio for up to seven secs.
- Focusing, exposure and white balance are all automatic or can be manually controlled.
- Zebra pattern indicator just like professional cameras.
- Preset, store and recall your own custom settings for: color intensity, white balance, sharpness, brightness and gain shift (0dB/-3dB).
- Precision 180,000 pixel color viewfinder incorporates a separate information sub panel which displays time code, battery time, tape remaining and other camcorder functions without cluttering up the viewfinder.
- Control L terminal for communication between camera and edit controller.
- Built-in ND (neutral density) filter.
- Square lens hood reduces external light flare effects.

JVC

GY-DV500

1/2-inch 3-CCD Professional DV Camcorder

The world's first DV camcorder designed from the ground up for professional ENG work, the GY-DV500 combines the convenience and cost-effectiveness of Mini DV with the performance and features you need. Incorporate three 1/2-inch 380,000 pixel IT CCDs for superior picture performance (equivalent to 750 lines of resolution) superb sensitivity of F11 at 2000 lux and minimum illumination of 0.75 lux (LoLux mode). Rugged construction with a rigid diecast magnesium housing. Extremely portable, compact and light weight (less than 11 lbs. fully loaded). Additional features like the menu dial and Super Scene Finder assure ease-of-use and shooting flexibility, while the IEEE1394 and RS-232 interface allow integration into various non-linear and post-production systems. A professional camcorder in every sense, the compact, lightweight GY-DV500 redefines acquisition for corporate, educational, cable and broadcast production, as well as wedding videography and multimedia applications.

Professional Specifications

- Applies JVC's DSP with advanced 14-bit video processing to bring out more natural details, eliminate spot noise, accurately reproduce dark areas, and restore color information in dark areas.
- CCDs are equipped with advanced circuitry to virtually eliminate vertical smear when shooting bright lights in a dark room. Ensures efficient light conversion with a sensitivity of F11 at 2000 lux.
- CCD Defect Correction function evaluates white defects with the lens closed and then stores their addresses in memory. When the camera is turned on, the data is sent to the DSP for storage and real-time correction.
- Black Stretch/Compress function ensures accurate reproduction of black areas on the screen. Advanced color matrix circuits give even difficult images a very natural appearance.
- Multi-stream parallel digital pipeline processing at 40 MHz creates an ultra-smooth gamma curve, calculated using a true log scale algorithm. The result is a dynamic range of 600% to accurately reproduce fine details and colors in shadows or highlights.

Professional Performance

- Multi-zone Iris weighting system gives priority to objects at the central and lower portions of the picture for accurate auto exposure under any condition, even if a bright subject moves into the picture.
- Adjustable gamma for adjusting the "feel" of the picture according to taste. Adjustable detail frequency for setting picture sharpness for a bolder or finer look.
- Viewfinder status display uses characters and menus to display selected information, including audio indicator, tape and battery remaining time, VCR operation and warning indicators. Camera settings and setup parameters can also be checked at a glance. A built-in menu dial lets you quickly navigate through the viewfinder menu.
- Highlight Chroma Processing maintains color saturation in highlights. The result is natural color reproduction, even in bright highlight portions of the picture.
- Smooth Transition mode ensures a smooth transition with no jump in color or light level taking place when manually changing gain or white balance settings.

Professional Audio

- To complement its superior video performance, the GY-DV500 offers outstanding digital PCM sound. You can choose between two 16-bit 48-kHz channels or two 12-bit 32-kHz channels with a dynamic range of 85 dB.
- In addition to camera mounted mic, has two XLR-balanced audio inputs with 48v phantom power and manual audio control. Phantom power can be switched off when not in use.
- Side-mounted speaker lets you monitor audio in playback and recording modes without headphones. The speaker also delivers audible warnings.

SR-VS10U MiniDV and S-VHS VCR Combo

The HR-DVS1U is a unique all-in-one video solution combining miniDV and Super Hi-Fi Stereo in one VCR. The MiniDV deck allows direct playback of cassettes you've recorded on a MiniDV camcorder without any cables to connect. One easy solution!

- Mini DV Format & High Resolution Super VHS and VHS
- Super VHS ET Recording
- Pro-Cision 19 micron width EP Heads
- DigiPure Technology w/ TBC and 4MB Frame Memory
- PCM Digital Audio (DV) and Hi-Fi VHS Stereo with MTS Decoder • Jog/Shuttle on Remote
- VCR Plus+ with "Cable Eye" Cable Box Controller
- Insert Editing with Flying Erase Head • Plug & Play
- Audio Dubbing • Auto Index and Index Search
- DA4 (Double Azimuth) Head Helical Scan System
- Digital AV Tracking • Express Programming • Auto SP-EP Timer Recording • Active Video Calibration • Multi-Brand TV/DBS Compatible Remote with Jog / Shuttle
- S-video Input on Front / Back Panel • Two S-Video Output on Back Panel • Rear AV INPUTS, Gold Plated Front Inputs
- DV Playback Component Video Output. Two A/V Outputs

anton bauer

HyTRON 50 Battery

Weighing a mere 31oz (880 grams) and packing 50 Watt-hours of energy - enough to operate a typical ENG camcorder for two hours, the HyTRON 50 is the most advanced lightweight battery in the industry.

- Made possible by recent advancements in a cell technology originally designed for the mobile computing industry, it incorporates nickel metal hydride cells that provide the highest energy density of any rechargeable cylindrical cell available. High performance is further assured through the integration of Anton/Bauer InterActive digital technology.
- Equipped with an on-board "fuel computer" which monitors energy input and output as well as critical operating characteristics and conditions. This data is communicated to the InterActive charger to ensure safety and optimize reliability.
- In addition, remaining battery capacity information is available by means of an LCD display on each battery and in the view-finder of the most popular broadcast & professional camcorders.
- Special low voltage limiter prevents potentially damaging overdischarge.

Specifications: 14.4 V, 50 WH (Watt Hours)
5-3/4" x 3-1/2" x 2-1/4" 1.9 lbs (88kg)
Typical runtime: 2 hours @ 25 Watts 3 hours @ 17 Watts

QUAD 2702/2401

Four-Position Power/Chargers

The lightest and slimmest full featured four position chargers ever. They can fast charge four Gold Mount batteries and can be expanded to charge up to eight. They also offer power from any AC main in a package the size of a notebook computer and weighing a mere four lbs! The 40 watt 2401 can charge ProPacs in two hours and TrimPacs in one. Add the Diagnostic/ Discharge module and the QUAD 2401 becomes an all purpose power and test system. The 70 watt QUAD 2702 has the module and is the ultimate professional power system.

IDX

NPH-50

50 Watt Nickel Metal Hydride Batteries

Packed with 50-watts of power, these batteries provide long run times. using them as you would a traditional NP-type battery. Equipped with IDX's proprietary SF technology, they can even be charged in existing Negative Delta V style chargers, like the Sony BC1-WD or any IDX nicad battery charger.

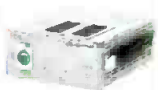
Both batteries are identical except that the NP-H50DX adds a power indicator.

- High capacity NiMH cells • Standard thermal and short circuit protection, extra thermal fuse for safety, special plastic design for added strenght
- Environmentally safe • High efficiency/low temperature module • Capacity: 50Wh (13.2V/ 3.8Ah)
- Camera run time: 115min @26 Watts)

NP-H50 ..... 129.95 NP-H50DX 149.95

JL-2 PLUS

2-Position Multi-Format Charger/Power Supply



Universal charger/Power Supply.
2-channel sequential quick charger and power supply for Lithium-Ion, NP/BP-type NiCad and NiMH battery packs.

SONY 800 SERIES

UHF WIRELESS MICROPHONE SYSTEMS

Consisting of 5 handheld and bodypack transmitters and 6 different receivers, Sony's UHF is recognized as the outstanding wireless mic system for professional applications. Operating in the 800 MHz band range, they are barely affected by external noise and interference. They incorporate a PLL (Phase Locked Loop) synthesized control system that makes it easy to choose from up to 282 operating frequencies, and with the use of Sony's pre-programmed channel plan, it is simple to choose the correct operating frequencies for simultaneous multi-channel operation. Additional features, like space diversity reception, LCD indicators, reliable and sophisticated circuit technology ensure low noise, wide dynamic range, and extremely stable signal transmission and reception. Ideal for broadcasting stations, film production facilities and ENG work.

QUICK DIAL 74

SONY

UVW-1200/UVW-1400A

Betacam SP Player • Player/Recorder

The UVW-1200 and UVW-1400A are non-editing VCRs which deliver Betacam SP quality and offer features for a wide range of playback and recording applications. RGB and RS-232 interface make them especially ideal for large screen, high quality video presentation, scientific research and digital video environments.

- Ideally suited for work in computer environments, because RGB signals can be converted into component signals and vice versa with minimum picture degradation.
- 25-pin serial interface allows external computer control of all VCR functions based on time code information. Baud rate can be selected from between 1200 to 38,400 bps.
- Built-in Time Base Stabilizer (TBS) locks sync and subcarrier to an external reference signal as well as providing stable pictures. High quality digital dropout compensator further ensures consistent picture performance.
- Equipped with two longitudinal audio channels.
- Both read LTC Time Code) and UB (User Bits). The UVW-1400A also generates LTC and UB (Free-Run/Rec-Run)
- Auto repeat of entire or a specific portion of the tape.
- Built-in character generator can display VTR status, time code, self-diagnostic messages, set-up menu, etc.
- Control of jog, shuttle, playback, record, pause, FF and REW with the optional SVRM-100A Remote Control Unit.
- Composite and S-Video as well as component via BNCs which are switchable to RGB output. The UVW-1400A has two switchable sync connectors and a Sync on Green.
- Built-in diagnostic function and hour meter.
- Initial set-up menu for presetting operational parameters. Settings are retained even after power is turned off.

UVW-1600/UVW-1800

Betacam SP Editing Player • Betacam SP Editing Recorder

The UVW-1600 and UVW-1800 are the other half of the UVW series. They offer the superiority of Betacam SP with sophisticated editing features. They feature an RS-422 9-pin interface, built-in TBCs and Time Code operation. Inputs/outputs include component, composite and S-Video. **All the features of the UVW-1200/1400A *PLUS*—**

- Optional BVR-50 allows remote TBC adjustment.
- RS-422 interface for editing system expansion.
- Two types of component output: via three BNC connectors or a Betacam 12-pin dub connector.
- Frame accurate editing is assured, thanks to sophisticated servo control and built-in time code operation. In the insert mode of the UVW-1800, video, audio Ch-1/2 and time code can be inserted independently or in any combination.

PVW-2600/PVW-2650/PVW-2800

BETACAM SP PRO SERIES

Whenever versatility and no compromise performance is needed, there is only one choice. Legendary reliability and comprehensive support for its many users has established the PVW series as the standard in broadcast and post production. The PVW Series includes the PVW-2600 Player, PVW-2650 Player with Dynamic Tracking and the PVW-2800 Editing Recorder. They feature built-in TBCs, LTC/VITC time code operation and RS-422 serial interface. They also offer composite, S-Video and component video inputs and outputs. Most important they are built for heavy, every day duty.

- Built-in TBC's and digital dropout compensation assure consistent picture performance. Remote TBC adjustment can be done using the optional BVR-50 TBC Remote Control.
- The PVW-2600, PVW-2650 and PVW-2800 (generates as well) read VITC/ LTC time code as well as User Bits. Ext/Int time code, Regen/Preset, or Rec-Run/ Free-Run selections.
- Built-in character generator displays time code or CTL data.

PVW-2650 Only

- Dynamic Tracking (DT) playback from -1 to +3 times normal speed.
- Set-up menu for presetting many functional parameters.
- Two longitudinal audio channels with Dolby C- type NR.
- Recognizable monochrome pictures at up to 24X normal speed in forward and reverse. Color at speeds up to 10X.
- Two types of component connection: three BNC connectors or a Betacam 12-pin dub connector. They have composite and S-Video signals as well.

PVW-2800 Only

- Built-in comprehensive editing facilities.
- Dynamic Motion Control with memory provides slow motion editing capability.

PVM-20S1WU

20-inch 16:9 Color Production Monitor

The PVM-20S1W incorporates all of the superb features of Sony production monitors for 16:9 viewing in post-production and broadcast stations. It features multi-system compatibility, blue gun, underscan and H/V delay. It also offers flexible signal connections, a full range of optional functions and ease of operation.

B&H SPECIAL $999

- 16:9 aspect ratio CRT with dark panel for high contrast image reproduction • Accepts component (Y/R-Y/B-Y), RGB, Y/C and composite signals • Beam current feedback circuit for stability in the color balance
- Optional component serial digital interface kits BKM-101C (video)/102 (audio) available • Switchable aspect ratio (4:3 and 16:9) • Color temperature D65, D93 or user preset (3200K to 10000K) selectable
- On screen display for adjustment/ operation • User preset function
- Underscan, Blue Only and H/V delay mode available
- Auto chroma/ phase setup
- Accepts external sync
- Digital 3-line comb filter • Auto/Manual degaussing
- Mountable into an EIA standard rack with the optional SLR-103 slide rail kit.

PVM-14M2U/14M4U & 20M2U/20M4U

13-inch and 19-inch Production Monitors

Sony's best production monitors ever, the PVM-M Series provide stunning picture quality, ease of use and a range of optional functions. They are identical except that the "M4" models incorporate Sony's state-of-the-art HR Trinitron CRT display technology and have SMPTE C phosphours instead of P22.

- HR Trinitron CRT enables the PVM-14M4U and 20M4U to display an incredible 800 lines of horizontal resolution. The PVM-14M2U and 20M2U offer 600 lines of resolution. M4 models also use SMPTE C phosphours for the most critical evaluation of any color subject.
- Dark tint for a higher contrast ratio (black to white) and crisper, sharper looking edges.
- Each has two composite, S-Video and component input (R-Y/B-Y, analog RGB) For more accurate color reproduction, the component level can be adjusted according to the input system. Optional BKM-101C (video) and BKM-102 (audio) for SMPTE 259M serial digital input.
- Beam Current Feadback Circuit
- 4:3/16:9 switchable aspect ratio.
- True multi-system monitors they handle four color system signals: NTSC, NTSC 4.43, PAL & SECAM.
- External sync input and outputcan be set so that it will automatically switch according to the input selected.
- Switchable color temp: 6500K (broadcast), 9300K (pleasing picture), User preset (3200K to 10000K).
- Blue gun, underscan and H/V delay capability.
- On-screen menus for monitor adjustment/operation.
- Parallel remote control and Tally via 20-pin connector.

PROFESSIONAL VIDEO TAPES

QUICK DIAL 71

fuji

Professional Grade VHS

PG-30	2.39	PG-60	2.39	PG-120	2.79

Broadcast Grade VHS Box

BGR-30	3.29	BGR-60	3.99	BGR-120	4.49

M471S S-VHS Double Coated

ST-30	6.69	ST-60	7.49	ST-120	7.69

M221 Hi 8 Double Coated

Metal Particles		Metal Evaporated	
P630HMP	4.99	E630HME	7.69
P660HMP	6.29	E660HME	10.19
P6120HMP	8.29	E6120HME	13.59

M321SP Metal Betacam (Box)

05S	11.99	10S	12.49	20S	12.99
30S	14.99	60L	24.95	90L	39.95

DP121 DVC PRO

12M (Med.)	7.49	23M	8.79	33M	10.99
63M	19.99	64L (Lg.)	22.50		
94L	30.99	123L	39.99		

maxell

Hi8 Metal Particle (XRM)

P6-120 XRM	6.99

Broadcast Quality Hi8 Metal Particle

P6-30 HM BQ	5.39	P6-60 HM BQ	6.09
P6-120 HM BQ			7.99

P/I PLUS VHS

T-30 Plus	1.69	T-60 Plus	1.99	T-90 Plus	2.09
T-120 Plus	2.19	T-160 Plus			2.69

HGX-PLUS VHS (Box)

HGXT-60 Plus	2.69	HGXT-120 Plus			2.99
HGXT-160 Plus					3.99

BQ Broadcast Quality VHS (Box)

T-30 BQ	3.89	T-60 BQ	3.99	T-120 BQ	5.99

BQ Professional S-VHS (In Box)

ST-31 BQ	6.79	ST-62 BQ			6.99
ST-126 BQ	7.45	ST-182 BQ			13.99

Betacam SP

B30MSP	13.49	B60MLSP	19.99	B90MLSP	29.95

Panasonic

Mini DV Tape

AY DVM-30	6.49	AY DVM-30 (10 Pack)	ea. 5.99
AY DVM-60	7.99	AY DVM-60 (10 Pack)	ea. 7.49
AY-DVM80	12.99	AY-DV123EB	16.99

DVCPRO

AJ-P12M (Medium)	6.99	AJ-P24M	9.99
AJ-P33M	11.19	AJ-P66M	19.49
AJ-P66L (Large)	20.99	AJ-P94L	29.99
AJ-P126L			38.95

SONY

Hi-8 Professional Metal Video Cassettes

P6-30 HMPX	4.59	P6-30 HMEX	7.99
P6-60 HMPX	6.49	P6-60 HMEX	10.99
P6-120HMPX	8.49	P6-120HMEX	14.99

PR Series Professional Grade VHS

T-30PR	2.39	T-60PR	2.59	T-120PR	2.79

PM Series Premier Grade Professional VHS

T-60PM	3.99

BA Series Premier Hi-Grade Broadcast VHS (In Box)

T-30BA	3.59	T-60BA	3.99	T-120BA	4.79

MQ Master Quality S-VHS (In Box)

MQST-30	7.49	MQST-60	7.69	MQST-120	7.99

BRS 3/4" U-matic Broadcast Standard (In Box)

KCS-10 BRS (mini)	8.69	KCS-20 BRS (mini)	8.99
KCA-10 BRS	8.19	KCA-20 BRS	8.69
KCA-30 BRS	9.60	KCA-60 BRS	13.39

XBR 3/4" U-matic Broadcast Master (In Box)

KCS-10 XBR (mini)	8.79	KCS-20 XBR (mini)	10.59
KCA-10 XBR	9.29	KCA-20 XBR	10.69
KCA-30 XBR	11.99	KCA-60 XBR	15.69

KSP 3/4" U-matic SP Broadcast (In Box)

KSP-S10 (mini)	9.59	KSP-S20 (mini)	11.09
KSP-10	10.09	KSP-20	11.59
KSP-30	12.99	KSP-60	16.89

BCT Metal Betacam SP Broadcast Master (Box)

BCT-5M (small)	11.99	BCT-10M (small)	12.49
BCT-20M (small)	12.99	BCT-30M (small)	13.49
BCT-30M (small) (10 Pack)			ea. 12.99
BCT-30ML	15.99	BCT-60ML	21.99
BCT-90ML			28.99

Mini DV Tape

DVM-30EXM w/Chip	12.99	DVM-60EXM w/Chip	17.99
DVM-30EX "No Chip"	11.99	DVM-60EX "No Chip"	13.99
DVM-30PR "No Chip"	7.99	DVM-60PR "No Chip"	9.75

Full Size DV Tape with Memory Chip

DV-120MEM	24.99	DV 180MEM	26.99

PDV Series Professional DVCAM Tape

PDVM-12ME (Mini)	15.25	PDVM-22ME (Mini)	16.25
PDVM-32ME (Mini)	15.49	PDVM-40ME (Mini)	15.99
PDV-94ME (Standard)	33.49	PDV-124ME (Standard)	37.99
PDV-184ME (Standard)	44.95	PDVN-64N	24.95
PDVN-124N	31.95	PDVN-184N	39.95

VIDEO and PRO AUDIO

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B&H
PHOTO - VIDEO - PRO AUDIO

Avid / IBM
Xpress DV On IntelliStation

Avid Xpress DV on IntelliStation is a turnkey digital video solution designed to give professional content creators in corporations, education and government institutions, the power to communicate with video. The solution consists of IBM's award-winning IntelliStation M Pro workstation, and Avid's Xpress DV digital video content creation software. Simply plug your DV camera into the IntelliStation workstation, launch Xpress DV and begin assembling a video. Using the high-powered and reliable able IntelliStation M Pro and intuitive Xpress DV software, you'll be creating professional-looking video and multimedia content for a wide variety of uses including sales and marketing videos, training videos and web-based teaching solutions-in no time.

The Hardware

The completely redesigned IBM IntelliStation M Pro features a high-speed Intel 840 chip set, 600/733 MHz Pentium III processor, 133 MHz Front Side Bus, a Canopus DV Raptor, and a Matrox display card. Designed with the Intel 840 chipset, the IntelliStation M Pro supports high-speed ATA-66 disk drives, as well as up to 1GB of high-performance ECC memory. The solution is pre-installed with the Matrox millennium G400 4X AGP graphics card (capable of 1GB/per second transfers) with 16MB of on-board memory, and the Canopus DV Raptor Adapter IEEE1394 interface for DV I/O. It also includes two Ultra2 SCSI hard drives: a 9.1GB drive for the operating system and programs, and an 18.2GB drive for capturing data.

The Software

Avid Xpress DV software combines powerful video and audio editing tools, digital mastering, and extreme ease of use. Xpress DV captures and edits DV video, adds effects, mixes audio, and outputs the finished results over IEEE1394 FireWire for impressive video. Or transcodes the content to all major new media formats. MPEG-1 (for CD-R) MPEG-2 (for DVD-ROM) QuickTime or AVI for computer based presentations or for streaming on the web. As a member of the Avid Xpress Family, The Xpress DV offers the Avid graphical user interface (GUI) based on the 3.1 version, offering powerful audio and video tools including:

- 4 tracks of nested video with single track transitions
- 8 tracks of audio with real-time mixing
- Batch digitizing, and RS-422 deck control.
- Integrated EDL support with built in logging
- 32 levels of undo/redo, making changes, painless!
- Tight timeline with precise timecode editing.
- Real time 3-band EQ, and rubber band gain adjustments.
- 32 and 48 kHz sampling rate, with down sample to 22 and 11 kHz for multimedia.
- Over 50 transitions, including dissolves, motion & color effects, superimposition, horizontal and vertical wipes, chroma and luma keys, picture in picture, flips, flops, resizes, spins, peels, pushes, squeezes, and many more.
- Integrated, anti-aliased titling tool
- Export to MPEG1, 2, Microsoft Windows Media (ASF), AVI, QuickTime, or RealMedia

The Service

IBM is maintaining a server where you can obtain disk space for approximately five hours of compressed streamed video, where your client can download your video from a customized web page, at no charge to you for the first three months (after three months it is fee based). This service eliminates small businesses from having to devote their own resources to set up and maintain their own servers.

- IBM IntelliStation M Pro (6868-91U/92U).
- 600/733 MHz Pentium III processor.
- 256MB Full Speed ECC memory.
- Matrox Millenium G400 4X AGP with 16MB of RAM.
- Ultra2 SCSI 9 GB (7200 rpm) drive for operating system.
- 18.2GB drive for video and audio storage.
- CD-ROM (20x -to- 48x)
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Avid MediaDrive rS Plus

The MediaDrive rS Plus is the latest in the line of leading edge storage products from Avid. Designed exclusively for AV professionals, the MediaDrive rS Plus is available in 9 and 18GB capacities and utilizes the highest performance 10,000 rpm drives on the market today. Available in a stackable model with a rack-mount option, the MediaDrive rS Plus incorporates QuietDrive, a revolutionary sound dampening technology developed by Avid. The MediaDrive rS Plus 10K drives provide Avid customers with a very affordable, versatile, high-performance storage solution.

- Using 10,000 rpm drives, MediaDrive rS Plus offers 40% higher performance than 7200 rpm drives. The increase in data transfer rates results in fewer drives necessary to achieve higher resolutions. Real-time AVR 75 can be achieved on a single rS Plus drive. Striping only two rS Plus drives across one dual channel controller can provide dual stream AVR 77 quality throughout the entire drive
- Built-in thermal circuitry controls the speed of the fan for efficient cooling and an external indicator helps to protect your drive and critical data by signaling high temperature conditions
- QuietDrive technology reduces drive noise by up to 15 dB. This allows finer audio editing and lower operator fatigue
- An innovative vertical interlocking stacking feature provides the option to physically latch striped sets together permanently or temporarily
- With its own power and SCSI connectors (conforming to fast and wide SCSI standards), the rS Plus drive is ready to travel down the hall or around the world. You can hook up the rS Plus drive in any studio. No docking system is required
- Optional rack mount kit adds great flexibility by allowing two MediaDrive rS units to be mounted in a 2U rack format. Quick release allows drives to be removed easily for transporting or replacing with new project drives

Configuration

- MediaDrive rS enclosure. 3.5 self-contained (power, cooling and connections) stackable unit. SCSI-2 68-pin connection
- Rack mountable with MediaDrive rS rack mount option kit

rs-18 "MediaDrive" External LVD 18GB Drive **$1199.95**	is-18 "MediaDrive" External LVD 18GB Shuttle **$1149.95**	is-18 "MediaDrive" Shuttle (Older Station) **$1149.95**
rs-36 "MediaDrive" External LVD 36GB Drive **$1799.95**	is-36 "MediaDrive" External LVD 36GB Shuttle **$1699.95**	"MediaDrive" rs Rack Kit (2 Drives) **$99.95**

SONY
ES-3 EditStation

The Sony ES-3 EditStation is an extremely flexible, powerful and high picture quality non-linear video editing system. Its self-explanatory yet sophisticated editing interface is easy to use even for newcomers to the non-linear editing realm. Its open architecture also supports popular third-party software for graphics, paint, text, and effects. The Sony ES-3 EditStation also offers the unique Sony "ClipLink" interface, allowing you to transfer only the clips you want for editing, since The Sony DSR-300/500 cameras mark the in/out points of each shot and a still frame of every in-point called the "index picture" is recorded on the cassette memory of the DVCAM tape.

- The video and audio files stored on the disk drive of the ES-3 system can easily converted to AVI or QuickTime file format. Allowing you to create multimedia materials for CD-ROMs, or to be streamed to the web.
- Slow and fast motion are available. The playback speed for each clip can be set to be played back at the desired speed.
- Edits on the ES-3 TimeLine are converted to the Sony EDL format and displayed in a EDL window. Additionally the EDL can be printed out or saved to disk.
- Dual monitor display is available for more efficient operation.
- The ES-3 can be switched to operate in either 4:3 or 16:9 wide screen aspect ratio.

Editor

You start with the Editor for uploading to create both video and audio clips. The Editor consists of the live picture window, In/Out point and duration windows, video/audio 1/2/3/4 selection buttons for uploading, a record clip button and VCR control functions. Using the Editor, you can upload video (including live upload) with or without VCR control.

ClipBin

This is where you store program material designated as clips. You can group clips and customize the ClipBin according to your needs. Two main display modes: picture mode and text mode. In picture mode you can select six different sub modes:

Timeline

The timeline is where you build your project. Each track may hold video, graphics, titles or audio. To build your project, clips (from the ClipBin), effects and transitions are dragged and dropped onto the timeline in sequential order. There are various timeline views available. You can select any items displayed such as Index Pictures of the head or tail of a clip, marker, name, duration, reel number, mark in/out and many others.

Trim Editor

A Trim Editor is available for precise trimming on the timeline. It is opened as an independent window, with the video of the out point of the "from" clip and the in point of the "to" clip displayed. Both single and dual trimming can be performed. Clips can also be played and trimmed directly in the Clip Monitor which is selected from the edit menu.

Audio Editor

With the Audio Editor, eight channels of assigned audio can be monitored in real-time. Each input channel can be assigned to any track in the timeline. Each channel has its own peak meter, level fader, level trim, phase control, three band EQ, panning and filters (low cut, high cut, echo, etc.). Volume and pan are processed in real-time and can also be modified in real-time using the ESBK-7011 Control Panel. Audio level and panning for each clip can be controlled directly on the timeline with the rubber band editing function. Each track has it's own rubber band control, which can be activated independently.

Control Panel

In addition to controlling non-linear functions via mouse and keyboard, also includes the ESBK-7011 Control Panel for conventional operation. Combine familiar linear techniques such as jog/shuttle control, effects transitions and audio fading with convenience of non-linear editing.

Breakout box

The breakout box provides easy interfacing to analog or digital equipment. It offers analog composite, component and S-Video input and output. For digital video, an i.LINK input/output is standard, and QSDI(SDTI) can be activated via optional software and dongle. For audio, four input channels of XLR-balanced analog audio (two out) and AES/EBU digital audio I/O (XLR-balanced) are provided. Two RS-422 ports are provided for deck control. Finally, the ES-3 is also equipped with a genlock input and blackburst output for reference.

Apple Authorized Reseller

Final Cut Pro

Professional Editing, Compositing and Effects Software for Macintosh

A breakthrough in non-linear video. Final Cut Pro combines professional editing, compositing, and special effects in one powerful application – turning a Power Mac into a powerful workstation. Designed from the ground up for DV, Final Cut Pro offers the easiest way to transfer material from DV sources to your hard disk; edit, composite, and add effects to the video and audio; and play the results. It has an advanced feature set that professionals will love, yet it's also easy enough for novice video producers who are just discovering DV and FireWire. Final Cut Pro supports DV and all QuickTime formats, including M-PEG and web-ready streaming video. Provides plug-and-play capabilities with most digital video cameras. Just connect your computer to a DV camcorder, capture video and edit it with sophisticated tools. Create multiple layers of video using text, graphics, or additional video elements. Each layer can be still, or animated along a user-defined path using tools such as Bezier curves with acceleration control. Then you can output your results for TV, videotape, QuickTime movies, or the Web.

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Help Wanted

AUDIO OPERATOR Major station in #2 market seeking audio engineers for live news operation. Be able to handle fast paced daily news broadcasts. Previous live news mixing a must. Euphonix audio console experience preferred. Applicant should have a minimum of 5 years experience, be able to work all shifts, and able to lift 50 lbs. Send resumes to: Personal/Confidential, Classified Ad Coordinator, Broadcast Engineering Dept. 799, 9800 Metcalf Ave, Overland Park, KS 66212-2216.

ASSISTANT CHIEF ENGINEER: We are seeking an experienced, highly motivated individual with strong technical skills and leadership abilities to assist in managing the Engineering department. Candidate should have a minimum of five years experience in television broadcast engineering with three years in a supervisory role. A thorough knowledge of engineering including maintenance, News operation, capital planning and implementation is required. Interested applicants should have strong computer skills and experience with networks. Excellent verbal and written communication skills are required. **Maintenance Technician:** Duties include maintenance of all broadcast and related equipment including DVC Pro and Betacam VCRs, GVG and Utah switchers, ENG/EFP equipment, etc. Microwave and VHF transmitter experience is a plus. 3-5 years broadcast equipment maintenance required. Please reply with resume to: Dept. 116F, KPLR-TV, 4935 Lindell Blvd., St. Louis, MO 63108. EEO EMPLOYER MALE/FEMALE, VETS/HANDICAPPED ARE ENCOURAGED TO APPLY.

CHIEF ENGINEER: We are looking for a leader who can work with and motivate our engineering staff. Applicant should be able to facilitate component level service on Betacam SP, DVC Pro, ¾", servers as well as other types of studio equipment. Strong knowledge in computers, Media 100, LAN's, etc... is preferred. Degree in electronic engineering and or equivalent experience required. Competitive salary, benefit package and 401K program. KHSL-TV is a Catamount Broadcast Group Station. EOE. Send resume to, Matt James, Operations Manager, KHSL-TV, 3460 Silverbell Road, Chico, CA 95973, e-mail: mjames@jps.net

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MAINTENANCE ENGINEER: PBS station has an immediate opening for an experienced broadcast Engineer. Must have a minimum of five years experience in broadcast maintenance, including systems trouble-shooting and repair of studio video and audio equipment to the component level. Computer and networking exp. a plus. FCC Operators Permit or SBE Certification is desirable. Send resume and cover letter to: Personnel Office, KTEH-TV, 1585 Schallenberger Road, San Jose, CA 95131 or fax to (408) 995-5446.

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MAINTENANCE ENGINEER Major station in #2 market seeking maintenance engineers with experience with in 2 or more of the following area's: ENG/SNG repair, Panasonic DVC Pro, Tektronix 4k switcher, 7k router or Profile, Quantel, Avid, studio camera, DVE, SS, CG and robotics. Automation and file server experience a plus. Applicant should have a minimum of 5 years maintenance experience, be able to work all shift, and lift 50 lbs. SBE certification preferred. Send resumes to: Personal/Confidential, Classified Ad Coordinator, Broadcast Engineering Dept. 798, 9800 Metcalf Ave, Overland Park, KS 66212-2216.

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Engineering

Discovery Communications, Inc. (DCI) is the world's leading provider of quality nonfiction entertainment and information across all media platforms, allowing people to explore their world, satisfy their curiosity and fulfill their lifelong search for knowledge and understanding.

DCI is seeking a motivated individual to fill the position of **Television Engineering Project Manager.** This individual is responsible for managing the design and implementation of technical projects and proactively monitoring industry developments to ensure that Discovery's technical systems provide maximum responsiveness to business units' technical and fiscal requirements.

Applicants must have in-depth experience with domestic and international television satellite distribution and compression systems, television automation systems, convergence and enhanced interactive television products, digital media storage systems and audio/video production and post-production equipment. Minimum 5 years of experience as a television design engineer or technical project manager, and a BS or BA, BSEE degree desirable. Applicants should be detail-oriented, have basic knowledge of architectural, mechanical and electrical systems; strong oral and written communications skills; and be computer literate. Multiple language skills are preferred. 25% international and domestic travel is required.

Discovery
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Interested applicants should send their resume to: explore_careers@discovery.com; FAX: (301) 771-3669, ATTN: HRG/LZBE. No phone calls.

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iBlast Networks is creating the future using the digital television spectrum to broadcast broadband media to PCs and other receiving devices. We are looking for senior-level engineers in the following areas to help build our next-wave technology network from the ground up.

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If you have excellent communication skills and a team-building attitude, send a resume to the address below or e-mail to: jobs@iblast.com

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iBlast Networks
100 N. Crescent Drive
Beverly Hills, CA 90210

ASSISTANT CHIEF ENGINEER GW TELEVISION: The George Washington University, a private institution located in the heart of Washington, D.C., is seeking an Assistant Chief Engineer to supervise the technical operation & maintenance of GW Television (GWTV). The successful candidate will coordinate and direct the day to day technical operation and maintenance of the television and multimedia production facilities. GWTV is looking for a hands-on engineer/supervisor to provide expertise, experience, and direction to GW Television's Engineering and Operations staff. Knowledge and experience with analog and digital television systems is essential. Remote operations experience is a definite plus. GW Television encompasses three multi.-camera production studios, EFT equipment and staff, digital audio/video/data compression systems, ITFS broadcast channels, multipoint ISDN Teleconference facilities, fiber optic and satellite communication systems, and a 750MHz campus-wide cable system. GWTV is also in the planning and design stages of a move into a new all digital facility. The selected individual will play a key role in making this new facility a reality. The individual selected will work with a group of dedicated professionals using state-of-the-art equipment in the rapidly developing field of communications and distance learning. The Assistant Chief Engineer reports directly to the Chief Engineer of GWTV and is a key member of the management staff. GW offers an industry-competitive salary (mid to high 50k's), a generous benefits package including exceptional education opportunities, and an opportunity to participate in shaping the future of technology learning. To apply reference requisition #R7760 and mail or fax a resume with cover letter and three professional references to E. Dancil, Human Resource Services, 2033 K Street, N.W., Suite 220, Washington, D.C. 20052. (202) 994-9609 fax. E-mail edancil@gwu.edu. Please see our web page at www.gwu.edu/~hrs and if possible submit a completed application and applicant data form with your resume. GW is an equal opportunity employer.

MAINTENANCE ENGINEER Immediate opening for a maintenance engineer. Wami-TV69, Southern Florida's most progressive television station needs qualified engineering personnel. Transmitter experience required Studio, fiber, ENG and SBE certification a plus. Great work environment and living environment. Please fax resume (with salary requirements) to 305-604-0406, Attention Human Resources. Equal opportunity employer. No phone calls please.

BROADCAST MAINTENANCE TECHNICIAN: Requires self starter having experience with Beta, VPR-3, PC's and other studio equipment maintenance. Experience with microwave, satellite, VHF & UHF transmitters, CADD ability and FCC General Class License preferred. Contact Charles Hofer, Manager of Engineering Maintenance, WTNH-TV, 8 Elm Street, New Haven, CT 06510. No phone calls please. EOE.

BROADCAST MAINTENANCE ENGINEER: Broadcast Engineer needed for National News Network in Washington DC. Extensive background in broadcast equipment maintenance. Team leader, minimal supervision, good communication skills, min 5 yrs experience. Digital knowledge a plus. Competitive salary and excellent Benefits. Fax resume, letter c/o Eng. Manager 202-515-2217. Email John.Cunba@turner.com

Classifieds

Help Wanted

ENGINEERS

Turner Broadcasting System has career opportunities for experienced television engineers. These career positions demand an extensive background in equipment maintenance, digital video and audio, and knowledge of computer systems and networks. Please mail or fax your resume and cover letter to:

Jim Brown
Assistant Vice President of
Engineering Services
Turner Broadcasting System, Inc.
One CNN Center
P.O. Box 105366
Atlanta, GA 30348-5366

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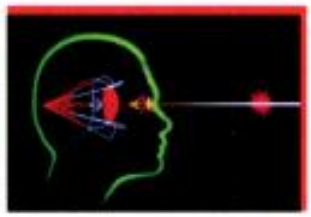

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We currently seek a hands-on manager to monitor satellite transmission equipment status, create and maintain daily RF logs, and coordinate and assist in the training of RF technicians. The qualified candidate will possess a strong knowledge (5+ years experience) in Satellite transmissions areas, video equipment (DC-II, Power VU, etc.) and transmission equipment maintenance. Excellent interpersonal skills and the ability to manage a team of multiple technicians is a must. Must be extremely flexible with working hours. Preference will be given to candidates possessing a Bachelor's degree in Engineering and who are bilingual in Spanish.

RF TECHNICIAN

In this key position, the qualified candidate will provide maintenance, monitoring and repairs on satellite transmission equipment (transmitters). Requires a minimum of 2 years experience in satellite transmission equipment maintenance and the ability to work in a schedule-driven environment, including nights, weekends and holidays. An Associate's or Bachelor's degree in Engineering or equivalent experience is desired.

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TV MAINTENANCE ENGINEER: New England Cable News seeks a F/T Maintenance Engineer to join our talented team. Qualified candidates must have 3 to 5 years maint experience in a cable or broadcast operation and the ability to perform component-level repair on a variety of electronic equip. Previous experience with Sony Betacam preferred. SBE cert and/or technical degree pref. **Send resume w/ cover letter to: Bob Colford, Dir of Eng., NECN, 160 Wells Ave., Newton, MA 02459, or fax to (617) 630-5057.**

BROADCAST MAINTENANCE ENGINEER: WVPT Public Television for the beautiful Shenandoah Valley is looking for Broadcast Maintenance Engineers. These challenging positions involve maintenance, installation, and repair of analog and digital equipment in studio, transmitter and microwave configurations. Specific emphasis on maintaining Video Tape recorders, Probel & Philips Routing & Master Control, Ikegami camera systems, and both Analog & Digital Transmission equipment will be required. Experience with Media 100, Virtual Recorder digital non-linear systems, and computer networking skills are all a plus. Candidate must have a minimum of two years engineering and operations experience and a current FCC General Class Radio Telephone License, or a Society of Broadcast Engineers Certification. Send cover letter, salary requirements and resume to: Executive Secretary, WVPT-TV, 298 Port Republic Road, Harrisonburg, VA 22801. EOE/AA

WMAR-TV 2 abc

WMAR-TV2/WMAR-DT is seeking a full time maintenance technician with 3-5 years experience. Must have experience in troubleshooting studio equipment to the component level with emphasis on maintaining digital and analog small format VTRs. Computer skills and or UHF high power transmitter experience a plus. SBE TV certification or FCC general license is desirable.

Send resume to Human Resources Job #163, WMAR-TV, 6400 York Road, Baltimore, MD 21212. EOE

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TURNER STUDIOS

Turner Studios is a brand-new, state of the art digital television complex serving the production needs of the Turner Networks. Turner Studios' Engineering is seeking client service oriented professionals to support this growing facility.

Avid Systems Administrator

Management and technical support of multiple non-linear editing systems, including installation, upgrades, troubleshooting and debugging complex software and hardware. Applicants must have significant experience supporting broadcast quality non-linear editing systems. A background in Windows NT, Avid, and television production is required.

Broadcast Maintenance Engineer

Engineering support of production and post-production operations including installation, integration, repair and maintenance of television systems. Systems include digital and analog VTR's, digital routing systems, linear and non-linear editing equipment, cameras, monitors, character generators and still store systems. Qualified candidates will possess a minimum two-year technical degree and a substantial background in television engineering or related fields.

Studio Maintenance Engineer

Engineering coverage of live television events, troubleshooting and repair of television production equipment. The successful candidate will have strong organizational skills, attention to detail, and thorough knowledge of TV studio, control room, and supporting equipment. Work shifts may include nights and weekends and will require a high degree of client interaction and excellent communication skills. Candidate must possess the ability to make sound decisions in rapidly changing situations and solve technical problems prior to and during "air".

Please send resume and cover letter to:

Jeff Sharpe
Director of Technical Operations
Turner Studios
1050 Techwood Drive
Atlanta GA 30318

Fax: 404/885-4485
jeff.sharpe@turner.com

CHIEF ENGINEER: WGBO/Univision 66 Chicago is looking for a Chief Engineer with a minimum of 5 Years experience as a Chief or Assistant Chief Engineer. Candidate will assist in preparation and administration of capital and operating budgets and be responsible for equipment purchases and installations. Candidate will act as liaison between engineering and all other departments for daily operations, major events and special projects. Candidate must have a good track record as a proven project manager, staff developer and administrator with excellent managerial, organizational, communications and interpersonal skills. Experience in all areas of television broadcast maintenance, including UHF transmitters, ENG systems, studio equipment and knowledge of FCC Rules & Regulations is required. College degree or equivalent industry training as well as computer literacy required. Send resume and cover letter to Human Resources, Univision/WGBO, 541 N. Fairbanks Court, 11th Floor, Chicago, IL 60611. Fax: (312) 494-2745. E-mail: fbaker@univision.net. EOE.

MAINTENANCE ENGINEER – WUTR-TV, an ABC affiliate in Utica, NY is searching for a Maintenance Engineer. A strong technical background with studio video and audio equipment, DVCPRO25, microwave/satellite equipment a must. UHF transmitter and computer experience a plus. SBE Certification or FCC General Class License desirable. Send resume to: Chief Engineer, WUTR-TV, PO Box 20, Utica, NY 13503. EOE.

BROADCAST SERVICE ENGINEER: Our expanding client base requires a Service Engineer to provide technical repair and maintenance services to broadcasters, post production facilities and other A/V clients. This position requires working with clients to provide on-site and/or shop repair services for broadcast equipment. Applicants must be experienced in the component level repair of cameras, video tape recorders and other production equipment. Fax or send resume and salary requirements to: Human Resources, Communications Engineering, Inc. 8500 Cinderbed Road Suite 100, Newington, VA 22122. Fax # 703-550-5180. Email: shay.martello@commeng.com

CABLE TECHNICIAN: Western Kentucky University is seeking applicants for Video/CATV Engineer. Responsibilities include the maintenance of television broadcasting equipment (including WKYU-TV, Ch-24) and CATV equipment. Minimum qualifications consist of good organizational, communication, and writing skills; as well as the ability to work independently; television broadcasting experience, working knowledge of DOS/Windows and IBM compatible PC's, and two years of formal training in electronics or equivalent experience in electronics. This is a hands-on position involving the maintenance of diverse equipment along with daily interaction of WKU students, faculty and staff. If you feel you are up to a challenge, meet the minimum requirements, and are interested in the many benefits WKU can offer (including free classes), then submit the following application materials to the Department of Human Resources: • WKU application • Resume • Three professional references (name, address, phone number) WKU applications are available at the Department of Human Resources, 1 Big Red Way, Bowling Green, KY 42101. Online application is available at the Human Resources website; http://www.wku.edu/Dept/Support/HR/ Review of application materials will begin immediately and continue until the position is filled. Western Kentucky University Is An Equal Opportunity/Affirmative Action Employer Woman And Minorities Are Encouraged To Apply

STUDIO MAINTENANCE ENGINEER Must be able to perform the following duties: install and maintain studio transmission equipment including video switchers, audio consoles, DVE, CG, SS, cameras, and robotics. Familiarity with automation systems and master control environment. Should possess a general computer/networking background. Must be able to work on a rotating shift schedule. Candidate should have an engineering degree or equivalent technical training. SBE/FCC certification a plus. If you want to be a part of the exciting transition to HDTV in the most exciting city in the world, please send your resume and cover letter to: Kurt Hanson, Chief Engineer, WABC-TV, 7 Lincoln Square, New York, NY 10023. No telephone calls or faxes please. We are equal opportunity employer.

TV CHIEF ENGINEER. Trinity Broadcasting stations in various cities. Experienced in maintenance and repair of UHF transmitters, studio systems and personnel supervision and training. SBE certification a plus. Send resumes to Ben Miller, P.O. Box C-11949, Santa Ana, CA 92711. E-mail: bmiller@tbn.org. Fax: (714) 730-0661. EOE

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EOM

If it's not broken . . .

BY PAUL MCGOLDRICK

There seem to be fewer intermittent faults with hardware in recent years. Certainly manufacturing quality has improved with the imposition of international standards. There have also been continuous developments of much cleaner and sophisticated handling of the components during circuit board construction. Designs, which now use far fewer discrete components, have become even more of a building block process. But software flakiness is taking over. I find software problems much more frustrating.

Software is never finished, but it seems the biggest names in software produce some of the least finished products. I have now found that upgrading a computer system is not something to be undertaken lightly, even (especially) when you think you are doing it right.

The system in question had been used mainly as a graphics engine (for statics) and had performed fine with a late 486 processor and Win95. The day inevitably came when housekeeping of the hard drive had become intense just to save simple work.

The local PC expert was consulted with a wish list in hand and the right sort of pricing came back. With Pentium IIIs on some sort of allocation it was decided to go for a 466MHz Celeron – after all, we have read all the glowing things in the trade press about the Celeron outperforming Pentiums. The new system pieces were acquired, built up and powered for about a week on the shelf. Now a decision had to be made about the operating system. The early days of Win98 produced many online gripes, but the majority of those were from people who upgraded from Win95 rather than from those with a clean install. I have a laptop with Win98 and have only had one mindshaking experience. It has locked up and done weird things about as much as Win95 did on an earlier machine. Win98 it was.

The old machine was backed up onto Zip drives and reloaded into the new machine. Smooth as clockwork. It couldn't have gone better, but the darned machine simply didn't perform as if it was a 466MHz machine. The principal user of the machine was not a happy camper. Fortunately, the local guru found a 450MHz Pentium Xeon at a good price. This one had a 2MB L2 cache (secondary CPU instruction cache), which, on the Xeon, runs at full processing speed. We thought crunching numbers on artwork would at least be faster with this baby.

It should have been a piece of cake, right?

The new machine was built up in a different tower and we began to transfer the other components from the Celeron machine into that tower, no hard drive changes or anything like that. It should have been a piece of cake, right?

As soon as the machine was switched on it, it became obvious that things weren't right. Norton error after Norton error would come up in booting. Then the machine would go look for strange interactive files and would lock up. Do you know how sick I got of being told by ScanDisk how I should have shut the machine down properly? As if there was a choice. But this machine was fast. It was difficult to catch it at the right moment to get into safe mode. Windows Uninstall did not want to uninstall Norton. After reconfiguring the boot to get the CD-ROM recognized in safe mode, Norton's Uninstall didn't work either, but a commercial uninstaller did.

When it finally booted up, numerous programs had been purged, drivers were gone again and one application had actually been dropped in the Recycle bin. All these were painfully re-installed, but when the machine was wired into its operating environment it locked up again upon boot. Disconnecting the equipment on the parallel port allowed the machine to operate again, and then one at a time the zip drive, the scanner and the printer were reconnected. Despite uninstalling and re-installing the drivers for the scanner, it refused to be a part of the chain.

So to recap, a peripheral that worked happily with Win95 and Win98 on a 466MHz Celeron, refused to work with Win98 on a 450MHz Xeon. The latest driver was downloaded from the scanner manufacturer, but didn't make any difference. Was it the speed of the processor or the type of processor that was different? Who knows? I won't worry about that problem until I can find out why the DVD drive is not being recognized.

If this had been an on-air machine I would have been in a lot of hot water this past week. After this experience I would never attempt to upgrade a machine that is in service – I would replace it and keep the old machine handy for a while after. I'm still not sure this new machine won't go back to Win95, but I'm glad I didn't consider Win2000. I would have had to call the factory twice to explain why I had used the disc more than three times.

I think I preferred intermittents. ■

Paul McGoldrick is a freelance industry consultant based on the West Coast.

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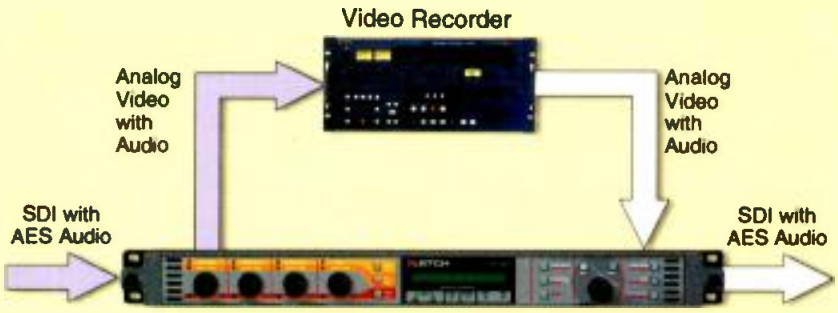

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