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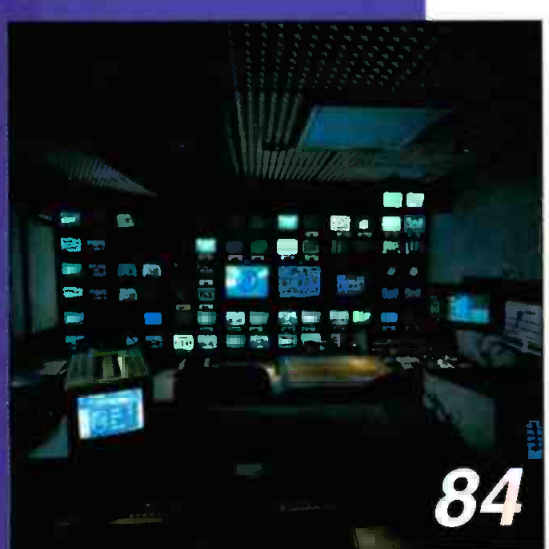

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Panasonic Broadcast President Warren Allgyer (left) and Capitol Broadcasting CEO Jim Goodmon (right)

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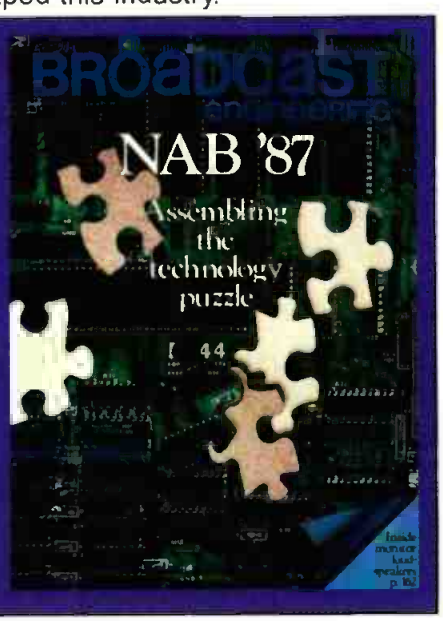
FREEZE FRAME

A look at the technology that shaped this industry.

Identify the FCC chairman

What FCC chairman did others describe alternately as a "visionary" and a "one-man wrecking crew?" He eliminated the three-year rule regarding the sale of stations, sliced logging requirements and threw out the first-class license. Correct answers received by January 30, 2001, will be eligible to receive a *Broadcast Engineering* T-shirt. Title your entry "Freezeframe" in the subject field and send it to editor@intertec.com.



ON THE COVER: Virtual sets are increasingly being used in applications such as live broadcast and in overseas operations because of their cost effectiveness and ease of use. Shown on the cover is a set designed by Vi[z]rt Creative Services for daily live weather broadcasts for Channel 2 in Tel Aviv, Israel. Image courtesy Vi[z]rt.

Editorial

Stewardship or sinking ship

As I was closing the books on 2000, I ran across some background materials saved as fodder for editorials throughout the year. As I looked through the clippings, one consistent theme was clear.

There is an obvious dislike by broadcasters and this industry for the current FCC Chairman, William Kennard. I've been in this business for more than 20 years and don't recall any of the previous chairmen being referred to continually in such strongly negative terms.

To be fair, the FCC Chair always gets criticized for its actions. Remember when the First Class license was eliminated? How about the battle over AM stereo? Remember the fits and starts about HDTV?

More recently, does anyone recall that consummate politician, Reed Hundt? That guy had his political finger up in the air so much trying to measure the Potomac winds that people thought he had a broken arm. If he'd been more of a leader than a meteorological politician, we wouldn't be in the DTV mess we are now. He juked back and forth on where DTV should go like a Heisman running back. He never did decide which way to go. He wanted to be seen as the guy who took the ball across the goal line. Unfortunately, all he did was delay the game.

Now we have William Kennard. If he's not the most disliked Chairman ever, I don't know who might have that honor. But why? I believe in giving the guy some credit. Unlike Hundt, who never met a politician he wasn't trying to impress, Kennard has adopted a more militaristic approach. Since his coronation by President Clinton, Kennard has been doing everything possible to promote his boss's political agenda.

The most oppressive of Kennard's measures has been his vendetta against broadcasters' use of DTV spectrum. His and Clinton's singular goal has been to raise money through the sale of spectrum. We're talking presidential legacy here, so get your priorities right. Of course, when you're in the food line, Clinton will be back in Arkansas and Kennard will be a highly paid lobbyist in D.C.

For this administration, it's been "damn the torpedoes, full steam ahead" on everything from idiotic spectrum sales to bestowing FM station licenses on anyone and everyone who might represent some kind of minority viewpoint. Whether it's all polka music all the time or broadcasting for left-handed kazoo players, Kennard is ready to let you create interference with the traditional broadcaster. After all, it's the right thing to do, politically.

If it weren't so expensive to broadcast video, I'll bet the guy would be handing out licenses for low-power TV stations like he does for LPFM. Fortunately, he's about to lose his job and it can't come too soon.

One of our sister publications, *Telephony*, recently ran a feature-length article on Kennard's stewardship of its industry. I went through two bottles of antacid trying not to throw up on the laudatory platitudes the writer bestowed on the guy. I'm serious. I stopped reading twice and looked again at the cover just to be sure he was writing about the same federal baloney bureaucrat I knew. According to the article, Kennard is the best thing since Alexander Graham Bell said, "Come here Watson, I need you."

Stewardship is not what I'd call his tenure. Let's hope that the president-elect tosses Kennard overboard before he sinks this ship.

Brad Dick

Brad Dick, editor

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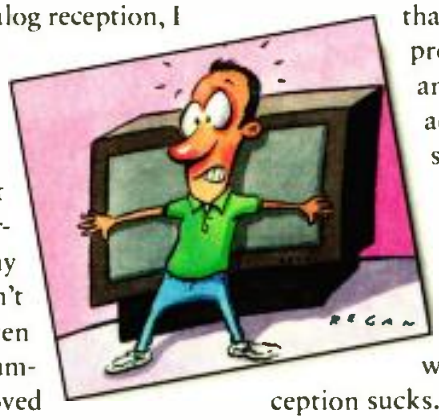
Reader Feedback

Editor:

When the head of Chronicle Publishing asked me if digital reception would be better than analog reception, I responded that I thought it would follow the hereditary principle of birth control. That being, if your parents didn't have any children, you won't have any children either. So far, circumstances have proved me correct. Difficult reception areas are difficult reception areas.



You can use any terrestrial technology you want but rock is still rock. Multipath is better tolerated using COFDM. But in a signal-blocked region reception is still zero. That includes ravines in the urban canyons of commerce. A notch in a multicarrier scheme can be overcome but the remaining carriers must still exceed receiver threshold.

My back-of-an-envelope calculations tell me that a COFDM station, using the power levels presently permitted for DTV, will cover about 30 miles. Beyond that, on-channel repeaters will be required. They will work with COFDM.

Because the peak-to-average ratio is higher for COFDM, to achieve a given average power, you'll require twice the transmitter rating required for 8VSB. To extend coverage, you must budget for repeater sites in multiple locations.

While I acknowledge problems with 8VSB reception and, frankly, don't know how well they can be solved, I do know that going down the COFDM road will require really deep pockets to extend coverage beyond 30 miles. COFDM isn't a panacea. It's a shame that the Grand Alliance was waved off of developing certain but lower resolution reception in difficult signal areas.

ROY TRUMBULL

To the Editor:

I just bought a DTC-100 after waiting way too long for these new STBs that will supposedly improve reception. It was and still is a huge headache to get all the L.A. stations, even with a rooftop antenna. Still, I get some but not all. I am glad you see what many early adapters have learned the hard way: that OTA 8VSB reception sucks. I am appalled that the FCC is screwing up another great technology by refusing to let the field results prove that 8VSB doesn't work. As an owner of the current 8VSB demodulation scheme, I am all for COFDM. I agree with everything you said. I only wish the FCC would listen. Who the hell do they work for anyhow?

The bottom line is that it doesn't work as advertised, and I am a perfect example of a typical user that struggles with 8VSB and will continue to if things don't change. I have nothing to gain by either demodulation scheme. I want HD reception and programming as much as anyone else. But I can tell you this: there is no way masses will be swayed by HD OTA with the current standard — it doesn't work well. I'd be pleased to discuss this with anyone.

Keep up the fight, and let the best technology win!

JOHN HAGHIGHI
HAGHIGHI@UCLA.EDU

Brad,

HDTV looks great, but so does Cindy Crawford. Neither is likely to end up in my living room anytime soon.

I did some early work setting up HD demos in several cities, only to find that even in areas without many large obstructions there were still reception problems. Since this technology is being force fed to the public in vague product descriptions, led by political lobbying, with strange press releases ... it's doomed. Consumer demand must drive a new technology in the marketplace or it will end up in the Betamax wastebasket of high-quality products.

PATRICK TURNER

HDTV looks great, but so does Cindy Crawford. Neither is likely to end up in my living room anytime soon.

Dear Editor:

As someone who has invested $3500 on my HDTV gear, I have in the past studied the issue of DTV standards and the actions from the FCC, Congress and the broadcasters. In addition to many e-mails, I also participated in phone calls and certified U.S. Mail complaints to the FCC and other agencies.

The fast growing HDTV consumers, although still in minority, are very vocal and will not sit on the sidelines and watch DTV derail at the hands of some broadcasters and the FCC.

They will have to go over our dead bodies to do so because too much is at stake. This movement is I think unprecedented (even compared to any others like VHS vs. Beta...), although frustrating. I am glad to be part of it.

JAMES YOUNG

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News

What the set makers have to say: An interview with Gary Shapiro

BY LARRY BLOOMFIELD

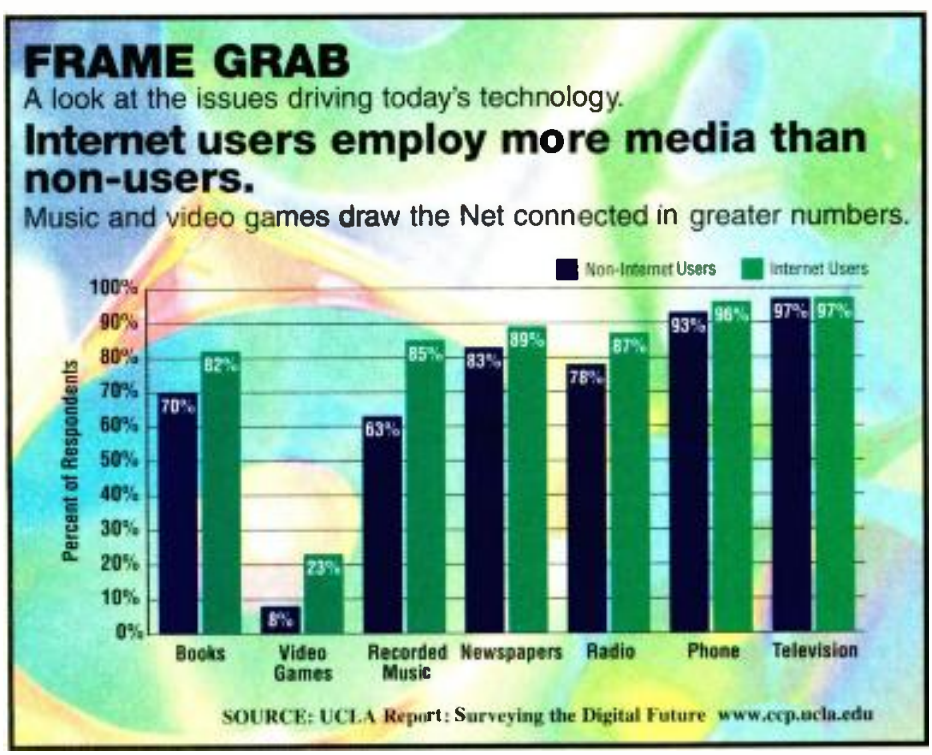
The laws of physics tell us that nothing is constant: All things must and will change. At this time of year, it is traditional to dust off the crystal ball in an attempt to cast a wary eye into the future.

Questions relative to the transition to digital continue to keep many a chief engineer and director of engineering burning the midnight oil. Congress looks to the ultimate auction of our precious spectrum like a greedy heir at an estate sale.

When attempting to learn from history, it doesn't hurt to look back at the RCA/NBC relationship, which brought us radio and television with enhancements such as color, FM and stereo. RCA/NBC was a complete chain, starting with the acquisition of program material and going through to presentation in the homes of listeners and viewers alike. Sarnoff was no dummy. He realized that the real money was in the sale of millions of TVs. To make them appealing, he provided the entertainment that helped sell them, while making a handsome profit from both ends of the chain. He even made the equipment that did the acquisition and distribution and challenged anyone who tried to compete.

In contrast to yesterday's glass-to-glass model, in today's television landscape, the perspective of the broadcaster is difficult to gauge because broadcasters are no longer a unified whole. Gary Shapiro, president and CEO of the Consumer Electronics Association (CEA), the trade organization that represents most of today's set manufacturers, sat down with me for a discussion of current issues that fleshes out the CEA's perspective and sheds some light on what the now disparate other end of the broadcast chain thinks may be the fate of digital television.

"If you look at consumer satisfaction surveys, HDTV is the only product with 100 percent consumer satisfaction in terms of the quality."



At the outset, we discussed FCC Chairman William Kennard's comments and apparent "get-tough" posturing during several recent speeches he gave in reference to the sluggish transition to digital television.

"I think the Chairman hit the nail on the head," Shapiro began. "The facts speak for themselves. If you go back for the past ten years on this issue, a lot of promises [regarding digital content] were made and we naively relied on them. We thought broadcasters would produce content and I think some of the networks and local stations have done a good job, but the fact is that most haven't. What has especially caused us some challenges is the issue of tuners. They have the standards issue and it doesn't make business sense to incorporate them into a product with a 12- to 18-month manufacturing cycle when several broadcasters, like NBC and Sinclair, are challenging the standard. Get on the broadcasters."

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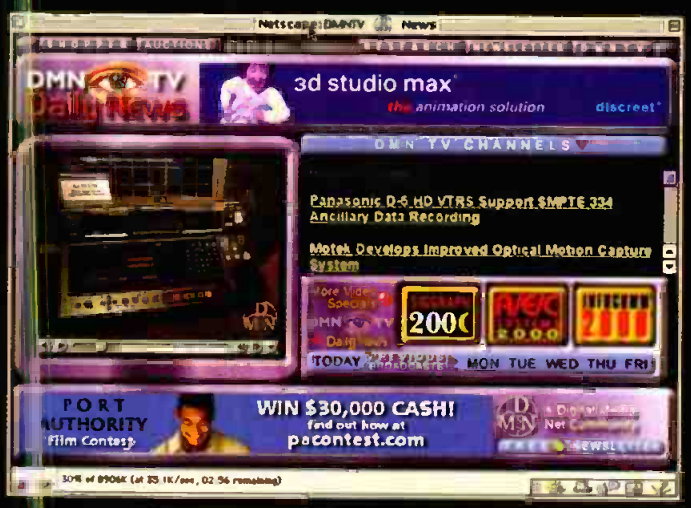

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good news is that there are a lot of the DTV's selling phenomenally well, mostly because of DVDs and also because of satellite. Our new third-quarter numbers are off the charts. It's incredible!"

With such exuberance expressed for the industry, it was telling that Shapiro himself does not have an HDTV receiver. "I have an old order to buy; let me put it that way. I've begun shopping several times. I've measured and the set I want will be on the market shortly. What I'm looking at is more of a satellite orientation. I was recently on a plane and going over my "to do list," and it said in the next few weeks, buy a DTV set. I have the permission of the wife, I have the cash set aside and I think I have a place I'm debating over where to put it. I guess as of this moment, you could say that Gary Shapiro does not have one, but that will probably be inaccurate by the time you get to press." Continuing, Shapiro said: "If I don't, I'm awfully stupid because I have everything as a go at this point. The question that I face, honestly, is whether I get one with a tuner or not, that's the issue."

But why the delay? Shapiro responded, "The local ABC affiliate here [Washington D.C.] doesn't even carry HDTV, it upconverts analog. I couldn't have gotten Monday Night Football last year. It was a great disappointment to those of us in Washington D.C."

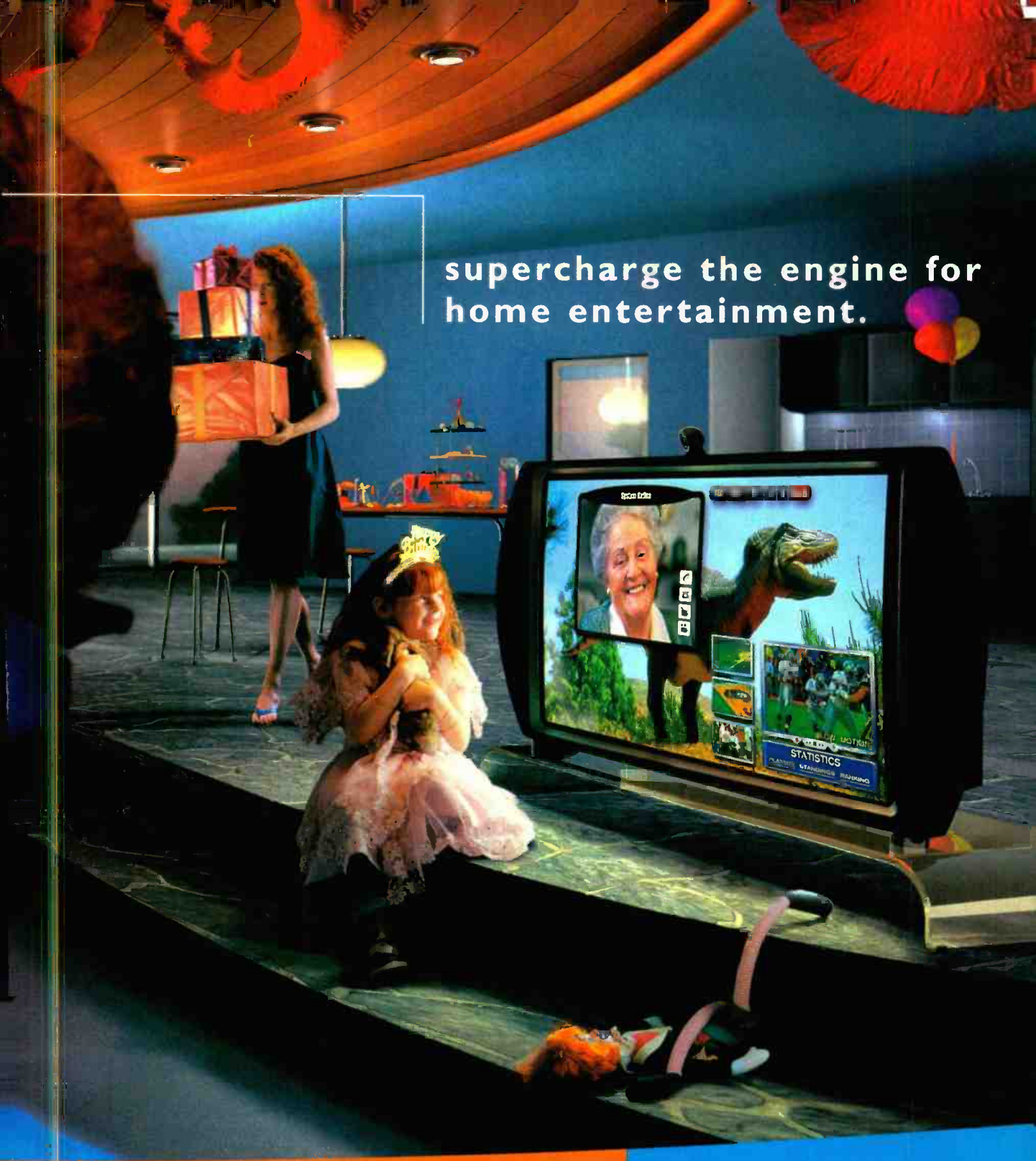
Shapiro was asked what size he would get if he got a digital TV by the first of the year for his home. Not even trying to dodge the question, Shapiro said: "It's a function of my fixed cabinetry and whether I go with the fixed cabinetry in my prime viewing area or I put it in another room. I believe it will be a 36-inch or a much bigger standalone. It's a debate going on between my wife and my kids."

When asked what his choice of programming source would be, Shapiro replied, "My big dilemma, quite frankly, is whether I get EchoStar or DirecTV, because EchoStar's doing some phenomenal things with HDTV. I was just talking to Jim Goodman this week, from WRAL-TV [president & CEO of WRAL-TV] and he was waxing eloquently about how wonderful his EchoStar is, says it's phenomenal."

When WRAL's commitment to doing full HDTV was mentioned to Shapiro, along with them offering 5.1 channels of audio, Shapiro responded: "That's right and Goodman says they are doing the Dolby digital, as well." He continued, "If you look at consumer satisfaction surveys, HDTV is the only product with 100 percent consumer satisfaction in terms of the quality. The only disappointment is the local programming. It is frustration with broadcasters. The issues we are increasingly facing, and what manufacturers are asking, is are broadcasters even relevant to HDTV anymore?"

Shapiro pointed out that broadcasters are inconsistent at best in their support of the HDTV transition. "With all respect to NBC," he stated, "it makes no sense to have the Tonight Show in HDTV, of any show you could choose, because that's the one show you're most likely to watch in your bedroom and you don't put your big TV sets, for the most part, in your bedroom. It's totally inconsistent with how HDTV is sold. NBC is probably the last network to get to HDTV. In terms of how we rank them internally, they're at the bottom."

Shapiro continued: "NBC is a disappointment not only because they are



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have cable, satellite, pre-recorded media of all types, video games, fiber optic to the home soon. So, you know, the question is: HDTV will be there but will it be there in the broadcast transmission format by the year 2006 with eighty percent? You'd have to be crazy to think that now. When that 2006 date was set, look at what we said: in 30 percent [penetration] of American homes. That's what we said then and we've maintained that position. Now if broadcasters go more slowly, it will be less and if they get more aggressive, it will be more."

When asked how manufacturers know what to make, Shapiro said: "Manufacturers always look to broadcasters first on this, but there's been a general shift in the last several months amongst manufacturers, thinking broadcasters just aren't going to play this game." Shapiro finished this thought in a tone of grave disappointment: "You know what? Maybe we'll do fine without them!"

Giving some feedback from the set-makers, Shapiro said: "What we're also hearing from manufacturers is that maybe broadcasters should be asked to give the spectrum back because there's a lot of other products we could build and use with that spectrum. When it comes to products like G-3 and G-4 technology, you know, portable communications devices, we're hearing a lot of our same members saying that broadcasters should give the spectrum back."

People like CBS have a bright future. They will be competing for the upper parts of the viewing audiences.

Shapiro says that the future of over-the-air television "is up to the broadcasters. If people are like Jim Goodmon, then I see a very bright future. People like CBS have a bright future. They will be competing for the upper parts of the viewing audiences, at least in the beginning, along with other viewers. If they [broadcasters] want to become the AM of video media, and be the low class media, that's their choice. It's obviously not a question of money, right now, because they have plenty of it. You could say that the stock market evaluations are low, but there's a lot of cash coming into broadcasting. Whether they choose to invest that for the long term is up to them."

When quizzed about the moving forces in the television/broadcast industry — are they the programmers, accountants or engineers — Shapiro said: "I think there's truly an absence of leadership. I think that engineers should be a little more assertive in talking about the quality of their signals, because that's something consumers respond to. HDTV consumers are not going to be happy watching broadcast television and every day there are more HDTV consumers. Not only are there HDTV consumers, but big set consumers, as well." ■

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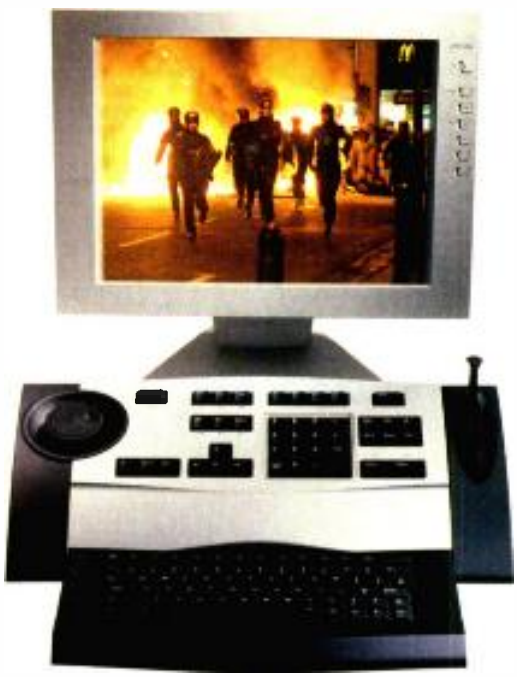

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Optical recording

Most everyone is familiar with the compact disc. Whether your encounter has been as a source for music, a storage device for data, programs and the like, or for movies, the CD has certainly carved itself a place in today's world. Simply put, the CD is nothing more than a storage device for bits. Other than format, bits don't know what they are: pictures, sound or your favorite computer program or game.

It has been a puzzle to many, with the gaining popularity of the CD in the digital videodisk (DVD) format, why it hasn't taken off as a means of distribution in the television industry. Gaining rapidly in popularity, and replacing VHS at the local rental houses, is the DVD movie. Although not high definition television (HDTV), the visual quality of the DVD is quite superior to that of VHS. The major reason for not having HDTV on DVD in the past is, despite its large storage capacity, you can't get a full-length feature in HDTV onto a DVD. A typical film (roughly 90 minutes or 2GB), with compression, will use up most of the DVD's capacity.

It would not be unreasonable for a television station to receive a plethora of spots, PSAs and interstitial material on one DVD and it would look better on air than some stations' S=VHS tape equipment and at a cost of considerably less for equipment and storage. How many DVD disks could you store in the same space as your current tape library?

Because "capacity" has been and will forever be the key issue in any storage media story, it was no wonder that eyebrows raised a bit this past summer when Hitachi-Maxwell announced a 4.70GB large capacity DVD-RAM disc. According to Hitachi, this new DVD-RAM media "provides high quality two-hour digital recording and large capacity data recording." In addition to this, a small size (80mm) DVD-RAM disc for video camera use is also now available.

How many DVD disks could you store in the same space as your current tape library?

That's not just playback. Hitachi says it's a "rewriteable" 4.70GB DVD-RAM. The disc holds up to two hours of digital recording or 4.7GB of computer data. In addition to this, a 2.8GB DVD-RAM disc for video cameras has also been released.

This might not seem like such a big deal in big market television terms; however, in smaller markets, where costs are a constant consideration, the potential for a device like this for a station's news department is certainly a very viable consideration.

It'll be interesting to watch this new DVD-based camcorder technology to see if it catches on any better than the Avid/Ikegami hard drive camcorder models that were introduced a few years back.

A New York-based company, Constellation 3-D, Inc. (C3D) has announced further product advances in the development of their "florescent multilayer disc" (FMD) for use with current standard red laser technology. Red lasers are pretty much the standard and an inexpensive component used in virtually all CD and DVD players in order to access and play the data stored on the disc.

C3D has developed the FMD media capable of much higher data storage capacity, on the same sized discs and can be played on CD/DVD drives which have been subjected to "minor and inexpensive modification." Single-sided FMD discs for use with these Red Laser-based drives will have capacities up to 25GB. You could get nearly a whole series of syndicated half-hour shows on one disk.

C3D has designed this new media to be backward compatible for use on any disc drive to play all types of CD, DVD and FMD media. It also provides C3D with a clear road map for production of removable data storage media with high capacity applications beyond the reach of DVD (storing up to 9GB).

"Certain vertical market applications such as Digital Cinema players and Internet streaming servers will require higher capacities of over 70GB almost immediately, and C3D will serve these markets using green and blue laser technology.

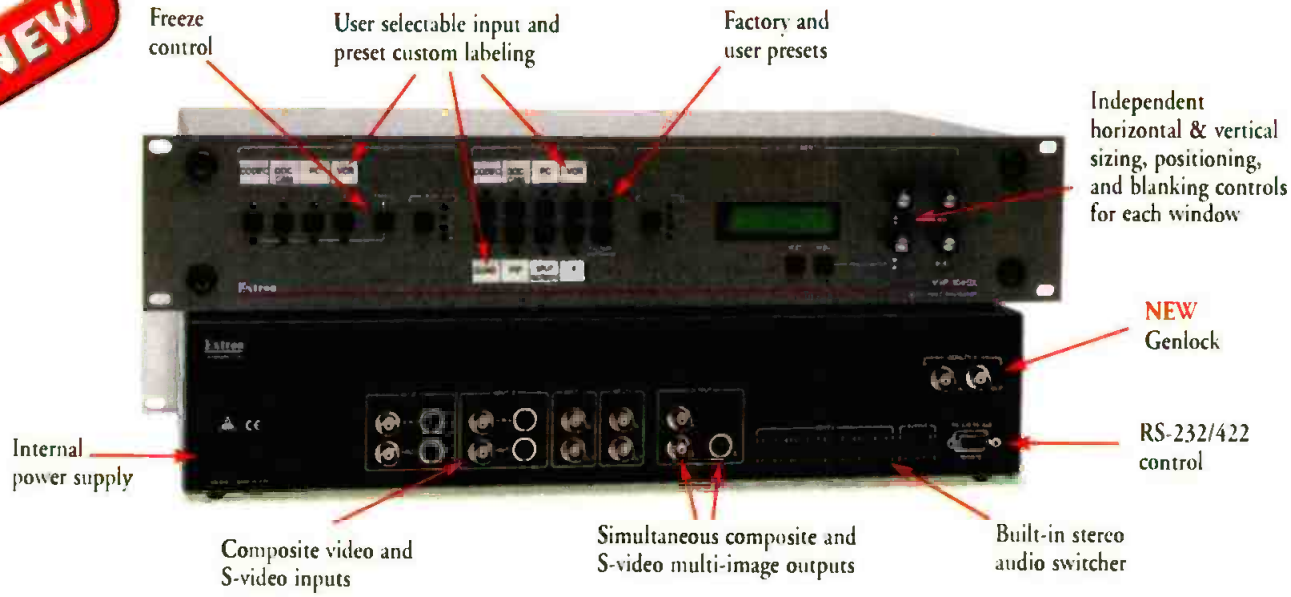
"We have extended our development efforts toward immediate exploitation of this 25GB Red Laser disc opportunity concurrently with our existing 100+ GB disc programs," says Patrick Maloney, SVP of Business Development.

C3D has some rather interesting things in their development hopper. One of the first items you can expect to see come out of their development group is an FMD Disc ROM-10 layer, 140GB oriented toward the new digital cinema industry, HDTV video storage and HD games. An FMD Disc WORM-10 layer, 50GB device aimed at data warehousing will most likely follow this.

In speaking with the folks at C3D, they have plans for up to 100 layers of data, up to 1TB of data storage capable of both read and write with parallel read-out of up to 500 tracks simultaneously. It should therefore come as no big surprise that they are also looking at up to 1Gb/s read rate and further development of Blue Laser technology. What's next?

More information is available at http://www.c-3d.net. ■

Hitachi-Maxwell's 4.7GB large-capacity DVD-RAM disc allows, two-hour recording and large-capacity data storage.



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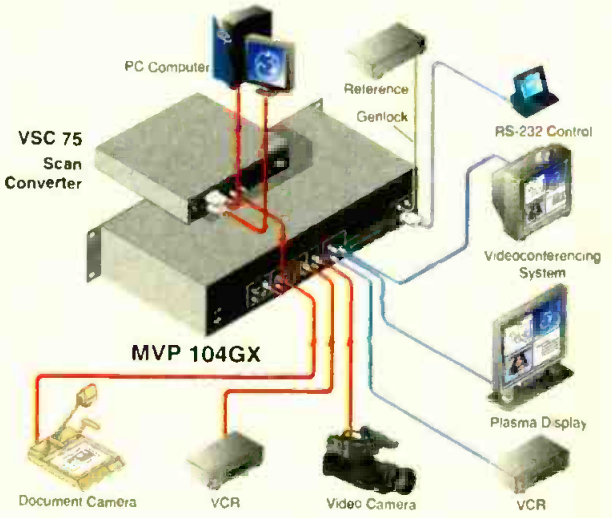
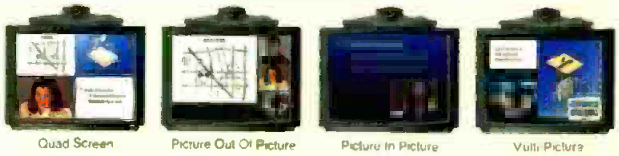


Output Examples



For an interactive product demonstration, check out the MVP 104GX Webcast at www.extron.com/d/mvp104gx

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LPTV processing relaxation postponed

BY HARRY C. MARTIN

The FCC has postponed until Jan. 15, 2001, the effective date of its relaxed definition of "minor" change for LPTV, TV translator and Class A television facility-change applications. Under the old rules (which now have been extended) LPTV and TV translator licensees could not file applications proposing any increase in coverage except in occasional filing windows. These applications were considered "major" changes and subject to auction processing if mutually exclusive with other window applications.

Under new rules, which originally were to be effective Oct. 1, only the following two classes of applications are still considered major:

- changes in frequency (not including offset); and
- changes in transmitter location where there would be no overlap with areas previously covered with a protected contour.

The FCC rule change is intended to provide flexibility to new stations and others who have not been able to upgrade under the window/major change system. Under the new procedure, applications for changes will be accepted on a first-come, first-served basis.

The relaxation date was postponed from Oct. 1 to Jan. 15, 2001, at the request of the Association of Federal Communications Consulting Engineers (AFCCE). AFCCE members wished to avoid confusion caused by the more than 4000 applications filed in the last window. Until the applications are entered into the FCC's database, engineers will be unable to prepare minor modification applications, because they are required to take into account the prior-filed applications.

Political editorial/personal attack rules repealed

Calling the Commission unreasonably slow and its recent 60-day suspension of political editorial and personal attack rules a "folly," the United States Court of Appeals for the District of Columbia Circuit directed the Commission to immediately repeal the rules.

As an outgrowth of a long-standing lawsuit filed by the Radio Television News Directors Association (RTNDA), the Commission had suspended its political editorial and personal attack rules for 60 days from Oct. 4 until Dec. 3. The lawsuit was a direct result of the failure of the Commission to act on a request by RTNDA to remove both the personal attack and political editorial rules, after the courts had thrown out the Commission's Fairness Doctrine many years before.

Late last year, the D.C. Circuit Court of Appeals acknowledged that the rules "interfere with editorial judgement of professional journalists and entangle the government in day-to-day operations of the media" and "chill at least some speech." Consequently, the court found it incumbent upon the Commission to explain why the public interest would benefit from these rules and remanded the case to the Commission in December 1999.

Despite the court's remand and an accompanying order for expedited action, the Commission had taken no action as of September of this year. As a result, with elections fast approaching on Oct. 2, RTNDA and the National Association of Broadcasters filed an emergency motion to compel agency action. The Commission finally responded to the court's remand by issuing the 60-day suspension. However, the court stated in its Oct. 11 decision repealing the rules that the Commission still failed to give any reasoning as to how the rules serve the public interest. Instead, the court stated that the 60-day suspension would only postpone a final decision by the Commission and would cause reinstatement of the rules because the Commission could not, in 60 days, analyze the information needed to evaluate the rules.

The political editorial rule required a station supporting a political candidate through an editorial to notify other candidates for that office and provide them an opportunity to respond. The personal attack rule dealt with attacks made on someone's integrity during a program raising a controversial issue of public importance. Under the rules, the station had to notify the person who was attacked and provide an opportunity to respond.

Correction: In the October column the deadline for stations in the top 25 markets to begin offering video description was incorrectly given as the second quarter of 2001. The FCC will not actually begin calculating compliance with video description rules until the second quarter of 2002. ■

Dateline

Unless the new EEO rules are invalidated by the D.C. Circuit Court of Appeals, stations in the following states will be required to place their Annual EEO Public File Reports in their public files and on their websites on or before Feb. 1, 2000: Arkansas, Kansas, Louisiana, Mississippi, Nebraska, New Jersey, New York and Oklahoma. Biennial ownership reports will be due for the same states, also on Feb. 1.

On or before Jan. 10, 2001, Children's TV Programming Reports (FCC Form 398) for the fourth quarter of 2000 must be filed with the FCC and placed in the public file.

All commercial DTV facilities must be on the air by May 1, 2002.

All NCE-TV stations must have built out their DTV facilities by May 1, 2003.

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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Act now to beat the DTV deadline

JIM SALADIN, SENIOR ASSOCIATE EDITOR

Though a significant number of stations have already reached the first FCC-mandated checkpoints along the path to DTV, the majority have yet to. Furthermore, various data sources indicate that budget enough to make even the most basic stabs at a transition has not been built into the financial plans of a surprisingly large segment of broadcasters. These factors point toward even more delays on the behalf of broadcasters.

What impact will those delays have with regards to installation and materials delays? How soon do those who have yet construct need to start?

To get the straight answers for broadcasters who might want to tempt fate and delay a little longer, we put those questions to Elmer Smalling of Smalling Systems and Jay Martin of Dielectric Communications. ■

Send questions and comments to:
jim_saladin@intertec.com

VENDOR

Jay Martin, Dielectric

Today, 165 stations are on-the-air with digital television. These stations are located in 57 markets covering 65 percent of American households. Considering these numbers, time is running short. The deadline for over 1200 commercial broadcasters is only 16 months out. With fewer than 200 stations in compliance today, this schedule is aggressive to say the least, suggesting a build-out rate of 65 units per month. The impact of this schedule will be felt in the manufacturing sector, the rigging community and finally the broadcaster. From a manufacturing standpoint, capacity is limited. From a rigging standpoint, there are only a limited number of crews qualified to work on tall towers with antennas that can weigh several thousand pounds. Waiting for the right or convenient time to purchase broadcast equipment can result in the broadcaster missing the mandated deadline.

Until now, the broadcaster has had a number of reasons for not aggressively completing the transition to digital. Unknowns such as the modulation scheme, changes at the FCC resulting from a new administration, the lack of a firm business plan to make DTV profitable, first-generation technology, lack of programming, a lack of DTV sets at a reasonable price and a lack of funding budgeted for the change have all been factored into the broadcasters' decision-making process. The truth is, as time goes on each one of the above arguments is further weakened. Soon there should no longer be any question as to which modulation scheme will "the" modulation scheme. The election is complete and the makeup of the FCC can be reasonably predicted. Business plans will materialize when operations force the issue. Second- and third-generation studio, transmitter and consumer electronic equipment is in the market today. One major network is simulcasting the majority of all new prime-time programming in DTV and set prices are coming down (although slowly). Last but not least, January brings about a new budget cycle for the majority of stations. Until the networks and the individual broadcaster truly embrace the idea of DTV, the consumer will not.

If you want to make the deadline, products should be on order and rigging crews scheduled prior to NAB 2001.

March 6, 2001, should prove to be a very interesting day for the broadcast industry. This is the day in which the Channel 60-69 spectrum will be auctioned off. Should this auction generate significant revenue, as it is expected to, this would force the issue of maintaining on-air deadlines as well as the 2006 deadline to vacate the spectrum currently used for analog broadcasting.

Today's environment should be viewed as an opportunity for change, an opportunity to catch up with the technological advances taking place around us. This change can be in the form of a greater offering of services by the broadcaster as a result of this technology or even a change in the implementation model from a standalone broadcasting plant to a shared "master-antenna system." Change of this magnitude may not be simple, but change is necessary in today's environment. If the broadcaster were to wait and see what kind of penalty may result in the failure to make the deadline, a great deal is at risk. Not only is there the risk of getting "behind the curve" of 1000 other broadcasters, but also the risk of the Commission taking action. Supply and demand will factor into the equation of both manufacturers and riggers' schedules and may work into the equation on pricing as well. In this environment, the customer is seldom the winner. If you want to make the deadline, products should be on order and rigging crews scheduled prior to NAB 2001.

The next 16 months should prove to be the most exciting, and stressful, times in the broadcast industry for all those directly involved with the transition. Decision making during this period is going to be all the more critical. ■

Jay Martin is director of marketing for Dielectric Communications, Raymond, ME.

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The delays will be in the areas of equipment design-in and delivery. Broadcasters should be phasing out analog studio and control equipment while updating routing, synchronizing, and test and measurement systems with digital equipment (or making "slide-in" provisions for digital equipment). Making various vendors' products (hardware and software) compatible with the equipment of other vendors and the total plant requires careful planning and engineering — especially when the goal is zero downtime. As equipment becomes more complicated, maintenance and operating staff training should be a part of the digital changeover. Broadcasters should have vendors conduct this on-site training as part of an equipment purchase package.

After the gradual change in studio and terminal equipment to DTV, changing over transmitters and transmission equipment (lines, antennas, etc.) will be the biggest (often uncontrollable) time consumer. If the broadcaster owns/shares a tower which is certified for the additional load, equipment should be installed side-by-side and tested for an "event-free" changeover. If there is no additional room in the transmitter building or existing tower or the tower can not be certified, an alternate transmitter site should be acquired as a first priority on the road to digital transmission. The broadcast market has a lot to do with over-the-air planning. The bulk of many broadcasters' audiences (especially in the top 20 markets) rely on cable systems or satellite distribution rather than off-the-air reception for the station's signal, and this trend will increase until the need for inefficient and expensive over-the-air transmission ceases in the not-too-distant future. The broadcaster should make certain that the hardware and software "link" to the cable distributor, satellite distribution, Internet, etc. is of the highest quality.

Broadcasters should begin engineering budgeting and planning now. If you plan to upgrade your plant, plan on at least a year for studio work and two or more for transmitter work. Using a reputable consultant who has no ties with any equipment vendor to help you budget, design and certify the completed installation, whether it is a studio system or whole new plant, will save money and time. Two of the biggest deciding factors for rapid digital TV growth in the U.S. are, in many ways, out of the direct hands of the broadcasters. They include the speed of acceptance and sale of consumer digital receivers and the impact of high-speed (DSL) Internet service to all customers (permitting broadcasters to provide their streaming signal on the Internet). A well-designed, engineered and documented plant will always be an asset for the broadcaster. ■

Plan on at least a year for studio work and two or more for transmitter work.

Elmer Smalling is President, Smalling Systems/ Jenel Systems and Design, Inc. Plano, TX

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Resolution

BY MICHAEL ROBIN

Many of the aspects of today's legacy television standards (SDTV) were developed through experiments carried out in the 1930s. They reflect the understanding of the psycho-physical perception of images applied to picture capture, efficient and economical signal transmission, and acceptable picture reproduction in the home, given the technology of the times. The extent to which a picture reproduction medium can reproduce fine detail and/or movement is expressed in terms of resolution. Historically resolution of a fixed image was understood to mean "limiting resolution," or the point at which adjacent picture elements of an image cease to be distinguished. Various disciplines measure and specify resolution differently.

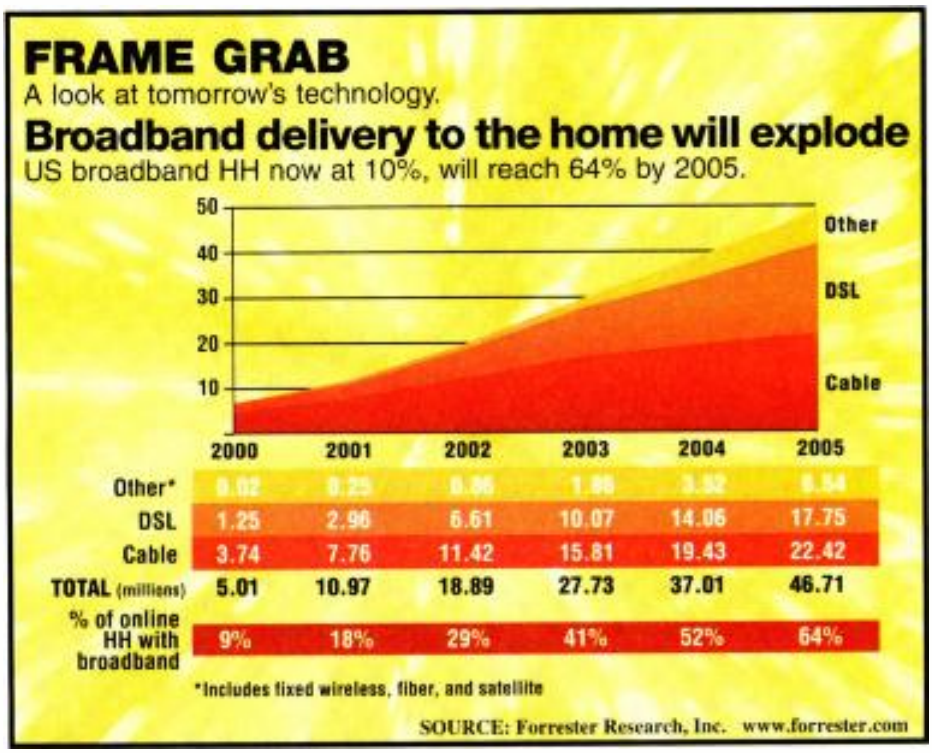
Spatial resolution

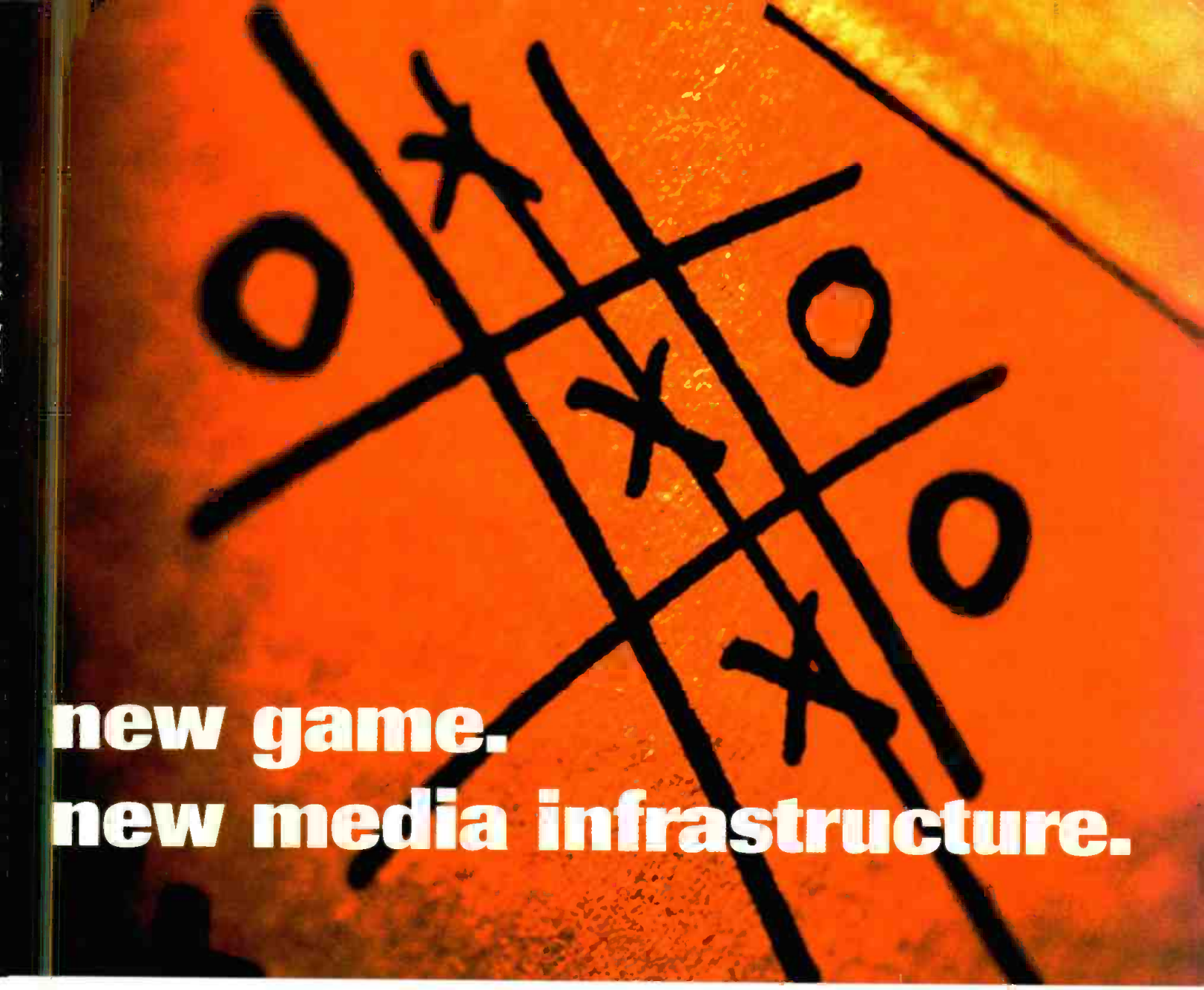
A photograph is essentially a two-dimensional representation of an event frozen in time. The difference between a photograph and motion pictures lies in the fact that "motion pictures" are a sequence of successive frozen images. The capability of the photograph to reproduce fine detail is expressed as the number of separate lines per millimeter (spatial resolution) which are just recognizable. Values can range from below 50 to above 1000. Photographic resolution depends on the emulsion, the contrast of the subject, the color of the light and other factors. The resolution of a photograph is the same in all directions.

The extent to which a picture reproduction medium can reproduce fine detail and/or movement is expressed in terms of resolution.

A television picture is an optical illusion. The original picture is scanned horizontally and vertically fast enough to create an impression of continuity. The result of the picture scanning process is an electrical representation (in volts) of the picture brightness values (in candelas per square meter) at specific locations on the scanned image at a given moment in time. A television picture is made up of a given number of lines, specific to the scanning format. The SDTV standards (525/60 and 625/50) were developed taking into consideration the acuity of vision of the human eye (1 minute of arc), assumed viewing conditions (viewing distance six times the picture height) and transmission-spectrum savings concerns. Experiments indicated that the optimal number of scanning lines making up a television picture given these constraints is about 572. This ballpark figure is at the origin of the number of lines specified for the two SDTV standards — namely the 525-line system used in North America and Japan and the 625-line system used elsewhere in the world. A high-definition standard with 1125 lines per picture requires shorter viewing distances, e.g. three times the picture height, to enable the eye to resolve all picture details. Due to the horizontal and vertical scanning process, television pictures exhibit two types of spatial resolution, namely vertical resolution and horizontal resolution.

Vertical resolution is related to, but not equal to, the number of active scanning lines. In interlaced television, the vertical resolution is equal to the number of active lines multiplied by the Kell factor, usually taken to be 0.7. The resulting "statistical" vertical resolution is expressed in lines per picture





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height (LPH) and is independent of the transmission bandwidth. In the 525/60 scanning standard, the vertical resolution is equal to 0.7 x 485 = 339LPH.

For equal horizontal and vertical resolution, the number of picture elements (pixels) per active line duration that the television picture needs to resolve horizontally is equal to the aspect ratio (e.g. 4:3 or 16:9) multiplied by the vertical resolution. In the SDTV NTSC system this is equal to 339 x (4/3) = 452. Scanning 452 pixels results in an electrical signal with 226 complete cycles during the active horizontal scanning line. Figure 1 shows how scanning horizontally alternate white and black pixels results in a sinewave. Given an active line duration of 52.85µsec, one complete cycle has a duration of 0.2338µsec resulting in a maximum video frequency of Fmax = 1/(0.2338µsec) = 4.28MHz.

The FCC permitted maximum transmitted frequency is 4.2MHz resulting in a slight loss of horizontal resolution. This bandwidth needs to handled by the transmission medium, all the way from the camera output to the TV receiver's CRT. The horizontal resolution is expressed in LPH and in an optimized system is equal to the vertical resolution. Every television format has a related horizontal resolution factor expressed as lines/MHz. In the SDTV formats (NTSC and PAL) the horizontal resolution factor is about 80 lines/MHz. A 4.2MHz bandwidth therefore results in an analog horizontal resolution of 80 x 4.2 = 336LPH, almost equal to the vertical resolution.

Temporal resolution

An important property of the eye is persistence of vision. Once an image has been formed on the retina, the eye acts as a storage device and the visual sensation of the image is retained for a finite length of time. As a consequence, the human vision system (HVS) can be "fooled" into believing that a sequence of static pictures represents motion. This occurs if the display rate is greater than 10 successive pictures per second. A different phenomenon, known as flicker, requires still higher picture rates. The number of pictures per second is chosen to provide a sufficiently rapid succession to avoid display flicker at levels of image brightness appropriate for given viewing environments. The "critical flicker frequency" (CFF) depends on the display brightness and is the minimum rate of display, at a given picture brightness, at which the HVS does not perceive flicker. Early movies used 17 pictures per second. Contemporary movies use 24 pictures per second and each picture is projected twice, resulting in a display rate of 48 pictures per second. The television picture (frame) has a refresh rate of (nominally) 30Hz (525/60 scanning standard) or 25Hz (625/50 scanning standard). Each frame is made up of two successive interlaced fields with a refresh rate of 60Hz or 50Hz. Historically these frequencies were related to the power line frequency but today they are only nominally related to it.

Due to the horizontal and vertical scanning process, television pictures exhibit two types of spatial resolution, namely vertical resolution and horizontal resolution.

The use of interlace is the consequence of the need to reduce the transmitted bandwidth and can be viewed as an early compression process. It causes large picture areas of uniform color and brightness to flicker at the field rate (large area flicker) and is an acceptable compromise. When two adjacent lines in two consecutive fields have different luminance values, the result is small area flicker at the frame rate, and this is highly objectionable. To avoid these problems, computers, which have no wide-bandwidth signal distribution constraints, use progressive scanning, a high number of lines and picture refresh rates in excess of 60Hz. Table 1 gives the CFF for commonly encountered flicker frequencies.

Digital system considerations

The advent of digital signal processing has introduced a new twist in the concept of resolution. According to

Picture Source	Flicker Frequency	Frames Per Second	Flicker Perception Threshold
Movies	48 Hz	24	68.5 cd/m²
50 Hz Television	50 Hz	25	99.4 cd/m²
60 Hz Television	60 Hz (nominal)	30 (nominal)	616.7 cd/m²

Table 1. Flicker perception threshold for commonly encountered flicker frequencies.

Format	ITU.R601	SMPTE 296M (1280 x 720 P)	SMPTE274M (1920 x 1080 I)
Aspect Ratio	4/3	16/9	16/9
F_H	15734.25 Hz	45 KHz	33.75 KHz
F_S (Y)	858 F_H = 13.5 MHz	1650 F_H = 74.25 MHz	220 F_H = 74.25 MHz
Total Y Samples Per Line	858	1650	2200
Active Y Samples Per Line	720	1280	1920
Y Filter Attenuation	12dB @ 6.75 MHz	12dB @ 37.125 MHz	12dB @ 37.125 MHz
F_S (C_B, C_R)	429 F_H = 6.75 MHz	825 F_H = 37.125 MHz	110 F_H = 37.125 MHz
Total C_B, C_R Samples Per Line	429	825	1100
Active C_B, C_R Samples Per Line	360	640	960
C_B, C_R Filter Attenuation	6 dB @ 3.375 MHz	12 dB@ 18.56 MHz	12 db @ 18.56 MHz
Total Lines Per Picture	525	750	1125
Active Lines Per Picture	486	720	1080
Scanning	Interlaced	Progressive	Interlaced

Table 2. Sampling structures of several digital video formats.

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Nyquist theory, to avoid the occurrence of aliasing, the maximum sampled analog video frequency has to be less than half of the sampling frequency. With one exception, the composite digital 4Fsc standard, all digital video formats use component video signals. The analog component video signals E'Y, E'CB and E'CR are sampled at a multiple of the horizontal scanning frequency (FH) resulting in the pervasive 4:2:2 sampling strategy. There is, therefore, a direct relationship between the number of samples (pixels) per line and the digital sampling frequency. SDTV and DTV standards specify the characteristics and tolerances of the anti-aliasing and reconstruction filters. Table 2 shows details of three digital sampling structures.

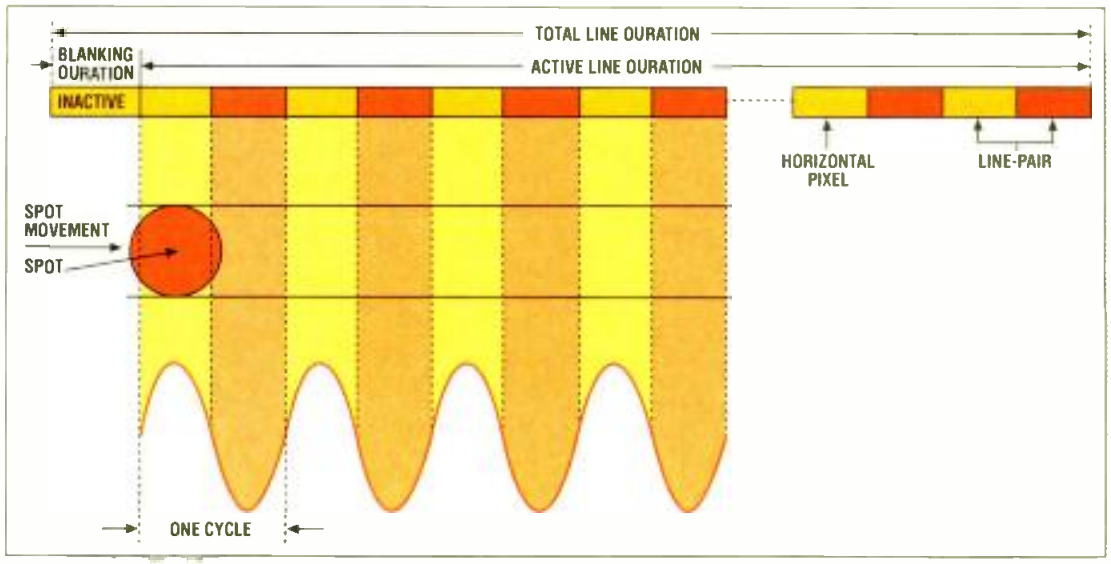
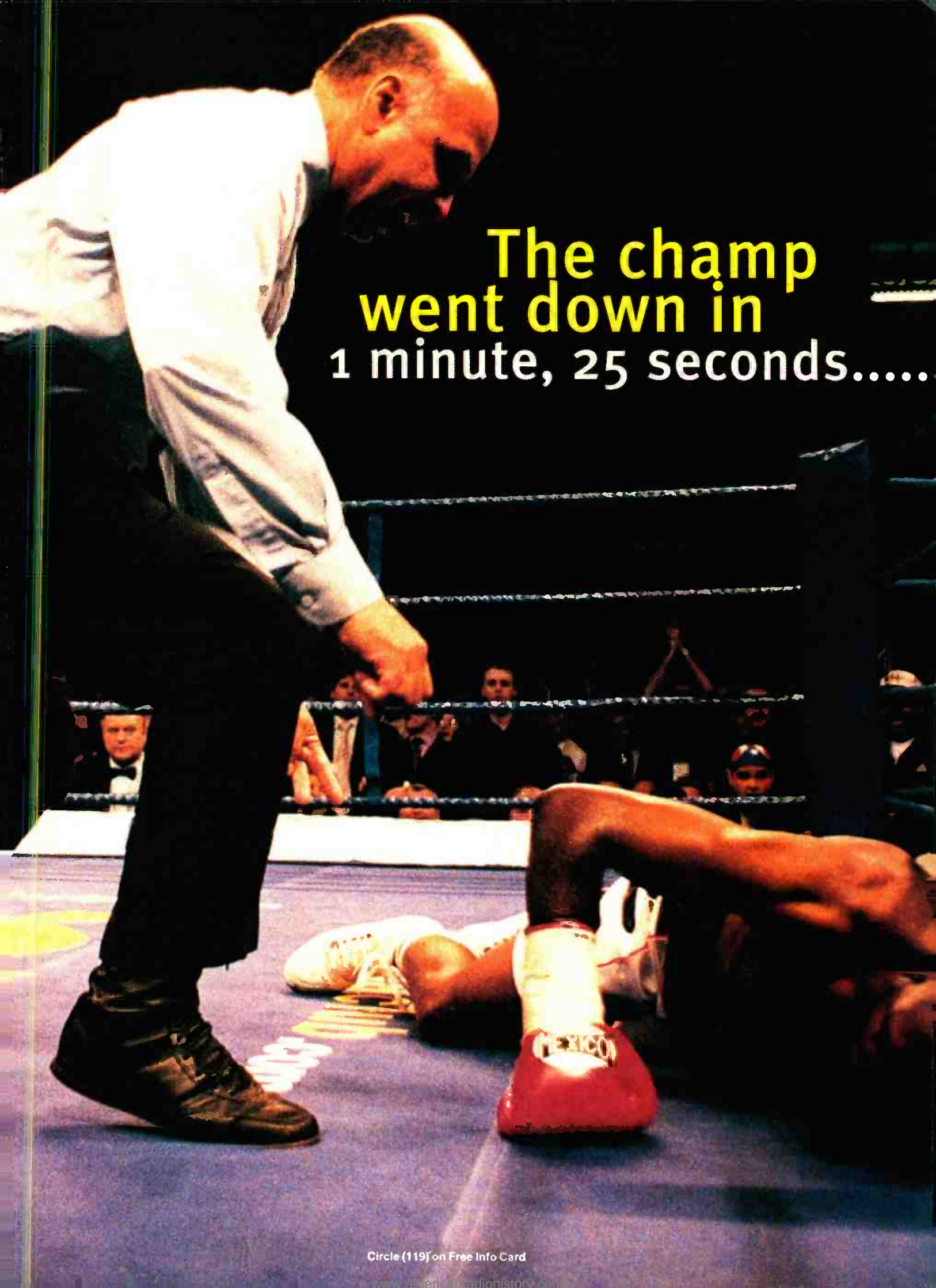


Figure 1. The horizontal resolution concept.

The ITU.R 601 standard is based on the existing traditional SDTV formats: NTSC and PAL. The sampling frequencies adopted were a compromise aimed at satisfying NTSC and PAL users. Although it allows many sampling structures the most popular one is the 4:2:2 format. The low-pass filter characteristics show a moderate attenuation at half the sampling frequency. Applying analog resolution concepts, a low-pass filter with a cut-off frequency of 6.75MHz would result in a horizontal resolution of 540 LPH; the equivalent of 720 pixels per active line. High-energy luminance frequency domain components around 6.75MHz, even if only 12dB attenuated as allowed in the standard, stress the A/D process and generate aliasing. Practical filters limit the Y bandpass to 5.75MHz resulting in a horizontal resolution of 460LPH. Similar considerations apply to the two color-difference signals. In both cases the analog horizontal resolution is superior to NTSC and PAL but it still bears the footprint of analog low-pass filtering.



The SMPTE 296M standard describes a progressive scan HDTV system with an active raster of 1280 active horizontal pixels by 720 active lines. The format is not interlaced, so the interlace-related vertical resolution ambiguity, partly responsible for the Kell factor, is considerably reduced here. There are no clear guidelines aimed at specifying the statistical vertical resolution of a progressive scan television system. The maximum video frequency resulting from scanning 1280 active horizontal Y pixels is on the order of 37MHz, thus tightly matching the constraints imposed by the 74.25MHz sampling frequency. Again analog considerations would require a higher sampling frequency for optimal analog resolution. Similar considerations apply to the color-difference signals. Generally all analog resolution concepts are ignored and this format is described as having a resolution of 1280 x 720.

The SMPTE 274M standard describes an interlaced scan HDTV system with an active raster of 1920 active horizontal pixels by 1080 active lines. This format is interlaced. Consequently, the Kell statistical factor applies and the analog vertical resolution is 0.7 x 1080 = 756LPH. The maximum Y video frequency is again on the order of 37MHz and a 74.25MHz sampling frequency is slightly marginal. Similar considerations apply to the color-difference signals. Once again all analog resolution concepts are ignored and this format is generally described as having a resolution of 1920 x 1080.

The use of interlace is the consequence of the need to reduce the transmitted bandwidth and can be viewed as an early compression process.

As shown, in all digital formats the sampling frequency imposes constraints affecting the anti-aliasing and reconstruction filters resulting in a reduction of the horizontal resolution to avoid aliasing. These constraints obviously do not exist with digitally generated pictures. However, remember that nature is analog so the transmission of real pictures requires filtering and A/D conversion. With digital television concepts and implementations, the trend is toward expressing the picture resolution as the number of pixels per active line multiplied by the number of active lines per field. This trend tends to ignore the original definitions of horizontal and vertical resolution gradually replacing them in equipment and system specifications. ■

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

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Storage area networks

BY BRAD GILMER

Storage area networks (SANs) allow multiple processors to share a pool of common storage. It is a powerful solution for sharing content across a homogeneous system. A SAN is a pool of virtual storage, which is treated by a device as if all the storage were local. SANs can be comprised of local storage on a number of machines, centralized storage or a combination of both. Unlike a traditional network, SANs do not involve file transfer. When users gain access to a shared piece of content, they are not making a copy of the content on their local storage. Nor are they attaching a file system to their local box. To the user, it appears as if the content resides on their local system regardless of where the content is physically stored. Furthermore, SANs operate separately from a local area network (LAN), so storage-related functions do not slow normal LAN traffic.

SAN assembly

The SAN consists of three basic components: an interface (like SCSI, Fibre Channel or ESCON), interconnects (switches, gateways, routers or hubs), and a protocol (like IP or SCSI) that controls traffic over the access paths that connect the nodes. These three components plus the attached storage devices and servers form an independent storage area network.

While the SAN supports a number of interfaces, Fibre Channel (both Fibre Channel Arbitrated Loop [FC-AL] and Fibre Channel fabrics) has gained the limelight due to its flexibility, high throughput, inherent fault-tolerant access paths and potential for revitalizing network-to-storage communications. In most, but not all SAN implementations, Fibre Channel serves as a sort of shared "SCSI extender," allowing local systems to treat remotely located storage as a local SCSI device.

Figure 1 shows a simple SAN system. Note that each video server has inputs, outputs, local storage and a SAN connection. Content stored on the local drive is accessible not just to users on the local node but to all users on the SAN. An item stored on System A is just as available to a user of that system as it is to a user on System B. A user on System B does not have to copy content from System A before it can be used.

SANs operate separately from a local area network (LAN), so storage-related functions do not slow normal LAN traffic.

Most of us are familiar with the Windows operating systems. When users want to access content stored on a different computer across a network, the remote computer must first be found on the network, a username and password must be typed, then the drive and the desired file must be located. At that point, the desired file must be copied to the local drive. As an extension to this idea, both Windows and UNIX support mounting remote file systems. Once a remote file system is mounted locally, this storage appears to be part of the local file. Remote file system technology has been around for a long time and is well understood. It operates well across public networks. However, it includes overhead that may not be appropriate for rich media applications at high bit rates operating across dedicated networks.

SAN concerns

SANs raise some interesting issues. For example, if SAN data is not stored in a particular location, how can it be adequately backed up? Some SAN solutions automatically create two copies of any newly ingested material. The system makes sure that the same data is not stored in the same location. Other SAN systems stripe the data across multiple systems. If one server's local storage becomes unavailable the SAN recreates the data using parity algorithms. In any case, it is important that

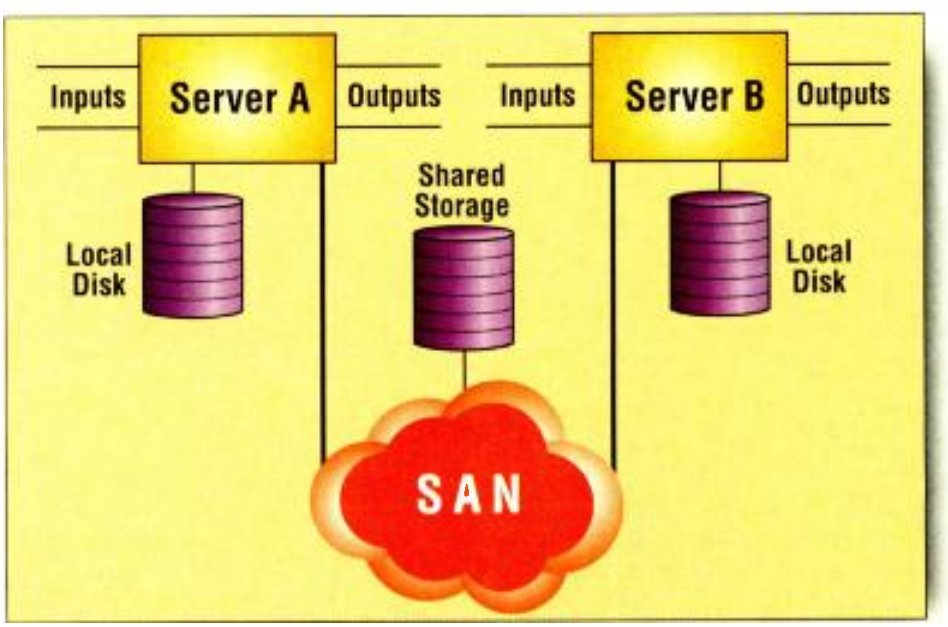

Figure 1. SAN allows servers to access stored content.

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users understand how their SAN data is protected and what the cost of this protection is in terms of disk storage.

Another issue in SAN design is bandwidth. How do SAN systems ensure that the SAN does not fall over if all users on the SAN request data simultaneously? First, they design the bandwidth of the SAN so that it has extra capacity. The extra capacity assures that the SAN keeps functioning even in times of extremely high demand. Some might argue that this is wasteful and drives up cost. The fact is that high-speed network hardware is falling in price, and is now such a small part of the total system price that this is no longer a consideration. Second, they insist that connections to the SAN be carefully controlled. If the SAN is grown in an unplanned way, the overall bandwidth of the SAN could be exceeded under peak conditions.

If SAN is so great, why doesn't everyone use it? SAN has a few challenges. First, SAN does not work well in a multivendor environment. If you are looking to mix vendors' equipment, you are better off using network-attached storage, or some other Internet protocol-based system. The standards for SAN do not address the issue of file interchange. Just because you can transfer a file from one vendor to another does not mean you can play it. For example, you might be able to create an MPEG file that cannot be decoded by another system. For this reason, SANs exist pretty much as single vendor solutions. Also, as previously discussed, most vendors are nervous about connecting to other SANs because of concerns about bandwidth demands.

SANs are best used in larger systems where users want many I/O channels and they all want to access the same content.

Second, SANs may turn out to be more expensive when you are looking for a server system that has a low number of I/O channels but lots of storage. Finally, SANs may not be the way to go if you are looking for a small system. Generally, simple, stand-alone systems are less expensive.

SANs are best used in larger systems where users want many I/O channels and they all want to access the same content. As storage prices fall, building one server with a huge amount of storage is not a problem. However, I/O still requires bandwidth inside the server. There are two common strategies for dealing with large I/O requirements. One is to build a large server with what amounts to a router inside it. The other is to connect a number of smaller I/O devices to a network. That is what a SAN does. It allows one to grow a network efficiently without having to upgrade boxes. ■

Brad Gilmer is executive director of the AAF Association and president of Gilmer & Associates, a technology consulting company.

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Ask Dr. Digital

Making sense of 4:4:4, 4:2:2 and 4:2:0

BY STEVE EPSTEIN, TECHNICAL EDITOR

I was looking for more information about 4:2:0 and 4:2:2 as referenced in the July article by William Zou on light compression. I have been unable to find a definitive source and believe that an exact definition would help with some of my confusion in understanding this article. Any help would be appreciated. Thanks,

Kevin A. McGrail

Rx

You are not the only one confused by that nomenclature. As a matter of fact, the signals represented are not entirely consistent across several very similar nomenclatures. To understand these, an understanding of signal sampling is needed. Based on Nyquist theory, a signal must be sampled at a rate at least double the highest frequency found within the signal to avoid aliasing. In other words, if you want to sample a 20kHz signal, the sampling rate must be at least 40kHz. Higher sampling rates are generally preferred, but like anything else, higher rates come at a price. In this case, the price is an increase in the amount of data generated.

In the early days of digital video, a sampling rate of four times the color subcarrier (3.58MHz X 4 = 14.3MHz) was used to sample composite NTSC video. A different sampling rate was used for PAL. Later, it was agreed that video would be sampled using 13.5MHz. Even though that value is not four times any specific frequency used in NTSC or PAL, it is common to both standards and works well as a standard sampling frequency.

With that said, a 4:4:4 signal could be digital representation of a component analog RGB signal that was sampled at 13.5MHz. A 4:4:4 signal could also be a Y, R-Y, B-Y signal that was sampled at 13.5MHz. The "4" represents a signal sampled at 13.5MHz. Likewise, a "2" is used to represent a signal sampled using a sample rate of 6.75MHz (one-half of 13.5Hz). A "1" is used for signals sampled at a rate of 3.375MHz (one-fourth of 13.5MHz). Figure 1 shows graphically where the samples are taken based on the nomenclature used.

As stated, various nomenclatures are used. Generally, three numbers separated by colons depict the sampling rate. If a fourth number is used it normally refers to an alpha or key channel. The first number normally refers to the luminance channel, while the next two numbers are for the color difference channels. However, variations exist, such as using 4:4:4 to represent RGB or using 4:2:0 to represent the fact that two samples are taken on every other line. HD signals have thrown another wrench in the works, as manufacturers are using 4:2:2 to represent a "normal" HD signal. These numbers are based on the "4" representing 74.25MHz. Relative to the original system ("1" = 3.375MHz), these HD numbers are actually the equivalent of 22:11:11.

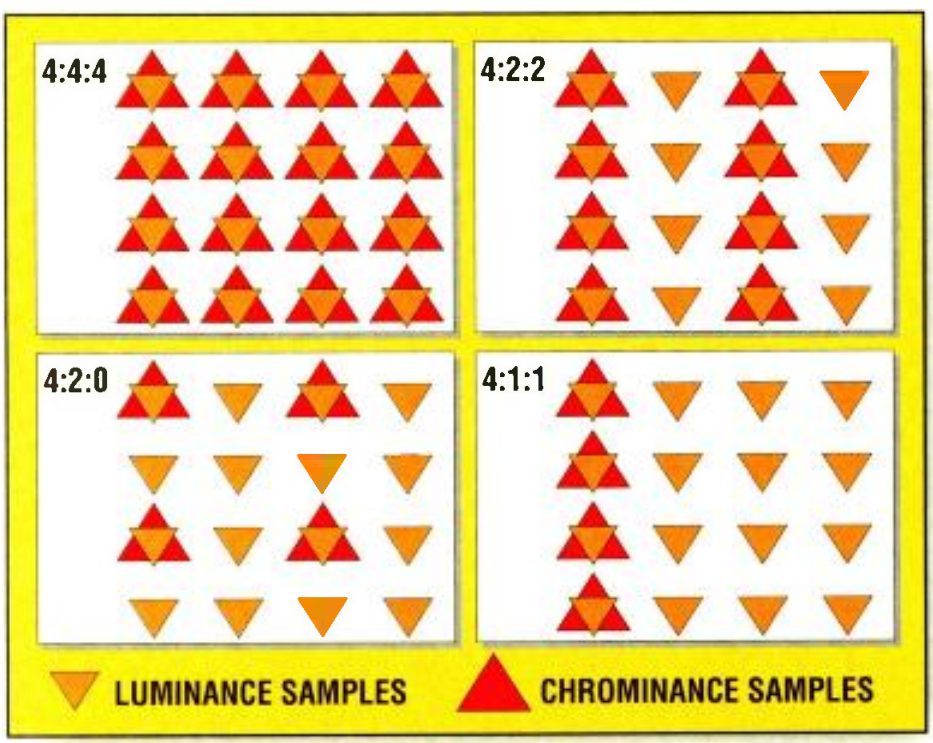

Figure 1. As video has evolved, multiple sampling formats have been used. Most use some form of chroma subsampling.

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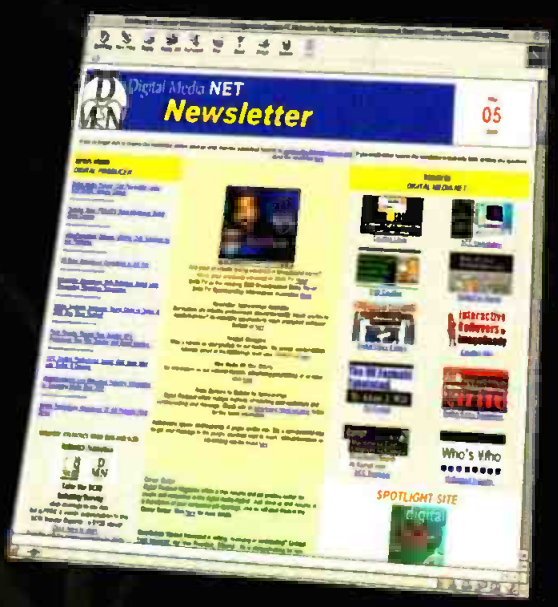

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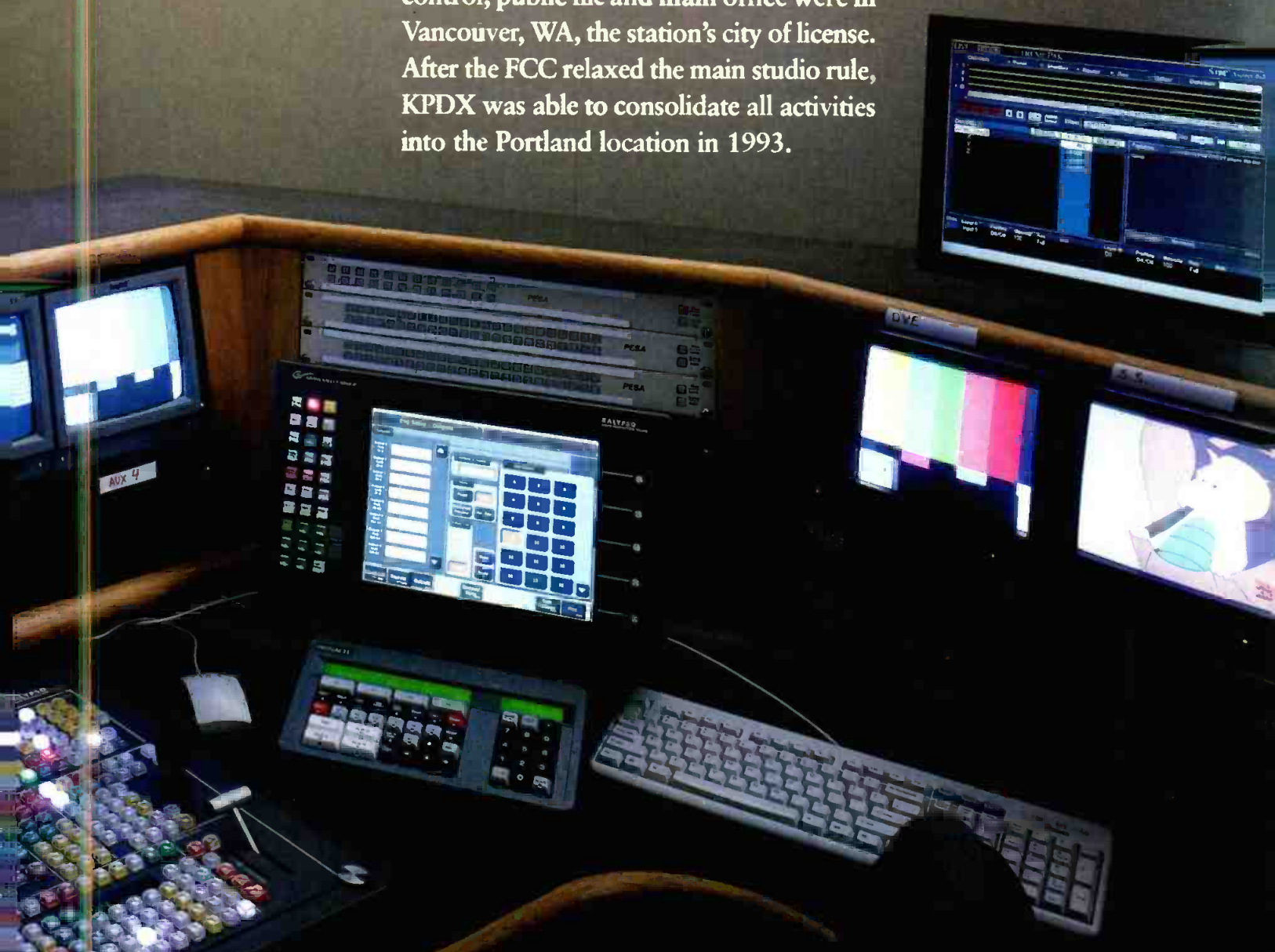
By Edward E. Williams

rebuilds from scratch

KPDX-TV began operation in 1983 in a small, renovated clothing store in Portland, OR. The station's master control, public file and main office were in Vancouver, WA, the station's city of license. After the FCC relaxed the main studio rule, KPDX was able to consolidate all activities into the Portland location in 1993.



An important part of the design of KPDX's new facility was to have separate production facilities for the news operation and post. To this end, the newsroom facility was designed to have its own studio, control room, editing facilities and computer network. The news control room, shown here, features a Grass Valley Kalypso two-M/E switcher and Pinnacle graphics workstations in a room layout following the traditional two-bench style.

In 1983, there was no Fox network, two-inch Quadruplex videotape was beginning to fade away and a small startup independent station fit right into such a location. A facility was built using nearly state-of-the-art technology for the time. The building, while leaving a lot to be desired from an image standpoint, was not expensive to operate and enabled the station to survive in the early years.

By 1997, after many remodels, upgrades and fixes, and several years of phenomenal growth, 63 people were shoehorned into just under 14,000 square feet. It was past time for a change. Meredith Corp. had just purchased the station and the directive was issued to find KPDX a new home.

Green field build vs. renovation

One of the main reasons for moving the station was the need to grow the station's news product. Fox News at Ten had been produced as a joint effort between KPDX and KOIN, the CBS affiliate in Portland, from mid-1991 to October 2000. From late 1994, the program had been routinely pulling a solid double-digit rating.

The station was having a hard time fitting new people into the existing space, let alone the equipment and studio space that would have been required to house a full service news department. In the existing facility, five desks to an office, parking eight blocks away, and frequent power and HVAC problems were facts of life. In the search for a new facility, the station had a very long shopping list to consider.

Six months of searching led the design team to one inescapable conclusion — a "green field," build-it-from-scratch approach would be needed. There was simply no existing facility available for renovation that came close to meeting most of the needs faced by KPDX.

In the summer of 1998, Meredith purchased approximately 3.5 acres of land in an executive office park in Beaverton, OR. The location is 6.5 miles west of downtown Portland and affords good access to freeways and commuter light rail. On this site, using design and construction services of The Austin Company, KPDX would build its future in a 45,000 square foot, 21st-century building.

Technical design philosophy

Because a few upgrades had been done in the existing KPDX facility over the years, not everything would be scrapped in favor of the newest technology. By the same token, some equipment that had been nursed along for a few years would finally be retired or sold.

of a systems integrator, although various sources were tapped to assist in early design work and research. KPDX Engineering, a group comprised of the station's broadcast engineers as well as building facilities supervision and computer network support personnel, formed the core of the main design team. They worked with Sparling Associates in Seattle, Doyle Technology Consultants in Redmond, WA, and The Austin Company's broadcast engineering department. In addition, KPDX Engineering personnel toured various manufacturers' facilities, commissioned almost 60 separate in-house equipment demonstrations and did approximately 2500 man-hours of

In the search for a new facility, the station had a very long shopping list to consider.

The team came up with a three-pronged approach to determine which portions of the existing plant would be moved and which portions would be built fresh. Post editing had received the greatest number of upgrades in the years before the move, so it would be left alone and transported en masse to the new location in its current analog configuration. Master control and the main technical core were in the greatest need of upgrade, so they would be built mostly from scratch and would be almost totally digital. Because the news operation was going to be all new, it would receive the most cutting edge treatment that the budget would allow.

In general, the design team lived by a principle coined as "Neo-Digital Luddite" — essentially meaning that flashy products were, in most cases, shunned in favor of more proven systems and technologies. After all, broadcasting is still about keeping the content in front of the viewer without interruptions and glitches, thus keeping the company's vital revenue stream flowing. The team wasn't against new products and systems, but always worked toward building a modern system that would work reliably.

The facility was built without the use Internet and telephone research to select products. Ultimately, the final designs and all of the installation documentation came directly from KPDX Engineering, making extensive use of VidCAD and AutoCAD.

Good power and solid principles

The building is fed with a 480V 3000A electrical service currently outfitted with 2000A switchgear. A Cummins/Onan 650kW diesel generator provides backup power for the technical core, newsroom, news studio, some HVAC and a few offices. An Exide dual parallel 225kVA UPS provides ultra-clean and stable power for all critical air systems. A counterpoise grounding system was built in and all technical systems are bonded with #8 wire back to a large, low-resistance single point grounding bus in the main tech core.

The foundation of the digital portion of the facility is a common, basic SDI video distribution and routing system with non-embedded AES/EBU audio on 75Ω coax. At the heart of the plant is a PESA routing system consisting of 144x144 hybrid analog/digital Tiger frames for main audio and video, Lynx 24x16 frames for analog conversion

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sources (satellite, microwave, etc.), an Ocelot 8x8 analog dubbing center frame and a 32 port RS-422 control switch. The router is controlled by PESA's 3500 control system. The PESA routing system was chosen after extensive research and both in-house and factory demonstrations. The design team needed a system that could easily be converted from analog to digital as the plant changed over time. The Tiger frames allow this changeover by just swapping cards.

Grass Valley and Ross DAs and ADC patching handle analog and digital distribution and patching. All router I/O, all DA inputs and about one-third of the DA outputs are patched.

The core of the facility also contains multiple quality control monitoring points, or "QC stations." In most cases these are based on Videotek VTM-200 or VTM-300 series multiformat test instruments paired up with a VGA monitor, Wohler audio monitor and a router panel. This allows the QC stations to be largely standardized from rack to rack and room to room, making life much simpler for the people who have to use and maintain the facility. Some critical QC stations are based on more traditional Tektronix waveform, data and audio monitors.

The master control room has no monitor wall.

In master control, an earlier planned server system was postponed due to budgetary issues roughly halfway though building construction. Because a Grass Valley M-2100 switcher had already been purchased and the rest of the plant was mostly digital, a solution had to be found for the analog gear that was now going to be moving with the station.

The station's Odetics TCS-90 received a minor retrofit. The Grass Valley Ten-XL composite switcher on the TCS-90's output would be joined by two more to handle the Betacam component video from the six Sony BVW-65 VTRs in the machine. The component video was then fed into a Grass Valley 9600 series A/D converter and digital frame sync. Audio conversion was also handled using Grass Valley converters.

Existing master control Betacam decks were matched up with Leitch DFS-3005 multiformat synchronizers. Twenty-three more of these units became the foundation of the station's main A/D functions. This design element leaves the plant ready for replacement digital equipment since each DFS-3005 stands by itself. The plant itself is wired only for digital signals at these locations. No space had been designed into the master control room for tape decks, because the floor plans had been locked in months before the server postponement decision was made. So control for the master control Beta machines located in the next room is done by switching the RS-422 control

The design team incorporated a 16' x 7' projection screen (shown above) into master control, displaying output from two Miranda Kaleido multi-image processors. Images from up to 32 separate sources at one time can be shown on the wall.

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from deck to M-2100 and back via the PESA control router. Control is switched using a salvo that also switches audio and video to a QC station. A DNF edit controller at the QC station is used to control the decks while they are off the M-2100.

While KPDX master control is much like any other, the design team decided to go a bit more high tech in one area: The master control room has no monitor wall. Instead of the traditional row of racks filled with glass-tube picture monitors, KPDX master control is dominated by a 16' x 7' projection screen in the front of the room. Two Hughes/JVC D-ILA projectors throw images created by two Miranda Kaleido image processors onto the screen. The Kaleidos are fed by the station router as well as by fixed sources. Analog, SDI and VGA video can be displayed. Each operator has his or her own "custom" wall setup. In case of a lamp burnout or other system crash, the operator has several nine-inch traditional color monitors mounted in a low console directly in front of the switcher to display critical video. The entire projection wall could go down and the operator could still switch air without a problem.

The entire projection wall could go down and the operator could still switch air without a problem.

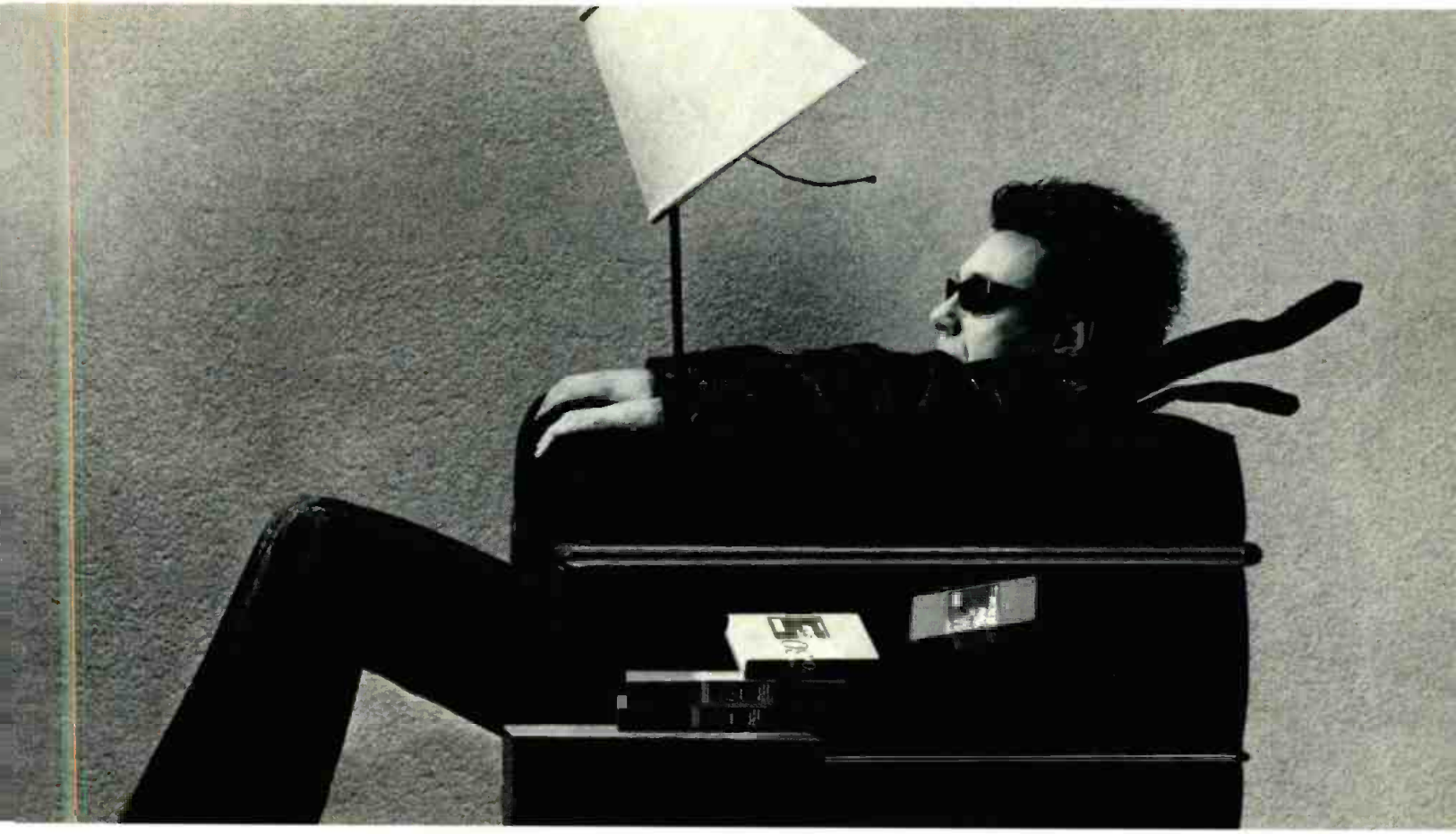
Shown above is a set of racks in KPDX's main technical core, containing the Profile XP server system, the Pinnacle and Quantel graphics mainframes, the main router, intercom and digital camera base stations.

News stands alone

A main design point in the building process was to leave the news operation as a separate entity that didn't have to share much in the way of production facilities with post. The newsroom facility itself physically stands alone with its own studio, control room, editing facilities and computer network. All rooms related to news sit atop a common eight-inch access floor and are fed with emergency power and lighting.

A Grass Valley Kalypso two-M/E switcher was selected for news control after much deliberation and four separate trips to manufacturer facilities for detailed demos. The switcher is equipped with six channels of built-in digital effects and a 100-frame still store resident in memory. Because of the selection of the switcher, only a single channel digital effects box was purchased—the Pinnacle DVExtreme. The graphics package is rounded out with a Pinnacle Lightning still store, a Pinnacle FXDeko character generator and a Quantel Paintbox FX.

News studio cameras are Philips LDK-100s with Canon studio lenses and the Philips SuperExpander studio adapter. The SuperExpander allows



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ENG microwave, satellite receive and analog to digital QC in KPDX's facility is accomplished at multiple quality control monitoring points, or "QC stations." The station shown above is compact, allowing ease of control over multiple sources.

the normal prompter power, multiple intercom channels and return video over the triax. A master setup station is located in master control for engineering setup, but nightly shading is done right in news control with three basic remote control panels.

News edits from Panasonic DVCPRO tape to Avid NewsCutters, transferring the final video to one of three Grass Valley Profile XP servers. The newsroom computer system from iNEWS controls the Profiles, CG and prompter via the iNEWS Broadcast Control System. The iNEWS MediaBrowse system is also due to be installed shortly.

A successful finish

The measure of a successful project may be as much how the people who work there feel as it is how the equipment works. By both measures, the KPDX project has been most successful.

In a project such as this, there is always too much to do and never enough time to do it. In hindsight, the station would rethink the decision not to go with a systems integrator for this job but, in most respects, the build has gone very smoothly. Most problems that have come along have been those of procedure, scheduling and timing rather than of design. The station has a top-flight engineering team that is committed to doing the job right the first time. In the end, the pride of craftsmanship and attention to detail shows in every rack, console and patchbay. ■

The measure of a successful project may be as much how the people who work there feel as it is how the equipment works.

Edward E. Williams is director of engineering for KPDX Engineering, Portland, OR.

DESIGN TEAM

BROADCAST SYSTEMS

KPDX Engineering:
Edward E. Williams, CSTE
Director of Engineering
Steve Benedict, Assistant Chief Engineer
Joe Kline, Systems Engineer

Design consultants:
Doyle Technology Consultants
Sparling Associates
The Austin Company

BUILDING

Meredith Corp.:
William Kerr, Chairman and Chief Executive Officer
Cary Jones, Broadcast Group President
Mike Rehm, Director of Facilities

KPDX:
Tony Thompson, Vice President & General Manager
Lee Petrik, Director of Operations & Programming
Dan Acklen, News Director

The Austin Company:
Don Archiable, VP Broadcast Planning Group
Jaggu Jagannath, Director Broadcast Planning Group
Greg Clamp, Director of Design
Joey Santa Maria, Design Architect
Glenn Schulz, Project Manager
Dave Conant
McKay Conant Brook, Acoustic Consultant
H.E. (Butch) Rowe, Architect of Record
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Roy Stilwell, Construction Superintendent
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The Most Demanding Markets

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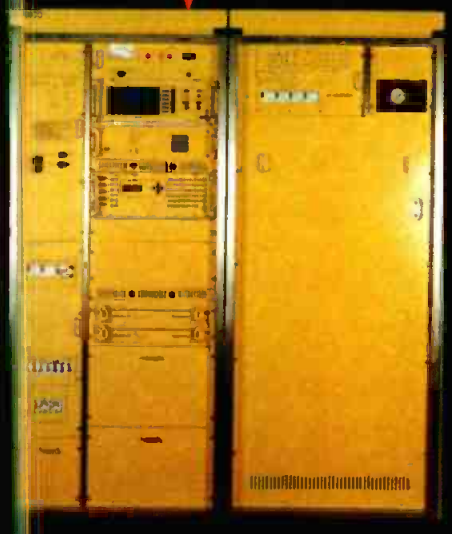

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after all filtering and combining is completed and do their final measurements at that point. Some also allow the predicted distortion from the line and antenna to be added to the sample signal, which should result in the greatest possible optimization of the system.

This may seem to be old hat and stale information to many readers. Rest assured that many transmitter technicians really don't yet comprehend the complexity of the process that takes place in the DTV exciter. It is significantly more complex than the more familiar NTSC analog exciter. Precorrection is not only desirable, it is absolutely necessary in the digital world. It doesn't just concern how the picture looks in the field – it now has a significant effect on how many viewers will receive the signal. DTV receivers mute when the bit error rate becomes excessive. That is largely a matter of field strength, but it also depends on the characteristics of the transmitted signal, which, in turn are heavily dependent upon the correction circuitry. Another little item to consider is that correction isn't simply a matter of a capacitor here and there. The digital correction process is far more complex and demanding.

Rest assured that many transmitter technicians really don't yet comprehend the complexity of the process that takes place in the DTV exciter.

A brave new world?

What does all this lead to for the station engineer? It means that the selection of a transmitter – and its attendant exciter – is far more complicated than in the days of analog. The old considerations still apply, including such items as power consumption, output device type, and operating cost and total price. But other considerations may be even more significant. For example, just how comprehensive and successful is the correction circuitry in reducing output errors? Equally important, how completely does the system provide the information necessary for correction adjustments? Picking the best system is far, far beyond the scope of this simple column. This is a decision to be made by the individual station or group engineers after discussions with the appropriate manufacturers. However, there is one major area that should be of concern to every engineer where this column's input is proper.

It is obvious that the modern DTV exciter cannot possibly be properly adjusted, operated or repaired without a complete understanding of its circuitry and the theory of its operation. That is not going to come from a cursory review of the instruction books. Stations should be hesitant to purchase any transmitter for which the manufacturer does not provide an in-depth training program. This should be done at the factory where the equipment exists to permit hands-on experience without screwing up the station's equipment. Experienced engineers who know the equipment in depth should lead the training courses. In addition, the program should be ongoing to allow new engineers to attend the school should the existing staff move on to greener pastures. The cost of such training should be established and considered in the selection of the transmitter supplier.

Station management must accept the fact that such training is not just desirable, it is absolutely imperative. Station staff cannot be expected to move into a totally new area with completely different demands without formal training in an appropriate venue. They also should not be faced with simultaneous demands to fix the ENG truck and repair the camera cable.

As for your author, after careful consideration of the demands of the digital world, he is giving careful consideration to returning to the world of glowing mercury vapor rectifiers and big glowing tubes. The faults were simpler, burnt-out filaments were the most common cause of trouble and no one had ever heard of bit error rate. ■

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

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

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Getting started with streaming media

BY BARB ROEDER

Streaming media is the talk of the town — at NAB, in the news and on the Internet. There have been debates over whether streaming media will take over the television broadcast world. Most agree that it will be a long time coming. But it is also assumed that streaming media will be an integral part of content delivery and that it will see phenomenal growth over the next few years.

The question for content producers and broadcasters is how to follow the trend and stay ahead of the technology curve in this evolving industry.

The basic steps to delivering streaming media to your audience are as follows: produce, capture, encode, serve. Each of these steps requires a set of skills and technology applications based on where, how and when you are going to stream your content.

Producing content for the Web

Professional broadcasting has a lot going for it in terms of producing or repurposing content for streaming delivery. Although today's modem users see small, low-quality images over the Internet, it is still important to start the production process with the highest-quality video and audio you can afford. As broadband delivery becomes more prevalent, the competition will heat up in terms of delivering the highest-quality productions. The good news is that MPEG-2, the standard for digital television, is a suitable format for beginning the media production process.

Broadcasters should also keep in mind that streaming media is not limited to video and audio content. When integrated into a webpage, these media elements can be combined with textual information, interactive elements and graphic overlays. Your production tools will need to include more applications to produce these immersive websites for your viewers.

One mindset that may need adjusting is the way motion graphics and effects are applied to your content. In fact, many producers may take straight video and audio and redo effects with more efficient technologies for delivery over the limited pipes of today's networks. These might include Flash and client-side rendering effects that can be accomplished in QuickTime.

With these thoughts in mind, you can produce a television show back to tape and move on to the capture phase of the production. Or you can keep these elements in mind as you produce a live show and webcast directly to your Internet audience as well.

Your choice of a format and data rates for delivery boils down to your target audience and the scope of your enterprise.

Capturing and encoding content for streaming

Generally speaking, video and audio capture and encoding are accomplished on a dedicated workstation or bank of encoders, depending on your delivery formats. If you are streaming live, this is a one-step process. For video-on-demand (VOD) applications, you can achieve better quality by capturing at very high resolution and then transcoding to the compressed formats for delivery over your network.

Input to the capture process can be analog or digital, composite or component, over firewire or SDI. It all depends on your budget and choice of capture cards and systems. Look for an upcoming article for more information on the latest technology in this field. We'll also discuss some pre-production issues you need to consider in the coming year.

Encoding is the process of compressing video and audio content and then packaging these streams for serving over a network. There are three major formats for delivery today: Apple's QuickTime, Real Network's RealSystem and Microsoft's Windows Media Technologies. These technologies include an underlying architecture used to produce content, a format description and server applications for delivery over networks.

Your choice of a format and data rates for delivery boils down to your target audience and the scope of your enterprise. Modem users can receive streaming media at data rates up to 53Kb/s. Broadband connections vary from 128Kb/s to 1.5Mb/s and above. A sample of connection speeds and technologies is given in Table 1. All of the delivery formats are designed to deliver across the entire range of network bandwidths.

Encoding is a time-consuming, CPU intensive operation. There are systems today capable of encoding four to six simultaneous streams. In addition, each of the delivery formats have methods for packaging different bit rates into one stream for more efficient delivery. If you choose to encode your content, expect a large capital outlay.

Another option for encoding is to rely on the multitude of streaming media service providers in existence. Most will accept taped content and satellite feeds, as well as MPEG-2 transport streams for live or VOD encoding and delivery. (See "Streaming" in *BE*'s June 2000 issue for coverage of these providers.) If you are encoding live you might also want to consider archiving the material for viewing on demand. In addition to encoding, these service providers will also have the capabilities or partnerships in place to serve your content.

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Serving your streaming media

Today's streaming media can be delivered using several different methods. True streaming media requires a specialized server such as RealServer, WindowsMedia Server or the QuickTime Streaming Server (QTSS). Your content is then delivered and viewed in real time, whether it originates from a live event or an archived media file. The caveat to true streaming is that the bit rate of the movie must match the bandwidth of the connection or buffering will occur and playback will be interrupted.

Without the specialized server application residing on a web server, media can be delivered by using progressive download. This is sometimes referred to as HTTP streaming because the media is delivered from a basic HTTP server — any server set up to deliver webpages as well. HTTP serving is designed to be an error-free delivery process using error correction mechanisms that will retransmit lost data. This process is not conducive to streaming media because it interrupts the playback of such files on the client's computer. With many simultaneous clients, this can also drain the resources of the server.

Network Connection	Maximum Transmission Bandwidth	Compression Ratio for Video
T3	45Mb/s	3.2
Cable Modem	10Mb/s	14.4
ADSL	6Mb/s	25
T1	1.5Mb/s	96
ISDN	128Kb/s	1125
Modem	56Kb/s	2250
Modem	28.8Kb/s	4500

Table 1. Network connection bandwidths and compression ratios required to encode full-motion, full-screen video originating at 18Mb/s.

Longer programs are more conducive to true streaming, since then they are not saved on the client's computer. There will be a short delay on the client side as the streaming server buffers the content. On steady network connections, no further interruptions will occur during the delivery.

The number of simultaneous streams you wish to serve is a function of your total network capacity and your server capacity. Aggregate bandwidth adds up quickly, and infrastructure for a large network is costly. Again, many service providers are ramping up their networks for streaming media delivery and it may be in broadcasters' best interest to seek out these providers. This aspect of the industry will be covered in a later issue as well.

Converging on your target audience

Today, streaming media is primarily viewed on computers using standard browser applications, so the audience is still limited. Broadband delivery via cable modems and DSL is building out, but to reach more eyes and ears many providers are keeping the modem user in mind when they produce and serve their content.

The industry is still building the infrastructure to deliver much more content at higher connection speeds for increased quality and business revenue sources. Convergence may come in other flavors as well. There have been experiments with interactive television and developments for viewing websites on a television in the past. Datacasting, or using some of the television broadcast spectrum for digital data, is another delivery mechanism that may take off as digital transmission standards are implemented around the world.

No matter how it is delivered, once the technology is in place it will be the content producers — the broadcasters — who will benefit from these increased markets and new applications. Stay tuned for further details on how you can begin the process of implementing streaming media in your productions and facilities. ■

Barb Roeder is president of BarbWired LLC. She can be reached through her website, www.barb-wired.net.

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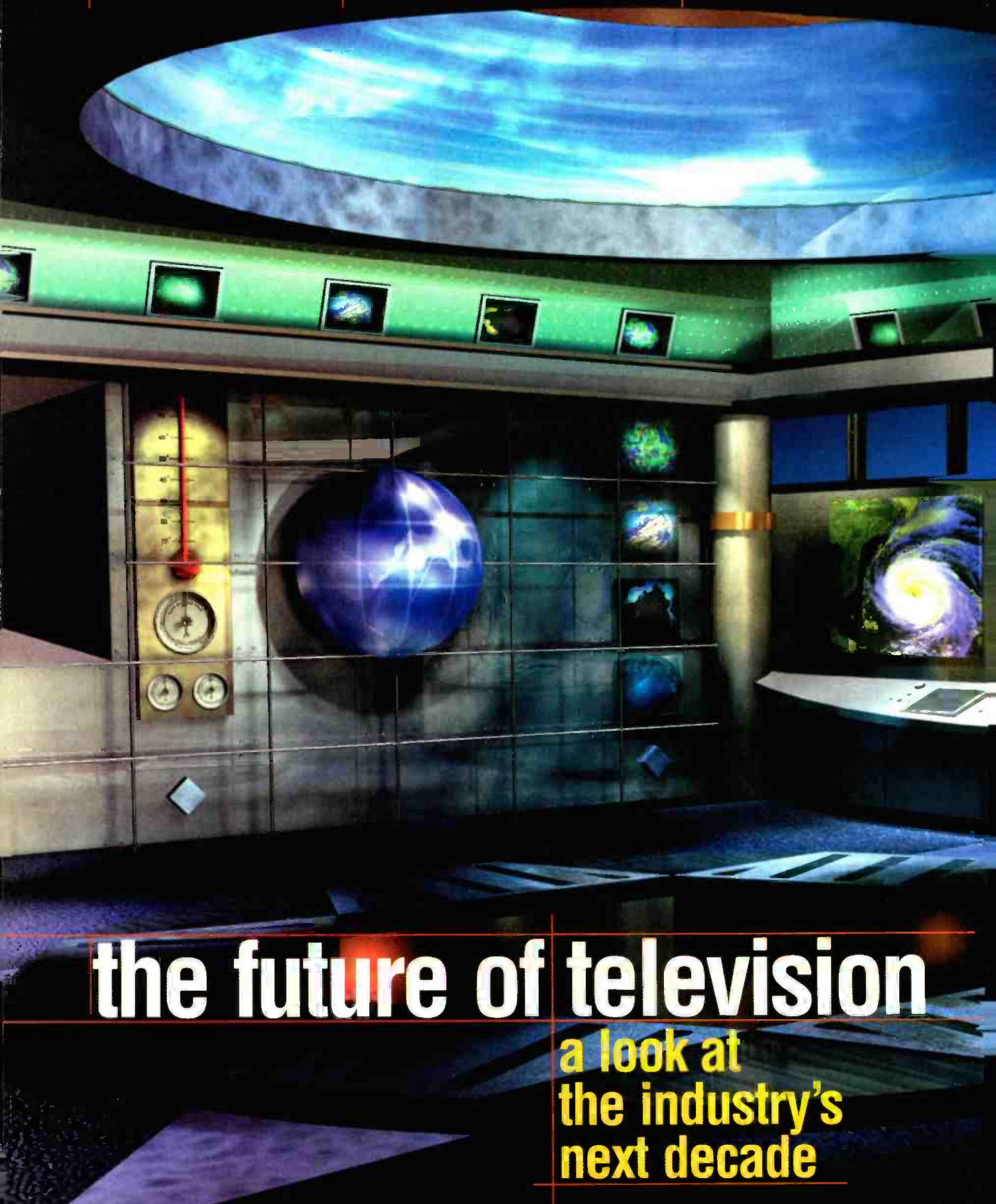

the future of television

a look at the industry's next decade

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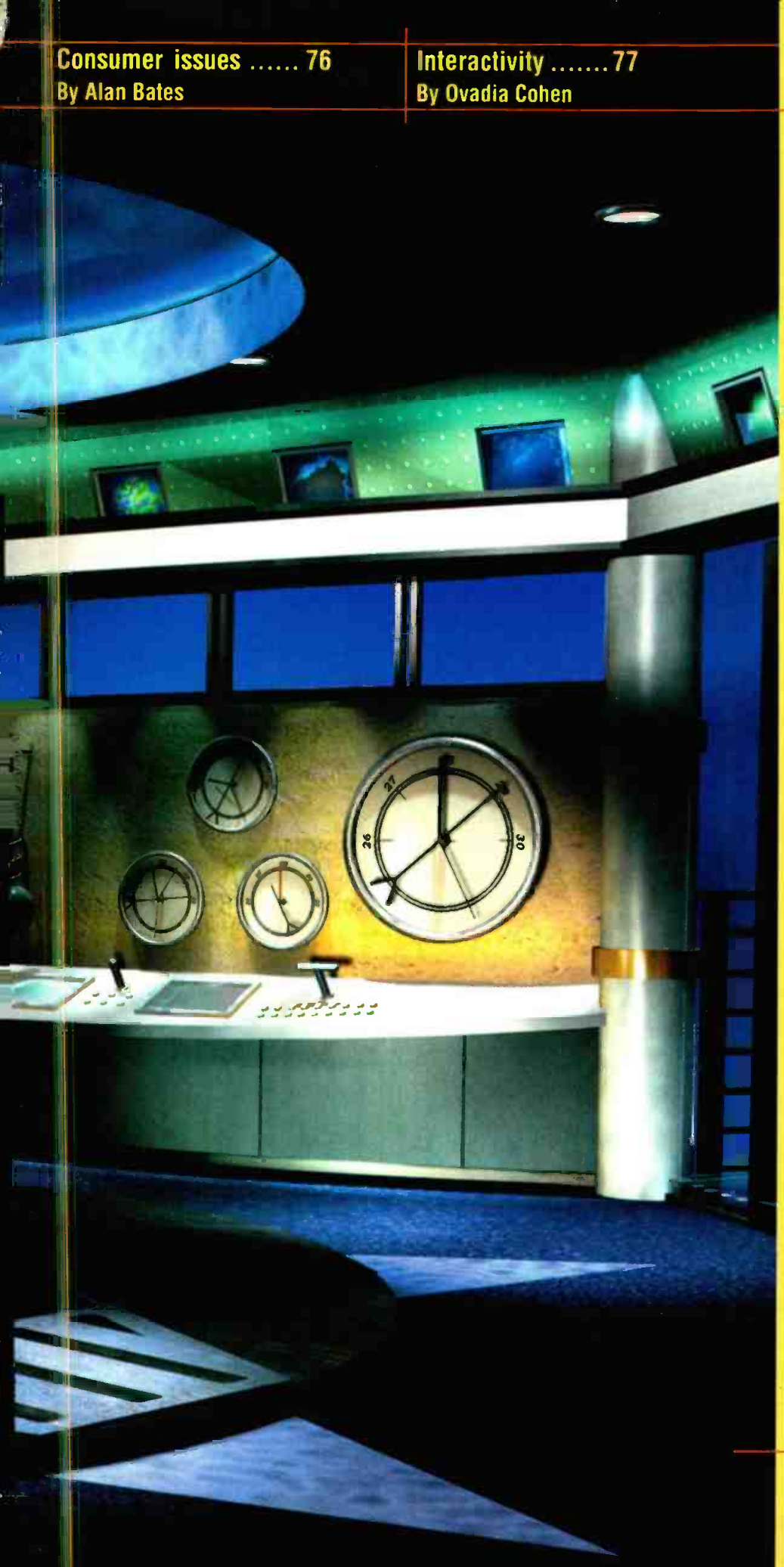

Uncertainty is as common a feature on the landscape of television broadcasting as are towers. If you think you have TV's next decade figured out, keep in mind that as little as three years ago, most would have predicted that the U.S. would be well along the path to DTV prevalence. That, obviously, hasn't happened, and those who predicted it have most likely simultaneously changed their tunes and covered their tracks.

Painting this industry with one brush is a mistake. Broadcasters are no longer monochromatic, they are a mixed palette of business plans, viewer bases, financial wherewithal and content provision capabilities. To render an accurate portrait of broadcasting 10 years on is impossible. Smaller studies of the disparate aspects of the industry are a surer bet, though even those require the input of experts who understand subtleties of those aspects.

We've brought together five such experts from varied walks of broadcast life. By giving us their perspectives on a few of the different elements of the broadcast landscape, they give us a better view of what broadcasting will be in 10 years.

The weather broadcast center of Channel 2 in Tel Aviv is a purely digital set for live broadcast created in "viz virtual studio," vi[z]rt's SGI O2-based virtual studio system. Set design by Clint Wallace and Scott Lelieur of vi[z]rt Creative Services.

leading in the transition to HD

By Conrad Denke

American Production Services has been one of the leaders in HD production and post for the last few years. We were one of the first to adopt 24p in our two HD online suites. Our experience has been one of great highs and great lows. Each time we post a new movie, we feel like HD has finally taken off. But following the completion of a project, we see HD fall back again into near anonymity. KCTS, WETA, KING, WRAL and several other television stations have taken bold steps to bring this format into the mainstream. Incentives for change vary tremendously among the various sectors of the broadcast industry. Ultimately, it comes down to a simple question: When should a post house, a station or a network make the leap into HD? Should they wait for the set penetration to evolve to a level where it makes economic sense? Do they need to lead the transition? The answers are as complex and varied as those who make up this diverse industry. Let's take a look at the future for content producers, TV stations and networks as they evolve into the digital world and especially the wonderful world of HD.

The future for content producers is bright in HD. This is primarily because HD technology for acquisition and post is mature, and producers can take advantage of a range of products that are all of extraordinary quality. Competition is beginning to push prices down, and now that the 24p cameras have been released, availability is good. It makes sense for producers to make their programs in HD and protect for the future. Even where film is the acquisition medium, HD is the best choice for telecine and post because of the great quality. The differential in cost is not that great, and the benefit for future use of programming in HD is clear.

The future for broadcast television stations is a different matter. In large markets, the incentive for change is high because of the need to look like a leader, but in smaller markets, just providing the basic service is enough. HD is still expensive and for stations still wired for analog production and transmission, the transition to digital can be prohibitive. Even where a station has committed to digital, the drive to change to HD is still limited. With the lack of television sets out in the public, there is little incentive for stations to provide programming for the few who have them.

With the lack of television sets out in the public, there is little incentive for stations to provide programming for the few who have them.

For the networks, the progress is mixed. So far, manufacturers have stepped up to the plate and given great deals or complete subsidy for HD production. Networks know that HD is the future, so they have begun to protect for distribution when the established base of sets justifies wider transmission. And now with 24p production, there are programs like Diagnosis Murder, Roswell, Titus, Earth Final Conflict and 110 Center Street experimenting with the format. So far, the results are positive and we should see a lot more 24p acquisition in the next season startup. Networks now make most of their profit on the back end in syndication or foreign sales. 24p offers tremendous advantages for foreign sales because it is an international format. With profits often withheld until a future sometimes four or five years away, it makes it even more critical to protect for the future. So HD is doing well with the networks, and the trend should heat up considerably as experience is gained.

So where does the incentive come for the kind of change needed to bring HD into the mainstream? I believe the answer lies in a fundamental value, the entrepreneurial risk-taking model that has kept the U.S. at the forefront of new technology in the world.

As the owner of a large post production facility, it is often painful to attend NAB and see the new technology. Yes, it's exciting to see new tools and better images, but what if you haven't paid for the old technology yet? That's what makes it so difficult to change. Will your competitors beat you to the punch? Will they now be able to provide better quality to the customer base and attract some of your customers away? This is part of the inner dialogue that goes on in the minds of owners of post facilities every year.

It may be helpful to think of your facility, whether it's a post production

house or a broadcast station or even a network, as a pipe. At one end of the pipe, you push new equipment in. On the other you pull the old out. At the beginning of the pipe, the equipment is worth a lot. As it travels through, it loses value quickly, sometimes with amazing speed. But as it travels, you receive benefit from it, hopefully enough to justify the original cost. By the time your equipment reaches the end of the pipe, it's probably not worth much, if anything. The goal is to get the maximum value out of the equipment before it reaches the end. So the speed with which it travels through becomes the key to survival. If it moves through too quickly, and you haven't obtained enough value from use of the equipment before it is worthless, then you face financial failure. If you don't replace old equipment with new, then your competitors eat you alive as your ability to serve customers falters. The pressures to bring on the new are much higher for post houses than broadcast stations or networks. That's why our industry has led the way. The incentive to get every dime out of equipment overcomes many station managers who remain conservative. The market is not forcing them to change. Fortunately a few are beginning to look past the present bottom line and see a bright future as a result of adopting HD now.

So, there is no easy answer. It depends on a willingness to step up and lead. We know it's going to happen and the more who commit to HD technology, the faster it will come. As a large investor (read risk-taker) I believe it will come sooner than later. ■

Conrad Denke is president of American Production Services in Seattle and North Hollywood.

new networking technology:
offsetting the cost of upgrading

By Richard M. Bauarschi

The digital television firestorm that we envisioned several years ago has so far provided little heat and less light. Nevertheless, we live in an extraordinary time in relation to the future of television broadcasting as we know it.

With the transition to digital television (DTV) well into its third year, you are probably facing both great opportunities and equally great uncertainty, depending upon your deadline for implementation.

Issues fueling change

Government regulatory and political requirements, advances and limits in technology, and existing and emerging business opportunities all provide fuel for the fire. How the sparks fly in your areas of interest, where they land and how well they can be controlled will determine your DTV future.

Implementation of DTV is fraught with political and technological issues.

At this time, COFDM modulation has failed the FCC litmus test and is before the U.S. Congress for review. Depending on your viewpoint, this issue may or may not play a profound role in our future. For those few who are not familiar with this topic, the issue is COFDM vs. 8VSB in multipath reception. In this case, the real and more important issue may prove to be COFDM vs. 8VSB in mobile reception.

Business issues

So far, the transition to DTV has been slow, with approximately 150 out of over 1600 television stations nationwide having upgraded. It appears that finding and making a business case has been the biggest obstacle to the transition. A quick analysis reveals that, depending upon which markets they serve, typical television broadcast facilities need to budget anywhere from $2 million to $5 million to upgrade to DTV. This includes obtaining construction permits and installing towers, as well as new transmission equipment. Not included is the cost of upgrading equipment within the plant, such as routers, servers, switchers, etc.

Because most facilities derive their income from the transmission of commercials, the question asked most often is, "How many more viewers will my DTV signal attract?" The answer is none, as the population demographics will remain largely the same. Therefore, typical broadcasters will have to bear the cost of upgrading to DTV, without the benefit of additional revenue to offset the expense.

Typical broadcasters will have to bear the cost of upgrading to DTV, without the benefit of additional revenue to offset the expense.

In order to mitigate the cost of upgrading, some broadcasters are looking at other business opportunities beyond traditional broadcasting.

One is datacasting, in which unused portions of the transmission spectrum are filled with data, typically Internet Protocol (IP) data, which can be extracted at the other end using an Integrated Receiver-Decoder (IRD). It makes a lot of sense for a television broadcast facility to use its surplus bandwidth for data, especially when that data can be distributed at relatively high bit rates. For example, a standard-definition transmission could have enough room to add upwards of 15Mb/s, whereas

high-definition transmission has room for upwards of 6Mb/s. Initially, this type of datacasting would be targeted at corporations for business-to-business applications. Later, as applications and bandwidth requirements become more developed, datacasting can be expected to migrate into the consumer market.

By implementing conditional access, data could be transmitted that would only be decodable by authorized entities. This enables content to be distributed from a single point to multiple points, securely and efficiently. New entities have sprung up to take commercial advantage of this capability.

New equipment manufacturers have also developed innovative hardware that allows data to be dynamically injected into a transport stream. In this example, an unused packet, also known as a null packet, is replaced with one carrying data. By monitoring the incoming signal, the amount of data injected into the stream can be controlled to prevent system overload.

While datacasting has taken off in the satellite transmission business, it remains to be proven as a viable business for broadcasters.

Another way to help offset the cost of conversion to DTV is centralcasting, where a group owner consolidates two or more facilities into one. Having one facility broadcast several channels through multiple station-to-transmitter links reduces expenses considerably and thus offsets much of the DTV upgrade cost.

Avenues for distribution

Today the majority of viewers, more than 65 percent, receive their broadcast television signal through cable. The remainder is split between over-the-air and direct-to-home, with a miniscule number receiving their signal through a telecommunications service. The telecommunications services are the ones to watch.

The differences between video data and other data are fast becoming indiscernible. The only difference is that in order for video data to be viewed, its time-sensitive requirements must be met. It should be noted that data pipes are expanding so quickly that video data can be transported faster than real time. This means that while the signal is being cached, it can simultaneously be viewed.

Telecommunications companies have begun to run fiber-to-the-curb (FTTC). In some areas this was completed over a year ago. This can have profound implications for consumers, especially when combined with dense wave division multiplexing (DWDM). DWDM is the process of passing laser light at different wavelengths through a single strand of glass fiber. Each adjoining wavelength may be shifted by as little as five nanometers from the next, and each can operate independently and transparently from others.

Currently, each wavelength may carry signals at rates up to 10Gb/s — one billion per second (OC-192).

Today, network switches and add-drop multiplexers running 160 wavelengths are being deployed in some network cores at 1.6Tb/s (one trillion per second) within a single strand of fiber. As this technology migrates to the curb, it will become possible to deliver more and more bandwidth to the end user. In fact, in Sweden, 155Mb/s (OC-3) is already being delivered to consumers. Furthermore, the present number of 160 wavelengths is only a starting point. Industry experts anticipate that it will be possible to run up to 1000 wavelengths in a similar fashion within a few years. At that rate, the bandwidth within a single strand of fiber will be simply mind-boggling.

While datacasting has taken off in the satellite transmission business, it remains to be proven as a viable business for broadcasters.

Besides the exponential growth in bandwidth (also known as broadband), Internet Protocol management techniques will play a greater role in signal distribution. Protocol wrappers such as real-time transport protocol (RTP) and real-time control protocol (RTCP) are used to prioritize and transfer media in real time while real-time streaming protocol (RTSP) makes it possible to send that data using a streaming method. Streaming simply means that the whole file does not have to be transferred before it can be read, as is the case with file transfer protocol (FTP).

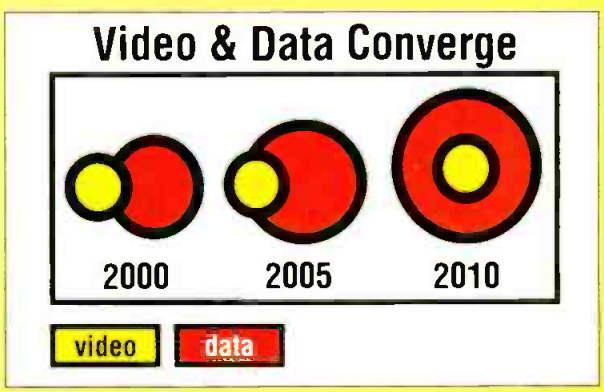

Figure 1. The major difference between video data and other data lies in the time-sensitive requirements of video data. The increase in broadband availability and new protocol management techniques will allow telecommunications companies to handle this difference and provide video data along with other types of data. Because of this, there is expected to be a convergence of transmission methods and vendors for video data and other data over the next 10 years.

In the future, these special protocol wrappers will be used extensively to identify the type of data packets and how they should be processed. For example, if the wrappers contain time-sensitive television and radio signals, they will be handled with a different priority than simple data files, such as bank statements and other documents that are less time sensitive.

Each new Internet appliance will automatically recognize the data's coded signaling and process the data accordingly. The PC will remain the ubiquitous device that, when equipped with the right applications software, will allow the data to be processed appropriately.

The advent of broadband availability, combined with protocol management, will totally change the nature of the broadcast business. Broadcasting will simply become one of many mechanisms to deliver data and will probably play a greater role in mobile wireless applications. For fixed site situations there will be a choice of vendors supplying the service. It is expected that telecommunications companies will be dominant players, while cable companies will play secondary roles in signal distribution.

Looking forward ten years, I expect to see the business case and market conditions being the driving factor, especially when new technology becomes available.

Broadband and the Internet appliance will be passé, and consumers will be able to select any programming at any hour, thereby freeing themselves from network schedules and time slots. The granularity of advertising will be down to the individual household, and advertisers will be able to select the specific demographics.

But, no matter which way government requirements go, regardless of any advances or limits in technology we experience, and despite the business requirements of broadcasters and telecommunications companies, one thing is certain: Ten years from now, content will — as always — be king. ■

Richard M. Bauarschi is vice president of marketing for Tiernan Communications in San Diego.

content management

By Gordon Castle and Kevin Ivey

The digital conversion is changing every aspect of media production and distribution. And with these changes, the software systems that help to manage and leverage systems and the content they create are becoming increasingly important.

Content management is not new to television or media production. We have always had systems to help us find, store and deliver content. However, because of the physical nature of the media, these systems tended to be physical and manual. Additionally, these tended to be backend systems that were not part of daily production and not depended on for primary success of businesses.

With the advent of digital production and content management systems, we have the opportunity to produce and extend content more aggressively than ever before. CNN has always been successful in moving content quickly from anywhere in the world to air. However, new opportunities such as narrowband to wireless devices and broadband will require dramatically more content. As a result, our systems need to be able to use, modify and deliver this content more interactively. We will need to be able to manage, access and deliver content with greater flexibility. These emerging management tools are the key enabler to our new businesses.

The complication is that media management systems targeted at television are relatively new. Database technology has existed for several years, and workflow and management software has existed in other industries. However, systems that can handle the large rich media files of television and media production are relatively new.

As we look to the future, two factors will help us better align facilities with our systems. First, technology will improve. Solutions already exist and development in this area is in full swing. Software companies, like broadcasters, see the future of rich media and are motivated to be part of the next explosion of content delivery. Secondly, our industry is moving toward a more computing-based environment. Both producers and consumers are adapting to information technology platforms and software-based systems while moving away from dedicated analog hardware systems.

The past few years have been marked by a greater number of initiatives in content management for broadcasters. A growing number of vendors, including Bulldog, Emotion, Informix and IBM, have all listed content management as a key component of future systems. Broadcasters of all sizes, including CNN, have listed content management as a key part of their futures.

As CNN starts its second major project in content management, common questions include: What business logic motivated the projects, how will it change our business, and what does the future look like? While these are simple questions, they lead to complex answers since this is an evolving area. Based on what we've experienced, we will share our views, on how content management

will continue to impact production, distribution and the user experience.

The why

CNN strongly believes that content is king. To be successful we must produce the best content, manage it efficiently and extend its use more effectively than ever before. We are also striving to be flexible as the Internet changes the rules for our consumers, allowing them to access information via an increasing number of outlets. These new services will put new demands on our production systems and require effective management to deliver more targeted content. It is therefore imperative that content management is a core requirement for our future systems. While we also see some direct return on investment through becoming more efficient with our content and adding ways it can be used, the core return on this investment is our ability to meet these new and changing business opportunities. In short, we think our new production systems must revolve around content management systems to be completely successful.

The how

CNN's approach to content management is one that represents both the diversity and centralized nature of our services. While we have always been successful in leveraging a common acquisition for multiple, we do not believe in a one-size-fits-all approach. We fully embrace the idea that CNN's future systems will be made up of many components targeted at particular needs. However, we do plan to extend our centralized approach to our production cycles, from content acquisition throughout production, providing all of our journalists and consumers common access to content. Our goal is to make content easily accessible to all users both inside and outside CNN's firewall.

This approach is represented in two major content management projects at CNN. First, a system we call "MediaSource" handles all incoming feeds and the daily editing processes. MediaSource provides indexing, searching and management of over 1500 hours of low-resolution video, keyframe storyboards and metadata. This system, built with CNN by Informix, SGI, Kasenna and Virage, helps us better visualize video and the production process at over 300 desktops in the CNN, CNN Headline News and CNN International newsrooms. It is scaled and tuned to handle the high volume of daily video production.

Our second initiative involves the CNN Archive and middleware framework for content management. This project targets both the creation of an all-digital system to house the rapidly growing CNN Archives (now at 110,000 hours) and builds a middleware layer for the CNN enterprise to connect content management and digital systems. Sony and IBM are building this system.

In both projects we have consistently maintained our overall content management goals. Together they represent our content management strategy. We will build a system that allows users to get access to all content in a centralized fashion without sacrificing individual needs in production areas or services. Various targeted media management, editing and movement applications connected via middleware will do this. This framework will allow us to meet user requirements, provide a scalable and flexible solution, and remain ready for future changes and growth.

The future

The future of digital asset management presents an interesting duality — the highly hyped "convergence" of television and the Internet and the long-term "divergence" of content for delivery on a variety of digital platforms. Convergence has long-term implications for how future "internal" production systems and workflow are organized and operated. Divergence represents the marketplace of tomorrow, or the external applications of content management to satisfy the demands of the next generation of wired or, more likely, wireless consumer.

Internal content management systems leverage the convergence of digital content types to optimized content production systems. Internal systems are valuable for recognizing the value of content as it applies to making decisions on how (and to whom) that content can be packaged and presented. This allows various versions of an asset to be created and associated back to the source data or the parent. In this way versioning is simplified to saving each set of edit decisions or changes, and reflecting those on the source data. This conserves storage media, enables desktop production or publishing, and eases creation of several versions in different formats and data rates to satisfy the demands of an evolving marketplace.

Various applications are emerging that will allow the search and retrieval of assets based on their visual content.

Understanding and capitalizing on the fundamental differences between the context and actual spirit of the content is particularly important for future profitability of media businesses. Obviously, (and particularly true in the news business) the original context of the content is important — it represents and tells the story. But its real value comes when we consider the content in all its various forms. Through the application of databases and content management applications, we can associate content based on its visual and aural content. Various applications are emerging that will allow the search and retrieval of assets

based on their visual content, and this will prove very valuable in finding specific faces, locations or shots of specific focal length and composition.

Furthermore, by sorting and cross-referencing the content, we can build collections of data subsets that reveal new value in the video. As the passage of time brings additional value to old items, so the evolution of news stories sheds new value on old assets. For example, the video of President Clinton in a receiving line after his second election would seem to have nominal value. Once it is discovered that the young woman he embraced in that line is Monica Lewinsky, the value of that particular video rises dramatically.

External systems broaden the value of the content to the end user and enable the content to be repurposed in a meaningful way. This allows the essence of the content to be reformatted in both format and context for delivery on a variety of existing and future platforms, such as television, the Internet, WAP cellular phones, PDAs and pagers.

The bottom line is the ability to effectively repurpose the content. By creating and maintaining useful metadata, such as text logs, timecode and standard formats for the exchange of content data between systems, content can be easily and effectively repurposed. It may be repurposed in format, as in transcoding a video presentation from an MPEG-2 file to QuickTime for presentation on the web. It may be repurposing video of a particular news event as a set of stills that can be used in a print publication. Or it may be completely reformatting a news story on a webpage so that it can be received and viewed in a meaningful way on a cellular telephone.

External systems are also necessary to create interactive television systems. ATVEF and other ATV applications will rely heavily on content management systems to understand and react to user profiles and orders, to repurpose and deliver content fitting the receiving device of the user, and to take on an active role in delivering non-real-time content to users as faster-than-real-time files or as stored-and-forwarded streams.

In the next decade, we expect content management systems to evolve into fairly intelligent applications that are not only highly interpretive in managing and providing content but are also conversant with other content management systems. Emerging standards in data exchange formats such as MXF and AAF will continue and eventually include individual user addressing. This is particularly important in creating persistent user profiles, in creating "personal content management" systems and in allowing effective interaction of the user with all the worldwide collections of content.

As wearable computing and other passive, low-cost and small form-factor delivery platforms become available, content provision should become as pervasive as hydrogen. Depending on the available bandwidth for delivery, intelligent systems will anticipate the needs of the user based on where he or she may be (walking, driving, sleeping). Such systems will make decisions as to what content has the highest priority, what content should be delivered right away and in what form, and what content may be of particular use to this consumer based on his or her profile. Personal content management systems will guard the user's privacy as well, refusing content that may be hurled at the user as offers or advertisements from nearby stores, restaurants or media providers.

Repurposing content, analyzing and extracting features important for finding and navigating content, and intelligence to reach out and grab the user are all strategies central to the effective leveraging of content management systems.

In the opening we noted that improvement in technology, coupled with changes in our industry, will better align content management with media production. And while we think it will be a long time before systems required to run our networks and content services are as "off-the-shelf" as word processing, we do believe that systems will evolve to the point that cost and difficulty of implementation will not limit their use. Software that can help manage content will be produced by a large number of companies. These systems should allow for high levels of connectivity, offering a diversified approach in scaling and matching software applications for specific purposes. These systems will also scale from small operations to large, complex enterprises. Most importantly, there will be less concern about success as solutions will be a more standard part of all components.

The key to these systems will be flexibility and scalability. Well-designed systems will allow users to grow and change without major forklift upgrades. They will allow small installations to work effectively with large diverse systems without compromising features or capabilities.

Where to start

It is important to have a clear directive or business plan that sells a clear message to all users of targeted implementations. While we don't think we must take a one-size-fits-all approach, we do think it important to develop a consistent strategy that aligns our businesses with the future of content delivery. It is also important to pick a vendor who can either offer a proven system that meets your requirements, or select motivated partners to deliver the solution. Successful partners are those who aim to provide products in this space and are motivated to produce systems that have a life (and viable market) beyond your project. This motivation helps when the project becomes difficult. It also ensures that you can move gracefully from a custom to a more general purpose system that can be more easily developed and more effectively supported.

Content management systems are a vital part of all future systems and we, as content producers and broadcasters, need powerful and effective solutions. The good news is that these systems are available and evolving quickly. The better news is that this is the ideal time to get involved and help shape the future. ■

Gordon Castle is senior vice president of Strategic Digital Systems for CNN, and Kevin Ivey is vice president of research and development, Basic Technology, for CNN.

consumer issues

By Alan Bates

FCC officials and CE industry leaders claim the transition to digital television (DTV) has been successful to date. Yet, despite the hype surrounding the many forms of digital television, growth of DTV in American homes has been slow at best, especially when compared to the red-hot DVD, one of the most extraordinarily successful consumer electronics products in history. At this time, three key issues impede widescale adoption of digital television: high prices, availability of programming and lack of consumer education. A recent survey of 750 consumers by Equifax CIS uncovered critical attitudes about digital television.

The affordability chasm

First and foremost, DTVs are out of reach to all but a handful of consumers. The average price respondents in the survey would pay for a fully integrated digital television was $800, over 700 percent less than the current average market price. This pricing preference fell 18 percent from March to October 2000, a sign that consumers believe prices should be dropping as DTV technology evolves. Not surprisingly, males are willing to pay 30 percent more than females for digital television, but still well below current pricing. Consumer pricing preferences for digital-ready TVs (no decoder) and set-top digital decoders were $700 and $200 respectively. The affordability chasm that exists must be bridged before mainstream adoption can occur.

Broadcasting obstacles

Most industry observers believe that content (programming) will drive the HDTV market. However, the consumers we surveyed were not as concerned with this lack of programming as the industry might think. Nearly two-thirds of respondents "disagreed" or "strongly disagreed" that the lack of HDTV programming is affecting their decision to purchase a digital television. Moreover, respondents' opinions about the importance of broadcasting grew more negative from March to October, falling from 68 percent to 61 percent "important/very important" rankings during that time. Most consumers lack the understanding of DTV technology to make thoughtful value judgments. Nearly half of the respondents in the Equifax CIS survey said they had never seen an actual HDTV picture.

Nearly half of the respondents in the Equifax CIS survey said they had never seen an actual HDTV picture.

While limited digital broadcasting is available in 64 percent of U.S. households, broadcasters have been reluctant to ramp up production of high-definition television programming due to the high cost and limited number of digital receivers in the field on which to view it. In a war of words and standards, manufacturers claim they have fulfilled their promise of delivering high-quality digital TV products, while broadcasters are lobbying for new DTV standards and for digital tuners to be built into every TV produced, which many claim could be detrimental to the industry.

The number of TV stations currently broadcasting some of their programming in digital had increased 30 percent since March 2000 to 162 stations as of October 2000. Among networks with at least five affiliates, PBS has been the most aggressive about delivering on the digital promise, increasing digital programming 64 percent since March. Among major TV networks, ABC currently has the most affiliates broadcasting digitally. However, NBC had the most unaided awareness of specific programming with 7.3 percent recalling a particular program broadcast in digital on NBC. Overall, the programs most often recalled were "news" (3.6 percent), "football" (3.5 percent) and "Jay Leno/Tonight Show" (3.1 percent).

Digital confusion

Compounding the pricing dilemma, lack of knowledge about digital television and fear of obsolescence further delay mainstream adoption. Confusion about the many shades of DTV pervades mainstream America, creating a climate of TV technophobia. Although one in four consumers surveyed believe they are "knowledgeable about consumer electronics," findings from the Equifax CIS survey suggest many consumers may be confused about what high-definition picture quality is, the equipment needed to view an HDTV picture and whether they actually own a digital television.

On the horizon

Until the pricing and broadcasting barriers can be overcome, keep an eye on digital TV delivered to personal computers, along with interactive features. PC DTV is technology that allows computer users to receive and view rich DTV, HDTV, Enhanced TV and datacasting services from a terrestrial broadcast, cable or satellite source. Current computer monitors already provide the progressive scan platform necessary to view high-definition signals. PC users in a DTV coverage area will be able to receive digital content using a low-cost PC DTV receiver card and a television antenna. PC DTV may present opportunities to speed adoption in the American home.

Interactive technologies, with their promise of increased viewer power, are the true harbingers of TV's future. Interactive technologies not only let viewers become more involved in what

they're watching, but they also offer more choice. Datacasting uses the high-speed DTV broadcast signal to deliver large data files such as music, video, subscription services and software over the air rather than by modem or DSL connection, at 10 times the speed. Enhanced Television contains interactive graphical overlays that present the viewer with additional information during the program. Enhanced DTV provides information related to the program by sending data files along with the DTV video and audio signal. The viewer can access the information through an interactive menu-driven interface or choose to turn off the information altogether.

Time will tell if consumers will watch and interact with digital television through their personal computer. In terms of interactivity or datacasting, there appears to be a general lack of understanding about the technology. The Equifax CIS study found four percent of respondents said interactivity was an important factor in their DTV purchase decision, up from zero in March 2000. Thirty-eight percent of respondents said interactivity was of "little/no importance" in their purchase decision.

In order for digital television to gain mainstream acceptance, several steps must be taken. First, pricing must fall significantly in order for consumers to realistically consider purchasing digital over existing analog technology. Second, a widespread consumer education program must be initiated to demonstrate the distinct advantages and improvements of high-definition picture quality, along with the broadband capabilities of datacasting and enhanced television. Third, broadcasters must develop a focused campaign to promote and develop new programming in high definition. The road to digital acceptance is long and difficult, and only thoughtful planning and execution will ensure its long-term success. ■

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interactivity

By Ovadia Cohen

The nexus of home entertainment and digital technologies is a great place to be. These digital entertainment technologies are changing the way people live, work and play. Around the world, digitalization is replacing antiquated communications systems, often from more than 30 years ago, and helping to eviscerate the digital divide.

As we stride into this future, I am betting that the rules of the game will constantly change, as they have in the past. Yet I also strongly believe that television and its associated parts will continue to play a large role. Let me quickly take a look at two examples.

HDTV has been touted for years as the next great experience in television. This has not panned out. This next great technology is still attempting to reach five percent market penetration in the U.S. Born in the pre-Internet era, when companies routinely announced new products to great fanfare for strategic egotistical reasons, HDTV's impact has not been felt, leaving manufacturers, service providers and the public to sort out the consequences.

Is interactive TV different? It could be following in the footsteps of HDTV. Here again, as in the case of HDTV, some of the biggest names and egos in the digital world are backing projects associated with iTV. This time it is the folks in Redmond and the chaps in London. These technologists are looking to coordinate digital TV technologies to bring new services to consumers. iTV remains to prove itself, but it is already clear that it cannot work for the final user – the consumer – without the full cooperation of the digital broadband technology providers. Here, I mean those who develop network delivery technologies as well as those who provide consumer or commodity reception technologies.

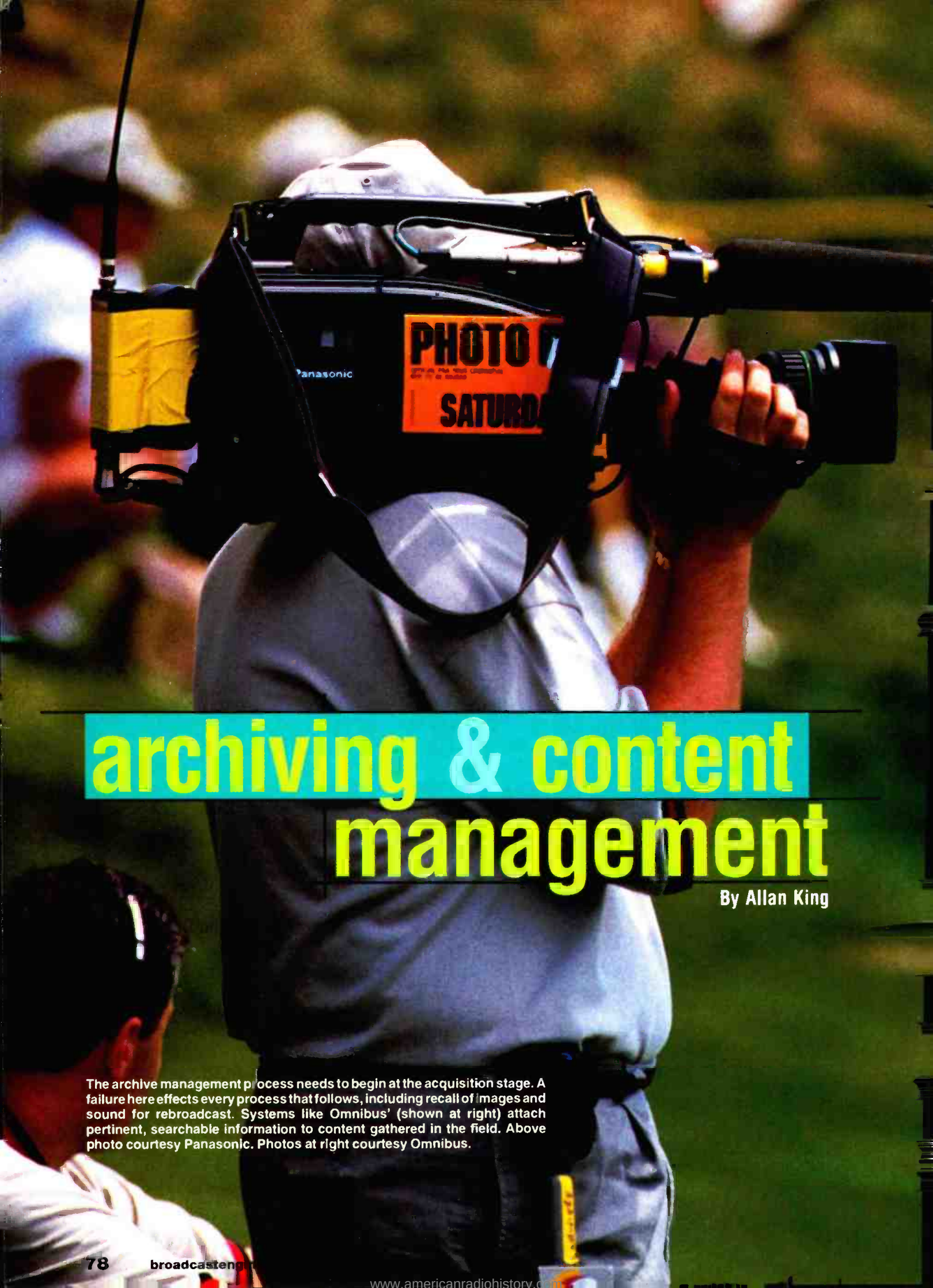
To avoid consumer bitterness, the last-mile bottleneck needs to be addressed. For the content provider this will depend on interoperable ways and means. Due to the pluralism of telecom and cable broadband technologies out there today and those soon to be introduced, digital broadcast equipment will be required to work with any number of protocols and transmission methods during the delivery process. To achieve this goal, a number of levels throughout the delivery process will be required to smooth the passage of content from provider to customer.

HDTV has been touted for years as the next great experience in television. This has not panned out.

At the main central office, content will be gathered and pre-processed, and from there delivered to the local central office. At the local central office, content will undergo further processing to adjust transmission rates and to format for delivery in accordance with the customer's line quality and equipment. Processing at the local central office will also enable the provider to customize interactive services such as PVR capabilities, channel selection and T-commerce.

To fulfill the promise of iTV technologies, optimizing digital broadband delivery chain technologies is key. I am convinced that interoperability is the best answer for our industry to prove that iTV is not another HDTV. ■

Ovadia Cohen is the co-founder of Tadiran Scopus, San Diego.



archiving & content management

By Allan King

The archive management process needs to begin at the acquisition stage. A failure here effects every process that follows, including recall of images and sound for rebroadcast. Systems like Omnibus' (shown at right) attach pertinent, searchable information to content gathered in the field. Above photo courtesy Panasonic. Photos at right courtesy Omnibus.

Content management (CM) may be considered to be a collective term that incorporates at least three activities: acquisition, management and distribution.

Acquisition refers to the intake of content or material (e.g. pages, photographs, etc). It often includes the digitization of the content or material, as well as its indexing or cataloging for a reference and retrieval system. Management represents what may be considered to be the core of content management systems, the systems to support the searching for and selection of requested material. This can cover the storage of material and its indexing information. Distribution revolves around accessing stored content or material as well as delivering relevant or requested material to end-users.

Content management in the broadcast environment usually involves software and systems for all three of the above activities. Media assets in this context can be still images, audio clips, video footage and/or full programs. Additionally, assets may be either physical (e.g. tape-based) or digital (e.g. server-based), although CM more commonly involves the digital variety.

The BBC example

The BBC's multimedia archive is one of the world's largest and most diverse. The scale of the management required to control the BBC's archive is indicated by the sheer size of the current holdings:

- 1,500,000 items of film/videotapes (600,000 hours of content);
- 750,000 audio recordings (300,000 hours of content);
- 22 million newspaper cuttings;
- 250,000 phonetic pronunciations;
- 1.2 million commercial recordings;
- 4 million items of sheet music;
- 3 million photographs; and
- 500,000 paper files.

The archives currently issue over 1 million items per year and handle over 600,000 inquiries. It is a dynamic archive with new items arriving at a rate in excess of 180,000 items per year. The use of the archive is increasing to meet the demands for more program production. Therefore, if an increase in costs is to be avoided, then clearly there has to be a change in the way these media assets are managed. The continued pressure on production budgets puts a higher premium on the update of existing systems as opposed to starting from scratch with new equipment.

Why is CM relevant?

Most broadcasters have sizeable archives of previous programs or clips (audio and video). Increasingly, internal researchers and production staff require more rapid access to these archives as part of the program making process. Additionally, broadcasters are increasingly

sharing their assets and opening access to their archives on a commercial basis.

Key constraints upon such activities are the current complexities associated with manual, labor-intensive archive processes. Most broadcasters have severe problems supporting more than one user accessing the same asset simultaneously. Similarly, tracking and tracing physical assets (their movements, whereabouts and usage) is also a real problem.

The industry in also moving toward "Internet-speed" operations, which require faster access to the archive and faster deliveries of assets to end-users who may be located across different sites. Growth in channels, the hours of output and the number of platforms to be supported are key forces driving the increasing need for reuse and repurposing of assets.

Substantial benefits can be brought to broadcasters by redesigning archiving and production processes and using asset management technology. Improvements in productivity and cost reductions are achievable by enabling rapid access to the archives and avoiding the costs of scaling up current manual systems.

Efficiency savings are also possible by different staff in different locations utilizing and repurposing the same content simultaneously. Additionally, attaching e-commerce applications to materials can turn them into true digital assets, which can be commercially exploited and converted into new revenue generating opportunities.

The archiving process

To smoothly and successfully effect a change it first helps to understand the current process.

Figure 1 shows, in simplified form, how the process currently operates from commissioning through to delivery and its relationship to the archive. It is a complex process and highlights a number of deficiencies. These are highlighted below:

1. The information obtained during production is not retained in a way that supports the archive process.

2. Although the production team will understand their program content, library and indexing skills to help future access are not held by production.

3. During the edit process the data from all the edit decisions is not retained.

4. The increasing number of channels and publishing media is putting greater pressure on broadcasters' processes.

5. The archiving currently occurs at the end of the chain.

6. The effect of being at the end of the chain is that cataloging of the material for future access entails considerable rekeying. The amount of this type of cataloging is limited by capacity.

7. The accessibility of the information is sometimes poor. An example of this is that some older material is on card catalogs, or only on local databases. Therefore access is limited only to local researchers or users.

8. Content accessibility problems result in private libraries — the "I keep the good bits under my desk" syndrome. This prevents wider reuse and exploitation.

9. There are substantial movements of requested content that are not used in the program.

After work done to re-engineer the archive process, a new model has been proposed which sits more centrally between commissioning, program making and distribution. Figure 2

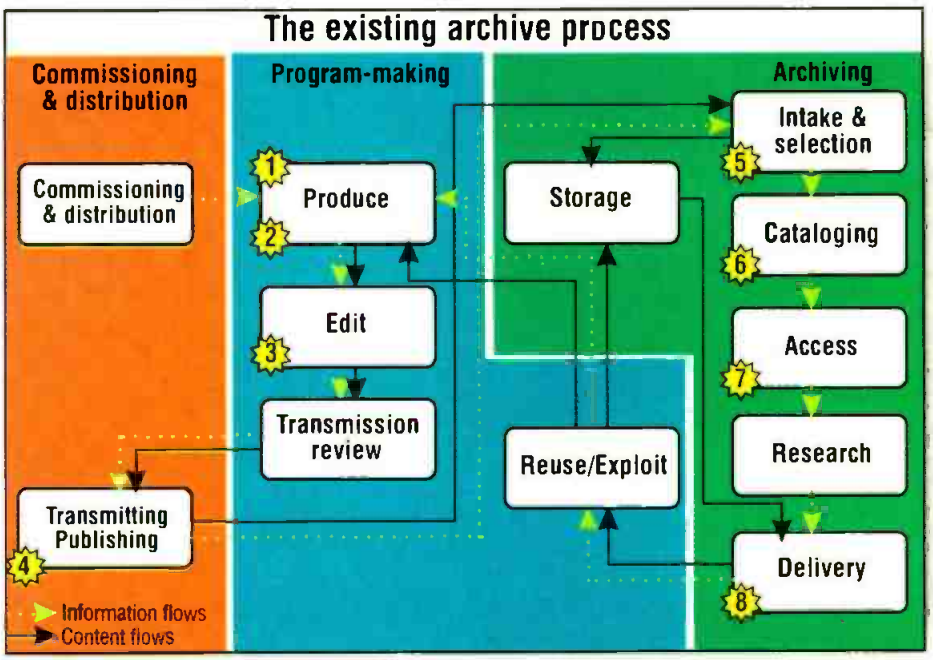


Figure 1. A reasonable facsimile of the archiving process as it currently exists in a majority of facilities. The process has a number of weaknesses, including a main concern that information obtained during production is not retained in a way that supports the archive process.

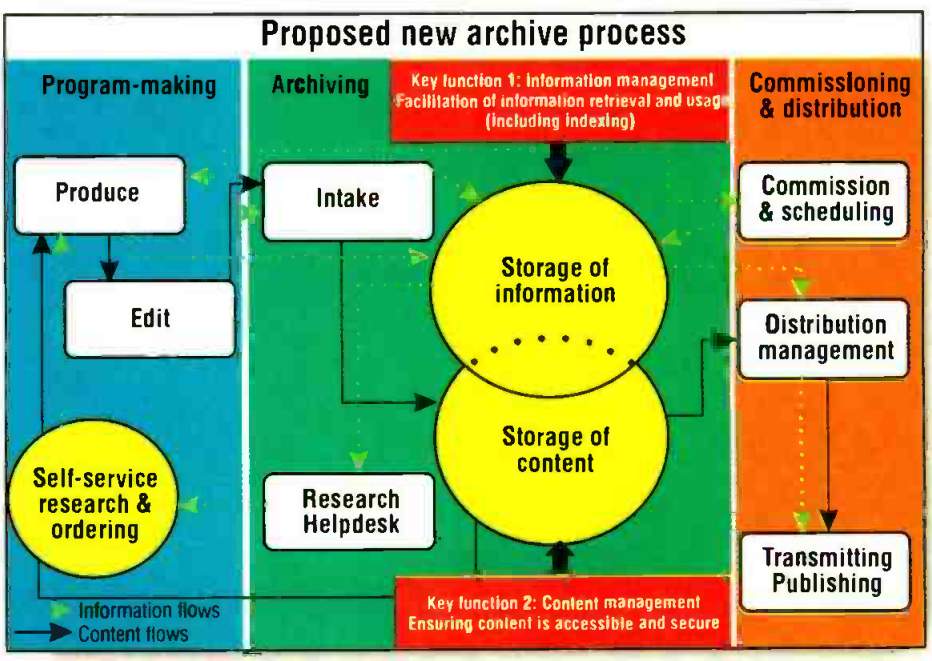


Figure 2. A proposed new model for content management processes. The point at which content is captured and cataloged is now much earlier in the production process. Tracking the media assets earlier will enable easier searching with faster retrieval.

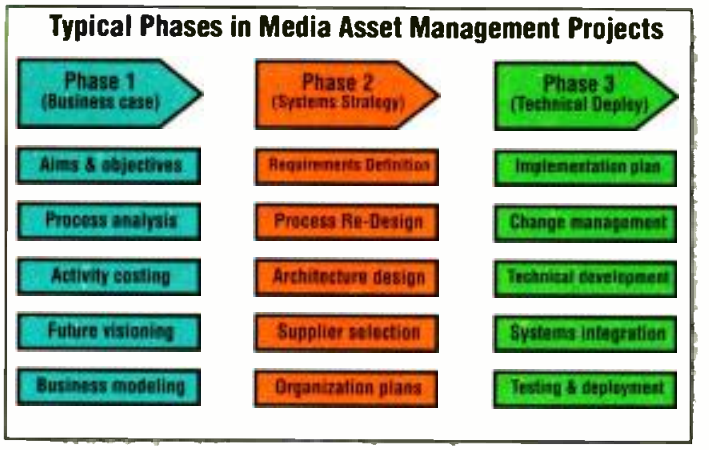


Figure 3. An example of a typical project "pathway." The issues involved in the technical strategies and selection of content management systems rely greatly upon the organizational scope of the implementation, the type and location of its end-users, and the applications and functions to be supported.

shows that the model focuses on the key archiving functions of information storage and content storage.

A key feature of the new process is self-service research and ordering. The point at which content is captured and cataloged is now much earlier in the production process, as opposed to being at the end of the chain in the existing process. Tracking the media assets at an earlier stage will enable easier searching with faster retrieval.

It is the fact that the desktop computer has become powerful enough to carry out the required functions and the software packages that are now available that makes this feasible. The difficulty may lie in the infrastructure: When streaming browse-quality files across the network becomes common, the links will be put under pressure due to their limited current capacity.

Electronic search and retrieval

Arguably the most important feature of any content management system is the ability to find the material. Traditionally, finding content has been via a text-based catalog system. The BBC has a text-based catalog system (called INFAX) that is available to all its internal customers at the program maker's desktop through the intranet. One method of finding material for a program maker is to search in the web-based version by using keywords or free text.

There are over 1500 tapes every day that leave the BBC archive, of these about 80 percent are VHS tapes for viewing and selecting. If just this part of the process could be achieved by electronic viewing at the desktop there would be significant improvements in terms of physical handling and speed of selection.

The videotape in the BBC's archive goes back over thirty years. A five-year project to preserve the oldest format, 2" Quad, has recently been successfully completed. This transferred over 37,000 hours of content to digital formats.

A new three-year program of work has started this year, which has been allocated $30 million.

This preservation program has started on the following formats:

- U-matic videotapes, which mainly contain news material, transferred to MPEG-2 (4:2:2) on DVD as data;
- One-inch C format videotapes containing all genres, transferred to D3 (digital composite) tape and Digital Betacam (component) tape;
- Ektachrome reversal film that was mainly news content, to Digital Betacam; and,
- Shellac and vinyl (78 & LP original sound recordings in the Early Radio Archive).

All of these are being transferred to digital formats. As this content is transferred the opportunity is being taken at negligible additional cost to create a browse copy. For video this is currently in MPEG-1 at around 1.5Mb/s with timecode, giving effectively VHS-like quality. In the near future and as soon as the codecs are available for MPEG-4 with timecode, this will change.

This program of work is therefore not only preserving the BBC's valuable content, but is also providing benefits in terms of accessibility.

Issues for content management systems installation

Content management projects may be categorized into three phases. Figure 3 is an example of a typical project "pathway."

The issues involved in the technical strategies and selection of systems are very much dependent upon the organizational scope of the implementation, the type and location of its end-users, and the applications and functions to be supported. Experience suggests that the following are generic requirements that are common across most broadcaster operations:

- Scalability. Systems need to cope with growth — both in the amount of material or number of assets input into the system, as well as the volumes and complexities of end-user demands placed upon the system.
- Flexibility. Systems should be as open as possible – able to interface with different products, software applications and database platforms. Support of any appropriate industry standards (e.g. in indexing and cataloging information specifications) should also be a feature in any solution.
- Suppliers. Content management solutions are likely to involve more than one system and hence, more than one supplier. Therefore, selected suppliers should be willing and able to work with each other and try to avoid using proprietary platforms or products.

In addition, it is likely that a significant integration effort will be required to ensure the interface between acquisition, management and distribution systems. Hence, a specific systems integrator may also be required.

If an increase in costs is to be avoided, then clearly there has to be a change in the way these media assets are managed.

Key video frames

The way forward from the existing text-based catalog has to be the annotated key video frames and browse video. The Virage and Techmath video loggers are examples of this technique. This new method of an initial search by text, which also returns key frames and browse, is essential to enable anyone to self search from their desktop quickly and easily.

Examples of one of the systems under trial show:

- At ingest, key frames are automatically generated by shot changes (or time) and logged against timecode.
- A storyboard with annotations and timecode.
- The result of a text search displayed with timecode values and key frames. Click on the desired key frame and the entire clip can be viewed.
- The search engines are improving all the time in speed and complexity. It is now possible to search using natural language e.g. phonetic, synonyms and antonyms, and by image content, texture or color.

Metadata

To enable the exchange of media and its metadata there is a need to create a standard set of labels for all program-related information. This has led to the development by the BBC Media Data Group of the Standard Media Exchange Framework (SMEF). The SMEF-DM (Data Model) is now being written as an XML template, which will allow the easy interchange of files for metadata exchange.

The business logic for investing in CM is growing almost daily, as evidenced by the increasing number of suppliers developing CM systems. The technology is now able to meet most functional requirements and deliver substantial benefits to broadcasters at a reasonable cost. However, it remains a complex exercise and the costs of failure remain extremely high.

The technology is now able to meet most functional requirements and deliver substantial benefits to broadcasters at a reasonable cost.

All of the technology to implement content management is of no use without the people with the skills to use these tools. The new systems will enable program makers to carry out easier, more informative searches from their own desktop computers. However new roles will be required to manage the work in progress and the intake into the new archive. In the near future we may see a new role of "Content Management Specialist" evolve. These people will need a combination of skills for the various tasks: for example, shot logging and cataloging for immediate and future use, filing/knowledge management, indexing, ingest management. In summary, these specialists will facilitate the media asset management process at all its stages. ■

Salman Momen, BBC Consultant; Adam Lee, Information & Archives; and Francis Galliano, Digital Archive Project group, also provided information for this article.

Allan King is the senior project manager for the BBC's 10-year BBC archive preservation program.

The business side of media management

By Mark R. Smith

The emergence of digital asset management solutions offers real benefits to the broadcasters. Specifically, the development of systems based on well-known industry standards that feature Web-based user interfaces means that these systems will be easier to implement, maintain and operate within a broadcast environment.

Still, the reason that engineers are reluctant to employ the technology is because it doesn't really solve a problem that's on their plate today. What it ensures, however, is scalability for the challenges of tomorrow.

Centralization of management functionality and resources is critical from an ownership perspective as is the efficient transmission of information, which ensures that everyone is working with the most current data set.

Whether your engineering department expresses immediate interest or not, there are three compelling arguments to adding a system: re-entering lost data, finding contents and moving them to where they should be, and sharing content in an organization.

Take for example a promo developed in the promotions department of a TV station. When it's created, that department knows where it was made, who worked on it, the start and end point of the message, etc. Most likely, that information is condensed to a tape label; something along the lines of "6 p.m. news promo." The rest of the information about its creation is lost.

Because no other details accompany the promo as it makes its way through the facility, vital information like in and out points are guessed at.

All of that promo's pertinent information was originally typed into paperwork for the order in the first place and was known by an editor or someone in production. With the right media management system in place, no extra effort on the front end of the spot's production would have meant a great deal less effort on the back end, as well as less margin for on-air error.

The replacement of videotape equipment with disk-based archives drives DAM. Video servers and archives require databases to index their content. It is optimally efficient to have computer-based systems that can track the material required from transmission and control the movement of material from the archives to digital video servers. Such a system provides for the efficient and effective transfer of content and its allied metadata, ensuring that your spot goes to air seamlessly, just as it should. ■

Mark R. Smith is an independent media consultant based in Crofton, MD.

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NewsTech:

Trucks & Audio Systems

By Allan Soifer

Remote trucks such as Crosscreek Television Productions' Voyager VI truck (shown above) allow broadcasters to record and mix high-quality audio to accompany HDTV's improved pictures.

Uplink trucks and remote recording vans are a regular part of broadcast life in this new millennium. Invest in and upgrade them accordingly. Several studies have demonstrated that if the picture goes fuzzy or even black, the average viewer will stay with the channel for at least one minute to see if corrections will be made if a broadcast's audio is maintained. If audio disappears, most viewers will abandon the defective channel after no more than 20 seconds. The particular mandate of remotely originated audio is to capture high-quality live sound from the location and deliver it intact onto a storage medium or to Master Control. As we'll discuss in this article, truck audio systems can be surprisingly complex.

Input sources remain much the same from situation to situation. A good selection of mics, cables, adapters, in-line attenuator pads, direct boxes, ground lifters and the like are the audio tech's stock in trade. Playback sources are similar too: audio from VTR, cassette deck, DAT deck, mini-disk, CD-ROM, discrete hard drive deck, and even open reel tape decks and the occasional cart machine can still be found in the audio gallery of a broadcast truck.

Consoles

Consoles have developed significantly from their humble beginnings. For many years, TV audio was treated (incorrectly) as radio with pictures, and truck audio mix desks were nothing more than two or more radio boards ganged together. The early recording consoles were unreliable in a mobile environment because they did not tolerate the vibration and climatic changes inherent in remote broadcasting. Today's audio mixing systems, in addition to their more rugged construction, can be specifically selected from a menu of module types and configurations.

Of primary importance are sufficient input channels. It is rare to see a broadcast truck or van with less than a 16-channel mix board available. The potential on-air requirements of a live production — eight or 10 mics on set, an off-camera announcer mic, theme music playback, stinger effects, VTR insertion playback, etc. — quickly consume 16 channels. Provide for as many channels as you can possibly afford — it saves upgrading every two years. Don't forget to spec several stereo input channels, as many as you have playback sources. Your station may not stereocast its audio, but your private production clientele will almost certainly want their show in stereo.

A good EQ section is vital. The equalizers should have frequency shelving and roll-off for the very highest and lowest ranges, and preferably two parametric stages for the intermediate ranges. A vital factor is the judicious use of equalization. Too much push or pull in any frequency range on any

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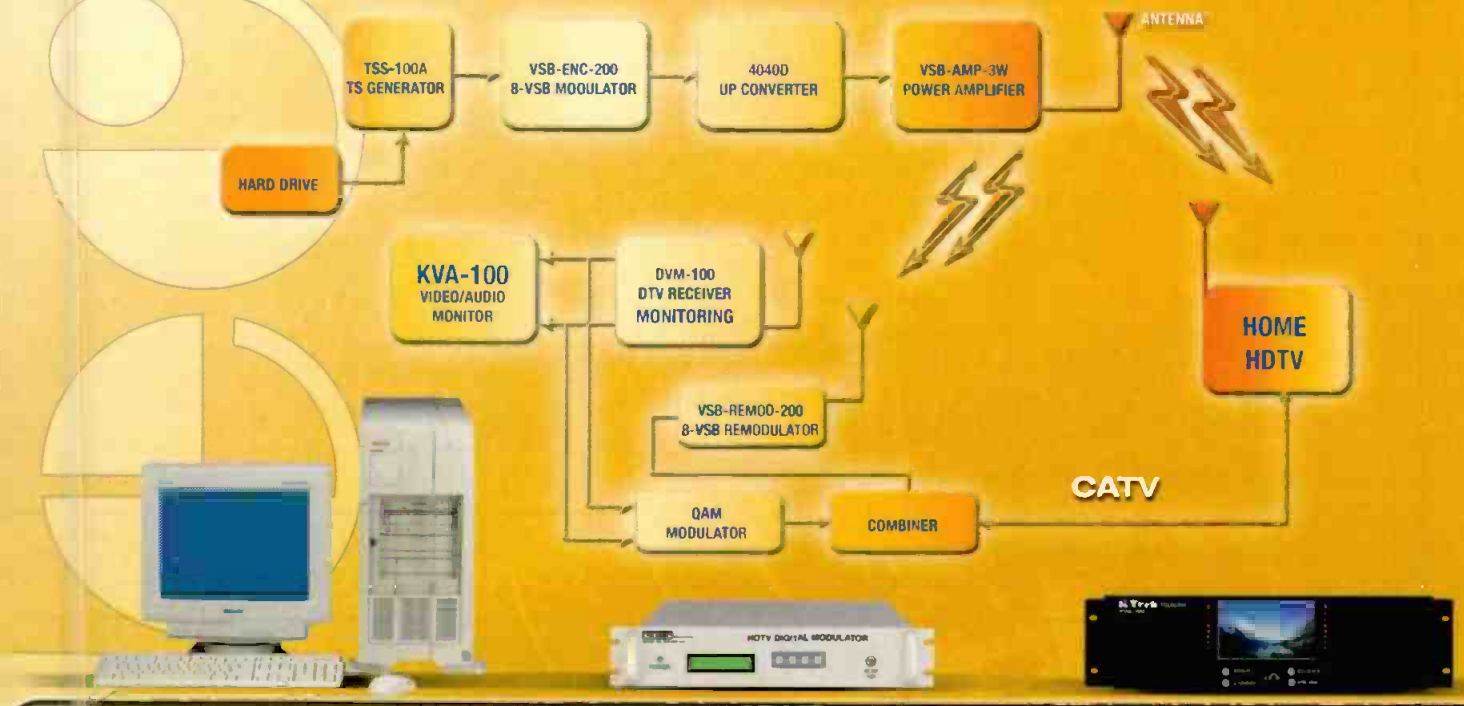

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TSS-100A is a video server based on a scaleable power PC engineering workstation. Using high speed SCSI-II LVD hard-drives, its maximum capacity is limited to 100-Gbytes of Raid-0 storage capability. This unit is designed to transfer files by FTP, Internet, LAN, CD-ROM and SCSI. It generates MPEG2 files through DVB-ASI, SMPTE-310M and DVB-SPI outputs and records through DVB-ASI and SMPTE-310 Inputs. Rack mounted and portable computer versions are also available.

8-VSB Modulator

VSB-ENC-200 is an 8-VSB modulator that conforms to the ATSC Terrestrial DTV Transmission Standard. Its input requires MPEG2 transport stream in SMPTE-310M, DVB-ASI or DVB-SPI format. The output is available on 44.0MHZ I.F. or a fixed channel RF. A variable frequency up-converter is also available as an option. External 10MHZ reference input or internal 10MHZ OCXO frequency source can be used to set the output frequency. Linear and non-linear precorrection is available as an option.

Video Audio Monitor

The KVA-100 is a rack mountable 6" diagonal unit LCD display, 16X9 aspect ratio, 640X350 resolution, L/R speakers, Volume meters, RGBHV input (BNC).

8-VSB Reference Receiver

DVM-100 is an 8-VSB Professional Receiver that accepts RF CH2-CH69 input, DVB-SPI input/output, DVB-ASI input/output, SMPTE-310M input/output and produces outputs in RGBHV video, VGA video, Y Pb Pr, Analog L & R audio, and Dolby Digital AC-3 audio. Video Modes: 1080i, 720p, 480p, 480i, NTSC Composite (BNC, SDI), PSIP Display, EPG.This product is useful in DTV monitoring and testing.

8-VSB Frequency Translator

The VSB-FREQ-100 is an 8-VSB channel converter, this unit performs tuning channels between VHF 2 - 13 and UHF 14 - 69 and produces an output frequency from 7 to 810 MHz. The LCD displays all input and output frequencies for an easy operation. This unit performs no demodulation.

8-VSB DTV Translator

VSB-REMOD-200 is an 8-VSB Translator that receives an 8-VSB signal via on-air or cable, demodulates to baseband data, corrects multipath errors by Forward Error Correction and Equalization techniques, Updates PSIP and re-modulates the baseband data into a new 8-VSB signal. A fresh copy of the original DTV signal is reproduced to extend your DTV coverage area.

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given input is almost sure to create distortion, possible phase imbalance (among channels), and other audible artifacts. Good EQ gently enhances a signal and sets it in its own acoustic space. TV audio is far more critically sensitive to EQ overload than radio — a bit too much high-end boost make a videotape audio track impossible to play or duplicate. Excessive highs can cause severe aural transmitter clipping. Overboosting the bass to deliver that fat bottom end loved by some rock musicians will invariably result in massive distortion in the four- or five-inch loudspeaker still used in many home TV sets.

Provide for as many channels as you can possibly afford — it saves upgrading every two years.

Checking your sound

One of my personal pet peeves is the installation and dependence on a pair of beautiful wide-range speakers in the audio section, probably powered by 50 to 100 watts per channel. This is nice if you are performing multitrack audio recording and mixdown of music. However, for a broadcast truck, employ a set of small- to medium-sized computer loudspeakers. These are generally of reasonable quality, without being too good, and they more closely mimic the response of a consumer TV audio system. Several trucks have gone to the trouble of installing a consumer-type TV and feeding the input with audio modulated on a small Channel 3 sender. The engineer in charge of one so-equipped van stated that his audio monitor setup sounded more like the viewers' sets at home than the $2000 plus monitor system originally spec'ed for his truck. When listening to the result on air at home the following day, I had to agree.

Audio processing assumes an important role in truck-based production, especially because live, on-site audio is not usually studio quality. One of the niftiest devices in a sound tech's arsenal is a humbucking line-to-line transformer — even a couple of them — with I/O connectors and adapters. Hum and line garbage can often sneak along the interconnect cable fed from house audio. For the most part, hotel, convention and stadium audio staff are not disposed to consider live TV needs. Often, the truck audio tech is forced to accept a premixed facility feed and bounce that along with a live announce mic or two.

When the truck tech has the option of placing mics and creating an original mix, some thought must be given to types and amounts of processing. Industry preferences drift toward a bit of limiting and often a gentle touch of reverb to enhance the live feel of the shoot. Too great a dependence on effects modules ends up creating a situation in which an inordinate amount of time is wasted in rehearsal, getting the mix right. After all, there is the video to deal with, and obtaining clean color imaging is more engineer-intensive than audio usually is. Extensive audio tricks are best left to a studio or to the post-production editor. If a broadcast vehicle sticks with a stereo limiter and maybe a few patchable individual limit modules, as well as simple digital reverb, great-sounding, workable audio can be delivered.

Mic-ing the truck

Wireless microphone and interruptible fold-back (IFB) systems are almost essential in any remote truck. With today's crowded RF spectrum, careful engineering consultation is a must when choosing RF channels for wireless devices. Without restricting or over-specing, the usual complement on a remote TV production truck is two independent UHF wireless mic channels, with either lavalier or hand-held mics. As companions to these, two IFB packs, also UHF, should be available. The interrupt facility should be responsive to the truck producer/director's intercom mic, with straight-thru IFB listening originating from the station control room. In this fashion, talent can hear the cues to both studio and truck crew and be able to jump in and out on cue when multiple cut-ins are called for.

In considering the IFB question, further telemetry or local microwave interconnection is mandated to cleanly send IFB com audio to the remote truck. On occasion, this is also done via land line or POTS connection. The number and

Remote trucks feature an expanding street-side wall. Space for audio operations is often limited in an effort to conserve space in remote trucks, but inadequate human space can be detrimental to show quality.

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type of transmitters and receivers required for glitch-free communications during the production, as well as talent audio pickup, can be astounding. During a week-long production in a truck last year, six wireless lav mics, two announcer mics (headset type), and all manner of wired and wireless IFB were employed to get cues and talkback to all the talent. It was a hellish setup, but the trouble taken was worth it when several of the talent remarked that they enjoyed the challenge of that particular remote because they could effectively communicate with all the crew and each other.

AC power distribution is always a vital concern in remote trucks. Careful routing of AC feedlines is mandatory to avoid EMI with both audio and video circuitry. Careful grounding is also paramount when setting up a truck. It's all too easy to create ground loops between trucks that may pose a threat to human life. Ground lift connectors or adapters may prove invaluable in these situations, and well thought out cable runs can save time and avoid the nasty consequences of looped AC leaking back along improperly grounded audio lines. If you must set up portable equipment on site outside the physical truck itself, the safest move is to run heavy-duty extensions and draw all AC power from the truck. No ground loops can form if all devices derive their power from the same phase on board the vehicle and share the same ground source.

With the improved pictures available, we must produce cleaner, more pristine audio.

Smaller considerations

Many of the newer trucks are boasting digital everything on board. The coming wave of EFP is indeed digital, but a word of caution here. Because many audio sources are still delivered in analog format — our voices into a mic being the prime example — it becomes vital to select a console that will permit both analog and digital inputs. Some manufacturers offer this as switched inputs into each module. By the way, widescreen HDTV audio is still audio. Unless we are specifically talking about 5.1 or a similar encoding scheme, stereo is still stereo. With the improved pictures available, we must produce cleaner, more pristine audio. Audio scopes and stereo waveform observation are critical to ensure that a mono-compatible audio track is being delivered. There are few things worse than a phase-imbalanced stereo track, causing mono phase-out and comb-filter effects. Instant viewer tune-out is almost guaranteed.

A word or two about operator comfort might be in order. In their zeal to maximize space usage, and offer good value to the purchaser, some remote truck designers shrink the human space to a minimum that is inoperable. Most techs need at least two feet of space around them in which to move. If too cramped, and hemmed into a tiny cubbyhole audio compartment, techs are unable to do their best work. Fatigue quickly sets in and show quality flies out the window. Watch out for too crowded overhead rack areas. Only non-essentials like power amps, DAs and such should be placed overhead. It's a very difficult area to work in, and ripe for bumped skulls and mistakenly turned knobs due to the inability to see clearly over one's head in dim light.

Although the remote truck is essentially a studio on wheels, there are some special considerations to ponder when purchasing or upgrading one of these rolling behemoths. Remember, high-quality audio output is the ultimate goal of this part of your truck. Attention to the details of the design of audio systems will help you and your staff achieve that goal. ■

In building an audio mixing system for use in remote operations, extra channels for potential on-air requirements of a live production such as off-camera announcer mics and VTR insertion playback should be included in order to save upgrading later.

Allan Soifer is an independent audio designer, recordist and consultant in Eastern Canada. He can be reached via email at asoiferaudio@broadcast.net.

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The post production facilities in the Dallas/Fort Worth market where I work do not have video tape decks or camcorders with LANC jacks, so I cannot provide any comment regarding the use of Pocket Producer via LANC control. But I did a significant amount of testing with the RS-422 and LTC Pod Protocol settings and was impressed with the results.

At HD Vision in Irving I generated several Sony edit format logs of high-definition footage in tape formats from three different kinds of machines: a Sony HDD 1000 high definition one-inch machine, a Panasonic HD-D5 and a Sony HDW 500 HD Cam.

At Verizon Directories and Verizon Corporate Communications I controlled and generated GVG and Avid format edit logs using a Sony 3000 one-inch machine, a DVR-20 D2 deck and a PVW-2800 Beta SP machine. In both facilities, Pocket Producer controlled these machines and generated logs with no problems.

Pocket Producer's intuitive display functions like an edit controller, with in and out mark points, a duration indicator, and standard play, pause, stop, rewind, and shuttle controls. The device also offers Tag functions that allow operators to choose the reference point for the clip.

Pocket Producer's Palm display and controls are very intuitive and function like an edit controller. There are in and out mark points, go to in, go to out, a duration indicator, standard play, pause, stop, fast forward, rewind, and shuttle controls, along with what Pocket Producer calls "Tag" functions.

This helpful function lets you program a clip duration that marks an in and out point with the press of the Tag button. It also allows you to choose the in point or the out point as a reference point for the clip. There are also five-, 10-, and 15-second tag functions.

Some controls have increment up and down arrow pairs that function like single frame trims. If you depress them for more than a second the trim arrows repeat, allowing you to easily trim a single frame or many frames. I really liked these trim arrows for fine tuning mark points and changing scene and reel numbers of my clips.

Some controls have increment up and down arrow pairs that function like single frame trims.

Pocket Producer's 9.5-foot RS-422 control cable was long enough to allow me freedom of movement with the device even when it was hooked up to rack-mounted video tape machines. Play also provides an LTC adapter that permits the RS-422 control cable to be connected to the timecode out of a camera for field logging applications.

Pocket Producer can also be rigged with a wireless microphone system (not supplied) to allow for wireless field logging.

You have to know what kind of timecode — drop frame or non drop frame — is on the video tapes you are logging when you use Pocket Producer and adjust it accordingly so that what you log is accurate. Pocket Producer's manual does not provide any detail or warnings about the limitations of the edit formats you are generating logs for. It is justifiably beyond the scope of the manual to list all the nuances of these edit formats. But a statement or two to make users aware of EDL format limitations would be helpful.

The Sony and GVG edit formats, for example, have a six-character limit for reel identification. Any reel identification longer than this is truncated. Reels labeled Tigers-1 and Tigers-2 would appear as Tigers in a log with the distinguishing "-1" and "-2" cut off. A production assistant, assistant director or producer using Pocket Producer to generate a Sony or GVG log needs to know this limitation in advance so that the logs generated are accurate and time is not wasted.

Pocket Producer will only work with 3Com's Palm Pilot, Palm III, and Palm VII. Play has no plans to offer Pocket Producer for use with other PDAs on the market.

Despite some of the user manual's informational shortcomings, and a less than intuitive system of generating the logs once they are HotSynced from the Palm Pilot to the Palm host computer, I found Pocket Producer to be a very helpful timesaving device. Individuals already familiar with the Palm PDA will welcome this additional producer's tool. ■

For more information on Play's Pocket Producer, circle (451) on the Free Info Card.

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

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Technology In Transition

Wireless microphones

BY JOHN LUFF

Just when everything is going well in a production, the audio operator often becomes the center of unwanted attention. One moment the singer on stage is moving freely around, belting beautiful sounds into a microphone. The next moment errant taxi calls are as clear as the singer. This seldom ingratiates the operator to the producer who is paying an orchestra by the minute. Fortunately it seldom happens at all today with the advancement in the technology of RF microphones. But all of us older than college age can remember the unmistakable sound of a wireless microphone receiver intentionally tuned to over-occupied spectrum.

Wireless microphone transmitters generally have three form factors today. In the first, the transmitter, battery and microphone elements are all contained in a shell about the same form factor as a conventional "wired" mic, just without a cable stuck in the south end. The second is a clip-on microphone (lapel style) connected by a (usually) thin wire to a separate transmitter/battery pack that can be put on a belt, in a pocket or even taped in an inconspicuous spot. The last is a variation on the second, with a lightweight boom microphone wired to a similar transmitter.

Many variations in usage exist. Put a mic on a guitar or violin, a moving calliope in a parade or the carefully tuned exhaust note of a speeding racecar, and the technology is precisely the same, though it is handled in a slightly different manner depending on the application. The logical extension of wireless microphones is wireless intercom. This operates in a "four-wire" mode, with separate transmitters operating in each direction, connecting to a four-wire intercom system directly, or to two-wire systems through a hybrid (transformer or active).

Under FCC rules in the U.S., wireless microphones operate in four bands: FM broadcast, VHF high band and UHF, all in FM, and Low VHF in AM and FM.

For professional use the FM broadcast band is generally not suitable, though in some limited applications it may be appropriate. It is generally not workable in crowed cities due to spectrum congestion. These microphones have limited range and are often used in consumer or "prosumer" applications.

In high favor are the VHF high band and UHF options. VHF systems have some ability to penetrate buildings. This is useful in instances where the receiver is in an audio mixing room adjacent to a theater or studio, or a microphone is used outdoors and the receiver is indoors. As you would expect, the lower the frequency, the better it is for such applications. VHF high band systems operate where the general noise floor is lowest, though it is important to select an unused channel.

When in doubt, a spectrum analyzer is a great tool to look for signals trampling on your fragile signal.

The most common VHF systems operate on television channels 7-13. When there are suitable unused television channels in your operating area this is a good solution. When using these channels, be cautious about harmonics from the FM broadcast band, which fall squarely in this range. For instance, the first harmonic of 88MHz falls in Channel 7, and the third harmonic of 107MHz falls inside Channel 13. A little spreadsheet work with the local FM assignments can give you good insight into what will likely be a problem. Be careful to consider intermodulation components caused by multiple microphones operating together in addition to interference from occupied television channels. When in doubt, a spectrum analyzer is a great tool to look for signals trampling on your fragile signal. Remember that channels from other nearby markets up to 70 miles away may cripple your well-considered plans. Interference may show up as an increase in the noise floor, crackling or other audible disturbances. There are commercial services that can help you plan frequency choices and evaluate likely interference using computer modeling. With the implementation of DTV we may well see both fewer unoccupied channels and mysterious interference effects from high power digital transmitters and the intermodulation products associated with them.

Additional factors affect the selection of band. UHF radios can perform over longer distances when operating at maximum legal power. In addition, UHF antennas are shorter and can be easier to conceal. VHF radios are generally easier to implement, though the frequencies available in an area may be congested, especially in urban centers.

In the past, most receivers were crystal controlled and had limited ability to be frequency agile. Now most modern receivers are capable of covering an entire band. For instance, one manufacturer provides 94 channels between 794MHz and 804MHz.

It is best to keep the receiver as close to the transmitter as is practical to minimize signal loss and fade. The power restriction on VHF microphones is 50mW. It doesn't take much distance or absorption to decimate the signal strength. Radios operating in the 450MHz to 488MHz range can use up to 120mW, but interference from other occupants can be a major concern.

Because these radio systems operate in closed environments where the

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receiver can often see a reflection as strong as the direct signal, they often suffer from phase cancellation, causing a loss of reception.

To avoid this problem it is best to use a diversity receiver. The second antenna does not receive the out of phase signal, only the direct signal. By sensing the signal level at each antenna and appropriately switching to the best signal source the system can maintain quality reception more reliably. Switching between the signals can be done in the baseband audio signal, or in the RF domain. When switching is done in the RF domain the background noise level may well change. When the switching is done in baseband audio it is difficult to prevent detectable differences in received sound. Also, a complete second receiver and external baseband audio switch is required at extra expense. A third technique utilizes a combination of the signals from the two antennas to maximize the received signal. This presents a somewhat less complicated receiver since a second full receiver is not required. The distance between the receiving antennas is dependent on the frequency being used. It is sometimes best to roughly align the two antennas toward the intended transmitter location so that any glancing reflections are forced to be of different path lengths. This distance must of course not be equal to a multiple of the half wavelength. It is generally true that "true diversity," or dual receiver systems, will provide the best performance. Another example of "no free lunch" I am afraid.

Most wireless microphones today also include some type of dynamics processing to help reduce the noise floor. Compressing — or more properly, companding (because the process should be reversed at the receiver) provides a degree of protection from overmodulation. This is particularly important with wireless systems because it is very difficult to produce an analog transmission system that is linear, free from noise and undistorted at the same time. Designers optimize the companding system to allow the operating level to be near the maximum undistorted transmission level and at the same time not prone to amplifying transmission noise. You may think of this as similar to noise reduction on analog audio tape, such as Dolby noise reduction in its various forms. In effect, it allows a higher average modulation level without creating distortion.

With all the problems with analog transmission, why not move to digital transmission? That is certainly a wonderful idea — provided spectrum can be devoted to the higher bandwidth of digital transmission. But digital transmission suffers from the same cancellation problems as analog, only with much worse effects. The well-known cliff effect can eliminate reception. This achieves a wonderful signal-to-noise ratio — or rather lack of signal to lack of noise. Dare we use the analogy of the emerging COFDM digital video microwave transmission systems for moving transmitters? If a cost-efficient system could be devised it would certainly raise the bar for wireless microphones. I suspect that the rapid advancement of digital transmission techniques will bring new approaches we have as of yet only glimpsed. ■

John Luff is the vice president of business development at AZCAR Technologies.

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TASCAM DA-98HR: offers high-resolution record and playback capabilities including eight tracks at 24-bit, 44.1kHz or 48kHz; four tracks at 24-bit, 88.2/96kHz; or two tracks of 24-bit 192kHz; system is compatible with the DA-78HR system; provides full record and playback compatibility with all DA-98, DA-88 and DA-38 tapes utilizing the 16-bit, 44.1kHz or 48kHz standard; digital I/O is standard, with switchable analog boards available as an option; other features include timecode I/O with onboard SMPTE synchronizer, onboard two-track mix function and internal electronic patchbay; 323-726-0303; fax: 323-727-7635; www.tascam.com.

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MIXING CONSOLE

TASCAM DM-24: small-format digital recording console with 24-bit digital converters and 96kHz sampling rates; offers full transport control, hierarchical grouping and built-in automation capabilities; features LED ring encoders, 100m motorized faders, 16 analog inputs with XLR mic, 24 channels of TDIF interfacing and eight channels of ADAT optical I/O; works with MX2424 to create an integrated 24-bit 96kHz recording system; 323-726-0303; fax: 323-727-7635; www.tascam.com.

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DIGITAL BROADCAST CONSOLES

Solid State Logic Aysis Air/Aysis Air Mobile: feature new analog and digital I/O features for the broadcast consoles, including RIO Grande I/O and MADI interface option; the RIO Grande I/O option provides up to 12 16-channel 24-bit ADC/DAC cards and four 24-channel AES/EBU cards for a total of 192 analog inputs and outputs and 96 digital inputs and outputs with sample rate converters; system also offers new support of the serial multichannel audio digital interface (MADI), which enables the serial digital transmission of up to 56 channels of linear digital audio data; 212-315-1111; fax: 212-315-0251; www.solid-state-logic.com.

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DIGITAL FILM CONSOLE

Solid State Logic Avant: offers enhanced hardware and software features; Version 4 software provides new tools for the posting process; users can now draw a panning path with PanPoint panning, in addition to using existing channel pan controls; features a range of new grouping options to link signal controls including pans and EQ; the DCTM option supports parallel control of a tape machine so no external synchronizer is needed; RIO Grande I/O option also available, offering a total of 192 analog inputs and outputs and 96 digital inputs and outputs with sample rate converters; 212-315-1111; fax: 212-315-0251; www.solid-state-logic.com.

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ANALOG CONSOLE

Solid State Logic SL 9000 J Series: software enhancements include the new Version 4.3 software package; the software allows seamless integration between the SL 9000 and Pro Tools machine controls by enhancing the Sony nine-pin control protocol; 212-315-1111; fax: 212-315-0251; www.solid-state-logic.com.

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REMOTE CONTROL/ MONITORING UNIT

Rohde & Schwarz Netlink: provides for remote control and monitoring of broadcasting transmitters via Internet web browser and an SNMP-compatible network; open platform works with analog TV, DVB-T and DAB, and can adapt to future standards; allows in-depth monitoring of all system components; 301-459-8800; fax: 301-459-2810; www.rsd.de.

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STUDIO MICROPHONE

Shure Inc KSM44: multipattern condenser microphone features externally biased large dual diaphragms in a side-address design; offers extended frequency response of 20Hz to 20kHz; contains Class A, transformerless preamplifier circuitry; dual one-inch, gold-layered, Mylar diaphragms provide added low frequency response, while improving environmental stability; the diaphragms' thin design reproduces any sound source and achieves a self-noise of 7dB; 800-25-SHURE; 847-866-2200; fax: 847-866-2279; www.shure.com.

Circle (356) on Free Info Card

QUICK RELEASE TRIPOD SYSTEM

Miller Camera Support, LLC Leo: electronic contact closures provide for full operation of rear zoom controls; quick release mechanism allows easy transition to hand-held without detaching rear zoom/focus controls; wide range balancing system extends the range of a tripod's bottom plate to make camera balancing easier; compatible with most major manufacturers' cameras and lenses; replaces standard tripod adapter plates; 973-857-8300; fax: 973-857-8188; www.miller.tripods.com.

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DAW SOFTWARE

SADiE SADiE4: runs on Windows 95/98, Windows NT and Windows 2000; provides support for a range of DVD-RAM drives for backup, asset transfers and easy file interchange with devices such as the DEVA portable recorder; multiple files can be imported into the system as a batch at fast speeds; increased playlist functionality is standard; new clip placing options are available on the right mouse menu and as an auto-place option; other options include CEDAR DeCrackle plug-in and DDP Image File; 615-327-1140; fax: 615-327-1699; www.sadie.com.

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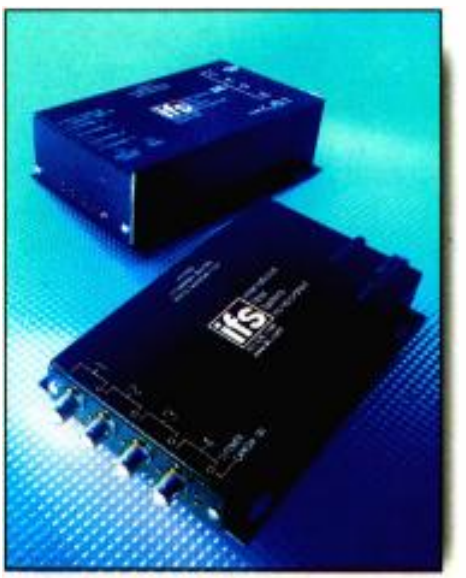

DIGITAL FIBER OPTIC LINE

International Fiber Systems VT/VR 7400 series: single mode and multimode systems allow four independent video signals to be multiplexed and transmitted over a single optical fiber to a switcher or a series of monitors; systems offer a loss budget of 23dB, medium haul performance and remote video input/output diagnostics; 203-426-1180; fax: 203-426-3326; www.ifs.com.

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CAMERA CONTROL PANEL

Radamec Shot Control Panel MkII: compatible with all robotic camera pan and tilt heads; includes touch-screen display to provide full shot and transition information; other features include a wide viewing angle LCD screen, 600 shots per camera storage and recall facility, and enhanced status reporting and prompt messages; 877-RADAMEC; 732-246-0906; fax: 732-448-1184; www.radamec.com.

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STEREO AUDIO STORAGE

Wegener Communications PowerPlay 1000: allows audio to be sent to affiliate stations, remote audio sites or satellator for storage and later retrieval; fed via a Wegener digital satellite receiver, now coupled with Wegener's control system, COMPEL; storage is accomplished on demand with a simple contract closure or serial word; system offers more than 24 hours of stereo audio storage, digital RS-422 input with optional analog input, simultaneous record and triple play, and mix and mute satellite audio with analog pass-through internal switcher/mixer; 800-848-9467; 770-814-4000; fax: 770-623-0698; www.wegener.com.

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Fujinon XA87x9.3ESM/XA87x13.2ESM: offer focal lengths up to 2300mm and 87x magnification for extreme close-ups and high image quality; new image stabilizing technology is available as an internal option or as a stand-alone device; maximum zoom speed from wide to telephoto is 0.6 seconds; both lenses feature a 32-bit RISC processor, high-speed serial communication, and 13-bit accuracy in zoom and focus control, as well as Quickzoom, two-shot preset and advanced back focus; 800-553-6611; 973-633-5600; fax: 973-633-5216; www.fujinon.com.

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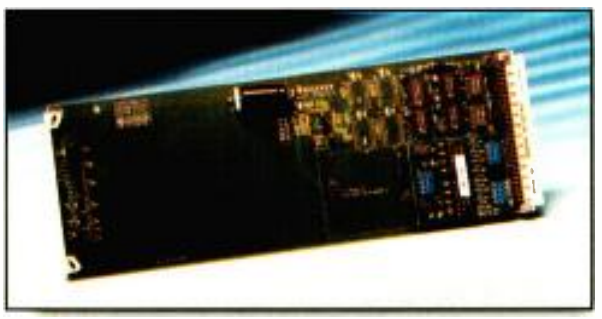

DIGITAL AUDIO DISTRIBUTION AMPLIFIERS

Crystal Vision DADA208/DADA208N/DADA208D: new additions to audio interface range offer either two stereo feeds in and up to four outputs of each channel, or one input and up to eight outputs; DADA208 standard version offers reclocked outputs and a cable equalizer; DADA208N offers non-reclocked outputs for use when the quality of the input is known; DADA208D features reclocked outputs and a selectable delay of up to one second at 48kHz, enabling it to double as an audio delay line; all units can be used with both 75Ω(ohm) and 110Ω(ohm); +44 1223 506 515; fax: +44 1223 506 514; www.crystalvis.com.

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VIDEO SERVER CONTROLLER

BUF Technology Spot Server Management System: system combines, creates and loads individual and multiple clips and sequences of trimmed clips for playback; features RM-4000 Remote Processor option for control of single or multiple server channels or VTRs; users can control up to 10 server channels and/or VTRs; system also allows the ability to create and record new clips from videotape segments and lay off clips and edited sequences to videotape; 858-451-1350; fax: 858-451-6589; www.buftek.com.

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PROGRAMMABLE BATTERY ANALYZER

Cadex Electronics C7200: analyzes most battery chemistries, including Li-ion, Li-Polymer, NiMH, NiCd and SLA; each station of the two-station unit can test batteries independently; features self-learning "Quick Test" for analysis of technical problems in four minutes; 10-second Ohm test quickly checks the pass/fail condition of a battery; operates as a stand-alone unit or with a PC running BatteryShop fleet management software; 800-565-5228; 604-231-7777; fax: 604-231-7755; www.cadex.com.

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PRODUCTION CONSOLE

Audio Toys Paragon II: complement to ATI's Paragon II Monitor Console; contains 64 mic inputs with full routing, eight stereo line inputs with routing to groups or the mix busses, and four stereo line inputs with routing to stereo masters or the matrix; outputs include eight mono and four stereo aux busses, eight stereo audio groups with inserts, or eight stereo matrix outs with inserts; another output option is two main mono mix outs and two main stereo mix outs; other features include four-band parametric EQ, on-channel gate and compressor, true LCR panning with LCR audio subgroup capability, and Distributed Intelligence technology; enhancements available allowing channel and aux mutes, eight-scene or 256-scene snapshot fader recall, and full dynamic SMPTE-based moving fader automation; 800-642-8063; 410-381-7879; fax: 410-381-5025; www.audiotoys.com.

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HD LCD MONITOR

Astro Systems DM-3000: monitoring device offers wide-angle, bright and high-contrast views; supports 1080i/60, 1080p24sf, 720p/60 and 1080i/50; input interface is swappable between HD SDI and analog YPbPr; 818-244-1806; fax: 818-244-1878; www.astro-systems.com.

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ONBOARD CAMERA POWER ADAPTER

Aspen Electronics PSM-160 Pro: features direct connection to standard battery mounts and an additional four-pin XLR power output for simultaneous on-camera lighting and power; uses seven forms of over-current circuit protection; RF shielded and compatible with all international AC power input voltages from 90 to 240 VAC at 50- or 60Hz; 714-379-2515; fax: 714-379-2517; www.aspenelectronics.com.

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CABLE AND TERRESTRIAL TV ENCODER

Thomson Broadcast DBE 4140: performs local program MPEG-2 encoding, receives an MPEG-2 transport stream containing the national program through its ASI input and performs the splicing between the two; internal splicer can be triggered through in-band commands, making the opt-out controllable from the national broadcast center; 800-882-1824; 201-569-1650; fax: 201-569-1511; www.thomsonbroad.com.

Circle (379) on Free Info Card

DATA MULTIPLEXING SOLUTION

Tandberg Television Data Reflex: facilitates the incorporation of new data services into wasted bandwidth; built into Tandberg's evolution 5000 multiplexer series; the evolution 5000 works in conjunction with Tandberg's Multiplex Element Manager to allow multiple data services to be set up as part of existing video groups or in their own group, each with a minimum quality of service threshold; 949-725-2500; fax: 949-725-2545; www.tandbergtv.com.

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Vigits iCON: smallest production downconverter available on the market; can be mounted on the side of an HDCam or monitor; converts from HDTV to NTSC; includes horizontal and vertical interpolation for minimal picture loss and four switchable outputs: letterbox, letterbox with 4:3 markers, Mag Mode (for focus or technical analysis) and internal color bars; 877-273-5691; fax: 877-273-5691; www.vigits.com.

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WEBCASTING SYSTEM

e-Studio LIVE e-Studio 7000: new line of turnkey systems provides all the components necessary to create a Webcast; enable users to create live interactive shows by incorporating synchronized graphics and text, multisource video and audio, and chats and surveys; system includes a streaming server, a producer workstation, flat screen VGA and 10/100 network hub; 978-250-3334; fax: 978-250-3335; www.e-studiolive.com.

Circle (394) on Free Info Card

VIDEO GATEWAY

Path 1 Network Technologies TrueCircuit: enables time-critical information to be carried over IP Ethernet with guaranteed QoS for both real-time and non-real-time traffic; three streams of 270Mb uncompressed broadcast quality video and audio may be sent through an IP/Ethernet network for greater utilization of a single fiber; 858-450-4220; fax: 858-450-4203; llinnebur@path1.net.

Circle (383) on Free Info Card

MEDIA NEWS MANAGEMENT SYSTEM

Dalet Digital Media TeamNews: tool for creating, editing and publishing stories on-air and online, including over the Internet, interactive TV and WAP-enabled mobile devices; features a new video editor, as well as the ability to preview stories on the Internet and WAP devices before publishing; integration of Virage's VideoLogger and AudioLogger allows for easier indexing of video and audio clips in the system; 212-825-3322; fax: 212-825-0182; www.dalet.com.

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CHARACTER GENERATOR ENHANCEMENT

Inscriber Active Texture Option: enhances CG layouts by making motion video available as a texture on Inscriber text or graphics objects; seamlessly integrates to expand Inscriber's VMP Studio, CG*Extreme and CG*Supreme; 800-363-3400; 519-570-9111; fax: 519-570-9140; www.inscriber.com.

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Accom Affinity nonlinear editing system: dual RGB color correction and enhanced DveousFX options for Affinity now shipping; the RGB color correction adds real-time RGB and YUV space color correction, as well as gamma, gain and lift adjust plus hue rotation for background and overlay tracks; features chrominance/luminance adjustment, HSL rotation (keyframed or preset rotations) and keyframable time variant correction or color effects within a clip; allows users to save color effects, and recall and apply them to additional clips instantly; the DveousFX option more than triples the number of warp effects available to Affinity users; 650-328-3818; fax: 650-327-2511; www.accom.com.

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Avid ePublisher: now shipping; allows users to create and deliver synchronized video and multimedia content to the Web, Intranets, CDs and DVDs; timeline-based Link & Sync editing enables users to synchronize video with elements such as graphics, slides animations and other HTML content on a web page; a single project can be delivered to multiple formats; also allows for easy video capture; 800-949-AVID; 978-640-6789; fax: 978-640-1366; www.avid.com.

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METADATA OPTION FOR D-5

Panasonic Broadcast AJ-MK2700: now available; option for the D-5 HD VTRs; set of plug-in sub-boards for AJ-HD2000 and AJ-HD2700 VTRs; enable metadata such as closed captioning or descriptive program information to be recorded and played; data is recorded into the VANC of the D-5 high-definition recording format; 800-528-8601; 323-436-3500; fax: 323-436-3660; www.panasonic.com/broadcast.

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FAST Multimedia Dual InTime Board: option now shipping; accelerates effects on silver. and purple. nonlinear editing systems; allows systems to be equipped with a second InTime processing board, for a total of 12 additional processors available; extra processors allow for faster-than-real-time image rendering and increase processing speed for all FAST-engineered effect editors, including 2D, 3D, key, wipe, color and filter editors; 800-249-FAST; 217-356-1884; fax: 217-356-1881; www.fastsalesus.com.

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MIC PRE-AMP

Shure Inc FP23: now shipping; offers 24 hours of operating life with two AA batteries for on-location recording; features all-metal construction, special filtering and transformer isolation; delivers excellent resistance to outside RF interference and features easy-to-use controls, including a selectable low-frequency roll-off; unit is nearly 20dB quieter than the FP11; offers a maximum of 66dB of gain, adjustable in 11 discrete steps for accurate, repeatable gain settings; 800-25-SHURE; 847-866-2200; fax: 847-866-2279; www.shure.com.

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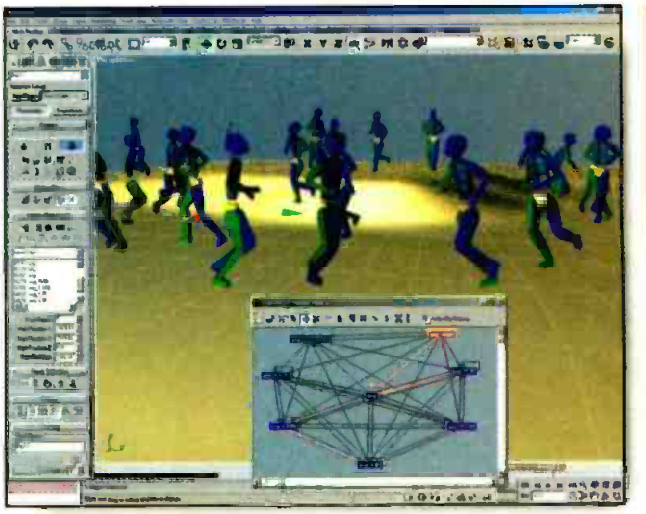

CHARACTER ANIMATION

Discreet Logic character studio 3: now shipping; allows for large-scale crowd character animation, behavioral animation, accelerated physique performance and biped inverse kinematics with pivot points that can be animated for natural hand and foot movements; also features multilayering features and the ability to hand-edit motion capture files; 800-869-3504; 514-272-0525; fax: 800-305-6442; www.discreet.com.

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NONLINEAR EDITOR

Pinnacle Cinewave: now shipping; uncompressed SD video solution available for Apple's Power Mac G4; combines TARGA Ciné engine with video authoring tools including Apple's Final Cut Pro, Commotion Pro and Hollywood FX Silver; offers uncompressed video editing and effects in both RGB and YUV formats; 650-526-1600; fax: 650-526-1601; www.pinnaclesys.com.

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STREAMING MEDIA DESIGN SOLUTION

Media 100 Cleaner 5: now shipping; allows users to create streaming media content for the Web in four steps: capture, author, encode and publish; simplifies the streaming media workflow; 800-773-1770; 508-460-1600; fax: 508-624-9384; www.media100.com.

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NLE SOFTWARE

United Media On-Line Express 2.7: now shipping; provides uncompressed video quality for the creation of high quality video and audio content; supports multiformat input and output of component, composite, Y/C or MPEG-2 video formats; features unlimited real-time video transitions, 2D and 3D effects, and real-time audio; available as an upgrade to current On-Line Express users or as a new purchase; 714-777-4510; fax: 714-777-2434; www.unitedmediainc.com.

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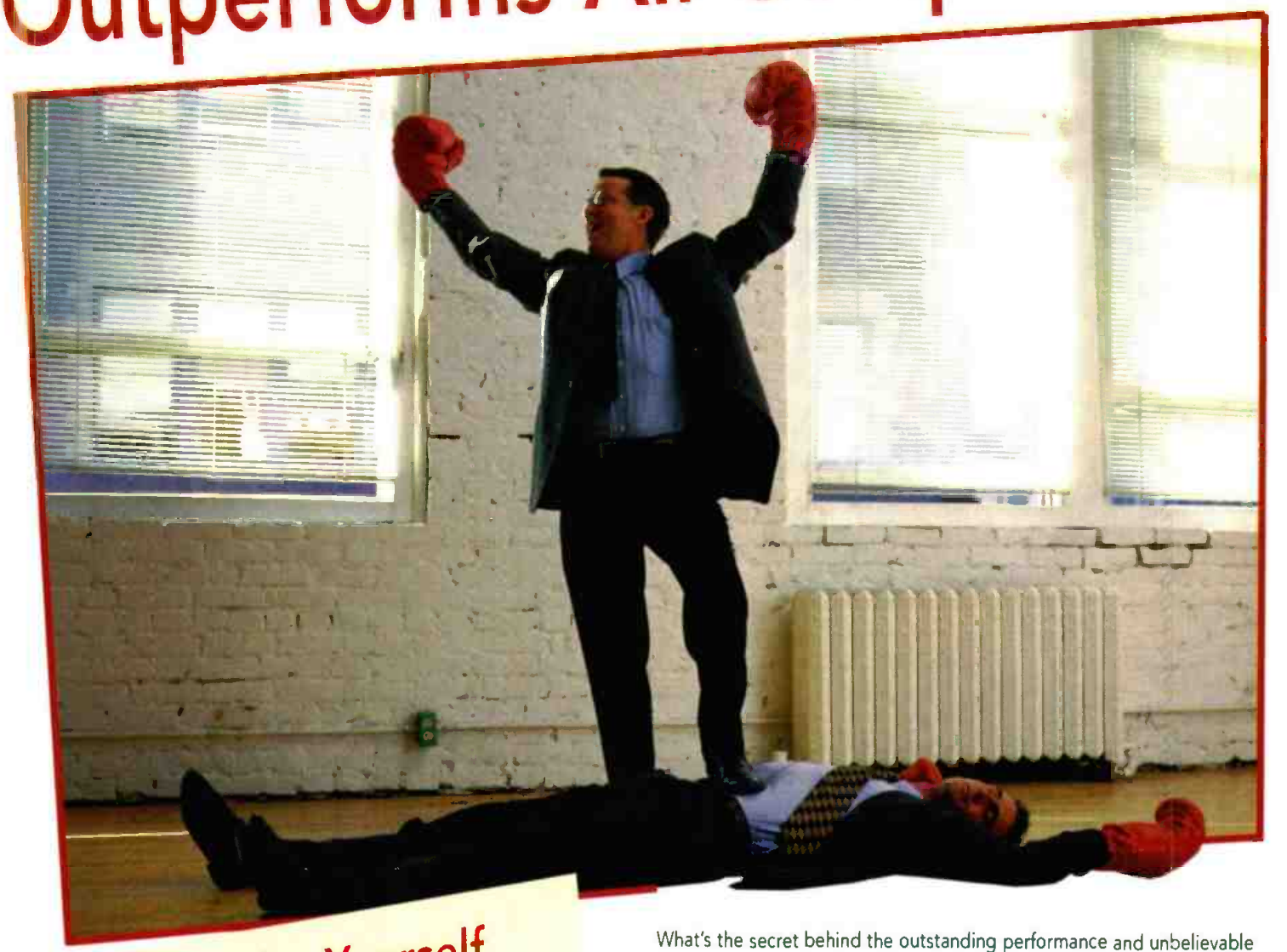

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Business Wire

Business highlights from broadcast and production

BY LAURA COLLINS, ASSOCIATE EDITOR

Digital Media Online is now offering DMNTV.com, an Internet broadcasting channel for the digital media industry. The site features a daily newscast covering industry news, as well as product demos, interviews with industry executives and coverage taken by roving video crews at industry tradeshows. The site utilizes an SGI Media Server with a Kasenna MediaBase to allow users to view QuickTime videos, MPEG-2 and RealVideo streamed at bit rates of 28.8Kb/s to 15Mb/s.

DBS television provider EchoStar Communications Corp. recently launched a new HDTV pay-per-view channel using two high-definition Profile XP Media Platforms from Grass Valley Group. The new channel offers widescreen 16:9 ratio format and Dolby Digital sound.

Enterprise Broadcasting Corp. is using Grass Valley Group's Profile XP Media Platform in its luxury Network Event Centers to play out high-definition programming onto 23-foot screens. The centers are located in malls and city centers across the country, advertising high-end goods and services such as cruises and sports cars.

Fox affiliate KJTV-TV launched their news operation with Grass Valley Group Vibrint and Kalypso systems. The station uses three Vibrint NewsEdit systems to create news and sports packages and a Kalypso system for switching in the news control room.

Crawford Post Production added an HD1012 multistandard switcher from Snell & Wilcox to the HD hybrid linear editing suite in their new Atlanta facility.

Enterprise, Columbine JDS and DAL have merged to form Encoda Systems. The new company will provide integrated systems for buying and selling advertising in electronic media, as well as managing and controlling multichannel transmission of the media.

National Mobile Television and Sportvision have reached an agreement to make Sportvision's video insertion technologies standard equipment on NMT trucks in the United States.

The arrangement is also expected to extend to NMT's European operation.

Avica Technology provided their high-definition Vecta DTV Stillstore for use in the production of the next installment of the Star Wars series, Episode II. The Vecta will be used to perform image quality analysis of production sequences acquired electronically using Sony HDW-F900 24p cameras.

Avica's high-definition FilmStore digital media platform has also been selected by the Entertainment Technology Center in the University of Southern California's School of Cinema-Television. The equipment will be used to play back compressed and uncompressed versions of high quality digital video sequences for the center's evaluation of digital video compression technologies.

Solid State Logic Avant digital console

An Avant digital console from Solid State Logic was chosen for installation in the sound studio at Maryland Public Television. MPT has used the console in the production of programs including "Outdoors Maryland" and "Maryland: State of Mind."

The Avant was also recently installed at Sony Music Studios to provide multiformat mixing on broadcast, CD and

Screen Shot

SGI, Discreet provide election numbers

NBC, MSNBC and CNBC utilized nine SGI Onyx2 systems running Discreet frost in their recent coverage of "Decision 2000." The combination of SGI systems with Discreet's real-time graphics solution allowed NBC to render 3D images and text in real time, using data from SGI 1400M servers connected to the Voter News Service.

NBC also provided viewers with real-time poll results, using SGI 230 Windows NT, OS-based visual workstations and 1600SW flat panel displays to collect poll data and send it to the servers.

Other stations using SGI and Discreet systems for election coverage include CBS, CNN, ABC and Fox NewsChannel.

Panasonic shoots Teddy Bears' Picnic

Digital production company Visionbox Pictures is currently in post production on the feature *Teddy Bears' Picnic*, written and directed by Harry Shearer. The feature is set at an exclusive resort and centers around the corporate retreats taken by rich and powerful men.

Visionbox Pictures shot the feature with Panasonic's AJ-PD900WA 2/3-inch DVCPRO50 Progressive camcorder. Visionbox is currently in post production on the feature. They go online for color correction and compositing. The company will output a DigiBeta tape for immediate use and then transfer the feature to film. The estimated release date for *Teddy Bears' Picnic* is late spring 2001.

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DVD productions. Sony has used the 24-mainframe, 96-channel console to mix a CD for Warner Brothers, a series for VH1 and a Gloria Estefan concert for CBS.

Crawford Audio is using three networked Avant digital consoles for digital operations in its new audio facility. The BBC selected Solid State Logic's 72-channel SL 9000 J SuperAnalogue console for installation in the Golders Green Hippodrome studio, for use with the music of the BBC Concert Orchestra.

Euphonix is providing a second System 5 digital post production console to World Wrestling Federation Entertainment for use in its production facility in Stamford, CT. The console will be used in live production, as well as to mix and sweeten WWFE's in-house productions.

Systems integration company TGS has designed a new studio for WTVI in Charlotte, NC. The new facility will use both Dolby Digital and Dolby E equipment to produce programming for PBS in 5.1 channel surround sound.

Dalet and Coolpit announced a partnership to combine Dalet's knowledge of digital audio broadcasting and multimedia publishing with Coolpit's experience in the customization of websites and development of site management solutions. The partnership will allow the two companies to provide end-to-end audio solutions for webcasters.

PVTV Studio News GUI

Digital System Technology installed ParkerVision's PVTV Studio News automated production system into the news control room at CBS affiliate KGPE-TV, a Fresno, CA, station owned by the Ackerley Group. DST plans 10 more installations of the system in Ackerley Group stations.

Fujinon captures underwater world

The National Park Service is working with the U.S. Geological Survey to produce a film on the sealife of Glacier Bay National Park in Alaska. The 26-minute film, tentatively titled "The Underwater World of Glacier Bay," will be shown at the park's visitor center and on cruise ships visiting the park.

John Brooks, Producer/Director of Photography with the U.S. Fish and Wildlife Service, shot the film on a Panasonic AJ-HDC 20A DVCPRO HDcam, and captured topside and underwater images with Fujinon's HA36x10.5BERD and HA10x5.2BERM HD lenses. He faced numerous challenges in producing the film, including near-freezing water temperatures and raging currents, as well as a not easily accessible remote location.

NFL teams practice with Panasonic

The Buffalo Bills and Baltimore Ravens recently purchased Panasonic DVCPRO camcorders to replace the Beta SP currently in use. The football teams will use the camcorders and a DVCPRO studio editing VTR to record football practices and games for coaching analysis. The VTRs digitize material into an Avid Sports Pro NLE editor for output to PCs at the coaches' stations. The teams have also used the equipment in training camps and preseason games.

A recent demonstration at the NASA Space Communications Technology Center at Florida Atlantic University utilized a Leitch A/D converter system and a 25-mile stretch of fiber optic cable to transmit the signal from a prototype high-definition camera in a 1.5Gb digital video stream.

NBC News Los Angeles used standards converters from Leitch to convert its Olympic coverage from PAL to NTSC.

Los Angeles-based post-production facility Complete Post selected Accom's Abekas 6000 DTV server to improve workflow in post production. The Abekas frees up Complete Post's telecine and audio equipment by allowing operators to transfer an entire roll of film to the. Abekas and play it back immediately to synchronize video with audio.

Fox Digital chose a 12-bit video and 24-bit audio fiber optic transport system from Multidyne for use in their coverage of the Democratic and Republican National Conventions.

QVC selected a custom-built server-based integrated post and production solution from Quantel for use in its new facility outside Tokyo. The system will be used to record, archive, edit and transmit up to 15 hours of live programming a day. The new facility and programming is set for launch in April 2001.

Canadian network YTV upgraded its AMS Neve Libra console to a Libra Post system and its two AudioFiles to SCs. The upgraded systems will enable the children's television network to handle large projects with increased operational speed.

Manhattan-based TRA Productions selected the Libra Post digital mixing console for use in its new 2500 square foot facility. The production company specializes in MIDI music and has provided sound design for Sesame Street for over 20 years.

Gray Communications purchased more than $19 million worth of equipment from Harris, including DTV transmitters, encoders, and master control and monitoring units. Harris recently completed the first installation at WRDW in Augusta, GA. The remainder of the equipment will be installed in Gray stations throughout 2001.

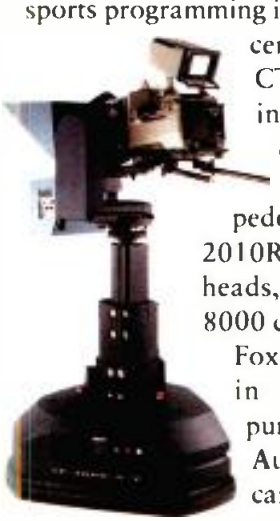
KLJA-TV, a bilingual station serving the Hispanic community in Los Angeles, recently purchased three Hitachi Z-3000W cameras, as well as display monitors for previewing its programs in the control room. The station recently upgraded to fully digital operation.

Sony's Oxford digital console has been installed in the music room of NBC's Studio 6A for use on production of *Late Night with Conan O'Brien*. The console is being used to mix the house band and special music guest acts for the show.

CNN announced a decision to use Virage's Video Application Platform for its digital archive project, encompassing more than 100,000 hours of video footage. CNN currently uses the platform to index incoming feeds and provide journalists with immediate access to video information at their desktops.

Virage's video indexing technology will also be integrated into Keops Broadcast's MediaWorks digital asset management system to allow automatic capture of video metadata into the server and simplify searching and retrieval of video assets.

ESPN is using a full suite of Vinten AutoCam robotic camera systems for sports programming in its production center in Bristol, CT. Systems in use in Studio C include four new SP-2000/X-Y pedestals, four HS-2010RED pan and tilt heads, and an ACP-8000 controller.



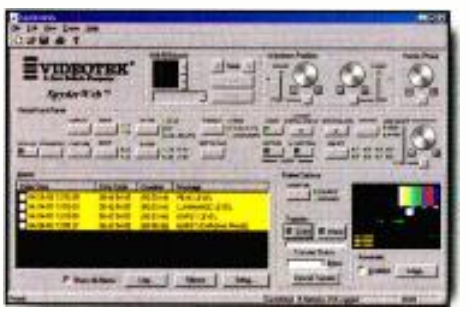
Fox affiliate KDVR in Denver also purchased Vinten's AutoCam robotic camera systems.

The Telemundo Network is using the Associated Press' ENPS to produce news, entertainment and weather segments for its program, Esta Mañana.

Florida station WFSU-TV is using over 50 camera robotics systems from Telemetrics for coverage of government sessions in the state legislature.

Canadian broadcaster ROBTv purchased StarDRIVE Automation and an OpenMedia newsroom system from A.N.N Systems.

Sonic Foundry announced its Media Services division will be providing extended service offerings. The division offers users integrated turnkey systems handling content acquisition, management, repurposing and implementation. It also assists with storage, management and delivery of rich media content, as well as content distribution and webcasting and hosting services.



Videotek's Spyderweb System was recently awarded the 1999 SBE Technology Award. The award is given for innovative items or ideas that further broadcast engineering and allow broadcast engineers to be more productive in their field.

North Carolina station WRAL-TV used YEM's HD-MPEG2 encoder and decoder to transmit the world's first all-HDTV newscast on Oct. 13, 2000. YEM's equipment allowed for live HD transmission via digital microwave.

AZCAR recently purchased systems integration company Synergistic Technologies for approximately $4.5 million.

WXLV-TV in Winston-Salem, NC, purchased a stacked antenna system from Dielectric.

Devlin Design Group created a new look for NBC affiliate KSL-TV in Salt Lake City.

Clarification: In the October *Systems Design Showcase* on XETV, the project architects were incorrectly identified as Barbrow, Thomas and Associates. The correct identification for the firm is Bobrow/Thomas and Associates.

PEOPLE

Barry Ballanger has joined Doyle Technology Consultants as director of engineering.

Digital System Technology promoted J.T. Duggin to executive vice president and chief operating officer.

The Institute of Electrical and Electronics Engineers honored Robert Plonka of Harris with the Matti S. Siukola Award at this year's IEEE Broadcast Symposium. Plonka received the award in recognition of his technical contributions to the industry, as presented at last year's symposium.

Prodromos Constantinou has been named president for Studer North America.

Steve Levine was recently appointed director of InnovaCom's new Advanced Technology Group. Larry Ball was named vice president of engineering.

Network-Electronics and Optronics appointed Morten Bilet managing director for its U.S. division.

Innovation TK's Stuart Hunt received the British Kinematograph Sound and Television Society's Phil Berkeley Award for his contribution toward linking film and television technologies. ■

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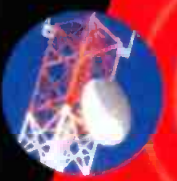

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STUDIO MAINTENANCE ENGINEER Must be able to perform the following duties: install and maintain studio transmission equipment including video switchers, audio consoles, DVE, CG, SS, cameras, and robotics. Familiarity with automation systems and master 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.

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EOM

Final fade

BY PAUL MCGOLDRICK

As a young broadcast engineer I was encouraged to join SMPTE because it represented the American face of television engineering to us very remote guys in Europe. Developments in the U.S. showed us many of the industry's future directions, and the SMPTE Journal showed us the technology in raw detail.

I lost touch — and my membership — during a prolonged spell in Nigeria. When I rejoined, the organization had changed profoundly.

The great thing about SMPTE was its focus on technology and the spread of ideas. The Journal was accurate and timely. More importantly, the conferences were meetings of like-minded individuals who openly talked about that technology. Real demonstrations of technology were encouraged. Spring NAB was the place to show new products, closely followed by a European debut at Montreux, but SMPTE was the place to show the "maybe" technologies that were being worked on.

Then some bright spark got the idea that exhibitions could make money for SMPTE, that they could even challenge NAB. But these exhibitions had strange rules. Imagine asking vendors to pay top dollar for a small space in an expensive venue for three or four days, to bring their best equipment and the company's best people — but under no circumstances to sell anything. Don't even bring a price list. It made for a surreal, schizophrenic world — a non-trade show where vendors were expected to exhibit for love of technology, but the society profited handsomely. You might call it a dot-org facade over a dot-com bottom line.

Of course the benefits of corporate membership are enormous. You even get a lovely pennant to hang at your booth at conferences and the incredible gift of a free hyperlink from SMPTE to your website. Of course, in practice, most manufacturers and the others who have sustaining membership feel that it is a form of institutional blackmail — one of those things that you feel you have to do so that your customers know you are still around. If you feel you need to put yourself even further ahead of the pack, you can always mail more dollars to become a "Sponsor" or even more for a "Bronze," a "Silver" or, my gosh, a "Gold" Sustaining Membership. The membership dues used to be related to revenues, but now they are just related to the status you feel you need to buy, or are persuaded to buy.

You might call it a dot-org facade over a dot-com bottom line.

Today, the exhibitions have been diluted by competing shows. (Ever tried to attend both the SMPTE and AES Conferences?) SMPTE's hold on standards is also a lot more muted than it used to be. Standards today evolve less from technology discussions than from a small group giving industry blessing to a commercial product's mode of operation. Originally being on a standards committee meant plowing through mountains of desperate detail, proving that each aspect of a standard was being evolved with almost religious perfection.

The Journal, too, has seen much better days. Its published papers (which any of the industry movers have already seen) are typically 10 to 12 months old. It reports on SMPTE Section Meetings that occurred two to four months prior — meetings, incidentally, that seem more often than not like commercial presentations.

So what value is there in SMPTE for an engineer living in a remote community? Obviously not the Journal, the standards or the exhibitions. But as a journalist as well as an engineer, I've found the conferences important in and of themselves. They still echo the organization's glory days, where no technological topic was too sacred to be discussed. Where ideas, not politics, still ruled.

Membership in any society or group has to have obvious benefits for those that are going to be actively involved. And SMPTE at its best has always been the membership. There are people who are Fellows and Life Fellows in SMPTE for whom I have a very high regard indeed. In many cases I wish I had a fraction of their abilities, their vision, their political acumen and their staying power.

The negatives, though, have finally come to outweigh the benefits, and I've had to conclude that SMPTE is no longer the organization for me. I won't easily or willingly travel more than 200 miles for a section meeting which may be little more than a commercial. My copy of the Journal has been going the way of the Sunday newspaper after a quick flick-through. Although others pay for my annual dues, I no longer "have" to be a member for political reasons.

So I hereby quit the Society. It's been an interesting trip, but there's a lot to be said for not sticking around for the final fade. ■

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

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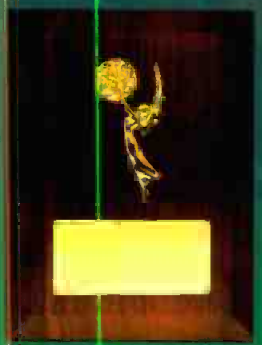

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