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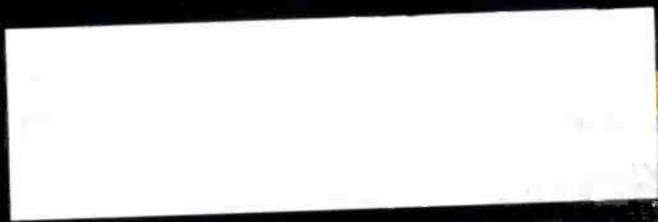
THE JOURNAL OF DIGITAL TELEVISION™

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An ATSC guide for engineers

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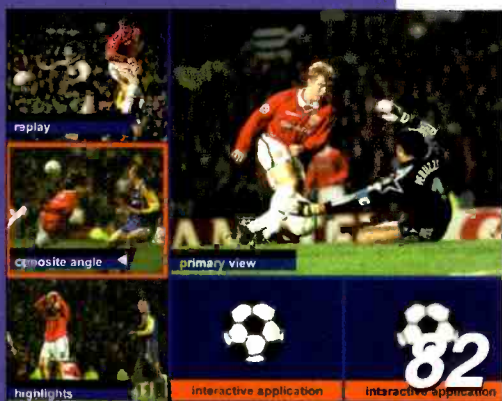
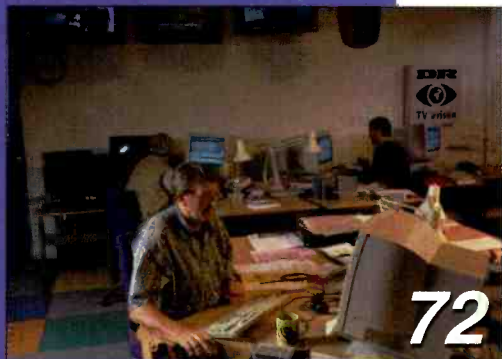
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ON THE COVER: Danish Broadcasting Corp., Denmark's oldest and largest public service radio and television company, operates two nationwide television channels and four nationwide radio stations. Its control room staff is at the hub of an all-digital newsroom providing acquisition control, asset management, indexing and logging, browsing and editing, and transmission automation and control. Photo courtesy of SGI.

(continued on page 6)

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FREEZE FRAME

A look at the technology that shaped this industry

Name this VTR

During the 1980's a variety of new video recording formats were proposed. Most didn't make it. Can you name this product? What is the manufacturer and model of this VTR? All correct entries will be eligible for a drawing of the new *Broadcast Engineering* T-shirts. Enter by e-mail. Title your entry "FreezeFrame-October" in the subject field and send it to: bdick@primediabusiness.com. Correct answers received by Nov. 17, 2001, are eligible to win.



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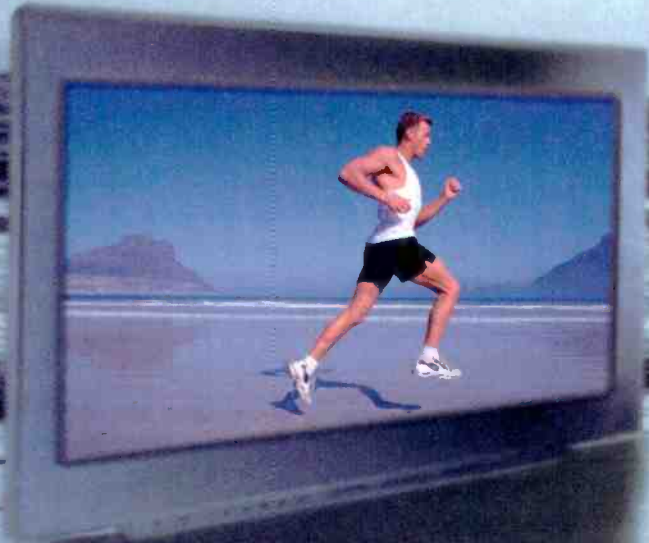


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Finger power

Sometimes the oldest ideas make for the best new inventions. I thought of that recently as I was researching some ideas for articles in *Broadcast Engineering*. I was investigating trends and the future of the home TV environment when I found some interesting research on remote controls. While today we use a small box pointed at the TV to control the set, new research predicts that soon viewers will be able to simply point at the TV with their hand to make things happen.

It all reminded me of playing cowboys with my pals when I was a kid. Sometimes we had toy pistols, sometimes not. It didn't really matter because we would still use our hands as six-shooters. With that

pointing finger stuck out, three fingers folded back and our pistol hammer (thumb) stuck way up in the air, we were ready to take on the bad guys anytime. "Bang, you're shot. Bang, bang, you're dead. No I'm not, you only winged me," we'd say.

Through a bit of imagination and by simply using our hands, as kids we were able to interact with, even control, our environment. Now it appears the old-fashioned pointing finger may come back into vogue.

Swedish TV researchers have developed what they call the future TV remote control. They claim that instead of the viewer having to hold and point a device at the TV to change channels or adjust the volume, merely pointing at the TV will soon be enough.

The idea is to relegate the remote to obscurity and, instead, allow viewers to merely wave their hands at the TV set to make changes. Sounds good, doesn't it?

Can't you just see it now... hold up three fingers and the channel changes. Two fingers up increases the volume. Two fingers down decreases the volume. Clench your fist and the set mutes.

Would we all start to look like Leonard Bernstein or Eugene Ormandy *conducting* our TV sets? Waving hands from easy chairs across America would cause millions of sets to switch, change and turn on or off. The TVs obligingly take commands from the tip of a finger or the jerk of a thumb. Up that volume, change that channel, mute that speaker, change the input to satellite. No more looking for lost remotes in the sofa cushions. No batteries needed. Wow, I'm getting carried away here.

After I calmed down, I asked myself another question. With all this new intelligence being built into our sets and STBs, could some, shall we say, more cryptic commands be allowed?

The new PVRs and smart STBs can learn your favorite TV shows and take you there, or even automatically record them. So what's to prevent these same devices from banning certain programs from your TV if you don't want to see them again? Suppose you never want to see those worthless garbage and channel fillers like Cops XXIII, Judge whoever or those mind-numbing auction channels. What if there was a unique command that the tuner would recognize as "dump this and don't go there again," say a thumbs-down or even the middle finger? The bird!

Tired of Peter Jennings dumping on Bush or Pat Roberts carping about feminists and gays? Want to send Bill Maher to the trash bin for calling the U.S. military cowardly? Just give them the finger and they're gone. Think of the empowerment you'd feel.

Best of all, now when you flip someone off, it'd really have some results.



Brad Dick

Brad Dick, editorial director

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THINK PURPLE

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Editor's note:

My August editorial on birds flying into towers brought me both hostility and humor. While the broadcasters saw that the numbers given by the bird lobby were obviously ridiculous and bogus, the bird lovers did not. What I learned is that the tweety bird has some really emotional, irrational (and hostile) friends out there. Here are a few examples.

How dare you print that!

I just finished reading your editorial "Could dead birds derail DTV?" I cannot believe that you would have written that. Talk about giving every environmentalist fodder to attack the tower/broadcast industry. You basically walked right into their trap by coming across as a bird-hating anti-environmentalist, which is something the broadcast profession does not need. You would have better served the industry and your readers by questioning whether or not such reports of massive bird kills are believable.

Here in Vermont and New Hampshire I have had the pleasure of visiting tower sites on many hills and mountains and I have never seen evidence of birds being killed by towers or guy wires. That is not to say that it doesn't happen, but the numbers seem way out of whack and are most likely being used to stop tower building rather than protect wildlife. If no one questions bad research, it eventually becomes fact.

I would suggest that you use your

power in the editorial seat to search out and offer better facts about such a possibility, rather than acting like we in the television industry hate all birds and could care less. Attitudes like that are what get industries into big trouble with the public — trouble we may not be able to overcome.

RAYMOND P. KULIG
DHMC
LEBANON, NH

Editor responds:

You missed the point Ray. The environmentalists and fowl lovers obviously don't need "facts." They just make 'em up as they go. Anyone who's ever worked around a tower knows the numbers put forth by these guys are bogus. I'm just reporting what they claim.

Wouldn't the birds be about 10 feet deep?

But it "feels" right

Even the most intelligent of our species can be overwhelmed by emotion, causing certain electrical pulses in the brain (particularly those of rational thought) to connect improperly. Towerkill.com tries to educate us through public channels; in this case, the Internet. As irony would have it, my access to the same public channel they are utilizing comes from a tower! That's right! Wireless Internet at your service. As technology advances, (Bluetooth, 802.11, etc.) we can expect to see fewer and fewer wires. The fewer wires there are, the more the towers will load up. The more the towers load up, the greater the need for towers.

I must confess that I am a city dweller. I enjoy the city lifestyle as well as the aesthetic of urban architecture. In the long run, when I look out the window of my apartment gazing towards the sunset, I would much prefer to see what birds do make it past those towers of death than peer through a maze of

twelve thousand wires strangling what little connection I have to nature.

JOSEPH PORTER

It's the lamp, stupid!

We had that problem in Canada at a generating station that was on a bird migration route. From what I've heard, all you need to do is change the lights from continuous to flashing/strobe. Planes still see it and birds don't see it as the moon. Next problem...

Cheers,

PETER FOULGER

Other responses:

Dear Brad,

Loved your editorial on the birds and towers. We've seen a few dead birds under our towers — maybe five a year.

I don't know where this guy comes up with 30,000 in one night. Wouldn't the birds be about 10 feet deep? Sounds like somebody is fudging the numbers.

Maybe you can promote horizontal towers to prevent any more bird deaths? Tell the bird lovers that towers provide a resting place for tired birds, and we prefer to have them called "bird sanctuaries."

TONY WORTMANN

This is a hoax, right?

Putting aside the fact that your average bird is a daytime creature and unlikely to fly into towers at night, I'll point out that almost all broadcast towers are within chain-link fenced areas where predators would find it difficult to gain access to this bounty of killed, stunned or wounded birds. I don't recall seeing any piles of avian accident victims under our tower, however. They should be several feet deep by now.

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News

New York broadcasters rebuild

BY LARRY BLOOMFIELD

Resilience may best describe how America treats adversity. It may also represent well how the broadcasters in New York City met this nation's most recent tragedy. There have been perhaps thousands of stories written about the events of Sept. 11, but there is one story that seems to have eluded the mass media — the one about the resilience of New York broadcasters in returning service to New York viewers.

Effect on WTC broadcasters

It was in the upper floors of the North Tower of the World Trade Center (WTC) in New York that the transmitters for most of New York's television stations and several FM radio stations resided. Of the twin 110-story towers, the North Tower was the most distinctive, crowned with its Dielectric broadcast antenna, which added 360 feet to the structure.

The list of tenants in the World Trade Center's North Tower reads like a page out of New York City's TV Guide: WCBS-TV, Channel 2 (CBS - O&O); WNBC-TV/DT, Channels 4 and 28 (NBC - O&O); WNYW, Channel 5 (FOX - O&O);

tions, four radio stations were located there: WKCR-FM, 89.9MHz; WPAT-FM, 93.1MHz; WNYC-FM, 93.9MHz; and WKTU-FM, 103.5MHz.

Up until the early 70s, nearly all New York OTA television was

A long-term solution for the New York broadcast community will be years in the making.

WABC-TV/DT, Channels 7 and 45 (ABC - O&O); WWOR-TV/DT, Channels 9 and 38 (UPN - FOX O&O); WPIX-TV/DT, Channels 11 and 33 (WB - Tribune O&O); WNET-TV/DT, Channels 13 and 61 (PBS - Educational Broadcast Corp.); WPXN, Channel 31 (PAX Net - Paxson O&O); and WNJU, Channel 47 (Telemundo O&O).

In addition to these television sta-

broadcast from the Empire State Building. At a height of 1250 feet, the Empire State Building was the tallest building at the time, which made it the logical choice for TV antennas. The addition of the broadcast antenna structure raised the height to 1472 feet.

With the construction of the World Trade Center complex in lower Manhattan, local broadcasters found a new, higher structure for their antennas. Tower 1 was completed in 1972 at a height of 1368 feet and Tower 2 in 1973 at a height of 1362 feet; both 110 stories high. The foundation for each tower had to be extended more than 70 feet below ground level to rest on solid bedrock. From the observation deck of the World Trade Center, it was possible to see 45 miles in every direction.

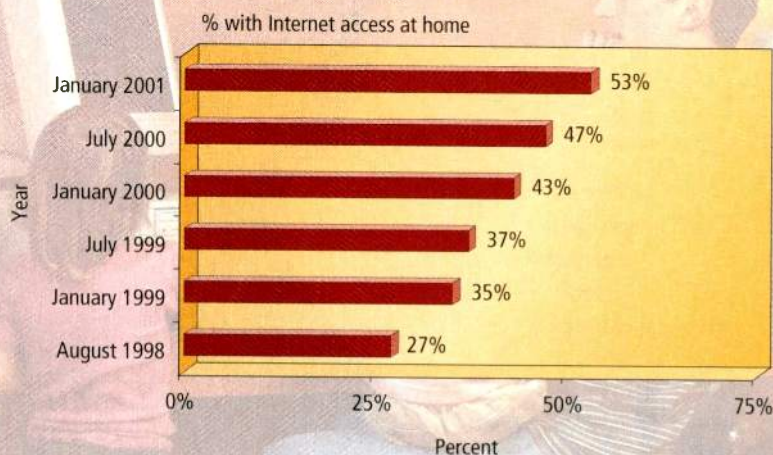
Few New York viewers realized the catastrophic effect that the loss of WTC-1 would have on the broadcast community — and their own viewing habits. Although off the air for a while, WCBS-TV (Channel 2) was able to switch to its auxiliary transmitter located on the Empire State Building. However, the remaining stations initially fell dark. About 30 percent of the New York viewing

FRAME GRAB

A look at the issues driving today's technology

Home use of Internet continues to grow

Home usage has doubled since August 1998



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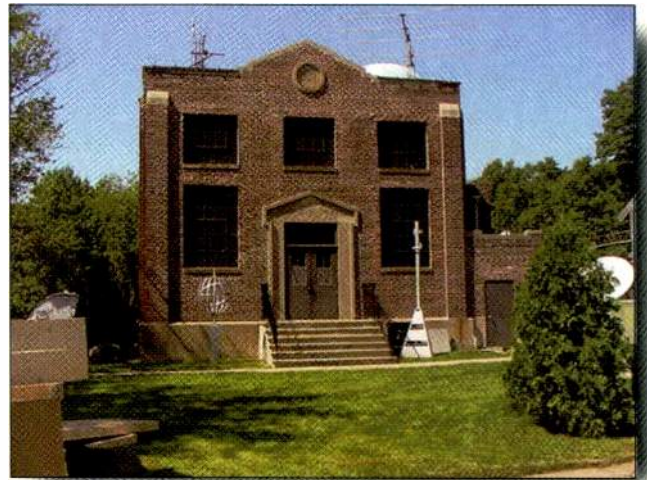
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Major Edwin H. Armstrong's laboratory and first transmission site was thought by most to have been relegated to history. With the WTC tragedy, however, it has become perhaps the most important tower site on the East Coast. Shown here is the original laboratory building, which still houses some broadcast equipment.

audience depends on over the air (OTA) broadcasting for television reception, so initially many thousands of viewers had little choice in what channels they could watch. Because cable systems in the New York area get their programming via fiber or satellite feeds, those systems continued.

Returning to the air

Within hours of the attack, broadcasters and potential vendors were discussing recovery. With support from a variety of manufacturers, available transmitters were soon identified by Harris, LARCAN, EMCEE and Thales Broadcast & Multimedia (formerly Thomcast). Dielctric, Andrew and RFS began working on transmission line and antennas.

The plans were fairly straightforward — get back on the air as soon as possible, with whatever power was available, from any location. The final location selected by several stations as their new site turned out to be one quite significant in broadcast history. The selected location, just west of New York City in New Jersey, was the original site of Major Edwin H. Armstrong's laboratory and first transmission site. His laboratories and a tower remain there today. (See photos.)

CBS fared best among the New York broadcasters. With a working backup on the Empire State Building, WCBS is now back at full power in NTSC, as well as DTV.

LARCAN shipped a 6kW transmitter to WNBC-TV. Initially, there were some issues with the shipment of the LARCAN transmitters across the Canadian/U.S. border, but after a thorough inspection by customs and the FBI, the equipment was allowed to enter the U.S. and headed for New York. WNBC-TV also took delivery of a 20kW Harris transmitter in Alpine, NJ.

Dielctric shipped antennas, feeders and accessories to WCBS-TV2, WNYW-TV5, WABC-TV7, WWOR-TV9, WPIX-TV11, WNET-TV13, WPXN-TV31 and WNJU-TV47.



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Andrew Corp. supplied Heliac cable to broadcasters at the emergency New Jersey broadcast site. They also supplied a standby broadcast antenna and transmission line to the Telemundo station in New York. According to Andrew representative Greta Brown, Andrew also supplied two diplexers and low pass filters to Harris for use on channels 4 and 11.

Harris shipped new transmitters for WABC-TV, WNBC-TV, WNYW-TV and WWOR-TV on Sept. 11. WNYW-TV

(FOX) is now back on the air from the Empire State Building with a 20kW Harris transmitter. A transmitter for WPIX was shipped on Sept. 12, and a new transmitter for WCBS is currently being built.

Thales also delivered a 100kW transmitter to Pax's WPXN-TV (Channel



The Armstrong tower resembles more of an electrical power transmission tower than a broadcast one. The three horizontal arms were made for difficult broadcast antenna installations. The tower had been used primarily for two-way, land-mobile and cellular antennas.

31) in West Orange, NJ. In the interim, several LPTV stations in East Orange, NJ, and Amityville, Long Island, NY, are carrying the station's signal. Thales delivered another 100kW transmitter to WNJU-TV, who will be joining the others at the Alpine, NJ, site. WNJU-TV (Telemundo) called

EMCEE looking for a UHF transmitter. The manufacturer had a portable 1kW broadband unit in nearby Harrisburg, PA, and it was quickly sent to the station for temporary use.

Harris Broadcast, LARCAN and Thales Broadcast &

Multimedia also redirected transmitters destined for other customers.

WABC-TV will install a 2kW transmitter in Alpine, NJ. The station returned to the air on Sept. 15 using a temporary panel antenna.

WWOR-TV plans to resume operations from the Empire State Building soon. They took delivery of a LARCAN 3kW transmitter and a 2kW Harris, while Tribune's WPIX-TV has opted to use a 10kW Harris in Alpine, NJ.

Everett Helm, director of RF engineering for

Oregon Public Broadcasting (Portland, OR) said he'd been asked to ship a 10kW Thomcast loaner transmitter directly to WNET at the Alpine site. WNET was back with a temporary system using a 1kW LARCAN by Sept. 13.

"The cooperation from broadcasters across the country, manufacturers and vendors has been outstanding," said Frank Graybill of WNET-TV.

He said that an engineer in a pickup truck drove up with a load of Heliac transmission line on Sept. 12, and told him to "use what you need." If that wasn't enough, Graybill said he was surprised and pleased when he was able to get an antenna the same day from MYAT in Norwood, NJ.

Initially, there were problems obtaining local property variances for the Alpine, NJ, site. Also, because the Alpine site is some 500 feet lower than

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Lest we forget

Several broadcast engineers were working on WTC-1 when it fell. While they are still officially classified as missing, all readers share a common concern. For the most current information, please visit the New York City SBE Chapter's website: www.broadcast.net/~sbe15. You will also find information on how to donate to the Broadcast Engineer's Relief Fund that has been established to help the families of those engineers who may have died in the tragedy. ■



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WTC-1, few stations were prepared for the drastic changes in their coverage areas. Some stations have since decided to install translators that will help fill coverage gaps in key areas.

STL feeds

New STLs and, in some cases, TSLs, had to be established for the stations at their new sites. Nucomm is located less than an hour away from New York and was able to provide emergency equipment quickly. Nucomm's president, Dr. John Payne said they received a call on Sept. 11 from WABC-TV to provide an STL from their studio facilities at Lincoln Square to the new transmitter site in Alpine, NJ. "We sent an engineer with the equipment to assist the ABC engineers and had the link up and running by midday Wednesday, Sept. 12," Payne said. Nucomm also provided microwave relay links for New York One, Time Warner Cable's 24-hour news channel,



The evidence of low-power radio usage on the tower is evidenced by more than a hundred separate coax runs, as shown above.

and ENG systems for WNJU-TV and WNET-TV.

Microwave Radio Communications (MRC) provided STL links for WPIX-TV and WCBS-TV. They are also supplying two-way STLs and TSLs for WWOR-TV and WNYW.

The long haul

Irrespective of the equipment and location, the sites where everything is

being installed are only temporary. The Empire State Building site does not have the infrastructure to handle all the increased demand.

The next step is for all the affected stations to turn their low-power emergency installations into full-power transmission facilities that can be used for several years. Despite all the talk of rebuilding the Trade Center towers, any reconstruction wouldn't be for many years. That means the Empire State Building

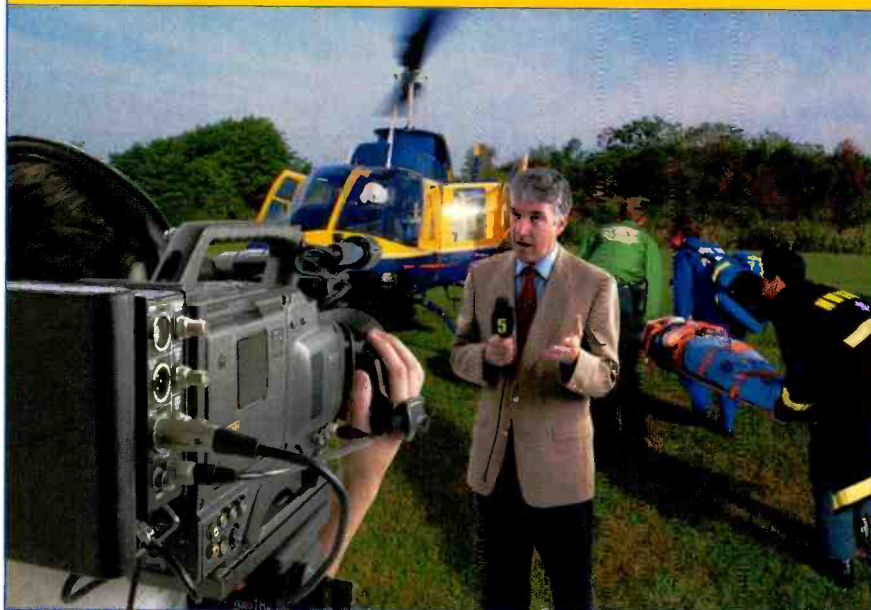
and the Alpine tower are likely to remain the area's primary TV sites for a while.

A long-term solution will be years in the making, but one benefit of the delay is likely to be a better mix of backup sites with new technology and better coverage for New York viewers.



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Multiple ownership and DBS must-carry rules challenged

BY HARRY C. MARTIN

In separate appeals pending in the U.S. Court of Appeals for the D.C. Circuit, broadcasters are challenging the 35 percent nationwide population coverage cap and the requirement that eight independently owned TV stations remain in a market after a TV duopoly is created. In the Fourth Circuit Court in Richmond, VA, DirecTV, EchoStar and the DBS trade association are challenging the FCC's must-carry rules for DBS operators.

The attack on the 35 percent cap is being brought by Fox TV, which wants to hold on to as many as possible of the Chris Craft TV stations it recently purchased (see below). The FCC temporarily waived the 35 percent cap in connection with approving the Fox/Chris Craft merger. The FCC is independently looking into relaxing or eliminating the rule. However, FCC Chairman Powell recently assured Senate Commerce Committee Chairman Ernest Hollings (D-SC) that the agency will take no action until the court renders its decision.

The eight-station test for TV duopoly is being attacked in court by Sinclair Broadcasting. Sinclair's brief argues that the Commission, in adopting the eight-station test, did not adequately explain how that number fits all markets, why daily newspapers, cable and the Internet were not factored in as "voices" for duopoly purposes and, generally, why the agency did not explain how it determined that eight

rather than some other number should be the cutoff for purposes of assessing diversity.

The DBS must-carry challenge involves rules that require satellite operators to provide all local stations to subscribers in markets where any of the local signals are provided. The satellite companies are arguing that must-carry rules limit the types of programming that can be offered on DBS, thereby infringing their first amendment rights and harming the ability of DBS to compete with cable. On the other hand, local broadcasters are concerned that, without local must-carry, their signals will not be seen by the increasing numbers of viewers in their markets who are subscribing to DBS. Arguments in all three of these cases will be heard during the next few months, with decisions expected next year.

LMA ban stayed

A U.S. Court of Appeals for the D.C. Circuit issued a temporary stay of the FCC requirement that broadcasters cease programming television stations under local marketing agreements (LMAs) in markets where they own television stations.

In 1999, the FCC grandfathered, until Aug. 6, 2001, existing LMAs signed after Nov. 5, 1996, but which were prohibited under new duopoly rules adopted at the same time. It grandfathered until 2004 prohibited LMAs signed before Nov. 5, 1996. Once the grandfathering date passes, the LMA programming arrangements must terminate.

A television broadcaster appealed the new TV duopoly and LMA rules to the U.S. Court of Appeals for the D.C. Circuit, arguing that the FCC did not legally justify the new LMA restrictions. The appeal remains pending and is scheduled for oral argument in January. Meanwhile, the Court granted a stay of the rule, finding that the broadcaster had proven that it had a reasonable likelihood of winning the appeal

and would suffer permanent harm if its LMAs were terminated before the Court acted. Other LMA operators have since sought similar relief from the FCC.

Fox/Chris Craft merger

The FCC recently approved the application of Fox Television Stations to acquire the 10 television stations held by Chris Craft Industries and its subsidiaries. The approval was granted with conditions requiring the license to comply with FCC rules on television duopolies, the 35 percent national audience cap and newspaper/broadcast cross-ownership. The transaction will result in duopolies in New York, Los Angeles, Phoenix and Salt Lake City. All but the Salt Lake City duopolies comply with the Commission's rules. Fox has six months to divest itself of one of its Salt Lake City stations.

Fox already has a waiver of the television/newspaper cross-ownership rule permitting it to own the New York Post and Station WNYW(TV), New York. As a result of the Chris Craft transaction, Fox will acquire a second New York station, WWOR(TV). The Commission gave Fox 24 months to come into compliance with the waiver's one newspaper/one television station ownership limit.

In approving the merger, the FCC's new Republican majority departed from the practice followed by the Kennard Commission of seeking an independent public interest rationale for approving media mergers. Chairman Powell, along with fellow Republican Commissioners Kathleen Abernathy and Kevin Martin went no further on this score than to insure the merger was consistent with existing rules and waiver policies. ■

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

Dateline

TV stations in the following states must file their biennial ownership reports on or before Dec. 3, 2001: Alabama, Colorado, Connecticut, Georgia, Maine, Massachusetts, Minnesota, Montana, New Hampshire, North Dakota, Rhode Island, South Dakota and Vermont.



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Conditional access

BY MARK MASSEY

Conditional access (CA) is a service that allows broadcasters to restrict certain programming products to certain viewers. The CA does this by encrypting the broadcaster's programs. Consequently, the programs must be decrypted at the receiving end before they can be decoded for viewing.

CA offers capabilities such as pay-per-view (PPV), interactive features such as video-on-demand (VOD) and games, the ability to restrict access to certain material (adult movies, for example) and the ability to direct messages to specific set-top boxes (perhaps based on geographic region).

Digital broadcast data

To understand how CA is used, we first need to look at the data it encrypts. Each individual program that a broadcaster provides is composed of many elements, such as video, audio and text. In digital television, these elements are converted into digital form using the MPEG-2 codec. The MPEG-2 data associated with each program are broken up into many packets, and the sum total of these packets for each program is called the program elementary stream (PES). The PES for each program is then multiplexed together with those of other programs. This stream of multiplexed programs is then broken up into 188-byte packets for transmission, at which point

it is called the digital video broadcast (DVB) MPEG-2 transport stream (TS). The CA service can scramble the programming data either at the PES level or the TS level. (For digital terrestrial TV, however, the ATSC specifies that scrambling must take place at the TS level.)

The set-top box

At the receiving end, it is the job of the set-top box (STB) to descramble

All packets with PID value hex 1 have not been encrypted and are used by the demux processor to construct the conditional access table (CAT). This table identifies all the PID values of the transport packets containing the entitlement management messages (EMMs). The demux processor also constructs the program map table (PMT) from non-encrypted packets and gives the PID

The CA service can scramble the programming data either at the PES level or the TS level.

the CA encryption and decode the MPEG-2 data for viewing. Figure 1 is a block diagram of a typical set-top box. The main areas of the STB that are involved with conditional access are shown in yellow. The block labeled CA might be a dedicated, embedded CA module, or it might be one of the standard descramblers.

The tuner portion of the STB receives the incoming signal, demodulates it and sends the resulting data to the transport stream generator. This part of the STB reconstitutes the transport stream, which contains many packets of information. Each packet has associated with it (in its header) a program identifier (PID).

values of all the transport streams associated with a particular program. Private data associated with the program can also be included in this table – for example, the PID value of the packet containing the entitlement control message (ECM). The data contained in these two messages (the EMM and the ECM) are vital in descrambling the encrypted programming material.

Figure 2 shows a DVB descrambling system. However, it should be noted that the standards don't specify the smart-card electronics or algorithms. Therefore, the system described here is a typical example. The EMM acquired by the demux processor is related to the authorization of services. It allows a particular set-top box, or a particular geographic region, to access services. It contains the encrypted service key. Typically, this key is changed every few months to discourage hackers. The encrypted multi-session key, carried by the ECM, is related to particular programming material. This key, once decrypted, actually becomes the control word that is fed into the DVB descrambler, allowing the transport stream to be descrambled so that the

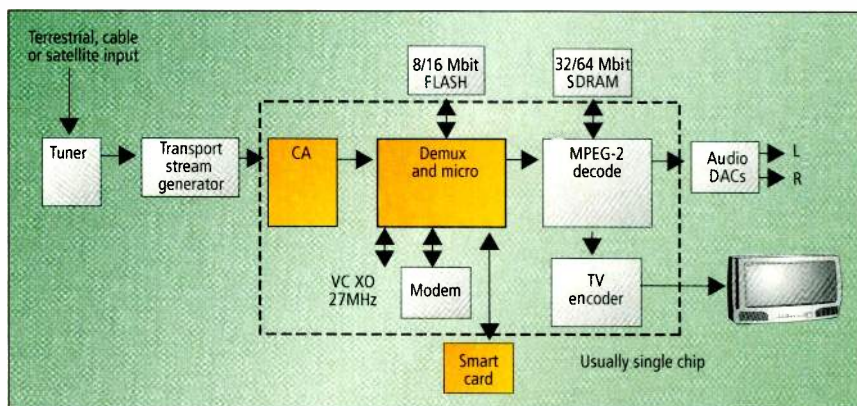
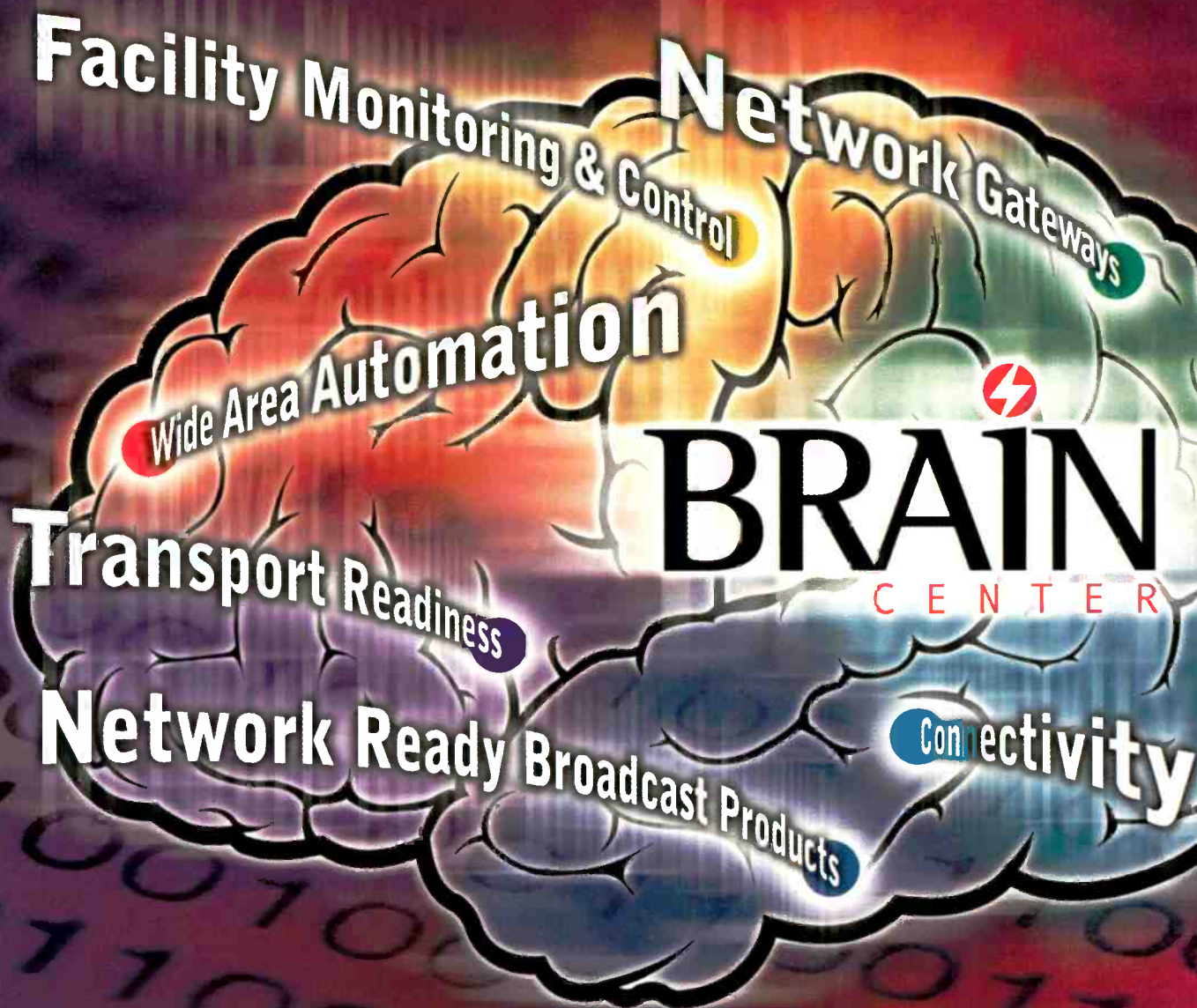


Figure 1. In this block diagram of a typical set-top box, the main areas of the STB that are involved with conditional access are shown in yellow.

continued on page 33

Centralization



Make the most
of your resources

**With The Power of
The B.R.A.I.N... pg 2**

- **Top 10** things to consider when making decisions about Consolidated Operations
- The Consolidated Operations **Vocabulary**

Consolidated Television Operations—

Television's conversion from analog to digital technology offers broadcasters far more than the ability to offer HDTV programs and generate new sources of revenue through multi-channel operation and dynamic new data services.

Indeed, digital technology—combined with advances in network interconnectivity that remove traditional barriers of time and distance—has unleashed the potential for unprecedented efficiency and resource maximization through consolidated broadcast operations.

Interest in centralization has been fueled by on-going ownership consolidation in the television industry. Today about 80 U.S. television station groups own nearly 1,000 stations. Not surprisingly, groups have a vested interest in identifying and adopting approaches that allow them to achieve the best possible economy of scale throughout their operations.

Consolidating broadcast operations is gaining popularity because it gives broadcasters the potential to:

- Withstand the shortage in the number of qualified station engineers and technicians throughout the industry;
- Leverage valuable station assets, including talent, equipment and systems, and media content, throughout the group;
- Initiate multi-channel operation and other new revenue-generating data services without significant – or, in some cases, *any* – increases in labor requirements and costs;
- Enhance the service and “on-air” production quality in stations with fewer resources – for example, smaller-market stations—by pooling talent, and
- Reduce capital expenditures related to DTV conversion.

The Key to Unprecedented Efficiency And Group Resource Maximization

Can Consolidated Operations Be Implemented Without Losing Local Identity?

One of the most frequently voiced concerns by groups considering consolidated operations is that centralization will be the death-knell for the local brand identity of participating stations. This concern is valid since localism is a key revenue driver for most stations.

The loss of local brand identity does not have to be the case – no more than it's been the case with radio stations that operate in one facility and share remote broadcast equipment but maintain their independent identities with separate on-air studios, program directors, sales staffs, and marketing functions.

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HARRIS

The point of consolidated operations is to realize the highest possible economy of scale. This is achieved by combining duplicated processes and increasing the accessibility of assets — be they talent, equipment and systems or media content — through systems that enable resource sharing.

Effective consolidation should actually improve and enhance the local brand identity of *every* participating station – especially stations with the fewest resources, not crush it. In fact, consolidation will allow individual stations to devote more of their resources to building their local identity by freeing them from redundant processes that do not add value to their local brand.

Consolidated Operations – Established and Proven

Although interest in consolidated operations is only now gaining momentum in television, the approach is well established in other industries and in other areas of broadcasting.

Widespread radio consolidation started five years ago; cable operations have long supported multiple channels from a common operational pod, and state public broadcast networks have increasingly centralized operations.

At its highest level, the concept of consolidation is very simple: a central “hub” is equipped and staffed to perform designated functions for two or more stations. Exactly *what* those functions are is defined by the business objectives of the consolidating group. Determining what those business objectives are is the key to understanding how to consolidate operations in the manner that will best maximize the group's return on investment.

While each consolidated operation will have its unique business objectives, one thing is clear: every consolidated operation will share one overarching goal—to maximize the value of resources. This goal is accomplished through the *intelligent* use of technology in interconnected systems.

Introducing the Harris B.R.A.I.N. Center – A Complete Solution for Consolidated Television Operations

Building on its leadership in automated multi-channel systems for radio, cable and state public broadcast networks, Harris has developed a complete solution for consolidated television operations. The Harris solution is called the **B.R.A.I.N** (Broadcast Resource Asset & Information Network) Center.



The Harris **B.R.A.I.N.** Center brings together all of the technologies and the full range of systems consulting, design and integration services that are needed to *intelligently* consolidate television operations.

The Harris **B.R.A.I.N.** Center provides a realistic and cost-effective way for broadcasters to consolidate operations through centralized facilities, management, and networks. As the expert in centralization, Harris offers customers processes and products that enable them to systematically transition their stations to operate efficiently with one or multiple “centers” — the **B.R.A.I.N.s** — managing resources, assets, or information. The **B.R.A.I.N.** Center not only has the potential for substantial cost savings over time, but it also increases station revenue by maximizing resource allocation and management.

The **B.R.A.I.N.** Center draws upon the full portfolio of Harris solutions, ranging from transmission, DTV systems, automation, and connectivity products. As the only manufacturer able to provide a true turnkey—yet open—system, Harris is poised to lead the industry in television centralization efforts, as it has in radio.

At the heart of the Harris **B.R.A.I.N.** Center is a series of scalable and customizable models for consolidated operation — each developed to respond to a particular set of operational circumstances and conditions. The Harris approach allows features and capabilities from *any* of the models to be seamlessly mixed and matched to meet the precise requirements of a group’s particular business objectives.

Beyond providing all required technical components and systems, Harris offers complete systems services to assist you at every stage of planning and implementation.

Through three different offerings, Harris works directly with station groups, regional clusters, or individual stations with multiple facilities to determine requirements (Analyze), create operational roadmaps to transition to centralization operations (Visualize), and implement these plans as an experienced systems integrator (Actualize).

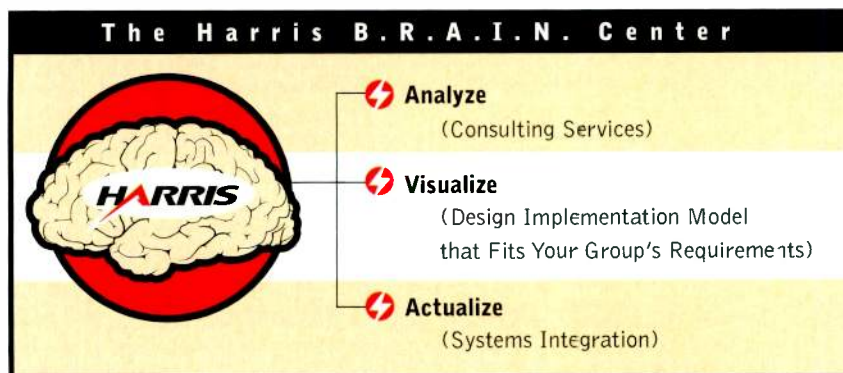
Harris also offers unrivaled training and long-term support.

Getting Started

There’s no question that consolidated operations offer enormous potential for every television broadcast group, but how can you move ahead?

1. Review the list of **Top 10 Things to Consider when Making Decisions about Consolidated Operation**. Harris has developed these questions as a starting point that will help you understand your full range of possibilities and the enormous potential centralization can provide.
2. Become familiar with enabling technologies that support consolidated operations. A comprehensive **B.R.A.I.N.** Center map is included in this insert, and covers the key enabling technologies that will provide the technical foundation of your system.
3. Phone Harris to arrange a preliminary meeting. Again, keep in mind that our team is available to work with you at every stage of your project, from planning and design to integration, training and long-term support.

Please phone Tom Deyo, Director of TV Sales, at 1-513-459-3408 to learn how you can put our **B.R.A.I.N.** power at the center of your operations. ⚡



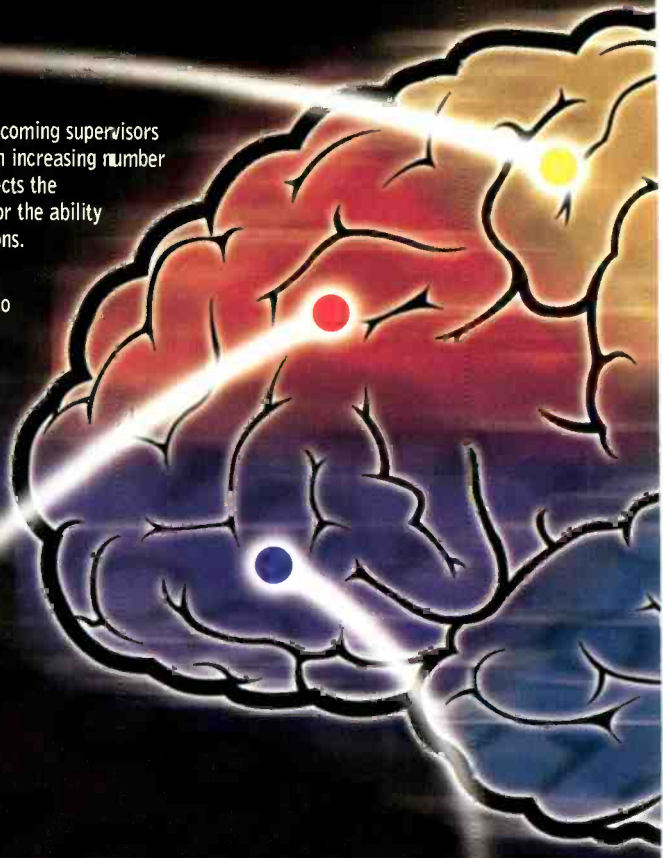
Facility Monitoring & Control

With the increased use of automation and servers, master control operators are really becoming supervisors who monitor the operation of high-reliability systems. To enable supervisors to monitor an increasing number of channels, an intelligent system that collects status and alerts from subsystems and directs the supervisor's attention to a possible problem is required. Such a system gives the supervisor the ability to manage by exception – essential for the effective monitoring of multi-channel operations.

The **Harris Broadcast Manager (HBM)** system will detect problems and, according to pre-defined scripts, place the necessary monitoring and control in front of the supervisor to handle problems. HBM monitors every aspect of the broadcast facility, technical plant and communication networks. This includes facility systems such as security, fire, HVAC, power and access control as well as transmitter sites and microwave relay points. Within the broadcast technical plant, HBM can monitor status, provide configuration control and archive events and information relevant to analyzing the individual and overall operational condition of the broadcast systems.

Based on client-server architecture and the ability to have a distributed system over LAN and WAN connectivity, facility monitoring and control systems like the Harris Broadcast Manager allow consolidated operations yet offer the ability to take advantage of engineering talent distributed over multiple stations. It can help with the shortage of qualified technical engineers, and its graphical user interface is easy to configure and operate.

Harris NetBoss™ technology, which has provided reliable network-based monitoring and control in telecom for more than a decade, powers the Harris Broadcast Manager.



Wide Area Automation

Many broadcast groups are planning to consolidate individual TV station operations into regional hub facilities. While sales and news production functions will remain local, "backroom" activities such as content ingest, media storage, and automated play-out can be centralized to eliminate redundant operations. However, there is still a need to provide local stations with the capability to ingest and send some media files to the central storage system, and also to control automation. These factors support the need for distributed automation architecture.

Wide Area Automation is a combination of several specific, enabling technologies and capabilities. Control of devices from remote automation servers using network protocol and communications makes a distributed automation architecture possible. The ability to remotely monitor and control an automation system is another aspect of a distributed architecture. Sharing media assets over a network among multiple locations and being able to transfer the assets to another location further expands the ability to operate stations on a distributed basis.

Harris Automation Solutions offers automation systems with the following features and tools for wide area automation:

- **NDCP** (Network Device Control Protocol) for distributed device control over IP based WAN and LAN systems.
- **Remote Air Client** for the remote control of automation systems.
- **GMT/WAN** for moving media assets over a distributed network of server based storage devices.
- **SNMP Proxy Agent** for complete automation system monitoring.

Connectivity

Digital networks that connect digital broadcast systems usually conform to a standardized telecom architecture. The circuits can be dedicated full-time circuits or switched circuits that are posted when required and taken down when not required. Traditional broadcast circuits are one way, so two circuits are required for two-way connectivity. Telecommunication circuits are full duplex and provide two-way interconnection.

The modern telecommunication network infrastructure has moved to a packetized switched system that uses a fabric of channels to move data from point to point or point to multipoint. This type of networking is based upon the asynchronous transfer method ("ATM") of moving information. Each packet of information is addressed to indicate routing and destination. It is then sent through the fabric of network channels and collected at the other end of the network and reassembled into a continuous stream.

With digital network circuits, multiple signals can easily be combined to carry content in real time—which typically requires more bandwidth—or as file transfers along with control, monitoring, intercom and other interconnect traffic in each direction. Where connection with multiple sites is required, the telecom circuit can be partitioned into virtual channels and mapped to specific locations. The partitioning of the digital circuit can be set up to be available on a continuous basis (Permanent Virtual Circuit "PVC") or switched and established as needed (Switched Virtual Circuit "SVC").

Broadcasters require high reliability and usually want redundant paths for critical circuits. Digital switched networks can be constructed in a ring to provide a high degree of reliability. Another advantage of switched circuits is that automatic rerouting is possible to re-establish service in the event of a circuit failure.

Moving broadcast information between distant points over telecom networks usually involves services from three different carriers. The long distance carrier provides connectivity between cities and terminates its service at a point of presence ("POP") in each city. A local exchange carrier (LEC), also known as the phone company, has traditionally provided "last mile" service from the POP to the broadcast center at each end. More cost-effective interconnection may be offered by competitive local exchange carriers (CLECs), local cable operators or other utilities.



⚡ Network Gateways

Transporting program audio, video and data content over digital telecom networks requires translation of broadcast streams into compatible formats used in the telecom world. Multiple signals have to be aggregated to fill the available network bandwidth; signal formats must be changed; and, in some cases, network signaling and error correction must be added to facilitate reliable network access. At the other end of the transport network, the same process must be performed in reverse. The network gateway, which is sometimes called the network interface device or "NID," performs these functions at both ends of the network.

Modern digital transport networks employ various transport protocols such as ATM and IP. Networks commonly used to transport digital broadcast signals vary in capacity from very low bandwidth T-1 (1.54Mbps) to very high bandwidth OC-3 (155Mbps) circuits. They also vary from dedicated point-to-point circuits to switched virtual circuits and point-to-multipoint transmissions. The network gateway must be able to adapt to the varying needs of modern network connectivity requirements.

Harris offers network gateway products for both ATM and IP based connectivity over a variety of network architectures ranging from T-1 up to OC-3. Products include:

- **LinkPlus™ TXA**, an ATM network gateway that supports connectivity to E-3 through OC-3 networks. The unit can interface and multiplex up to 4 transport streams along with 10/100 base T Ethernet connectivity into a single network connection.
- **LinkPlus™ VIP**, which offers the same capabilities as LinkPlus TXA except that it is designed to support IP based networks.
- **FlexiCoder™** family of MPEG encoders and decoders, which has a series of network interface cards available that support ATM network connectivity at rates up to OC-3.
- **Intraplex** family of network access products for digital transport of program audio, voice and data over E1 and T1 public networks, fiber, and microwave links.

⚡ Network Ready Broadcast Products

The ability to control, monitor and configure broadcast products over local and wide area networks is a basic building block requirement for the development of a distributed broadcast system. Network communications should be capable of operating over conventional IP based networks rather than requiring specialized communications channels.

Network ready communications capability has been incorporated into a wide variety of Harris products and is becoming a standard element of all future product design activities. Current Harris Broadcast products that incorporate network ready communications capability include:

- **Harris Sigma CD™** and **Diamond CD™** television transmitters.
- DTV studio products including Harris' **FlexiCoder™** and **UniCoder™** MPEG-2 encoding systems; **PSIPplus™** PSIP management system; **DataPlus™** data encapsulator; **LinkPlus™** network gateway product; **NetPlus™** HD IRD; **MasterPlus™** HD integrated master control system; **RF ViewPlus** 8VSB signal analyzer; **Transport ViewPlus** ATSC transport stream analyzer; and **ARX-H200** and **ARX-H300** ATSC professional receivers.
- Harris Automation Solutions, in its industry-leading activities to pave the way for wide area automation, has developed **Network Device Control Protocol (NDCP)**. NDCP enables Harris automation systems to control a vast array of industry devices over IP-based networks. In addition, Harris Automation Solutions' **Remote Air Client**, **GMT/WAN** and **SNMP Proxy Agent** are network ready and part of Harris' expanding portfolio of wide area automation solutions.
- IP network connectivity is at the very heart of **Harris Broadcast Manager**.
- In addition to Harris products designed with network connectivity, our Systems Integration team has been using many **OEM products** in the design and construction of modern digital broadcast facilities.

⚡ Transport Readiness

Moving audio and video assets across digital networks requires that content is compressed and packetized to fit into standardized signal transport formats. MPEG-2 compression is the most widely used format for converting wideband content to transport readiness. Not only is MPEG-2 encoding the key to moving content across networks, but it is also the standard for distribution that is central to digital television (DTV). All DTV formats use program content that has been compressed and multiplexed into a standardized transport stream for final transmission.

Harris offers:

- On the sending end of the link, **Harris FlexiCoder™** MPEG encoding systems for ATSC transport encoding and high quality signal contribution and distribution applications in both standard and high definition.
- **Q-Dec**, **NetDec**, **NetPlus™** and **LinkPlus™** MPEG decoding products which complete the contribution or distribution solution by providing MPEG decoding at the other end of the link.

Harris has developed these questions to help you begin defining your requirements for consolidated operation. As the first part of the planning process, you may want to assemble a team of business and technical managers who can work together to assess your full opportunities for resource maximization. As you begin laying the foundation for your consolidation business objectives, you will undoubtedly discover other areas of potential that you'll want to address.

1. What stations do you anticipate consolidating and where are they located in relationship to each other?

Discussion: Clearly this is the starting point for centralization. While it is possible to consolidate every station within a group, groups with many stations or with stations located throughout a large geographic region will typically establish station "clusters." Time zones or regions in which stations are located may suggest natural groupings for consolidation.

2. What commonalities do these stations share?

Discussion: When defining how to implement consolidation across your stations, start with the most obvious. This should help identify where automatic cost savings can be anticipated. Some areas to address include:

- Programming:
 - Network affiliations
 - Syndicated programming
- Systems, for example:
 - Technical: Servers, automation, traffic systems
 - Business: Billing, graphics, budget

3. What legacy technical systems need to be included in your consolidation plan?

Discussion: Certainly not everything can be updated immediately. Where are systems in your operation that are integrated so completely that it would increase the cost of your consolidation efforts to replace them?

4. What operational processes are duplicated across the group?

Discussion: Many stations use similar processes, including syndicated program ingest, regional and national spot ingest, program promo creation, etc. Determining what similar or duplicated processes exist can create a starting point for consolidation.

5. What operational functions would be improved by being centralized, and what functions should remain within the individual stations?

Discussion: It's important to recognize that while there are substantial benefits to consolidation, not every function should be consolidated. Consider the following functions (and others) to determine whether you would be better served by leaving them at the individual stations or by aggregating them:

- Traffic-to-"on-air" operational interface
- Promo spot creation
- Transmitter management
- Monitoring of other technical systems
- Facility monitoring
- News
- Local spot inges
- Other

TOP 10

Things to Consider When Making Decisions about Consolidated Operations

6. What staff expertise and talent exists that, if shared across the group, would improve overall group performance?

Discussion: Reviewing key areas of expertise with an eye to centralization can help to determine opportunities to pool resources and leverage expertise—important aspects of resource maximization. Keep in mind that this could require new training for your staff. Some traditional talent "pockets" may include:

- Promo production
- Transmitter management
- Technical knowledge of key systems such as servers
- Other:

7. What impact will DTV and possible multi-channel operation have on your staff and facility requirements?

Discussion: When planning for DTV and consolidation, it is important to consider long-term opportunities as well as short-term goals. In many cases, DTV operations will include a separate HD service and possible multi-channel operations. Even if your group won't offer multi-channel service immediately, it should be considered in your consolidation plans. With proper forethought, systems can be designed to allow you to initiate HD and multi-channel operation with no—or minimal—incremental operational costs.

8. What long-term digital storage requirements do you anticipate to support the group and individual stations?

Discussion: In an analog world, television media assets traditionally have been stored in the form of videotapes on a shelf. With television's conversion to digital technology, media assets no longer will be physical. While servers already provide short-term media shortage and real-time retrieval capability, there is a growing need by some television operations for long-term storage solutions. Your anticipated archiving needs should be considered as a part of the planning process.

9. What connectivity options are available?

Discussion: Centralization requires connectivity—but at many different levels. After determining processes that can be consolidated, review the many ways they can be interconnected, including:

- Digital microwave
- Private fiber
- Competitive Local Exchange Carriers (CLECs)
- Other:

10. What considerations are necessary to incorporate the proper level of reliability into the system?

Discussion: Once a group or a cluster of stations has centralized, it's essential to determine the best way to create a system that reduces your risk. It is critical to your success to incorporate key recovery plans, including redundancy, disaster management, or the ability to revert to independent station operation. ⚡

HARRIS

the vocabulary of Consolidated Operations

ATM

Asynchronous Transfer Mode is a data transmission scheme using self-routing packets of data. ATM is commonly utilized in telecommunications networks to carry both compressed and non-compressed data over a very flexible network infrastructure.

ATSC

Advanced Television Systems Committee, the group that standardized the digital television system utilized in the U.S. DTV is often referred to as ATSC.

Bandwidth

The information-carrying capability of a channel of communications. In both broadcast and telecommunications applications, the bandwidth is usually limited by the standards to which the channel has been designed. Bandwidth is typically stated in the amount of data per second that the channel is capable of transmitting.

Connectivity

The electronic channel or pipe that is used to connect stations in a group or cluster within a consolidated operation. Typically the connectivity comes from telecommunications service providers using standardized types of channels. Connectivity might also include private microwave, satellite, fiber and even laser transmission methods.

Demultiplexing

Separating elementary streams or individual channels of information from a single multiplexed channel of information that has been transmitted over a network.

Digital Archive

A method of long-term storage of media content that has been compressed to a file format compatible with video server systems.

FTP

File Transfer Protocol is a standardized method of moving data files over a network where bandwidth limitations and signal impairments are monitored and corrected for during transmission of the data. FTP methods are commonly used to move media asset files from one video server to another.

Global Media Transfer (GMT)

A collection of tools for managing the automatic transfer of media between storage and playback devices. For instance, GMT can automatically retrieve media from a local digital archive or across a WAN from another facility.

Latency

The factor of time delay experienced from the processes of encoding, transmission and decoding.

Media Asset Management

A database system that provides a means to catalog and store media assets so they can be located and retrieved as necessary. The Media Asset Management system includes technologies such as automatic scene recognition, voice recognition as well as other cataloguing tools to create a database that includes full text descriptions, keywords, thumbnail pictures, or low-resolution versions of clips to support browsing.

Metadata

Commonly referred to as "the data about the data," metadata is information such as house ID, title, duration, creation date, purge date, author, etc. that describes the associated media content.

MXF

Material Exchange Format is a proposed standard for the exchange of MPEG-2 media files including content related metadata. Implementation of MXF will make possible the exchange of media content files between video servers — regardless of manufacturer (assuming that all systems comply with MXF).

MPEG-2

A form of digital video compression used in digital broadcast television transmission, station interconnection, recording on video servers and archive systems. The name MPEG is an acronym for Moving Picture Experts Group. It is an open standard that defines a set of tools for compression of moving images.

Multiplexing

Combining elementary streams or individual channels of information into a single channel of information for transmission over a network or broadcast over DTV.

NDCP

Network Device Control Protocol (NDCP) is a protocol for controlling broadcast devices across a TCP/IP network. Device control across a Wide Area Network (WAN) is essential for implementing consolidation plans. Originated by Harris and rapidly gaining acceptance throughout the industry, NDCP replaces the protocols that were based on RS-422 serial control.

SNMP

Simple Network Management Protocol is a standardized method of providing status information about a piece of equipment in a system to a networked monitoring center.

Streaming

The continuous output of compressed digital media designed to be received in real time at the other end of a network. Typically, streaming is used as a method of monitoring the transmissions of a remote broadcast facility using narrow bandwidth channels for connectivity.

TCP/IP

Transmission Control Protocol/Internet Protocol is the most widely used protocol of both private local networks and the Internet. Systems communicating with TCP/IP can operate seamlessly with existing networks and leverage the most recent advances in network communication technology.

Transport Stream

The encoded program output stream containing compressed digital audio and video ready for transmission over a network or via a DTV transmitter.

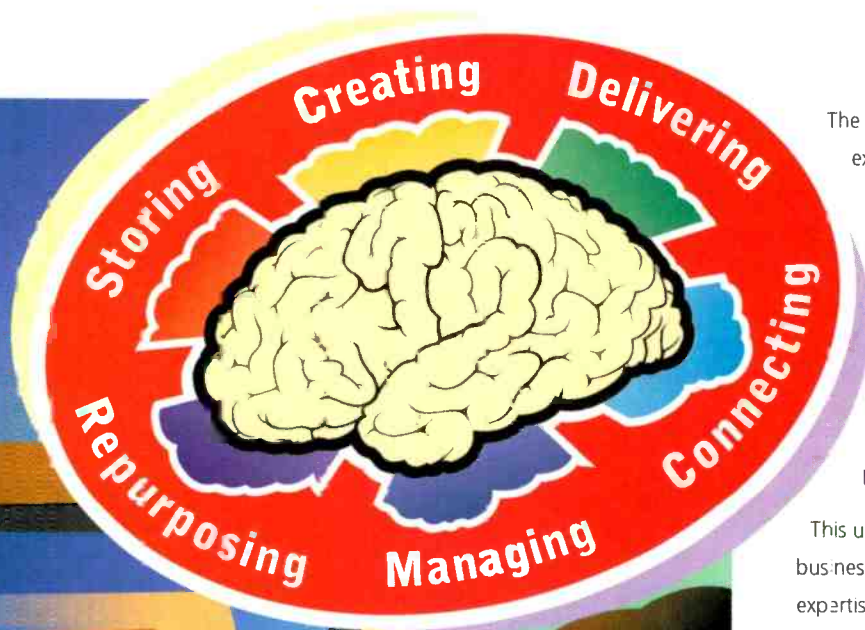
UMID

Universal Media Identification is a SMPTE standard for media identification that enables local facilities to generate unique identifiers for media that can be used globally.

Wide Area Automation

Pioneered by Harris, Wide Area Automation is the application of new technologies, such as NDCP, to support control of broadcast devices and supervision of automation systems across Wide Area Networks.

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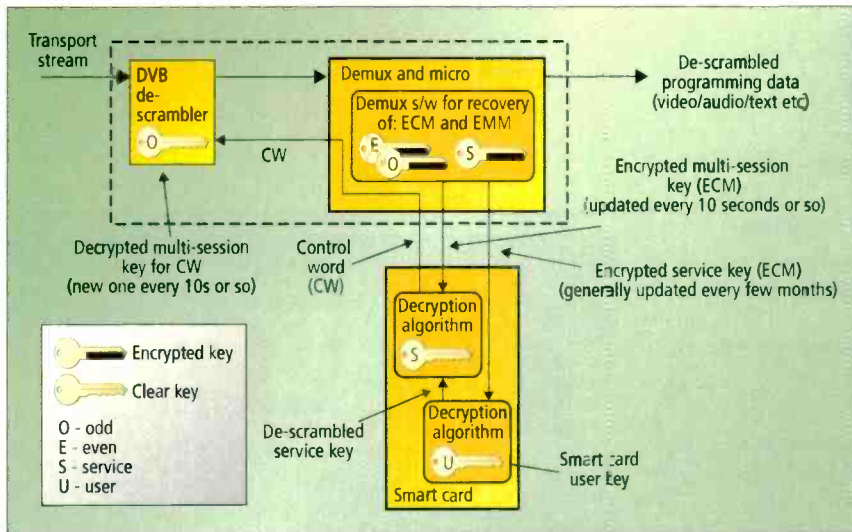


Figure 2. This block diagram shows a DVB descrambling system.

viewer can see a particular program or view the programming material for a particular session. As Figure 2 shows, the service key (EMM) is sent to the smart card, where it is decrypted with the help of the user key held inside the smart card. The descrambled service key is then used as the key to descramble the session key (ECM). This descrambling yields the control word (CW). It is this CW

that is the key to the DVB transport-stream descrambler.

Middleware

With features such as video-on-demand (VOD) and games, the operating systems or middleware selected are important to the overall functionality of the system. The two main middleware programs being used today are OpenTV (originally

developed by Sun Microsystems and Thomson MultiMedia) and Media Highways.

The future-proof promise

With the incorporation of the middleware, the overall solution came with the promise of being future-proof. This means that as more features become available on the STB silicon, the STB manufacturer need not change his software. New middleware software versions are generally needed to take advantage of the new features, but these operating systems or middleware are interpreted script languages. Alternative solutions, available from smaller, independent software houses, offer cheaper, more-efficient options. ■

Mark Massel works for STMicroelectronics in technical marketing and is author of "Digital television, DVE-T COFDM and ATSC 8-VSB," available either at www.digitalTVbooks.com or from Amazon.com.

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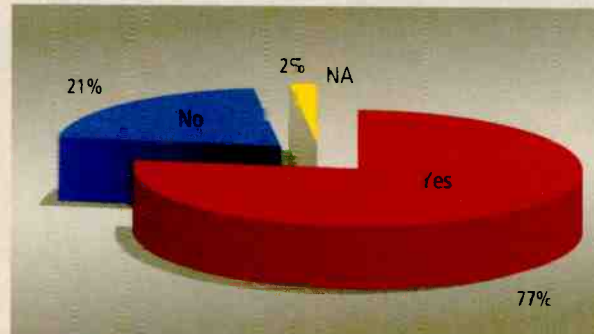
By the Numbers

BY BRAD DICK, EDITORIAL DIRECTOR

In part V of our series on the industry's building plans, we focus on RF systems. Specifically we'll look at key issues related to the purchase and scheduled implementation of DTV.

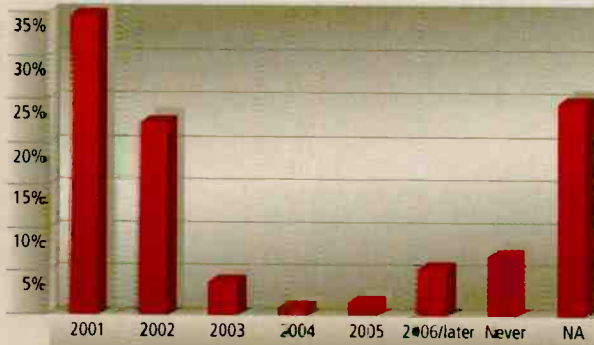
Will you meet the DTV deadline?

Television station respondents were asked if their facility would meet the FCC timetable for providing an on-air DTV signal. That's May 2002 for commercial stations and May 2003 for non-commercial stations. Almost 77 percent said they'd meet the deadline.



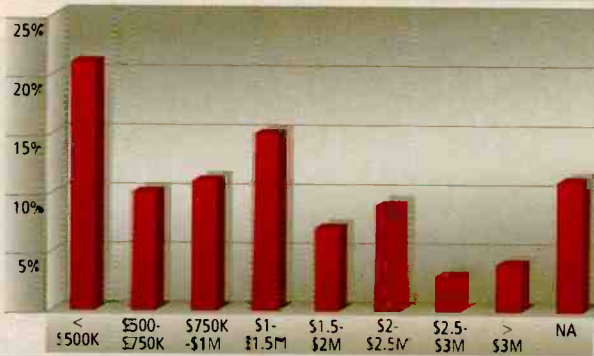
When will you buy?

The same question was then asked in a different way. If you're planning to meet the FCC deadline, then when will you purchase the needed equipment? Almost 35 percent said they have or will make the purchase this year. That's good, given today's market conditions. Another 22 percent planned to buy their DTV RF system next year. However, at this schedule, only 57 percent of all stations would even have equipment purchased by the end of 2002. Another 25 percent apparently don't even know when they'll make the purchase decision. Could they be hoping for a delay?



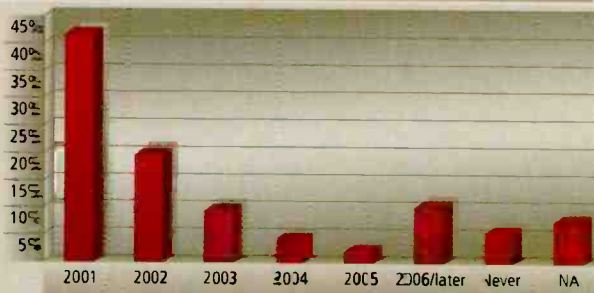
How much will you spend?

Estimated average budget for the DTV RF system is just over one million dollars — \$1,157,813. There's good news in that more than 20 percent said they'd be able to get on the air for less than \$500,000.



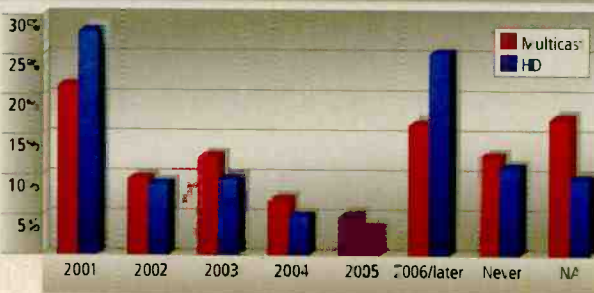
When will you begin DTV transmissions?

The follow-up question was, obviously, when will you be on the air? In question one, 77 percent said they'd meet the FCC's deadline. About 42 percent said they'd be on the air by the end of this year. Another 20 percent said by the end of 2002 and another 10 percent by the end of 2003. This would leave only 30 percent of U.S. stations still not on the air by the end of 2003. That's not bad, and those numbers match nicely with the results from question one.

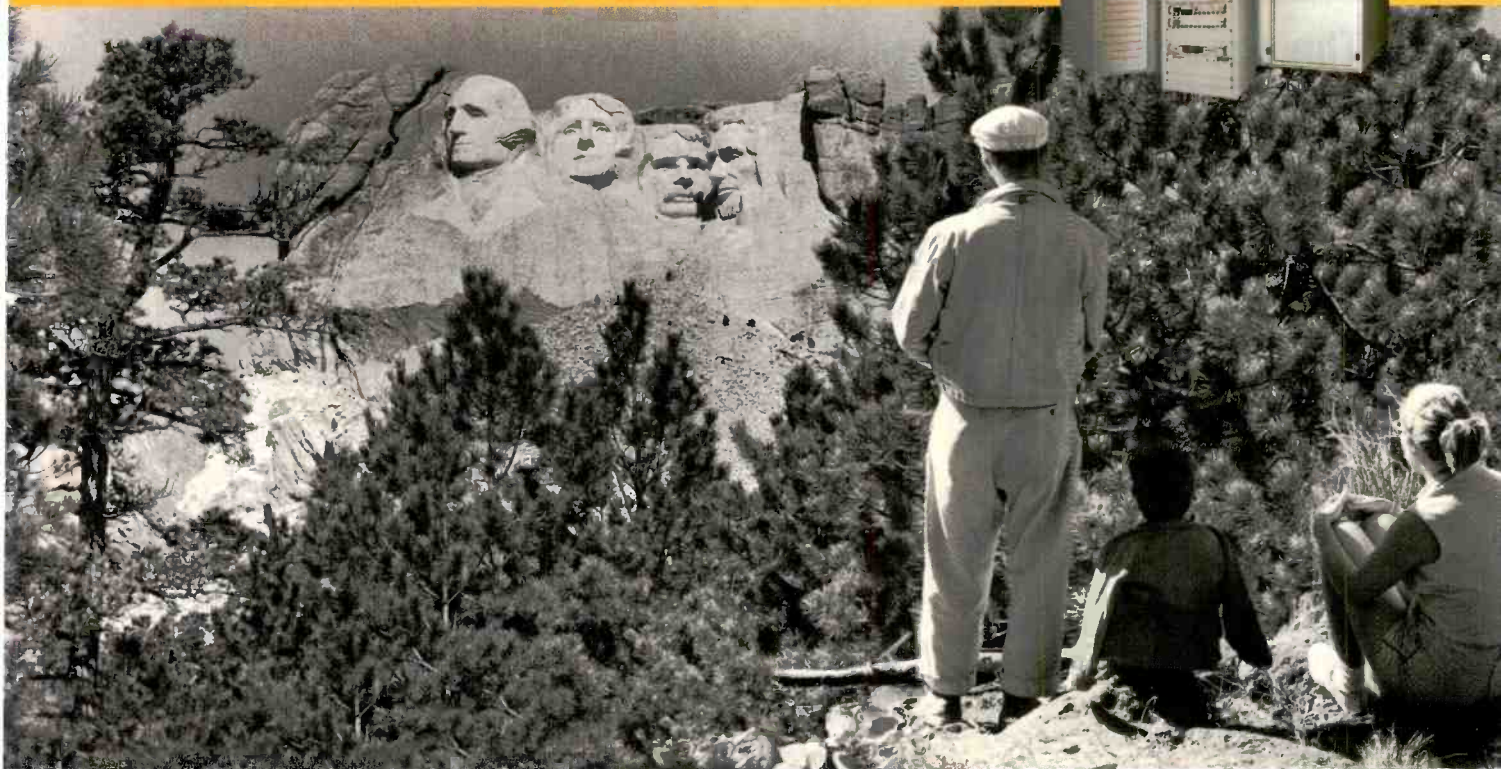


When will you begin HD or multicast?

Two questions related to the type of DTV transmissions planned were asked. Remember that just transmitting a digital signal is sufficient to meet FCC requirements. There is no requirement for either HD or multicast transmissions. The average date for both HD and multicasting transmission is 2006. It's positive to note that almost 30 percent of respondents claim to already be transmitting HD signals.



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Transition to Digital



The need for digital video compression

BY MICHAEL ROBIN

Conventional analog composite systems use video information compression methods by restricting the bandwidth of the baseband luminance and chrominance signals to reflect the eye sensitivity to spatial and temporal picture details as well as using spectrum-saving transmission methods. Analog component video formats use similar baseband spectrum-saving methods but slightly wider bandwidth chrominance signals. The ITU R BT 601 4:2:2 video format specifies a luminance signal bandwidth of 5.75MHz and a chrominance signal bandwidth of 2.75MHz, slightly below the Nyquist frequencies corresponding to the related sampling frequencies but well above any analog composite signals such as NTSC, PAL or SECAM. After digitization, the three component digital signals are time division multiplexed into a 27Mword/s parallel bitstream and subsequently serialized. The serial bit rate equals 270Mb/s for a 10 bit/sample accuracy. While this signal can be comfortably distributed

inside a teleproduction center, the high bit rate is unsuitable for transmission purposes or moderate cost and size digital videotape recorder applications and needs to be reduced. It is therefore necessary to compress the bit rate. Compression is usually affected by removing video signal redundancies.

The video signal redundancies

Redundancy is best described as unnecessary data carried by a video signal. Since these data are unnecessary, removing them will reduce the bit rate without necessarily affecting the picture.

- *Statistical data redundancy:* Most images contain large amounts of identical or very similar pixels. Unchanging picture details repeated pixel after pixel and image after image constitute redundant information in a data stream. Compression systems exploit the fact that identical data need not be repeated and transmitted. The identification of unchanging pixel values within a frame or a sequence of frames

is called decorrelation.

- *Psychovisual redundancy:* Certain picture details are not perceived by the human visual system (HVS). These picture details can be altered (i.e. reducing the number of bits per sample) or removed, thus reducing the data rate, and will result in imperceptible errors in the reconstructed picture.

- *Entropy:* The entropy is best described as the unpredictable in a picture that needs to be preserved in order to be able to reconstruct the original picture. Reducing the bit rate below the entropy value of the picture will result in the loss of a certain amount of information.

The human visual system (HVS)

Video signals are ultimately decoded and displayed for human observers. The human eye, in conjunction with the brain, constitutes a precise imaging system. It can operate under a wide range of light intensities, recognize colors and perceive picture contrast as a function of picture detail (spatial frequency) and light intensity. Picture width and height, as well as the viewing distance, determine the perception of picture detail. The visual acuity of the eyes depends on:

- *The luminance of the background:* Visual acuity increases with the brightness level up to a limit of 340cd/m² (100 foot-lamberts).

- *The contrast of the luminance and chrominance signals:* Picture details are visible only if there is a significant difference between them and the background (high contrast). The sensitivity of the eye to luminance detail is higher than that of chrominance detail. The eye contrast sensitivity varies with the temporal frequency of the picture. At high brightness levels, flicker becomes perceptible.

FRAME GRAB

A look at tomorrow's technology

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The HVS perception characteristics result in image redundancies in the spatial and temporal domain. These redundancies are taken into consideration by compression systems to help reduce the bit rate.

- *The spatial redundancies:*

- Spatial frequency sensitivity: High frequencies (fine picture details) are less visible.

- Texture masking: Errors in textured regions are difficult to see.

- Edge masking: Errors near the edges are difficult to see.

- Luminance masking: The visibility threshold increases with the background luminance.

- Contrast masking: There is a reduced visibility of one image detail in the presence of another.

- Noise frequency: The HVS has a low sensitivity to high frequency noise.

- *The temporal redundancies:*

- Temporal frequency sensitivity: Below 50Hz, flicker effects become noticeable.

- High brightness levels increase the flicker perception.

- Spatial frequency content: Low spatial frequencies reduce the eye sensitivity to flicker.

Data reduction techniques

Data rate reduction can be achieved using a combination of various tools. The aim is to achieve the bit rate reduction of the original signal to the minimum value that does not result in an unacceptable degradation of the picture quality level. The picture quality level is chosen for the intended application. A higher quality level is required for contribution signals (undergoing further processing in a studio) than for emission signals (direct-to-home broadcasts).

There are two complementary data reduction techniques used, namely the bit rate reduction and the compression. The bit rate reduction reduces the data rate by discarding superfluous or imperceptible information. The compression uses statistical and higher-order mathematical means to remove redundant information. Many "lossless" and "lossy" reduction techniques have been developed over the years.

- *Lossless techniques*

Data rate reduction is lossless when it allows the recovery of the original

signal after decompression. It is a fully reversible process. Only modest compression ratios (<3:1) are achievable. Among the lossless techniques are:

- The blanking removal: Nonessential data in the horizontal and vertical blanking interval are removed without affecting the picture. The bitstream is reduced to the active (essential) picture area content.

Compression is usually affected by removing video signal redundancies and unnecessary data.

- The Discrete Cosine Transform (DCT): The forward (in the encoder) and inverse (in the decoder) DCT process is totally transparent if the transformed frequency coefficients have a word length of 13 to 14 bits for an input signal with eight-bit word samples. With 11 bits or less the DCT process becomes lossy.

- The Variable Length Coding (VLC): Also called Huffman coding and entropy coding, it takes into consideration the probability of identical amplitude values in a picture and assigns short code words to values with a high probability of occurrence and long code words to others.

- The Run Length Coding (RLC): Generates special codes to indicate the start and the end of a string of repeated values. Only non-zero values are encoded along with the number (run) of zero sample values along the scan line.

- *Lossy techniques*

The data rate reduction is lossy when information is lost and the original image can only be approximately reconstructed. It combines several data reduction techniques to achieve considerably higher compression ratios (from 3:1 to 100:1) and is an irreversible process. The picture is degraded after decompression as a result of data rounding or discarding within a frame or between frames. Among the lossy techniques are:

- Subsampling: A very effective method of lossy data reduction. Subsampling is generally applied to chrominance signals resulting in such sampling schemes as 4:2:2, 4:1:1 and 4:2:0. A special video conferencing subsampling scheme,

called Common Source Intermediate Format (CSIF), subsamples luminance as well as chrominance and is claimed to have a resolution similar to that of a VHS recorder.

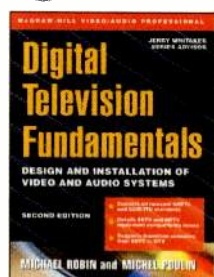
- Differential Pulse Code Modulation (DPCM): This is a predictive encoding scheme that transmits the sample-to-sample difference rather than the full sample value.

- Requantization: A process of reassigning the available number of bits per sample in a manner that increases the quantizing noise of imperceptible (to the HVS) picture details. In addition, it controls the bit rate to avoid digital buffer overload and achieve a constant bit rate required by transmission and tape-storage media.

Taken separately none of these techniques can generate a significant data reduction. The success of the MPEG approach lies in the fact that it combines several techniques to achieve an efficient data reduction system. These techniques have resulted in the well-known intra-coded (I), predicted (P) and bidirectionally-coded (B) pictures approach which, if properly designed and implemented, results in good quality pictures at reduced bit rates. Essentially ITU R BT 601 4:2:2 quality pictures can be obtained with a 10Mb/s bit rate. Compare this with the original 270Mb/s bit rate! ■

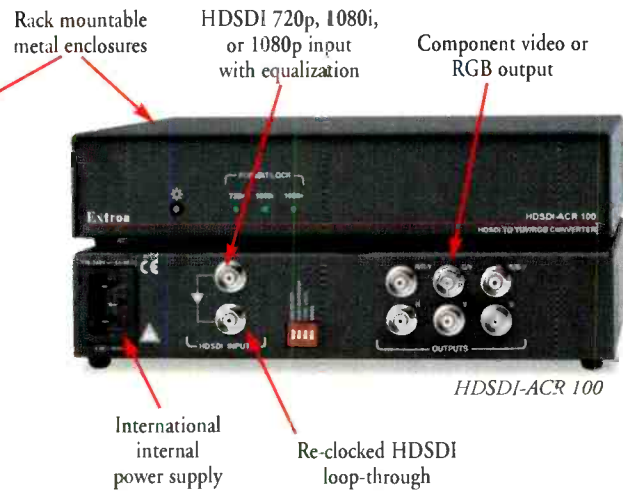
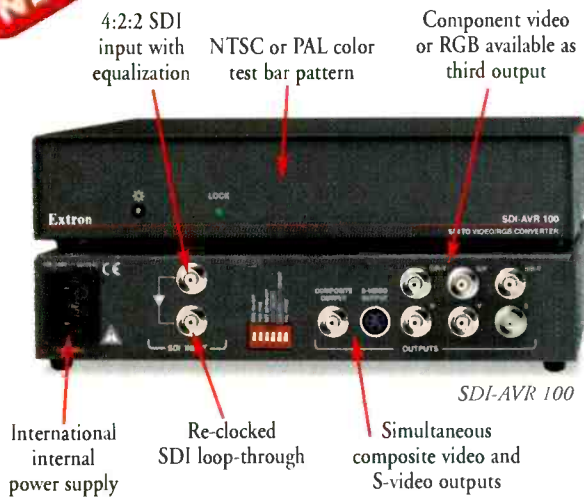
Michael Robin, former engineer with the Canadian Broadcasting Corporation's engineering headquarters, is an independent broadcast consultant located in Montreal, Canada. He is co-author of Digital Television Fundamentals, published by McGraw Hill.

 Send questions and comments to: michael_robin@intertec.com



The Second Edition of Michael Robin's book may be ordered directly from the publisher by calling 800-262-4729. It is also available from several booksellers.

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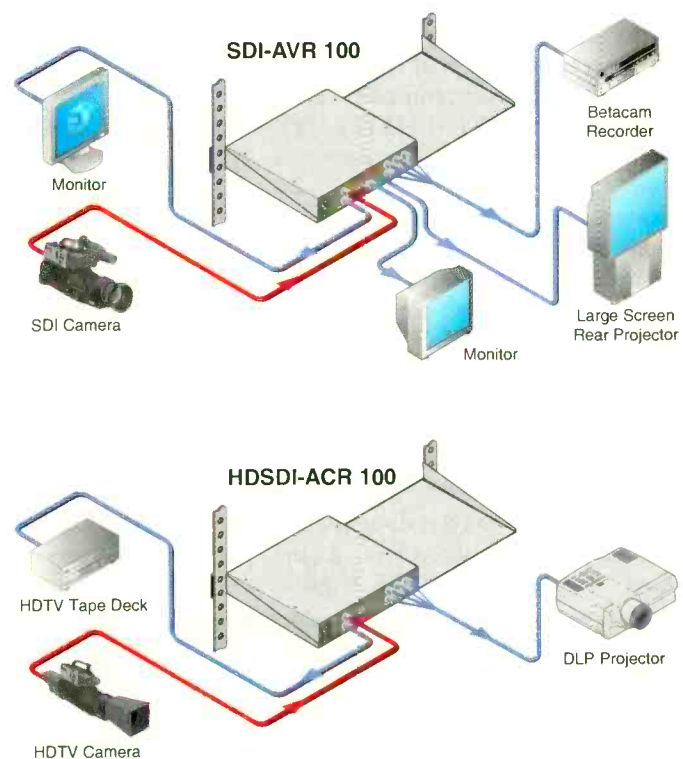
The Extron SDI-AVR 100 is a 10-bit 4:2:2 Serial Digital Interface (SDI) to analog video signal converter, and the Extron HDSDI-ACR 100 is a 10-bit High Definition Serial Digital Interface (HDSDI) to analog video signal converter. These versatile signal converters bridge the gap between SDI or HDSDI and analog video to simplify the integration of digital video sources into analog systems, or to analog devices. To route the highest quality analog video signal possible, the SDI-AVR 100 and HDSDI-ACR 100 output RGBHV with separate horizontal and vertical sync. For convenient integration, both devices are rack-mountable and include worldwide, internal power supplies.

The Extron SDI-AVR 100 provides these advantages:

- Accepts 4:2:2 SDI (ITU-R BT 601)
- Auto-detects data rates up to 270 Mbps
- Automatic input equalization
- Re-clocked SDI input with loop-through
- Outputs composite video and S-video simultaneously, third output available as component video (Y, R-Y, B-Y) or RGB (RGsB, RGbS, or RGBHV)
- Choice of output formats: NTSC or PAL
- NTSC or PAL color bar test pattern for system setup and troubleshooting

The Extron HDSDI-ACR 100 provides these advantages:

- Accepts HDSDI data rates up to 1.5 Gbps (720p, 1080i, 1080p)
- Automatic input equalization
- Re-clocked HDSDI input with loop-through
- Outputs component video (Y, R-Y, B-Y) or RGB (RGsB, RGbS, or RGBHV)
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ATVEF and DDE: Keys to new television services

BY BRAD GILMER

By now, most television engineers have seen examples of interactive TV—applications that mix conventional television with specially designed Web pages. As broadcasters and networks move toward a Web-based look and feel, it will become important for engineers to understand how the technologies behind these creative tools work. In this month's column, we take a look behind the scenes at one of these technologies: declarative data essence (DDE). The screen shot from "Family Feud" below shows a typical DDE application. The tools used to construct the frame, the text and other images on the screen are adapted versions of well-known Internet protocols such as unidirectional HTTP (UHTTP). ITV displays the TV picture as part of a Web page.

You may be familiar with "Family Feud." In this show, contestants try to guess the most common responses the audience has given to a particular situation or phrase. In the ITV version, Web technologies and tools such as style sheets are combined with DDE triggers to change the behavior of the ITV content as the game progresses. When the viewer starts to play the game, the entire game is downloaded into the DDE-compliant box. As the show continues, the DDE triggers

affect the behavior of the game. For example, these triggers may reveal answers or move on to the next question.

DDE started out as ATVEF, an open specification for creating and delivering interactive TV developed by the Advanced Television Enhancement Forum (www.atvef.com). Once the ATVEF specification was substantially complete (ATVEF 1.1r26), the organization turned the document over to SMPTE

a model of how to transport ATVEF using NTSC. Transport A uses line 21 of the VBI, following the Text-2 (T2) service specified in EIA 608 (recommended practices for line-21 services). The encoding allows URLs and related data to be encoded in line 21 without interfering with closed captioning and other data that share this line. Transport B uses an IP-over-VBI binding in conjunction with North American Basic Teletext Specifi-

"Wheel of Fortune" is available in some markets as ITV. DDE is used to create the experience.

for standardization. The result was a more complete specification of ATVEF: DDE-1, standardized as SMPTE 363M.

How does DDE work? The answer to this question comes on several levels. First, let's look at how DDE information is transported.

DDE-1 supports two transport modes, Transport A and Transport B. Transport A is used when a return channel is available, and Transport B is used for one-way broadcasting. Applications may be written to support both Transport A and Transport B. This lets the sender

take maximum advantage of the transmission channel being used. It is important to note that DDE-1 does not specify a particular transport mechanism. It is a content format. However, DDE is designed to be transported using conventional vertical blanking interval (VBI) technology and new digital transport.

The original ATVEF specification included

ation (NABTS) coding. In either case, since the FCC mandates pass-through of line 21, DDE can pass from the source to the viewer unimpeded. It can be encoded on tapes and passed over satellite links as well. (Note that the FCC does not mandate that T2 be passed.)

The model receiver shown in Figure 1 takes video (at the top of the diagram) and audio (at the bottom of the diagram) from the output of the tuner section of the receiver. Both of these signals pass through the DDE components and on to the screen and speakers of the television or monitor. Triggers and Internet data are delivered using the VBI. The Internet data is stored in a 1 megabyte data cache or buffer. Audio delivered as Internet data is played out via a PCM audio decoder and is mixed with real-time audio coming from the traditional TV channel. This mixed audio is then fed to speakers.

It may be easiest to describe the video chain starting at the output. An on-screen display (OSD) renders Internet content for display on the TV or monitor. The OSD receives inputs from two sources. The first source is an image renderer, which receives its input from various image decoders. In this way,



This interactive TV image shows how AOLTV uses DDE to allow viewers to play Family Feud along with contestants. Image courtesy of Mixed Signals Technologies, Inc.

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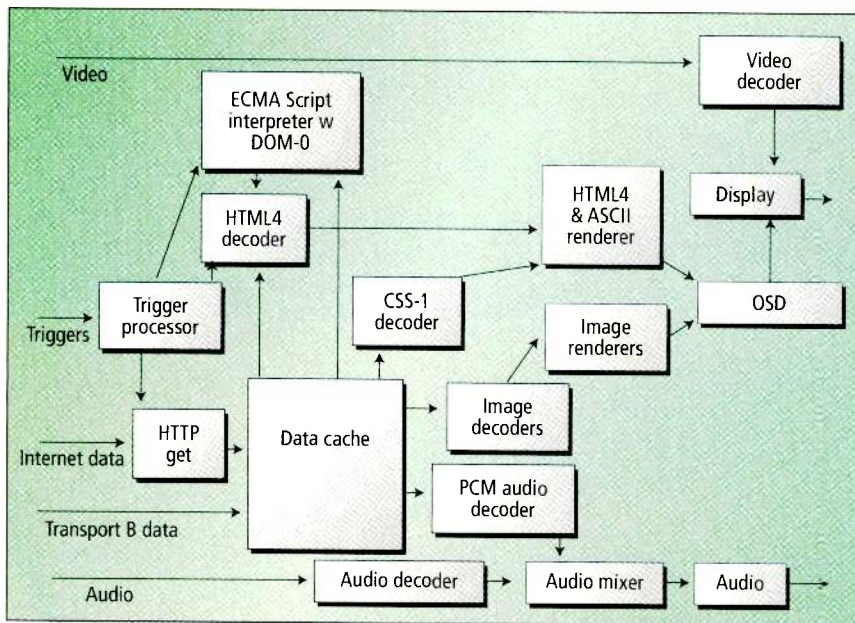


Figure 1. Block diagram of receiver using DDE. Courtesy of Mike Dolan, industry technical consultant.

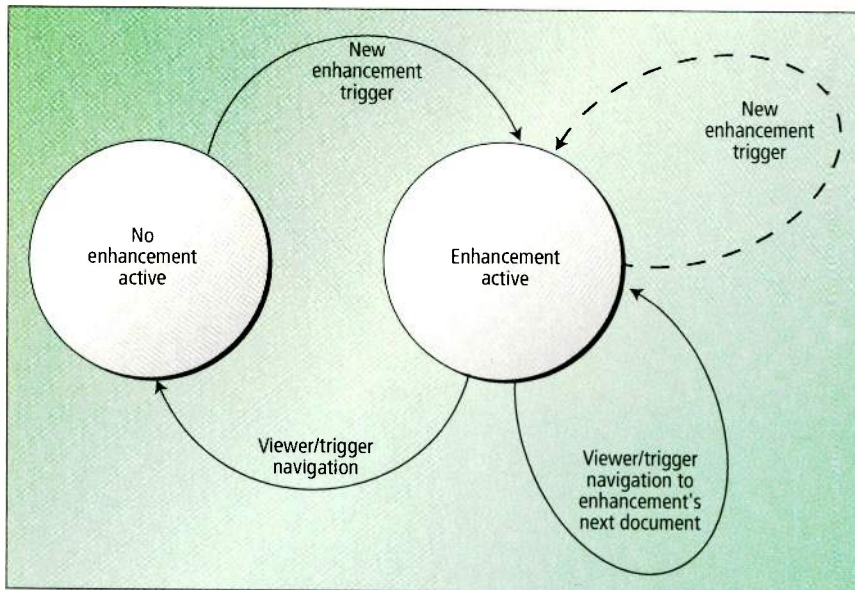


Figure 2. Diagram of DDE enhancement states. Courtesy of John Barkley, NIST.

images such as JPEG, BMP and others are mapped onto the screen. The other input to the OSD comes from the HTML4 and ASCII renderer, which derives its input from the HTML4 decoder. The CSS-1 decoder guides the manner in which HTML data is displayed. The HTML4 decoder receives and decodes HTML. This process is very similar to that of the Web browser in your computer. CSS stands for cascaded style sheets. Style sheets describe how documents are presented on screens or in print. The World Wide Web Consortium (W3C) has actively promoted the use of style sheets on the Web since 1994. By attaching style sheets to struc-

ture documents, authors can influence the presentation of documents without sacrificing device independence. In other words, CSS provides a page layout into which various HTML display elements can be incorporated, thus providing precise layout control (a feature infrequently used on the Web today).

Finally, triggers that control the timing and presentation of ITV content are received and decoded by the trigger processor. From there, they affect retrieval of information from the Internet, start or suspend scripts, and can affect the behavior of the HTML decoder.

Given that an ITV-capable box can act like a conventional television or an

ITV device, it is useful to further explore how triggers affect the operation of these devices.

Enhancements are ITV content added to conventional TV programming. They consist of a sequence of HTML documents. The first HTML document of an enhancement is always instantiated by a trigger. Subsequent documents within an enhancement are instantiated as a result of navigation from the current document initiated either by a trigger or viewer selection.

ITV boxes have two basic states: enhancement active and no enhancement active. Figure 2 shows how a model receiver behaves through a sequence of viewer navigation or triggers. Note that to get from the no-enhancement-active state to enhancement-active state, the box must receive a new enhancement trigger. From that point, the box can change state based either on new triggers or user navigation.

As time goes on, you may find yourself more involved in ITV issues in your facility. If you operate a conventional television station, you probably have already done what you need to do to ensure that ITV will work properly. However, if you find that ITV Transport B works well but Transport A does not, check to see that CC TEXT2 passes through your station. Some broadcasters strip TEXT2, which is not strictly required for transmission of closed captioning. This will cause a failure of ITV Transport A. In some stations, networks have provided ITV decoder boxes so that broadcasters can view ITV content as it is broadcast. You can use these decoders to troubleshoot problems throughout your facility.

Since ITV content and triggers are encoded in line 21, editing of source tapes can destroy portions of the ITV content, just as it can destroy closed captioning. Also, some programs that rely on a return path can experience significant problems if the latency between the viewer and the Internet is slow. ■

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

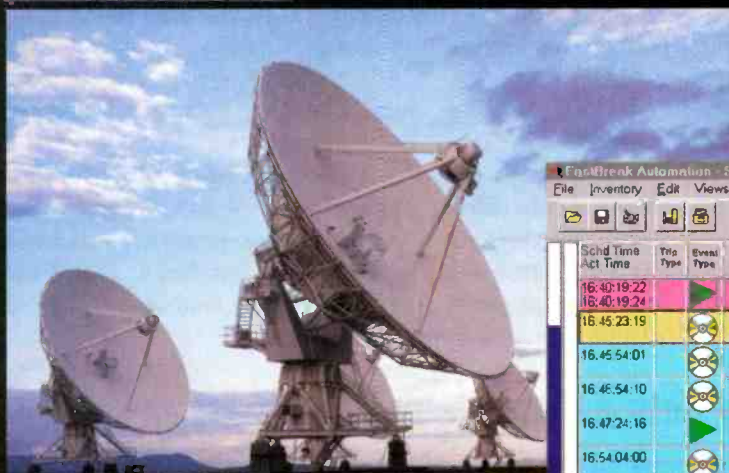


Send questions and comments to: brad_gilmer@intertec.com



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File Inventory Edit Views Specials Options HotList HotSwitch Help

Warnings 16:40:36

Schd Time	Act Time	Trig Type	Event Type	ID	Time Comment	Duration	Transition	Source	TC	Status	Yagna
16:40:18-22	16:40:19-24			1043-F	MORTEL WEDNESDAY	TRV11 00:05:02:25	T	TRV11	04:00:00:00	Eject	No Tape
16:45:23:19			PR1045	PROMOTION KGET	LOI:58	00:00:30:12	T	TRV18	03:58:00:10	Eject	No Tape
16:46:54:01			L338	AMT TELEVISION	PCDS PCE:00RV	00:01:00:09	T	TRV18	03:58:00:10	Eject	No Tape
16:46:54:10			L364	JUNIOR ACHIEVEMENT		00:00:30:06	T	TRV18	03:58:00:10	Eject	No Tape
16:47:24:16			1043-G	MORTEL WEDNESDAY		TRV11 00:06:39:14	T	TRV18	03:58:00:10	Eject	No Tape
16:54:04:00			PA2704	AMERICAN CANCER SOCIETY	RELAY 4 LIFE	00:00:30:05	T	TRV18	03:58:00:10	Eject	No Tape
						00:00:30:05	T	TRV18	11:43:56:29	Eject	No Tape

23:18:23 PROMOTION KGET Next Offset Event

16:58:38 Server

Break Automation

Abort PlayBack Next

Downs Cue Skip Next End

SalesView
A FastBreak Component

File Options

Play Element

Play Low Res

Select

On Server Sort by Cmt

Request

Find Element

Find Next

ID: wed01 wed20

Title: CM2342 CM3493

Cmnt: Accura Legal ID

PS3425 PS3425

CM3254 CM3452

CM9853 CM9853

ID0935 ID0935

CM7834 CM7834

PS4563 PS4563

ID1009 ID1009

CM9842 CM9842

Political

Total Records: 75
Version 1.20a1
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9.11.2001

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System security

BY STEVEN M. BLUMENFELD

Is there really such a thing as true system security? When asking this question, the first issues that must be answered are “what do you want protected” and “what level of inconvenience are your users willing to tolerate”?

We can physically secure our servers from theft by putting them in locked rooms with lockdown cables and limited access. Alarms, scramble pads and biometrics are all available to make us feel safe and free from worry that someone might come in and walk off with our equipment and physically steal our precious data.

Security gets a little dicey when theft or unauthorized access is through electronic means as opposed to physical. We can take matters into our own hands by incorporating some rudimentary security, such as implementing a good password and pertinent access policies. These may include a mandatory password renewal or keyboard and screen lockouts for both hardware and software access. Firewalls, VPNs, secure IDs and dial-back networks are also available to ensure that only the approved users have access to the servers.

Firewalls are not enough

Corporate networks have become diverse multi-protocol infrastructures supporting multimedia servers, storage area networks, PCs, PDAs, phones and a whole host of new data appliances. More and more of our employees are working from remote locations, and these networks are no longer limited to their physical boundaries. Organizations now rely on firewalls to implement security policies on their Internet gateways. Firewalls are tremendous tools that protect networks through controlling multiple connections. However, traditional firewalls do not inherently provide any mechanisms to prevent viruses or vandals from entering the network. As enterprises continue to take advantage of

Internet connectivity, they open the door to viruses, vandals and other threats that cost businesses billions in lost productivity and data.

Like all good physical security, firewalls are meant to keep the honest out and make it a little harder for the determined intruder. Unfortunately, there are no access-proof systems. Instead, there are viruses that can sit on a network and record all computer use,

continue to be, a nagging problem.

Content security is about:

- Making sure you know what information goes in and out of your computer network
- Ensuring that your systems are not abused for personal use by employees
- Protecting your organization against misuse, mischief and accidents
- Maintaining control of data and avoiding piracy

Security gets a little dicey when theft or unauthorized access is through electronic means as opposed to physical.

and at the appropriate time, these can be transmitted to the intruder for easy access.

But we are in the content business and our jobs depend on sharing information and allowing as many users access as possible. This is our problem. How do we allow dissemination of our content while still maintaining the ability to control its use? Piracy is, and will

Scared yet? You should be. Access to your most precious data is only a keystroke away. Or worse yet, a delete command for the malicious intruder.

So how do we go about protecting our content assets in a logical way that still makes them accessible? What should a secure system be?

Here are the ground rules:

- A secure content system needs to

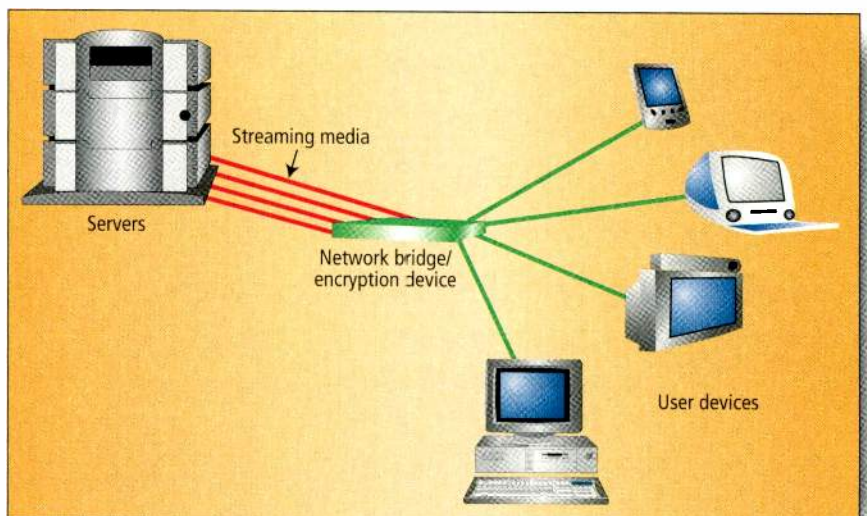


Figure 1. Encryption systems are one way broadcasters can protect their content from piracy. Using a platform-and-format-independent system like the Widevine Cypher enables users to receive that content on equipment they already own.

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have compatibility with all major streaming technologies, including Real Networks, Windows Media and QuickTime.

- It needs to support industry standards, including TCP/IP, UDP, HTTP and RTP/RTSP.

- It must be open enough to allow compatibility with future streaming technologies.

- It should allow for seamless deployment and integration, with minimal changes to the server cluster and a small but scalable footprint.

- Installation of any client-side software needs to be transparent and all upgrades need to be automatic.

- The end users should be able to access content using their favorite media player application like Winamp or QuickTime.

- It must have a secure return channel for quality-of-service monitoring, microbilling, copyright protection and other application-specific uses beyond media control.

- It has to be relatively transparent to the end user; the user should not know or care that a secure technology

is being used to protect the copyright holder's content from unauthorized use.

- The system must be a reasonable deterrent to piracy.

A company called Widevine Technologies (www.widevine.com) offers a solution to some of these problems.

Firewalls are tremendous tools that protect networks through controlling multiple connections.

Their system is based on a real-time hardware encryption device that gets inserted after your multimedia storage and allows for on-the-fly hardware protection of your content. (See Figure 1.) This opens a new type of protection that is not available in a pre-encrypted system – we can now encrypt real-time broadcast streams, which adds another level of content protection. More specifically, since content is protected at the source, this streaming media solution allows a different encryption/decryption “key” to

be sent to each and every user. Additionally, the same user can actually be given multiple “keys” during subsequent viewings.

Streaming in this system is made secure by having the ability to use multiple encryption techniques that

can be made unique each time the content is viewed. The byproduct of this system is that the algorithm for encryption can be updated on the fly without affecting the content itself.

Streaming media is a valuable asset that, until recently, was difficult to protect in real time, but with systems like Widevine's protection is only another hardware device away. ■

Steven M. Blumenfeld is currently the vice president of advanced services for America Online.

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SYSTEMS DESIGN SHOWCASE

The Los Angeles facility uses proprietary ASi mux technology to provide multiformat and multichannel capability.

BT Broadcast Services' L.A. Media Center

BY JON ROMM

A new client base, new service offerings – including a fully digital platform, content management offerings and IP-related services – and the need for expansion within the United States, were the driving forces behind BT Broadcast Services' decision to build its new, state-of-the-art media center in Los Angeles.

When Broadcast Services first made the decision to expand into the U.S., the company found the demand for broadcast services quickly outpacing the capacity of its infrastructure. In less than four years, the company had outgrown its Washington, DC, facility and required more room for personnel, technical space and increased capabilities to meet growing demand.

Los Angeles, with its proximity to

program originators and content providers, and access to the Pacific Rim, was a natural choice for content aggregation and distribution. The location provides look angle to the entire U.S. Domestic Arc and the Pacific Ocean Region, as well as a few Atlantic Ocean Region Satellites (i.e. PAS9 at 302E and IS805 at 304E). This presents the perfect complement to the company's existing global transmission capabilities. This location also allows for single-hop transmissions between Europe and Los Angeles.

Existing customers provided the incentive and revenue flow required for completion of the brand-new facility in Marina del Rey, CA. A year before the new facility was completed, Broadcast Services had already signed up several

full-time clients. Channel 7 and Network Nine of Australia were looking for contribution service and redistribution of their programming to their respective Australian networks. (These services are now provided on Intelsat 701 at 180° C-band, using a Tandberg multiplexer and 16 QAM modulation). A third customer, Media Overseas, wanted to expand into unserved French-speaking markets in French Polynesia. To address these needs, it provisioned a 45Mb fiber service all the way from Paris to Los Angeles, uplinking to IS701 at 180E Ku-band. Direct-to-home service is received in 80cm receive packages in Polynesia.

Broadcast Services' entire U.S. infrastructure is digital, and the primary goal of the new facility was to broadcast digital, high-definition, multichannel

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A C-band, five-meter antenna is situated on the roof at Broadcast Services' Los Angeles media center. The antenna is directed toward the Atlantic Ocean region most of the time, facilitating single-hop transmission between Europe and Los Angeles.

television. However, the company quickly realized that many potential customers were not yet in the digital realm, so the company needed to re-engineer its existing facilities to make them compatible with clients' analog technology, even as the company pursues a fully digital platform. Included in this project was an upgrade of the existing Washington, DC, facility to make the platform entirely digital with

The new location had to be designed with extra capacity to accommodate a significant growth rate.

backward compatibility to analog.

The Los Angeles platform was planned from its inception to be fully digital and able to support multiformat, multichannel capability using proprietary ASI mux technology. This platform also brought Broadcast Services into the IP realm, with new developments and capabilities operating seamlessly in multiple formats and protocols. Other developments,

slated for Fall 2001 deployment, include a digital content management system, a store-and-forward product with a real-time application using a front-end browser, and a catalog system.

This service gives clients the opportunity to view different types of content in the library, select what they want to use, and redistribute and package it for content delivery utilizing its global network via satellite, fiber or Internet.

Design criteria

Broadcast Services based its model on the Washington, DC, facility, which has proven successful. First and foremost, the new location had to be designed with extra capacity to accommodate a significant growth rate. The company also recognized the need for a massive push into the fiber and digital world. Transmission services requiring more capabilities in turn necessitated additional hardware and technical space. The new design included an enormous area for rack space and router capability, accommodating a multitude of IP- and fiber-based offerings.

Other changes were driven by the new location: Los Angeles' customer base for satellite-based services differs significantly from DC's. Los Angeles' customer concentration includes a number of media groups, production houses

and full-time distribution services. Washington, DC, is more driven by political news, special events and sports.

The challenge

The difficulties Broadcast Services encountered were primarily construction-related. In light of the sophisticated range of services the new facility would offer, it was important to build a facility to company specifications, rather than take on the refurbishment of a pre-existing site. From preliminary blueprints all the way through to technology deployment, the facility design had to take future functionality into account.

Starting from scratch allowed the company to implement the construction to ensure its completion in a timely manner and make sure the integration was done properly and supported correctly. Providing a significant number of conduit paths in different areas of the building enabled fiber connectivity to PacBell and Verizon switches. Dual and diverse fiber, and autonomous switches, provided all-important redundancy and security, as well as enabling Broadcast Services to incorporate its own technology in order to provide multichannel services. Also, because the company was transitioning its existing customer services through other teleports in the Los Angeles area, the company had to go through double illumination issues and



The design for the new media center includes extra rack space and router capability to accommodate growth in the company's IP- and fiber-based transmission services.

orchestrate the handoff perfectly.

Finally, the facility was designed to be easily upgradeable so that it would be able to handle an increase in volume, services and capabilities, providing flexibility and redundancy.

The company's UK-based procure-

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And that's where we always begin.



Planning for the return

Centralizing operations is a complex undertaking. Implementing the technology may actually be the easiest part. The more difficult tasks are understanding what you expect to achieve and developing plans that deliver results.

The first step is to perform an in-depth analysis of your business—business operations as well as technical operations—with the objective of developing a plan that will optimize all aspects of your operation. Remember, centralization isn't really about implementing the latest technology, it's about meeting business goals and objectives.

We can advise you where it will be advantageous to centralize, and where *not* to centralize. Most importantly, we will put a value on the plan in terms of your return on investment.

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 - Control management of contracts
 - Optimize scheduling
 - Simplify rights management

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- Improve reporting—ensure stations get maximum rates
- Improve staff efficiency in performing basic functions—copy, order entry, log scheduling

Automation Central

- Pursue full centralization or a range of distributed automation models (day-parts, multiple geographic locations, etc.)
- Save on equipment costs through elimination of redundant equipment
- Manage archives of content whether centralized or distributed

Encoda



Encoda Systems has worked with major broadcasters around the world to develop the basic models for centralization. All have the same objectives: to simplify operations, to increase efficiency and reduce equipment costs in a multistation or multichannel environment, and to maximize the returns.

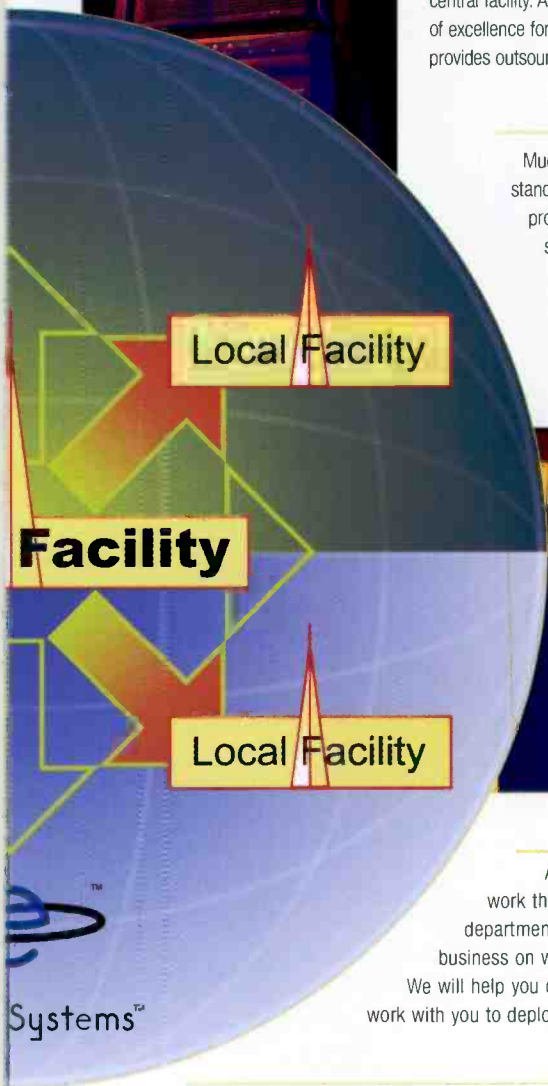
In any model of centralization, operations within an organization are linked via wide area networks, leased lines, the Internet and satellite communications. But the degree to which control is relinquished by the local operations can vary, ranging from nearly full central control to more of a distributed control model in which only management and certain control activities are transferred to a central facility. A group might want to establish designated local operations as centers of excellence for particular functions, like production, sales or finance. Encoda also provides outsourcing for managing your facility and/or operations.

Same objective, many paths for centralization

Much of the savings from centralization will come through simple standardization. If all of your stations are using the same equipment, software and procedures, you'll have reduced training costs, be able to shift personnel between stations or channels easily to fill in as needed, and generate consistent management reports from all business units.

Consolidation of functions also provides great savings. For example, running two stations in the same market out of a single facility and implementing a common database will improve efficiency.

Finding the savings



As soon as a plan for centralization is proposed, Encoda specialists will work through change management procedures with you—from aligning departmental goals within your organization to educating everyone in your business on what centralization means and what you are trying to accomplish. We will help you define responsibilities and accountabilities, and only then will we work with you to deploy new technologies.

Managing the change

1. Understand what you want to achieve—what do you want centralization to accomplish for your business?
2. Get industry experts to help—take advantage of their experience and be aware of the different centralization configurations available.
3. Plan the transition carefully—your staff needs to make it happen, and will therefore need to understand the process and their role in it.
4. Understand the scope of the investment—the savings you achieve in the end will not come until after you have made the initial expenditures.
5. Work closely with your vendors—centralizing operations is re-engineering your entire business, and you should not underestimate the magnitude of that endeavor. You will need help from experienced resources.

Five rules of implementing centralization

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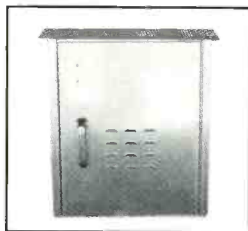
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opened its doors, the Los Angeles facility was producing income for Broadcast Services, and indications are that this will be a continuous and growing stream.

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Transmission services requiring
more capabilities in turn
necessitated additional hardware.

services: full-time, part-time, occasional use, special events, broadcast, B-to-B, IP gateway, fiber or satellite over the long term. The ultimate goal is to provide a level and quality of service of engineering and operations that meets or exceeds the quality required by the customers. ■

Jon Romm is general manager for BT North America Broadcast Services.

Design team

Broadcast Services

Brita Anthon, John Robinson (retired), Martin Bennett and Katherine Costelloe, project managers

Globecomm Systems, Inc.

George Sumarev, project manager

National Teleconsultants, Inc.

Greg Jones, project engineer

Solutions Custom Furnishing, Inc.

Bliss Ehrlich, project manager

Robert Ward & Associates, architectural design

Robert Ward, project manager

TG Construction, Inc., general contractor

Dave Sestak, project manager

Equipment list

Alteia IRDs

Tandberg E5424 DSNG encoders

SA Power VU IRDs

Tandberg Evolution 5000 MUX

EFData SDM2020 modulators

Vertex antennas

CPI support mechanisms

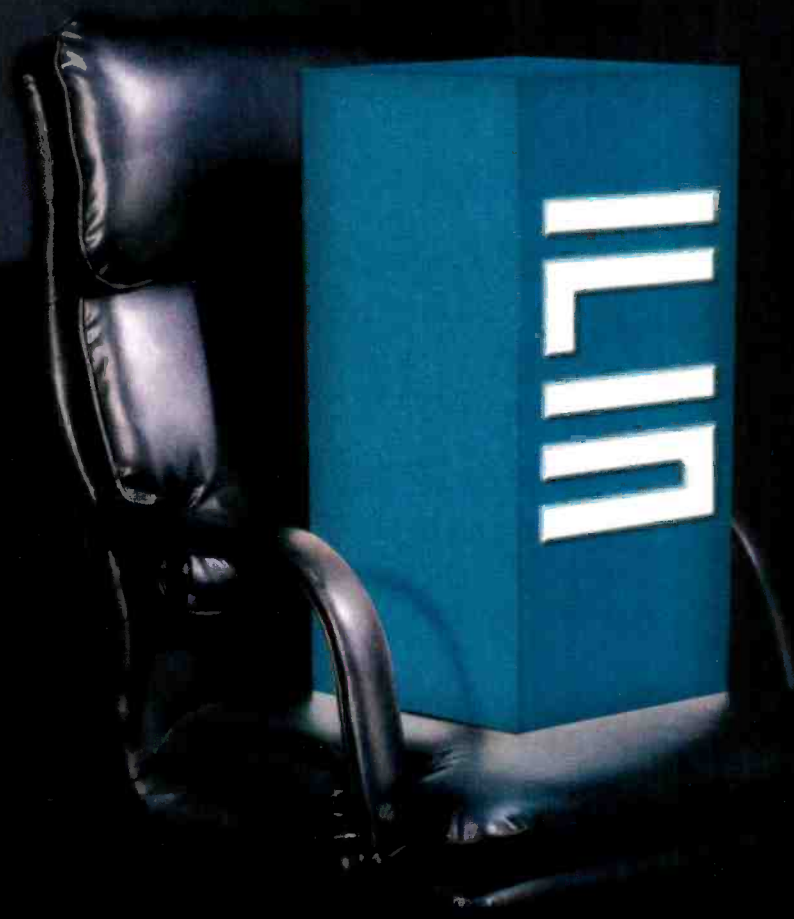
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SYSTEMS DESIGN SHOWCASE

WGCL's new digital facility in Atlanta includes a 50' by 70' news studio dedicated to production of the station's five daily local news programs.



WGCL-TV's

BY JACK VERNER

digital facility

Georgia's ClearTelevision station, WGCL-TV in Atlanta, now delivers its news and CBS program lineup from a brand-new building with a digital infrastructure designed by Digital System Technology (DST) to handle the changes and challenges the broadcasting industry faces in a less-than-certain technological future.

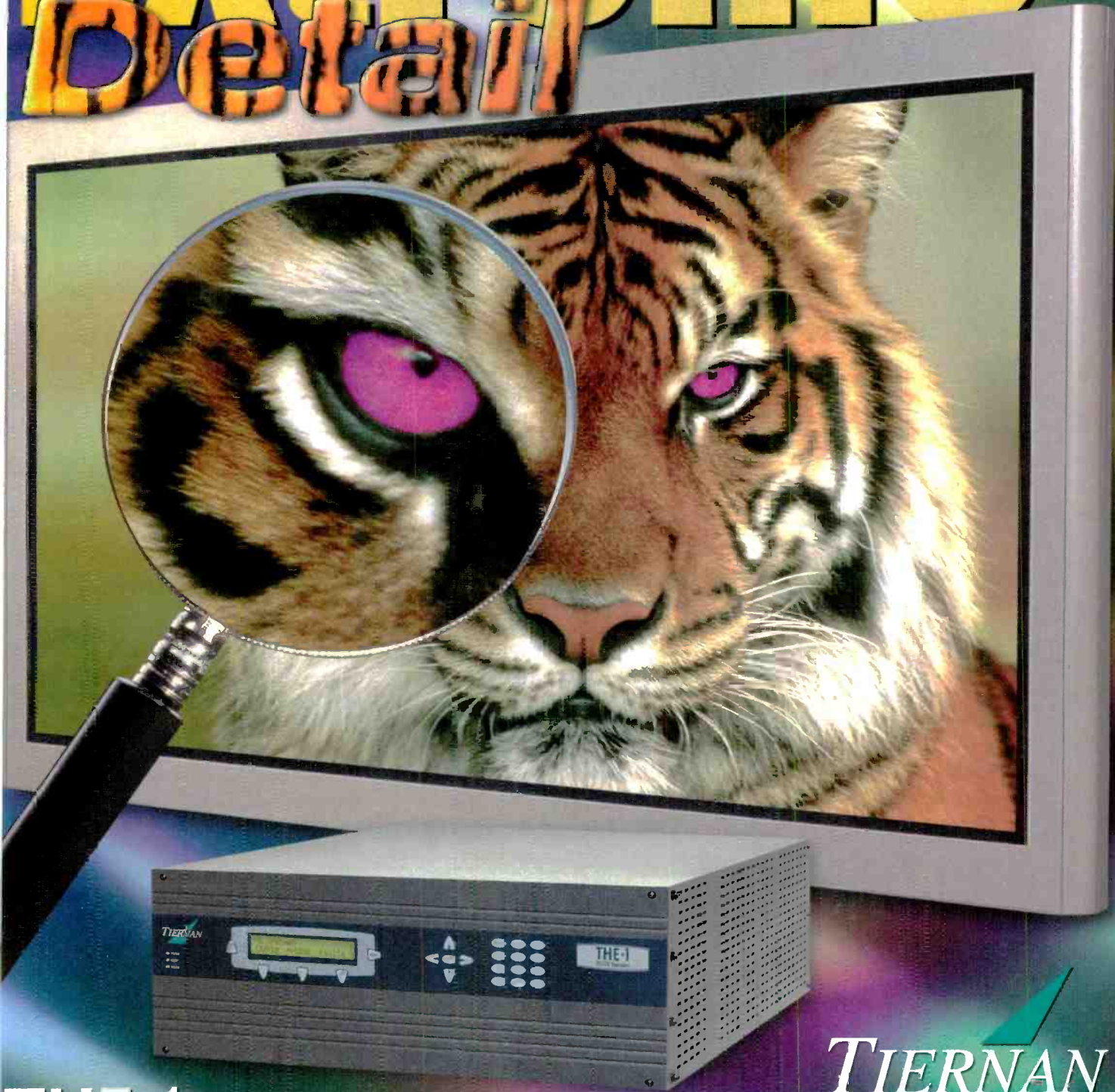
The new 53,000-square-foot facility with its own heliport is miles from the old one both in terms of location and capabilities. The new location on 14th Street is closer to the action in downtown Atlanta, and is built around a 270Mb/s serial digital routing and distribution infrastructure. The routing frame and the

cabling and patching will enable support of high-definition signals at 1.5Gb/s in the future. It is as near to plug-and-play as possible.

The station was known as WGNX-TV until July 4, 2000, when it changed call letters to WGCL to reflect the station's "clear" news image. The technical facility was housed in an old Atlanta mansion on Briarcliff Road that was originally remodeled in 1969 to house an early UHF TV station. Many of WGCL-TV's operating departments, including sales and accounting, were housed in a nearby corporate office park because of space constraints. The old Briarcliff location was a maze of news

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Conversion equipment and legacy systems at WGCL are located for easy replacement with digital machines in the future.

edit rooms and support operations, creative services production workstations and technical facilities. Georgia's Clear News clearly needed a new home.

Technical facilities

DST was selected to consult, manage, design and install the technical facility in cooperation with Jim Bernier, director of engineering and operations, and his staff. The Austin Company was chosen to design and construct the building. The team built two studios, a combination master control/news support area, central equipment room, newsroom, two

major progress milestone. WGCL-TV decided on a serial digital video infrastructure, but opted for analog audio for ease of use and economy. The wideband Grass Valley Group 7500 video router was wired for 256x256, and high-definition boards can be installed when the demand arises. Analog video and audio 64x64 frames were also installed to operate under a common control system.

Cable management is always a challenge, but the 1.5Gb/s requirement for video coax (Belden 1694) meant special handling throughout the installation process. The cables were laid into cable trays instead of pulled.

The old Briarcliff location was a maze of news edit rooms and support operations, creative services production workstations, and technical facilities.

production control rooms, a technical shop, multiple news edit rooms, graphics suites, production rooms and satellite earth stations. The first broadcast from the new building was March 25, 2001.

The completion and customer approval of conceptual design was a

Steel guides with round vertical prongs were used to segregate and guide cable in the 15-inch clear area under the access flooring. Work areas for coax assembly were roped off to prevent personnel from accidentally stepping on the cables. A bend radius of at least 10 times the diameter of the

cable was scrupulously maintained. The cable bundles in racks were strapped with one-inch-wide Velcro wraps that do not cinch, crimp or indent, and therefore avoid impedance

Cable management is always a challenge.

changes that could reduce the desired return loss. Careful attention to rack layouts and equipment layouts in the racks allowed power conduit and broadcast system cabling to follow separate routes. The 15-inch vertical clearance between the depressed slab and the underside of the access flooring was sufficient, but tight in the area of the router where extra cable bend radius was needed for the 1.5Gb/s cable specification.

The entire technical plant for WGCL-TV operates continuously on an uninterruptible power supply (UPS). A generator comes online during power failures to maintain the charge on the UPS batteries, and provide lighting and other services in areas where short outages can be tolerated while the generator cranks. Oversize neutrals and K-rated transformers were used in the electrical service, and separate neutrals were run for each technical circuit. A two-foot grid of two-inch wide flat copper strapping was installed on slab under the access flooring to provide the signal reference ground.

DST managed the budgeting, equipment purchasing, and shipping and receiving logistics throughout the project. Initial equipment orders were routed to DST's Norcross (Atlanta) facility where 36 of the equipment racks, including the cable-intensive routing, patching and distribution racks, were partially or completely assembled, cabled and tested.

New equipment selections included a Grass Valley Group M2100 master control switcher and two Kalypso production switchers destined for the two studio control rooms. These were set up and checked out with the routing, digital video effects and other

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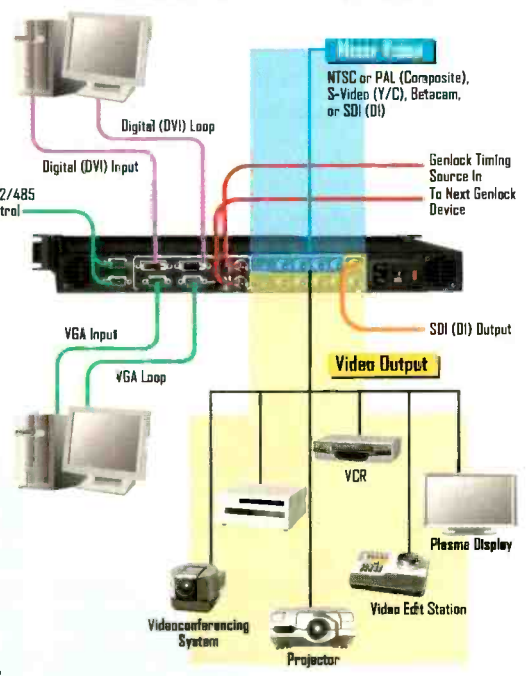
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ViewMAX Connectivity Diagram



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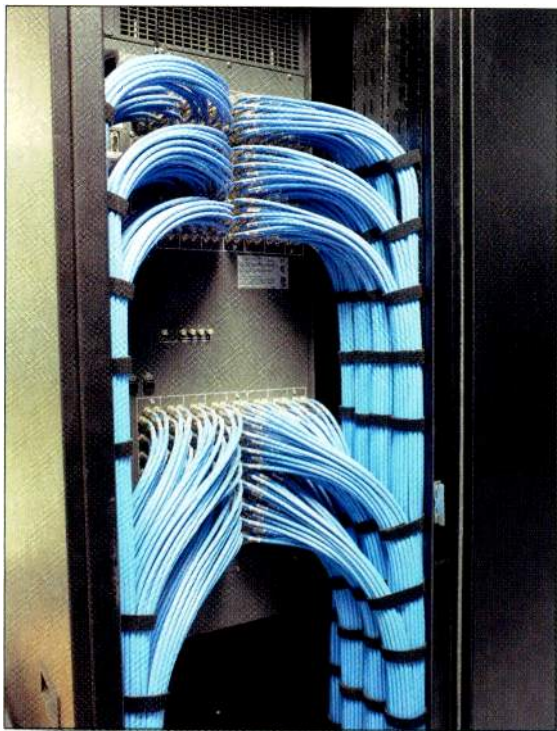
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The new WGCL facility is built around a 270Mb/s serial digital routing and distribution infrastructure, with cabling capable of data rates up to 1.5Gb/s to accommodate high-definition signals in the future.

accessories in a replica of a broadcast facility constructed in the DST training area. This training area, complete with monitor wall and tape machines, was then used for scheduled professional training classes for WGCL-TV's operators. The equipment

The Technical Operations Center utilizes two Miranda Kaleido multi-image displays projected onto two 100-inch screens. Quality control monitoring is still done on professional monitors mounted in the console below the screen, but the staff is able to move

WGCL-TV decided on a serial digital video infrastructure, but opted for analog audio for ease of use and economy.

was disassembled following training and shipped with the racked equipment to the construction site for final installation.

WGCL-TV's news studio is a 50' by 70' facility that houses the news set and is primarily dedicated to daily news production. Studio B is used mostly by Creative Services and for major projects such as election coverage. The B control room offers hybrid (linear and nonlinear) editing capabilities and is equipped with an Accom Axial 3000 editor and Attaché digital disk recorder. The studio B

about the area and still maintain eye contact with the large, wall-mounted displays. The system is capable of displaying an assortment of inputs in a variety of sizes and aspect ratios. WGCL-TV displays clocks, television and computer pictures, waveforms and audio metering in any order desired and can change the display layouts to other presets with the push of a button. The use of two projectors and screens eliminates a projector bulb as a single-point failure mechanism and provides a larger display area.

A great deal of analog-to-digital

production control room is otherwise configured similarly to control A and can serve as a backup for news if needed.

The master control area is called the Technical Operations Center and combines engineering support and coordination with master control operations. The area houses the studio camera control units and, during news events, the personnel needed to manage and coordinate feeds from ENG vans, satellite trucks and the helicopter. A specially designed ingest room with its own routing records incoming feeds on a complement of eight Panasonic DVCPRO50 videotape recorders.

conversion equipment was used to support legacy analog equipment that had to be removed and relocated to the new building during a busy changeover weekend. The location of conversion equipment frames and analog tape machines, as well as the length and routing of their associated cables, was carefully calculated to facilitate future replacement with digital machines. WGCL-TV signed off on the entire project on June 4, 2001, following completion of a punch list and several change orders and should be future-proofed for the challenges to come in a top-ten market. ■

Jack Verner is vice president of engineering for Digital System Technology in Atlanta.

Design team

DST

Dick White, project manager

Mickey Kroll, project engineer

Mike York, construction foreman

Equipment list

GVG M2100 MC switcher package

GVG Kalypto production switcher package

GVG routing system package

GVG Gveous DVE

Wheatstone audio console for news

Wheatstone audio console for Control B

Accom 3000 editor w/live video option

Accom Attache' APR-60 DDR

DNF machine control system

Miranda Kaleido multi-image processors

HJT G-1000 projectors

Tektronix SPG-422

Tektronix ECO-422

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Remote control systems: Push the button and hope

BY DON MARKLEY

You can bet on it. It will happen on a dark and stormy night. The telephone will ring and a strange, mechanical-sounding voice will advise you that the transmitter is off the air — or the tower lights are out — or that the power is off and the generator won't start, or some other problem. You enter the magic numbers into the telephone and push the button for "raise" or "on" and wait to see what strange numbers the mechanical voice will repeat next, if any. It is at that time that the true character of the remote control system, either the hardware or your installation, will be known.

Over the years, remote control systems have changed significantly, just as everything else about the transmitting plant has. When this author started in the business, the standard remote control had 10 channels, selectable with a telephone dial that caused a stepping switch at the transmitter to be advanced in a strange and often variable fashion. The unit required a dedicated

telephone line and the meter readings would usually give a reasonable indication of the transmitter parameters. It didn't have to be overly accurate as it was only used on non-directional AM or FM stations. Directional AM and TV stations could not be operated by

the operation of the physical plant haven't changed. In fact, they are even tighter than in past years in some areas. For example, the remote meters have a required accuracy of ± 2 percent and the station is required to maintain the calibration to meet that accuracy. To

The era of deregulation allows all stations to be operated by either remote control or be unmanned if certain criteria are met.

remote control. Now, the era of deregulation allows all stations to be operated by either remote control or be unmanned if certain criteria are met. One of the arguments for such operation is that equipment is much more reliable than it was years ago. As most equipment is now solid state, with the possible exception of RF output devices, that probably is a true statement.

The kicker is that the rules concerning

examine those rules further, it is advisable to review Sections 73.1300 and 73.1350 of the Rules and Regulations.

Section 73.1300 simply says that the station can be operated by remote control or unattended if it can comply with the EAS requirements. In other words, the way the station is operated is largely up to the individual licensee, but the response to emergency messages is an absolute requirement. While that may seem to some like an unnecessary burden, the events of Sept. 11 have shown the justification for that requirement.

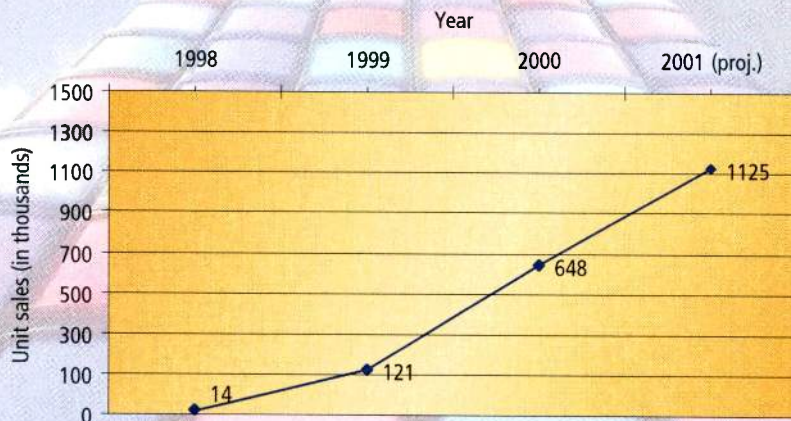
Section 73.1350 (a) is the one with the wide-reaching requirement. It states that each licensee is responsible for maintaining and operating its broadcast station in a manner that complies with the technical rules set forth elsewhere in this section in accordance with the terms of the station authorization. In other words, you can get your meter readings by semaphore flags as long as that method results in accurate indication of, primarily, the power output and the tower lights. It is also necessary to be able to turn the transmitter off. Of course, that particular method would require a line-of-sight path and two operators so it probably wouldn't be too practical. The point here is that the individual station

FRAME GRAB

A look at the consumer side of DTV

DTV set sales continue to grow

Sales in 2000 up more than 400 percent over previous year



SOURCE: Consumer Electronics Association

www.ce.org

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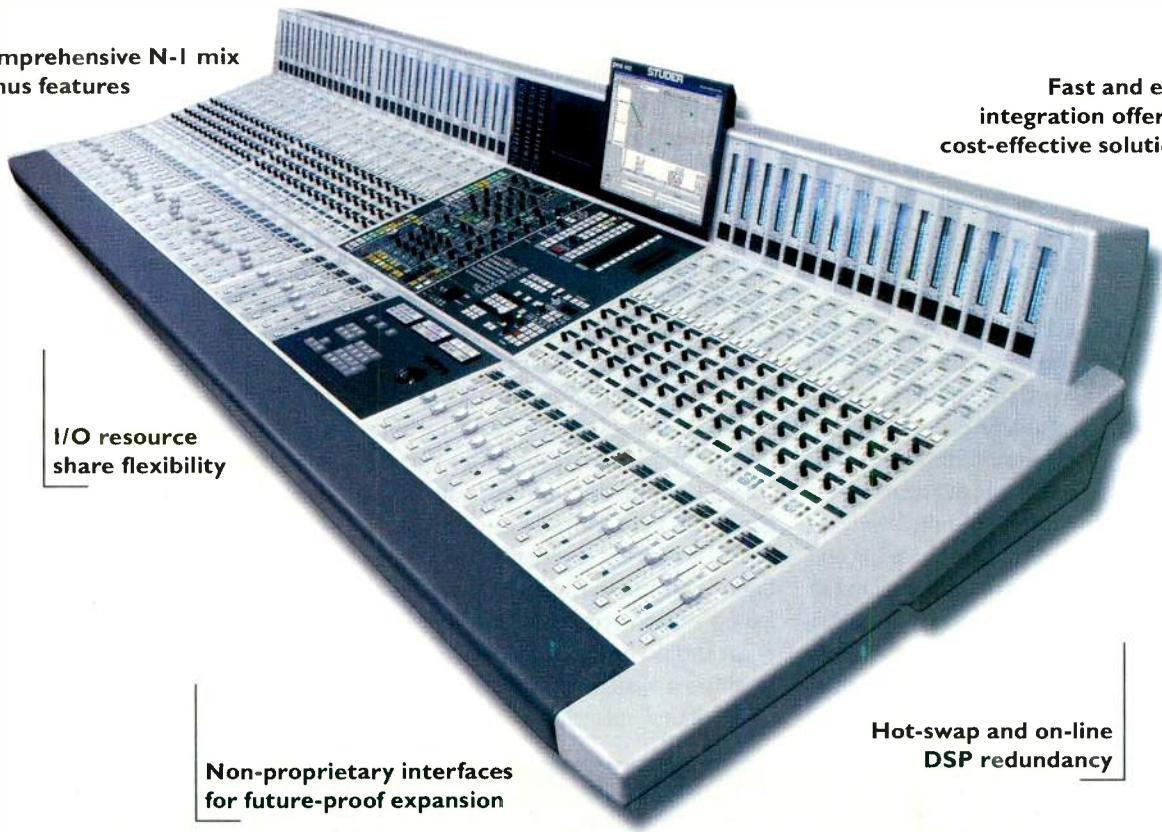
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is given a great deal of latitude to install a system of their choosing, but the results have to be correct within the required level of accuracy.

Remote control systems went through a great metamorphosis a number of years ago when they first started using microprocessors. A number of new units appeared at the conventions offering differing levels of complexity and capability. The usual shakedown has occurred over the years, resulting in a smaller number of systems being offered. The units currently on the market have been field proven to be reliable and stable.

This author has long argued that remote control systems should be standardized in accordance with some yet-to-be-written guidelines. All remote control systems should have the same plugs on the back – one per transmitter with one for the building systems. Then, all transmitters could have one plug, enabling them to be connected to the remote control. Since that hasn't been done, and probably never will be, the installation of a new remote control system should be started with a

great deal of planning. First, it is necessary to determine just what parameters need to be measured on each piece of equipment as well as the building systems. The sum of all of that, plus a healthy margin for future additions, determines the number of measurement channels for the system. The same action is then taken with regard to the number of command channels. Depending upon the system, the larger measurement or command channels will usually determine the actual configuration of the remote control system. Then, some decisions need to be made to further identify the system to be installed. Is access by modem desired or necessary? How many sites are involved in the system? What type of link will be used between the control point and the transmitter site(s)?

When all of this information is on hand, the next move is to contact the manufacturers of choice to actually configure a system that will meet the anticipated station requirements. One little point should be carefully considered in selecting a system. Adjusting a system using digital metering is always more

awkward than with analog metering. It is frustrating to make a minor adjustment and then have to wait to see what that adjustment did. In selecting a remote control system, determine from the manufacturer exactly what the delay will be between when a parameter changes and when the new value appears on the monitor screen at the control point. A delay of a second or two is acceptable. Having to wait for 10 or 15 seconds to see the results of an adjustment is an unbelievable pain and should be avoided if at all possible.

As a last point, be advised that a well-configured and reliable remote control system for multiple transmitters isn't going to be cheap. On the other hand, today's crop of remote controls is stable and extremely reliable. They are flexible and allow a far greater degree of control over the transmitting plant than was available twenty years ago. ■

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



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Building a progressive suite

BY CHRISTIAN MITCHELL

The idea of scratching your current suite and starting over in a brand-new marketplace is an exciting one.

In today's marketplace, you can build an online suite comparable to your current suite for only 70 percent of the cost. In addition, technology has bettered itself threefold since you bought your last system. "Better, faster and cheaper" can be a reality without compromising the integrity of your system architecture.

But where would you start? And what would you need? Here are some ideas.

Just plain old

The first entries in the NLE race were Avid's avr26 and Lightworks. Both were promising systems for the nonlinear future. Nonlinear, uncompressed, dual-stream 601 was nowhere on the horizon. The Macintosh Quadra 950 series was the choice of many in this industry.

By contrast, most modern facilities have digital online suites with Abekas 8150 switchers and multiple channels

of DVE, Avids, and an Audiovision or Pro Tools audio station. Most also have a Windows NT graphics suite and can use any format available: DigiBeta, D-1, D-2, D-5, 1", 3/4", Beta SP, Hi-8, SVHS, VHS, DAT, and 1/4".

money. But prices have been slashed, and building an up-to-date, cost-effective post house is an attainable goal.

Starting over

The new gear has more options and

Prices have been slashed, and building an up-to-date, cost-effective post house is an attainable goal.

Broadcast technology has advanced steadily since the early '90s, and prices on the old stuff are dropping. That's opportunity. But, despite advances in technology, most post houses have stuck with tradition. Instead of evolving, they're falling behind. Why? Well, beyond tradition, and the old adage "If it ain't broke, don't fix it," the underlining reason post houses don't upgrade is

higher-quality output than a D-2 suite, and can accomplish more. It is also faster, and can offer an upgradeable path to DTV/HDTV. For example, Discreet's smoke-and-fire release produces 1080/24p. The Quantel IQ has multi-resolution editing and effects, including MPEG editing. Likewise, 5.1 audio editing equipment is available, and is far more appealing than Dolby Surround Sound. Overall, the amount of new-media equipment knocking on the door daily is astounding.

Another emerging technology is nonlinear online. When posting a project, do you prefer linear or nonlinear online? Some might dismiss linear altogether. With the FCC's mandate for broadcasters – and consequently all content providers – to migrate to DTV, the purchase of a linear switcher today might not be a profitable venture. But the choice is up to you. In either case, your primary objective should be to create an end-to-end, progressive system.

Start with decks: Beta, Beta SP, DigiBeta and Beta SX. Since the accepted standard for approval copies is still VHS, you'll also need a couple of these for duplication. These formats still work, but you may want to go a step further to MPEG. A good option is one of the Sony M-series recorders, because, with them, you can designate the output signal to be MPEG, analog



This modern nonlinear post-production suite features Avid Symphony nonlinear system supported by an Avid Media Composer nonlinear editor, both operating on the Windows NT platform. System integration by MCSi, Inc. Photo courtesy Locke Bryan Productions, Inc.

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component/composite and conventional baseband SDI. You'll find that the MPEG format helps on every level – archiving, production and future system expansion.

Now you need the equipment to get the job done. Start with an Avid 9000 or Symphony. They combine real-time multi-format editing, mastering and versioning, and can be integrated into a workgroup environment. A solution for offline/online editing and effects compositing might include a smoke-and-flame combo from Discreet operating through a Mackie ML2 Pro (1604).

Smoke can perform short-form, long-form, creative editorial, graphics and effects work at full bandwidth (RGB 4:4:4). Additionally, smoke offers networking and storage options, as well as high-end efficiency features through Discreet's Multi-Master Editing. Likewise, the flame toolset backs up your graphics and visual-effects capabilities. Together, they provide a graphics solution for commercials, interactive media, broadcast programming and feature films.

For mixing, a Graham-Patten D/ESAM 230 can give you the performance of a high-end mixer in a single table-top unit with assignable inputs. Through the unit, you'll have access to programmable device assignments, industry-standard ESAM II and D/ESAM IV protocols, four digital and analog output buses, multi-band parametric EQ, programmable audio delay, full monitoring and metering, and simultaneous support for both analog and digital inputs, plus all the standard features. A Pluto DDR and a DAT could be used for duplication and archiving.

Future bound

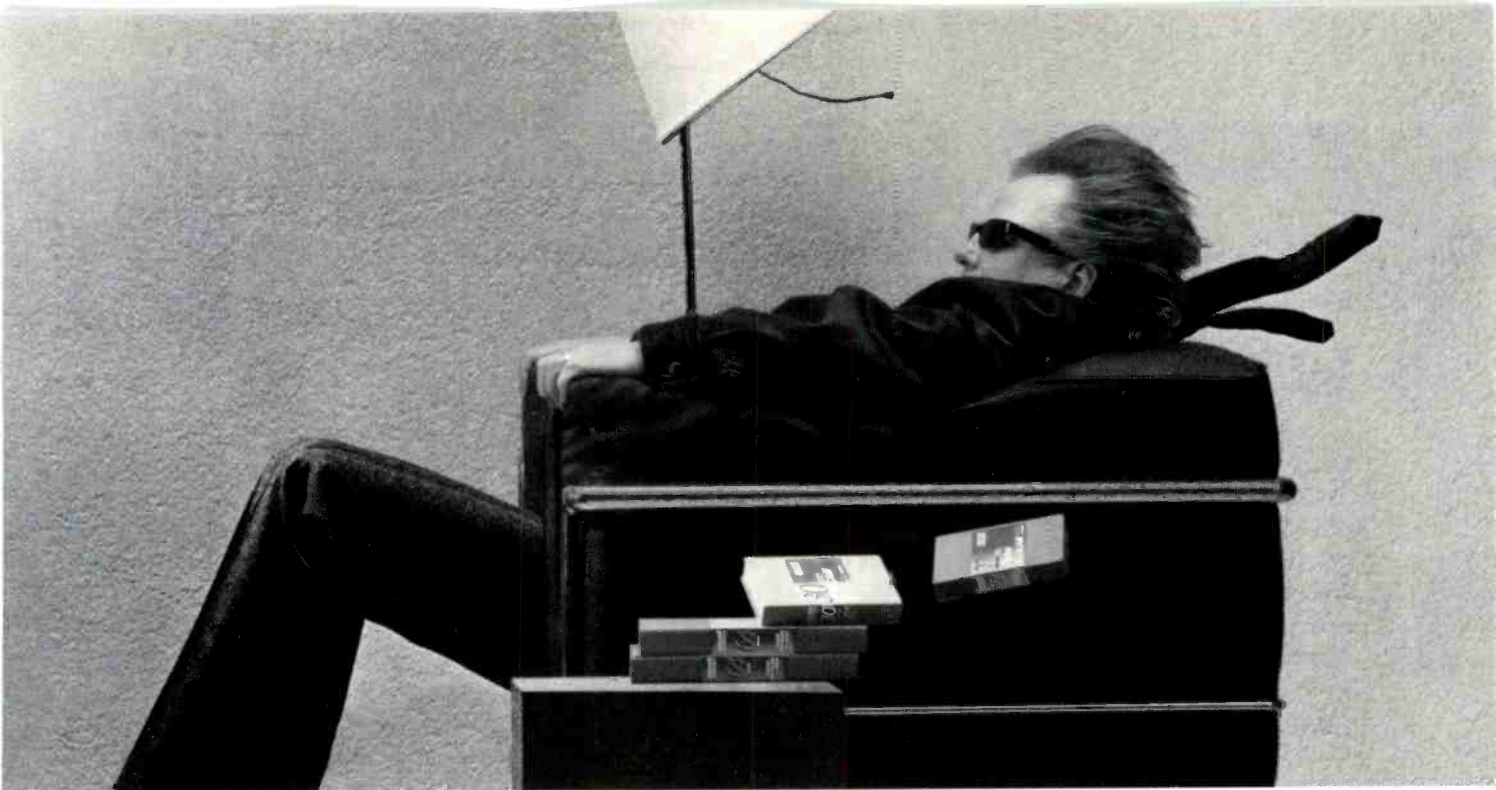
To reach the level of efficiency and quality you ultimately seek, it is essential to look beyond current hardware to asset management: file transport and storage via a conventional network or the Web.

An example of this type of system is the Media360 from Ascential Software, which creates a framework to load, digitize, index, retrieve, browse, edit, distribute and protect your projects. Good asset management systems can open the door to new revenue opportunities. They can also lower production and distribution costs by allowing clients to view samples and approval copies via the Web. To enhance this process, use an asset-logging station like Virage's VideoLogger to ease the MPEG encoding process and further reduce production and transfer times.

So, there you have it: your new, state-of-the-art suite, packed full of all the progressive architecture it can handle. With it, you can service the production and post communities, and provide creative and technical services in film, video and sound – unhindered and unmatched.

Bottom line: remember that when you lay the groundwork for your system, you don't need the biggest and the best, you only need what it takes to get the job done, and to enhance the success of your clients. But, having the biggest and the best is always nice. ■

Christian Mitchell is a freelance writer based in Atlanta. He can be reached at mitchell_christian@hotmail.com. The author would like to thank Kevin Garguilo of MCSi, Broadcast Solutions Group for his help on this article.



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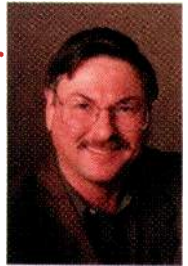


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Video networks: Packaging and shipping data

BY JIM BOSTON

We've always packaged, or wrapped, video with other information before sending it on its way. Originally, we wrapped it with sync pulses. Now we convert analog picture elements into sequences of numbers (data), but we still surround them with timing information. Instead of sync pulses, we now add data strings called "start of active video" (SAV) and "end of active video" (EAV). We can also add audio and other ancillary data now in SMPTE259M/CCIR601 bit streams. We can use these streams to move data other than baseband video and audio signals. The Serial Digital Transmission Interface (SDTI) replaces the baseband video payload with what is usually MPEG data.

As technology progressed, analog video and audio came to live most of its life as digital data, and we began to move it in ways developed by the computer and telco folks. That is, we developed sets of rules – protocols – to break the data into "chunks." Until very recently, the three most common protocols we used for this purpose have been Frame Relay, Internet Protocol (IP) and Asynchronous Transfer Mode (ATM). All three of these protocols use virtual, connectionless paths. This means that there is no physically switched, dedicated path between end

guarantee that the data will arrive at its destination in a timely manner. To achieve this, frame relay uses paths called permanent virtual circuits (PVCs) to connect end users. Many other data sessions can share different links of the path, but the data carrier sets up the virtual paths to be there all the time, whether or not the user has data to send. If no data is sent, the time slots (or, more precisely, the frames) devoted to that data customer are empty.

What can be confusing about these protocols is that some are often wrapped within others. For example, IP frames often can be inserted as the data payload into ATM cells. In another example, a user's data can be wrapped in an error-correction scheme called Transport Control Protocol (TCP). This TCP data can then be wrapped a second time in IP, which provides destination addressing. Additionally, IP can be wrapped in Ethernet protocol for transport over the user's local network.

Different protocols are used in different situations according to the advantage they offer. The advantage of frame relay is that its frame lengths are long, generally 128 bytes and up. This means that, for lower-bit-rate (bandwidth) paths, there is less overhead.

time-sensitive material only in networks that are not congested, or through congested networks where quality-of-service levels along the path need to be tunneled out. IP traffic outside the carrier's synchronous optical network (SONET) backbone is routed via routers, which are cheaper than switches. Routers are generally software-driven devices, and thus the propagation delay through them is longer than the hardware-oriented switches used for ATM. Another protocol, User Datagram Protocol (UDP), can be used in place of TCP since, unlike TCP, it doesn't require re-sending cells that are lost. The re-sending of lost cells and the wait to assemble the re-sent cells in the proper order would greatly hamper the high-bit-rate/real-time nature of television bit streams.

Another protocol and set of hardware now used to transport television data is a specification known as P1394. As with Fibre Channel, P1394 carries SCSI commands known as Serial Bus Protocol. P1394 automatically negotiates itself into a "tree" network with nodes establishing parent/child relationships. P1394 divides its time between asynchronous "normal" data transfer and isochronous "ship and pray" data transfer from one node to any other node interested in receiving the data. Isochronous data transfer is used for moving video between P1394 devices. These architectures provide common access to a file system. They use special switches – content-aware packet switches – that transport both isochronous and asynchronous data, extending the network's reach via optical fiber.

There are two types of network topologies used to attach storage to data networks.

Storage Area Networks (SANs) and Network Attached Storage (NAS) comprise one or more storage devices connected to clients as servers, usually via Fibre Channel. While the SAN is based on Fibre Channel connectivity, the NAS

Many data users require some guarantee that the data will arrive at its destination in a timely manner.

locations. The data from one location is merged – via time multiplexing – with other traffic headed the same direction.

Data traffic can be very "bursty," and many data users require some

The trade-off is that data requiring fast access to the network has to wait longer for its turn. To solve this and other problems, ATM has shorter cell lengths. IP is much cheaper to implement than ATM. But ATM is good for carrying

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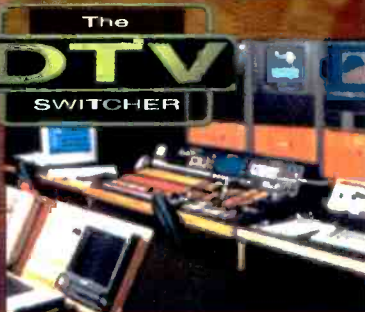
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is based on Ethernet connected to a "protocol converter" that converts NAS to a SAN. Compared to a SAN, NAS storage greatly simplifies client access to storage.

Since SONET is usually the backbone that moves data over WANs, you need to gain access to the SONET carrier. This is usually achieved by using the Incumbent Local Exchange Carrier (ILEC) – often the local phone company – or a Competitive Local Exchange Carrier (CLEC) to provide connectivity from your facility to the

ATM carrier's point of presence (POP). Once your data is at the POP, the ATM carrier charges a port charge. This is a

about 8Mb/s overhead on top of the 44.21 DS-3 stream. OC3 (155Mb/s) carries three DS-3 streams, or 84 DS-1

Different protocols are used in different situations according to the advantage they offer.

subscription into the SONET network. One DS-3 bit stream is inserted into an STS-1 frame, which in turn is inserted into an optical carrier (OC-1) stream. An OC-1 stream is 51.840Mb/s with

streams, or 2016 DS-0 (voice) streams. It is possible to achieve a concatenated mapping, by which all the bandwidth is given to a single user (no digital hierarchy at all) such as an ATM user. (A small "c" indicates a concatenated frame, e.g.: STS-1c.) OC-12 carries 12 DS-3 streams (622Mb/s). OC-48 carries an STM-16 bit stream, which handles 48 DS-3 streams. OC-192, which can carry 192 DS-3 streams, is currently the highest bit rate available. On a SONET ring, you often find different kinds of traffic. Some carriers have voice, IP and ATM traffic all traveling over the same OC ring. Although the different traffic can be thought of as separate virtual networks, they all travel over the same physical fiber ring in STS frames.

As you can see, there are many ways to wrap and ship video data over networks. Different protocols and network topologies have been developed to solve particular data-transport needs, and they often work in concert to move the data from place to place. ■

Jim Boston is director of emerging technology for the Evers Group.

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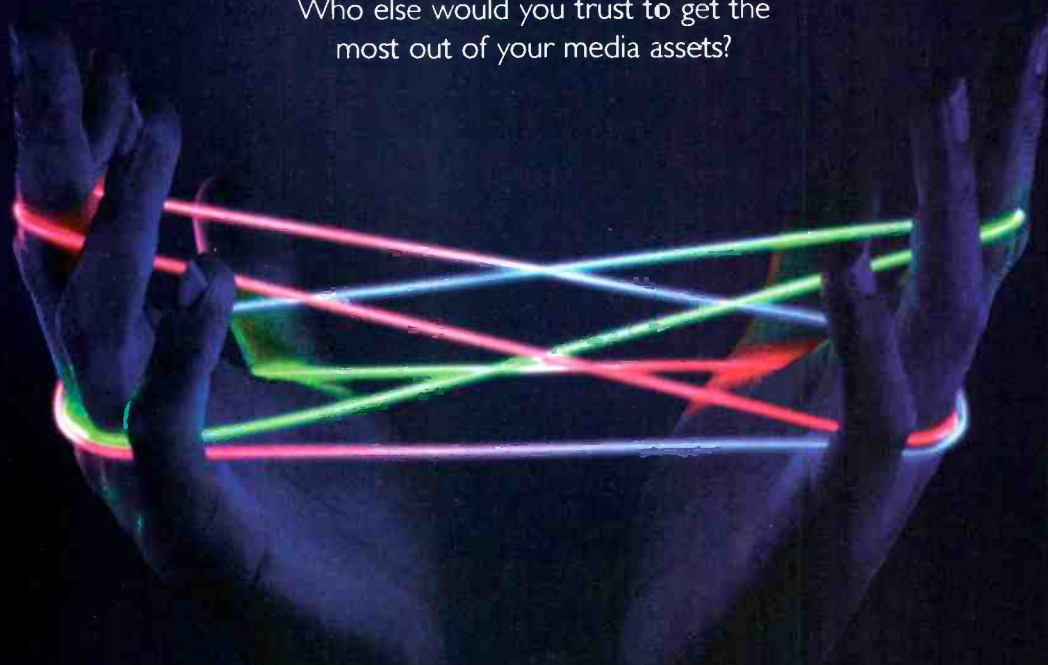
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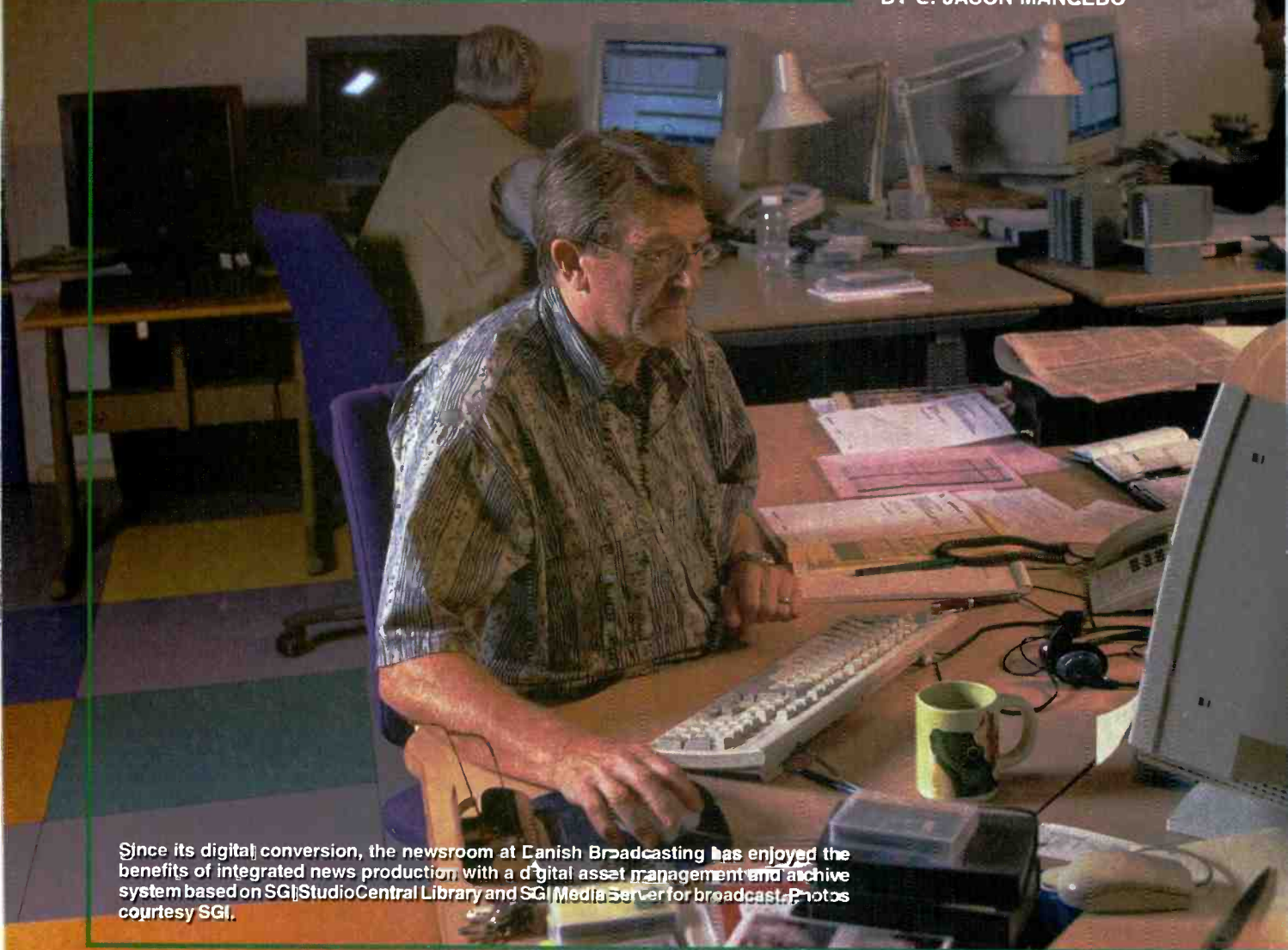
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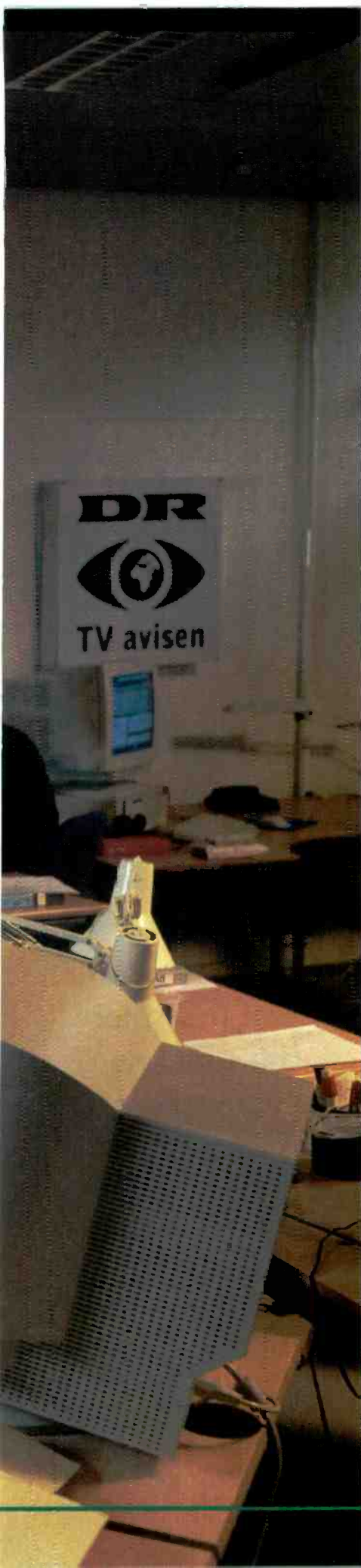


Asset management in news and broadcast production environments

BY C. JASON MANCEBO



Since its digital conversion, the newsroom at Danish Broadcasting has enjoyed the benefits of integrated news production with a digital asset management and archive system based on SGI StudioCentral Library and SGI Media Server for broadcast. Photos courtesy SGI.



A sset management is the latest buzzword. A lot of people are talking about it, and they all think they need it. But what exactly is asset management?

First, let's deal with a more basic question: What exactly is an asset? In news and broadcast production, an asset comprises two parts: content (or essence) and metadata. Content is the file (or set of files) that holds the digitized program material (for example, an MPEG-2 or DVCPRO .dif file of a video clip). Metadata is information that describes the parameters of the content (bit rate, television standard, file format, etc.). In some cases, an asset may consist entirely of metadata with only pointers to other assets that hold the actual essence. An example of such an asset is an edit decision list (EDL), which contains no actual program data but instead has pointers to the EDL's assets, along with the EDL's in and out points and transition and overlay specifications.

In 1996, an asset management system was a computer program that consisted of a database with information about a physical tape. This information included the title or subject matter, the date shot or recorded, the photographer and/or producer, the physical location of the tape in the library, and perhaps (if the system was advanced), the barcode number. The term "metadata" was not a part of our daily language back then, but metadata existed and was being used. Typically, it consisted of handwritten notes on a shot log or a computer printout of the EDL. But, in a mere five years, the industry has moved from being firmly rooted in magnetic-tape media to being engaged in the third generation of the digital transition: the tapeless environment.

Generations

The first stage of the transition started with the migration from magnetic-tape equipment to video servers and proprietary computer-based nonlinear editors. The first of these systems allowed more flexible editing as well as lower cost of ownership and operation. But the question is: Did they allow better management of digital assets?

Unfortunately, the typical equipment

that led this transformation was little more than a tapeless VTR. In fact, most video servers or digital disk recorders (DDRs) of the era used storage that was similar to the videotape medium it was replacing. Videotape has a continuous area of magnetic particles on which to record data. There is no inherent structure to the medium; rather, the data provide the structure. These first-generation devices used identical techniques when recording to their hard disks. They wrote data to a raw partition, an area of the hard disk that, like videotape, had only magnetic particles capable of recording the raw video and audio data. The raw partition did not have an inherent structure – a file system accessible to the computer's operating system. The data provided the structure. The downside to this was the lack of interchange capability. Without a

An asset comprises two parts: content (or essence) and metadata.

file system, there is no file, and with the raw partition defining the format of the video, the ability to transfer data to another system is severely limited. The most flexible of these systems were able to save the data to removable storage media. Still, the best that could be hoped for in an asset management system using this technology was the tracking of a physical asset: the videotape.

In the second generation of the transition, generic PC-based computers surfaced as the new hardware platform for much of the next-generation technology. Its intrafacility interchange capability provided an excellent gain in efficiency. Rather than using analog or SDI video as the medium of transfer, these second-generation devices are connected using standard Ethernet networks, albeit to homogeneous devices. Disseminating content via computer networks illustrates the concept

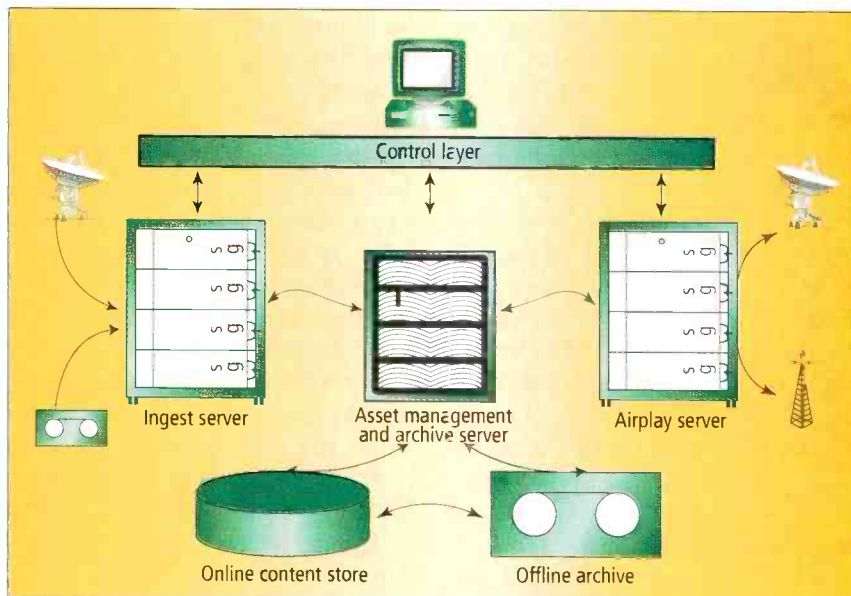


Figure 1. This block diagram shows the workflow of digital media asset archiving and retrieval used in broadcast applications.

of “distribute data, view video.”

There are two associated actions — distribution and viewing — that you can do with video. Rather than keep these as a unified process, the “distribute data, view video” concept removes the bind between the two. Unless you need to view the video, you can distribute it over a network without viewing it and without using a time reference.

This model is superior for two distinct

reasons. First, distributing the video as data does not require encoding or decoding, and therefore avoids the degradation of quality associated with these processes. Secondly, since you can distribute the video data without using real-time references, you can exploit the characteristics of high-speed data networks. It is now very common to have 100Mb/s, 1000Mb/s, or ATM OC-3 data networks within (and some-

times between) facilities. File transfer times on these networks are several times faster than the video clip’s total run time (TRT). For example, a 30-second file of 25 Mb/s MPEG-2 and its associated protocol overhead would transfer, via gigabit Ethernet, approximately 30 times faster than its TRT. By the same token, a news story with a TRT of one minute would transfer in approximately two seconds.

Now, in the third generation of digital transformation, we move to use the “distribute data, view

video” concept between heterogeneous devices. This means sharing assets not only between devices linked by high-speed local networks, but also on wide-area networks (WANs) between facilities of a station group, global WANs or global public networks (the Internet).

There are two common misconceptions about network-based transfer and distribution. These misconceptions, and the factual explanations to dispel them, are listed below.

Misconception #1: The lower the bandwidth of the network, the lower the quality of the video.

The facts: The quality of the video is not related to the bandwidth of the network.

Since network-based distribution is done with files rather than with real-time streams, the quality of the video is determined when encoded or recorded. A clip recorded at 50Mb/s MPEG-2 will always have the same characteristics unless otherwise acted upon by further compression or transcoding. Simply transferring a file has no effect on the quality.

Misconception #2: The cost of a WAN connection with the bandwidth to

The industry has moved to the third generation of the digital transition: the tapeless environment.

transfer the file is prohibitive.

The facts: The time required to transfer a file becomes a business decision. Measured leased lines can be an effective strategy for those who may have a sporadic rather than consistent need for faster-than-real-time file transfers. Examples may be a breaking news story or an immediate post-production session. At other times, when immediacy is not crucial (perhaps news stories for the next day or digital dailies),



A StorageTek L700 and SGI 2100 server are key to the scalability of the digital asset archives at Danish Broadcasting.

transfer can take place in slower-than-real-time over a monthly lease line with a much lower bandwidth capacity and much lower cost. The key is that the network must support the requirement for data availability at the remote location rather than the compression format's requirement for real-time availability.

Digital asset management/archiving

The ability to transport many digital files over a LAN or WAN by different workstations serving different functions (such as editing, graphics, and acting as the ingest and air-play servers) exacerbates the task of managing the digital assets. Imagine taking a clip from the ingest server and sharing it with three NLEs as well as a graphics workstation. The original clip is now a contributor to five different clips. However, when the task of managing these assets is left to the asset management system, this once-daunting challenge at last becomes feasible (see Figure 1).

Using the asset management system at the center of the workflow as shown in Figure 1, all devices must check assets into the management system before other devices on the network

can use the assets. High-speed networking should be used, and the speed of the network should be selected based on the format and compression (or lack thereof) used. A typical 30-second commercial spot using an MPEG-2 4:2:0

networks or LFNs) in conjunction with an application that uses TCP/IP, such as FTP, you must be sure to select a device that supports RFC 1323. RFC 1323 is a TCP extension for high performance, which allows the TCP window

The speed of the network should be selected based on the format and compression (or lack thereof) used.

file at 4Mb/s (a typical playout format), would take approximately three seconds to transfer over a T-3 (45Mb/s) network between facilities, whereas an uncompressed 1920x1080i 4:4:4:4 file at ~250Mb/s would need nearly 25 minutes to transfer over the same network. Clearly, the speed of the network you use is a business decision as well as a product of the type of work in which your facility is engaged.

One additional item to note is the case of high-bandwidth, high-latency networks. When you use a network with an effective bandwidth greater than approximately 4Mb/s and a latency greater than approximately 15 msec (often referred to as long-fat-pipe

size to scale. In LFNs, as the RFC reads, "TCP performance depends not upon the transfer rate itself, but rather upon the product of the transfer rate and the round-trip delay. The window-scale extension expands the definition of the TCP window to 32 bits and then uses a scale factor to carry this 32-bit value in the 16-bit window field of the TCP header (SEG.WND in RFC-793). The scale factor is carried in a new TCP option, window scale."

Without operating system and application support for RFC 1323, transfer times over LFNs will be severely impacted, and the added capital outlay for the high-bandwidth network will be for naught.

Asset sharing

Typically, several different digital-media data formats are used during television production and broadcasting. The number of formats will continue to increase as more video compression schemes and file formats emerge and pervade the industry. Digital media will also continue to exist in several different media servers or file servers within a facility. Some content will be stored online, and other, less-frequently-used content will be stored in archives or in other types of near-line storage. This creates the need to search and access content, regardless of its type or physical location.

Searching can and should be extremely flexible. A system that supports data models is critical for a flexible, working system. A data model is a capability that allows the data structure of the asset to be defined. The most flexible asset management systems will provide typical



A Danish Broadcasting operator is performing ingest using Keyvia's (formerly Keops) Key-MediaWorks – creating and checking in multi-resolution assets to the asset management system from VTRs and satellite.



Four SGI Media Servers for broadcast (purple rackmounted systems) and RAID-3 storage by Ciprico provide dual redundant systems for newsroom and airplay operations at Danish Broadcasting.

data models for common media file formats. But they should also allow for user-definable data models. This ensures the systems will interchange with current and future file formats (see below).

Additionally, a critical factor that enables content sharing is a defined file format. Without one, there could be no interchange of assets between applications in a heterogeneous environment. While at least two key manufacturers attempted to urge the acceptance of their proprietary or wrapped proprietary file formats as open standards, the advanced authoring format (AAF) file [offered by the AAF Association (www.aafassociation.org)] and the MXF file format [offered by the Pro-MPEG Forum (www.pro-mpeg.org)] are two excellent examples of industry working for the common goal of true file interchange in the most flexible and suitable format for the respective segments of the industry each organization represents. The AAF format is intended for editing and content-creation users, and the MXF file format is aimed at streaming, ingest

and transmission uses. The goal is not only to exploit file interchange between heterogeneous devices by diverse manufacturers, but to have AAF and MXF files interchange as well. This means that an editor could create an AAF format file using an NLE in New York and check it into the asset management system. Doing so would allow the transmission facilities (each

played to air. This metadata would likely be in coordinated universal time format. With a user-defined AAF-to-MXF filter that applies the start time – -7 hours for central time or -9 hours for the user in the Pacific time zone – the metadata created in the new MXF file is customized. While this is an extremely simple example, one can see the potential of the AAF and MXF files and their filters. The key to all of this is the information quarterback: the asset management system.

Devices that do not have standard, native file formats limit flexibility and choice, and reduce efficiencies. Employing a standard information technology infrastructure unlocks the key to a world of flexibility and lowers costs. Open-system file servers, the latest in high-speed networking, high-performance operating systems, and file systems are all examples of technologies employed by forward-thinking broadcasters managing and delivering their content as data. As such, they enjoy reduced capital outlay, ease of repair, and greater access to parts and service – all economies of scale.

Without compatible products using open and accepted standards, asset management by itself will do nothing more than allow you to manage your homogeneous islands of content. In this scenario, a user is able to query the metadata that is available on the local system or perhaps the local facility – a moderately interesting exercise that offers very little return on investment

Devices that do not have standard, native file formats limit flexibility and choice.

in a different region of the country but connected via a network) to request the same file. However, they could each apply their own MXF filter to the original file. These filters enable the creation of a new file by selectively choosing and applying metadata within the original AAF file to the new MXF file. A typical use would be an AAF file that contained the metadata of the start time of a program to be

(ROI). The added value of asset management is the ability to share valuable assets, locally or globally.

Archiving

As the transition to an asset-centric environment proceeds, the asset archive becomes increasingly important in the digital news environment. The digital archive can store – on RAID arrays or on computer tape – all

of the footage that has passed through the facility. The shooting ratio for most news/documentary productions is 50 to 1, even without reuse of final story footage, and the resulting archive material is an invaluable resource for the newsroom in the creation of future stories. The asset management system performs a vital role in the management of the archive. The high-quality, high-resolution footage can be moved to less expensive, offline storage formats such as data tapes or DVD-ROM. Metadata from the archived footage can be kept online in a database. Materials that are likely to be reused can be duplicated in low-resolution versions and kept available in online or near-line storage. This allows queries on the metadata and viewing of low-resolution versions of the footage via LAN, WAN or public networks using standards-based, streaming media technology.

The asset management system must support different modes of operation for its archives. Near-line and offline or archive storage can be provided by hierarchical storage management (HSM) systems that provide seamless access to media contents by quickly bringing low-resolution footage onto a disk cache. One example is to use an HSM with a virtual file system to move infrequently accessed files to tape while keeping the content files that are used most often on a disk

cache. In this case, streaming a low-resolution version of footage can initiate the HSM system to bring the footage from tape to disk. The high-resolution format of the footage could

be archived automatically, or the direct approach of explicitly moving it to the offline archive manually could be used rather than letting the HSM decide when to move it. Furthermore, the facility administrator may want to control the specific tape or archive on which it is placed (for example, grouping all of the footage from a particular location together).

At first glance, making the transition to the digital environment seems a daunting task. With further exploration, one finds the current state of affairs an excellent indicator of the efforts manufacturers are making to provide truly open systems that will fulfill the promises of the digital transition.

While asset management systems encompass the entire workflow of a broadcast facility, not limited to acquisition and transmission servers as well as the database server, a flexible and effective asset management system

includes high-bandwidth connection to content creation and editing seats, automation systems, and online and offline asset archives. This asset-centric system depends on a strong API

Making the transition to the digital environment seems a daunting task.

and software bus to unite the entire environment into a highly productive, well-connected and efficient workplace. Such a workplace saves time and money by accomplishing goals in the following areas:

Content sharing and repurposing

- Decreasing the duplication of efforts to create or gather footage that the station or station group may already own

- Providing potential additional revenue streams by easier cataloging, tracking and versioning of assets and finished stories

Increased flexibility and creativity, allowing faster production

- Allowing access to all levels of personnel in local or remote facilities and increasing productivity and creativity

Decreasing capital costs of editing systems

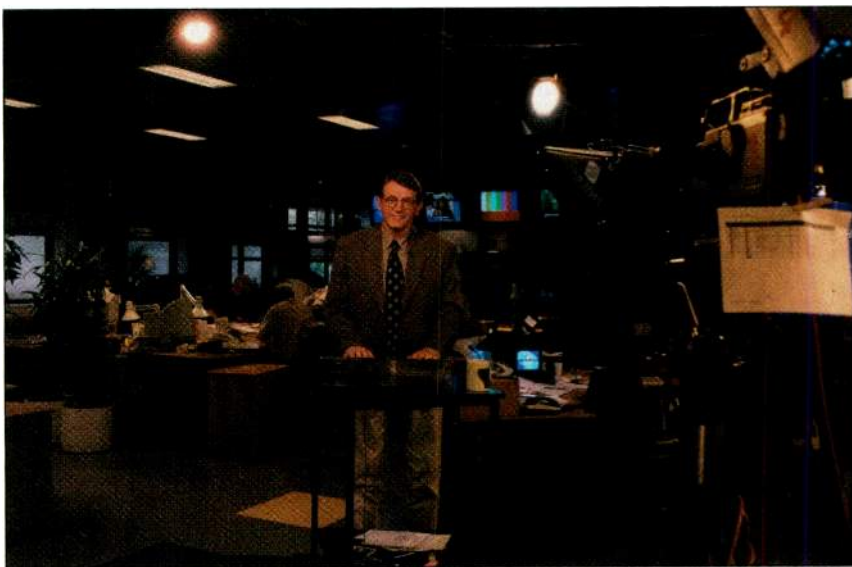
- Allowing fast access to metadata and low-resolution versions of footage for the creation of rapid virtual clips and EDLs

Future-proofing capital investments

- Supporting data models and open file formats such as AAF and MXF

- Being flexible and scalable enough to work with existing technologies and future technologies that might be added to scale system capacity

Bearing in mind the above benefits, you must weigh the risks discussed and determine the ROI by carefully considering your expectations. But your thorough preparation will be rewarded with a system that satisfies both users and management. ■

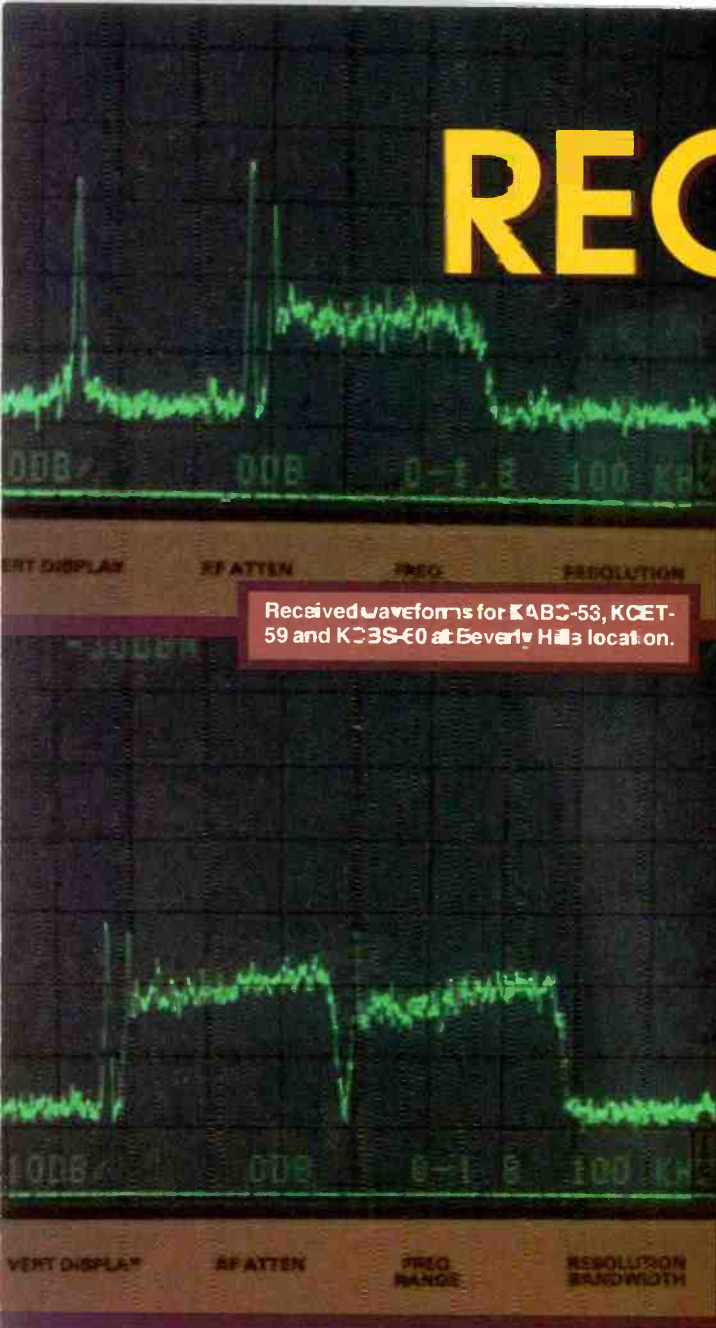


From presenters to behind-the-scenes editors, all the members of a modern digital news department have desktop access to an asset management system on a daily basis.

© Jason Mancebo is senior technology manager for the Media Industries division at SGI in Mountain View, CA. He can be contacted at mancebo@sgi.com.

RECEIVING

BY PETER H. PUTMAN



There has certainly been more than enough debate about the efficacy of the 8VSB modulation system for digital television. Early reports of difficult reception and problems with multipath have led some parties to believe that the United States has made a serious mistake in adopting VSB as opposed to the OFDM standard being adopted by Europe and Asia.

The truth is, 8VSB signals are not as difficult to receive as many would maintain. I know; I have done extensive testing over the past year-and-a-half with a variety of antennas in several different indoor and outdoor locations. As a result, I can report that it is indeed possible to receive 8VSB signals — at least those transmitted on UHF frequencies — in a variety of indoor and outdoor locations by paying careful attention to the type of antenna used and overall signal levels.

While 8VSB doesn't work everywhere, it's still early in the game; and further developments in 8VSB receivers — and enhanced 8VSB data streams for "training" those receivers — are showing promise for solving even the most difficult reception problems. Aside from these developments, there are plenty of things that can be done to improve the antennas used to watch DTV.

Let the games begin

My initial tests with antennas began as I was trying to watch Monday Night Football in HD in October of 1999. Oddly enough, the primary reason I began experimenting with a few Radio Shack antennas was to try to get a more reliable signal to test out a 50" plasma panel and a 32" 16:9 direct-view TV.

By January 2000, I had installed a semi-permanent antenna mount on the rear of my deck to facilitate swapping out various antennas I had accumulated from Radio Shack, Terk and Channel Master.

Along the way, I had discovered a couple of interesting things. First, the best antennas I tested weren't always the biggest. Second, I found that optimum reception of two stations with antennas mounted on the same tower — KYW-26 and WPVI-64 — often came from different directions.

The best antenna for receiving WPVI-64 turned out to be a plain little screen design with four collinear UHF bow ties mounted on it. This antenna helped my Panasonic TU-DST50W first-generation set-top box lock up the three strongest Philadelphia UHF DTV stations and even let me see snippets of a fourth, WCAU-67 (running low power). I decided to start conducting more scientific tests of antenna performance. News that additional DTV stations from Philadelphia (WHYY-55) and Allentown 25 miles northwest (WFMZ-46 and WLVT-62) would soon be coming on-air provided further incentive.

DTV IS EASY

As the weather warmed up, I mounted five feet of mast and a rotor next to the chimney on my house and installed the previously mentioned Channel Master model 3021 collinear with an accessory UHF preamp. Eighty feet of RG-6 routed from my basement to connect to the Panasonic tuner completed the installation.

With the help of Dave Smith, an engineer at KYW-TV, I was able to borrow a spectrum analyzer and began to shoot some waveforms from the local stations. By April 2000, I was able to watch all the local DTV stations that were available for viewing, as well as pick up an 8VSB carrier or two from New York, 65 miles to the northeast.

I secured review models of numerous TV antennas. I positioned each antenna on my rear-deck test mast and then atop the roof mast, measuring signal strength on each received DTV signal with a Sadelco Mini-Max 800 meter.

I also purchased a precision 75Ω step attenuator from JFW Industries and began conducting what I called "headroom" tests for every DTV set-top box I could get my hands on. This test involved peaking the antenna for best signal, then adding attenuation in either 1dB or 10dB steps until the signal started to break up. This reverse-engineering process, combined with spectrum analyzer measurements, gave me a rough idea of the carrier-to-noise performance of each STB, as well as which antennas worked best for 8VSB reception.

Too much fun to be work

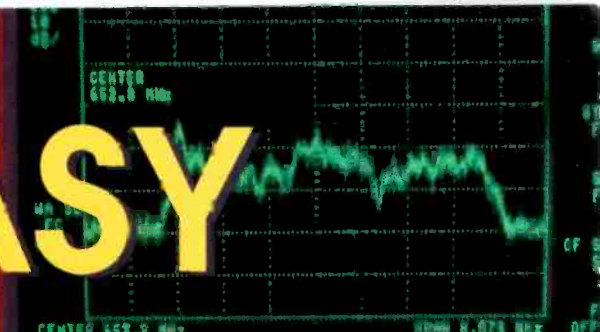
As spring turned into summer, I had identified a few antennas that seemed to work well for UHF DTV reception. I also decided to try to build a compact UHF antenna that would be optimized for gain around channels 40-45. (We have a lot of local DTV channels above 40 in the Philadelphia area.)

Eric Hodges at Tektronix provided a model 3661 spectrum analyzer to enable me to perform real-world comparisons between my designs and the ever-growing piles of aluminum in my yard.

It is well known in antenna design circles that a full-wave dipole is a moderately broadband, antenna-driven element that is relatively easy to match. In fact, the folded bow tie dipole configurations used by many of today's commercial antennas are simply modifications of the folded dipole design.

In short order, I had a working five-element yagi using a folded dipole that was doing an excellent job of picking up all the Philadelphia DTV stations while mounted on 10 feet of mast on my rear deck. The 8VSB waveforms I was seeing on the 3661 showed low to moderate multipath on the received signals, although the C/N levels weren't really high.


Further modification to the antennas resulted in flatter-looking waveforms and improved C/N levels. I got to work cutting and gluing, and soon had a three-element version of the same antenna, which tested nearly as well as the five-element version.



The actual received waveform for WYVW-44 at the Schuylin site (top) and the larger homebrew antenna sitting on the floor (bottom).

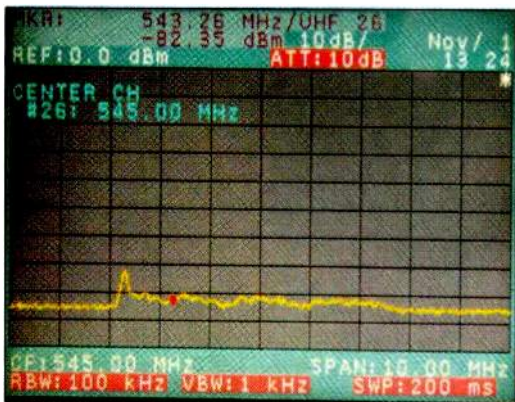
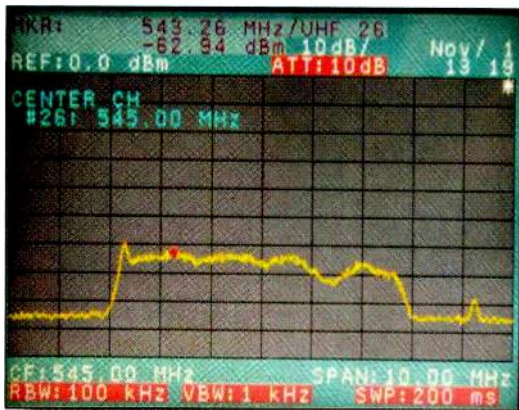


The Channel Master 3022 with modified dipole feed and reflector spacing.



Like most first-time DTV viewers, went for the biggest antenna on the tallest mast for my first DTV antenna setup.





Spectrum analyzer plots showing how DTV channel 26 was received on a homebrew UHF yagi (top) vs. a commercial VHF/UHF amplified antenna (above).

Insight

Coupled to either antenna, my “deaf” Panasonic TU-DST50W set-top box proved quite sensitive. The received signals had only about a 20dB C/N ratio in some cases, but reception was

analyzer showed lots of multipath and low signal levels.

After some testing, I placed one of my antennas on the floor for a moment to pick up my camera. Instantly, the local Fox channel, WNYW-44, locked up on

DTV reception. The result was a modification to Channel Master’s model 3022 suburban yagi that improved gain and multipath performance on the upper UHF channels. The 3021 screen antenna didn’t need further tweaking — it was still the best performer on hand.

During September and October of 2000, I tested my antennas indoors in my family room and basement. Results were encouraging — the strongest stations could be pulled in with the 12” long three-element yagi, provided the C/N was strong enough. (The CM775 UHF preamp helped in many locations.)

I also took a pair of antennas to the famous “Schubin Site,” an apartment located in the upper west side of Manhattan that is the residence of industry pundit Mark Schubin. His reception problems are legendary, and a borrowed Hewlett-Packard spectrum analyzer showed lots of multipath and low

reception from KYW-26, WTXF-42, WHYY-55, WPVI-64 and WLVT-62 with not much more than the three-element yagi and a UHF preamp. These results were duplicated with the Anti-interference Silver Sensor, a tabletop logarithmic UHF antenna that is quite compact.

A trip to ABC Television’s Advanced TV Labs in New York resulted in successful reception of WNYW-44 and WCBS-56 simply by placing the 12” three-element yagi on a filing cabinet near a rear window and aiming it at a building across the street — no preamp was needed. By anyone’s reckoning there were numerous signal paths to this location. Once again, though, the high C/N was sufficient to lock up a Sencore AT984 receiver, as well as a Panasonic TU-DST50W STB.

By now, I had a few of my antennas fabricated out of something more substantial than PVC pipe. I took two prototypes down to the DTV 2000 conference in Atlanta. Most of what transpired there was detailed in the January 2000 issue of *Broadcast Engineering*. Brad Dick, editor of *BE*, made a bet with me that he’d buy me dinner if I could receive an Atlanta DTV station indoors at the hotel.

The site was a tough one — the Hyatt-Regency, which sits on a steep incline. The mini-trade show took place in its basement exhibit hall, and the

Subsequent tests of set-top boxes confirm that the new receivers are indeed more sensitive than their ancestors.

rock steady.

Adding a high-quality UHF preamp (Channel Master model 7775) and deliberately inducing multipath taught me something else. The Panasonic tuner could also handle a fair amount of signal multipath, provided the overall C/N ratio remained high. If multipath produced notches in the received 8VSB waveform that dipped below the STB’s minimum discernable signal level then there wasn’t any way I was going to get reception.

By now, I had started to cannibalize the pile of antennas from my previous tests to make up improved versions for UHF

his RCA DTC-100 set-top box. The antenna was oriented northwest, with Fox’s transmitter atop the Empire State Building about 40 blocks south-southeast.

Further testing was bringing in WCBS-56 intermittently, but in another direction. By the time I had to depart, I had hard evidence that an 8VSB signal with considerable multipath could be received indoors — again, provided that the C/N ratio was high enough.

More tests

Subsequent tests in my basement and office revealed I could get reliable

ceiling of that room is below ground level. That’s not a particularly great place to try indoor reception, but with the assistance of the kind folks at Sencore, I set up my five-element yagi and several feet of coax to another AT984 receiver.

I was as surprised as anyone a few minutes later when local Fox station WAGA-27 appeared. Not only that, the signal was fairly steady — it only dropped out when we walked in front of the antenna. No preamp was used, and the AT984’s readout showed we had a fluctuating signal level from 18dB C/N to as high as 26dB C/N.

Neither of the other two Atlanta DTV stations was strong enough to receive indoors, as both measured below 18dB C/N. Of course, the Fox signal had lots of multipath, and re-

The best antennas I tested weren't always the biggest.

ception wasn't easy. In fact, we measured one notch as deep as 12dB on the accompanying Sencore 8VSB waveform analyzer. Still, the AT984 held firm and we watched several Fox programs before pulling the plug. (Brad, I'm still waiting for dinner!)

Antennas and fitness

My reception tests continued into this year, as next-generation DTV set-top boxes started coming to market. My first experience with these was with the terrestrial-only Samsung SIR-T150, with a complete Broadcom front end and 8VSB demodulator. In a side-by-side test with my old Panasonic tuners and an RCA DTC-100, the Samsung box exhibited at least 6dB more sensitivity across the UHF spectrum.

In fact, with this tuner and either of my two Channel Master UHF antennas, I can watch 14 different UHF DTV stations at home over partially obstructed paths as long as 70 miles. Subsequent tests of set-top boxes from Panasonic (TU-HDS20), Princeton (HDT2000) and Sony (SAT-HD100) have confirmed that the new receivers are indeed more sensitive than their ancestors.

A trip to the Los Angeles area in late March gave me another chance to test out my antenna designs. Several high-profile clients of a home theater firm were having little or no success with reception of UHF DTV signals in Beverly Hills, Malibu and Bel Air. The causes were varied, but in Bel Air the problem turned out to be an inefficient antenna and too much feedline.

The Beverly Hills location was a real puzzler — the house was located al-

most 300 feet below and 1/4 mile away from a nearby canyon rim and about 20 miles from the Mt. Wilson transmitter site. Previous attempts by the installer had resulted in intermittent or no reception of Los Angeles DTV signals.

Armed with a spectrum analyzer, preamp, some of my own antennas, a modified Channel Master 3022 and the Samsung receiver, I quickly determined that signal levels were abysmally low with lots of multipath.

Still, the modified Channel Master 3022 coupled to a CM7775 UHF preamp turned the trick. I situated it on a rise about 60 feet higher than the house, using 10 feet of mast and a tripod support. All eight of the available DTV stations were subsequently received reliably with no dropouts by aiming the antenna directly at Mt. Wilson.

Even though the feedline consisted of 250 feet of RG-6, the Samsung SIR-T150 worked quite well with the signals it was being fed. (Note that the antenna was still over 200 feet below the rim of the canyon.) Similar success was had in Malibu and Bel Air with driveway reception and 10 feet of mast. In some cases, the antenna had to be rotated slightly to improve some of the channels, but the beam angle never varied by more than 30 degrees for all stations.

Subsequent to these tests, I had the pleasure of hearing several reports by John Tollefson of PBS and James Kutzner of MSTV on outdoor and indoor reception of DTV signals at NAB2001. All of the reports confirmed (in a much more scientific way) what I had learned: 8VSB works much better if there is sufficient C/N ratio present at the input of the receiver.

That's not to say you can receive



As I experimented, I found that classic antenna designs often worked better. This antenna design is nearly 50 years old, but it's fine for UHF DTV reception.

delay 0dB echoes continues at several of the 8VSB chip designers.

In fact, an old bit of wisdom still holds true: The easiest, most cost-effective way to add extra gain to your station is to make improvements to your antennas.

I'd like to acknowledge several people who have provided invaluable assistance and insight during my 8VSB reception tests: Mike Strein and the engineering staff at ABC's Advanced TV Labs; Tom Duff and the NBC Engineering staff; Ed Williams at PBS Engineering; Bob Seidel and Bob Ross at CBS Engineering; Bill Weber and John Doran at WHY-TV; David Smith at KYW-TV; Mark Schubert; Duffy Paul and Wayne Massengill at Channel Master; and Gil Akroyd, formerly of WLVT-TV.

If you'd like to read more about my antenna work, go to my website at

8VSB works much better if there is sufficient C/N ratio present at the input of the receiver.

8VSB "anywhere, anytime." The system still needs work. Enhanced 8VSB tests are now under way to enable receivers to better learn and remember a particular signal's multipath characteristics and how to compensate for them. Research into the infamous short

www.projectorexpert.com where you'll find several articles detailing antenna tests and news about DTV set-top receivers. ■

Peter H. Putnam is president of ROAM Consulting.



BY JERRY WHITAKER

Building a future for advanced video services

The Advanced Television Systems Committee (ATSC), with the help of dozens of companies worldwide, is designing the foundation for what is expected to become the cornerstone of advanced digital video services for the home.

The DTV application software environment (DASE) is an ambitious four-year effort nearing completion within the ATSC (specialist group T3/S17) to define a platform for advanced receiver functions. As such, it will form the basis for a wide range of new services. DASE makes it appear as if it is interactive programming content running on a so-called common receiver. This common receiver contains a well-defined architecture, execution model, syntax and semantics. The benefits of this approach include the following:

- It affords the capability to write content once and run successfully on all compliant receivers.
- Consumer electronic equipment manufacturers have the freedom to independently choose the hardware and operating system for their receiver products.
- Content and application authors have the assurance that their content will be decoded and displayed on all receiver brands uniformly.
- All receivers have certain common functions and features, such as remote control, service selection, MPEG decoding and so on.

The DASE standard is the next step in the evolution of DTV functionality following the ATSC data broadcast stan-

Broadcasters can provide additional functionality in interactive services like those shown above and at left through the use of the new DASE standard.

dard (specified in document A/90). The DASE system builds upon A/90, which builds upon the core DTV standard described in A/53, the PSIP standard described in A/65, and the conditional access standard described in A/70.

General concepts

There are certain fundamental building blocks involved in the DASE system, the most basic of which are:

- Application – information that expresses behavior (i.e., a program)

- Application environment – a system that interprets an application to produce a specific behavior (i.e., a program or document processing system)

To develop an advanced interactive service, there are three basic application approaches:

- **Embedded application approach**, where the application is pre-installed on the receiver. Such a service is generally non-portable and requires re-implementing or porting for new receivers or new technology. As such, it is



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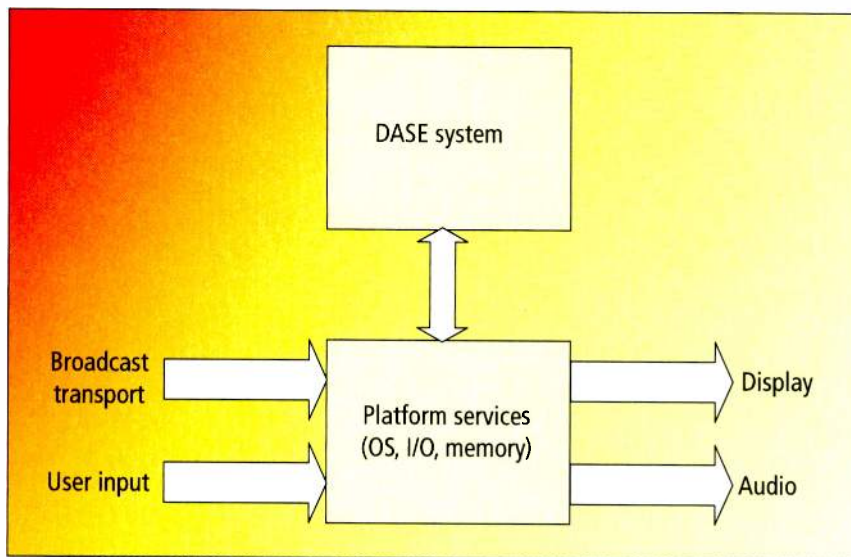


Figure 1. Interconnection of the DASE system elements

difficult to change or innovate with new applications. This approach is very stable, but allows only simple features.

- **Thin-client application approach**, where the application is shared between a server and the receiver. The application is executed or interpreted on a remote server. This approach requires a low-latency, high-bandwidth, point-to-point communication channel. It typically does not scale well.

- **Full-client application approach**, where the application is dynamically installed on the receiver through broadcast or a point-to-point channel. The application is executed or interpreted at the receiver. This system requires more resources and greater performance than the thin-client approach, but offers significantly greater flexibility.

But there are challenges to implementing any of those approaches:

- **Installing the application.** If the application is pre-installed (embedded), it is difficult to innovate. If the application is dynamically installed, it must be downloaded to the receiver and prepared for processing in sufficient time to be ready for presentation. For the DASE standard, the application is downloaded through the broadcast stream.

- **Application form.** An application can take a range of forms divided into two categories: procedural and declarative. If procedural, options include native compiled code, portable byte code (p-code) and source code. If declarative, options include HTML, XHTML, SMIL, SVG, XML and MHEG. For DASE, the approach is a standardized form with

strict conformance.

- **Environment.** The system designer must identify the “native” resources that an application can reference or use. Examples of resources include graphics, video, audio, user input (remote/keyboard), broadcast stream, network, memory and processor functions. Other

DASE makes it appear as if it is interactive programming content running on a so-called common receiver.

issues relate to the method used to reference or use these resources. If the mechanism is proprietary, applications cannot remain portable. For DASE, the approach is a standardized environment with strict compliance.

Figure 1 illustrates the interconnection of elements that comprise the DASE environment. Figure 2 details a common set of DASE application resources.

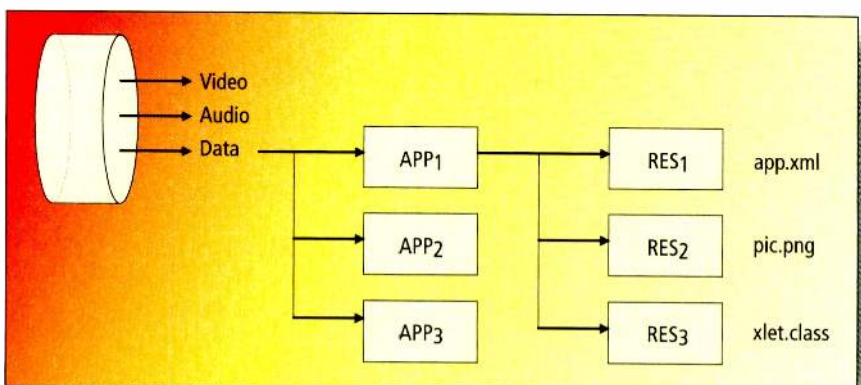


Figure 2. DASE application resources

There are three basic types of DASE applications:

- **Declarative applications**, including: 1) declarative-content type (XHTML and XHTML subset), 2) supporting-content types (CSS, ECMAScript, graphics and others), 3) document-object model (DOM), and 4) declarative-application environment (which controls system behavior).

- **Procedural applications**, including: 1) procedural-content type (Java class file format), 2) supporting-content types (graphics, audio, video and so on), and 3) procedural-application environment (Java virtual machine, APIs and system behavior).

- **Hybrid applications**, including: 1) declarative using procedural content (embedded active object content) and 2) procedural using declarative content (synthesize markup, style and script content).

The DASE content environment is illustrated in Figure 3. A return channel, which probably will be supported in a future version of DASE, is com-

monly described as DASE-2.

The API is a platform-independent abstraction of receiver software libraries and built-in functions such as remote-control input, network communications, graphics and other basic features. Specifically, the DASE API categories include:

- Network communication – navigation, event information, program

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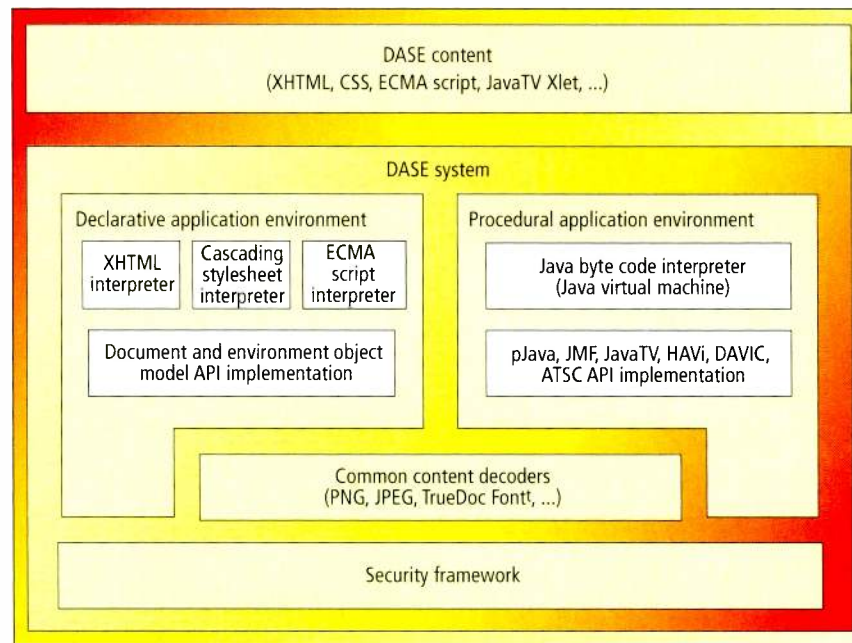


Figure 3. The DASE application environment

selection and data broadcast services

- Content management – audio/video and media decoder, playback control, audio control, video presentation, presentation and synchronization, and decoder/player synchronization services
- Presentation and user interface – graphics presentation, font and color management, and user input services
- Application and resource management – application life cycle, registration, verification and application state (diagnostic) services
- Security management – authentication, security (policy) and signature-checking (certificate-exchange) services

The architecture of the DASE declarative environment is built around six basic elements:

- Markup language, which defines the structure of a presentation
- Style language, which defines the presentational aspects such as position and color
- Event model, which defines a means for interaction with a presentation
- Document object model, which defines a means for programmatically manipulating a presentation
- Media types, which define what type of content may be used in a presentation
- Locations, which define how to find resources

Evolution of the DASE system

Because of the complexity of DASE, the rollout of this technology has been

partitioned into multiple levels. The basic specification is identified as DASE Level 1; subsequent releases are designed to build upon this foundation:

- DASE Level 1 – provides for local interaction of enhanced television. This level is the basic foundation. It is broadcast-only in scope; there is no return channel. Examples of DASE-1 applications include play-along games (such as “Jeopardy” or “The Price is Right”),

“for more information” services (such as sports statistics, product information, local weather and traffic updates), and a rudimentary “mini” program guide.

- DASE Level 2 – is expected to provide remote interaction with interactive television. This version will build upon DASE Level 1. It will provide for a return channel and enhanced security framework with digital-signature capability and return-channel encryption. With DASE-2, interactive television commerce (T-commerce) applications become practical. Examples of DASE-2 applications might include community gaming (where users play each other), gambling (where legal), instant produce purchase, coupon printing and a

full-featured program guide.

- DASE Level 3 – is expected to provide Internet-enabled services or Internet television. This version builds upon Level 2 and facilitates general Internet content. As such, DASE Level 3 must handle invalid, non-well-formed content to be interoperable with the existing Web practice. DASE-3 applications include Internet browsing, general Web access, Internet commerce, banking and investment management.

There are a number of deployment challenges for the DASE standard. End-to-end issues include metadata management, format conversion and synchronization requirements. Interoperability issues include conformance requirements and compliance testing. Distribution issues involve the preferred authoring standard (i.e., will authors create native DASE content format or other content to be transcoded into DASE format?) and distribution (i.e., will non-terrestrial media – cable and satellite – distribute DASE content?).

Harmonization of the DASE system with other technologies has been an ongoing priority for the ATSC T3/S17 specialist group. The group has put substantial efforts into making DASE compatible – to the extent possible – with the multimedia home platform


The DASE standard is the next step in the evolution of DTV functionality.

(MHP) of DVB and the open-cable platform (OCAP) of Cable Labs. Although many of the operational details differ, the general approach and key technology choices are identical.

The work continues

Work to produce a set of DASE standards documents is still underway within the ATSC. The entire suite of documents will consist of nine separate elements. The target date for completion of DASE Level 1 and formal acceptance by ATSC as a standard is early 2002. ■

Jerry Whitaker is technical director of the ATSC.



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Applied Technology

Triveni's PSIP generators

BY MARK CORL AND GOMER THOMAS

The ATSC Program and System Information Protocol (PSIP) tables in a DTV broadcast enable a number of important features for DTV receivers, including the ability to tune to programs by virtual channel numbers rather than physical broadcast bands, built-in interactive electronic program guides and "V-chip" restrictions based on content advisory ratings. Other available features include automated setting of the receiver's wall clock time and display of distinctive channel names for virtual channels, rather than just MPEG program numbers.

The PSIP data consist of collections of "tables," which are packed into sequences of transport packets in the ATSC broadcast stream. These packets have packet identification, or PID, values, that can be used to separate the PSIP tables from each other and from the audio, video and data streams in the ATSC broadcast stream.

One problem facing a DTV receiver is how to figure out what is in the broadcast stream and how to find it (i.e., how to find out what PID values correspond to what video streams, audio streams, data streams and PSIP tables).

The combination of the MPEG-2 Systems standard and the ATSC PSIP standard provides the necessary information to do this.

It is important for digital TV stations to ensure that complete and accurate PSIP tables appear in their broadcast stream. While the FCC does not mandate these tables, they are required by ATSC standards, and many DTV receivers will not function correctly without them.

PSIP generators

PSIP generators gather the data that goes into the PSIP tables, format the data correctly into transport packets and insert them into the broadcast

stream at suitable intervals. While the operation of a PSIP generator is fairly automatic, there are some tasks that require user input.

When evaluating a PSIP generator,

Without these features, PSIP generation can become a burden on the station.

make sure it has a convenient user interface that doesn't require user knowledge of ATSC or MPEG-2 standards. The ATSC and MPEG-2 standards required to ensure proper PSIP data formation are complex. The implementers of the PSIP generator must have an intimate knowledge of these standards in order to correctly format the PSIP tables.

Other features critical to proper operation include encoder/multiplexer interfaces, automatic importing of programming data, automated interfaces to the station's traffic and/or automation system, the ability to merge data from multiple sources, access controls, remote user interfaces and fault tolerance. Without these features, PSIP generation can become a burden on the station.

A PSIP generator should have reasonable default values indicating how often to transmit the various tables so that the engineering staff does not have to address this issue early on. If they do want to address this issue, it should be possible to specify the frequencies by means of a few carefully chosen parameters, rather than individually for each of the 260 different tables (RRT, STI, MGT, VCT, 128 EITs, 128 ETTs).

A PSIP generator should provide special operations for such common occurrences as inserting a special news bulletin or coping with a program that overruns its time slot (as often happens with sports events).

PSIP data maintenance

Different portions of the PSIP data may need to be maintained by different departments in a station. For instance, the engineers may need to maintain

information about certain technical features of the broadcast stream or the programming staff information about the program lineup. The master control operator may need to add information about last-minute changes to programming or the newsroom may need to maintain descriptions of lead news stories. If a PSIP generator does not allow for remote data entry from all necessary departments, managing the PSIP data will become a logistical nightmare.

Many DTV stations are finding that not all brands of DTV receivers can tune in their broadcasts successfully, even when RF reception is clear. In almost all cases the problem is that the PSIP tables in their broadcasts are incomplete or incorrectly formatted. Many DTV receivers can cope with some minor deviations, but different receivers vary widely in the deviations they can handle. If you're getting calls from viewers, ask the make and model of their television or set-top box. Complaints originating from owners of the same make or model probably indicates faulty PSIP data.

For more information on Triveni's PSIP generators, circle (450) on Free Info Card. ■

Mark Corl is director of transport information systems and Gomer Thomas is a senior member of the technical staff for Triveni Digital.



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ParkerVision's automation solutions

BY ALEX HOLTZ

The process of developing a newscast is complex. Adding Web distribution to it presents an entirely new set of issues. Should the reporters that gather the news during the pre-production phase also be responsible for Web-enabled packages including extended play video segments, supporting data and copy for Web publication? Should editors in the pre-production phase also produce editing packages for Web streaming?

Today's technology for live production automation allows many of the traditional roles in production to be automated. ParkerVision's PVTV WebSTATION provides broadcasters with a turn-key integrated solution for controlling original content and generating profits from the Internet by developing a targeted advertising model to attract advertisers, while delivering compelling multimedia entertainment to their customers. It can be used in a manually operated, traditional production environment, or in a fully automated environment.

The PVTV STUDIO NEWS can be used to feed the WebSTATION system. The live broadcast video production system integrates video, audio, machine, camera and teleprompter control functions into an intelligent single-operator station. The system includes integrated DVE, video switcher, keyers, audio mixer, RAID3 backup system, tally controller, automation/control technology and dual-interface monitors with keyboard and mouse. The dual-monitor configuration allows for both manual and automated control.

It is interesting to note that several of the responsibilities in the WebSTATION live production process are now automated. A director, without assistance in some cases, can execute a programmed newscast as identified by the PVTV STUDIO NEWS rundown. Automating the process can re-allocate anywhere from four to eight production employees to assist in other areas.

Also note that the process of editing

program output is eliminated from Web production. This is because integration with news production allows for the automated editing, linking and cataloging of story segments. This process works whether the main "A" control room is automated or manual.

With a manually controlled environment, a "B" automation control room is established to shadow the live newscast while using the "A" control room pro-

Automation can re-allocate four to eight production employees to assist in other areas.

gram output as a feed. In addition, the "B" control room can also be used for breaking news, cut-ins, a second multicast channel and for Web-only newscasts.

Web automation

The system utilizes timeline-based Transition Macros that allow for the serial and parallel processing of commands assembled to represent a production. Commands are represented by icons correlating to either voice or machine control commands. The grouping of the commands to define a story or element is defined as a Transition Macro Element (TME).

Transition Macro technology is an event-driven technology. Step Marks are incorporated at the beginning and within each TME to allow the event to be "triggered" by the director.

STUDIO NEWS' rundown converter feature translates the rundown from a new automation system into the appropriate TME files to populate the Transition Macro timeline. TME files are developed and stored for the news broadcast station during the training phase. TMEs can be added later as necessary. The TME files are selected and recalled by the rundown converter when identified on the news automation rundown.

The PVTV WebSTATION uses this technology to stream live shows with multimedia graphics, advertisements and URL links, as well as for on-demand access by viewers.

Integration with PVTV STUDIO NEWS enables PVTV WebSTATION to link Web Objects to specific stories within the newscast prior to air, including objects to initiate encoding and to identify auxiliary information to be displayed

with the streaming video. This allows Web production to present the newscast with additional graphics, data and extended play segments not viewable through standard television. For instance, an ad that is affiliated with a specific topic, such as sports, can be inserted and further defined by a specific target category. The segment name can be used for reporting purposes to give broadcasters the ability to sell and invoice based on segment downloads, show "air-time," ad media type and duration of exposure. In addition, information can be captured about the specific consumer.

The PVTV WebSTATION viewer screen was designed to represent a multimedia television set. The viewer is launched from the television station website. Users can elect to watch a "live" or "on-demand" video presentation.

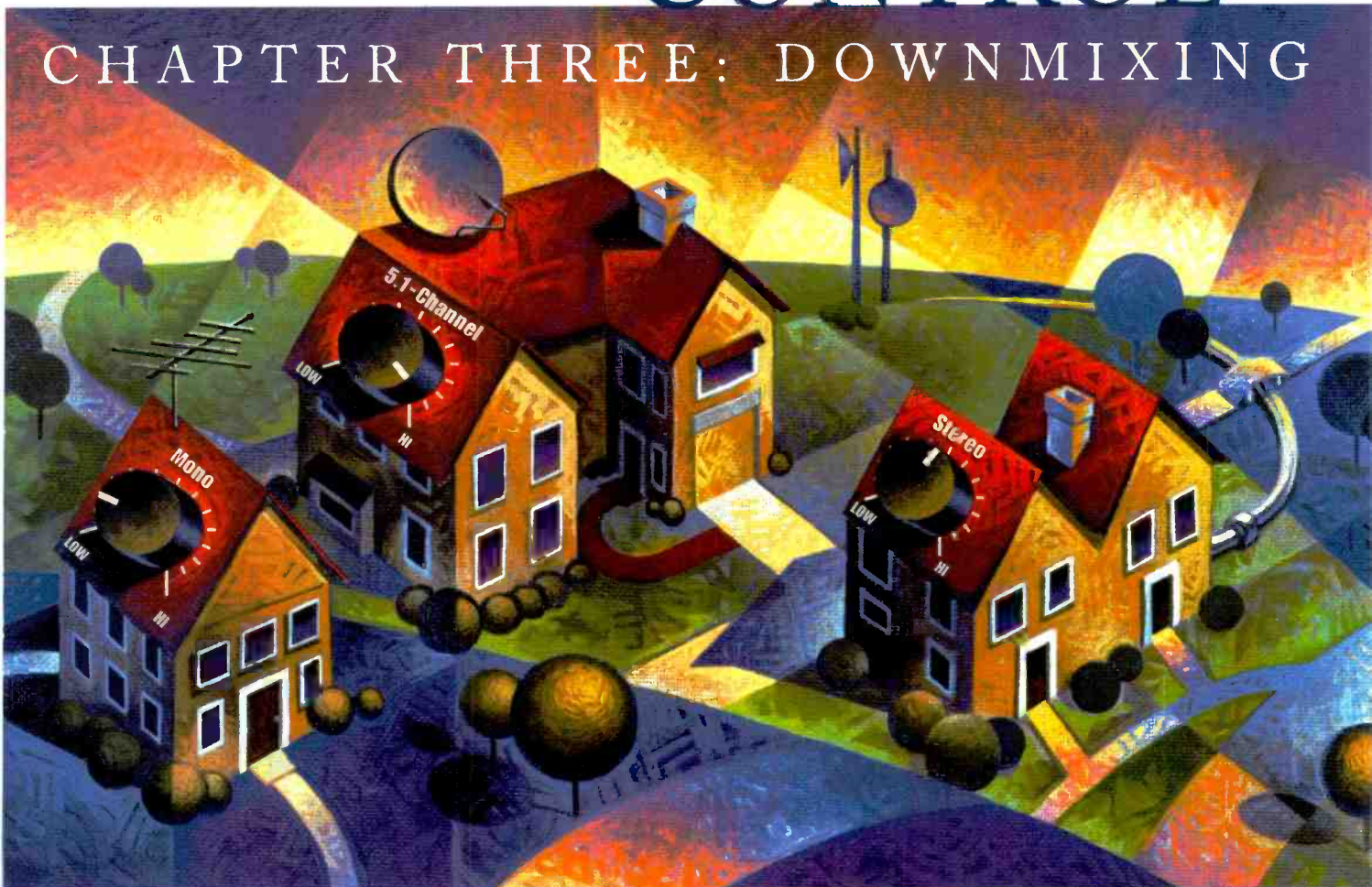
ParkerVision's automation solutions give broadcasters an opportunity to bring the production of Internet Webcasting in-house.

For more information on ParkerVision's automation solutions, circle (451) on Free Info Card. ■

Alex Holtz is director of product management for ParkerVision.

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WCPO broadcasts with Euphonix's System 5-B

BY WAYNE CHANEY AND GREG REAMS

WCPO Channel 9 in Cincinnati, an ABC-affiliate station owned by the E.W. Scripps Company, recently purchased a Euphonix System 5-B digital broadcast console to make the jump to digital audio.

We had been operating on an ADM model BCS 3243 console since late 1986. We needed to update, and everyone in the engineering department knew that digital was coming due to the budgeting for high-definition equipment that had been done in the past few years. We wanted to provide a transition for the operators that was fairly smooth, which required a console that could be configured similar to our ADM, yet that would provide more functionality. Other requirements included the ability to handle the many new audio sources that had come online since we originally installed the ADM, capability for future expansion, the amount of heat the console generated, ease of integration and, most importantly, dependability.

The System 5-B quadrupled the amount of sources that could come into the board without having to hardwire anything to a specific row or strip on the board. With digital, you can put so many more sources into the same size console. Also, the operators aren't complaining that it's too hot in the room.

System 5-B has hardly any heat compared to another digital board that we considered. That board was warm to the touch. The Euphonix audio boards are cool to the touch. We wanted to have cooler equipment without having to put in more air conditioning or install extra cooling ourselves.

We need to know we purchased equipment that we don't have to reinvest in.

We also liked the System 5-B because the installation was so simple. We are in a unique situation because we have to move the board twice. We are creating a new control room and only have one system. We didn't have the luxury of using a backup system while hooking up the new board. So we had to create a temporary office to put the Euphonix in, and then in six months the Euphonix will be moved to the new control room. The System 5-B is a lot easier to integrate than an analog console. Its I/O converters use standard connections rather than being hardwired via punch blocks. The converters then multiplex the signals into a MADI stream on coax cable. This greatly reduces the amount and cost of

wiring, which helps offset the additional cost of a digital console.

Training and support were also very important to us. We do not operate the same as most stations. While most stations have four or five audio operators, we have 13. Most rotate through every job in the engineering department, and a lot of them will only

get to be on the audio board one day a week. Within a few hours, Euphonix assisted our main audio tech in setting up the console with templates for our operators to use for every production. One benefit of the System 5-B is that while operators may change, the on-air production doesn't. Our operators

were initially concerned that the digital would be too complex, but it is actually simpler than the analog.

System 5-B also has a feature called multifunction faders. Using these, the operators have only a single fader on the surface of the console and with the touch of a button can access the underlying component channels. This works particularly well for rebalancing split channel sources in seconds.

In summary, the overall sound quality has been greatly improved, as has on-air reliability. In addition, the dependability has been improved. The equipment we had been using was ancient and troublesome, with limited redundancy. System 5-B's distributed architecture is inherently redundant. If it fails, sections can be rebooted without affecting the operation of other areas of the console while on air.

We aren't sure what we're going to have to do in five years. We need to know we purchased equipment that we don't have to reinvest in. We know that we have at least five to seven years of expansion without being concerned. Plus, we now have a solid dependable console that can carry the station into the digital era.

For more information on Euphonix's System 5-B, circle (452) on Free Info Card. ■

Wayne Chaney is chief engineer and Greg Reams is a maintenance technician at WCPO.

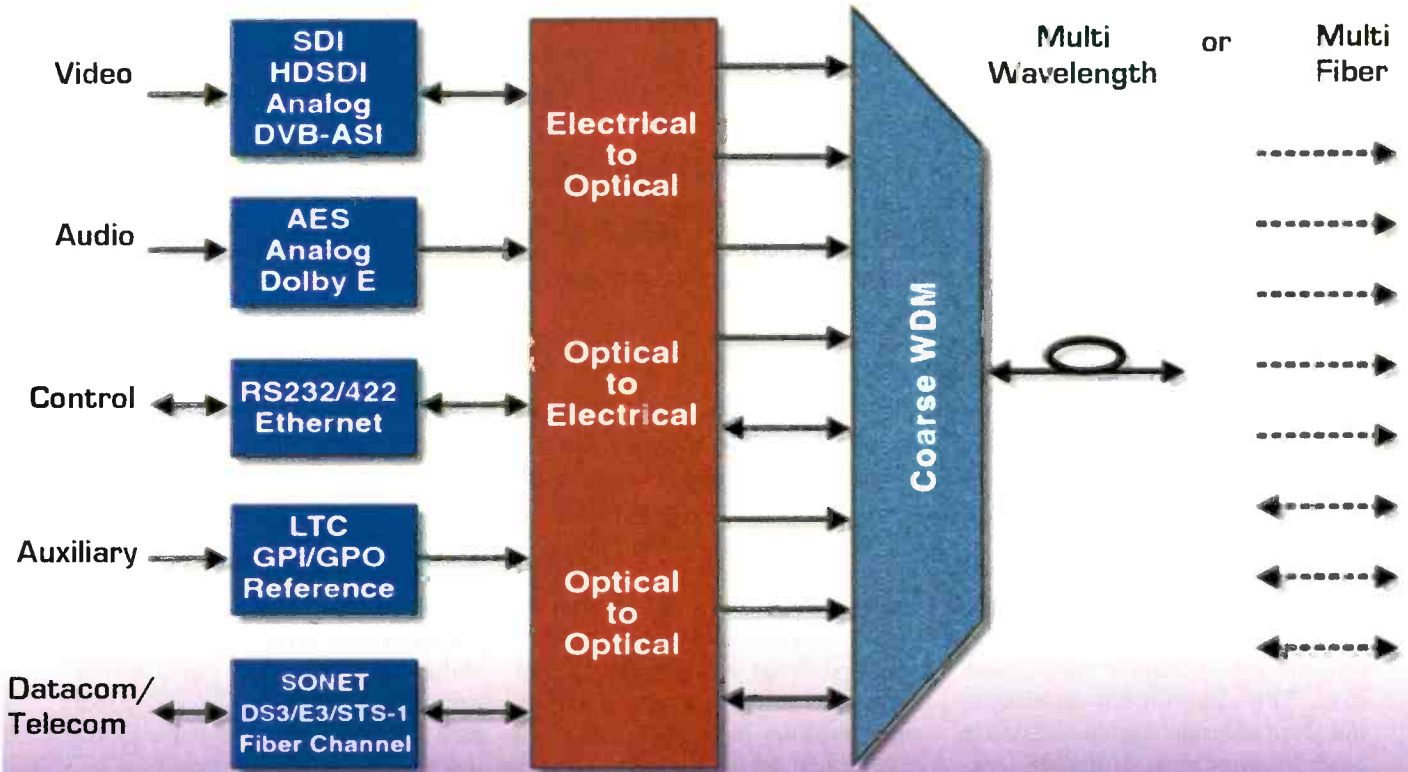


Unsure of what direction it will need to be going in five years, WCPO's Greg Reams chose Euphonix' System 5-B console for its transition to digital audio in large part because of the flexibility and capability for future expansion it provided.

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Company 3 eliminates patch bays with Thomson Multimedia

BY MIKE CHIADO

Company 3 is one of Liberty Livewire's post production/television facilities specializing in high-end commercials, music videos and feature work in both standard definition and high resolution. For these projects, we have seven Thomson Multimedia Spirit DataCines.

While the day-to-day work of commercials, music videos and coloring films such as "Pearl Harbor" and "Swordfish" is the job of the artists who work here, I am responsible for designing the infrastructure of new facilities.

In all of my previous designs, the use of patch bays has always been a fait accompli, but C3 had gone without patch bays in their previous facility because the patching had caused more problems than it was worth in terms of reliability and operations.

When the decision was made to move to a new location in August 1997, the decision was made to design the new facility without patch bays. This decision was controversial from a design standpoint. Using patch bays had appeal for quick trou-

bleshooting on an aggressive move schedule, but a design without patch bays made Company 3 much more efficient in its ability to move work around the facility. With new Thomson Multimedia Venus routers, I found that I could design Company 3's new facility to be more flexible

The decision to go without patch bays was controversial from a design standpoint.

and more reliable without having to use patch bays.

This was the first time I had designed a facility without patch bays, and drew ideas from Company 3's original facility design, which incorporated one visual effects and three telecine bays. I also had four additional telecine bays to incorporate — two from Pacific Ocean Post (POP) and two from Hollywood Digital West, plus additional visual effects and graphics bays. Company 3's heavy client load dictated that only

one bay be down at a time, and for no more than a week.

In all the facilities I've worked in and designed in the past 25 years, I've always had Bosch, then BTS, then Philips routers. I know their track record, so going with the new Venus routers was an easy decision for me, with Thomson assisting us in the integration phase through commis-

sioning. In routers, large is synonymous with flexible, which is why we have a 256x256 SDI router, 128x160 analog video router, 128x160 primary AES router, 128x128 secondary AES router, 128x128 timecode router and a 160x160 machine control router.

Without patch bays, we saved four racks worth of space (the routers take up four racks with two for wire management) and saved money by streamlining the wiring needed in the design (which helped fund the larger routers). With 10 bays and 80 VTRs throughout Company 3, we were able to eliminate operational downtime due to patches being left in from prior shifts. Because of their physical connections and wiring density, patch bays are often not as reliable as today's sophisticated routers.

Often, engineers and facility designers don't consider not using patch bays in a design. Patch bays have been around for years and are still often considered a necessary part of any facility design. With today's larger and more reliable routers, the concept of a facility without patch bays became a reality for Company 3.

Our experience has shown that we have far less downtime, primarily due to the lack of operator patch errors. With reliable large routers, like the Venus routers, we've found we don't have a need for patch bays.

For more information on Thomson Multimedia Venus routers, circle (453) on the Free Info Card.

Mike Chiado is director of engineering for Company 3 in Santa Monica, CA.



Stefan Sonnenfeld (L), president and managing director of Company 3, with director of engineering Mike Chiado (shown above), utilized Thomson Multimedia Venus Routers to eliminate patch bays in their new facility.

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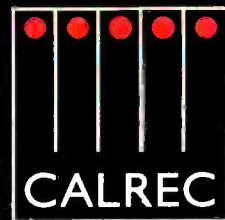
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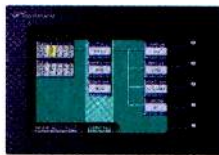
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Production switchers

BY JOHN LUFF

Digital production switchers have been on the market for many years now. The first digital model was the Grass Valley Group Kadenza, introduced in 1988. It was a unique architecture intended for the postproduction market and pretty much unsuitable for live production. It had some operational modes in which it could be driven like a more conventional switcher and others in which each successive row of crosspoints acted like another layer in a complex mix. Up to five layers could be controlled at one time, with a total of eight layers available. The heart of its technology came from the Kaleidoscope digital effects generator. Each picture layer could have full DVE capability, or simple "switcher channels" without transform capabilities that could be used.

The Kadenza was equipped with parallel digital component inputs. Cable lengths had to be kept to under 100 feet. Building cables for digital component equipment was a bit of an art, with tight specifications on the electrical length for each pair carrying one bit of the data stream. By using analog-to-digital converters, one could use NTSC and component analog signals as sources or destinations.



Early digital production switchers have evolved into versatile live production tools, many featuring internal digital effects, increased inputs and programmable outputs. Zodiak from Grass Valley Group is shown above.

While the Kadenza was a groundbreaking product, it was quickly joined by competition from Alpha Image and Abekas. The Abekas A-84 had eight fully functional layers, while the Alpha Image catered to a smaller market with four layers and nine inputs.

For a while, as standards organizations and manufacturers debated, com-

Companies now are planning switchers that can accept both 270Mb and 1.485Gb inputs to provide an insurance policy for the future.

posite and component standards both existed, as did both variations of production switchers. Sony even made switchers (DVS-8000) that could be reconfigured quickly between both standards. However, as equipment designed for the SMPTE 259M standard became less expensive and more ubiquitous, component strategies prevailed.

Today, component equipment is the basis of virtually all new systems, and the old parallel interconnection standard has disappeared. Though many digital switchers can still be equipped with analog inputs and outputs, virtually all production switchers delivered today process in the digital domain.

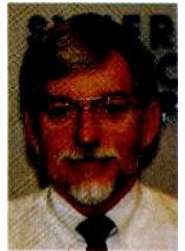
There are good reasons for this beyond the desire of manufacturers to sell products to the marketplace. Digital switchers are inherently more reliable and require far less routine maintenance. With no, or very few, analog circuits, there are no adjustments necessary to keep performance optimized. Manufacturers have been able to deliver

features that far exceed the capability of analog switchers for real dollars that approximate the cost of the best of the last generation of analog products. In the last year a new crop of less expensive digital switchers has emerged that provide the benefits of digital technology and reliability to a market more sensitive to capital cost.

Digital switchers also lend themselves to several interesting possibilities. With Kadenza, GVG was first to introduce a powerful function in which the "assets" of a digital production system were networked together. In a facility that had two control rooms it was possible to give control of some layers to a second room, shifting capabilities to where they could be most productive without duplicating all options in each room. Abekas expanded this function with the A-82/83 series, allowing entire effects banks to be assigned to a second control panel.

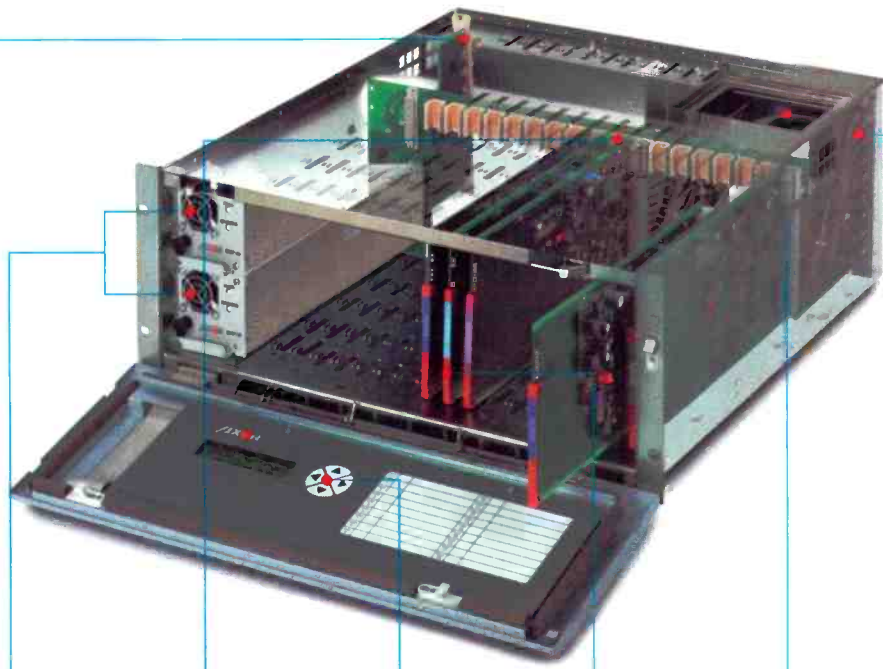
Some functions that existed in analog products have been significantly enhanced with digital technology. Timeline control over effects memory existed in a number of analog products. However, digital switchers require less technology to "memorize" settings and transition between them. Such features can also be modified and enhanced to best suit the marketplace without new hardware development. By forwarding new operating software to users, manufacturers can provide updates and new features to the entire installed base. Doing so has the added benefit of keeping the support costs lower since fewer versions need to be fully supported at any one time.

Modern digital production switchers now include full function digital effects





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in software (and hardware) within the switcher. No external connections are necessary and the DVE channels are tightly linked to the switcher control system. At first, the DVE channels supplied in such implementations were simple planar devices with limited creative capability. Now most implementations have the ability to at least supplement external DVEs, if not replace them.

The potential drawbacks are clear: This is the ultimate all eggs in one basket.

Today it is quite common for links between newsroom computer systems and other devices, including production switchers, to be a central part of any production. By allowing the script and all production elements to be tied directly together, one creates a seamless production environment, cutting down on the second-by-second management of a complex program. Digital switchers greatly enhance this capability, but not without some new problems. There is currently no universal language for such devices to use

for communication. This means that each pair of devices must be "debugged" individually, which is not always simple to coordinate since manufacturers of many of these products compete with each other.

One manufacturer has carried this concept to a logical extreme, integrating newsroom automation, production automation, a digital production switcher,

graphics and character generators, and camera remote control into one seamless product. Developing the script for a program in this system would in theory allow a program to be controlled by a single person. The potential drawbacks are clear: This is the ultimate all eggs in one basket. However, if the basket is reliable and allows for creative freedom to handle live events, it could help control costs in some production environments.

Production switchers have also grown in scale. The conventional analog

switcher was 24, or perhaps, 32 inputs. Today, one manufacturer is delivering a switcher with 80 physical inputs and a virtual router internally that can map any of those inputs to an active effect — without requiring the input be assigned to a physical button! Even the outputs are programmable, essentially making the backplane of the switcher virtual as well.

In the last year we have seen the emergence of the next serious step up in production switcher capabilities. Until now a company who desired to have future HDTV capability had to assume its current 525 switcher would have to be replaced when it moved to HDTV. However, at least two companies now are planning, or delivering, switchers that can accept both 270Mb and 1.485Gb inputs. You cannot mix signal formats (yet), but at least you can shoot today in 525 and tomorrow in 1080i, 1080p24 or 720p. This provides a significant insurance policy for the future. ■

John Luffis vice president of business development for AZCAR.

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REMOTE CONTROL AND MONITORING SYSTEM

Miranda iControl: remote control software allows users to remotely configure, monitor and operate Miranda's Network routers via a Web-based management system; software features a customizable interface for displaying router status; units can control one output or the entire network; a live video window provides a preview of switcher presets before executing commands; 514-333-1772; fax: 514-333-9828; www.miranda.com.

Circle (354) on Free Info Card

MULTIPLEXER

International Fiber Systems VT/VR7800

series: eight-bit, eight-channel digitally encoded video multiplexer offers reliability in video performance; allows users to transmit and receive eight channels of eight-bit digitally encoded video on one single-mode optical fiber; 203-426-1180; fax: 203-426-3326; www.ifs.com.

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now available; combines Pinnacle's Thunder multichannel servers and Lightning digital stillstore systems with AP's ENPS; applications work together, appearing as a single application to ENPS users; ENPS can be used to browse content stored on the Thunder and Lightning systems; 650-526-1600; fax: 650-526-1601; www.pinnaclesys.com.

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WEB ENCODER

DPS dpsNetStreamer: now shipping; stand-alone Web encoding system allows users to encode live video and audio in real time to provide up to six simultaneous streams through a single user interface; outputs streams in RealNetworks, RealVideo and Microsoft Windows Media; features comprehensive professional I/O, video proc amp controls and input audio controls with VU meters; 859-371-5533; fax: 859-371-3729; www.dps.com.

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ANIMATION TOOL

Kaydara Filmbox 3.0: now available; real-time 3D content authoring and delivery tool features improved Control Sets, allowing 3D artists to animate CG characters without having to program complex IK rigs and work interactively with both inverse and forward kinematics; also features native support for Kaydara's FBX for acquisition of 3D assets from external sources; 514-842-8446; fax: 514-842-4239; www.kaydara.com.

Circle (360) on Free Info Card



SYNC GENERATOR

ShibaSoku TS55A6: now shipping; generates 525 black-burst and HDTV tri-level sync at 59.94Hz signals and 14 TV signal formats; both inputs can be genlocked to ensure video components are synchronized; features a redundant system of dual generation modules and a changeover module, as well as the ability to embed eight-channel digital sound signals in SDI output signals; 303-278-1111; fax: 303-278-0303; www.shibasoku.com.

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Today's broadcasting requires the seamless integration of **stills, clips, and animation**

Show openings
Bumpers
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Live playback



Images courtesy of TSN

"Kaydara mediastore provided us with instant cues to images and animations, all the stuff we use to dress up our [Olympic coverage]. Trying to create these effects without Kaydara mediastore would have been a nightmare for us."

- Paul McLean, producer, TSN

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Business highlights from broadcast and production

BY LAURA COLLINS, ASSOCIATE EDITOR

ADC Broadband Wireless Group was recently purchased by Platinum Equity and will operate under the name **Axcera**. David Neff will serve as president and CEO of Axcera, and Ken Foutz will serve as senior vice president and COO.

Panasonic recently announced that Chicago-based SMS Productions will use the new AJ-HDC27V HD Cinema camera for rentals and for its own projects.

Buzz, a New York digital audio postproduction facility, purchased a **Quantel** Henry Infinity for picture finishing of high-end commercials.

Thomcast has changed its name to **Thales Broadcast & Multimedia**.



NBC station WJAR selected ConvergenceCams from **Livewave** to create an interactive traffic camera network for its TV and Internet newscasts.

Two facilities have installed consoles from **AMS Neve**. Harmony 534 Studios in New York installed the Libra Post for use in a variety of audio and video projects, and the National Geographic Channel is using a Libra Live Series II console for production of its daily news program "National Geographic Today."

WGCL-TV selected TV-80 audio mixing consoles from **Wheatstone** to control audio in its new digital complex. Allbritton Communications also

purchased the TV-80 consoles for news and production in three of its stations: WJLA-TV in Washington, DC; KATV-TV in Little Rock, AR; and WHTM-TV in Harrisburg, PA.



WETA-TV purchased **Solid State Logic's** new Aysis Air Plus digital console for its new live broadcasting studio.

Service Electric Cable Television of Allentown, PA, purchased a Kalypso from **Grass Valley Group** for use in its 30-foot mobile production unit. Merrill Lynch also purchased a Kalypso for its in-house production studio.

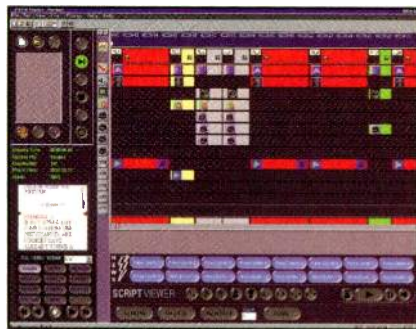
Hamlet Video International opened a new sales office in Malibu, CA, to serve the U.S. market. The address is P.O. Box 6530, Malibu, CA, 90264.

A **Harrison** PRO-950 audio mixing console will be used in WIBW-13's new facility in Topeka, KS. Sony Pictures Entertainment has also ordered Harrison equipment – a 616-input MPC2 digital console for use in SPE's new dubbing theater.

CBS Newspath chose **BitCentral's** Mediapipe News system to provide digital news content to CBS stations and affiliates.

West Coast music and film recording facility O'Henry Studios recently installed a second **Lexicon** 960L multichannel digital effects system.

The studio purchased its first 960L in December of last year.



ParkerVision's PVTV Studio News production automation system was chosen by ABC Network News for use in its main newsroom. The system will be used primarily for breaking news coverage. McGraw-Hill Broadcasting Group is also using a ParkerVision system, the PVTV Studio News 24 Plus!, for ABC Network affiliate stations in Denver, Indianapolis, San Diego and Bakersfield, CA.

Heartland Video, a Wisconsin-based systems integrator, completed installation of ATSC master control solutions for three Midwest PBS stations — WTVS-TV in Detroit, WMVS in Milwaukee and KCPT in Kansas City, MO. The systems used encoding and multiplexing equipment from **Tandberg**.

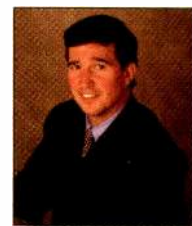


Phil Livingston

People

Phil Livingston has been named vice president and technical liaison to Panasonic.

Turner Entertainment Group announced that **Craig Heyl** was named senior vice president of Turner Studios. ■



Craig Heyl

Screen Shot



Fujinon lenses aid in documentary filmmaking

Two Fujinon lenses, an A36x10.5 ERD telephoto and an HA15x8BEVM HD ENG lens, mounted on two Sony high-definition cameras, were recently utilized for production on a program for Montana State University entitled "The Search for Lewis and Clark."

Ronald Tobias, head of MSU's graduate program in filmmaking, directed and produced the hour-long special, which will air on the Discovery Channel in April 2002.

The program retraces the route of the famous expedition through Montana, the Dakotas and Oregon. A hailstorm at one site briefly threatened production, but Tobias used it to recreate a hailstorm the explorers described facing in their journals.

The lenses are utilized for all imaging applications in MSU's new graduate program in Science and Natural History Filmmaking. The three-year program is run in conjunction with Discovery Communications and allows students to produce broadcast-quality films ranging from 15 minutes to an hour.

SGI lends processing power for CGI films

Tippet Studio used SGI workstations, servers and storage for production on two films, Warner Brothers' *Cats and Dogs* and Dreamworks SKG's *Evolution*.

The studio used SGI systems to create more than 60 3D-animated shots for *Cats and Dogs*. The systems were also used to create more than 150 shots and 15 CGI creatures for *Evolution*. Maquettes of the creatures were sculpted and scanned into O2 and Octane2 visual workstations for manipulation by character animators.

Digital Video Conversion and Interface Products by AJA Video



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HD-NTV PCI Bus HD-SDI Video Interface/Framestore	\$7,900
SD-NTV PCI Bus SDI Streaming Video Interface	\$2,395



Miniature Converters

HD10C HD-SDI D/A Converter w/EVGA Mode*	\$2,495
HD10M HD Analog to NTSC Monitoring Downcnvrtr.*	\$ 800
D10C SDI to Component Analog Converter, 10-bit *	\$ 800
D10A Component Analog to SDI Converter, 10-bit*	\$1,200
D4E Serial Encoder, SDI to NTSC/PAL or Y/C*	\$ 250
D5CE Serial Encoder, SDI to NTSC/PAL /w Component*	\$ 375
D5D Decoder, 3-line Comb Filter, NTSC/PAL to SDI*	\$ 595
DWP Power Supply, 110 Volt (*requires power supply)	\$ 40



Rack Mount Products

R20D Decoder, 5-line Comb, NTSC/PAL to SDI, 10-bit	\$1,300
R20E Encoder, SDI to NTSC/PAL or Component, 10-bit	\$1,300
FSG Frame Sync/Genlock Module (fits R20E/D Cards)	\$ 600
R44E Four Channel SDI to NTSC/PAL Converter	\$ 990
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RD5CE Dual Universal D/A Converter SDI to NTSC/PAL or Component	\$1,300
R5CE Universal Monitoring Distribution Amp, 1X4	\$ 590
FR1D 1-RU, Forced-Air Cooled, 4-Slot Frame, Dual Power Supply	\$ 895
FR2D 2-RU, Forced-Air Cooled, 10-Slot Frame Dual Power Supply	\$1,490



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SONY DSR-250 3-CCD DV & DVCAM

Introducing everything you need in an event camera and more. The new completely digital DSR-250 from Sony is a high image quality reduced size camcorder which has been optimized for shooting events and parties. Every feature you could want is included in this revolutionary acquisition tool!

- 1/3 inch x three 380K pixel (effective 340,000 pixels) CCD's allow two scanning modes: 480 progressive (still) or interlaced (for video) • One touch auto focusing in manual focus mode
- 530 lines of horizontal resolution
- Switchable aspect ratio 4:3 (TV mode) or 16:9 (Movie mode)
- DXF-801 high resolution 1.5" black & white viewfinder (same as on DSR500P1 & DXC-D35) enables easier focusing. Automatically switches from 4:3 aspect to 16:9
- 58mm lens with 12x optical zoom
- Records in DVCAM or DV, standard tapes or mini. Up to 270 minute recording in DV mode onto a 184 min. DVCAM tape
- Manual or automatic functioning. Focus, Iris, Shutter-speed, Zoom, Gain (3 positions and memory)



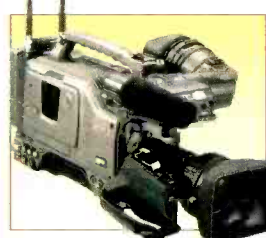
DSR-300A 3-CCD Digital (DVCAM) Camcorder

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

- The DSR-300A has three 1/2" IT Power HAD CCDs to deliver 800 lines of horizontal resolution, 620B S/N ratio and high sensitivity of F11 at 2000 lux
- With built-in 26-pin VCR interface, they can feed composite or S-video output signals to an external recorder for parallel or back-up recordings. VCR recording modes including Parallel, Internal (only) and External (only) are selected via the trigger switch positioned on the operational panel
- LSI Digital Signal Processor (the very same one used by the DXC-D30 camcorder) for a high signal-to-noise ratio of 62 dB
- Both mini cassettes (PDVM Series) and standard cassettes (PDV Series)

series) can be used with the DSR-300A. With PDV-184ME (Standard), a maximum recording time of 184 minutes can be achieved. They can also play back tapes recorded in the consumer DV format!

- For operational convenience while shooting, the Time Code is superimposed on the viewfinder screen or MONITOR OUT screen, even during playback
- DXF-801 viewfinder featuring variable peaking, 3 level tally light and a white LED light with 2 levels of intensity to illuminate the lens setting • IEEE1394 i.Link (out only)



DSR-500WSL 2/3" 19:9 CCD (DVCAM) Camcorder

The DSR-500WSL camcorder gives the video journalists the ability to acquire footage quickly and easily because the required functionality and performance was packed into this camcorder. In the meantime, the next generation widescreen TV's have been introduced and the demand for video material in widescreen (16:9) has greatly increased not only in broadcasting but also in the event production and corporate communications market. To meet this demand, Sony offers this Widescreen Digital Camcorder. The DSR-500WSL offers outstanding picture quality by adopting Full Digital Signal Processing and three 2/3-inch (520K) Power HAD WS (Wide Screen) CCDs which are specifically designed for a 16:9 aspect ratio, switchable to 4:3 full screen. The camcorder extends the mobility, operational convenience and system flexibility with a range of peripheral products. Built-in digital output of the i.LINK interface for backup and simple field editing is just one example. Technological advances in Sony DSP and CCD Technologies, many powerful options and a convenient low price-point make the DSR500WSL a formidable tool for a wide range of applications.



DXC-D35/D35WS Dockable (DVCAM) Camcorder

The DXC-D35/D35WS cameras are designed to the highest specifications, providing unprecedented video quality in this price range. The DXC-D35 is at home in the studio or field, docking directly to a host of backs including Betacam SP and DVCAM, as well as studio backs and viewfinders. The highly adjustable picture means that these cameras are ideal for capturing detail in low or changing light, as well as compensating for peoples skin flaws while keeping the rest of the image sharp. DXC-D35WS is switchable 4:3 to wide screen 16:9 ratio.

The DXC-D35WS camera is the latest Sony digital camera designed to the highest technological standards. With the proven Sony DSP technology combined with Sony high performance 16:9 CCD's. This high standard was previously held by the DXC-D30 series now being replaced by the NEW DXC-D35 series. DXC-D35 series feature a new Prism Assembly, new Pre Amplifiers, new DSP Software and a new Digital Encoder resulting in astounding performance. The DXC-D35WS camera fully interfaces with Sony's CCU-TX7 Wideband Component Triax System. It provides 8 set-up files (3 user) as a stand alone 16 additional scene files (all user settable) are available when combined with the RCP-TX7 remote control panel. The DXC-D35WS is equipped with three 2/3" IT Power HAD CCD's switchable between 16:9 and 4:3 aspect ratio's. The camera docks to DSR-1 DVCAM and DNV-5 Betacam SX recorders for digital video recording, or PUV3 and

- BVV-5 Betacam SP recorders for analog recording
- 880 TV lines of resolution for DXC-D35
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- Reduced noise at Gain Up • Variable color temperature adjust
- Adjustable 4:3 safety zone when at 16:9
- New HyperGain mode of 42dB gain
- DSR2 spot select from Main Menu

JVC

GY-DV500U 1/2-inch 3-CCD Professional DV Camcorder

QUICK DIAL 74

The GY-DV500 combines the convenience and cost-effectiveness of Mini DV with the performance and features you need. Incorporate three 1/2-inch 340,000 pixel IT CCDs for superior picture performance (equivalent to 750 lines of resolution) superb sensitivity of F11 at 2000 lux and minimum illumination of 0.75 lux (LoLux mode). Rugged construction with a rigid diecast magnesium housing. Extremely portable, compact and light weight (less than 11 lbs. fully loaded). Additional features like the menu dial and Super Scene Finder assure ease-of-use and shooting flexibility, while the IEEE1394 and RS-232 interface allow integration into various non-linear and post-production systems. A professional camcorder in every sense, the compact, lightweight GY-DV500 redefines aquisition for corporate, educational, cabin and broadcast production, as well as wedding videography and multimedia applications.



GY-DV550U 1/2" 3-CCD DV Camcorder

Introducing the Versatile GY-DV550 from JVC. Designed by professionals, for professionals, the GY-DV550 is the world's first DV camcorder to offer studio camera capability. Thanks to the built-in 26-pin interface, you can connect the GY-DV550 to a CCU for remote-controlled studio operation or backup recorder in the field. But that's not all. It also comes with pool feed input/output, so you can transfer image data back and forth to another camera or camera, making it ideal for special shooting situations such as press conferences, exclusive interviews, and sporting events. Record isolated camera views (ISO-Cam) during a live multi-camera shoot, making it ideal for parallel shooting at live concerts and other events.

Naturally, we've made sure the GY-DV550 is equipped with all the other capabilities you need, including a standard 1/2-inch bayonet mount for use with a great diversity of professional lenses, bidirectional IEEE 1394 (NTSC), two 48 kHz 16-bit digital PCM audio channels, and a built-in SMPTE or EBU timecode reader/generator, as well as XLR microphone inputs, audio outputs, headphones output, and both composite and Y/C outputs. Maximum versatility, top-level performance, and superior cost-efficiency make the GY-DV550 the smart solution for producers who need a camcorder capable of doing double-duty in both the studio and the field.

Ready for EFP remote control (RM-LP57/LP55) The EFP remote connects directly to the GY-DV550 for precise control over the video parameters.
Return video output for Tele-Prompter Tele-Prompter capability assures full support for studio program production.
Genlocking function To meet the demand for systemization, the GY-DV550 is equipped with a genlocking function that includes SC lock to assure high-resolution pictures.

State-of-the-art 1/2" 3-CCD image pickup Incorporates three 1/2" 380,000 (NTSC)/440,000 (PAL) pixel interline-transfer CCD's. Each CCD is equipped with highly advanced circuitry that eliminates vertical smear when shooting bright lights in a dark room. Lag and image burn are also reduced to indiscernible levels, while high sensitivity of F11 at 2000 lux assures creative flexibility and simplifies lighting requirements.

Panasonic AJ-D610WA 2/3" 16:9 IT-3CCD DVCPRO Camcorder

The AJ-D610WA is an affordable DVCPRO camcorder which combines three high sensitivity 2/3" IT CCD's with digital component technology, to create a true broadcast recording. The AJ-D610WA is switchable between 16:9 and 4:3 aspect ratios. A built-in PCMCIA card slot makes it quick and easy to adapt the camera to different shooting conditions. Features Super Gain, Super Iris, and Digital Signal Processing (DSP). The AJ-D610WA can operate with a minimum illumination of 0.5 lux (F1.4, +36 dB Gain), and resolves 750 lines of resolution.
 • The AJ-D610WA has three high density (520,000 pixels) 2/3" CCD's. The CCD's feature a large light collecting area that gives the camera a S/N ratio of 63 dB, plus a sensitivity of f11 @ 2000 lux.
 • The Digital Signal Processing (DSP) helps to deliver a very high quality picture. The user has the ability to adjust different parameters of the camera to accommodate any situation.
 • A PCMCIA card slot is built into the operator side of the camera, allowing the set-up (DSP) data to be saved. The saved set-up data can be used to reset the camera parameters.



- The optional AJ-YAP900P Picture Link Board is part of an exclusive Panasonic production data information system which stores shot logging in camera memory and records it on tape during the log cycle. The logging information can be read by Panasonic's newsBYTE DVCPRO native nonlinear news editing system.
- Exceptional resolution of 750 horizontal lines.
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Pickup Device: 2/3" IT Power HAD 1000 16:9 x 3
 Picture Elements: 1038 (H) x 504 (V)
 Filters: Clear, 5600K + 1/8 ND, 5600K, 5600K - 1/4 ND

SONY

DNW-9WS 2/3" 16:9 IT-3CCD Betacam SX Camcorder

Equipped with three 2/3 inch 16:9/4:3 switchable Power HAD 1000 16:9 IT CCD's. Designed as a cost effective camcorder to help bridge the transition from 16:9 to 4:3, yet it still maintains a high performance and high mobility. The DNW-9WS weighs less than 14 lbs., including a battery, tape, viewfinder and lens. Includes an integrated slot for the optional WRR-855A wireless audio receiver.



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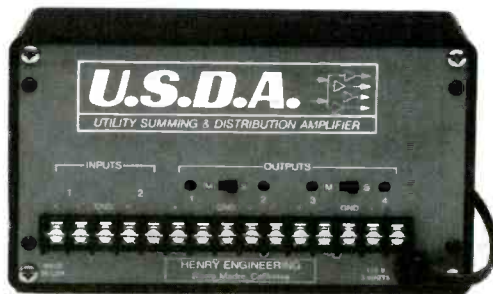
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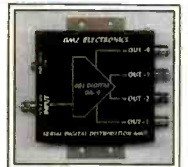
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TRANSMITTER ENGINEER—WSMV-TV, Meredith Corporation in Nashville, Tn. has an immediate need for a fulltime engineer to replace a retiring transmitter engineer. Must have a minimum of 5 years experience repairing transmitters. Background in studio repair would be a plus. Send resume to the following address: Human Resources Department, WSMV-TV, 5700 Knob Rd, Nashville, Tn 37209. EOE.

WHBQ TV/FOX13, MEMPHIS, TN.: Maintenance Technician Supervise Maintenance Engineers, responsible for overall preventative and corrective maintenance, ensure compliance with FCC and OSHA rules, perform maintenance duties and other duties as may be required. Five years television broadcast maintenance experience and supervisory experience preferred. Able to troubleshoot broadcast equipment to the component level. SBE Certification preferred. Send your resume to: HUMAN RESOURCES, FOX 13 WHBQ, 485 S. HIGHLAND AVENUE, MEMPHIS, TN. 38111. OR FAX RESUME TO: 901-320-1252. Equal Opportunity Employer

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CHIEF ENGINEER: WIPX in Indianapolis, IN needs a Chief Engineer with strong TV transmitter maintenance background, knowledge of FCC rules and regulations and 5 or more years maintaining modern broadcast equipment. Practical knowledge of electrical, plumbing, HVAC and basic construction techniques helpful. Certification through the FCC or SBE a plus. Send resume to: Director of Engineering, WIPX TV 63, 6602 E. 75 St., #510, Indianapolis, IN 46250. EOE.

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Protecting our facilities

BY PAUL MCGOLDRICK

The tragic events in New York and Washington, DC, on the morning of Sept. 11, 2001, signaled a movement of terrorism to the United States that will change our lives forever. What was once a piece of Tom Clancy fiction has become a brutal reality, and draws our attention anew to questions of

sider Orson Welles' famous "War of the Worlds" broadcast in 1938. In that piece of radio drama, aliens ostensibly arrived on Earth. The broadcast caused panic because people believed what they heard. Could an even more convincing (and false) story be easily made with today's video technology?

small task force to look at your own operation to see what you can do to protect your signal from being hijacked. Use your remote control equipment not only to detect signal and transmitter problems, but also to detect entry or tamper alarms at your STL and transmitter sites. Set up a routine to alert the authorities if those alarms are triggered. Also, talk to the cable companies that handle your feed – how secure are their headends? Finally, be sure your staff is trained in whatever practices are best for your facility. Merely putting a procedure in some manual won't work. Practice it regularly.

We need to do our best to protect the broadcast media from being used by anybody illegitimate for any purpose.

security. Now that it has been demonstrated that it can indeed happen here, we all have a responsibility to examine our respective broadcast systems to ensure that it doesn't.

I have been in many, many central control rooms in broadcast stations around the world. Access is generally easy, even in those countries where armed guards – sometimes even a tank – are outside the front door. You just hand in your passport at the reception desk, take a pass and you're on your way. Easy, no escort required. Provided you know where you are going, you could take over control of that station's output within minutes. I was in those places legitimately, of course, but I never remember being asked by the working technicians who I was, or what was the nature of my business.

What should broadcasters do? The goal of a coup or terrorist act is to induce fear in the rest of the population, and the broadcast media is the strongest and most efficient means of doing that. When you want to take over a country, you storm the presidential palace, keep the troops not friendly to you in barracks, and take over the radio and TV stations. Con-

Couldn't happen, you say? In the 1960s I was involved in a threat check in London to evaluate whether anyone could ever take over the BBC's television output. We identified 17 locations with simple access where someone who knew what they were doing could simply plug in a video and audio signal and be on the air nationwide. All those access points were away from normal personnel activity, so that the intrusion could possibly last for an hour or more before it could be located. The compromising points we found were all blocked or additionally protected, but we probably missed others.

How vulnerable is your station? With reasonable front desk security and locked back doors (many are propped open for the smoker on shift), it should be straightforward to avoid the direct injection in a control room; but how easy is it to get to your STL? I could take you to stations where a ladder could access the STL directly and where you could probably connect a battery-powered VTR and escape within minutes.

We need to do our best to protect the broadcast media from being used illegitimately by anyone. Engineers have little spare time, I know, but set up a

Let's make sure that the broadcasting industry is never used as a blunt instrument in this era of home-ground terrorism that we have entered. We all want the scenarios above to stay where they firmly belong...in the realm of fiction. ■

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



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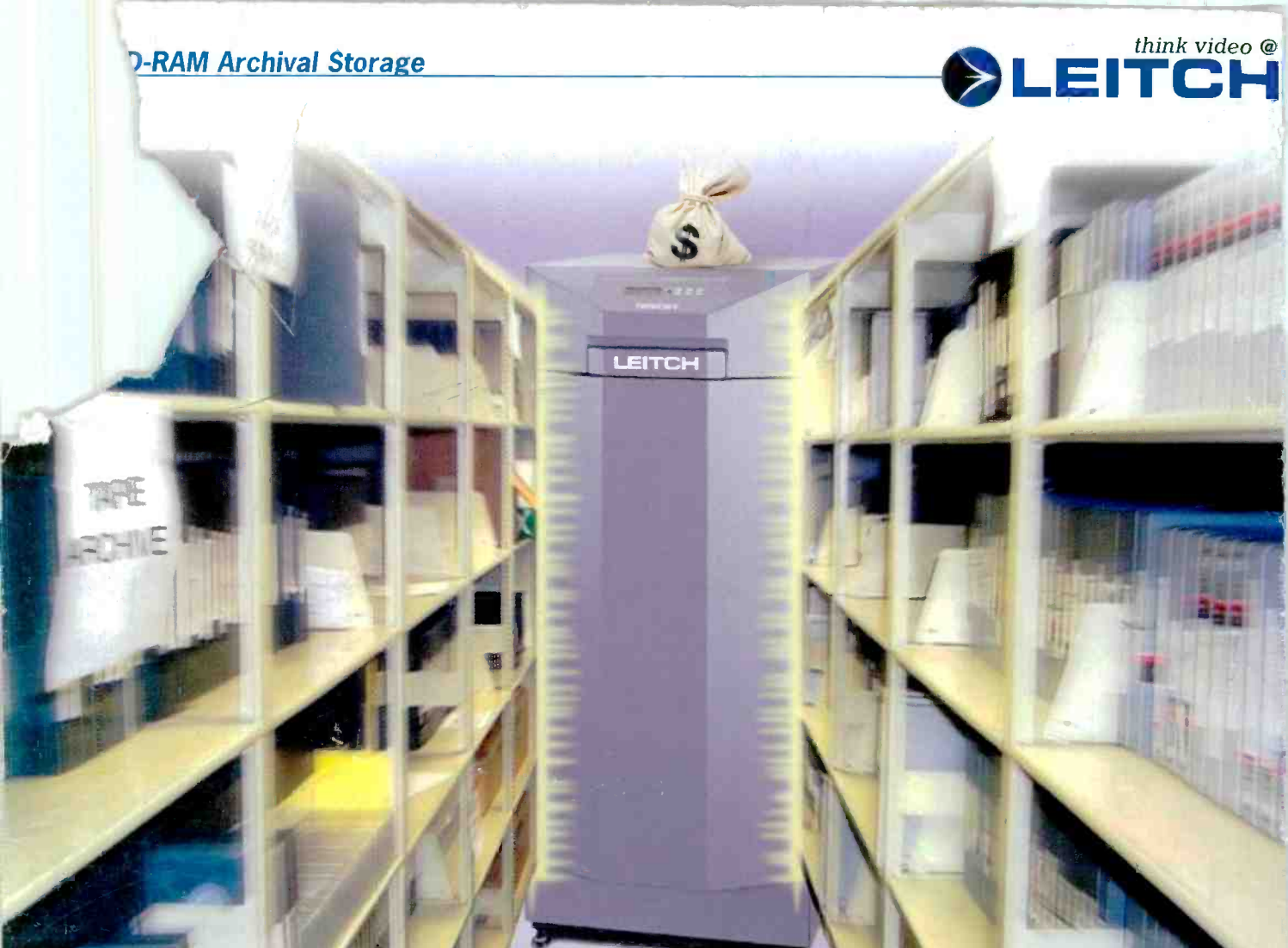
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