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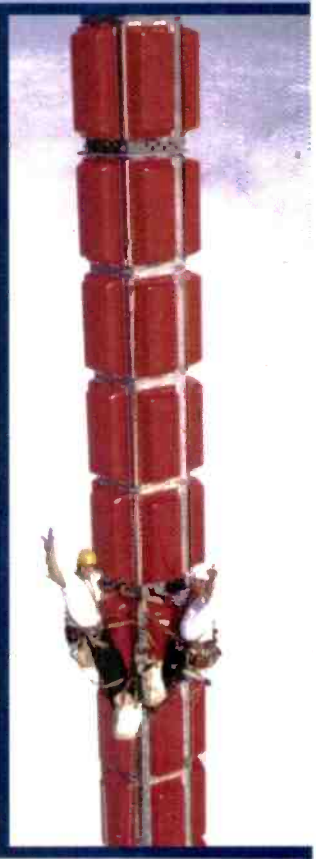
JULY 2003

Broadcast Engineering®

THE JOURNAL OF DIGITAL TELEVISION



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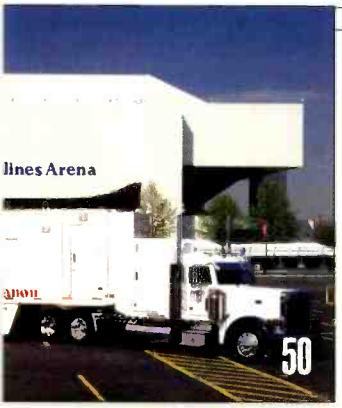
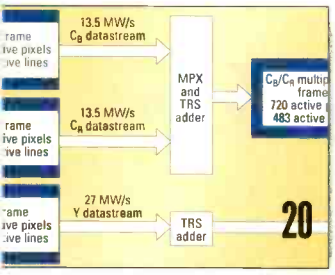
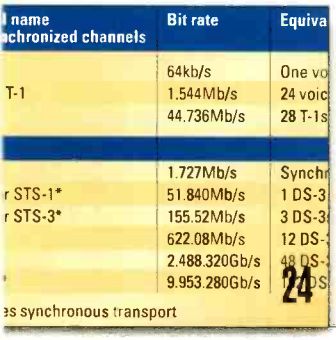
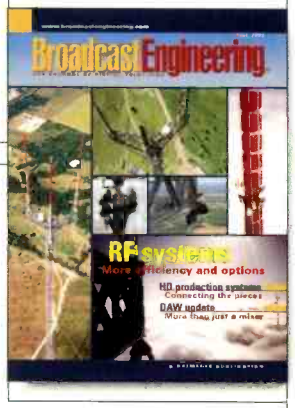






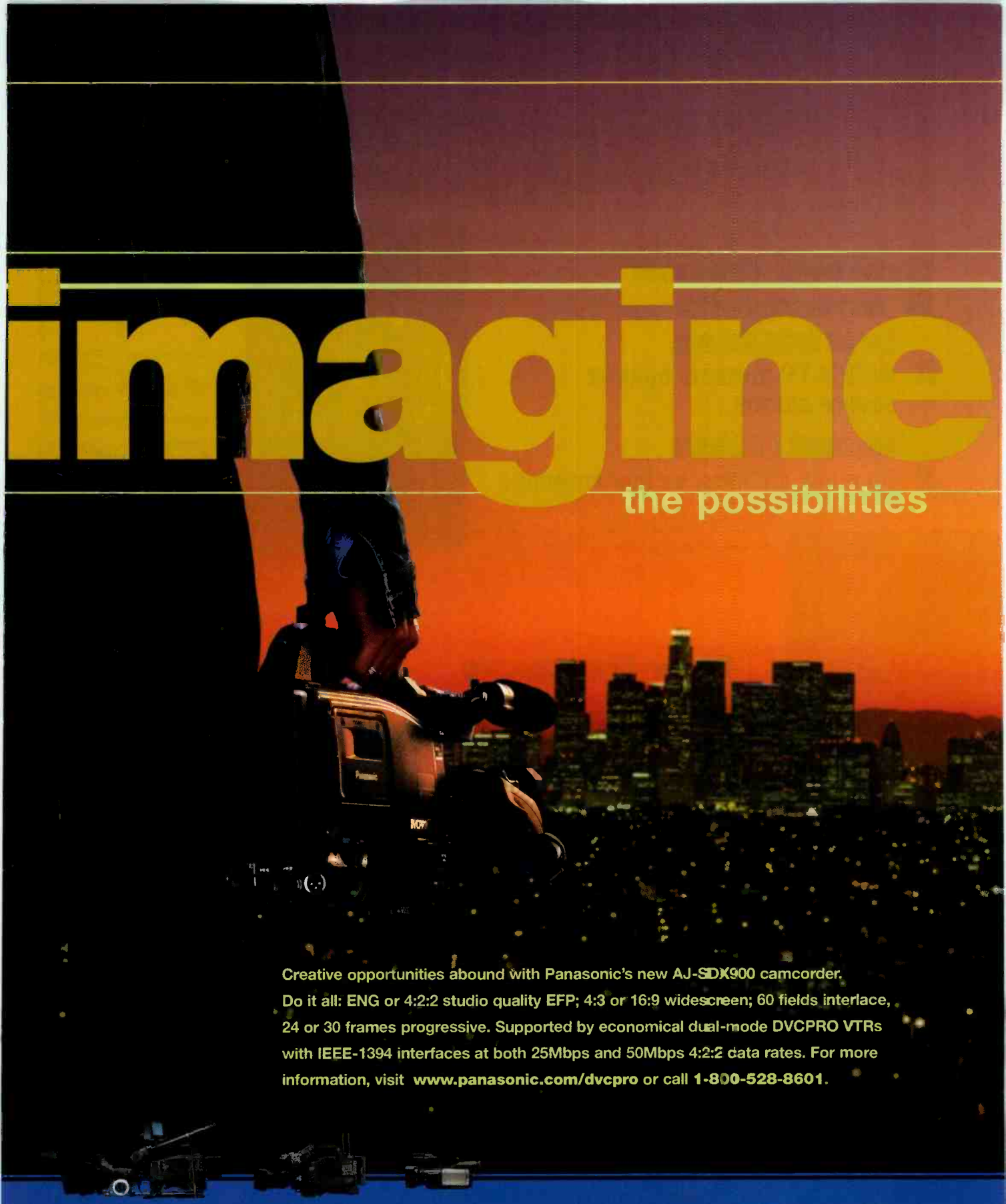
BEYOND THE HEADLINES

DIGITAL HANDBOOK



ON THE COVER: Sharing a tower is one option for broadcasters who want to lighten the financial load of upgrading their RF systems. The 2000-foot Houston and 1600-foot Dallas multi-tenant towers depicted on the cover were designed and built by Richland Towers.

(continued on page 6)



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Systems Design & Integration

New Products & Reviews

Departments

Defining HD

What cable television company announced in 1998 that it planned to downcovert 1080i broadcast HD signals to 480p (calling that format "HDTV") to save bandwidth? Correct entries will be eligible for a drawing of *Broadcast Engineering* T-shirts. Enter by e-mail. Title your entry "Freezeframe-July" in the subject field and send it to: bdick@primediabusiness.com. Correct answers received by Sept. 17, 2003, are eligible to win.

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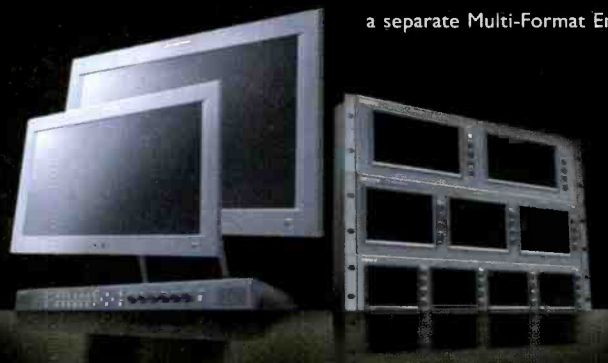

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Broadcast Armageddon

Grab your wife, your children, your friends. Store away your videotapes, record your favorite shows now – quickly. Disaster is about to consume us. Media Armageddon is coming. The end as we know it will come soon, starting as an epidemic of media mergers. The hundreds of media companies will be quickly consumed by a few, omnipotent

corporations. In the end, they will join together, creating a viewer's worst nightmare – Mega Corporation.

Mega Corporation's unquenchable thirst for sinfully large profits drives this monster. This white male-controlled machine is just waiting to sacrifice the needs of our women, children and minorities upon its altar of profits. The result will be the extinction of viewer choice, programming variety and yes, even that lofty goal of every liberal – diversity.

The result of this coming mega merger will be Americans with no media choice. The Corporation will control the vertical. The Corporation will control the horizontal. Brace yourselves, we are about to enter the Twilight Zone of Media Deregulation.

Sound extreme to you? Apparently not to our two Democrat FCC commissioners, Jonathan Adelstein and Michael Copps. They think the media sky is falling because of the FCC's June 2 action to raise media ownership caps.

Commissioner Copps characterized the rule changes as "...centralization, not localism; uniformity, not diversity; monopoly and oligopoly, not competition." His diatribe went on for 23 pages!

Based on the extremist's hype about the FCC's actions, viewers might think that the entire commercial television industry had decided to broadcast nothing but pornographic films 24 hours a day, complete with obscene dialogue.

The real truth is that the broadcast industry is highly regulated. And, unless broadcasters have the freedom to manage their businesses like other American enterprises, they won't be in business. Without, dare I say, *profits*, there won't be any free television. Perhaps Copps and his ilk prefer we have more government-funded (that means tax-payer funded) networks like PBS and NPR.

Unlike those taxpayer-supported channels, commercial broadcasters are companies that strive to serve their viewers' (customers') needs. They are only rewarded financially by how successfully they meet those needs. You see, commercial stations don't get free money from the government like PBS and NPR. They have to earn every dollar they get. Each commercial station has to serve their audience or they don't survive. Apparently Copps, Adelstein and their whining media kin, can't grasp that fact.

So, unless those media doomsayers are willing to fund all TV stations, they need to shut up and let the industry, viewers and the realities of capitalism work out the details. Powell did exactly what Congress said to do and the results will be exactly what our industry needs – the flexibility to grow, sell, buy and produce profits just like other companies.

So, take a deep breath Mr. Copps. Relax. The sky isn't falling and the media Armageddon you predict isn't coming.

Brad Dick
editorial director

Send comments to: • editor@primediabusiness.com • www.broadcastengineering.com

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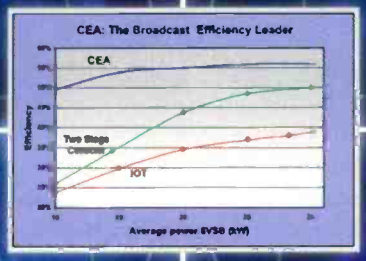

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Networking 101

Hello Brad,

I've just finished reading your January article, "Computer Networking for Beginners – Part 1," and I have a couple of questions.

First, take the company who is assigned an IP address by the ISP. Why would anyone choose a subnet mask other than 255.255.255.0?

What would be the purpose of choosing, for example, 255.255.255.252, which allows only two IP addresses?

Second, my company uses NetBEUI protocol on its NT4.0 network and, as far as I know, TCP/IP is not installed. Does every device on the network still have an IP address?

Also, a related issue that you haven't discussed so far in your series is how to handle firewalls on a network. Does the firewall need to be installed on every computer on the network or only the one that serves as the gateway to the Internet? (We have DSL through one computer, which is then distributed over the LAN with an Alcatel router.)

ART WAGNER

Brad Gilmer responds:

Hi Art,

First, thanks for your interest in the article. Now on to your questions: First, regarding subnets, almost everyone I know uses a subnet of 255.255.255.0. This is easy to remember and makes sure that all addresses on the network are usable. However, you might consider using a different subnet if for some reason you wanted to set a limit on the number of computer addresses on the network. This might be desirable if, for instance, you were setting up a network to be used only by a set number of computers in, say, the accounting department, and didn't want someone else to come in and grab another address on this network.

Perhaps others would disagree, but I would say keep it simple and use 255.255.255.0 unless you have a specific reason to limit the address range on your network.

On your second question, NetBEUI and TCP/IP can co-exist, but they are separate networking technologies. In the old days, NetBEUI/NetBIOS comprised Windows Networking. But as TCP/IP became the dominant networking technology, Microsoft modified NetBIOS to run on top of TCP/IP. This greatly reduced the everyday usage of NetBEUI in medium- to large-scale networks. If you enable TCP/IP on your network, each computer will need its own IP address, but you can run NetBEUI by itself. If you do that, all you need is to assign each computer to a workgroup (usually Workgroup), and assign each computer a computer name. If you would like to run NetBEUI alongside TCP/IP, you can do that too. All you need to do is enable TCP/IP in the "Properties" of the particular network card you are using. If you want to replace NetBEUI with TCP/IP, you can do this and still run NetBIOS. So it all depends on how you would like to configure your network.

On your firewall question, whether or not you need to install a firewall on every computer on the network depends on how the gateway is configured. If the gateway is configured to do network address translation (NAT) to conceal the addresses of computers on your internal network, and if the gateway is running a firewall to block things like the ports that enable Windows for Workgroups, then you only need one firewall. If the gateway is not running a firewall, then I strongly recommend running a firewall on each computer. Also, if some of the computers in your company are laptops, they should be running firewalls in case their owners dial into the Internet while traveling. People have their own preferences, but I have been very happy with the Zone Alarm firewall. If you want to check to see if your computer is exposed, you can go to *www.grc.com* and run the tests under the "Shields Up!" section of the site. This great site run by Steve Gibson provides a quick test to see how vulnerable your computer is to hacking over the Internet.

To Brad Gilmer:

Well... you've done it again!

You've said in two short pages what an entire networking for dummies book took two chapters to do.

Good article and good job!

Best,

TONY BE

February Freezeframe:

Q. What was the last year that the NAB convention was held outside Las Vegas, and where was it held?

A. 1996 was the last year the convention was held outside Las Vegas, in Dallas. No one correctly guessed the year, although several got the place correct.

Test your knowledge!

See the Freeze Frame question of the month on page 6 and enter to win the redesigned *Broadcast Engineering* t-shirt.

Send answers to *bdick@primediabusiness.com*

grass valley

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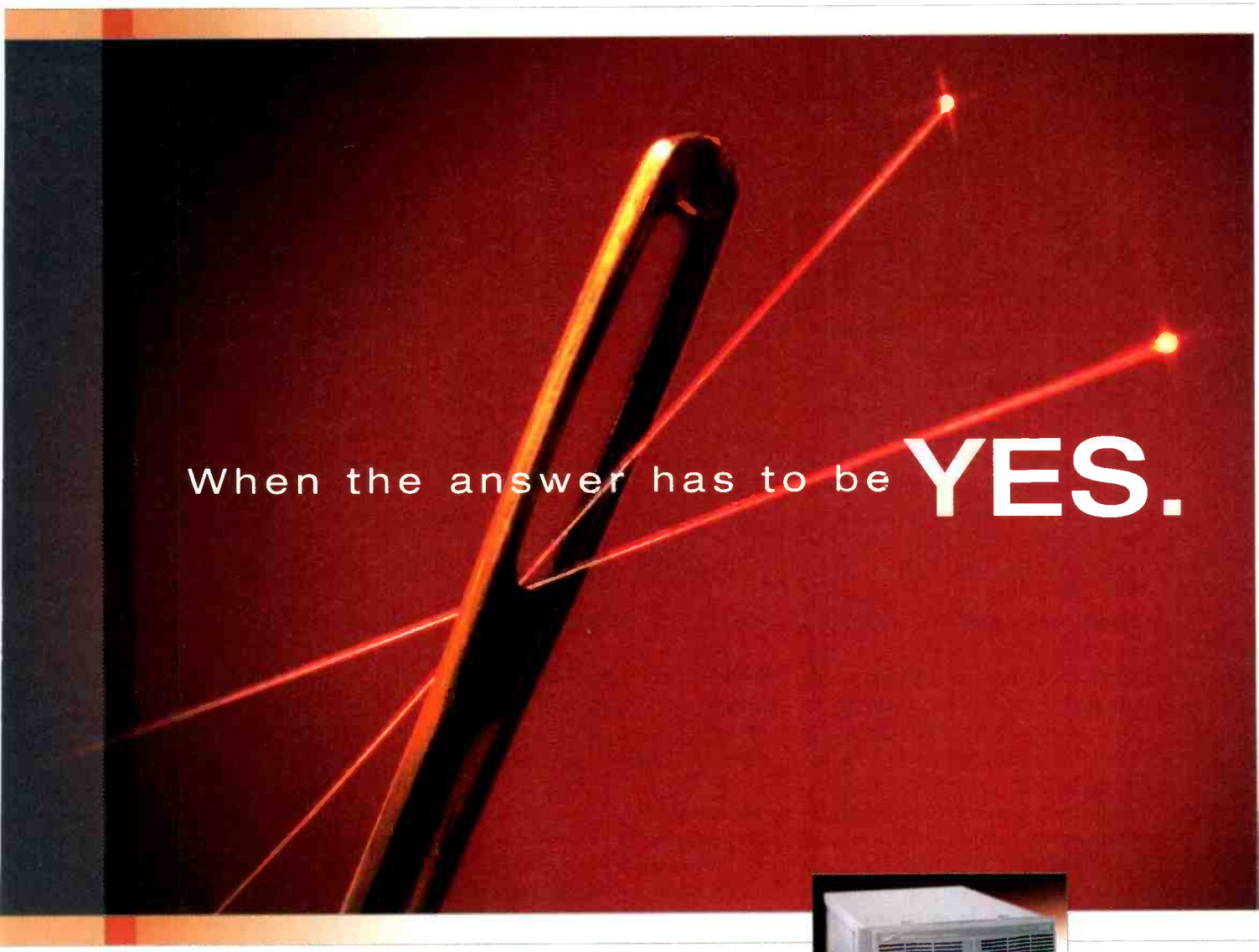

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BEYOND THE HEADLINES

Buy, sell or trade?

BY CRAIG BIRKMAIER

Just in case you've been away on a world cruise, or you are a broadcaster caught in the Golden Age of TV time warp, the Federal Communications Commission completed a biennial review of its media ownership rules on June 2, as mandated by the 1996 Telecommunications Act. This is the same legislation that authorized the broadcast DTV transition and launched massive radio industry consolidation, resulting in single-owner *radio clusters* in most major markets.

For 20 months, the NAB, the broadcast networks, large station groups, a variety of public interest groups and hundreds of thousands of citizens inundated the FCC with comments to three notices of proposed rulemaking related to media ownership. In the weeks leading up to the announcement of the new rules, the big media actually started covering the story. The story is that the new rules could lead to a new media reality in which the masses would get the majority of their information through a rapid proliferation of *broadcast portals* controlled by a handful of powerful media companies.

If the new rules stand up to anticipated court challenges and/or legislation that would reimpose most of the existing ownership caps, the content delivered by newspapers, radio and TV stations, and Internet news portals could become a homogenized product produced by a few big media conglomerates. Who will control these *broadcast portals* in a brave new digital world, is far from certain.

The decisions made over the next few years by independent owners of newspapers, radio and TV stations will strongly influence the outcome. Is it time to sell out, take the money and run? Or is it time to move proactively, buying, trading and partnering in an effort to compete with the conglomerates who seek to control both content and distribution, and most important, the billions and billions in advertising revenue generated in more than 200 U.S. markets.

Who will control these *broadcast portals* in a brave new digital world, is far from certain.

Balance of powers?

After the FCC released the new rules, Chairman Powell noted that the number of outlets and the number of independent owners have risen dramatically over the course of the last 40 years – from three broadcast networks originally, to three *24 hour all-news networks*, seven broadcast networks and over 300 cable networks today.

Clearly there appears to be an abundance of sources of information today. The content flowing through those portals, however, is largely controlled by only five media conglomerates. Disney (ABC), NewsCorp (FOX), General Electric (NBC) and Vicacom (CBS) control about 80 percent of the combined broadcast/cable/DBS viewing audience. AOL/Time Warner controls another 10 percent.

Few things escape the attention of those aligned on one side or another of any issue, and Powell is correct in asserting that there are many new ways to bypass the mass media gatekeepers. The real power of the mass media, however, lies in its ability to determine whether an issue is covered in the media most likely to reach the masses.

Just weeks before the FCC made its decision, a media industry leader sent a letter to the FCC asking it to extend the comment period on the ownership rules. "I heard about this public comment opportunity through word of mouth," he wrote. "The major networks have done very little to inform the public of this extremely important issue." The letter was from Michael Eisner, CEO of Disney, which owns ABC, one of the

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

New services may generate revenue

DBS subscribers show interest in DVR, HD and VOD

New Service	Percentage of DBS customers interested
DVR	27
HDTV	23
Satellite Radio	18
VOD*	14

**Defined as a service currently available to digital cable subscribers for a per-use fee offering pause, fast forward and rewind features.*

SOURCE: Taylor Research www.taylorresearch.com

networks that ignored the story even as it lobbied heavily for the rule changes.

The massive consolidation that took place in the radio industry after deregulation in 1996 has been cited frequently as an example of the downside of media consolidation. In particular, Clear Channel, which now owns more than 1200 stations, was a target. The company has become a dominant force in the music industry through its control of playlists and concert venues in major markets. The Federal Trade Commission is investigating to determine if they are exerting monopoly powers in this area. And Clear Channel has used technologies like voice tracking to control costs and gain the efficiencies that Chairman Powell and his fellow Republican FCC commissioners cited as a potential benefit of the media cross-ownership and consolidation.

On one hand, Clear Channel has reduced opportunities for the DJs and announcers who might otherwise be employed across the country. On the other hand, they have brought a degree of "market balance" to an industry dominated by the music industry oligopoly.

The need to improve operational efficiencies is a fact of life for broadcasters today. The abundance of consumer choices and resulting market fragmentation make it more difficult for second-tier stations to succeed financially. The newspaper industry consolidated in the face of competition from electronic media; now broadcasters face a similar competitive environment.

While many people are expressing concerns about the potential negative impact of media consolidation, there may be a silver lining to this cloud. Most of the network conglomerates left the NAB because it opposed increasing the network ownership caps. Large station groups, who are in a position to grow and provide a counterbalance to the big networks, now dominate the NAB. Perhaps more important, larger groups may be able to invest in content, as we have seen with Scripps Howard, which created a group of successful cable networks including the Food Channel and HGTV.

This is not a time for independent broadcasters to fold their hands...the game is just getting interesting. BE

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

IN ADDITION

For a closer look at the issues surrounding the media ownership ruling, visit www.broadcastengineering.com.

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

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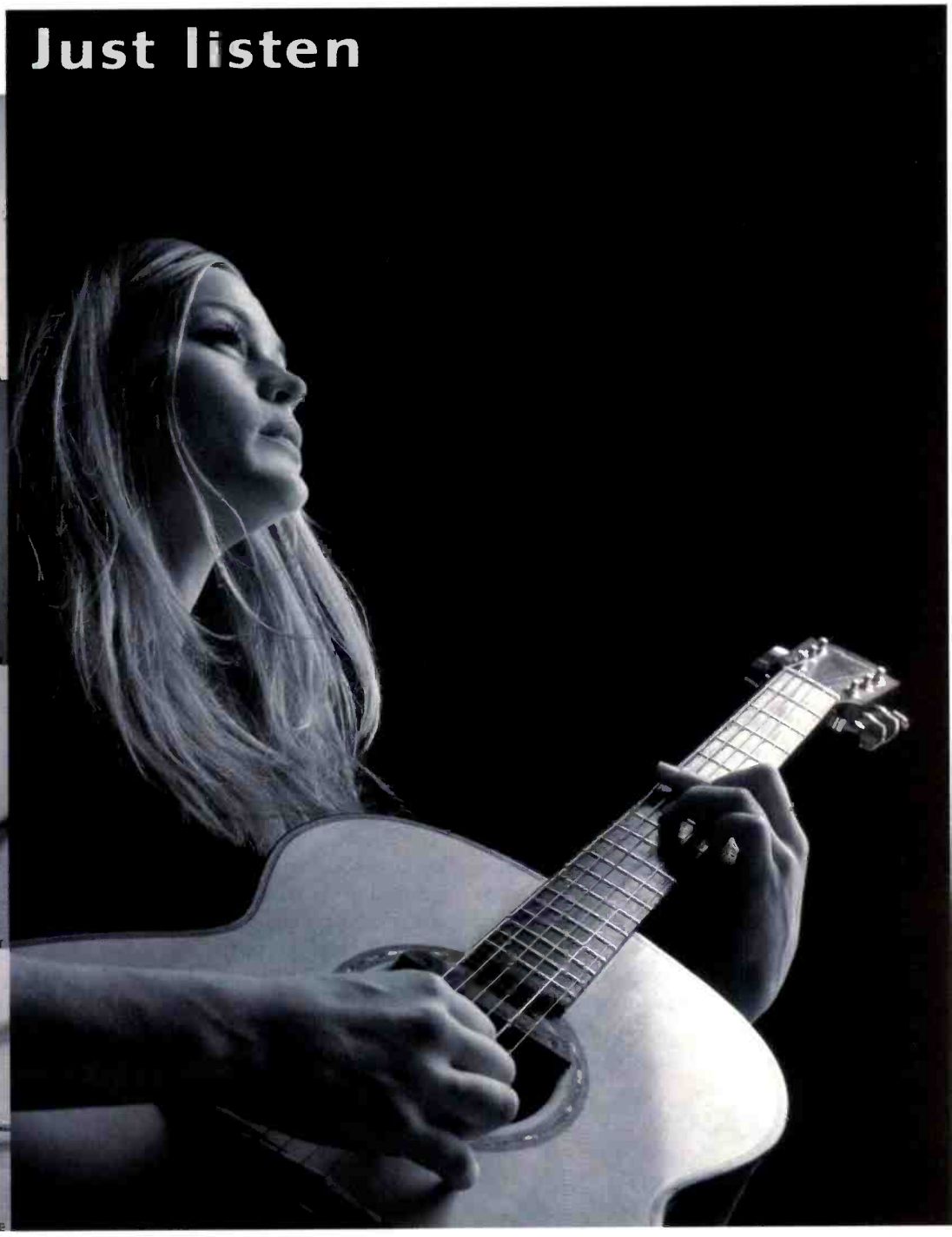

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BEYOND THE HEADLINES

DTV signal may be used for analog must-carry

BY HARRY C. MARTIN

The FCC recently ruled that an analog TV station is entitled to must-carry status on local cable systems if its DTV signal reaches the cable headend, even if its analog signal does not.

Under the FCC's rules, if a station's over-the-air signal does not have a "good quality signal" at a certain headend, the station is not entitled to carriage on that system. However, the FCC has long allowed full-power stations to qualify for must-carry by using alternate means. These include microwave hops, fiber, translators or satellite links.

A station's DTV signal may cover a broader area than does its analog signal, but for must-carry purposes, the FCC has just recently recognized DTV coverage as an alternate to analog. The station's DTV signal is picked up over-the-air at the headend, then converted to analog and transmitted on the cable system like any other analog TV signal. Cable TV operators have seen this as a form of "back door" must-carry for DTV, and have opposed it. This situation has changed as a result of the new decision.

Dateline

Stations in the following states, commonwealths and territories must file their biennial ownership reports with the FCC, and place their annual EEO reports in their public files and on their Web sites, by Aug. 1: Alaska, American Samoa, Florida, Guam, Hawaii, Iowa, the Mariana Islands, Missouri, North Carolina, Oregon, Puerto Rico, South Carolina, Virgin Islands, and Washington.

The decision was in response to a must-carry complaint filed by a station with an analog station, as well as a simulcast DTV signal on another channel. The station demanded carriage on a particular cable system, even though there was no dispute that the analog over-the-air signal did not meet the FCC's minimum strength requirements at the cable headend.

The bureau ruled that the station's DTV signal could be used to transmit the station's programming to the headend, and qualify for must-carry, as long as (1) the programming on the DTV signal is identical to that of the analog signal; and (2) the station pays the costs of conversion equipment at the headend. The bureau also stated that this does not constitute "dual carriage" because only the station's analog signal is being carried, and only one feed of the station will be carried on the cable system. The bureau reaffirmed the current commission policy that stations with both an analog and a DTV signal are not entitled to must-carry for the DTV signal until the analog license is surrendered.

While the FCC decision may be appealed, TV stations should now consider using their DTV signals to qualify for analog must-carry, as long as they are willing and able to fulfill the simulcasting and converter-provision conditions in the new decision.

Environmental action plan

FCC Chairman Michael Powell is serious about protecting historic and environmental resources from burgeoning tower construction. Powell released a statement in May announcing his "action plan," the agency's first comprehensive strategic plan to improve the FCC's ability to comply with the long-standing mandates of the National Environmental Policy Act of 1969 (NEPA) and the National Historic Preservation Act of 1966 (NHPA) while simultaneously accelerating deployment of communications infrastructure, including broadcast towers.

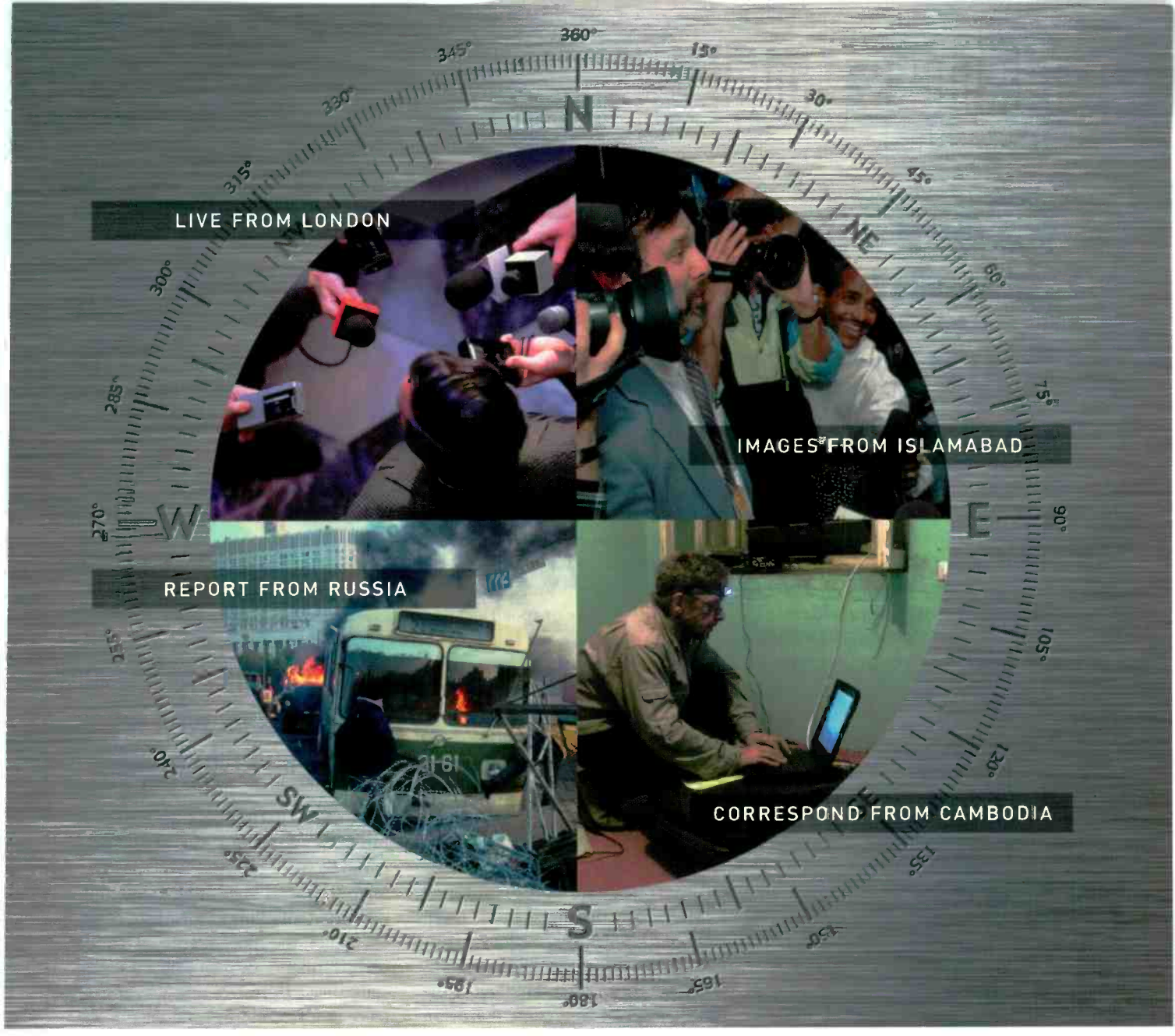
The four basic initiatives are to increase agency expertise and modify rules as needed; improve transparency and communication with external parties; make commission processes more effective and efficient; and provide vigorous enforcement.

For years the FCC has declined to consider the overall issue of the placement of towers in or near environmentally, historically or culturally sensitive areas. While Congress has long directed the commission (and other agencies) to consider such issues in connection with their normal activities, and while the commission did, in response, dutifully adopt a set of environmental rules several decades ago, by and large the commission has shown no enthusiasm for expanding its regulatory role into the environmental, historical or cultural arenas.

Chairman Powell's "action plan" may reflect a major shift away from that historical reluctance. If the full commission follows Powell's lead, broadcasters are likely to find that the process of relocating their towers will be subject to a good deal more complication and uncertainty. BE

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

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



TRACKING DOWN THE STORY MIGHT BE HARD. SENDING IT WON'T.

Unfortunately, the places in the world that make news don't always build the best local communications networks. Which can be a bit of a problem for reporters and broadcasters, especially when live transmissions or urgent news updates are demanded. But, fortunately, Inmarsat has the answer. Or rather, a range of them. Our unique network covers almost the entire globe, with an unrivalled record for reliability. And offers a full suite of Inmarsat Global Area Network solutions, including high-speed voice, data and video transmission; web access; e-mail and fax. To find out how we can help make sure your stories get across, just visit our website at **www.inmarsat.com/media**

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Centralized graphics

C. JASON MANCEBO

With the recent FCC rulings on ownership rules, interest will likely increase in the topic of centralized graphics in news production departments. A brief overview is in order to assist in determining if a centralized graphics workflow system is right for your operation.

Overview and discussion

The Weather Channel and *TV Guide* had two of the first centralized graphics operations. These pioneering systems were in place and up and running before the terms centralized graphics or centralcasting were coined. Now centralized graphics systems are widely used, primarily by station groups with news operations in multiple markets. With limitations on single-market ownership relaxed, it is logical that centralized graphics will also be engaged within markets to further increase operational efficiencies.

Centralized graphics is a system that provides a central location for creating graphics and a system of distributing these graphics to remote facilities. Centralized graphics are frequently employed by station groups seeking to consolidate, centralize and ultimately lower the expense of creating graphics content. While management is not reducing head count at facilities, a centralized workflow allows reduced hiring in graphics creation and news departments by allowing journalists and other non-artist members of the team to either selectively drag and drop remotely created packages into their newscast or automatically apply a graphics template created for a local "look and feel" to remotely created content.

Additionally, by employing more experienced graphics talent at hub locations, station groups are able to increase the quality and uniformity of the "look and feel" at local stations.

Operations and workflow

In a centralized graphics workflow, there are two distinct types of facilities. The central or hub location acts as the primary graphics content creation and distribution facility for the system. The remote or spoke locations are typically smaller-market stations using the content created at the hub for local broadcast. Many real-world facilities often have three or four spoke locations functioning as hubs. A centralized graphics system does not use a real-time, centralcasting type of distribution, but rather, employs a file-based, non-real-time content distribution network (CDN). In addition to getting content from the hub location, spoke stations often search peer spoke systems. The centralized graphics system facilitates this sharing.

Increased collaboration is a natural byproduct of such active sharing of information. Peer-to-peer relationships allow multiple locations to actively use relevant graphic information.

The challenges of such a complex system may at first seem daunting, but most vendors are aware of the situation and are prepared to work with professional systems integrators and their customers to accomplish the project goals. The main issues faced in the integration of these systems today are communication with legacy systems and integration with current systems, both Media Object Server (MOS) protocol compliant and non-MOS devices.

By providing the protocols to make their systems MOS compliant, most vendors are eliminating the need for customers to spend time and money on an extensive customization project. But, in the case of legacy systems or non-MOS systems, some level of customization is to be expected. While there's not a perfect plug-and-play solution, vendors are aware of and prepared to work on these issues.

Now centralized graphics systems are widely used, primarily by station groups with news operations in multiple markets.

While several vendors are now selling varied solutions to solve broadcasters' issues, the most successful return on investments are seen where a strong centralized infrastructure was put in place as a key and integral part of the project. In addition to content creation systems, a full-featured and specifically designed asset management system is key to gaining all of the benefits of a centralized system. Systems that are not built on industry standards such as those from the World Wide Web Consortium (*www.w3.org*), are short-lived, because they are islands unto themselves and as such are more costly and limit extensibility and expandability. Successful vendors are wisely conforming to the standards. As a result, more complete, full-featured, interoperable systems are available to the broadcaster seeking a solution for long-term success in remote graphics. BE

C. Jason Mancebo is president and chief technologist at Korsade Technologies.

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720x483p
SDTV format

BY MICHAEL ROBIN

The latest revision (Feb. 7, 2003) of SMPTE Stan-dard 293M, *720x483 Active Line at 59.94-Hz Progressive Scan Production – Digital Representation*, defines the SDTV 720x483p image sampling system. The standard covers both GBR and YC_BC_R formats. Its ITU counterpart, ITU-R BT.1358, covers the 525- and 625-line progressive systems.

The formats described in both standards have a 16:9 aspect ratio. The 483 figure in the SMPTE version refers to the active number of lines per frame. The principal application of this standard is to produce enhanced standard-definition television (EDTV) signals for digital television broadcasting as per the ATSC standard. Table 1 details the picture scanning characteristics of the 720x483p format.

Item	Parameter	Value
1	Frame rate (Hz)	59.94Hz
2	Interlace ratio	1:1
3	Number of total lines	525
4	Number of active lines	483 (43-525)
5	Blanked lines	1 to 42
6	Line frequency (f_H)(Hz)	31,500/1.001 ±3 ppm

Table 1. Picture scanning characteristics of the 525x483/59.94 format

The digital representation

Table 2 details the digital representation of the format. The digital coding is based on one luminance, E'_Y, and two color-difference, E'_{CB} and E'_{CR}, analog signals. The specified coded signal matrix coefficients are as in ITU-R BT.601. The specified color primaries and transfer characteristics are as per SMPTE 170M. The implication here is that format conversion applications into and from ITU-R BT.709 (HDTV formats) require matrixing as well as colorimetry parameters recalculation.

The luminance sampling frequency of 27MHz is obtained from the analog input video sync signal using a phase-locked-loop-controlled oscillator operating at 858 x f_H, resulting in a Nyquist frequency of 13.5MHz. The specified anti-aliasing low-pass filter has a cutoff frequency of 12MHz.

Item	Parameter	Value
1	Coded signals	$E'_Y = 0.587\ E'_G + 0.114\ E'_B + 0.299\ E'_R$ $E'_{CB} = 0.5643\ (E'_B - E'_Y)$ $E'_{CR} = 0.7133\ (E'_R - E'_Y)$
2	Sampling frequency (MHz)	Y: 858 x f_H = 27.00 C_B: 429 x f_H = 13.5 C_R: 429 x f_H = 13.5
3	Sampling structure	-Orthogonal -Line, field and frame repetitive -C_B,C_R samples cosited with odd Y samples in each line
4	Samples per total line	Y: 858 C_B: 429 C_R: 429
5	Samples per active line	Y: 720 C_B: 360 C_R: 360
6	Coding	Uniformly quantized PCM
7	Black level Y	040_h (64)
8	White level Y	$3AC_h$ (940)
9	Lower peak C_B,C_R	040_h (64)
10	Upper peak C_B,C_R	$3C0_h$ (960)
11	Video data range	004_h to $3FB_h$ (4 to 1019)
12	Lower prohibited codes	000_h to 003_h (0 to 3)
13	Upper prohibited codes	$3FC_h$ to $3FF_h$ (1020 to 1023)

Table 2. Digital representation of the 720x483/59.94 format

The color-difference signals' sampling frequency is 13.5MHz or 429 x f_H, resulting in a Nyquist frequency of 6.75MHz. The specified anti-aliasing low-pass filter has a cutoff frequency of 6MHz. The selected sampling frequencies result in an active line with 720 Y samples and 360 each C_B and C_R samples.

As shown in Figure 1 on page 22, the digital representation assumes two separate bit-parallel datastreams consisting of:

- A digital datastream conveying a digitized luminance bit-parallel signal Y with a data rate of 27Mwords/s.
- A digital datastream conveying digitized time-division-multiplexed bit-parallel signals C_B and C_R with a data rate of 27Mwords/s.

Each datastream carries the active video information as well as its own TRS information, end of active video (EAV) and start of active video (SAV), and the ancillary data if present.

In a 10-bit system, the digital information occupies a range extending from 000_h to $3FF_h$ (0 to 1023 decimal).

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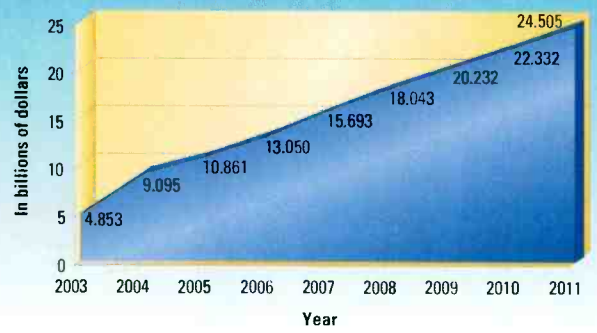

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Table 2 shows that the luminance (Y) signal normally extends from black, 040_h (64), to $3C0_h$ (960). In order to cater to overshoot and undershoot, the allowed range is extended from 004_h to $3FB_h$ (4 to 1019). Values from 000_h to 003_h (0 to 3) and $3FC_h$ to $3FF_h$ (1020 to 1023) are reserved for TRS signals (EAV and SAV).

The EAV and SAV signals each consist of a four-word sequence:

•The three synchronizing words with hexadecimal values of, respectively, 3FF, 000 and 000.

•The XYZ word, which carries the V bit, the F bit and the H bit. These bits define the vertical and horizontal blanking. Note that the F bit is always zero as there are no fields requiring identification. In addition, bits P0, P1, P2 and P3, which assume values depending on the status of the V, F and H bits, provide a limited error correction (single error) and detection (two errors) of these bits.

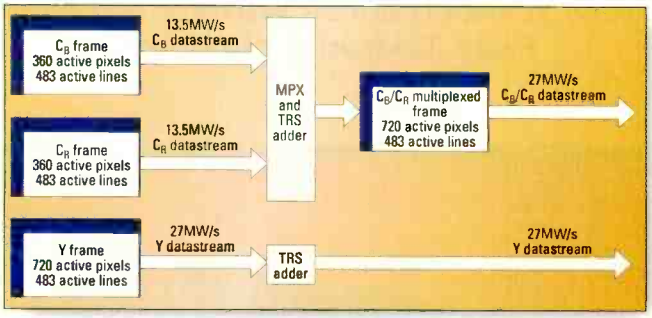

Figure 1. Formation of Y and C_B/C_R bit-parallel datastreams

reduction of the passband will result in a reduction of the horizontal resolution. Other digital standards like the 1920x1080 and 1280x720 have a less critical cutoff frequency.

Table 3 compares the potential luminance resolution of the 4:3 aspect ratio SDTV SMPTE 259M format (based on Rec. 601) with that of the 16:9 aspect ratio SDTV SMPTE 293M format. As shown, the SMPTE 293M format horizontal resolution is considerably lower than that of the SMPTE 259M format horizontal resolution. This is due to the relatively low Y and C_B/C_R sampling frequencies. The result is stretching the Y samples (720 per active line) and C_B/C_R samples (360 each per active line) over a wider (16:9 aspect ration) screen. The serialization of the bit-parallel Y (27Mwords/s) and multiplexed C_B/C_R (27Mwords/s) results in a bit-serial signal with a 540Mb/s bit rate. SMPTE Standard 344M covers the subject.

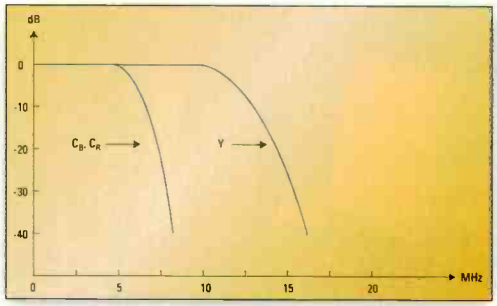

Figure 2. Typical frequency response of the C_B/C_R and Y channels

One of the early attempts at handling a 525-line interlaced format with a 16:9 aspect ratio, while maintaining the 4:3 aspect ratio horizontal resolution resulted in a Y sampling frequency of 18MHz and a C_B/C_R sampling frequency of 9MHz each. The associated bit-serial signal had a 360Mb/s bit rate. The Panasonic D5 tape format could record this format, albeit with an eight-bit precision. This was the only VTR capable of recording this format. This signal format has not survived and is not an ATSC suggested format.

Because the format is progressively scanned, the reproduced pictures do not suffer from interlace artifacts such as sporadic interline flicker and movement judder. When viewed side-by-side, while displaying the same program material, the 16:9 SMPTE 293M format picture looks better than a 4:3 SMPTE 259M format picture, even though the latter has a higher horizontal resolution. This, coupled with the fact that MPEG compression is easier to carry out on a progressively scanned video signal and that a 6MHz ATSC channel can carry four SMPTE 293M programs, will undoubtedly attract a considerable segment of the broadcasting community. BE

Resolution considerations

The static vertical resolution, expressed in "lines per picture height," uses concepts dating back to the 1930s. It is equal to the number of active lines (483) multiplied by the controversial Kell factor taken as 0.7. So the 720x483 format has a vertical resolution of 483 x 0.7≈338 LPH. This holds true for camera source signals. Digitally generated signals can individually activate each scanning line, so here the Kell factor is meaningless, and the vertical resolution equals the number of active lines.

Given the active line duration of this format, the horizontal resolution factor is 29 lines/MHz. The specified luminance channel anti-alias filter has a cutoff frequency of 12MHz, as per Figure 2. The horizontal resolution is 12Mhz x 29 lines/MHz+348 LPH. So the luminance horizontal resolution practically equals the vertical resolution. Any

Format	SMPTE 259M		SMPTE 293M	
Component	E'_Y	E'_{CB}-E'_{CR}	E'_Y	E'_{CB}-E'_{CR}
Sampling frequency (MHz)	13.5	6.75	27	13.5
Nyquist frequency (MHz)	6.75	3.375	13.5	6.75
Cutoff frequency (MHz)	5.75	2.75	12	6
Number of pixels per active line	720	360 each	720	360 each
Resolution factor (Lines/MHz)	≈79		≈29	
Horizontal resolution (LPH)	≈454	≈217	≈348	≈174
Active lines per frame	485		483	
Vertical resolution (LPH)	≈339		≈338	
Multiplexed serial bit rate (Mb/s)	270		540	

Table 3. Comparison of resolutions of two SDTV 525-line formats

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

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DIGITAL HANDBOOK

SONET

BY BRAD GILMER

In the November column, we gave an overview of ATM and briefly described how ATM uses synchronous optical network (SONET) as its transport layer. This month, we take a closer look at SONET and some of the telephone-industry nomenclature behind the technology.

You might wonder why broadcasters would care about or need to know a core telecommunications technology such as SONET. The answer is simple: convergence. We are now at the point where video, data and voice are commonly being carried over the same infrastructure. And SONET is an ubiquitous, standardized, high-speed network capable of delivering information at very high speeds.

Evolving jargon

Broadcasters frequently run into terms such as T-1, DS-3 and OC-48. Let's see how these terms evolved. When the telecommunications industry transitioned from analog to digital, it settled on a speed of 64kb/s for one voice channel. This defined the lowest level or base signal for digital transport. A trunk line (T-1 line) carries 24 voice channels and runs at 1.544Mb/s. (If you take 64 and multiply it by 24, you come up with 1.536, not 1.544. Extra bits are added to each channel for synchronization.)

Channel name Non-synchronized channels	Bit rate	Equivalent
DS-0	64kb/s	One voice channel
DS-1 or T-1	1.544Mb/s	24 voice channels
DS-3	44.736Mb/s	28 T-1s or 1968 voice channels
SONET		
VT-1*	1.727Mb/s	Synchronous equivalent to DS-1
OC-1* or STS-1*	51.840Mb/s	1 DS-3 (plus overhead)
OC-3* or STS-3*	155.52Mb/s	3 DS-3s
OC-12*	622.08Mb/s	12 DS-3s
OC-48*	2.488.320Gb/s	48 DS-3s
OC-192*	9.953.280Gb/s	192 DS-3s

*Denotes synchronous transport

Table 1. Various telecommunications circuits and associated bit rates.

AT&T long ago referred to the T-1 datastream as simply a datastream (DS). The resulting nomenclature is DS-n, where "n" indicates the number of datastreams. A DS-0 is equivalent to a 64kb/s voice channel. A DS-1 is the same as a T-1 and has a bit rate of 1.544Mb/s. SONET's base level, optical channel 1 (OC-1), is 51.84Mb/s and is equivalent to one DS-3. OC-n stands for optical channel "n." STS-n stands for synchronous transport signal "n." OC-n is the optical equivalent of the electrical transport provided by STS. Table 1 shows the various telecommunications circuits and their associated bit rates.

Currently, OC-192s is the highest speed of commonly deployed SONET networks. At 9.9Gb/s, an OC-192 can carry 129,024 voice circuits or more than 3000 3Mb/s, MPEG-2-compressed television signals. Only connections between the largest cities require this much bandwidth.

SONET is designed to be payload unaware – as an underlying transport technology it has no knowledge of what it is carrying. And any higher protocol layers such as ATM or IP cannot have any dependency on SONET technology per se. This is a classic implementation of the ISO 7 layer data model, where you may substitute layers without disrupting layers below.

Timing is everything

As you can see from Table 1, DS-n channels are asynchronous. DS-n data rates can vary up to 20 parts per million (a DS-3 at 44.736Mb/s can vary by as much as 1.7kb/s). This has several impacts. First, if you want to stack multiple DS-ns together, you have to add extra space for stuffing bits to deal with the variation in timing of each individual DS-n. Since telecom infrastructure is built upon combining tributary datastreams into larger transport pipes, this compounds and becomes significant wasted space.

You might wonder why broadcasters would care about or need to know SONET. The answer is simple: convergence.

SONET networks are synchronous and they control timing very tightly. SONET switches use a Stratum 1 atomic clock for their reference, and SONET includes a hierarchy that allows lower nodes to derive timing references from these highly accurate and stable clocks. This tight timing greatly reduces the need for stuffing bits (SONET uses pointers instead). Since DS-3s are commonly used as tributaries to SONET streams, SONET includes the concept of the virtual tributary (VT). VTs are synchronous versions of DS-3s that run at a constant 1.728Mb/s. In this way, asynchronous tributaries can contribute to synchronous SONET networks.

Additionally, tight timing allows switching in the optical domain. This is important because optical switching is faster, more reliable, less costly and results in less signal degradation

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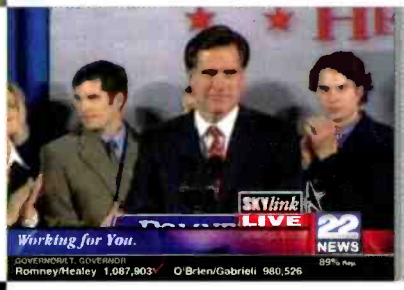

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than switching in the electrical domain. Without this capability, signals would have to go through an optical-to-electrical (O/E) conversion, be switched as required, and then go through an electrical-to-optical (E/O) conversion for onward transmission.

Like TV but different

Understanding how data are loaded into a SONET frame is easy for a television engineer. In a television analogy, each SONET STS-1 frame consists of a television "line" that is 90 bytes wide. Each television "field" comprises nine television lines. The computer scans the line from right to left, jumps down to the next line and does it again. At the beginning of each line is a "horizontal sync pulse" (transport overhead). STS-1 frames are sent at a rate of 8000fps. The math to get to 51.840Mb/s per SONET STS-1 frame is dead simple: 90 bytes per line x 9 lines x 8 bits per byte x 8000fps = 51.840Mb/s

Topologies and features

As you might expect, SONET supports a wide number of networking topologies, including point-to-point, star and ring. It also supports add-drop, a cable-television-industry term with which you may be familiar. Remember, SONET is doing all of this in the optical domain. This is important. Until the advent of SONET, it was not possible for telecommunications companies to switch or to provide handoffs to other carriers in the optical domain. An O/E and subsequent E/O conversion was required to go between boxes from different manufacturers. SONET enabled interoperation of vendors' equipment in the optical domain, allowing carriers to interconnect at lower cost and higher speeds.

SONET's add-drop feature is critical to telecommunications providers and may ultimately prove critical to broadcasters as well. Because SONET is a core transport technology, carriers must be able to add or delete even a single 1.5Mb/s VT-1 circuit from a 2.4Gb/s OC-48 feed (or any other combination, for that matter). Users want to be able to add and remove payload from the system at any point. The process by which SONET enables this is fairly simple, but it involves a whole lot of terminology that we cannot wade through here. Suffice it to say that SONET supports the ability to add or delete tributaries from a larger pipe.

SONET was designed from the ground up to provide "carrier-quality" transport, meaning that it must have very low error rates and elaborate alarming and restoration features. Broadcasters understand the concept of low error rate. But the concept of alarming and restoration may have slightly different connotation in the telecommunications world. Carriers have developed elaborate automated error-monitoring, alarming and restoration features on their networks. These systems constantly monitor transport circuits for errors. When errors on one circuit exceed a preset threshold, the system switches to a backup path and generates an alarm. When the equipment is repaired, the system automatically switches it back into service. Note that it is difficult to equate errors in a SONET network (typically expressed as bit errors) to video error measurements such as EDH errors. Also, because MPEG has varying responses to errors depending on where in the MPEG bitstream the error occurs, it is difficult to correlate errors in an underlying SONET network with outages experienced on a video feed. But broadcasters should know that video ultimately transmitted over SONET is carefully monitored and that elaborate alarm technology is present on all major SONET circuits.

As convergence becomes a reality, it is important for broadcasters to acquaint themselves with a growing body of knowledge and terminology from the telecommunications and IT world. SONET is a key underpinning of almost all terrestrial WAN video transport. BE

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

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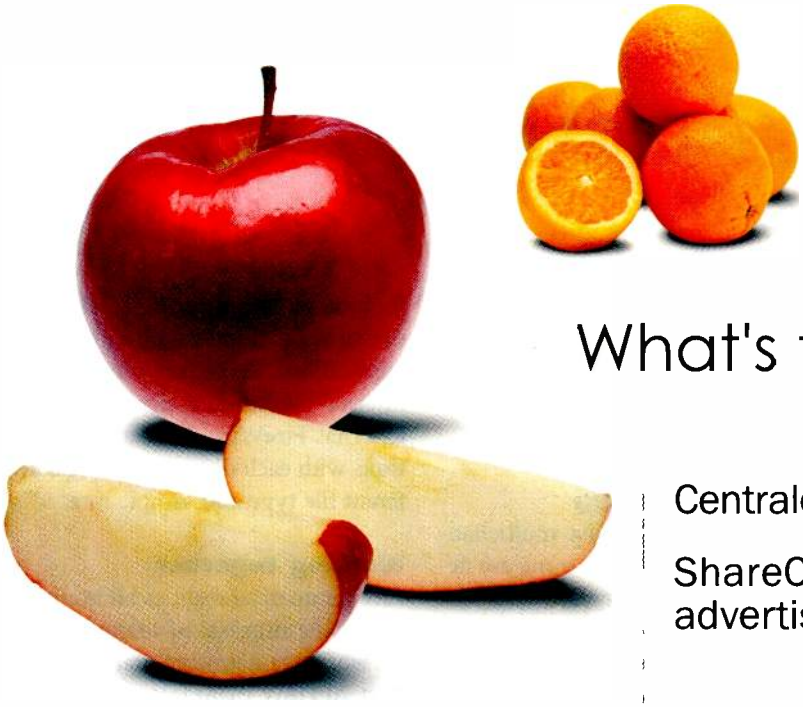

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FLORICAL SYSTEMS

Digital audio workstations

BY YASMIN HASHMI

There is now a multiplicity of formats with which the audio professional may have to deal, not least of which are the various multichannel surround choices for TV and theatrical film, and the competing DVD-A and SACD consumer formats. An increasing number of systems are addressing these markets, such as the Cube-Tec AudioCube with its CubeDVD-A authoring package.

For SACD, Sonic Studio has three new products, ranging from an eight-channel processor card and Sonic Studio DSD application software, to an add-on processor board that adds a further eight channels and supports DSD-native EQ and dynamics processing, to an SACD authoring application. The Merging Technologies Pyramix also supports 16 channels of DSD, along with a new DSD de-noise plug-in by Purnotes.

The new SADiE Series 5 DSD8 offers multichannel DSD processing as well as being a fully fledged eight-channel PCM editor supporting all high-resolution formats.

For audio post to picture, an increasing number of digital audio workstations (DAWs) now support multichannel surround in one form or another, with useful features such as the multitrack trim of surround stems as supported by the AMS Neve AudioFile.

In addition to loop mixing, waveform editing, DSP effects, mastering and analysis tools, and audio restoration, the Syntrillium Cool Edit Pro includes a multichannel encoder for surround sound. The Steinberg Nuendo supports a Dolby Digital encoder plug-in for AC3 encoding from mono to 5.1, and can also export DTS-encoded audio as a WAV file to directly burn a 5.1 mix to CD. The Digidesign Dolby Surround Tools option allows users to produce Dolby Surround LCRS mixes (not Dolby Digital 5.1 mixes) on both Mac and Windows-based Pro Tools TDM systems.

Multichannel and portable recording

While most DAWs have multichannel operation internally, some are designed specifically for the multitrack recording and playback market. These offer multiple inputs and outputs, sometimes freely routable, sometimes fixed to tracks, and tend to be modular in groups of eight or 24 tracks.

Among the latest arrivals to this market is the Otari DR-100. This operates as a 48-track at 48kHz or as a 24-track at 96kHz, has a dedicated 48-track remote, waveform GUI, seamless punch-in/out, several DSP functions, a variety of analog and digital I/O, a removable hard disk, and the ability to import sessions previously created on the RADAR-II system.

The Genex GX9000 supports eight channels of 24-bit/192kHz and DSD recording/playback, while the GX9048 accommodates up to 48 tracks of 24-bit/192kHz or up to 48 channels of DSD recording/playback from a single hard drive. A choice of file formats is supported, and a built-in sample rate converter operates up to 192kHz as well as enables conversion between PCM and DSD.

For multichannel portable or location recording, a handful of new products has come onto the market. Zaxcom has launched three hard disk recorders, namely Deva III, IV and V. These range from a six-track model for basic recording to a 10-track model designed for multitrack, high-bit-rate applications. Recording can be to the internal hard disk, internal DVD and external FireWire drive at the same time, with each disk supporting a different file type and sample rate.

Working together

As commercial realities hit home, an increasing number of manufacturers are working on project interchange. At least 20 DAW manufacturers have either already implemented or are planning to implement AES31 so that whole projects can be interchanged with other systems. Many manufacturers are supporting an increasing number of formats for third-party file and plug-in support.

Many manufacturers are supporting formats for third-party file and plug-in support.

In addition to AES31, SADiE V5 software allows drag-and-drop of DirectX plug-ins onto a mixer strip. The effect can immediately be heard or bounced in non-real time, and DirectX processes may also be chained on the same mixer channel.

The Merging Technologies Pyramix V4.1 includes direct project interchange formats, including AES31, Open TL, Pro Tools and Sonic Studio. The Emagic Logic Platinum 6.1 allows Digidesign TDM users to use Emagic software instruments in combination with TDM DSP hardware on the Mac OS X platform. It also supports import of Akai S1000/3000 samples. BE

Yasmin Hashmi is a partner in SYPHA, publisher of The DAW Buyers Guide *at www.SYPHAonline.com.*

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SYSTEMS DESIGN SHOWCASE

WCBD's master control room provides a good example of the integrated automation and switching systems utilized throughout the new facility. These systems, including an M2100 switcher from Thomson Grass Valley, enable a relatively small staff to handle station operations. Photos courtesy PCS.

WCBD-TV protects against severe storms

BY PETE RIGHTMIRE

WCBD-TV Channel 2 was operating with equipment seriously in need of updating when its parent company Media General decided to build an entirely new facility for the station, directly adjacent to their old building and tower.

Although it was unlikely WCBD would ever originate HD programming, Media General did want the new station to be a fully SDI plant, capable of switching and pass-through of HD.

Weathering the storm

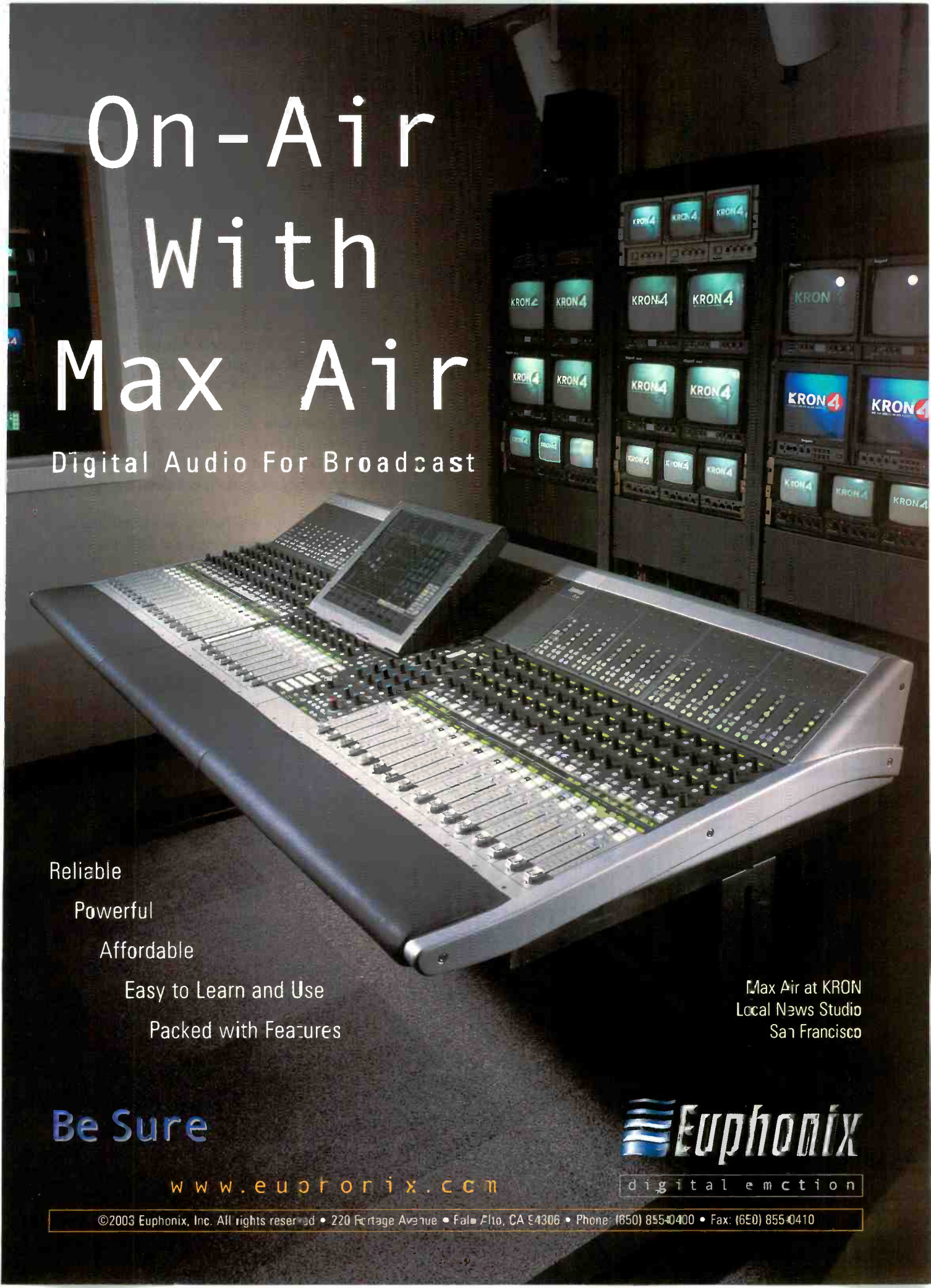
The region's frequent and severe storms were a major factor in the design and construction of the new facility. When Hurricane Hugo swept through South Carolina in 1989, it destroyed the station's newsroom and rendered its outdoor generator virtually useless. The new facility had to be able to withstand such severe storms and still remain on the air.

The new building's first floor sits 13 feet above sea level. The broadcast studio, training room, reception area and remote camera storage are all located on this level, along with a covered garage for the station's news vehicles and staff parking. If the studio is threatened by floodwaters, television cameras can be popped off their tripods and installed in a second-floor newsroom.

Master control, production control, edit suites, audio rooms, rack rooms, and the news, marketing and sales departments are all located on the second floor, at 24 feet above sea level, with technical gear including UPS and transmission racks another two feet higher. The station's transmitter was installed at a separate location. If the station is cut off from outside power, it

Equipment List

- Thomson Grass Valley
  - Kalypso and M2100 switchers
  - 7500 series routers
  - Concerto router
  - Encore control system
- Ikegami HL-45 studio cameras
- Avid AirSPACE servers
- Pinnacle
  - MediaStream servers
  - FXDeko
  - Thunder LT
  - Lightning
- Miranda
  - Densité audio and video DAs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A Thomson Grass Valley four-M/E Kalypso switcher and new Pinnacle graphics equipment work together to help WCBD achieve a large-market look.

can switch to its 750kva generator, equipped with a 4000-gallon fuel tank.

Designing the facility

Professional Communications Systems (PCS) was chosen as the systems integrator, and set out to deliver a large-market station on a mid-market budget. They adopted engineering practices to utilize 100 percent of each piece of equipment, and took the operator's perspective to design everything for efficient use by a minimal staff.

Most of the equipment can be operated at multiple points, and individual operator positions have access to most control panels for graphics, CG, automation and ingest. An Avocent KVM router allows control of any graphics or automation systems, the Miranda iControl, and numerous other systems from several designated locations. So, when a graphics operator is not on duty, the TD can control the graphics. During breaking news the MCR operator can control the graphics equipment. Use of the router also reduced the clutter at workstations responsible for the control of several pieces of equipment. System flow and equipment layout were designed around a core infrastructure that can be expanded with minimal cost and effort. To maximize control and monitoring compatibility and redundancy, different equipment platforms were kept to a minimum. Miranda iControl was used for the station's distribution and conversion requirements. The system allows operational positions to adjust any parameter of the video and audio signals within the complex.

Mixing old and new

WCBD wanted to transition existing equipment to the new facility, so PCS adjusted the operation of the old facility to allow removal of designated equipment at specific turnover points.

Prior to the switch to the new facility, commercial playout and automation had to be simultaneous in both buildings. Provision for multiple feeds to both the new and old buildings also had to be made for services such as satellite feeds and microwaves. The project team planned for redundancy so equipment removal wouldn't affect operations.

Making news

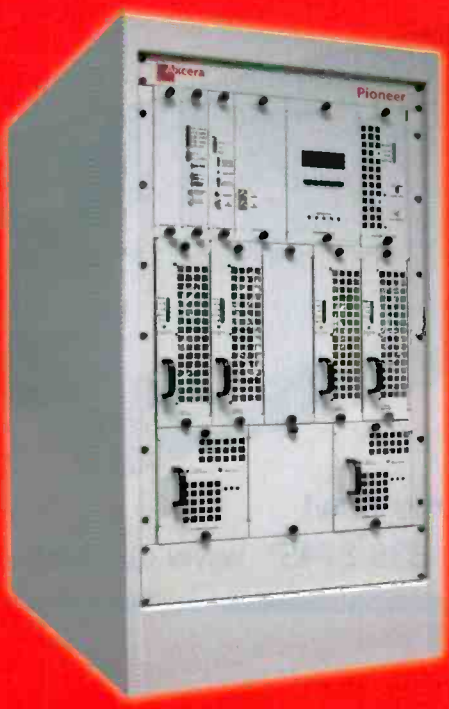
Media General chose Panasonic DVCPRO as the tape format for all of its stations, and 25Mb/s DVC is used for all acquisition and playback at the station, with a mixture of linear and nonlinear editing suites. All external news feeds via satellite, microwave or IP are recorded in the feeds room.

A Thomson Grass Valley four-M/E Kalypso switcher was chosen for production control due to its built-in DVE and still stores, remote control of serial connected devices and its bypass capability, which allows redundant backup via the router in case of switcher failure. The Kalypso, used with Pinnacle graphics equipment, give news programs a large-market look with strong, distinctive branding. The switcher was also configured for control of all videotape players in the feed area as well as serial control of the moving graphics, which reduced staffing demands.

During breaking news the MCR operator can control the graphics equipment.

The system ties in well with the station's new 7500 series router and Encore control system. The Encore system maximizes the features of the extensive Image Video UMD and tally systems, which draw information from the routing

Eliminating obstacles for today's broadcaster



Introducing the Pioneer

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system to keep the UMD updated. Active UMD and tallies indicate when the switcher is live to air.

The station chose to use analog audio in its new facility since most of the external feeds into the station were still analog, and the net gain in quality was not enough to justify the additional expense of using AES digital.

A Calrec S2 audio console was chosen for its ability to deal with the varying uses encountered in production control. The console also has extensive intercom capabilities for IFBs and multi-way working, essential for handling the number of live satellite and ENG feeds in use every day.

The facility's new studio is equipped with Ikegami HL-45 digital cameras, and large plasma screens are used for both news presentations and weather, giving newscasts a distinctive look. Flat panels are used for all preview monitoring for the talent.

The new studio utilizes Ikegami HL-45 digital cameras, and makes extensive use of large plasma screens for news and weather.

Pinnacle MediaStream spot servers, 50Mb/s DVCPRO tape and Avid AirSPACE program servers are used for acquisition and playback, with each server mirrored for redundancy. Spot servers are one-in, two-out, with one output for monitoring. Program servers are three-in, three-out with one output for monitoring.

WCBD had a small Florical automation system in its old facility, and it made sense to expand on that system. For the transition, PCS moved part of the system over to the new facility, and then used one of the new program servers as a spot server. This meant program and spot redundancy had to be provided by tape machines. After the transition, the system was migrated such that the station had the two old Pinnacle servers for spot playback and the two new Avid servers for program playback.

Staying within the Thomson Grass Valley platform, the team chose an M2100 switcher for master control.

Meeting a tight deadline

When the system pre-build began at PCS' Tampa facility, on-site installation was scheduled for just three months later.

PCS met the target date, reconstructing the system starting from the core and working out – rack room to master control to production. Today, WCBD's new building is a fully SDI facility, designed and built with the ability to expand and grow easily. BE

Pete Rightmire is a writer with 25 years experience in the video industry.

Design team

Media General:
Ardell Hill, sr. vp
WCBD:
Richard Fordham, GM
Jack Becknell, CE
Professional Communications Systems (PCS):
Glenn Thomason, DE
Rich Merriam, sr. designer
Ed Kothera, sales engineer
C.T. Stellwag & Associates, building engineering consultant
Rosser International, architect

SONY

it's a digital world:

MPEG Times

Over 900 TV stations broadcasting in digital

The DTV transition reached another milestone as the NAB count of digital stations exceeded 900 this week. Some 98% of U.S. TV households are in markets served by at least one DTV broadcaster. 78% are served by fi

OVER 1,000 MPEG IMX DECKS DELIVERED TO U.S. TV STATIONS AND PRODUCTION HOUSES

Sony's MPEG IMX production system achieved another plateau this month as cumulative sales in the United States surpassed 1,000 units. Over 8,000 units have been shipped worldwide. Users praise the format's phenomenal picture quality. operating costs and backward compatibility with decades of assets reco and Betacam SP®, format

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MPEG IMX IS THE FORMAT OF CHOICE FOR REALITY TV

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So many stations, so few antennas

BY DON MARKLEY

Stations are still having problems finding room on their towers for DTV antennas. Many stations are realizing that the only solution is to eliminate the old antenna and replace it with a new one that will handle both analog and digital signals. Combining signals into a joint antenna system does not require more tower space nor does it significantly increase tower loading.

VHF + VHF

Perhaps the simplest of the combinations occurs where both analog and digital signals are VHF and occupy the same portion of the band. That is, they are both either high-band or low-band VHF (either 2 to 4 or 5 to 6). For this application, the familiar batwing or superturnstile antennas are usable because of their excellent bandwidth.

In some cases, a batwing permits two stations to use the same antenna with a minimum of additional hardware. The stations, if analog, must be diplexed prior to the conventional hybrid combiner. Then, one station is connected to one of the batwing's inputs and the second station to the other input. The result is two output signals, separated by 90 degrees in phase.

For more flexibility in the antenna, the conventional solution would be to use a VHF panel array. In that configuration, it is easy to design a directional antenna to meet protection needs. Panel antennas also offer good power handling and bandwidth characteristics.

Some broadcasters have complained that panel antennas have too many components that can cause maintenance problems. Granted, such a configuration requires power dividers, matching networks, multiple feed lines, etc. But the good old batwing antenna has more parts than a '36 Ford when you add in all the lines, straps, dividers, etc. Yet broadcasters accept it as fully reliable. Panel antennas, both VHF and UHF, are just as reliable when properly designed and installed. The real issue here is the installation. Someone with experience installing batwing antennas must install it or supervise the installation. Grounding and panel adjustments are critical to its performance and reliability.

When one station is VHF and the other is UHF, your choices dwindle.

VHF + UHF

The next combination is a little more difficult to deal with. When one station is VHF and the other is UHF, your choices dwindle. The obvious solution is to install two antennas. You can stack one antenna on top of the other, side-mount one antenna and top-mount the other, or use either a "T" top or candelabra on the tower. Most manufacturers can provide a VHF antenna on a sufficiently strong mast to support a UHF antenna on top. The transmission line is normally routed on the outside of the lower mast, which does have a minor effect on the antenna pattern.

Dielectric offers a more sophisticated approach to the VHF/UHF problem. The company has developed an antenna that will work with either low-band VHF and UHF or high-band VHF and UHF. In both cases, directional patterns are available and the two signals can be tailored somewhat independently of the other – a neat trick not normally available in multiple-station antennas.

FRAME GRAB

A look at the consumer side of DTV

Digital cable losing revenue

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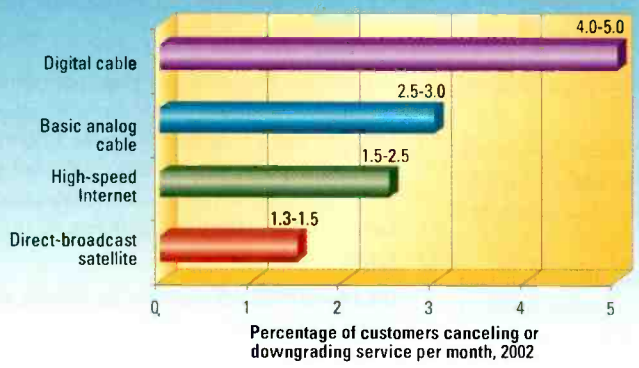

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By the way, you can find all of these antennas on the manufacturer's Web pages. Some of these sites offer a lot of really neat free software and catalog information.

See the expanded version of this article at www.broadcastengineering.com for new developments in combining multiple UHF stations on the same antenna.

Handling power

One last thing you must consider is the antenna's power-handling ability. If the antenna must accommodate five or six stations, each with an ERP of 5MW and non-directional patterns, well...lots of luck. The best power-handling capability available is about 150kW average power. That's ok for one or two high-power stations, depending on the pattern, and some lower-powered DTV stations. The ideal situation would be a bunch of approximately 200kW DTVs. One panel antenna can handle enough of those for a medium-sized city. The problem here is the power-handling capability of the individual panels along with their transmission lines. The size of the internal lines is restricted by a limited amount of space available. The same applies to the power dividers.

Richland Towers' dual-purpose antennas on the Richland Atlanta broadcast tower stand 120 feet above the tower. The stack on the left shows these two broadband antenna systems, both carrying DTV and NTSC signals.

Helpful hints

When doing the original planning, work with the manufacturers carefully to determine the power budget on the antenna. Remember, as you modify beam tilt and null fill, the power distribution to the various panels will vary. The hottest panel will ultimately determine the power rating of the antenna. There is one additional advantage to panels: you can make some really weird designs. For example, beam tilt and null-fill amounts can vary with azimuth to comply with the terrain around a site. So far, patterns must stay essentially the same for all channels, but do not be surprised if someone comes up with a cure for that problem as well. BE

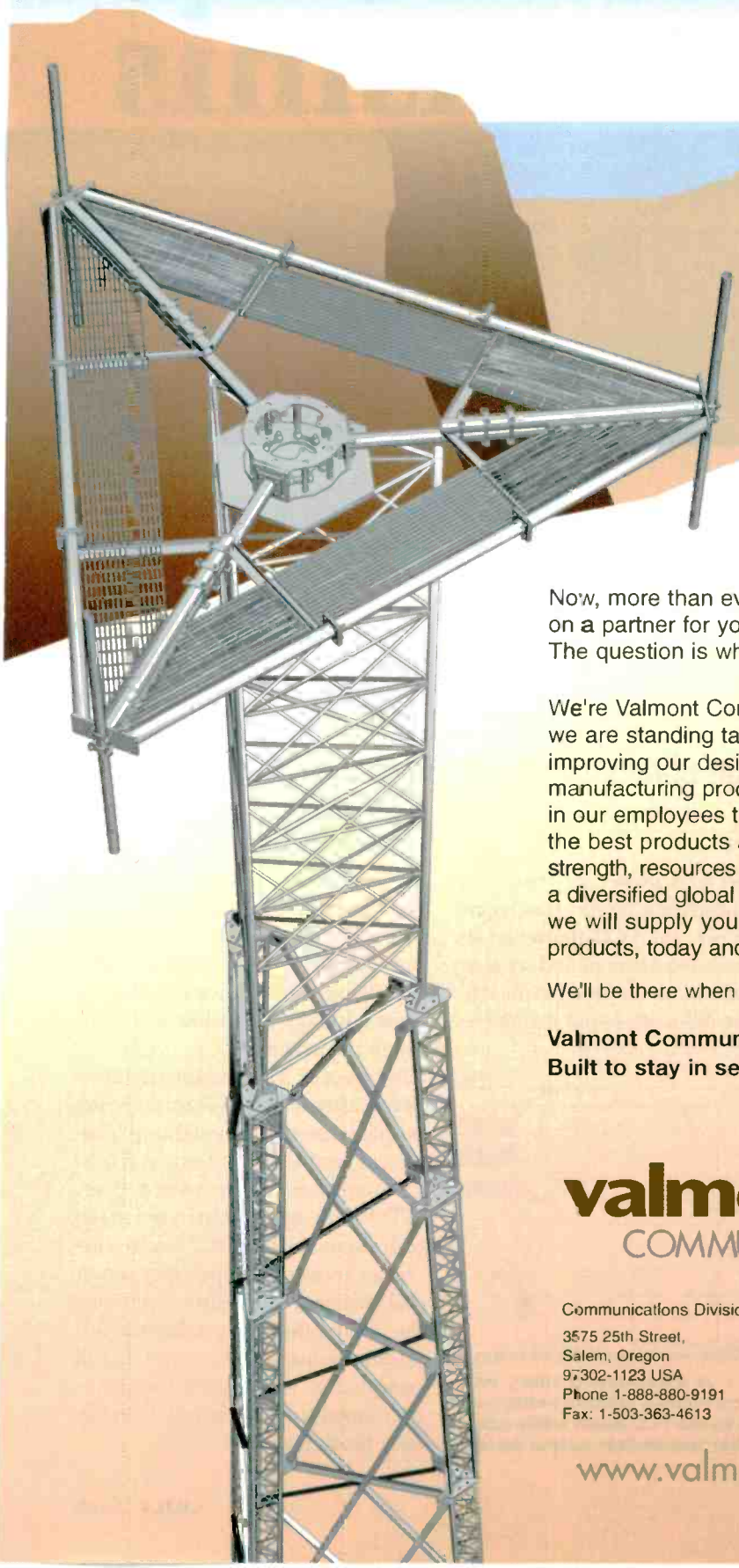
Don Markley is president of D. L. Markley and Associates, Peoria, IL.

IN ADDITION

For a closer look at how to fit multiple signals on one antenna, visit www.broadcastengineering.com.

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

Standing Tall



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Advances transmis

BY DAVID GLIDDEN

As broadcasters near the completion of the initial on-air phase of DTV, they must manage new challenges to ensure that the entire digital transition is successful. Compared to the initial scope of DTV planning, the challenges in 2003 include:

- An increased emphasis on maximizing UHF coverage area
- An extended period of uncertainty about broadcast interference due to later dates for maximization and replication
- Additional costs of operating dual facilities for a longer period of time
- A need to operate aging analog transmission plants past 2006
- Fewer trained technical personnel to maintain both analog and digital facilities.

Unless managed carefully, these challenges could overwhelm the resources of many broadcasters in this critical stage before DTV generates significant revenue. Fortunately, recent technology and product advancements offer broadcasters effective ways to address and overcome each of these transmission issues.

Maximizing DTV coverage area

To minimize interference between TV stations, the FCC requires all stations to limit the amount of power they radiate outside of their designated 6MHz channels. This restriction is specified by a power vs. frequency curve known as a "mask" (see Figure 1). In 1998, the FCC tightened its DTV mask requirement and, as a result, broadcasters operating at the limits of the old mask found themselves in violation of the new mask. To comply with the new mask, they had to reduce their transmitter power output by about 10 percent, which reduced their coverage area. Many of these broadcasters responded to this by purchasing more powerful transmitters (which have a wider linear operating range) to maintain the same coverage area while conforming to the new mask.

By placing a sharp-tuned filter at the output section of the amplifier, a station can eliminate unwanted out-of-band emissions before they are transmitted.

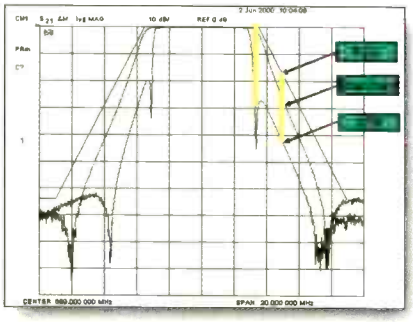

Figure 1. A sharp-tuned filter, with proper correction, enables better compliance to the FCC mask while allowing higher transmitter output power.

But recent advancements allow broadcasters to achieve greater power output without additional amplification. Combining a temperature-compensated sharp-tuned filter (STF) with appropriate correction techniques in the DTV exciter increases transmitter operating power and efficiency while also attenuating the intermodulation products in adjacent channels. The result is full compliance to the DTV mask requirement and enhanced interference protection.

in DTV
sion technology

Getting the most bang for your digital buck

High-power transmitters located at (from left to right) KCPQ, Tacoma, WA; WCBS-DT, New York; and WDWB and WWJ-TV in Detroit. These stations are benefiting from advancements in transmitter technology.

Sharp-tuned filtering

Power amplifiers have a finite linear operating range. At the upper portion of this range, the harder an amplifier is driven, the more distortion it will create. A DTV broadcast station typically uses three or more linear amplifiers in parallel to achieve its desired output power. To avoid distortion that could create out-of-band emissions, the station drives these amplifiers well below saturation. But, by placing a sharp-tuned filter at the output section of the amplifier, a station can eliminate unwanted out-of-band emissions before they are transmitted. Thus, sharp-tuned filtering frees the broadcaster to drive the amplifiers harder because the filtering will eliminate the out-of-band emissions caused by the increased distortion. This increases the station's operating efficiency. It may also allow the station to use fewer amplifier sections in the amplifier to reach its required output power, reducing power consumed by cooling and other ancillary systems.

Sharp-tuned filters also provide the level of isolation needed for upper-adjacent combining into a single antenna without serious degradation to the lower analog channel. With this level of isolation, it is also possible to combine two DTV signals or a lower-channel DTV and upper-channel NTSC signal.

However, while the sharp-tuned filter effectively suppresses out-of-band radiation caused by transmitter nonlinearities, it can increase in-band nonlinearities such as ripple and group delay as the power output is increased. These nonlinearities can degrade the in-band signal-to-noise performance in a way that cannot be corrected by a receiver's adaptive equalizer. Consequently, broadcasters must use adaptive pre-correction

techniques to limit and pre-correct these artifacts if the transmitter is to achieve the minimum signal-to-noise ratio of 27dB.

Adaptive pre-correction

Since transmission chains are subject to environmental and operating anomalies that can affect the quality of the RF transmission, adaptive pre-correction techniques are critical to ensuring that stations are radiating only within their licensed channel. Adaptive pre-correction continuously samples the DTV signal at the output of the channel combiner or the mask filter. If the pre-correction system detects any distortions, it feeds them back to the exciter and automatically corrects them without interrupting transmission.

Until recently, 8-VSB exciters provided effective techniques for adaptive linear correction, but little in the way of nonlinear adaptive correction. New exciters can provide continuous sampling of the transmitted signal before it is filtered, and then add the needed adjustments automatically to correct nonlinearities that could result in non-mask-compliant, out-of-band performance.

Nonlinearity correction ensures compliance with the FCC's DTV RF mask in the two critical regions 500kHz inside the lower and upper limits of the 6MHz channel – regions that a standard mask filter cannot protect. Prior to these recent advancements, transmitter engineers had to perform tedious manual adjustments or difficult computer-to-exciter interface adjustments. The latest techniques are self-contained, using intelligent algorithms to perform all the underlying digital filter adjustments on a continual basis in a way that is essentially transparent to the user.

Broadcasters never anticipated that they would operate both analog and digital transmission plants for an extended period.

As more and higher-power DTV transmitters come online, adaptive correction techniques can help mitigate the effects of a crowded RF environment by ensuring ongoing DTV transmitter compliance with the FCC's DTV RF mask.

Higher-efficiency transmitters

In their initial DTV planning, broadcasters never anticipated that they would operate both analog and

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digital transmission plants for an extended period. As the period of dual transmission stretches out, it is critical that broadcasters find ways to reduce operating costs. In addition to the positive impacts of sharp-tuned filters and adaptive correction, new amplifier technologies are promising dramatic improvements in transmitter efficiency. For digital high-power UHF operations, a new generation of multistage depressed collector (MSDC) devices promises to improve the operating efficiency of inductive-output tubes (IOTs) as much as 50 percent compared to IOTs with conventional collectors.

Inside the MSDC

In a conventional IOT collector, the kinetic energy of the electrons striking the collector electrode is converted into heat, which is wasted energy. If the collector could slow the velocity of the electrons before collecting them, it would convert their kinetic energy into potential energy, which could then be returned to the power supply. This might be simple if all the electrons traveled at the same speed, but they don't. During IOT operation, signal modulation varies the speed of the electrons as they travel from the cathode to the collector. In fact, the velocity of the electrons entering the collector ranges from zero electron volts (corresponding to the cathode voltage) to several thousand electron volts (corresponding to the anode or collector voltage), and an infinite number of velocities in between. If the collector could reduce the kinetic energies of all the electrons to zero velocity by using electrodes with corresponding voltages, it would collect them with perfect efficiency. But, of course, it is impossible to build a collector with an infinite number of collector electrodes. Even implementing more than just five collector electrodes in a tube significantly increases its design complexity and cost.

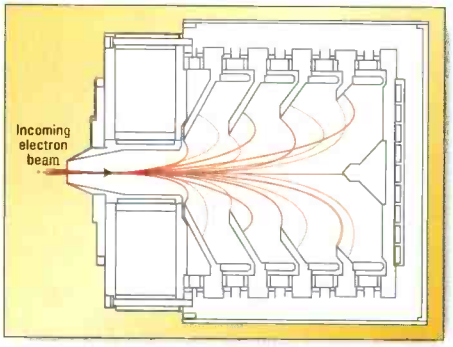

Figure 2. This cutaway view of a four-stage MSDC shows the five electrodes that create the electrostatic field and collect the incoming electrons.

Several manufacturers are developing MSDC IOTs that typically have five collector electrodes instead of the one found in conventional IOTs (see

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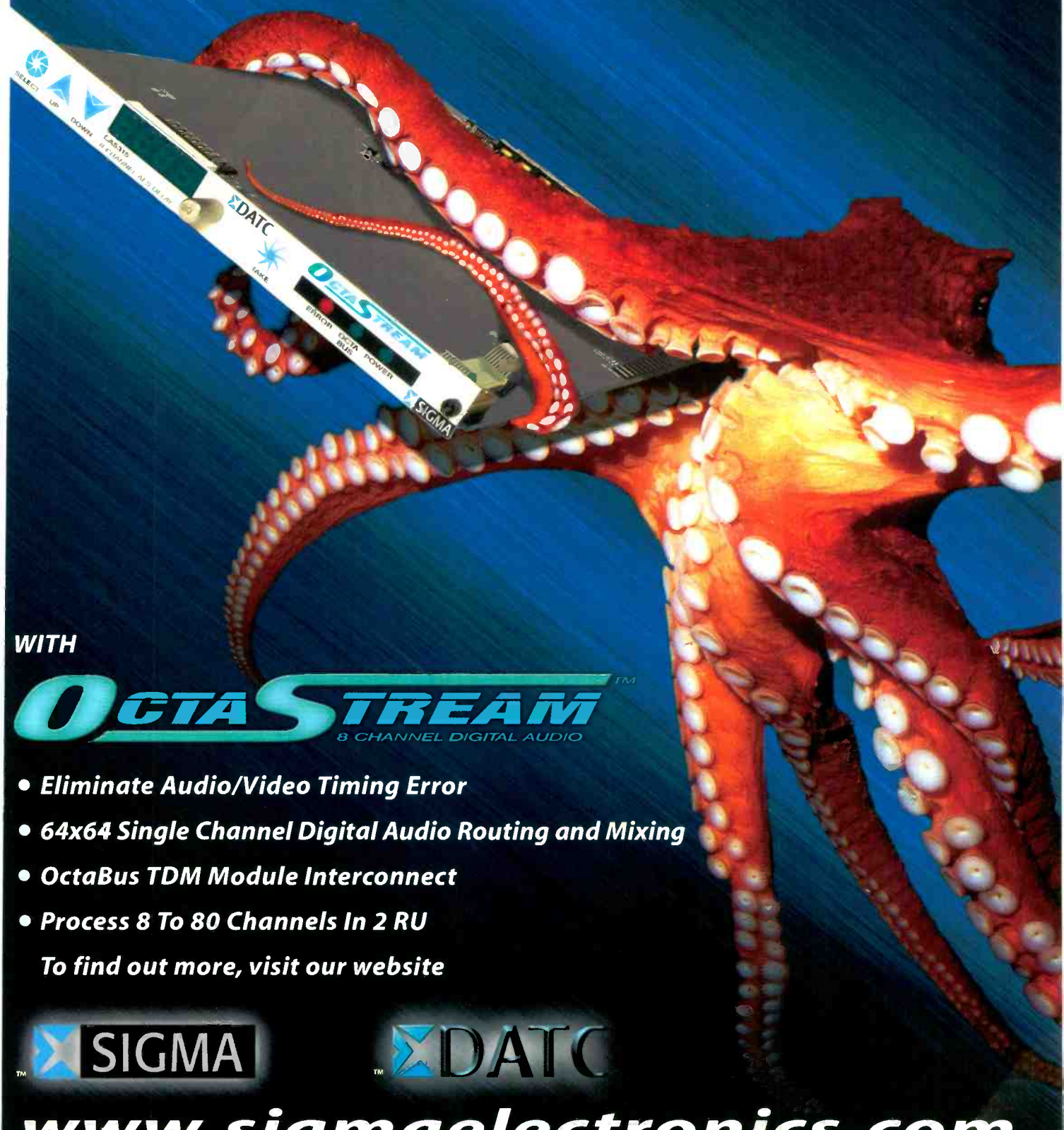

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Figure 2). Such an MSDC has an electrode at the back of the collector that is set at cathode (ground) potential and four conical-shaped electrodes that are set at higher voltages. The conical-shaped electrode at the mouth of the collector has the highest voltage. The next one has a lower voltage, and so on. Together, the five electrodes create an electrostatic gradient, albeit a very uneven one. As the electrons enter the MSDC, the electrostatic gradient slows them down, converting their kinetic energy to potential energy (voltage). The conical-shaped electrodes collect the electrons at four usable voltage levels and return them to the power supply, thus saving energy that would otherwise be wasted as heat. Initial figures from tube manufacturers show that an MSDC increases an IOT's beam efficiency by 50 percent while reducing the power required to drive the tube by one third.

We should mention here that, unlike klystrons, IOTs that use MSDC technology offer only a minimal efficiency benefit to NTSC stations – perhaps too little to justify the implementation cost.

Eventually, DTV broadcasters may be able to choose five-stage, oil-cooled tubes, three- and five-stage tubes that are cooled with de-ionized water, or a three-stage tube that cools two stages with de-ionized water and one stage with air. All systems require a secondary cooling loop of water and glycol to port the heat to outside dry coolers. Five-stage tubes should operate at greater efficiency than three-stage designs, but may require a trade-off analysis of operating efficiency, system complexity and initial transmitter cost.

The first transmitters using MSDC technology are now coming online, and most IOT transmitter manufacturers will be shipping MSDC solutions within the next year, in time for stations planning to replace their initial low-power DTV transmitters with maximized UHF facilities.

Digital-ready analog systems

With the uncertain timing of analog TV's sunset, many stations are struggling to keep their aging analog transmitters operating because they cannot justify new analog transmitters.

For stations planning to revert to their analog channel assignment for DTV, one clear answer is to purchase a digital-ready analog system. Many manufacturers offer systems that can be readily upgraded to digital.

When the final channel selection choice is not clear, or if the station plans to stay with its current DTV channel assignment, a viable solution might be to upgrade only part of the

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older transmitter, or upgrade the transmitter in stages. For example, a broadcaster might replace an aging, unreliable control system with a newer one while keeping the existing amplifiers in service.

In some cases, stations and ownership groups might need additional versatility in their systems. Some of the newest transmitters are based on a single control and drive/amplifier cabinet that can be used as a stand-alone transmitter or as a driver for higher power systems, including high-power IOT transmitters. In addition, these new systems can convert readily from analog to digital operation.

Such designs offer ease of upgrading and redeployment and can be an effective way to ensure that capital equipment remains in use for years to come.

New monitoring and control systems

Each year, the pool of qualified RF engineers is shrinking. For the remaining engineers, the need to operate multiple air chains and provide technical direction during the DTV transition is an ongoing problem.

But new approaches to transmitter monitoring and control are making it easier to manage complex facilities. While traditional systems required point-to-point connections and specialized programs, a new generation of control systems enables engineers to control transmitters using a standard Intranet connection and Web browser.

In addition to transmitter control, these new systems also provide Simple Network Management Protocol (SNMP) agents for real-time fault reporting and trend analysis. Performance monitoring provides oversight of transmitter spectral emissions, 8-VSB signal-quality monitoring, and control and metrics for linear and nonlinear adaptive correction.

As station groups implement more complex transmission plants with fewer technical resources, these advanced systems can also enable the transmitter manufacturer to provide enhanced remote diagnostic and repair services that further increase system reliability and lower operating costs.

The next step

While many challenges remain in the digital transition, broadcasters can choose among a growing range of technology and product advancements to ensure that the next stage of DTV is poised to operate efficiently and effectively while capturing the maximum possible audience. Be sure to discuss your upcoming challenges with your consultant or transmitter supplier as you plan your next step. Solutions to your transmission requirements might be easier and more effective than you think. BE

David Glidden is director of television transmission products at Harris' Broadcast Communications Division.

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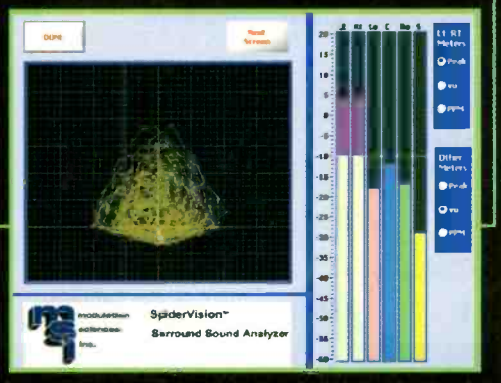

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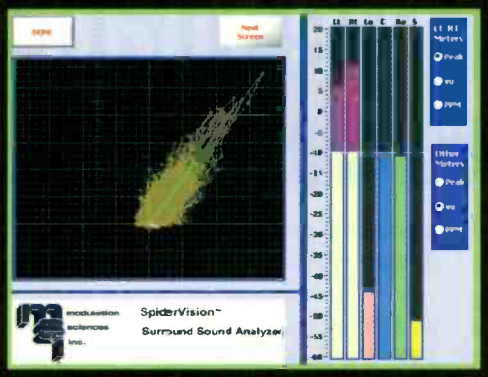

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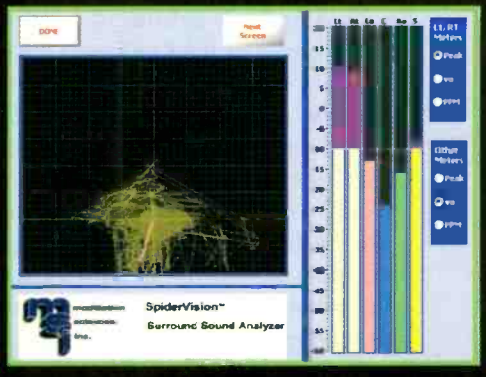

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HD4 (pictured in front of Continental Airlines Arena in New Jersey) enjoyed a successful rollout on April 29, 2003, providing the network feed for Game 5 of the first-round NBA playoff series between the Milwaukee Bucks and the New Jersey Nets.

Producing HD on the road

Making mobile profitable

BY Mark Howorth

So far, 2003 looks to be the year that high definition television (HDTV) finally turns the corner toward its long-promised arrival as a consumer medium. CBS and The Madison Square Garden Network (MSG) were early pioneers in offering sporting events in HD. MSG has been providing high-definition feeds of home games for the Knicks and Rangers since 1998, and CBS recently entered the arena by broadcasting high-profile events such as the 2002 Masters Golf Tournament and the 2002 season of SEC college football in HD. Encouraged by the success of these early adopters, other networks are offering increasing numbers of sporting events and prime-time programs in the new format. And the prices of HD-ready television sets are declining. These are encouraging signs that the mainstream viewing public is ready to accept HDTV. But HD's continued acceptance hinges on the development of enabling technologies, along with the growth of distribution outlets.

Making HD production easier and more cost-effective was the goal behind HD4, National Mobile Television's first all-digital, multiformat HD truck. Its first application was a simultaneous 1080i HD and NTSC widescreen SD feed of a May NBA playoff game and continued through the NBA finals. The truck already has signed to a multi-year contract to broadcast ABC's "Monday Night Football" in HD. It is a complete break from the traditional design philosophy of broadcast trucks. Unlike previous generations of HD trucks using an HD layer on top of a digital layer, HD4 is a purely HD truck. Everything this truck does is HD, in one format or another. To produce standard NTSC video, it uses a downconversion process.

Building a truck of this magnitude required an unprecedented investment of $10 million.

HD's continued acceptance hinges on the development of enabling technologies along with the growth of distribution outlets.

The fact that ABC would use one of its most high-profile sports telecasts as a springboard for HD clearly illustrates the network's commitment to the format. The show's consecutive 18-week

annual schedule presents demanding broadcast challenges for a mobile facility. Adding HD to the equation raises the bar even higher, especially considering that a great deal of HD technology is still emerging and many engineers are still unfamiliar with the process. HD broadcasting not only requires new technology, but also new ways of working with audio and video that were never encountered in the analog world, especially with digital audio where issues like latency and synchronization are much more challenging.

Right now, HD equipment is experiencing a technological boom. Compared with cameras or switchers that were introduced a year ago, those introduced today may include completely new functions and features, simply because new production requirements have cropped up that required an immediate update. In fact, during HD4's construction, some equipment that was delivered looked completely different than what was originally ordered because the manufacturers were designing and building until the last minute.

NMT's Venue Services Group designed and built the 53-foot HD4 truck to handle more than 30 cameras and 30 channels of VTR and DDR. The truck features a Thomson Grass Valley HD XTenDD production switcher with four mix/effects busses and 90 inputs, as well as 22 Thomson Grass Valley LDK 6000 MKII cameras. It can operate as a native 1080i30, 1080p24 or 720p60 production unit with a fully digital audio system that can support stereo, 5.1 surround, 6.1 surround, eDolby, ProLogic and CircleSurround.

Monitors

The truck's main production monitor wall, which uses CRT, plasma and LCD technology, can display a total of 95 images. The plasma and LCD monitors produce less heat, weigh less and use less space than their CRT counterparts. For example, in one 50-inch plasma monitor, you can put the equivalent of 16 separate nine-inch images. Such virtual monitors increase flexibility.

But plasma monitors are designed to work horizontally, in a landscape orientation, and there simply isn't that kind of real estate available in any truck. So NMT rotated the plasma monitors 90 degrees and uses BARCO's Hydra universal multi-video insertion unit to display the images in a portrait orientation. This allows the truck crew to enjoy the benefits of virtual display technology while still maximizing use of the available space.

Producing HD on the road
Making mobile profitable

Communications

Using communication-enabling technology is important. To this end, the truck features a 128-port Telex ADAM digital matrix intercom system.

All of the equipment in the truck is designed to provide a plug-and-play environment at nearly any venue across the country. It has also been "future-proofed" by including dual high-speed LANs with Dell, Cisco and 3Com components, which provide full control and recall for all major systems as well as onboard client services. Also built in is a wireless access point (WAP) for 802.11b network access, as well as the capability to seamlessly integrate broadband service for communications, data and remote control/diagnostics.

Video storage and playback

The VTR/DDR complement offers multiformat VTRs as well as dual-format DDRs. Six Panasonic HDVCPRO recorders, two Panasonic D5 machines and two Sony DigiBeta units make up the standard videotape complement. This is supplemented by four EVS LSM-XTHD DDRs. The HD LSM is capable of working either in 720p or 1080i HD formats. All are tied together over an EVS SDTI network that allows file sharing and access by any channel to any other channel in real time.

An EVS Spotbox is tied to the SDTI network. This four-channel HD DDR is coupled directly to the switcher, providing hours of dedicated storage for playing back elements such as replay effects and head shots. Because it is part of the EVS network, the Spotbox can access clips from any EVS channel and can make its content available across the network in real time without distracting the technical director or the production team. HD4 is designed to accommodate additional VTRs or DDRs based on a particular show requirement.

HD4 features a complete walk-through environment to improve efficiency and workflow, with all departments accessible from any point in the truck.

Cameras

Twenty-two Thomson Grass Valley LDK 6000 MKII cameras permit native operation in all HD formats. Since the cameras operate on triax cable, the truck is compatible with the existing

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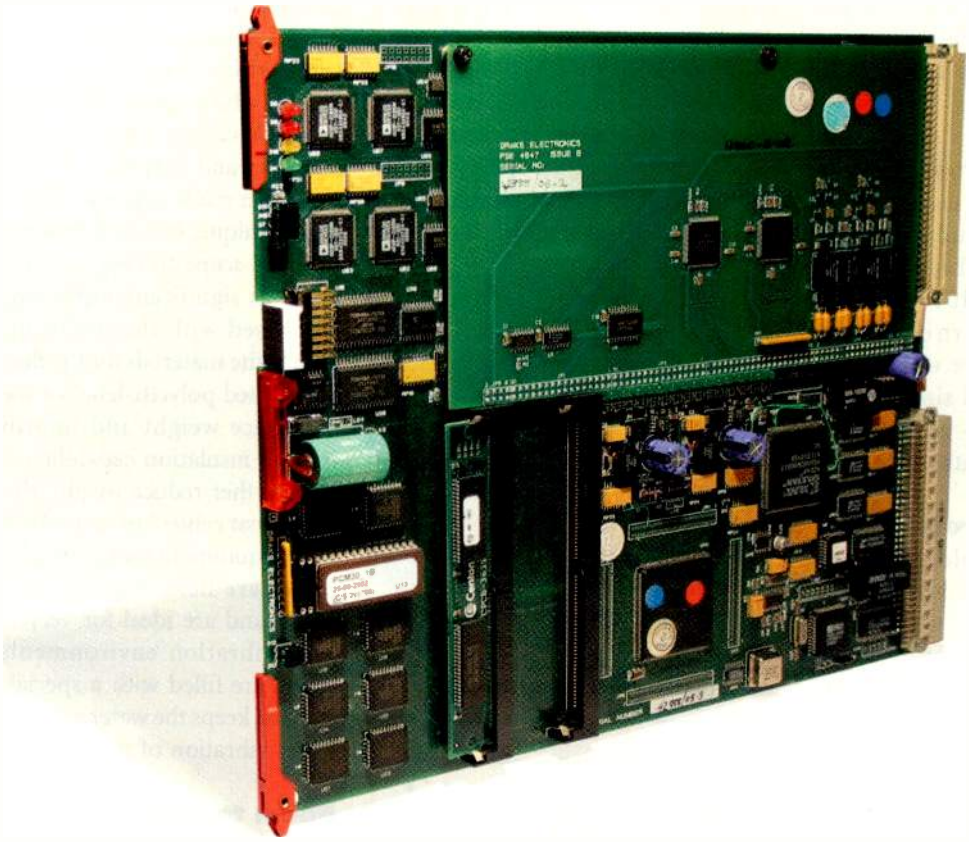

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infrastructure at most major venues in the United States. In HD4's initial assignments, the crew has been able to employ triax cable to unprecedented distances of up to 3000 feet.

Audio

The truck's audio room features a full complement of current audio production equipment, including a Solid State Logic MTP digital audio console with 216 AES inputs, 104 analog line inputs and 192 mix-down channels on motorized faders. The console can generate multiple and simultaneous 5.1, stereo and mono program and transmission-signal paths.

Conversion and routing

The truck employs Evertz multiformat HD upconverters and AJA distribution amplifiers (with built-in aspect-ratio converters and HD downconverters) in its infrastructure. Teranex Xantus One converters provide additional up-, down- and crossconversion. The truck has over 200 downconversion devices allowing SD feeds (in either 4:3 or 16:9) of every source in a production. It can also upconvert 20 discreet SD sources. The dual Thomson Grass Valley Trinix routing systems allows simultaneous HD and SD feeds of all truck sources.

HD4's audio room features a Solid State Logic MTP digital audio console (pictured), Genelec surround sound monitors and Sennheiser mics.

Mechanical innovations

Actuators mounted below the truck's expandable 48-foot by 5-foot side expand and retract the side. This contrasts with conventional expandable trucks, which often use "tooth-and-gear" drive arrangements prone to jamming and slipping.

A trailer made entirely of aluminum is not unique, but for a trailer of this size and scope to have an aluminum frame is significant, especially when combined with the use of graphite composite materials for the floors and corrugated polyethylene for the walls to reduce weight and improve the trailer's insulation capability.

To further reduce weight, the truck uses "boat cables" to carry AC voltage to the equipment racks. These flooded cables are held in place by special straps and are ideal for very rugged, high-vibration environments. The cables are filled with a special material that keeps the water out and minimizes vibration of the conductors.

Room to move

The truck boasts the largest amount of interior square footage (in excess of 640 square feet) of any television truck in the United States. The design team capitalized upon this by providing a complete walk-through environment. Users can enter through any door in this truck and walk its entire interior length. This provides easier access to all departments – video, audio, transmission, videotape or production – and improves the efficiency and workflow of the production teams.

The bottom line

Every company in the industry is feeling its way through the HDTV transition, learning that HD production costs more and is more time-intensive from an engineering standpoint. Eventually, it will become easier. But right now it's really an investment in the future of broadcasting. BE

Mark Howorth is CEO of National Mobile Television.

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Centralcasting solutions

BY JOHN LUFF

The word "solution" implies the existence of a problem. In the case of broadcasting, the word "answer" might be more applicable because centralized operations are not a solution so much as an answer to the question, "How can the cost of local operations be reduced?"

In the context of group ownership, the answer takes on significant importance, as margins are eroding constantly. Advertisers place their commercials on not three or four national services, but literally hundreds, which vary from enormous audiences to narrowcasting streams. The result is that broadcasters' share of total media buy revenue is not increasing, though costs are. Labor costs, and indeed program acquisition costs, are harder to control. At the same time, network compensation revenue is down, and the threat exists to have broadcasters paying networks for programming in "reverse compensation."

The net result is close scrutiny of cash flow from operations. Any method of reducing costs is appealing, and centralized operations holds promise to do just that. It is not, however, a panacea for other problems. Savings in centralized operations come largely from reduced head count at the local station. The trick is to automate the on-air stream and move much of the labor to a "hub," where a small pool of labor can control several stations as effectively as they used to be controlled locally.

Balancing the central operations savings is an increase in interconnection cost. To the extent that the labor savings is significant and the interconnection costs are modest, the savings could accrue quickly in large amounts. But the cost of interconnection often does not fall low enough to make the savings attractive enough.

From a technical perspective, several recent developments can allow significant savings to be achieved. Reliable automation at modest cost has a major impact on the equation. An automation system that removes as much human intervention as possible is key. For instance, show timings for multiple stations, if done separately, are costly. If the automation system can share the timings and content in many playlists (in appropriate time slots, of course) then repeated manual ingest operations are saved. This might be as simple as standardizing the numbering scheme used in all affected traffic systems, but clearly multiple playlists must be able to draw on a common pool of content. In the future, service companies may well deliver the content with the timings in MXF format, ready to be moved seamlessly to the air servers inclusive of all metadata.

An automation system that removes as much human intervention as possible is key.

Efficient centralcasting requires the ability to manage and coordinate content across a number of channels while minimizing the level of manual intervention. Shown here is master control operations at KGET-TV, the Ackerley Group's NBC affiliate in Bakersfield, CA. Photo courtesy KGET.

Servers have a major impact on centralized operations. If the content is stored not on videotapes, but rather in a server system that homogenously serves multiple output streams, the result is less redundancy and the ability to simultaneously play the same content to multiple stations, even if start times are staggered. This applies to interstitials as well as program-length content. Even more attractive is a server system that can be interconnected over arbitrarily long distances to "put, or get" via FTP content to or from remote servers. The logical result is what appears to be an arbitrarily large server system, one that can move content under automation or media asset management control as needed for on-air operations.

An outgrowth of sophisticated modern servers is a return to the roots of the first Tektronix (now Thomson Grass Valley) Profile server. Several manufacturers now offer "edge servers" – small and cost-effective servers whose functionality is chosen to be limited

in the interests of cost, and whose scale and complexity look remarkably like early server products. These servers are deployed near the playout point without the need to have large amounts of storage, for their function is to play limited amounts of content, and to do so locally.

A word must be said about switching and monitoring of feeds, for the paradigm of a single station control room does not work for centralized operations. When many streams are to be controlled by fewer personnel, one must look at the presentation of visual, aural and control information critically. If the operator is overwhelmed by large monitor walls or computer displays that look like spreadsheets gone whacky, they cannot hope to assimilate all of the information in the order of its importance. Monitor matrices and integrated control systems can allow burrowing down to find problems before they take a station off the air. In addition, status and monitoring must be returned from the remote station to the hub so the operators can fully appreciate the effect of any actions or failures. Many manufacturers have developed products in this area that can work on low-bandwidth return circuits.

Today switching has become more a question of local branding because the number of live parallel sources needed in MCR is considerably lower with server playout of content. Many stations are moving to "branding boxes," which offer squeeze back, internal character generators, background graphics and templates. In this case, the station's routing switcher can provide parallel access to all required sources.

Finally, a short word on low-hanging fruit. Centralizing air operations is risky and not very rewarding if the cost of interconnection is high. But centralized operations could easily work to reduce the cost of traffic, accounting, and promotion and graphics production.

In centralizing these departments, interconnection can be T-1 bandwidth and still be quite effective, and the potential for labor savings is every bit as high in many operations as with on-air control. Promotions can be centrally produced and sent via FTP as bandwidth is available at low risk. This can create a common look for all stations and may allow a small, highly creative department to produce superior results for many outlets in a cost-effective way. **BE**

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

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Chief, P4
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BROADCAST ENGINEERING July 2003, Vol. 45, No.7 (ISSN 0007-1994) is published monthly and mailed free to qualified persons by Primedia Business, 9800 Metcalf Ave., Overland Park, KS 66212-2216. Periodicals postage paid at Shawnee Mission, KS, and additional mailing offices. Canada Post International Publications Mail (Canadian Distribution) Sales Agreement No. 0956295. POSTMASTER: Send address changes to *Broadcast Engineering*, P.O. Box 2100, Skokie, IL 60076-7800 USA. CORRESPONDENCE: Editorial and Advertising: 9800 Metcalf, Overland Park, KS 66212-2216 Phone: 913-341-1300; Edit. fax: 913-967-1905. Advert. fax: 913-967-1904.

Cry havoc!

Let slip the dogs of war

BY PAUL MCGOLDRICK

June 2, 2003, started a new era in media ownership in the United States with the relaxation of ownership rules by a 3:2 (Republican: Democrat) FCC. The two sides of this debate have been extremely polarized, but this column is not about to get into the political ramifications in this arena. Rather, we need to look at what it means and how it happened.

This has been a two-sided fight to change the ownership rules that were adopted between 1941 and 1975. On the pro-change side have been the Republican chairman and two Republican commissioners, together with the large networks – News Corp/FOX, GE/NBC, Viacom/CBS, Disney/ABC – and publishers such as Tribune and Gannett. On the anti-change side have been the two Democratic commissioners, together with consumer advocates, small broadcasters, academics, musicians and writers, with two strange bedfellows in the form of the NRA and NAB.

Just spending lobbying money has not been the manner of trying to change the commissioners' views. The largest contributor to travel for the FCC has been the NAB. It has spent $191,472 in the last eight years to bring FCC officials to its shows, while the total spent by the industry on FCC travel for 2500 trips over the past eight years has been $2.8 million. The destinations, in order of popularity have been Las Vegas; New Orleans; New York; London; Orlando, FL; San Francisco; Miami; Anchorage, AK; Palm Springs, CA; Buenos Aires, Argentina; and Beijing.

These numbers come from the Center for Public Integrity (*www.publici.org*) that has shown over the five years of its existence little or no favoritism for either political caucus.

The center also has detailed the amount of time senior executives from the industry have spent in ex parte meetings in relation to the ownership rules – meetings that are not recorded or minuted. It tells of the day in March 2003 when 18 FCC officials met with executives from ABC and Disney in six different sessions, and the days when Rupert Murdoch (News/FOX) and Mel Karmazin (Viacom/CBS) dashed from one meeting to another with commissioners and top FCC staff.

The swing vote on the present commission has been considered to be Republican Kevin Martin. He was the most visited commissioner during the run up to June's vote, with 16 visits – Viacom, three times; NBC, three times; ABC, two times; Hearst, two times; and one time each with Clear Channel, Cox, Cumulus, Gannett, News Corp, and Radio One.

From the moment the commission ruled in favor of the "big guys" they were no longer on the same team.

Obviously the most pressure was from the TV broadcasters who were looking to consolidate the industry, as well as cross-own other media. The general argument they put forward is that if consolidation is not allowed then they will be short of money and will not be able to afford to make or purchase the programming that the cable networks are able to put together. The shouts from the other side have been mostly about Big Brother, the lack of local content, and the dumbing down – or even ownership control – of news content.

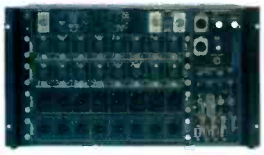
Everyone I have talked to says that consolidation of TV broadcast stations will be a slower process than what happened with radio. That may be so, but from the moment the commission ruled in favor of the "big guys" they were no longer on the same team. It would seem logical that one would expand their ownership in the TV media by going after affiliates with whom they have had soured relationships for many a year.

I have no doubt that the big players have already drawn up their first-, second- and maybe even third-tier lists of targets, together with identified station valuations, most valued players, most valued equipment and most valid market futures. We're certainly going to see the stations that have invested in DTV go first – that will help keep the FCC off the networks' back over DTV date quotas – and in the second and third rounds we will see the smaller markets fall. If we look to radio as an existing example, there could be four or five levels of consolidation with maybe only two networks left at the end of it all – and a few independents stubbornly hanging on.

The arguments are over. Things will never be reversed from this point and, the industry as a whole, particularly the equipment vendors, needs to realize that the rules just changed in the way one will sell their products as well. Don't let any feelings of how things should be get confused with the realities of June 2. BE

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

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



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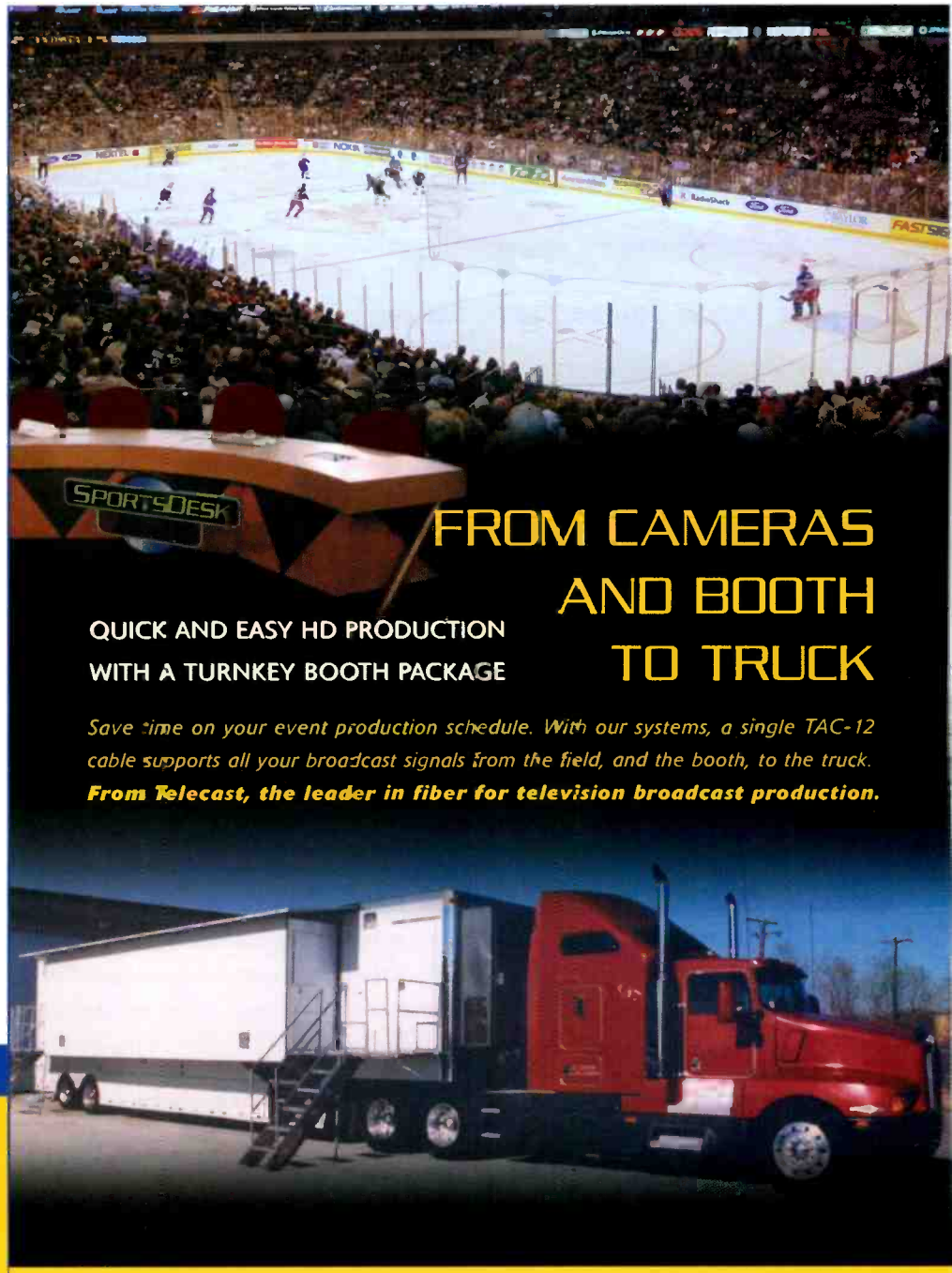

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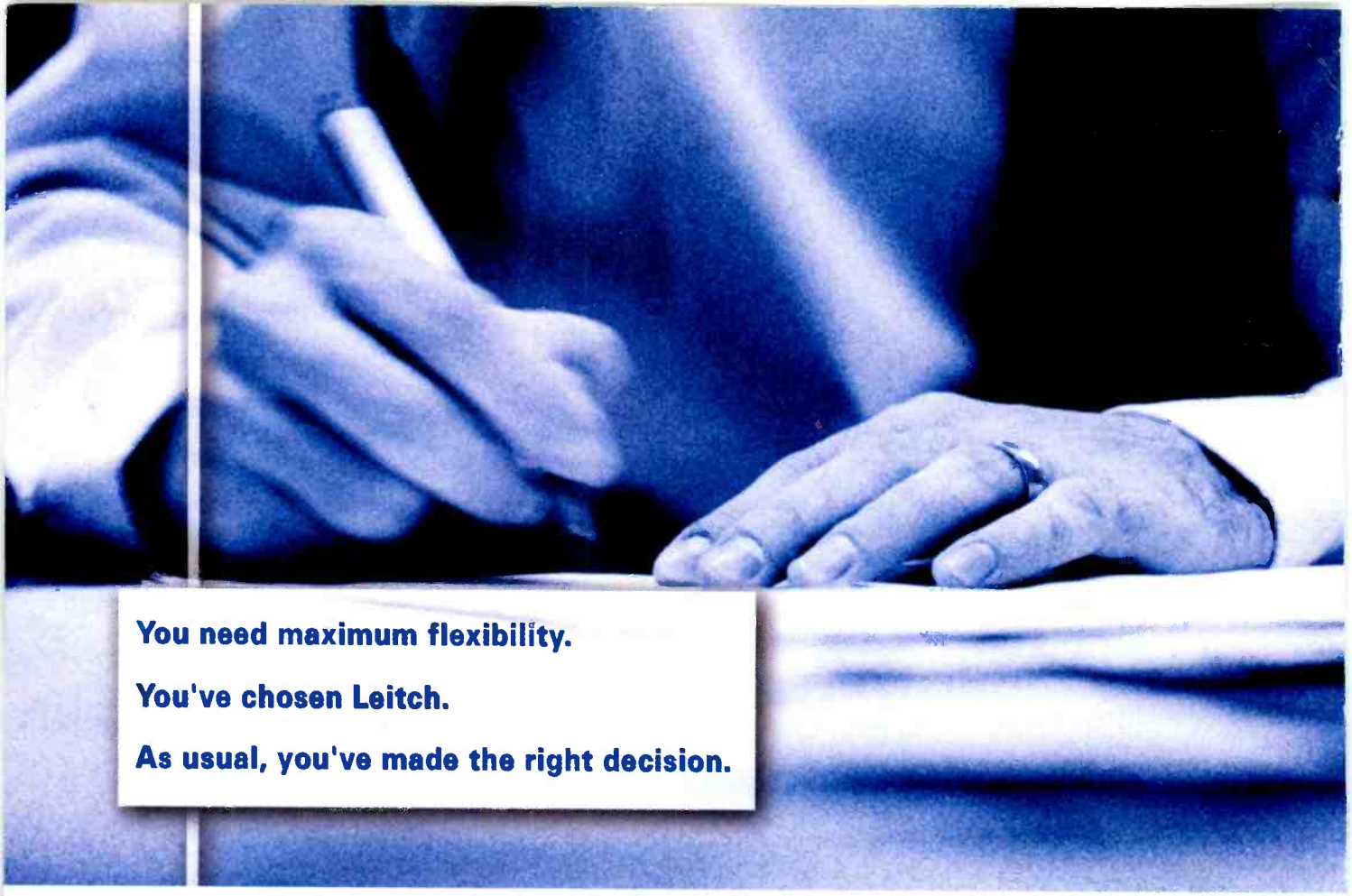

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