SEPTEMBER 2007

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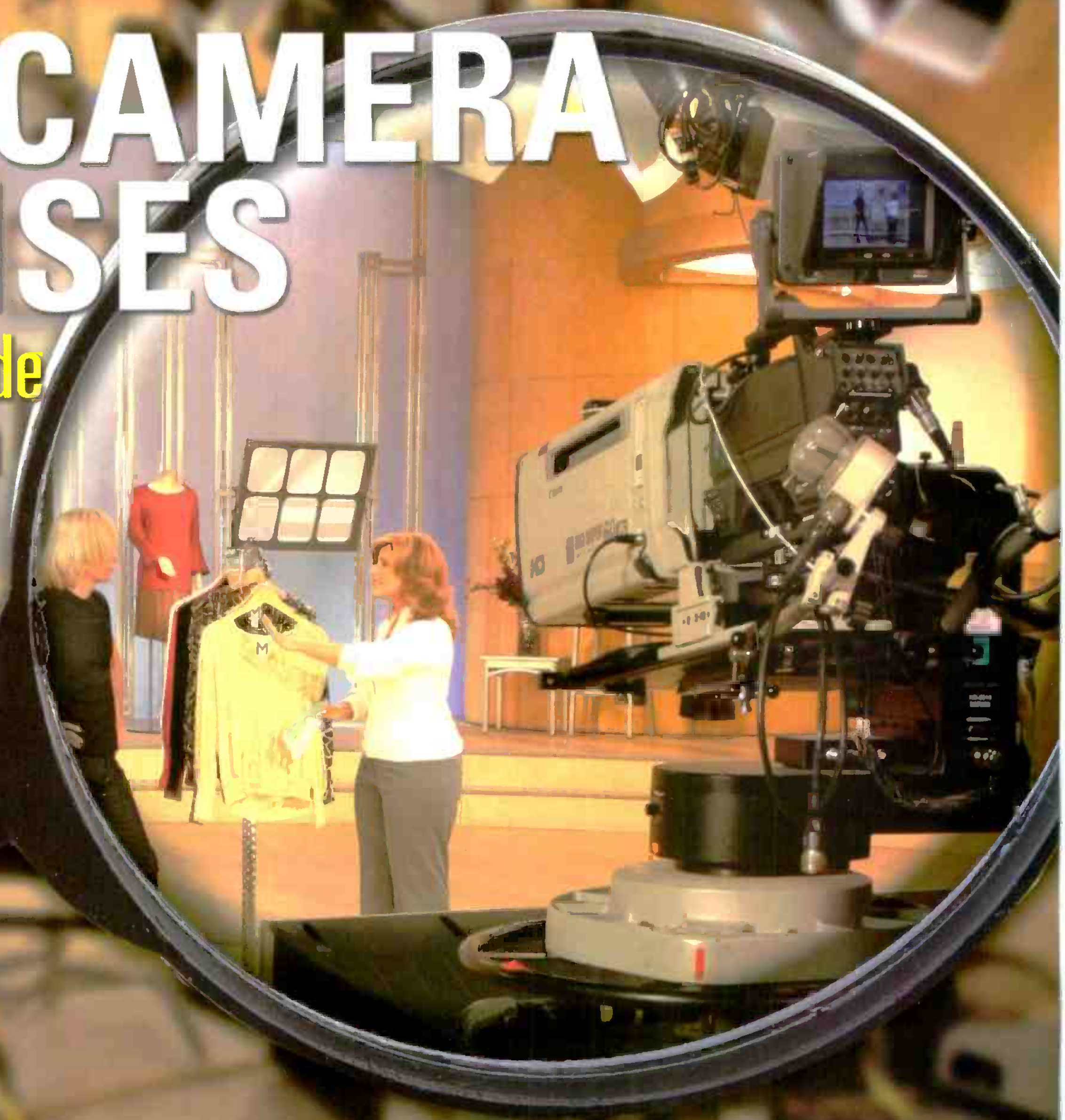
A look inside lens design



ALSO INSIDE:

UNDERSTANDING DIGITAL AUDIO
A closer look at A/D conversion

SERVICES ORIENTED ARCHITECTURE
A better way to design facilities

IPTV SPECIAL REPORTS:
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A PENTON MEDIA PUBLICATION

TABLE OF CONTENTS

VOLUME 49 | NUMBER 9 | SEPTEMBER 2007

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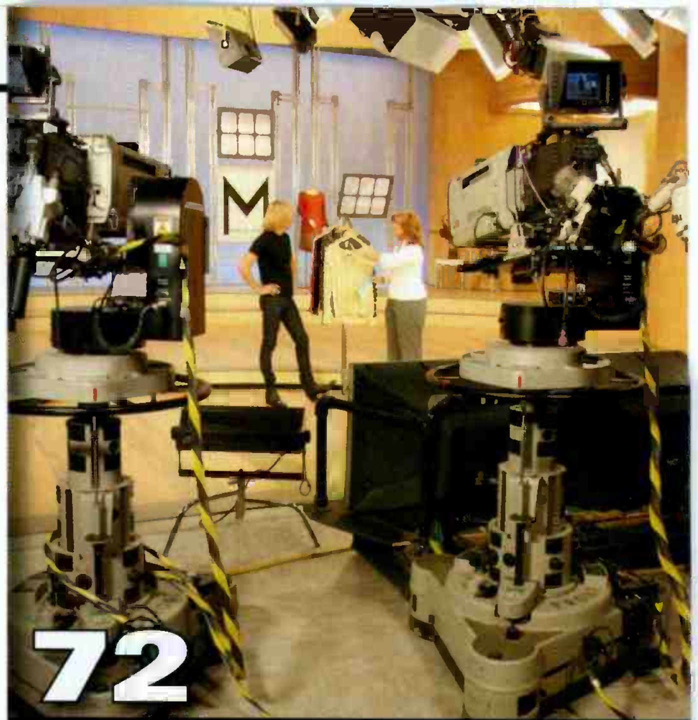
FEATURES

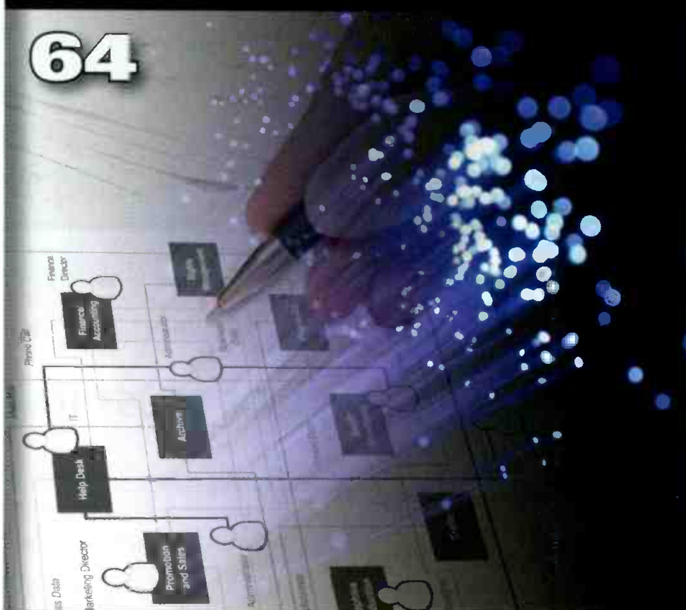
BEYOND THE HEADLINES

DIGITAL HANDBOOK

continued on page 6



ON THE COVER:
QVC recently upgraded its Studio Park facility with Canon HD studio and portable lenses. Photo by Rick Gerrity.



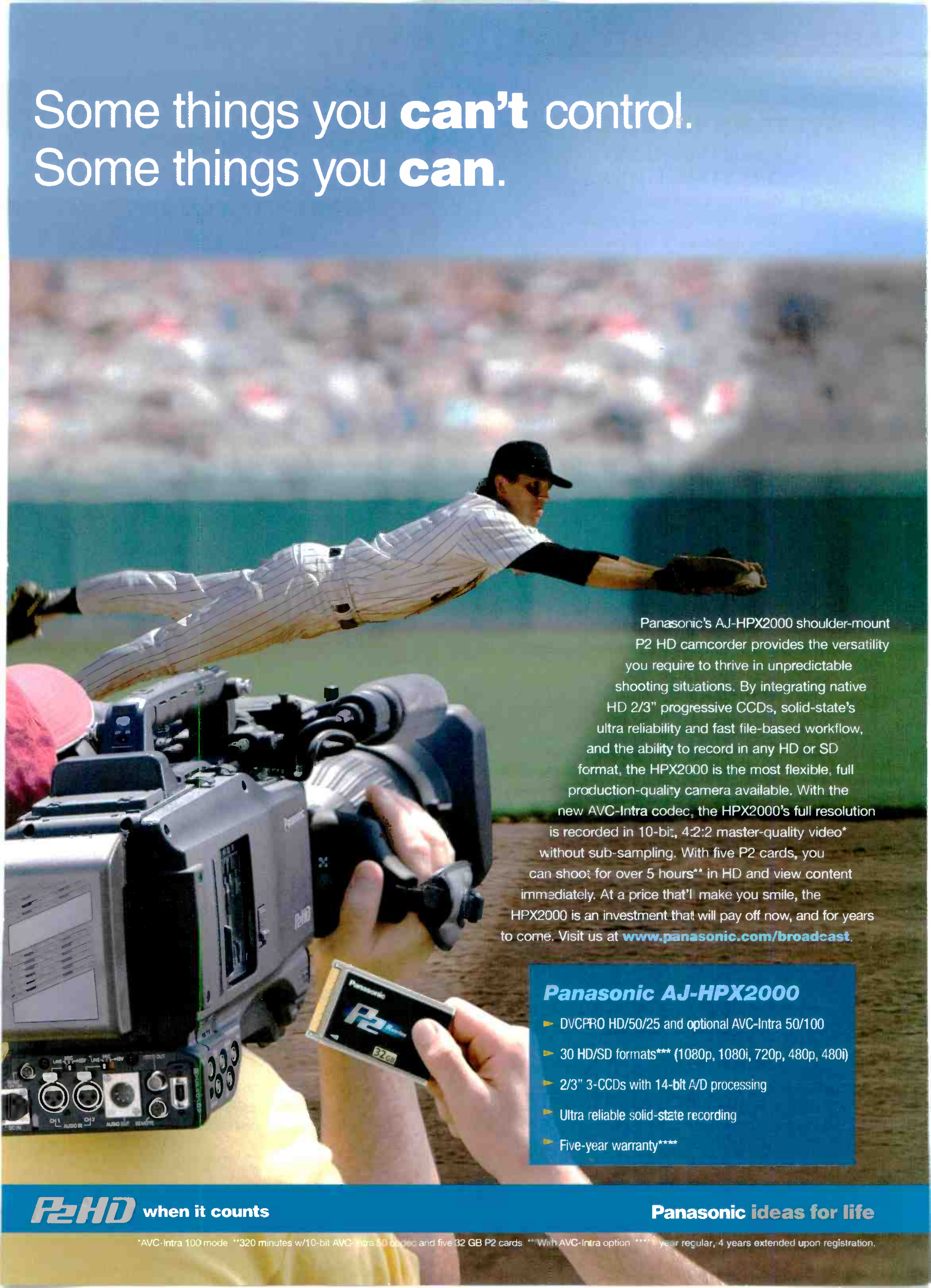


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TABLE OF CONTENTS (CONTINUED)

VOLUME 49 | NUMBER 9 | SEPTEMBER 2007

THIS MONTH'S FREEZEFRAME QUESTION

How's your audio history? Who is credited with developing the modern audio tape recorder, which was based on the German AEG Magnetophon? What famous singer/actor invested money in what company to make the device a commercial success? Answer taken from the "Broadcast Engineer's Handbook," by EPJ Tozer, editor in chief, Focal Press.

Readers submitting winning entries will be entered into a drawing for Broadcast Engineering T-shirts. Enter by e-mail. Title your entry "Freezeframe-September" in the subject field, and send it to: editor@broadcastengineering.com. Correct answers received by Nov. 1, 2007 are eligible to win.

JULY'S FREEZEFRAME ANSWER

Q. What is the status and application of MPEG-3, -5 and -6?

A. They are not standards. MPEG-3 was originally intended to be the standard for HDTV. However, MPEG-2 accomplished what was needed for HDTV, so MPEG-3 was dropped. After MPEG-4, the next sequence should have been MPEG-5 then MPEG-6. However, the MPEG committee simply decided to jump over MPEG-5 and MPEG-6 and go to MPEG-7 as the next developing standard. There are no MPEG-3, -5 or -6 standards.

JULY WINNERS:
Al Conte, Tim Costley, Rich Lohmueller, Bob Sulecki

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Competition is ugly

In spring testimony before the House of Representatives Appropriations Subcommittee on Financial Services and General Government, FCC Chairman Kevin Martin said he supported an à la carte model for cable consumers. Yet, Martin claimed his hands were tied because Congress first needs to change the rules.

So, our fearless chairman has decided that while he supports à la carte, he can't implement à la carte. And why not? Because he believes it would require Congress to first change the rules. What a cop out.

Not surprisingly, cable's mouthpiece, NCTA vice president of communications Brian Dietz, chimed in that à la carte would merely reduce viewers' options while increasing their costs. Besides, à la carte would discriminate against programming for minorities and women, he added.

This was so predictable. Whenever some realist suggests that the cost of cable could be reduced through à la carte, the NCTA counters that if people watched fewer channels, they'd have to pay more.

To support the organization's self-serving justification, the NCTA trots out the same old, tired activists from the NAACP, NOW and other minority groups who shriek — on cue — of the wanton discrimination and victimization they'd suffer if à la carte were allowed to happen.

Speaking for the National Hispanic Media Coalition, its president and CEO Alex Nogales claimed "…à la carte pricing, could squeeze out of the marketplace the next generation of minority programmers and networks." For the record, this is the same guy who wants the government to give spectrum auction money to minorities and women so they don't have to compete on equal footing with other broadcasters.

Maybe Nogales and Dietz haven't heard about BET, Oxygen, Lifetime, Logo or a whole list of other minority-focused channels. The BET channel defines itself as "the leading provider of media and entertainment for African Americans and consumers of Black culture globally." Last time I checked, BET was run by Debra L. Lee, a highly regarded African-American woman.

The Oxygen channel says it's on a "mission to bring women (and the men who love them) the edgiest, most innovative entertainment on television." It is run by chairwoman and CEO Geraldine Laybourne. I've been to Oxygen's headquarters and seen its female-focused programming.

There are plenty of other "focused" channels that compete without needing government support.

Suppose this requirement for bundling applied to everyday products, such as TV sets. You go into Circuit City to buy a new television. After selecting the model you want, the salesperson says, "Along with this nice new TV, you also have to buy this outside antenna, a 50ft mast and 200ft of coax for only $200."

You reply, "I don't want any of it. I'm just going to hook this TV to my satellite system."

The seller replies, "I'm sorry. Everyone who buys a new TV set also buy these other items, even if you'll never use them. We call this bundled packaging."

As you try to object, the salesperson says, "We can't allow à al carte DTV sales because without bundled packaging, no one would buy these products made by left-handed Armenia-Turkestans. We realize you'll never use these extra items, but won't you feel better knowing you've helped this minority business?"

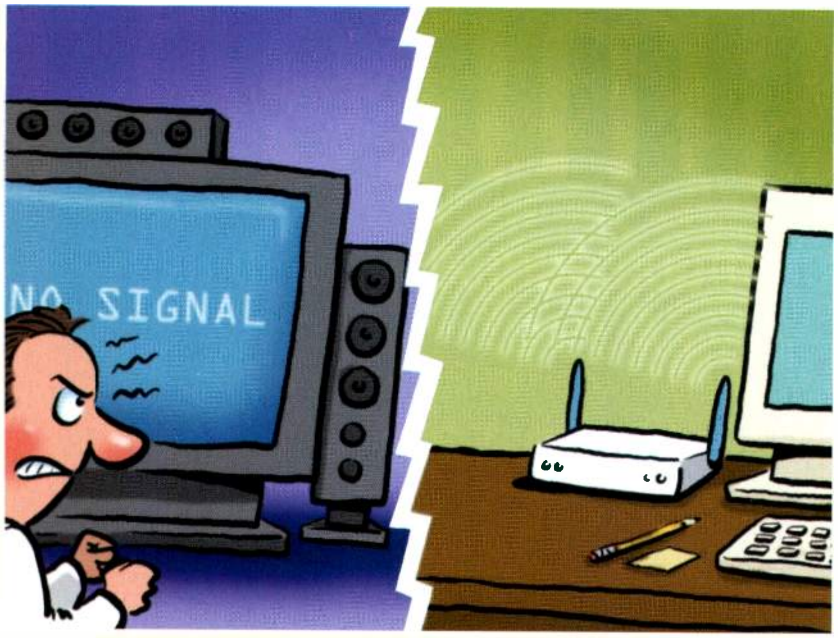
What happened to free enterprise where competition is good for the consumer?

Woops, I almost forgot, free enterprise doesn't apply to cable TV because for most viewers, there is no competition. Most would call that a monopoly. Cable just calls it business. BE

Brad Dick

EDITORIAL DIRECTOR

Send comments to: editor@broadcastengineering.com



Interference revisited

Editor:

Regarding your July 2007 editorial, "Could interference kill DTV?," I have a parallel question. Remember AM radio? I remember when there was nowhere in the country where you could not tune into AM radio. Today, with more stations on the air, you hear less of it. Is it that difficult to figure out?

Tom Norman, CPBE
Burst

BNC

Editor:

For the *Broadcast Engineering* December 2006 Freezeframe answer, you listed Baby N Connection as the definition of BNC, but I believe BNC actually stands for Bayonet Neill - Concelman. The "N" was named after Paul Neill of Bell Labs, and the "C" was named after engineer Carl Concelman. Also, TNC stands for — you guessed it — Threaded Neill-Concelman connector.

The following is a short blurb about BNC from Wikipedia:

"The connector was named after its bayonet mount locking mechanism and its two inventors, Paul Neill of Bell Labs (inventor of the N connector) and Amphenol engineer Carl Concelman (inventor of the C connector), and is much smaller than both the N and the C connectors. Other acronyms the BNC has picked up over the years include: 'Baby Neill-Concelman,' 'Baby N connector,' 'British Naval Connector, and 'Bayonet Nut Connector.'

The basis for the development of the BNC connector was largely the work of Octavio M. Salati, a graduate of the Moore School of Electrical Engineering of the University of Pennsylvania (BSEE '36, PhD '63). He filed a patent in 1945 (granted 1951) while working at Hazeltine Electronics Corporation for a connector placed on coaxial cables that would minimize wave reflection/loss."

Pete Putman
ROAM Consulting
HDTVExpert.com
Rochester, MN

Metadata interchange

Brad Gilmer:

I enjoyed your article "Metadata interchange" in the July issue of *Broadcast Engineering*.

Clearly, standardized metadata is becoming increasingly necessary. Sure, today we may have standards, but I think we have too many of them. I hope the Task Force's work on a standardized wrapper goes well, and that its recommendations are universally adopted. Standards aren't really standards if everybody's got a different one!

Mike Langner
New Mexico

Brad Gilmer responds:

The industry has talked about the importance of metadata for many years. I think everyone realized that it is vital, but users are just beginning to harness the power this can bring to their facilities.

Why did it take so long? Well, first users had to convert from tape-based technology to files. Then they had to get the video and audio to interchange. (It turns out that this was no simple feat!) Finally, they were in a position to use metadata to aid workflows, but they had to get past proprietary solutions. All of this took some time, but I think you will see major advances in this area in the coming years. BE

Close to the edge

To be successful, broadcasters must make their services available on portable devices.

BY CRAIG BIRKMAIER

The end of the analog broadcast era finally has some broadcasters thinking about what being digital will really mean for an industry that has thrived for decades by delivering linear entertainment and news to local television markets.

There is widespread interest in developing the standards for broadcasting to mobile and handheld devices. It is less clear, however, what the interest level is among consumers to buy products that support these standards. To date, consumer interest in paid video subscription services through cellular telephone providers has been minimal. Most of these services do not offer localized content, an area that local broadcasters may be ideally suited to develop. The question: What kind of content can broadcasters create to serve these markets?

Early adopter

In the late '90s, there was significant enthusiasm for the concept of data broadcasting. Companies such as Geocast, iBlast and AccessDTV were formed to build what many thought would be a new industry, using broadcast bits to push all kinds of bits to local markets. DTV broadcasting was to become another lane of the information superhighway, helping to bypass some of the traffic jams on the wired Internet.

There was, however, one requirement out of the hands of these companies and industry pundits. That requirement was — and still is — a reliable way to deliver bits to both fixed and mobile devices. In 2000, Sinclair Broadcasting, Nokia and others collaborated to provide a proof of concept demonstration at NAB using the European DVB standard. A Nokia Mediascreen prototype provided reliable reception of streaming video and data in venues throughout Las Vegas and at 70mph in a vehicle on I-15.

Unfortunately, because of reception issues and a general lack of interest by broadcasters, the nascent data broadcasting industry floundered, and the early pioneers gave up. Seven years later, at NAB2007, two prototype enhanced ATSC systems were demonstrated, and now the ATSC is working on developing a harmonized standard in time for the 2009 shutdown of NTSC.

In the meantime, the World Wide Web kept growing, and Wi-Fi networks started popping up everywhere, providing wireless two-way data to notebook computers, and hybrid cell phone/PDA devices like the Blackberry, Treo and iPhone.

If consumers are not interested in watching TV on tiny 2in to 3in screens, and the Wi-Fi powered Web is driving the market for untethered data services, is there really a viable market that DTV broadcasters can serve?

The answer is an unequivocal yes! It is still too early to make any judgments about what consumers really want, especially considering that the technology for receivers is just beginning to mature and few, if any, appropriate services are available, other than Web sites that are typically optimized for the larger screens of a desktop or notebook computer.

A local cloud of bits

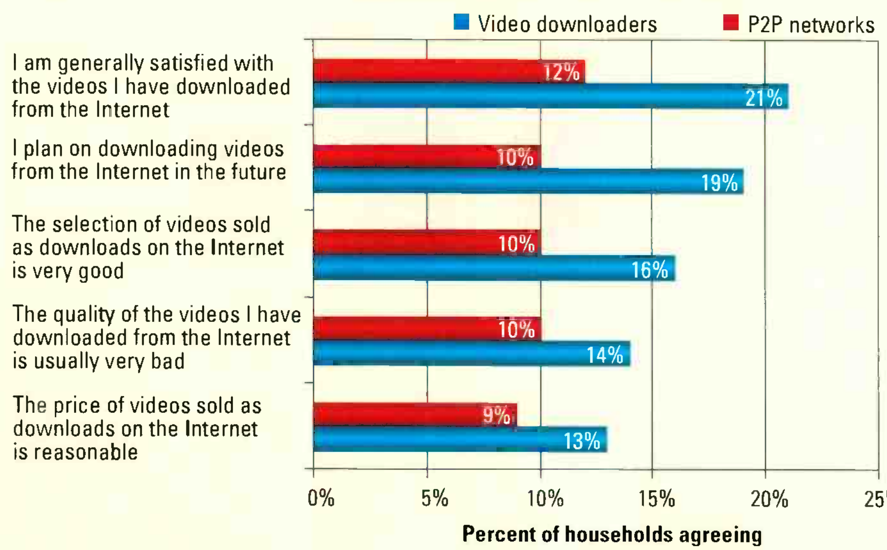
Consider the iPhone. Why is it a breakthrough product, and why is it relevant to DTV broadcasters?

To begin with, it delivers better-than-NTSC quality to a 3.5in, 480 x 320 pixel high-resolution screen (160dpi). Downloaded TV shows like ABC's "Desperate Housewives" can be enjoyed anywhere at any time. (But

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

Consumers give low marks to video download service

Only one in five users is satisfied with video downloading



Source: Parks Associates *www.parksassociates.com*

downloading shows to watch later requires planning and frankly, I did not buy an iPhone to watch TV.)

The real breakthrough is that Apple has created a computer with a 3.5in screen that actually allows users to surf the Web, send and receive text messages and e-mail, and manage the information needed on the go. Apple has solved several important problems with the iPhone:

- *Human interface.* The touch-screen interface is intuitive and easy to use.
- *Battery life.* The 2000 Nokia Mediascreen prototype had an Achilles' heel; total battery life was less than two hours, due in large part to the large screen size. The iPhone can easily get through a busy day with battery capacity to spare.
- *Platform.* It's a real computer, and as such, it will be able to support many new applications, including those that DTV broadcasters can develop if Apple sees the opportunity to include a DTV tuner in future models.

Broadcasters are in a good position to cover their markets with a cloud of bits that will be useful, not only to people on the move, but also in providing updates to fixed screens like the HDTV in the family room and the computer in the den.

Linear video programming is one way to attract eyeballs that can be sold to advertisers. Unfortunately, most of these ads are untargeted, and frankly there are so many these days that watching a network TV show has become a painful experience. On the other hand, those same eyeballs routinely go to the Web to get information about products and to buy them.

It's not the ads that are the problem; it's the relevance of the information. If there is one place where relevant information can be useful, it is when you are looking for something, like when you are out shopping or trying to find a restaurant for dinner.

Today we still rely on an ancient technology for directory services, the phone book. It's already out of date by the time it shows up on the doorstep. Online directory services are no

Web links

Read Craig Birkmaier's August column, "Life after NTSC?" online at *www.broadcastengineering.com*. Elsewhere on the Web, check out:

- "A Visual Compositing Syntax for Ancillary Data Broadcasting," by Craig Birkmaier, February 1997 *www.pcube.com/dtv.html*
- DTV Answers, NAB's DTV information site *www.dtvanswers.com*
- ATSC Data Broadcast standard *www.atsc.org/standards/a90.html*

better, despite the fact that they could include text, photos and video. To be fair, most commercial enterprises are putting their resources into their Web sites, which can easily be found via search engine like Google.

So why is Google interested in radio and mobile TV? The answer is context. Google helps companies reach customers across multiple media with the information they are looking for.

Imagine that the market you serve is covered with a cloud of bits about the market. One of the interesting quirks of the iPhone is that it finds wireless networks as you move around. Imagine a cloud of bits that you could access as you move around with useful information about almost everything in your market. Data broadcasting can create that cloud, and Wi-Fi networks can provide the back channel to allow those eyeballs to interact with it.

Picture a directory service that is downloaded to your TV, PC or handheld device. The main database can be delivered in many ways, including DTV broadcasts, but the broadcast path is best for delivering smaller updates on a continuous basis. The computers in your car or home can store the database, which can then be updated via data broadcasts. A restaurant could print out its daily specials to put in their menus, and the same information could be delivered by a local broadcaster as an update. DTV broadcasts could be used to provide off-hour updates to wireless point-of-sales devices in stores. Local traffic conditions could be delivered in real time to the computers in vehicles, or a handheld device.

The iPhone caused me to reset my expectations for a handheld device, especially with respect to the kinds of services that a small handheld device can support. Now it is time for local TV broadcasters to reset their expectations for the kinds of services that they can deliver to their communities.

As a starting point, broadcasters need to think of their traditional linear video services as an application, not the core of their business. I did not get that episode of "Desperate Housewives" from the local ABC affiliate; ABC sells these shows via Apple's iTunes store.

In the future, consumers will get their entertainment fixes from many sources; it is not clear whether you, as a broadcaster, can survive as a local gatekeeper for network TV shows. But you can survive if you focus on what you are good at — serving your markets with information that is relevant for viewers and advertisers.

You already rely on cable and DBS to deliver their signals to fixed receivers. Now you need to optimize the front ends to the pipes that you control — the bits that you radiate, and the bits that you feed the Internet via your Web portals. Together these pipes can be used to create services for all kinds of receivers, including fixed, mobile, portable and handheld. BE

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

Send questions and comments to:
craig.birkmaier@penton.com

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DTV surprise

Moving to your analog channel? Avoid coverage losses.

BY HARRY C. MARTIN

There may be an unpleasant surprise for TV stations planning to use their current analog channels for digital operations once the DTV conversion is complete. The parameters proposed in the DTV Table of Allotments substantially limit the DTV coverage that some licensees' stations will be able to provide once they start operating digitally on their current analog channels.

The problem results from a conflict between the proposed DTV Table of Allotments, which specifies directional operation in many cases, and a station's actual analog operations, which commonly are nondirectional. The commission has stated that stations may not expand their coverage outside of the footprint specified in the proposed DTV Table of Allotments, so stations are left trying to squeeze their analog operations into the directional digital parameters in the table.

Appendix B to the FCC's seventh further notice of proposed rulemaking in the DTV proceeding — released last October — consists of a table of all proposed DTV allotments. The table includes the basic information about each station's proposed post-transition digital facilities, such as channel, effective radiated power (ERP), height above average terrain, antenna ID, and latitude and longitude. The antenna ID number is a key factor, as each such number corresponds to a particular directional antenna pattern in the FCC's antenna database.

The majority of the proposed allotments in Appendix B specify an antenna ID number, which means that the majority of proposed DTV allotments have directional characteristics.

Stations planning on using their present analog channels for their post-transition DTV operation may find that the DTV directional antenna specified in the Appendix B table is different from what the station is otherwise planning to use post-transition. Stations returning to VHF analog channels from UHF DTV channels may have particular difficulties because the design of digital patterns is less flexible for VHF channels, and some of the minimums specified are quite low. The FCC currently requires that such stations not exceed their Appendix B coverage footprint, so those stations that might want to use their existing nondirectional antenna may need to reduce ERP to meet the FCC's requirement. Of course, reduction in ERP results in reduction of service area. In some cases, that reduction would be severe.

The commission's recent notice of proposed rulemaking in its further review of the DTV process, however, indicates that the agency recognizes this potential problem. One solution would be to allow stations making a transition back to their analog channels to exceed their proposed DTV allotment footprints as long as they do not cause any interference. Stations that have selected their current analog channels as their post-transition channels should examine this issue and, if a problem appears, consider notifying the commission.

The deadline for comments on this issue was last month, but the FCC will likely consider appeals after that date if the proposals do not cause harm to other stations.

In other news: Listen to TV on the radio

Due to the proximity of TV Channel 6 (82MHz to 88MHz) to the lower portion of the FM band (ending at 88.1MHz), in some areas, radios pick up the audio signals of TV stations broadcasting on that channel. As a result, some enterprising Channel 6 TV licensees have managed to put their proximity to the FM band to use to reach radio audiences.

For example, the Channel 6 station in Temple, TX, tells radio station listeners to tune to 87.7 to listen to shows, such as "Dr. Phil" on "NBC 6 Radio." The station's Web site, with perhaps a little too much enthusiasm, says, "When you can't watch, listen!"

The same approach has been taken by a Channel 6 LPTV station in Hawaii, which is targeting radio audiences with programming suitable for listening only.

All of this will cease to exist once analog Channel 6 operations disappear, but that could be later rather than sooner in the case of LPTVs, which have no DTV conversion deadline. BE

Harry C. Martin is a past president of the Federal Communications Bar Association and a member of Fletcher, Heald and Hildreth PLC.

Send questions and comments to:
harry.martin@penton.com

Dateline

- October 1 is the deadline by which TV stations in Iowa and Missouri must file their biennial ownership reports with the FCC.
- October 1 also is the deadline for TV and Class A stations in the following states and territories to place their annual EEO reports in their public files and post them on their Web sites: Alaska, Florida, Hawaii, Iowa, Missouri, Oregon, the Pacific Islands, Puerto Rico, the Virgin Islands and Washington.

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Managing lip sync

With many sources for delay, an end-to-end solution is needed.

BY ALDO CUGNINI

Technological progress often seems to occur haltingly: two steps forward, one step back. With the advent of digital processing, video processing began to take longer than audio processing, and the lip sync issue has become critical. Some consumer electronics manufacturers deny that there's any issue at all, believing (or pretending) the difference in their units to be imperceptible. Knowing how to measure A/V delay and how to compensate for it have become increasingly important.

Sensitivity well known, but not precisely defined

The characterization of sensitivity to the alignment of sound and picture includes early work at Bell Laboratories. For film, ITU-R Recommendation BR.265-9 (and its earlier versions) states that the accuracy of the location of the sound record and corresponding picture should be within ±0.5 film frames, or about ±22ms. In 1998, ITU-R published BT.1359, recommending the relative timing of sound and vision for broadcasting. Studies by the ITU and others have suggested that the thresholds of timing detectability are about +45ms to -125ms, and the thresholds of acceptability are about +90ms to -185ms. (See Figure 1.)

Other research shows similar but not identical results — and being a function of human perception, we should expect the results to vary. The ATSC Implementation Subcommittee IS-191 has found that under all operational situations, the sound program should never lead the video program by more than 15ms, and should never lag the video program by more than 45ms (±15ms). According to the IS, BT.1359 "was carefully considered and found inadequate for purposes of audio and video synchronization for DTV broadcasting." Notwithstanding this and other work, some TV manufacturers still claim that there is no data available to provide a normative reference.

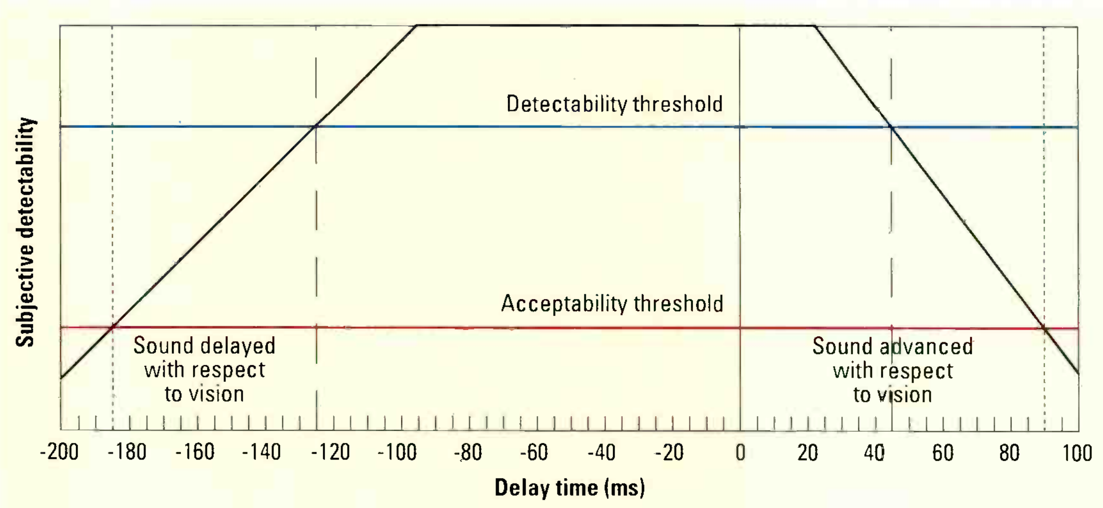


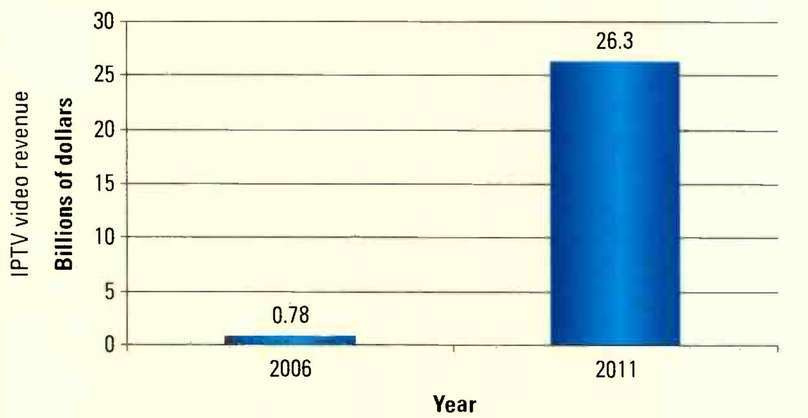
Figure 1. Subjective tests show that the acceptability of A/V delay has an asymmetric characteristic.

FRAME GRAB

A look at tomorrow's technology

IPTV video revenue to increase

Revenue is expected to reach $26.3 billion in 2011



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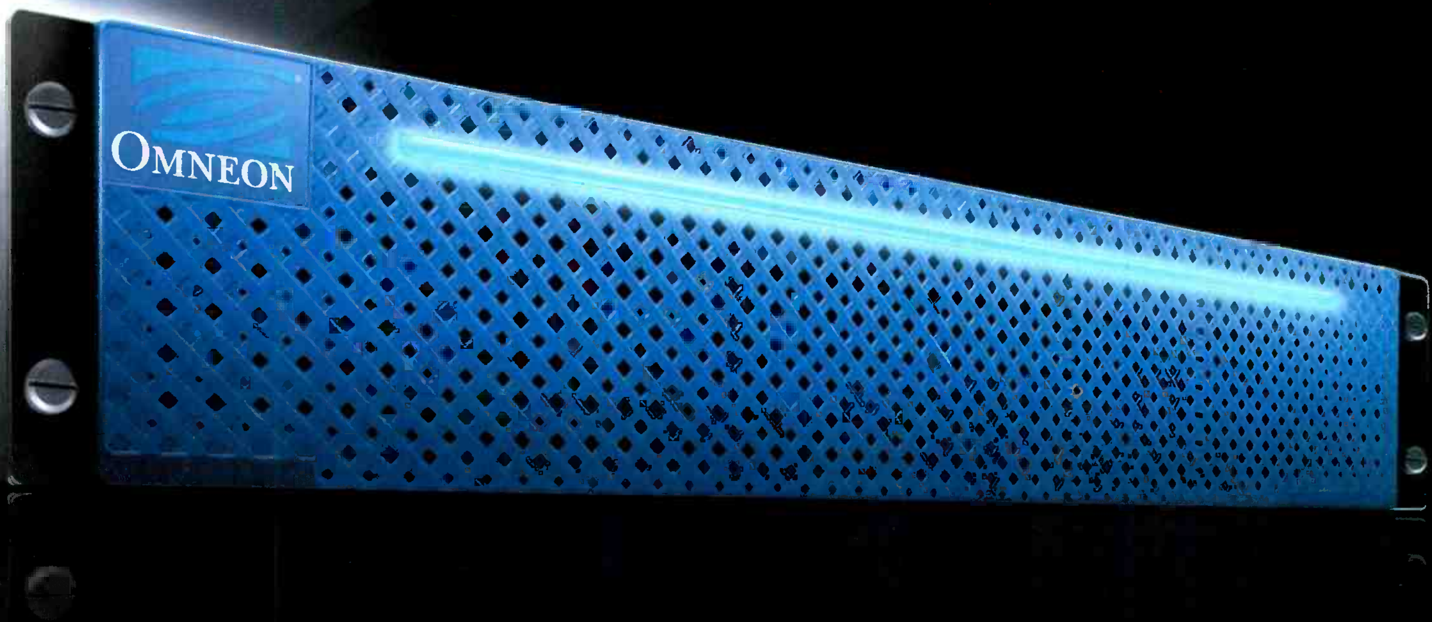

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Many sources of the problem

Anywhere video is processed, there will be a delay in the signal. Processing filters, format conversion, compression — all of these will add delay to the signal, perhaps as little as a few pixels or one line of video, or perhaps as long as many frames of video. Although faster processors and clever algorithms can minimize these delays, they can never completely eliminate them.

Even a simple digital filter requires "taps" or coefficients in order to operate, and that means some order of delay to the signal. Cascade enough of these systems, and the delays can add up. Ignore the delays, and you have audio and video out of sync.

Compressed video brings yet another difficulty to the scene — variable delays. Since the amount of compression varies with video material, the instantaneous compressed bit rate (bits per frame, for instance) will vary as well. In order to use bandwidth efficiently, the rate needs to be smoothed to an overall constant bit rate, and that means that the delay will vary.

The delays in a well-designed system should be known (to the designer), and should be compensated between audio and video.

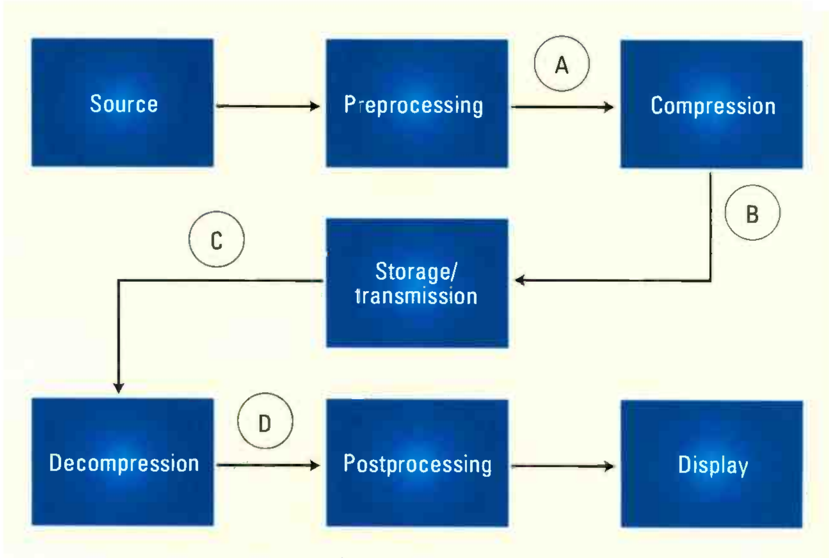


Figure 2. Video delays vary and are not always constant.

In a compression system, such as in Figure 2 on page 22, the encoding delay ("A" to "B" in the figure), is not precisely known, due to the nonconstant instantaneous compression rate. Similarly, the decoding delay (from "C" to "D") is not defined. Nonetheless, the entire system works (if designed properly), because of the time stamping mechanism, such as that used in the MPEG standards. Thus, the delay from "A" to "D" should be fixed, and the presentation of audio and video should be aligned if the encoder and decoder are both operating correctly.

However, proper decoder timing reconstruction is not required for compliance. There is no "timing conformance" that must be demonstrated to any authority in order to build or license an MPEG- or ATSC-compliant product. And several experts believe decoders may be a significant contributor to the problem.

Yet another problem arises if bit stream splicers are used to feed the transmission chain. In that case, the A/V delay can actually jump to a different value when the new stream is spliced in.

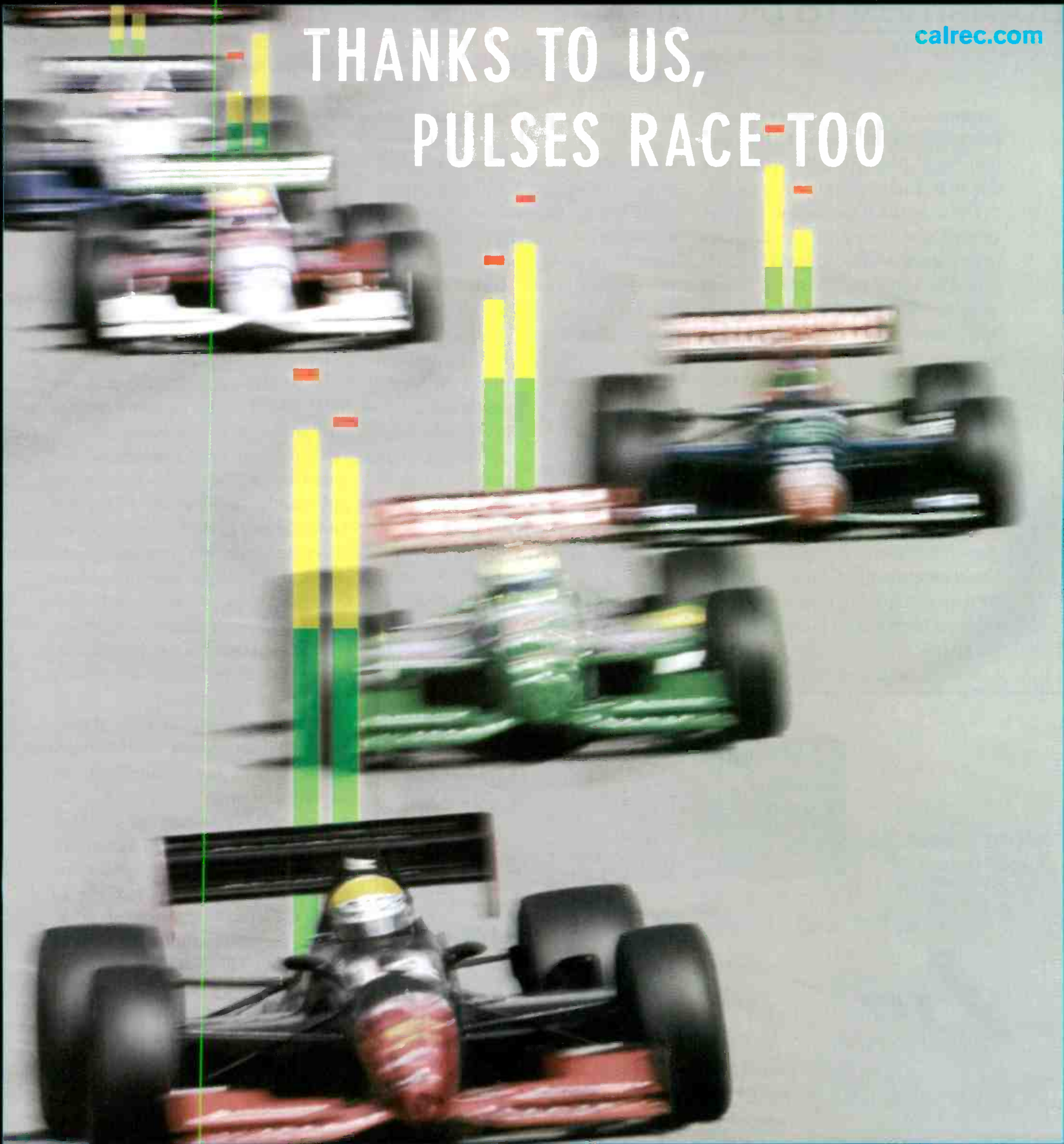
On the display side, video processing delays become significant for LCD and plasma display panels (PDPs), where memory-based video-processing algorithms, as well as panel response times, can cause a delay of more than 100ms.

Measurement, correction tools emerging

Various technologies currently exist that can analyze, measure and correct lip sync error. One measurement system uses a special test signal that synchronizes a video "flash" and audio tone burst. The two signals can be monitored on an oscilloscope to determine the delay between them. Of course, this process is intrusive and cannot be done with on-air programs.

Another scheme uses an active element to tag the audio and video at an upstream point, which sets a reference for the A/V alignment. These tags are then sensed downstream and compared to the initial reference. Any difference in the timing is then relayed to the operator. In more sophisticated systems, the accumulated delay can be signaled to a corrective device to compensate for the differential delay, usually by altering the audio delay in a memory-based digital delay line.

One nonintrusive method of tagging is to use watermarking technology to embed timing data within the video itself. Tektronix had such a device called the AVDC100 audio-to-video delay corrector on the market years ago. The watermark was claimed to be permanent, surviving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compression and other types of video processing. Unfortunately, the unit has been discontinued, apparently due to lack of interest in the product.

Other products use various proprietary schemes to measure — but not actively correct — video delays. The JDSU DTS-330 real-time transport stream analyzer with SyncCheck provides lip sync analysis when used with a special test tape video source. The K-WILL QuMax-2000 generates a "Video DNA" identifying signal that can measure the timing of video signals in a plant or even at separate locations. The Pixel Instruments LipTracker detects a face in the video and then compares selected sounds in the audio with the mouth shapes that create them in the video. The relative timing of these sounds and corresponding mouth movements are analyzed to produce a measurement of the lip sync error.

Several units can correct varying delays automatically, such as the Pixel AD3100 audio delay and synchronizer, which provides compensation based on a control input from a compatible video frame synchronizer. It can also automatically correct independent variable delay sources by interfacing with the company's DD2100 video delay detector, which samples the video at two points in a system and then provides a control signal to the AD3100 audio delay unit. Similarly, the Sigma Electronics Arbalest system uses a proprietary technology to provide automatic video delay detection and audio compensation in a system.

Industry activities to address solutions

Aside from a handful of proprietary solutions, no standard solution has yet been described. It is becoming apparent that end-to-end solutions are needed, and several trade groups are actively studying the problem. SMPTE has created, within the S22 Committee on Television Systems Technology, an Ad Hoc Group on Lip Sync Issues to address the problem and produce guidelines documents. Work on a coordinated studio-centric solution will probably include problem assessment, current practices, control signals, and known and potential solutions.

The ATSC's recently developed strategic plan notes that although the AC-3 digital audio standard is mature, implementations have varied, in particular with regard to lip sync and sound levels. The ATSC Technology and Standards Group on Video and Audio Coding (TSG/S6) has thus been directed to look into these issues, and has established two working groups to gather implementation data and report back with recommendations. It is believed that the group will coordinate with SMPTE and concentrate on emission stream issues.

Other groups are studying the issue, as well. In Canada, World Broadcasting Unions International Satellite Operations Group (WBU-ISOG) has conducted tests on satellite encoders and decoders. A European Broadcasting Union (EBU) audio group has performed tests for SDTV receivers. In Japan, the Japan Electronics and Information Technology Industries Association (JEITA) IEC-TC100 has started investigations on TV receiving devices.

The entire problem is quite complex when one also considers the effects of editing, voice-overs and other routine operations. In addition, practical feedback to controlling systems must be developed, or an unstable condition could be created.

We can see that entire issue has many facets, including the potential for technical (and legal) disagreements. Let's hope that the motivation for a better viewer experience trumps that and provides a genuine improvement. BE

Aldo Cugnini is a consultant in the digital television industry.

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Video over IP

Pay attention to this technology. It will likely be a key part of your future video transport infrastructure.

BY BRAD GILMER

Video over Internet Protocol (IP) affects just about all video-related industries — broadcast, post, news and live sports. The promise of inexpensive transmission of video, audio and metadata over packetized networks — almost always employing IP — has driven an explosion in popularity of this transmission medium.

Engineers need to be familiar with this technology because it is likely to become a key part of broadcasters' video transport infrastructure in the near future.

Defining video over IP

In this context, when I use the term video over IP, I mean video that is compressed and transmitted over a packetized network. The video is most often either for contribution or distribution.

Contribution video originates at a remote location, such as at a football stadium. The video is then transported back to a central broadcast network facility for manipulation, branding and packaging.

Distribution video is sent from a central broadcast network facility to other broadcast facilities or cable systems for ultimate transmission to the end user. (Throughout this tutorial, video over IP includes video, audio and data such as subtitles, in addition to metadata.)

Video over IP has been a hot topic lately, and broadcasters are not the only ones who have noticed. Several large carriers, including AT&T and Verizon, have deployed video over IP technology for the transmission of signals into the home. The environment in which this technology operates, and therefore, the user requirements for these deployments are quite different from the broadcaster.

In this tutorial, I am not talking about delivery of video content to the home over packetized networks. While this is an interesting topic, and while there are some challenges that have been overcome in creative ways in this area, nothing I say in this tutorial should be construed to apply in the domain of content distribution to the home.

Steps in transmission

You may be familiar with analog video transport over TV-1 lines. TV-1 is an old AT&T term for the transmission of analog NTSC, 525-line video and two audio channels over a terrestrial network. The original system consisted of microwave links and balanced, two-conductor coaxial cable. It used modulators, diplexers, clampers and line amplifiers to maintain signal quality during transmission. These early systems took in analog video and audio, modulated them onto a carrier and transmitted them either over microwave frequencies or down a coax cable.

The steps required for transmission of video over IP are quite different. (See Figure 1.) Typically, serial digital video with embedded audio is presented to a compression device. If the user requires it, forward error correction (FEC) is applied to the compressed data. The data is then encapsulated into packets, and addressing information is added. Then the data is transmitted over the packetized network. The data is received at the destination, addresses on the packets are analyzed, and the data is directed to the appropriate device for de-encapsulation. Once the data has been de-encapsulated, error correction may be applied, and the video and audio data is then decompressed and converted back to a serial digital interface (SDI) stream. Let's examine each step in some detail.

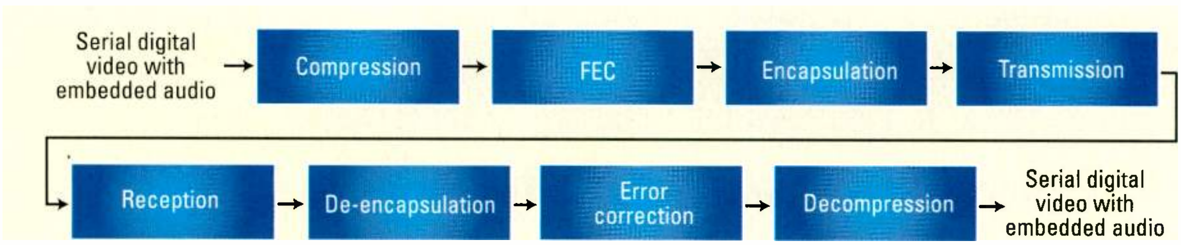


Figure 1. Steps involved in video over IP transmission

Compression

The compression device removes redundant information, thereby reducing the amount of information that has to be transmitted. Today, the most commonly employed

compression methods are MPEG-2 and JPEG2000. The effect of specific compression settings in transport applications is critical. In MPEG-2, for example, it is likely that one would want to configure video transport compression parameters so that compression efficiency is high. In other words, it's a good thing if you can get the same quality with a lower number of transmitted bits.

One way to achieve this is to use a large group of pictures (GOP). The GOP setting defines the number of P- and I-frames sent between B-frames. B-frames take up much more bandwidth than the other types of frames, so sending B-frames only occasionally seems like a good idea — and it is as long as you do not encounter an error in transmission. But using a very large GOP size means that if you lose a B-frame during transmission, you must wait until you receive another B-frame, plus the time it takes the decoder to resynchronize before a usable video signal is restored. This can result in an outage of a second or more in some configurations. That said, if the transmission error occurs during an I-frame or P-frame, it is highly unlikely that anyone would notice the error.

It's a good thing if you can get the same quality with a lower number of transmitted bits.

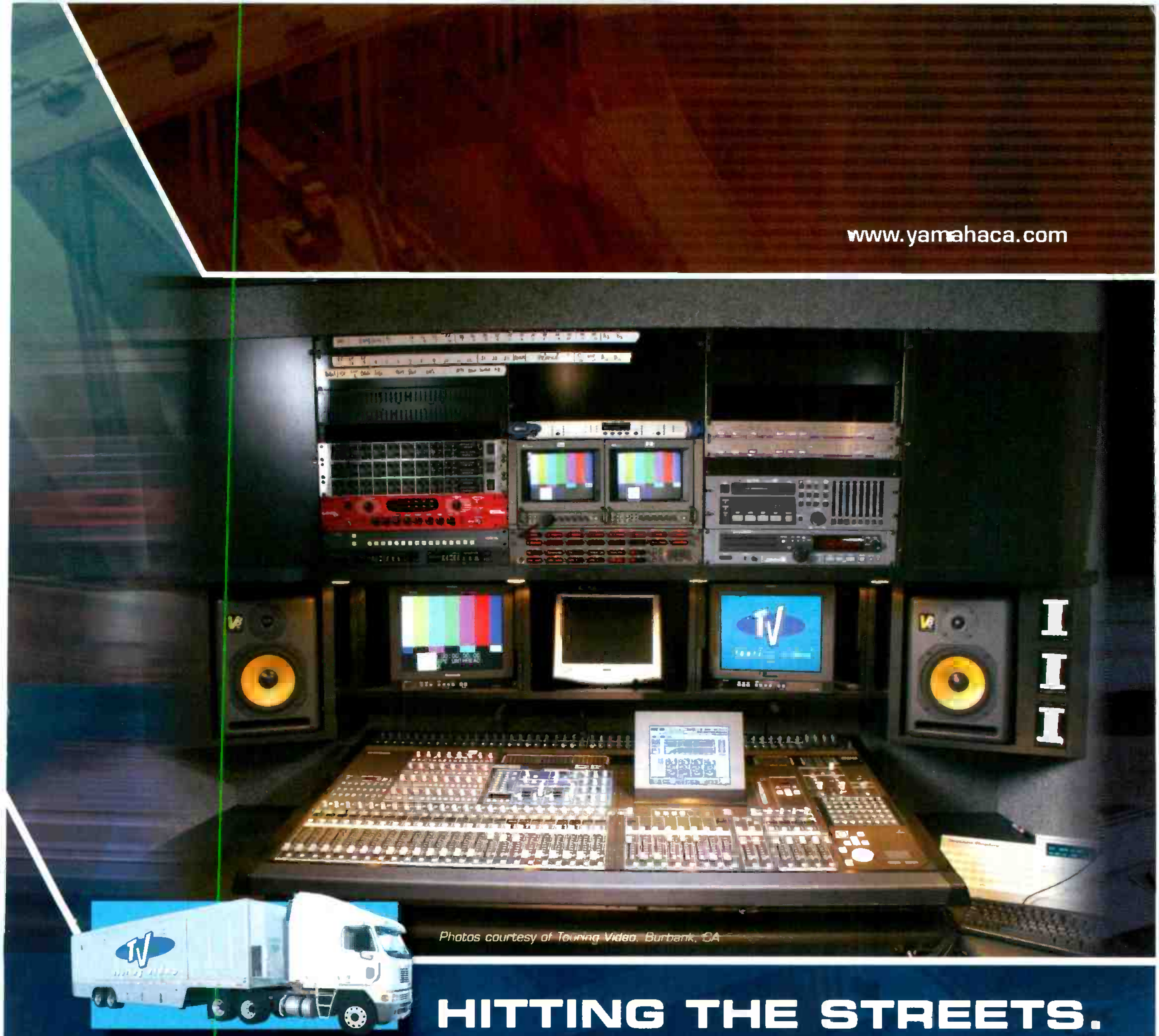
So the impact of an error may be extreme or inconsequential, depending on where the error occurs in the compressed bit stream. This has caused more than a little frustration for transport equipment designers. The choice of compression parameters, such as GOP size, is a balancing act between reduction of transmitted bandwidth and the impact of errors on the usable video.

Forward error correction

Next month's article will focus on real-world challenges, and FEC will be part of that discussion, so I will not spend much time discussing FEC here. Suffice it to say that if you have a transmission network that is prone to errors, one way to deal with the problem is to send error correction information along with the video and audio data. This information can be used at the receiving end to recreate lost data.

Encapsulation

Encapsulation is the process of putting the compressed video and audio data into packets so that it can be sent over a packetized network.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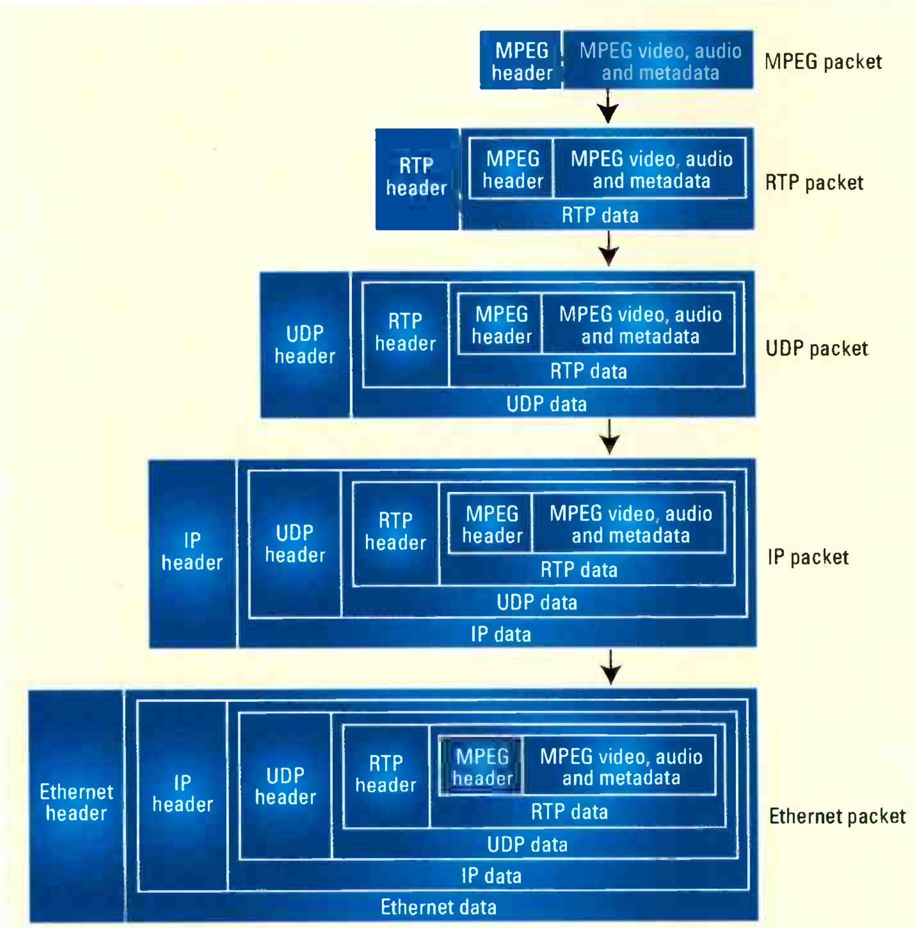
Photos courtesy of Touring Video, Burbank, CA



(See Figure 2.) Packetized networks are strongly based on the layered approach to networking and the fact that the functions of each layer of encapsulation are separated from the layers above and below it. Encapsulating the data in the various layers provides flexibility by allowing the user to transmit this video over a variety of networks in a standardized way. For a complete discussion of encapsulation, please refer to the *Broadcast Engineering* June 2007 Computers & Networks article.

Transmission

Transmission in the video over IP world means transferring the IP packets from one location to another using IP. Internet Protocol is a self-routing protocol containing both the source and destination address in each

Figure 2. Encapsulation of an MPEG video stream over Ethernet

packet. Each packet is transported across the network individually. In IP, there is no concept that these packets are somehow related; this association is made in the higher level protocols, or in this case, the application.

It is the network's job to transport packets from one place to another. Generally, the network has no notion of a nailed-up path — a path from one point to another that is fixed so that all packets flow the same way through the network. Due to network congestion and many other factors, packets may arrive out of order. They may also be lost, of course, and in some cases, packets may even be duplicated in the network. If you are using a dedicated network that has been specifically designed for carrying video and audio, the network has been crafted to eliminate many of these issues by using QoS parameters.

Reception/de-encapsulation

It is the receiving equipment's job to detect packets that are addressed to it and to begin the de-encapsulation process. Each stack in the protocol unwraps the payload, performs specific tasks on that payload if required and then passes the data up to the next layer.

Error correction

Error correction corrects data that has been lost during transmission. Extra bits sent along with the payload allow error correction algorithms to recreate missing data. Which error correction algorithm you choose, or whether you decide to use error correction at all, depends largely on the loss characteristics of the transmission network. You should work closely with your equipment vendors and your transport providers to select the appropriate error correction technology.

Decompression

Decompression reverses the process of compression described earlier, usually recreating the SDI video stream that was presented to the encoder at the beginning of the process.

Looking forward

In the first installment of this two-part tutorial, I introduced the concept of video over IP — defining it and discussing the steps in the process of moving video and audio between facilities. In next month's tutorial, I will discuss some of the challenges of transmitting video over IP and how the industry is addressing these challenges. BE

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

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Taking ENG HD

It's the last frontier on the HD map.

BY SPRING SUPTIC

HD newsgathering. Avoiding the issue? Don't quite know how to plan for this last piece of your otherwise HD newscast?

Stations are preparing for HD in the field methodically. Many stations already broadcasting from the studio in HD acquire from the field in 16:9 SD. Some local broadcasters consider adding HD to the helicopter as a practice ground for HD. For example, WLS-TV in Chicago captures HD from its helicopter and passes it through the station's microwave towers. When it started in April 2006 only one site was HD-capable. The station has since made all of its ENG receive sites digital-capable, and this has smoothed the path for other HD transmissions down the road. Currently, at WRAL-DT in Raleigh, NC, the chopper and one truck are capable of HD. The helicopter went HD in October 2005, and according to chief engineer Pete Sockett, the station plans to begin HD transmission from the field sometime next year.

In Chicago, WLS' news fleet includes eight digital trucks, two trucks with the capability for HD live shots, an HD helicopter and nine microwave sites that are digital-capable.

For broadcasters big and small

WLS, which has been broadcasting local news in HD since January 2007, has 10 live trucks — eight digital trucks and two with the capability for HD live shots — that can handle analog, digital, digital satellite and digital microwave.

Currently, newsgathering is shot in 16:9 SD. The digital feeds look gorgeous, according to Kal Hassan, the vice president and director of engineering at the ABC-owned station. To the untrained eye, it looks like HD.

Don't think that because you aren't a broadcaster in Chicago, Los Angeles or New York that you have an excuse to avoid planning your full HD transition. Being a broadcaster in a smaller market means little in the new fast-paced digital world, according to Sockett.

That's why WRAL, the CBS affiliate in the 28th-ranked Raleigh-Durham market, began HD newscasts in 2001 and began testing ENG, microwave and HD systems four years ago.

Getting HD back from remote sites was a complex task, he said. And it isn't cheap either. So, why does this station work to make these transitions happen before many of the bigger guys? "We do it because it looks great and we want to give our viewers the best picture possible. The nice side effect is that it gives us a market advantage," Sockett said. In addition, he says that broadcasters in smaller markets need to consider making this transition now, and not wait for the stations in the top 10 DMAs to make the jump first.

Going digital in the field is about accommodating more than one signal type, one being HD, another SDI.

Getting the truck right

There's no one solution when it comes to HD truck design, according to Rex Reed, director of business and product development for E-N-G Mobile Systems. Going digital in the field is about accommodating more than one signal type, one being HD, another SDI.

There's a general hesitation. Everyone knows the next step is HD, but many are not quite ready, Reed said.


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WLS can perform HD live shots with JVC GY-HD250U ProHD cameras. A Miranda ASI Bridge converts the live 720/60p stream to ASI for transmission to the station, where it is decoded back to HD/SDI for production using TANDBERG Television TT1280 or TT1290 decoders.

They say, "I want this truck to be exactly like my older trucks, but make it HD-ready." This seemingly benign statement is a frequent request to a truck builder. Defining and fulfilling that request is a complex challenge. How can you keep it the same, yet make it totally different?

The old needs

The physical aspects of trucks have changed little. According to Reed, there have been some innovations by truck manufacturers in the past 30 years, but the truck package itself hasn't changed much. Systems within the trucks, on the other hand, are changing significantly and rapidly.

It's not that people are trying to avoid new technology, but they don't want to let go of the human interface because it's an environment they're used to. And this is for more than nostalgic purposes. It's for the sake of the operators, Reed said. The operators in the field may likely be photojournalists rather than engineers.

"If it seems to you that technical complexity of the truck and operator skill sets have gone in exactly opposite directions, your observation is correct," he said.

If it seems to you that technical complexity of the truck and operator skill sets have gone in exactly opposite directions, your observation is correct.

Not only that, there are fewer people within the news organizations to maintain the equipment. More than ever, the pressure is on the truck builder to be the expert, to advise and direct the truck user to make prudent decisions that will survive the ever-moving target. The term "HD-ready" has an elusive meaning, with many definitions and solutions.

Until recently, there were proven paths to designing and building a truck. The families of equipment were well known, and most trucks were equipped with similar fundamental elements. Now those equipment families are falling apart, and old standard pieces are disappearing due to different production demands.

The multiple needs

In today's broadcast environment, simplicity has given way to the need to accommodate multiple formats, as well as ways to move between those formats. All this must be incorporated into the design, Reed said. The first transition was SDI capability — but not at the expense of the NTSC system. Later, A/D and D/A conversion was needed along with new monitoring and switching technology.

A more recent transition is the move to make HD the final output of the truck — but, again, not at the expense of the heritage infrastructure. The result is systems that must manage many more types of signals than in the past.

Cameras and encoders

Field acquisition cameras are in a slow transition, due mostly to their expense. As the cameras change, so do the needs in the truck. For example, mast-mounted cameras were not initially available in 16:9 format, even though the rest of the equipment in the truck was available in the format. Mast cameras, once an inexpensive novelty feature on trucks, have become nearly as sophisticated and expensive as the handheld camera.

WRAL's field crews are armed with 29 HD cameras. Why capture in HD and send it back as SD? Two reasons. First, according to Sockett, "You start better; it ends better." Second, it builds the stations HD archive for future use.

The next pricey bit: encoders. One option, employed by WLS, is to use

WRAL began its nonstudio HD coverage of the Raleigh-Durham market with an HD helicopter. It also has an HD-capable truck. The plan is to begin HD transmission from the field sometime next year.

cameras with built-in HD encoders that may cost less than using an external HD encoder. The difference is that the encoder in the cameras cannot be adjusted. It's an option for news crews willing to forgo the flexibility of bandwidth and input options.

Towers

Don't forget that the trucks are interrelated to the receive support structure, Reed said. With the move to digital transmission, typical coverage areas may not be the same or equal to that from analog systems. More receive sites may be necessary, and coverage patterns will be altered.

Most stations still rely on analog repeaters, and even if the devices are digital, they may still not be capable of handling HD signals. WLS has five remote sites that can carry HD encoded in MPEG-2.

At a recent air and water show, the station brought in a few live trucks equipped with cameras with 20Mb/s ASI outputs. This was fed back by fiber to the truck for microwave transmission and decoded at the station, providing three solid HD feeds from the field.

BAS relocation

The big change on the horizon for the traditional news truck is the BAS relocation. "As these new digital systems are implemented, new limitations will be realized, and new potential will be discovered, which may change the truck," Reed said. IFB, for example, is becoming more difficult. The delay created by digital transmission will only exacerbate the painful pause between the station and the talent in the field.

Before the Nextel transition, conversion was very expensive — almost prohibitive. Now HD is reasonable.

While there are headaches involved, Sockett said the BAS relocation is a boon for broadcasters because it resets the clock. After the digital transition, everyone is going to have a transmitter capable of transmitting an ASI signal. That could make upgrading to HD as simple as buying an encoder (provided you have the cameras). "Before the Nextel transition, conversion was very expensive — almost prohibitive," Sockett said. "Now HD is reasonable."

Audio and video

Whether or not to embed the audio is a frequent question, Reed said. The audio delay problem is another issue that must be dealt with when building digital systems. The encoding delays and resulting lip sync errors that can develop between video and audio can be difficult to resolve. This can be especially the case if more than one hop is needed. How much delay is acceptable and what to do must become part

The E-N-G Mobile Systems EasyLINK II HDTV microwave news van is equipped to operate with NTSC, SDI and HD inputs.

Technology changes quickly. Make sure you and your truck vendor work together to select equipment and systems that are upgradable and flexible for your present and future needs. Shown here is the interior of the E-N-G Mobile Systems EasyLINK II.

of a systems engineering discussion.

As for producing in 5.1, WLS is capable of producing surround sound from the field. However, this is primarily used for major local programming remotes.

Backend systems

Make sure your upgrade plan takes into account all the systems and procedures down the line. Last year, WRAL installed an HD-capable newsroom production system.

Initially, Hassan thought WLS would go HD in the field as soon as possible. The station has everything needed in the field to capture in HD and the repeaters to send the microwave signal back in HD, but the news automation system back at the station wasn't made to handle HD. Upgrading the news automation system will take additional time, planning and budgeting.

To be tried and true

The fast pace of change feels unnatural to the OB truck world. In the past, the equipment could endure the life of the truck and live again in a new truck. Now, some equipment is short-term, to be replaced in a few months or years when the station purchases new cameras or begins remote HD broadcasts.

The transition in trucks is moving faster than many news organizations envisioned, Reed said. Stations that a year ago were convinced that HD was several years away are now scrambling to fit HD into their current plans.

If we provide compelling content in high quality, people will stay with this media.

When the time's right

It's an industry trend that if one station in a market makes a move, that accelerates the move by other stations. This places unexpected demands on financial resources. According to Reed, a capital budget submitted at the first of the year may be inadequate only months later when it becomes time to actually buy the equipment based on the need to accelerate the implementation of technology in the truck.

HD equipment is expensive, and it is not as easy to determine what equipment has the architecture and stamina to withstand the demands of mobile broadcasts. Also, product design changes more rapidly than in the past.

"Make it SDI today, but upgradable to HD for tomorrow" is a common request, according to Reed, but to what extent is the system HD? How much are you willing to invest now in order to ease the eventual transition? The truck business is competitive, and even a slight difference in interpretation of this request can change the overall cost of the vehicle.

Why make the change?

"There's a perception of television as old media. I consider digital television as new media. If we provide compelling content in high quality, people will stay with this media," Hassan said. "There's nothing that compares to our HD signal that can be found on a computer or even a DVD." BE

Spring Suptic is an associate editor for Broadcast Engineering.

Weather systems

Here's a look at new weather technology and how you can use it to help protect your viewers.

BY SUSAN ANDERSON

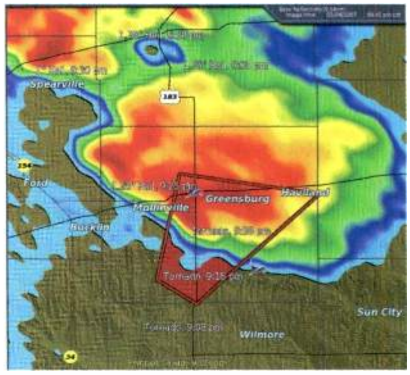
Mark Twain once said that everyone talks about the weather, but no one does anything about it. My, how times have changed. Today's viewers want to know about the weather and how it will affect them and their families. The greater the effect that the weather will have — whether it's just a chance of rain or more severe weather such as a hurricane or tornado — the greater the interest. Viewers want the most accurate and specific information possible, and they want it presented in a display that's easy to understand and viewer-friendly.

Weather companies are responding to this need with new technology that will help keep viewers safe.

Storm alerts

AccuWeather recently introduced the CinemaLive HD weather display system, which offers realistic virtual sets and scenes, live performance on every layer, and meteorological tools and coaches. The system combines an advanced 3-D graphics engine with virtual sets, custom-built local landscapes and specially designed HD weather elements to produce realistic local weather segments. Custom-designed 3-D models of local landmarks are available. The system includes virtual sets ready for on-air use. To complement these graphics, it also imports virtual sets from designers such as Virtualsets.com and Full Mental Jacket.

CinemaLive HD makes old-fashioned rendering architectures obsolete. It offers live performance on every graphics layer, which makes weather presentations fast to build. Likewise, it offers state-of-the-art mapping technology to automatically and continuously integrate up-to-the-minute warnings and current conditions into ready-for-air graphics.



AccuWeather's Storm Hawk is a mobile device that uses GPS to center radar and storm data on the precise location of the weather chaser, law enforcement or emergency management. KWCH-TV in Wichita, KS, used the system to provide warnings of a recent, deadly tornado in Greensburg, KS.

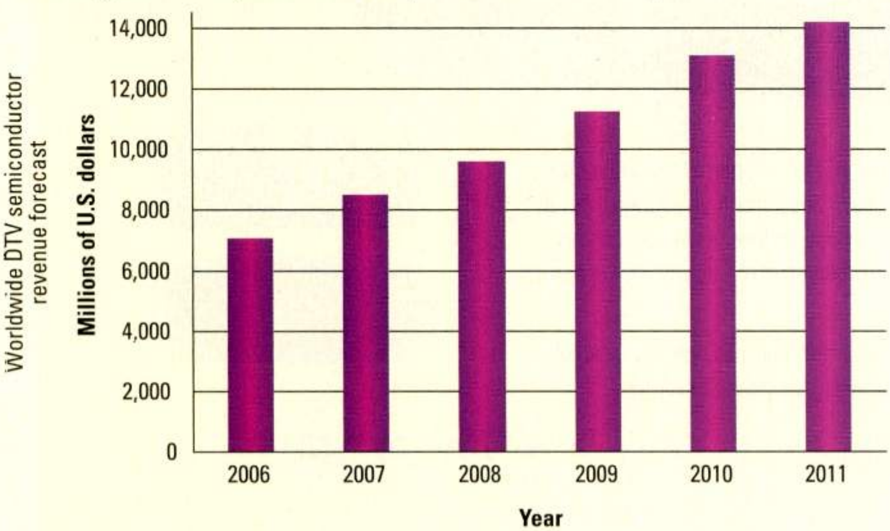
The company's SelectWarn 2.0 is an advanced, on-air radar system that delivers on-screen weather graphics and video fast. It uses National Weather Service's (NWS) new, official storm-based warnings, which are 70 percent more precise than the traditional countywide warnings. The new release includes extensions of SelectWarn's StormVision, which tracks storm movement and precise lightning forecasts up to 30 minutes into the future; AccuRain, which uses rain gauge data to show viewers how much rain was received in specific neighborhoods; and an enhanced graphics toolkit for the annotation of automatically generated, continuously updated on-air radar displays.

The system includes "ground-truth" reports that present severe weather in terms of precise locations that connect with viewers. NWS storm-based warnings and local storm reports are plotted in real time with no delay, allowing stations to air severe weather

FRAME GRAB *A look at the consumer side of DTV*

DTV semiconductor revenue forecast

The digital TV chip market is expected to double by 2011.



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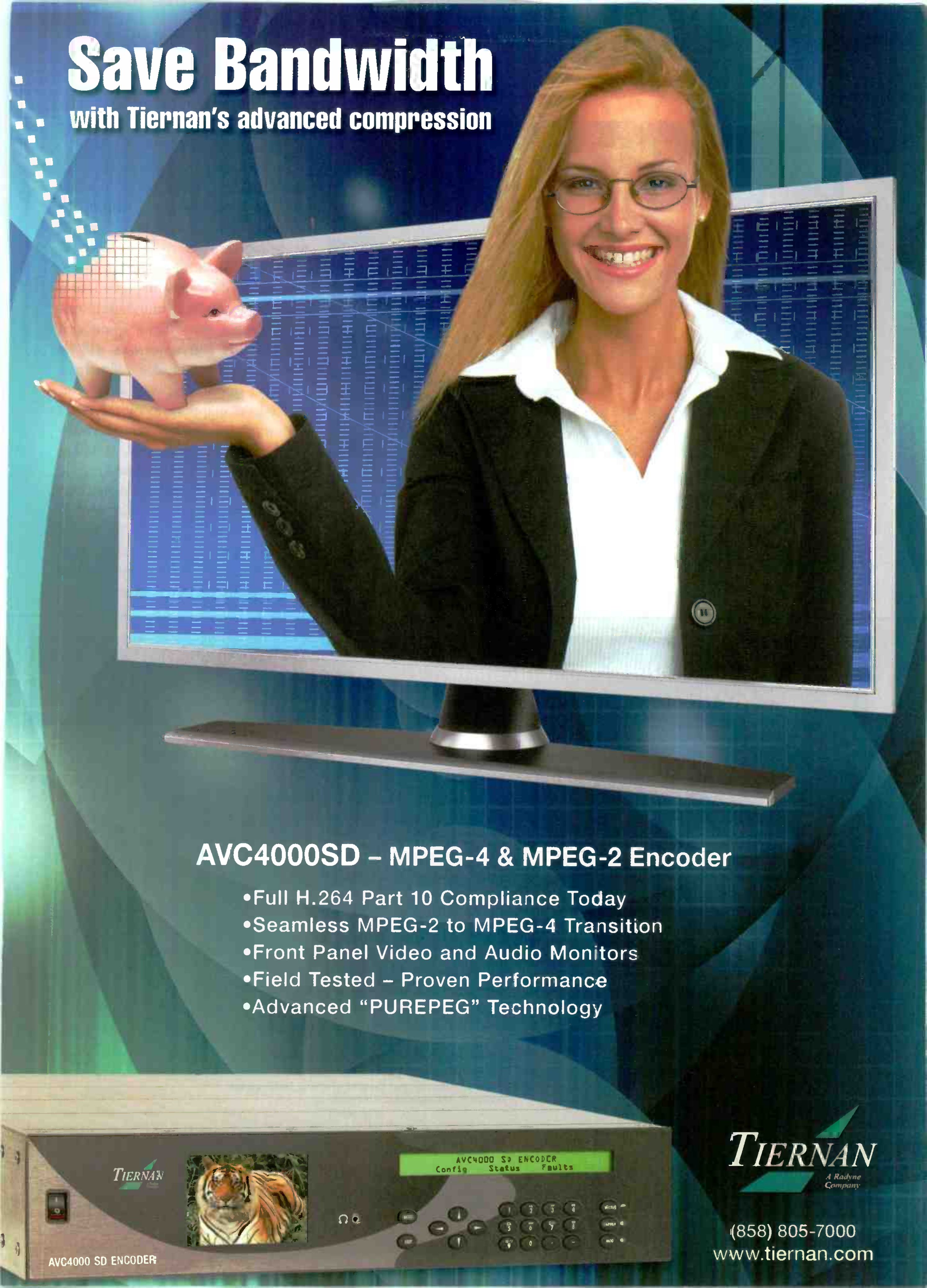
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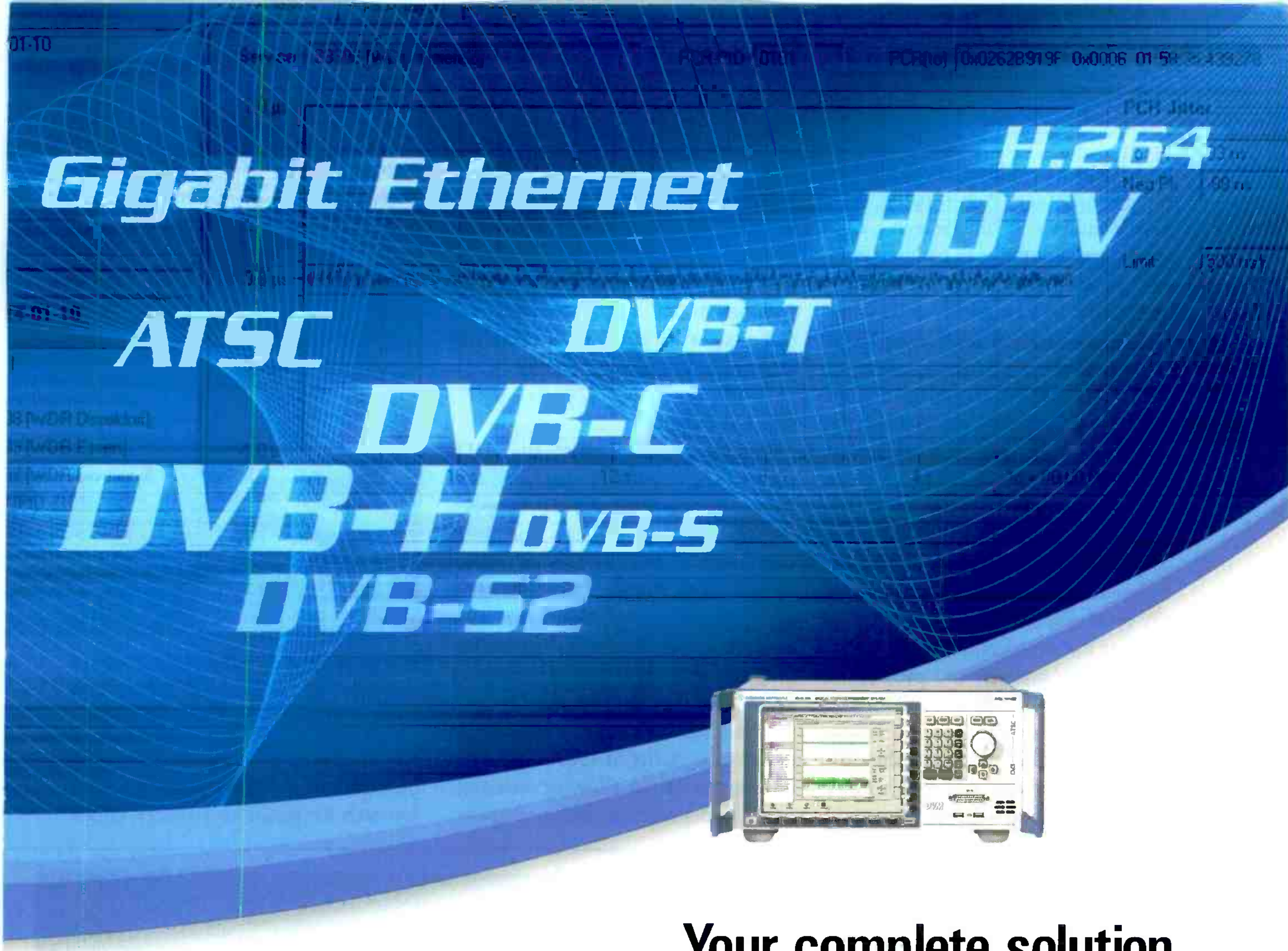
AccuWeather's SelectWarn 2.0 uses National Weather Service's new, official storm-based warnings, which are 70 percent more precise than the traditional countywide warnings.

coverage quickly. To supplement these automated displays, SelectWarn can also present reports filed by news teams in the field via Storm Hawk — a handheld, GPS-based weather monitoring and forecasting device. It sends reports and images directly to SelectWarn 2.0 for immediate, on-air display of the exact GPS location of the report.

In addition, the system includes earth-shaking maps that portray neighborhood damage within 15 minutes after an earthquake, as well as SelectWarn street-level flood-inundation animations. The latest upgrades speed the on-air presentation of street-level flood-inundation animations that show viewers how and where rivers and waterways will be flooding. The technology illustrates the river flooding at each stage over street-level mapping to quickly alert viewers about which homes and businesses should be evacuated, as well as which roadways will be closed.

In addition to HD systems, AccuWeather offers a turnkey mobile Web platform. According to recent Pew Research surveys, more than 75 percent of U.S. households have one or more mobile handsets; this is


Gigabit Ethernet
H.264
HDTV
ATSC
DVB-T
DVB-C
DVB-H
DVB-S
DVB-S2

more than 225 million in all. Most of these handsets are Web-capable. With AccuWeather's Third-Screen Network, media outlets can get their content, including weather information, on mobile devices quickly and easily.

Going HD

Weather Central has taken note of the number of stations making the switch to HD. The company offers 3D:LIVE, an HD weather graphics system. Its real-time environment enables broadcasters to tell the weather story as it unfolds, without rendering. It provides detailed topography and city-level resolution images, offering imagery for any location on the globe.

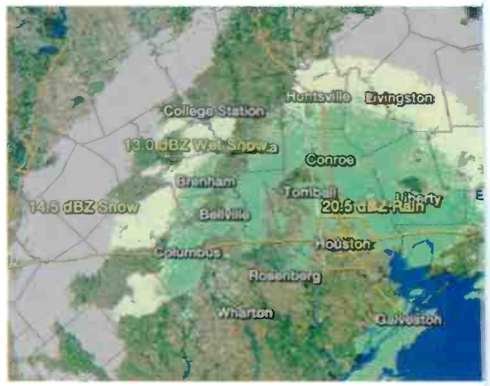
For storm analysis and prediction, Weather Central offers its ESP:LIVE HD storm tracking system. The system gives weather presenters the ability to alert, forecast and report every kind of damaging weather.

The company has also introduced MetroVision. The system provides viewers with a visual forecast, allowing stations to incorporate local photographs with simulated weather phenomena to create powerful forecast imagery and to more effectively explain the forecast.

HD displays

Baron Services has created HD-compatible weather displays that deliver native 1920 x 1080 support, eliminating the need for upconversion, which can degrade an otherwise pristine image. Each HD system uses a dual-head solution, separating weather visuals from the user interface and delivering full HD weather graphics and radar display.

The company's FasTrac HD system delivers the clarity of 1080i support in widescreen format, allowing meteorologists to deliver more comprehensive, high-resolution weather presentations. The system includes Automated Tropical Storm Tracking and other upgrades that are useful for the hurricane season. For example, with Automated Tropical



The image shown here is hydrometeor classification from dual-polarization radar. Image courtesy Baron Services.

Storm Tracking, meteorologists can instantly see the current position and forecasts for position, pressure, winds

and movement during tropical events. ETA Scan rapidly scans across a manual or automatically created storm track, refreshing the ETA marquee box with a list of all the communities that are in harm's way throughout the entire duration of the track.

Another upgrade is support for dual-polarization display and hydrometeor classification. Dual-polarization radars use horizontal and vertical pulses to derive accurate information on precipitation types and rainfall rates. A final enhancement allows users to view updated severe weather outlooks from the Storm Prediction Center at any time. Different viewing categories are accessible, including thunderstorms, winds, hail and tornadoes.

FasTrac can double as an interface with a live radar, allowing meteorologists to manage radar operation straight from their weather center. They can track storms and their effects on cities and towns down to the neighborhood level, while also pinpointing the exact arrival time at a certain location.

Likewise, the company's VIPIR HD weather system integrates radar and forecast display, live weather graphics and sensor data into one presentation, in real time with no rendering. The system has the built-in capability to deliver an entire weather show, complete with storm tracking, current conditions and Baron Advanced Meteorological Systems (BAMS) forecasting. It automatically tracks dangerous storms at neighborhood-level and navigates 2ft resolution imagery for an entire DMA and 15m resolution imagery for multiple states.

Baron Services' StormWarn alert crawl has recently been updated with HD capabilities and bilingual support for English and Spanish speaking viewers. The system delivers all the functionality of the SD system, adding 16:9 display and native 1080i or 720p performance.

It allows stations to internally and externally key. Internal key capabilities enable the meteorologists to control the graphics overlay at the StormWarn computer. With external keying, StormWarn sends the graphics needed for overlay to the master control operator.

With the system, National Weather Service watches, warnings and advisories can be configured to go on-air automatically. Customizable features allow meteorologists to list community names and display county maps, live radar or next-generation radar displays. Squeezebacks with customizable border graphics offer a way to unobtrusively show alert graphics at the same time as regular programming.

In addition, the company offers live radar and integrated Doppler systems, as well as Mobile Threat Net. The system uses a satellite signal from XM WX Satellite Weather to provide news trucks, storm vans and helicopters with real-time radar and other weather information.

Weather 24x7

Viewers want instant access to live weather information and local forecasting, and broadcasters can achieve this with Weather Metrics' 24x7 Channel. Net. The fully automated weather and news content management system integrates information and data from multiple sources and displays it in a single screen for broadcast on a digital and local cable channel.

The system displays a variety of weather and information sources at one time, providing viewers with live data and weather information 24 hours a day. It ingests and displays live video, live data from neighborhood weather networks, Internet-delivered images, graphic files, animated files, live radar, looped NWS

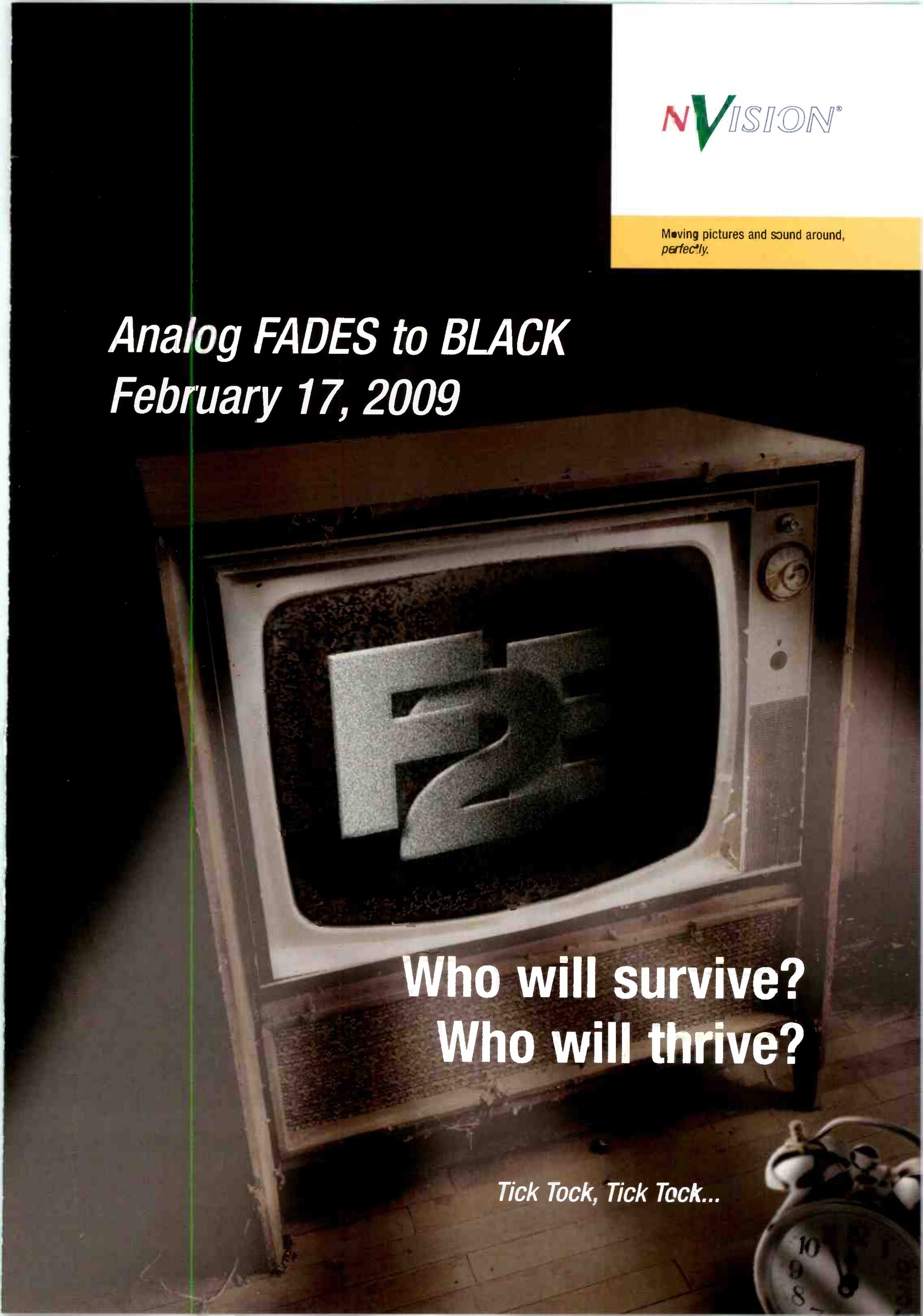
Baron Services' VIPIR HD system automatically tracks dangerous storms at neighborhood-level. Shown here is a VIPIR image of Hurricane Felix.

radar, recorded video and standard text. As data or files are updated in existing weather systems, an automated file transfer process accesses the newest information and adds it to the display.

Also, the company's WxVision. Net combines live weather information with live streaming video via the all-digital WxVision camera. All video is sent over a standard DSL Internet connection, enabling users to view live weather conditions from remote locations.

Weather Metrics' Severe Weather.Net is a fully automated, severe weather and news crawl system, available in both SDI and HD output. The Internet-based, NWS automated system includes 99 severe weather warning parameters. It supports RSS, XML and text feeds, downstream and upstream keying, DVE squeezeback, and custom messages with graphics. BE

Susan Anderson is managing editor for Broadcast Engineering.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Analog FADES to BLACK
February 17, 2009
Who will survive?
Who will thrive?
Tick Tock, Tick Tock...

Fade to Black
The analog to digit

Five players from across the broadcast industry are battling it out – trying to beat the FCC deadline for conversion from analog to digital delivery. Watch as they maneuver their way around the obstacles and try to improve their positions in a fiercely competitive field.

What will they do next?
Who can they trust?

George

Director of Engineering, 15-station TV group

With an ambitious vision gleaming in his head, George convinced corporate management to invest enough capital to "do it right." Will he go power mad, or stay focused on his goals?

George's plan:

- Consolidate operations into 5 regional facilities
- Go all HD, up-converting SD sources to HD, and down-converting HD master control feed to SD as needed
- Engineer for maximum resiliency and redundancy
- Allow for future growth

What NVISION built for George:

- Independent, expandable master control for each station
- Shelf spares ensure fast recovery from any malfunction
- Redundancy options protect all signal paths and provide full router control even if a system controller fails.
- Router expands up to 256x256 with modules, or 512x512 with a second frame.

See the whole package at
www.nvision.tv/george

Doris

General Manager, two public TV stations in middle America

She's a 20-year broadcast pro, but no engineer. Now she has to design and spec the right system to convert to digital, yet leverage her legacy in analog. Can she do it on a "charitable" budget?

Doris's plan:

- Replace 15 year-old analog routing system with digital
- Originate one HD program stream in prime time
- Originate four SD streams in daytime
- Unique branding and independent programming for each station

What NVISION built for Doris:

- A cost-effective master control system supporting 2 HD channels and 8 SD channels
- A cost-effective all digital routing system comprised of a 32x16 HD router and a 32x32 SD routing system
- Single cost-effective router control system for both routers

See the whole package at
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Digital audio 101

BY ALDO CUGNINI

Digital signal processing is often a mystery to many people, but the underlying principles are fairly straightforward and within the grasp of anyone with a technical background. In this feature, we'll take a look at the theory and practice behind digital signal conversion, sampling, sample rate conversion, and quantization noise, especially as they relate to digital audio. Although some of these principals might be familiar, we'll dig a bit deeper into the processes and offer a more in-depth understanding of the technology. Remember that the basics of signal processing also apply to any digital signal, including video.

A/D and D/A conversion

In order to convert an analog signal to digital form, sampling and quantization must be performed. Sampling is usually performed by a sample-and-hold circuit that takes brief, high-speed repetitive snapshots of the analog signal. In order to prevent sampling errors, which would cause a sin(x)/x rolloff in the frequency response of the system, the sampling period must be extremely (in theory infinitesimally) short. Quantization resolves the signal into a specific number of voltage levels. This process is defined by the number of bits needed to resolve the signal. With audio signals, these samples are usually 16-bits wide, allowing a resolution of 2^{16} levels or 65,536 different levels. (With video, 8- or 10-bit per color sampling is usually used.)

Quantization and digital conversion are implemented by one of several

different means, including flash conversion or successive approximation. In the former, a series of comparators evaluates the input voltage in relation to a set of fixed reference voltages. In the latter, a high-speed counter and D/A converter compare an estimate of the output with the input. The result of any of these methods is to generate the string of digital words that represent the samples of the signal.

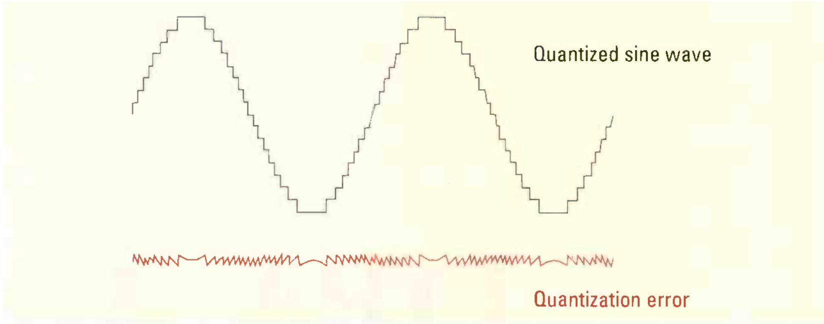


Figure 1. Quantization results in the overlay of a noise signal onto the original.

The digital-to-analog conversion is much simpler. Usually, the individual bits of the sampled signal each contribute to a weighted ladder network of resistors in a simple summing circuit. The most significant bit contributes the most weight, and each successive bit contributes one-half of the previous one. The D/A converter is then followed by a low-pass post-filter that removes the sampling frequency and repeat spectra.

Sampling and quantization

The difference between a quantized signal and its original is a low-level signal known as the quantization error or noise, as seen in Figure 1. The level and characteristics of the quantization noise are defined by the type of quantizer, the quantization resolution and the sample rate.

A well-known property of quantization noise is that the signal-to-noise ratio (SNR) in dB for a full-scale sine wave is defined by the following formula: $SNR = 6.02B + 1.76$, where B is the number of bits. This formula is true only for sine waves, however, as it depends on the distribution of the signals. For other signals, similar formulas apply, but ordinarily each added bit of resolution cuts the noise level in half, or by 6dB.

According to Nyquist's theorem, signals must be sampled at a rate at least twice as high as the highest frequency component. Otherwise, aliasing will occur, which is essentially a folding of the spectrum. In the time domain, this can be seen in Figure 2 on page 60. With the five cycles of sinusoidal signal shown, Nyquist states

that the signal should be sampled at least 10 times over this interval. Because the signal was sampled at less than the Nyquist frequency in the example, the resulting sampled signal will have a frequency lower than that of the original, i.e., it has been aliased.

Figure 3 shows the frequency spectrum of the signal, i.e., a graph of the amplitude of the signal components versus frequency. (The spectrum of the sine wave signal in Figure 2 would consist of a single vertical line at the frequency of the signal, and that would not be very illustrative. Hence, the use of wideband signal with energy distributed over the spectrum in the figure.)

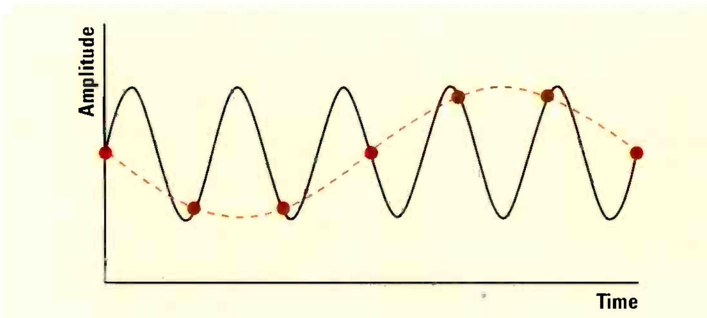


Figure 2. The red wave is the aliased version of the black one.

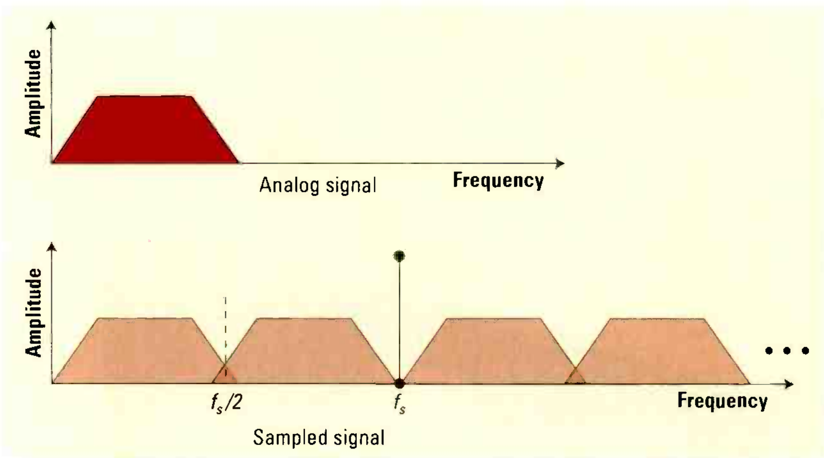


Figure 3. Sampling creates repeat spectra, and sampling below the Nyquist frequency results in aliasing, as seen at $f_s/2$.

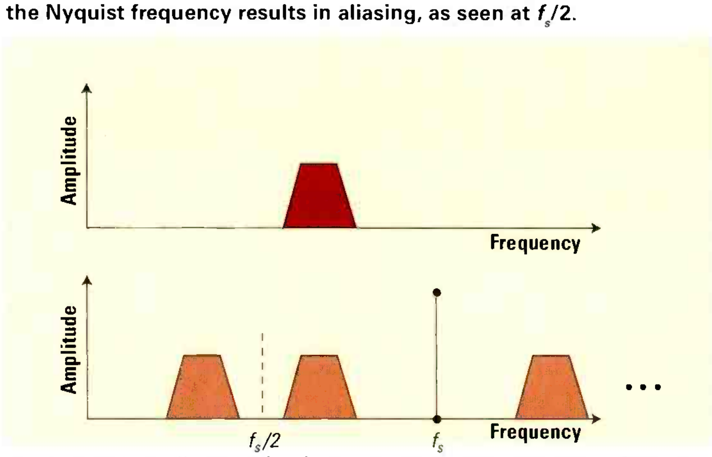


Figure 4. Bandpass signal (top) and its subsampled spectrum. Note that the alias is below $f_s/2$.

In the frequency domain, sampling has the effect of reflecting and repeating the baseband spectrum around multiples of one-half the sample rate ($f_s/2$ in the figures). (For ideal sampling, the repeat spectra repeat indefinitely;

In the frequency domain, sampling has the effect of reflecting and repeating the baseband spectrum around multiples of one-half the sample rate.

in practice however, realistic sampling will generate a series of repeat spectra that continue and eventually fall off. It is the function of the analog low-pass filter to remove all of these higher frequency components.) In the frequency domain when the wideband signal is sampled below the Nyquist rate, the signal is aliased in the neighborhood of frequency $f_s/2$, where the components overlap, and cannot be fully recovered in any subsequent processing.

One last point: If a signal is sampled at exactly twice the highest frequency, then the signal is said to be critically sampled.

However, an interesting technique can be employed to successfully subsample a signal below Nyquist. This is because the usual form of the theorem applies to baseband signals that have frequency components (essentially) all the way down to DC. Actually, the general form of the Nyquist criterion states that signals must be sampled at a rate at least twice as high as the bandwidth of the signal, and if the lower edge of the signal stops considerably above DC (called a bandpass signal), then this allows us to sample at less than two times the highest frequency. This is shown in Figure 4.

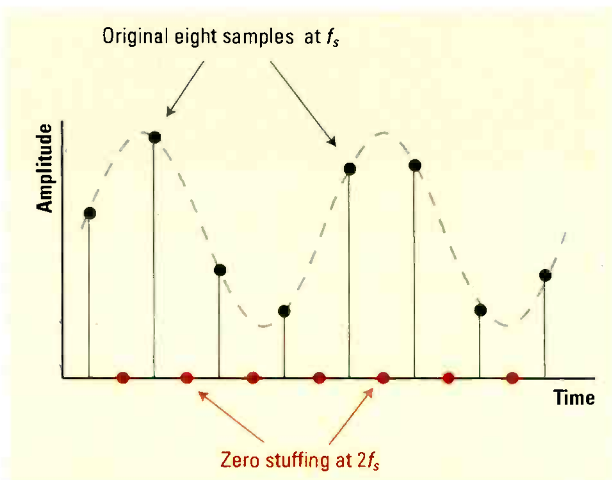
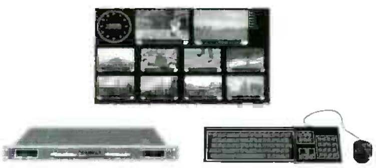


Figure 5. Zero stuffing is used to upsample a signal.

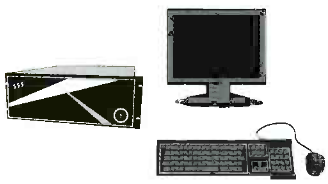
Conventional Control Room

Conventional Switcher

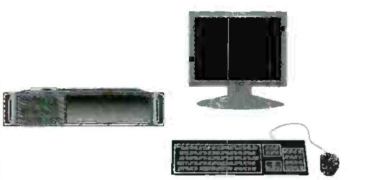
Multi-View



CG



Clip Store



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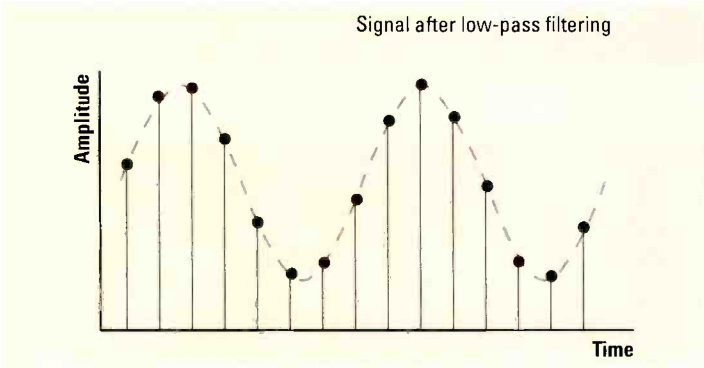


Figure 6. Upsampled signal after filtering

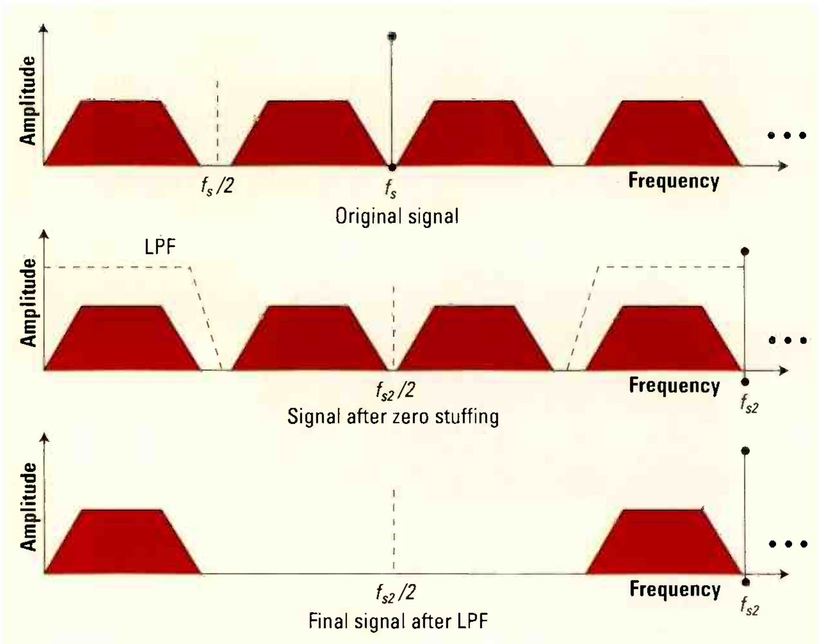


Figure 7. Upsampling is performed by zero stuffing followed by low-pass filtering.

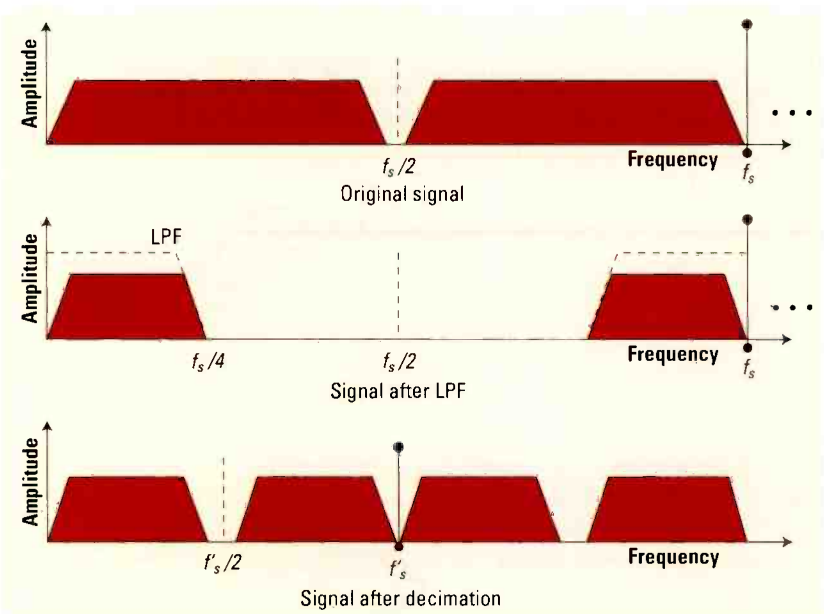


Figure 8. Downsampling is performed by low-pass filtering followed by decimation.

This subsampling can be combined with a sample-rate downconversion and filtering operation. The result, when dealing with multiple subbands, ensures that the amount of digital data does not increase — an important consideration when dealing with compression efficiency. If a wideband signal was split into bandpass signals and the result was not decimated, a data increase would result because the sample rate actually determines the amount of digital data.

To change the sampling rate of a signal, the signal can be upsampled or downsampled. When an integer upsampling is needed (also called interpolation), the process first involves zero stuffing the samples, i.e., adding a series of zero samples in between the original samples, as seen in Figure 5 on page 60, where the signal is being upsampled 2x. A low-pass filter is then used to smooth the signal, resulting in the signal shown in Figure 6.

In the frequency domain, zero stuffing has

When a rational rate change is required (e.g. 3/2), upsampling and downsampling can be cascaded.

the effect of shifting the sampling frequency to a higher set of repeat spectra. (See Figure 7.) A low-pass filter is used to remove the repeat spectra. A simple repetition of samples is not satisfactory for upsampling, as it will create alias components that will not be removed by the final low-pass filter. Straight linear interpolation will also create aliases, though at a lower level than with sample repetition.

Downconversion is performed by a similar process. In order to satisfy Nyquist (and avoid aliasing), it's necessary to first low-pass filter the signal and then decimate the result. For example, to downsample the signal 2x, it must be low-pass filtered at $f_s/4$, and then every other sample is discarded. Ideally, it should be a brickwall filter, so that no aliasing is produced — but ideal filters are expensive and have long delay, so some amount of residual high-frequency components is sometimes tolerated. The process in the the frequency domain is shown in Figure 8.

When a rational rate change is required (e.g. 3/2), upsampling and downsampling can be cascaded. Through clever designs, these conversions are often performed at the same time, minimizing the number of computa-

computations. When an asynchronous rate conversion is needed (where the source and destination sampling rates are not integrally related), interpolation or decimation can be carried out on a sample-by-sample basis. However, while this allows for the most versatility, fixed low-pass filters cannot be used, as there is no integral relationship between the sampling rates. Therefore, some kind of cubic spline or similar operation will be performed on the neighboring samples in order to minimize aliasing.

Quantization revisited

Long ago, a clever observation was made that the quantization SNR applies over the entire bandwidth of the digital signal — and hence, a signal that is oversampled will have a lower noise floor within the usable bandwidth. Thus, it is possible for a 1-bit converter with 16x oversampling to have the equivalent audible SNR as a critically sampled 16-bit converter! Such a design is often used in consumer digital equipment, as a 1-bit D/A converter is trivially easy to implement. It is essentially just a low-pass filter — the D/A and post-filtering are both done at the same time.

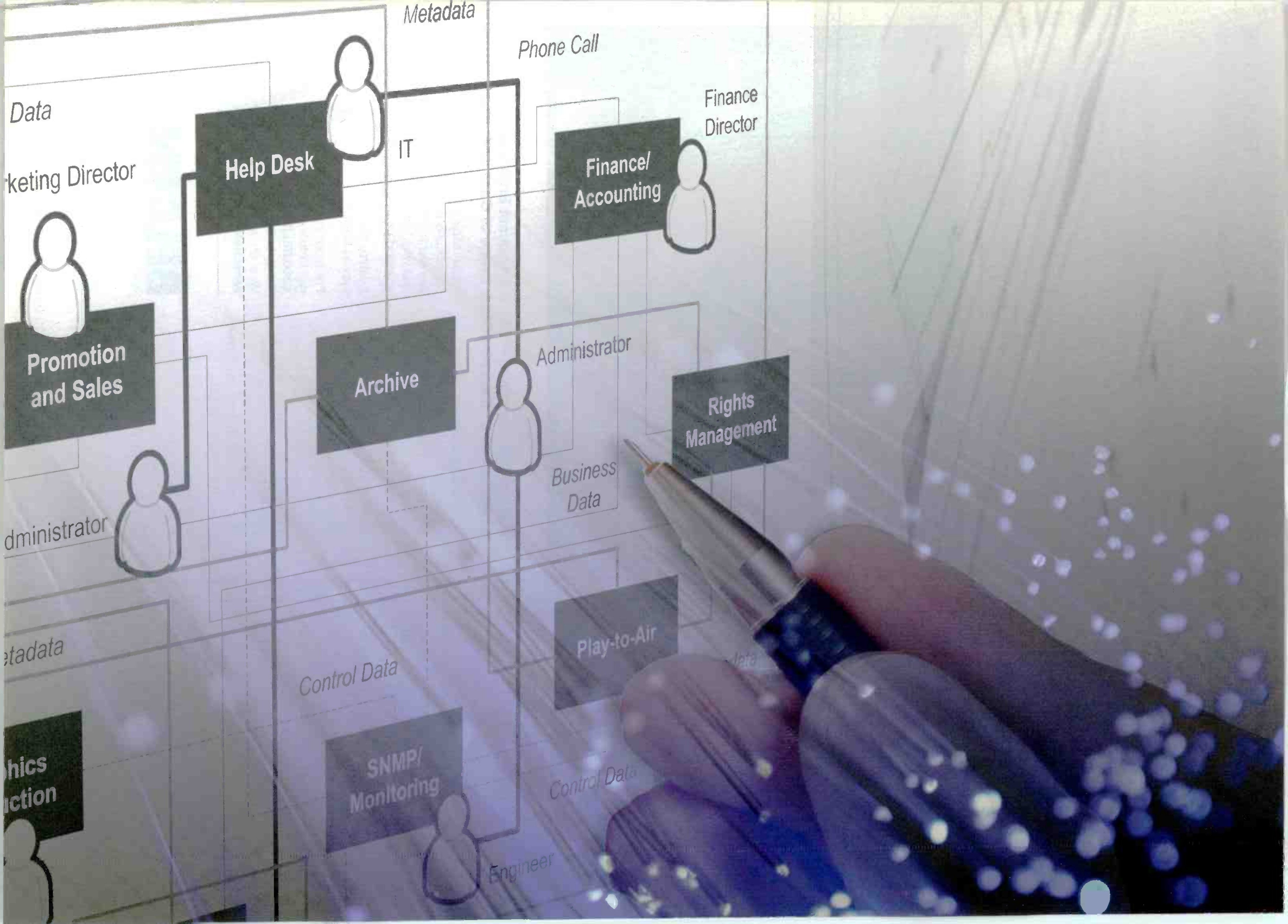
It is possible for a 1-bit converter with 16x oversampling to have the equivalent audible SNR as a critically sampled 16-bit converter!

Another benefit of oversampling is that the first repeat spectrum above the baseband signal will be much higher in frequency than it would have been if the signal were critically sampled. Compare, for instance, the top and bottom signals in Figure 7. The bottom signal can have a simpler and less-expensive low-pass filter that takes an entire octave to roll off above the highest component of the signal, whereas the top signal requires a filter that rolls off quickly before $f_s/2$.

Class dismissed

There you have it; you're now an expert in digital signal processing. The next time you have to deal with signals at different sample rates — or even video at different resolutions — you should have a better idea of what's going on inside conversion equipment and what differentiates amateur components from professional gear. BE

Aldo Cugnini is a consultant in the digital television industry.



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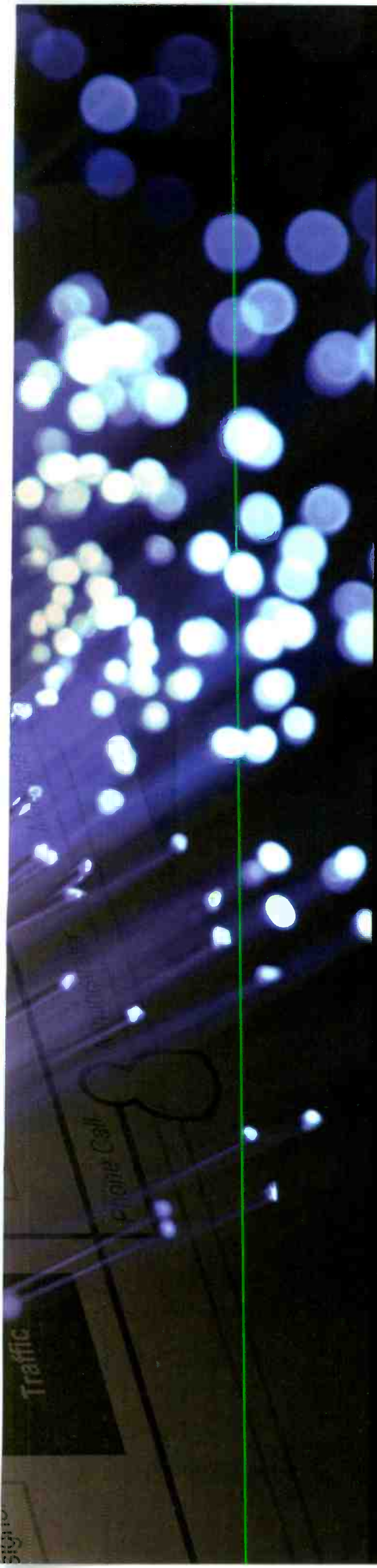

Service Oriented Architecture

BY JOHN FOOTEN AND JOEY FAUST

SOA is the new way to design a facility's workflow.

The broadcast industry has a great need for agility and efficiency in dealing with new technologies and business models. Distributing content to HDTVs, mobile phones and software-based media appliances imposes new challenges on the production workflows of all media enterprises.

Advances in technology are moving so rapidly that media companies can no longer add or change a system without considering how quickly it will become obsolete. Although file-based production allows for less expensive, faster turnaround, it also introduces new issues such as security, administration and media management, all of which must be dealt with efficiently. Large, single-vendor, vertically integrated solutions with a long ROI are quickly becoming impractical.

Media companies have traditionally integrated each new system or business model separately. Getting one new system online in a media enterprise can be relatively straightforward. A new HD editing system, for example, can usually be installed and configured relatively easily. Connecting it to other systems in the enterprise (such as automation or asset management) was likely part of its selection process, so integrating it in the workflow is largely an exercise in vendor management.

A patchwork approach to integrating each new system and business model, however, really doesn't work in the digital age. (See Figure 1 on page 66.) Even with good system-design practices, this course of action will create further hurdles over time. After two, three, 10 or 20 such additions, a media enterprise is left with multiple silos of vertically integrated systems working together over tenuous communication channels. This kind of tightly-coupled, point-to-point architecture inevitably relies on informal data (phone calls, e-mails, etc.) to communicate important production-chain information (such as tape numbers or clip metadata). Data can be easily lost, misunderstood or entered with errors into multiple systems. Each subsequent change becomes more difficult than the previous because each system iteration adds complexity.

The real challenge today is not to address each individual change, but the process itself of making these changes. In short, broadcast companies need to build business agility into their design process and infrastructure so that when faced with new distribution models or content-production requirements, they are able to react efficiently and effectively. In the digital age, this has become essential to broadcasters and media facilities. A technology solution known as Service Oriented Architecture (SOA) is one way to do this.

Understanding SOA

A system architecture that addresses the business needs faced by broadcasters today must:

- Facilitate the development of highly reusable business and infrastructure components.
- Have an easy-to-implement alteration and update strategy for these components.
- Allow for the greatest transparency of standards and other communications options among these components.

A focus on reusability and ease of alteration allows such a system to address both current and future business requirements. (See Figure 2 on page 68.) SOA is such an approach; it treats discrete and reusable business functions as services because they offer a business service to the rest of the enterprise. Instead of concentrating on points of integration and technical compatibility, SOA operates according to a functionality-centric facility design. Beginning with the traditional tightly coupled verticals of software, an integrator can design and connect reusable services using SOA technologies.

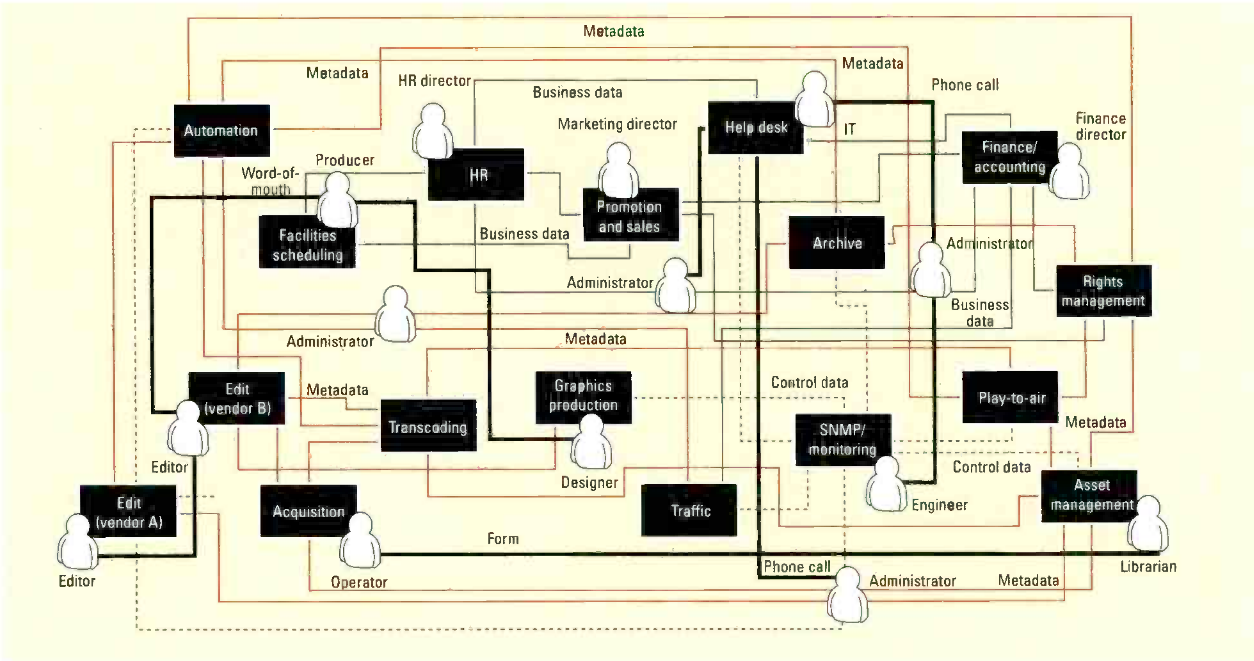

Figure 1. Tightly coupled architectures rely on siloed software, direct paths of integration and informal data. Each additional change in such an architecture adds more complexity.

Even though most software vendors (including producers of software-based media systems) do not currently claim SOA support, their software can be made compliant to a facility's SOA by wrapping the programmatic interfaces offered by the software to a service interface. (See Figure 3 on page 70.) This creates reusability because vendors that offer different implementations — but essentially the same business service — can be individually wrapped to present the same service interface. A service interface is the only communication point between that software and the rest of the media facility in an SOA, so it presents a single point for alteration. If the underlying application changes, only the connections between that consistent wrapper and the specifics of a vendor's API need to be changed. This is known as separating interface from implementation.

The way an SOA addresses greater transparency is through the use of a common messaging "layer" built over an enterprise network. This middleware layer provides the communication infrastructure needed for various services to interoperate. It is a single network, which means that there is a common location for data management, information gathering and security. However, it can also be distributed over many computers or many facilities, providing necessary redundancy and reliability.

Once several services are connected

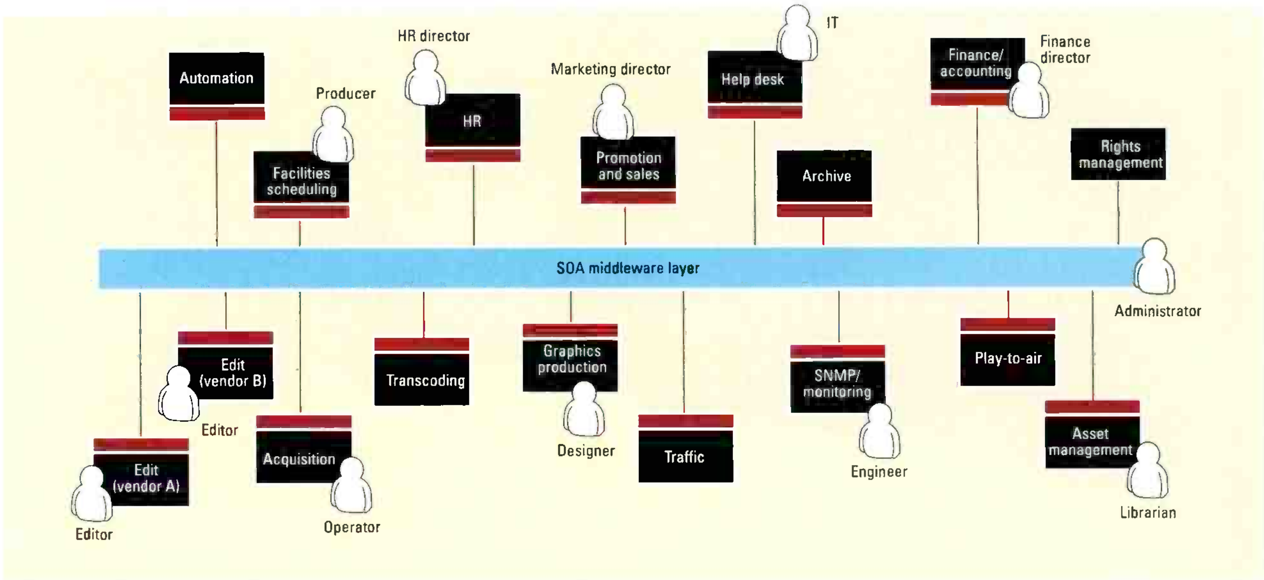

Figure 2. A Service Oriented Architecture uses wrappers and a unified middleware layer to open communications to all systems. SOA facilitates agile reusability and unified management of business logic.

to the middleware layer, the benefits of SOA begin to really become apparent. Some of the best practices of Business Process Management (BPM) can be put in place in the form of automated business processes that work in the middleware layer and orchestrate communication among services.

Depending on how it's defined, SOA has been around for a decade or more; it is not a new concept. The media industry is one of last verticals to begin adopting SOA extensively throughout its business. SOA has been put to use successfully in many other industries, including manufacturing, banking, retail, healthcare and telecom. Billions of dollars a day move through an SOA middleware layer. In fact, in heavily regulated industries (such as healthcare or finance), the use of defined services helps companies meet stringent privacy and security requirements. It also helps ensure that new business models and technologies fall within regulation.

SOA in media

Media professionals can immediately conceive of potential services such as transcoding, distribution, scheduling and automation that would be good choices for integration. Using SOA, a media facility can service-enable many aspects of workflow, effectively becoming a Service-Oriented Media Enterprise.

Some areas that initially seem applicable may cause second thoughts for broadcast professionals, due to the high reliability requirements and real-time processing needs of many media applications. Past experience may suggest that commodity IT solutions don't always meet the high standards that media facilities demand. In addition, the concept of a middleware layer may at first seem to be a single point of failure. This is a common reaction, but not necessarily an accurate one. Using well-established techniques such as server clustering and various redundancy and security schemes, a Service-Oriented Media Enterprise can ensure the same reliability in its computer systems as it is accustomed to in its broadcast systems.

Modern networks and modern media applications are fast enough to handle many upstream processes in a faster-than-real-time manner. It is important, however, not to assume that this fact implies that media will be moving across the middleware layer like SOA messages. An SOA will not generally alter the routes through which the media flows in a facility (whether those routes be SDI, FTP, or other transport). SOA does, however, offer the opportunity to abstract and automate control messaging or metadata movement. In other words, SOA can handle the non- and near-real-time applications that make up the vast majority of the modern broadcast facility.

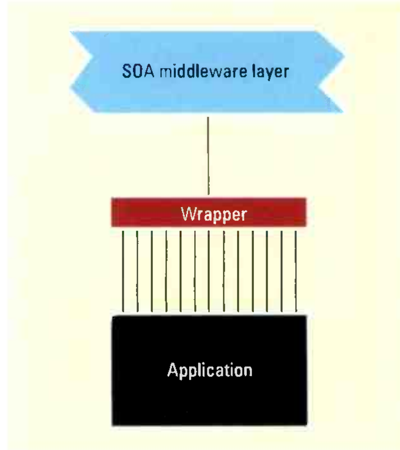

Figure 3. Service wrappers separate the details of implentation from the interface presented to the rest of the architecture. They also provide an efficient location for alteration should any aspect of the service or middleware layer change.

There are many business challenges that are easily solved by SOA in broadcast. Asset management, automation, and rights and security are a few examples of immediately applicable uses of SOA. Any media enterprise hoping to keep up with the steeply rising curve of business changes would do well to consider using SOA when approaching these applications.

State of SOA in broadcast

The beginnings of the SOA revolution in the broadcast industry are underway. A quick walk through the exhibits at NAB or IBC is enough to convince any media professional that many vendors have heard of SOA and are incorporating this methodology in some form into their products (or at the very least into their marketing messages).

Many vendors support a Web Services interface and make the claim that they are service-enabled. It is important to note, however, that these two are not the same thing. Web Services is the most common technology used to support SOA architecture. It is XML-based and provides standards and technologies for all of the necessary components of an SOA. SOA is a design methodology, while Web Services is an underlying technology. The knowledgeable broadcaster must be careful not to take a vendor's Web Services interface as an indication that the product is inherently service-oriented.

There are, however, products on the market that organize themselves into distinct business services, each of which could as easily communicate with a third-party product presenting a similar interface as they could to other services in the product architecture. These vendors are getting the message of SOA and realizing that interoperability and established standards are the keys of making integration work. The vertical "silos" of integration that currently exist in many facilities can be slowly opened and integrated with the horizontal processes of the media enterprise.

There are also media vendors that offer middleware solutions (and often media-specific ones). A middleware solution in broadcast should be one that considers the types of business processes that a Service-Oriented Media Enterprise uses and interoperates with many third-party services over standards-based communication methods to accomplish this work. These solutions, when properly implemented, will become the core of the SOAs that are the future of the broadcast industry.

Some media enterprises have begun to incorporate middleware into their system architecture and have begun to service-orient their business. These early adopters will see the benefits of agility and visibility as other media companies are struggling with constant business change. The shift to SOA is inevitable; indeed, it has already happened in most other industries. The sooner that a media enterprise adopts the SOA methodology, the better prepared it will be to face coming challenges. BE

John Footen is a vice president and Joey Faust is a systems engineer at National TeleConsultants.


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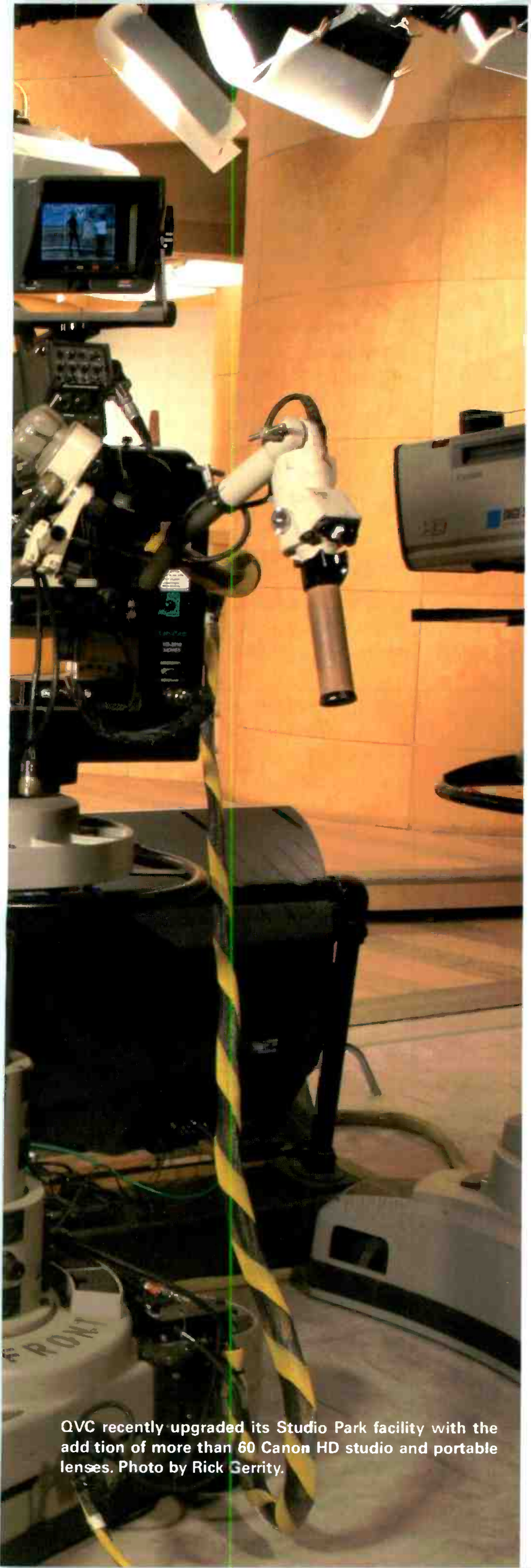
MARC BOUWER



QVC recently upgraded its Studio Park facility with the addition of more than 60 Canon HD studio and portable lenses. Photo by Rick Gerrity.

Maximize your HD camera's performance

BY LARRY THORPE

Consumer HDTVs are becoming commonplace and continue to improve, with full 1920 x 1080 resolution and larger, brighter models featuring contrast ratios that are achieving impressive levels. Maximizing the image-creation performance of an HD camera combined with an HD lens must anticipate this unprecedented new HD picture performance yardstick now present in so many homes.

When speaking about HDTV picture quality, creative people often make use of such superlatives as high sharpness, crispness, high contrast, richness and vibrance. When videographers, cinematographers, directors and other creatives use such language, they are in fact expressing a psychophysical response to the multidimensional nature of HD pictures. The separate optimization of each of the contributing picture attributes — which include sharpness, tonal and color reproduction, and exposure latitude — is critical to high overall image performance of an HD lens-camera system.

The six stages of HDTV origination

HDTV origination is a six-stage process that starts with the lens performing the all-important initial act of image creation. This is followed by the camera imager's sampling of that optical image (both spatially and temporally) and its transformation to an analog representation. This, in turn, is followed by the image's conversion into a very high data rate digital representation and then digital processing of the three RGB video signals. (See Figure 1 on page 74.) All five of these processes imprint their own imaging characteristics onto the final HDTV video signal. In the case of the now ubiquitous HD camcorder, a sixth stage entails digital processing to lower the huge camera digital data rate before it is recorded to videotape or one of the numerous new tapeless media.

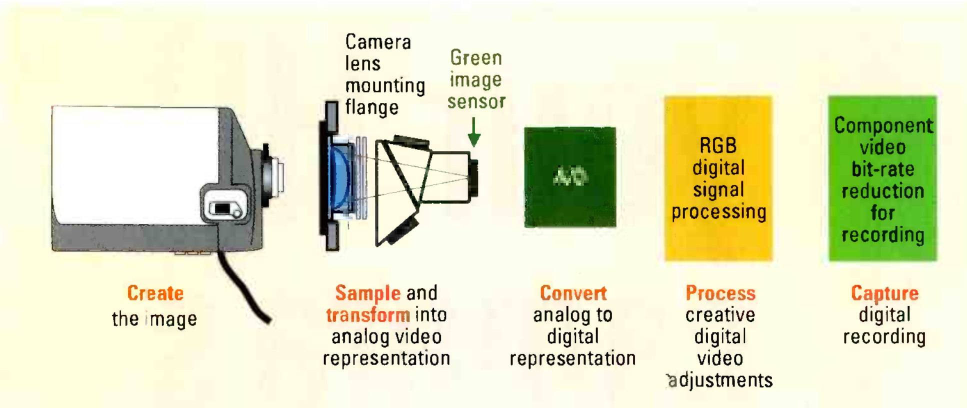


Figure 1. The origination and capture of an HDTV digital video signal is a six-stage process. Each stage imprints a performance footprint onto all of the separate attributes of picture quality.

Maximizing HD camera performance

Table 1 correlates the separate image-related parameters of HD lenses and HD cameras with those picture attributes that contribute directly to overall HD picture quality. All of these lens and most of the camera-imaging parameters are inherent in their respective technologies. In the case of the camera, there are additional variables in the form of video controls that manipulate some picture-performance attributes, which are shown in yellow in the table.

Key picture attributes	Lens	Camera	Final picture performance
Sensitivity	• Maximum relative aperture	• Electronic sensitivity (imager plus drive circuits) • Video gain	• Operational sensitivity (and SNR spec) • Minimum illumination
Sharpness	• Diffraction • Defocus aberrations • Surface quality of lens elements • Dynamic behavior of MTF with actuation of zoom, focus and iris	• Optical prefilter • Sensor count • Sensor fill factor • Electrical post filter • Digital image enhancement • Skin tone detail	• Sharpness at picture center • Sharpness at picture extremities • Sharpness changes as lens controls are operationally manipulated
Tonal reproduction	• Black reproduction (flare and veiling glare) • Highlight reproduction (point spread function and protection against reflections) • Relative light distribution	• Black level controls • White shading correction • Gamma • Black gamma • A/D converter	• Reproduction of detail in deep shadows • Reproduction of color details in deep shadows
Exposure latitude	• Contrast ratio • Reflections and ghosting	• Imager dynamic range • A/D converter bit depth • Nonlinear calculations bit depth • Nonlinear strategies (knee etc.)	• Handling of strong highlights • Preservation of detail in highlights
Color reproduction	• Spectral response • Element coatings	• Spectral response of: • IR filter • Beam splitter • Imager • Linear matrix • Secondary color corrections	• Extent of the color gamut that can be accurately reproduced

Table 1. A correlation of the image-related parameters of HD lenses and cameras and the picture attributes that contribute directly to overall HD picture quality. In yellow are video control variables that manipulate some picture-performance attributes.

Clearly, the lens has a definitive first say in the quality of the HDTV picture. The imaging parameters for the HDTV lens listed in Table 1 will be significantly different between a large studio box lens and a compact portable ENG lens. This bears directly on the quality of the HD image sought for a specific program genre.

For the purpose of this article, two extremes of HD television production will be profiled. First, high-end studio production seeks the best HD imagery using the highest performance HD lens and HD camera available. Second, field acquisition for HD news seeks the best HD imagery possible with a low-cost tapeless HD camcorder and HD lens.

Figure 2. A close-up shot includes important outlines and transitions that should be sharp and devoid of artificial edge contours. It should also show subtle textural detail in human faces and clothing, which is a key imaging attribute that distinguishes HDTV from SDTV.

Maximizing HD studio lens-camera performance

Following competitive evaluation, the selection of a contemporary HD studio camera conforming to the highest HDTV production standard of 1920 x 1080 at 60p is assumed. Maximizing the HD picture from that camera requires an equally careful choice of a high-end HD studio box lens.

Beautiful HD studio origination entails an overall pleasing sharpness across the entire image allied with superb tonal and color reproduction. Picture edge sharpness (accurate reproduction of all outlines and transitions, with no artificial edge contouring) combines with high contrast and faithful reproduction of all textures within the scene. Studio origination requires optimized imagery across the entire 16:9 image plane as the principal talent in news interviews and talk shows are often framed at the picture extremities. (See Figure 2.)

Key concepts to keep in mind when selecting a studio camera and lens, include:

- Carefully evaluate the lens parameters listed in Table 1, including sharpness, and tonal and color reproduction.
- The camera must not usurp the role of the lens. It should be understood that the camera is not the primary determinant of picture sharpness, contrast ratio or color gamut. Rather, its digital video controls are applied to the creative optimization of each.
- The HD lens is master in creating subtle textures, closely allied with the creative skills of the lighting director, makeup artist and camera video operator.
- Studio sets can embody large defined horizontal and vertical edges. On wide-angle shots, these will test the geometric distortion performance of an HDTV lens. Such specifications are not published, and only careful subjective testing of HD lenses will uncover the degree of optimization of this distortion achieved by each.

Further steps need to be taken for optimization. Engineering and production should work as a collaborative team and view the final HD images on a large (60in or more) precisely calibrated high-performance HDTV monitor. Hiring a professional actor or model is a good investment for the initial tests and adjustments. A new camera will benefit from the involvement of the manufacturer's technical specialist. At the outset, adjust the camera for accurate reproduction of the studio scene, that is, a faithful representation of the object image projected by the lens. Do not apply digital image enhancement or color correction at this stage. Set lighting levels and lens aperture to achieve the desired facial illumination and depth of focus between the news anchors at their desk and the background studio set.

Adjust the various camera RGB controls (using appropriate grayscale and color test charts) to achieve superb tonal reproduction between capped

It should be understood that the camera is not the primary determinant of picture sharpness, contrast ratio or color gamut.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black and reference white. Follow with an optimized reproduction of overexposed studio highlights and details in deeply shadowed areas using all of the contemporary nonlinear tools in the camera. (See Figure 3.)

The all-important treatment of anchors and prominent talent will require final adjustments to lighting and makeup while framing a close-up within the studio set. Makeup should be subtle and uniformly applied. Seek reproduction of a natural-looking sharpness with pleasing texture on the large HD studio monitor. Follow this with a medium-angle shot of three subjects (preferably with different skin and hair coloring) sitting across the news desk and framed to span the 16:9 image plane. Sharpness, contrast and color should be subjectively equal for all three. Production should now make the final creative decision on application (or not) of a small amount of digital image enhancement for a subjectively optimized image of the three anchors on the large viewing monitor. Carefully recheck this on a close-up of a single anchor. Choose a best compromise between the two settings (amplitude of optical image detail is altering with lens focal length as shown in Figure 4).

Finally, examine a wide selection of colored materials (both high saturation and pastel) on the HD monitor, including the clothing favored by anchors. This will aid final decisions on the degree of secondary color correction that might be required in the HD camera.

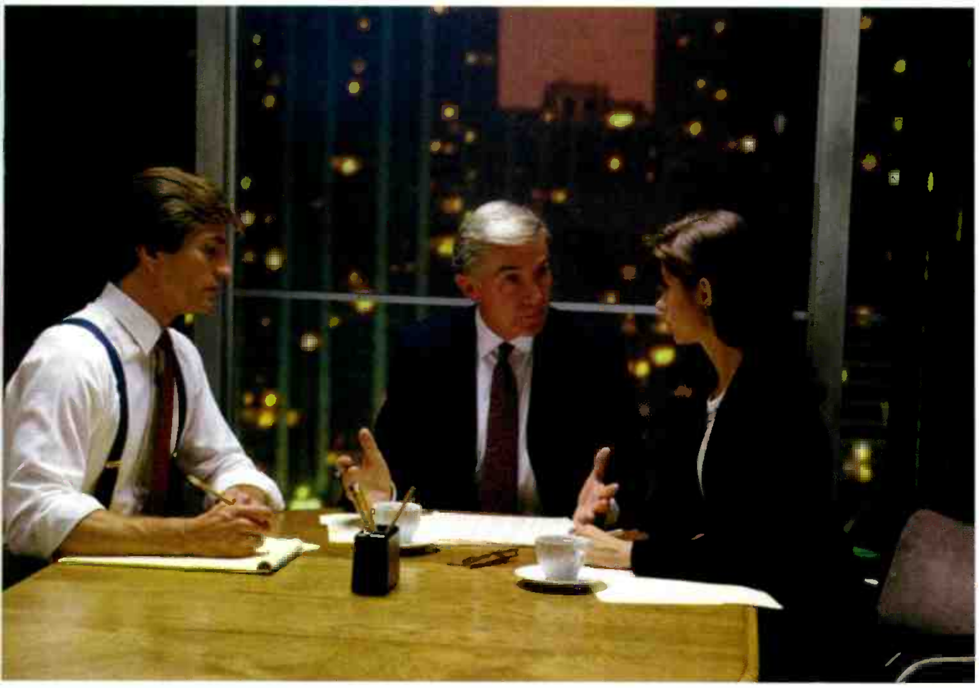

Figure 3. In medium wide-angle shots, edge sharpness is more prevalent and textural information has increased in spatial frequency. The nature of this picture requires all image attributes be optimized over the entire image plane.

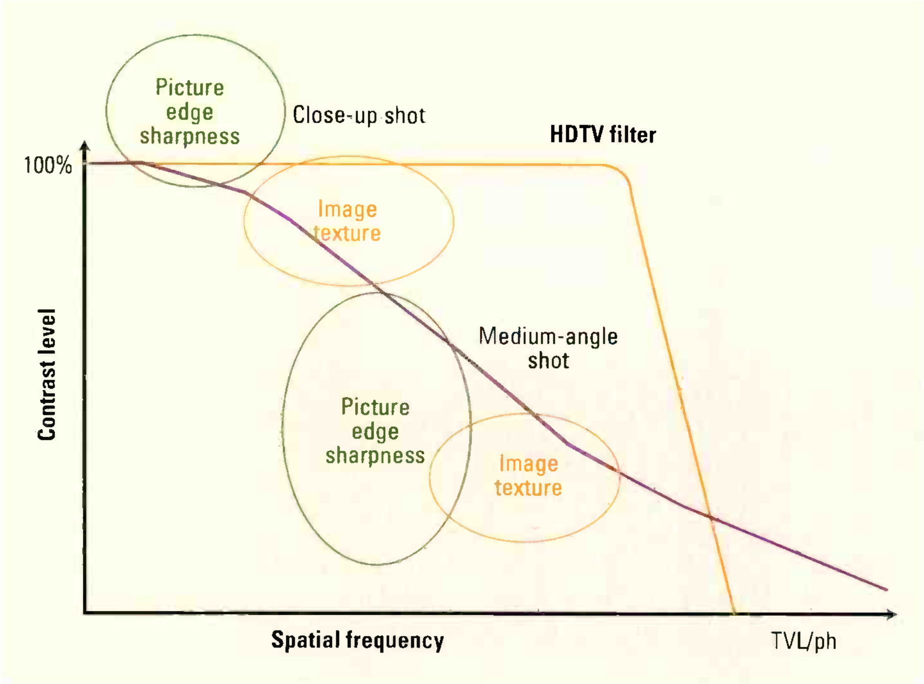

Figure 4. MTF for a typical 2/3in HDTV lens-camera. Lens focal length changes cause edge sharpness and textural spatial frequencies to ride the HD lens-camera curve, thus posing a challenge to a single optimized setting of camera digital image enhancement.

Maximizing HD field lens-camcorder performance

The new generation of tapeless HD camcorders leverages multiple technologies to lower cost, size, weight and power. Camera sections include a range of image format sizes, choices of CCD and CMOS imager technologies (with an attendant broad range of sensor counts in these imagers), different bit depths in A/D conversion, and different DSP bit depths for digital nonlinear RGB video calculations. Lens manufacturers have introduced a second tier of portable HD lenses specifically designed to complement the cost and performance of these new tapeless camcorders.

Separately, the recording sections of these HD camcorders resort to a range of aggressive bit-rate reduction strategies to meet the specified recording times of disparate media,

which include tape, optical and hard disk drive, and solid-state memory cards. These strategies include component video color recoding, digital filtering and bit-depth reduction, and finally, advanced compression algorithms employed (many with quite aggressive compression ratios). There are subtle imaging footprints associated with all of these expediencies.

Maximizing HD ENG picture performance entails different criteria than those used in HD studio cameras, the imperative being the best possible imagery within the technical constraints listed. Engineering must collaborate closely with production and news photographers in this quest. Optimization of the central zone of the image plane in terms of sharpness, contrast, color and exposure latitude is a priority.

Superb picture edge sharpness off the recording media should be the primary concern for ENG. Everything that the HD ENG lens can possibly deliver to the camera over that lower and midband spatial frequency range is precious contrast detail that comes with no additional penalty in noise, aliasing or compression artifacts.

The unpredictable scene illumination (day and nighttime) encountered in ENG shooting places a special priority on reconciling optimization of camera dynamic range with the bit depth of the recording system.

Key concepts to keep in mind when selecting an HD lens and camera for ENG, include:

- At picture extremities, the HD ENG lens sharpness will be compromised relative to that of the high-end studio lens. The contrast will likewise be impaired at picture extremities (relative light distribution characteristic). Optical aberrations will also be higher.
- Minimizing digital image enhancement has a special importance in ENG in that the filtering and compression of the recording system can exacerbate associated aliasing and noise as well as alter edge transitions created by that enhancement.
- Patient and iterative testing and adjustment is required to maximize the playback performance of any of the new low-cost tapeless lens-camcorder systems.

Figure 5. The HD ENG picture should seek optimization of imagery in the central zone of the picture (where primary subjects are generally framed) and accept any inherent modest shortfalls at picture extremities.

Further steps need to be taken for optimization. Start with the camera (initially ignoring the recording section) using the direct HD-SDI feed available on most HD camcorders. Optimized tonal reproduction of high contrast scenes will require particular care in the setting of the overall nonlinear transfer characteristic (black levels, white shading, gamma, black gamma and knee controls).

Record a range of carefully selected test pictures (reflective of news acquisition in daytime and nighttime) in the camcorder, and play back the pictures onto a large accurately aligned HD monitor (preferably in the region of 60in diagonal). Compared to the raw camera images, the imaging footprint of the recording will be apparent. For example, some scene color detail may fall victim to color component coding strategies (such as 4:2:0 and 4:1:1) together with associated digital filtering.

Textural detail may be somewhat compromised by digital recording bit-rate reduction strategies. Compensating for these may require iterative adjustments to camera image enhancement controls (recording and playing back each time) to optimize sharpness of the central zone of a medium-angle shot. (See Figure 5.)

Eventually, an optimized set of adjustments will be identified that provide the cleanest, sharpest high-contrast imagery in the central region of the picture. Any attendant imaging shortfalls at the extremities should simply be accepted. Most HD camcorders allow storage of these special ENG settings on a memory card.

Summary

HD studio cameras outfitted with studio-style HD box lenses provide maximum HD performance, delivering the best possible image across the entire image plane. Only the studio box lens embodies all of the required performance attributes. HD ENG camcorders outfitted with portable HD lenses don't offer the same performance as their studio cousins, but are essential for news. HD image performance is nevertheless impressive, as these camcorders exploit powerful contemporary digital-camera controls that optimize the look of the HD playback. BE

Larry Thorpe is the national marketing executive of the Canon Broadcast and Communications Division.

It's important for broadcasters to identify the total cost of ownership of operating and maintaining an IPTV service. Photo courtesy ANT.

SPECIAL REPORT

IPTV: Reducing total cost of ownership

BY HEMANG MEHTA

IPTV technology has experienced tremendous growth in the past four years. The technology has evolved from an initial concept to the brink of commercial deployments.

There are several reasons for this progress. First, telecommunications service providers understand that they must provide a competitive offering to counteract declines in landline subscriptions. Second, consumers are demanding more interactive and personalized television services. Third, the technology required to make IPTV a reality has come of age.

Now that IPTV has become a reality, the industry chatter has shifted from "this will never work" to "how soon can I get it?" But little has been said yet about the different approaches to constructing IPTV platform architectures and the resources to operate and maintain them. It's time for the industry to address the total cost of ownership (TCO) of operating and maintaining an IPTV service, as well as fully understand the different IPTV options available and the TCO associated with each.

IPTV service models

In today's market, there are basically two IPTV service approaches. First is the heterogeneous approach, in which multiple vendors provide different components of the solution, often with one or more systems integrators providing the services that bind these heterogeneous solutions into a single service delivery solution. In this approach, operations management is typically layered on top of the service delivery system after the fact. Second is the homogenous approach, in which a single solutions vendor designs, builds, tests, validates and supports the IPTV service delivery and operations management solution.

There is a perception that both approaches can deliver IPTV subscribers a similar service experience. However, the TCO associated with each service delivery approach differs greatly. There are a few factors that affect the TCO of an IPTV delivery platform, including:

- content acquisition costs to deliver the best of TV programming to consumers;
- operating expenses (OPEX) for the development, ongoing delivery and maintenance of the service delivery infrastructure; and
- capital expenses (CAPEX) for the service delivery hardware, software and network infrastructure.

Content acquisition

Content acquisition costs vary based on revenue opportunities that a service provider can offer a content provider. Typically, the content costs are based on the number of subscribers. However, the expanded service delivery opportunities afforded by IPTV may change this. If the IPTV service offers subscribers a chance to select alternate camera feeds from a sporting event, for example, the content provider that owns these feeds may charge a higher fee for content.

There may be some variations in pricing for content delivered over IPTV. However, service providers will likely pass along these additional content fees in the form of higher subscription fees, so the net effect of any content cost variations will be negligible on TCO. Consequently, content costs are not a critical component in the calculation of TCO for the purpose of this article.

Hidden just under the surface, and often overshadowed by the licensing costs, are the costs for setting up and operating the delivery of content. A digitized stream or a file is inconsequential unless it is associated with sufficient metadata that describes it.

For example, let's say a service provider pays a specific fee to license the use of a channel. The program information — such as the start time, end time and the program description — are the more obvious elements of the metadata that must be managed. Associating the digital stream generated by the encoder to a multicast address, assigning network identifiers to transmit this stream across the network, and connecting license keys that allow subscribers to access this channel are all metadata elements that must also be managed. Collectively, the digital file and all the metadata required to deliver this channel is referred to as a service. There are costs associated with maintaining and operating services.

A homogeneous IPTV platform can support picture-in-picture applications.

Operating expenses

Certain OPEX will be startup costs, such as the costs associated with initial deployment and with the integration of the IPTV infrastructure with existing business support systems (BSS) and operations support systems (OSS). Other OPEX are ongoing, including the expense of day-to-day monitoring and managing the infrastructure.

In addition, OPEX will arise as a result of decisions to change or evolve the service delivery network. These expenses are project-related expenses, but upfront decisions about how the service provider will deliver the IPTV service can lead to higher operations costs and more complex projects when it is time to upgrade or evolve the service delivery network. These downstream costs must be factored into the TCO equation.

Capital expenses

To offer IPTV as a subscriber-oriented service requires investment in a platform to deliver and manage the service. The service provider must acquire systems for encoding and delivering live content as well as systems for encoding, storing and delivering video-on-demand (VOD) content. The service provider must deploy systems to manage this content and its delivery. It must also deploy systems to monitor and maintain the network, the content delivery and the management systems themselves. This is just a high-level description of a central headend installation. There are multiple metro headend configurations that involve local content delivery servers, local VOD servers, local management servers and more.

TCO for such a network infrastructure depends in part on the service delivery approach selected by the provider.

Heterogeneous approach

The heterogeneous approach typically involves the integration of different systems, such as billing, operations support, VOD and content ingestions, from various vendors. Each system performs a specific task in the delivery of the IPTV service. To perform these tasks as well as they do, the systems often rely on specially tuned or proprietary technologies that can be costly to acquire and support.

Integrating these systems requires that a service provider engage a systems integrator. The work involved with integrating, testing and validating the solution can be complex, costly and time-consuming. No single party is responsible for the entire solution, so problems arising at any stage of the integration effort can be difficult to resolve — particularly if the problem involves hardware and software from different vendors.

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Take the case of content acquisition costs. Besides the fixed costs of encoders, there is a real cost (operations) for ensuring a service is correctly delivered. A service is more than the digitized file (or stream), and it is more than the program descriptors. It includes delivery provisioning and can effect not just the encoder, but also service delivery components and the subscriber management components. Making a change in one area can often result in a cascading change through the platform. The number of touch points and different systems involved in a heterogeneous approach make this a costly task.

Due to many years of building voice networks, telcos may be familiar with the heterogeneous approach. It offers certain attractions, because it enables a service provider to build a service delivery solution based on best-of-breed components that may have been fine-tuned for the delivery of IPTV. At the same time, telcos are familiar with the downside of this approach: Best-of-breed products are so focused on doing one thing well that they are often built on specialized or proprietary architectures that are costly to acquire and support. Moreover, individual component vendors are unlikely to have built their products to interact with precisely the collection of components in a given heterogeneous service delivery configuration. There are simply too many possible configurations and variations.

IPTV can be used in electronic programming guides, mobile devices and video-on-demand applications.

Success is a matter of adjusting one's

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No single solutions vendor has tested and validated the entire solution prior to the service provider's acquisition of these separate components, so the creation of a heterogeneous solution requires a costly and time-consuming systems integration and testing effort.

Homogeneous approach

The homogeneous approach emphasizes the creation of a comprehensive IPTV service delivery and management platform based on a single integrated architecture. Wherever possible, the homogeneous approach relies on cost-effective, industry-standard hardware and software components. Where industry-standard components are unavailable, the vendor developing the solution offers the service provider a choice of specialized components that have already been integrated, tested and validated to ensure proper service delivery.

Operations management is incorporated as a core component of the complete solution — not an afterthought. The vendor developing the homogeneous solution has already identified the operations management needs at every point from rollout to routine maintenance. It has identified, tuned and validated the operations management tools as part of the development of the service delivery solution. Even operations management costs are lower because everything a service provider needs to build and maintain the IPTV service is provided as part of the platform.

This approach has caused the industry some concern. Some claim the homogeneous approach represents a closed architecture that does not give the service provider a complete choice of vendors or best-in-class technologies. However, the homogeneous approach does allow for third-party technologies and applications to be built on top of the main platform, while ensuring accountability when problems arise.

Operations and maintenance costs

TCO involves more than the cost of deploying the hardware and software associated with the core service delivery platform. Maintaining the highest QoS across a distributed network demands 24-hour support. Given that the annual cost (fully-loaded) of a well-qualified support technician can run between $100,000 and $150,000, recurring OPEX costs can be among the most important to consider when calculating TCO.

Reducing TCO requires an IPTV approach that enables a small

operations management team to work efficiently. If the service provider chooses a heterogeneous systems approach, OPEX costs may be higher than if the service provider selects a homogeneous systems approach.

There are two key reasons why this is true. First, the individual components in a heterogeneous solution are typically specialized or proprietary, so they typically require the attention of support personnel with specialized training and experience. These personnel usually command higher salaries in the marketplace. Second, operations management in the heterogeneous approach is typically layered on top of the solution as an afterthought. As a result, the operations management component may not provide the levels of automation and efficiency that would enable the service provider to support a large distributed network with a lean operations team.

An approach to operations and maintenance that enables a service provider to rely on a leaner and less costly support staff can have a dramatic impact on TCO. Reducing the size of the operations team by seven or eight positions can reduce annual costs by $1 million or more.

Upgrading or adding to a service package

It is clear that television services will evolve. Often the thrust for evolving TV service is based on competitive pressures. A competitor offers a VOD package that includes unlimited use of a popular television serial. The service provider facing this competition will have to respond, not just to replicate the offer, but to ensure that there are valued differentiators that they can offer. Service providers have to give their subscribers strong reasons to sign up and stay with them.

A heterogeneous platform will require multiple rounds of negotiations to ensure that the various systems can all support the new service. In direct contrast, a platform is just that — a platform on which consumer packages can be created and can evolve. There is a monetary cost involved with both approaches, but there is a notable difference between the two.

The best approach to IPTV service

An ideal IPTV service merges the best of the homogeneous and heterogeneous approaches. This platform would take a homogeneous approach insomuch as it is a complete solution that is architected, validated, delivered and supported by a single vendor. It would rely on industry standard hardware and software to facilitate the delivery of an IPTV service at lower capital expense. It would include operations management tools and approaches that enable a relatively small team of operations professionals to manage a large distributed service delivery environment.

This IPTV service would preintegrate specialized service delivery components where preintegration would reduce risk, cost and complexity. At the same time, it would be open and tending toward heterogeneity where such an approach enables the service provider to make choices that reduce cost and increase its ability to innovate. Taking this open yet homogeneous approach would enable a service provider to deliver a powerful IPTV service at a significantly reduced TCO. BE

Hemang Mehta is product management director for the Microsoft TV business for Microsoft.

IPTV operators must overcome five major challenges in order to be successful. Photo courtesy ANT.

SPECIAL REPORT

IPTV: The telco catch-22?

BY MICHAEL DARGUE, BOB HOUSE AND ED NAEF

IPTV is finally coming of age. Major telcos in the United States and overseas have launched their services and now compete with cable and satellite operators in the pay-TV market. In the broader market of content delivery, consumers have even more choice, as online players and consumer electronics giants enter the game.

The big question is: Who will triumph in this battle for domination of the living room? In an increasingly competitive market, will IPTV ever be profitable for telcos, or is it actually a catch-22 — can't survive without it, can't make money from it?

Looking back to when IPTV was first espoused, today's competitive landscape is different from that envisaged. Facing declining revenues in their core business, telcos saw IPTV as a unique opportunity to leverage investment in broadband and deliver a new generation of entertainment services. However, since then, cable operators have developed their own comprehensive on-demand services, removing a key anticipated differentiator. Telcos must now work harder than ever to make a success of their IPTV investments.

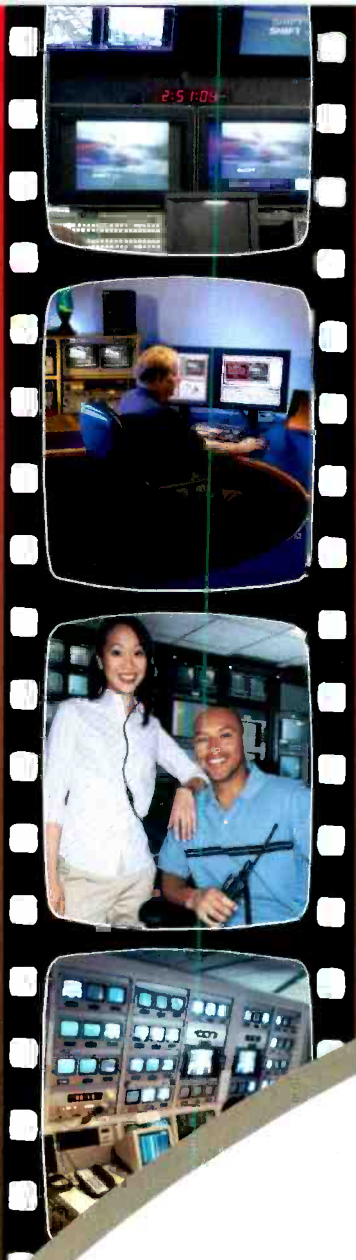
Challenges for IPTV operators

To become successful, IPTV operators face five major challenges:

1. Getting the basics right. Given the complexity of IPTV platforms, it is perhaps unsurprising that it is difficult to successfully launch services. The challenge is to quickly address these issues to avoid customers perceiving IPTV as inferior to cable and satellite. The risk of spiraling costs in customer care makes earnings before interest, taxes, depreciation and amortization (EBITDA) and customer-retention imperative.

2. Securing appropriate and adequate content. Securing good content deals continues to be a significant challenge for IPTV operators. Compared with satellite and cable providers, they lack the experience and have significantly less subscriber scale. Some telcos have acquired exclusive sports rights, particularly soccer in Europe, but this is a high-risk strategy, and the investment case is far from guaranteed. Collaboration between IPTV operators to improve their collective voice may help to improve the range of available content.

3. Developing advertising-funded capabilities and models. To deliver profitability, IPTV operators need to extend revenue generation capabilities



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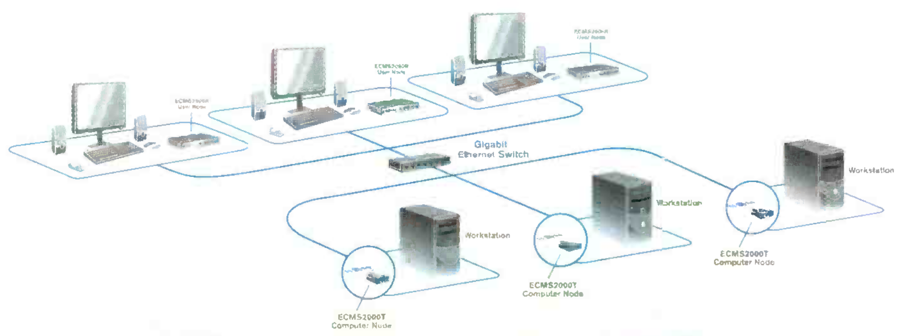

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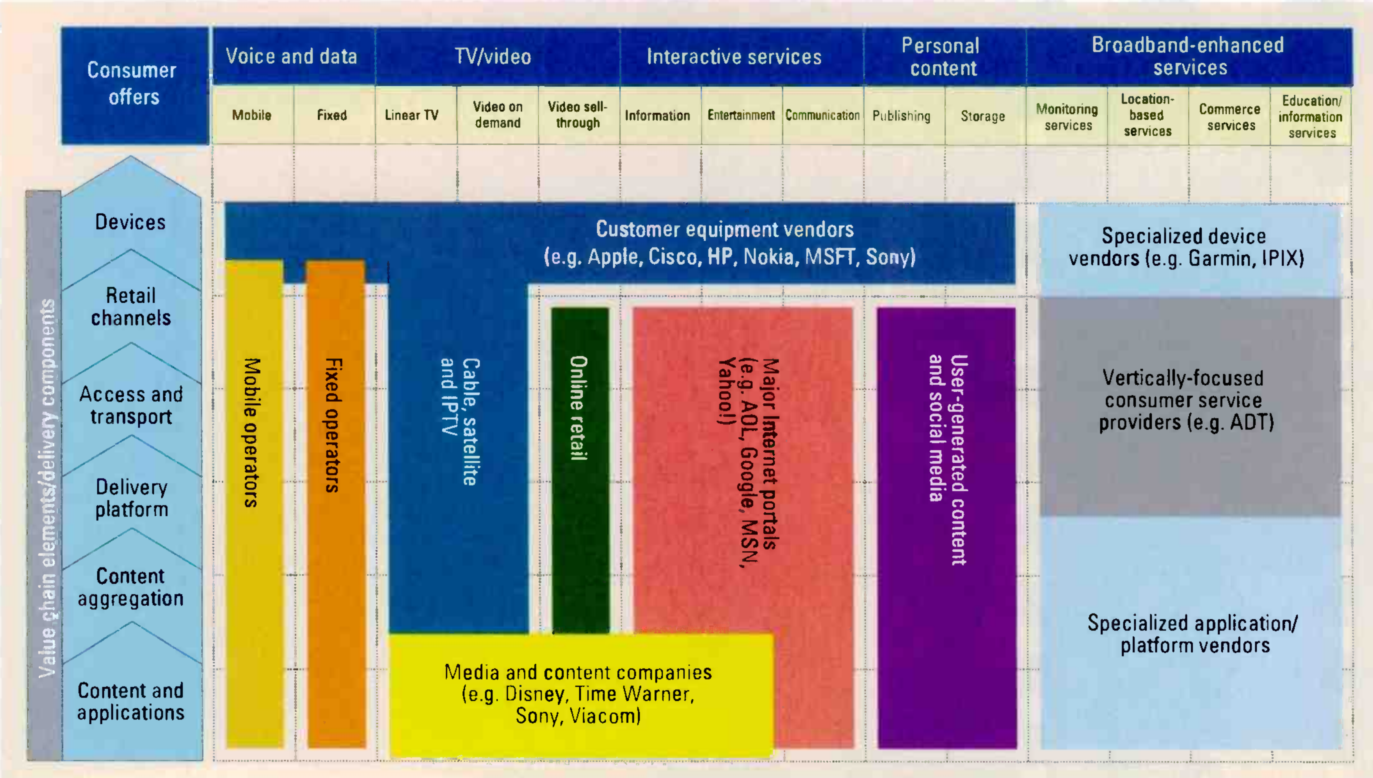


Figure 1. Digital marketspace map illustrating territories of the major players

beyond subscription and pay-per-view services. Advertising potential extends from basic banner advertising in the electronic program guide (EPG) to sponsored on-demand content. However, technical hurdles remain, and telcos may lack the necessary relationships and scale to generate significant advertising revenues at this stage.

4. Moving from commercial convergence to functional convergence. The

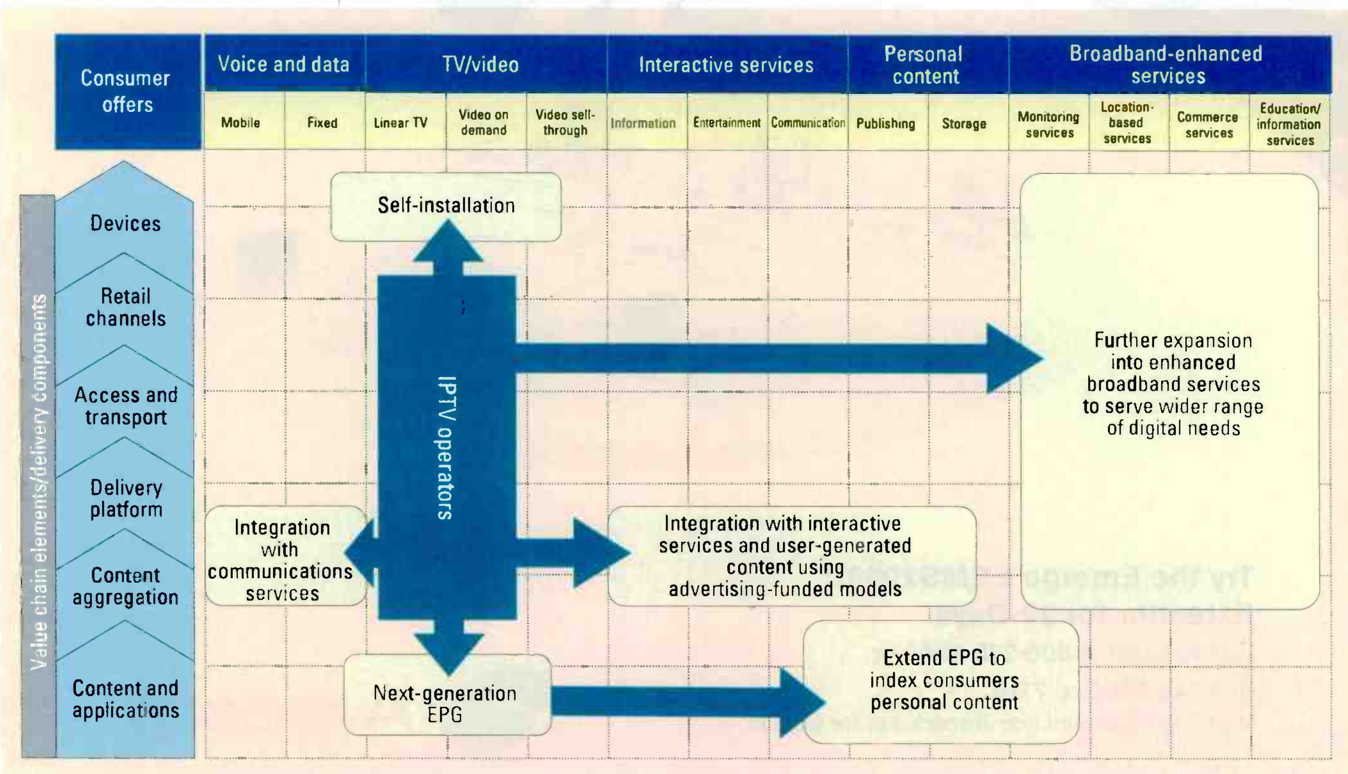
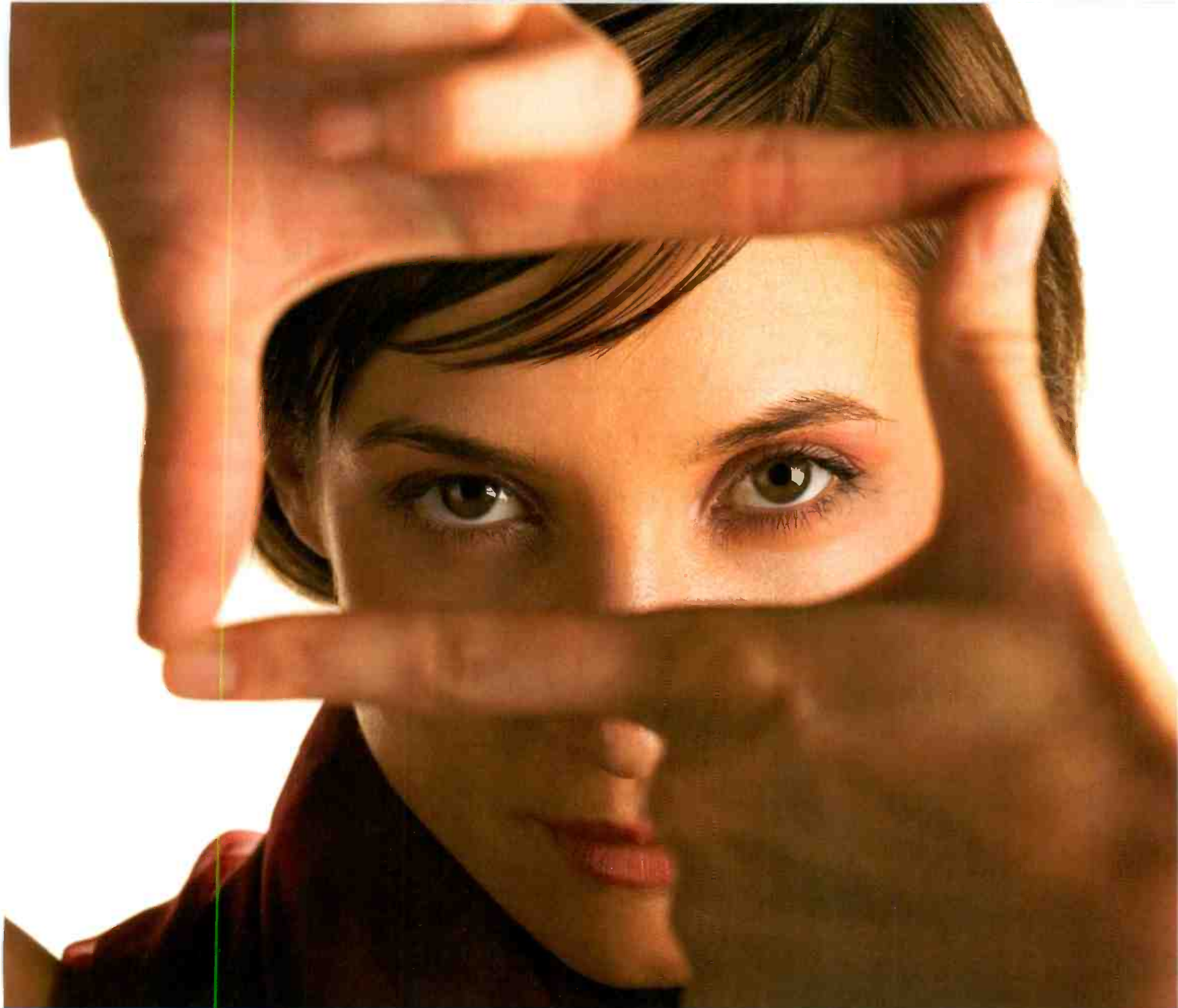


Figure 2. IPTV operators must develop their propositions to survive in the digital marketplace.



triple-play bundle of IPTV, Internet and voice is a popular approach to promoting services, but bundle discounts may undermine profitability. Commercial bundling is also easily replicable, with replication by competitors likely to increase pressure on pricing. To avoid a price war of me-too offers, telcos should instead seek to enhance and differentiate their customer experience through functional convergence. Potential examples include cell phone control of PVRs and in-program electronic messaging, both of which could have customer loyalty upsides.

5. Delivering personalization. In the longer term, telcos are well-positioned to capitalize on personalization, given their experience with centralized resource management (CRM) systems. Service providers must exploit the customer profiling capabilities of their IPTV platforms to deliver targeted advertising that will both enhance revenues and differentiate their offers.

A crowded digital marketspace

As IPTV operators attempt to gain market share from cable and satellite operators, other players are not sitting idle. Figure 1 on page 94 illustrates the territories of the other major players and reveals sources of competitive tension.

While telcos have pursued horizontal expansion, other players have

To avoid a price war of me-too offers, telcos should instead seek to enhance and differentiate their customer experience.

expanded vertically to capture a greater share of the value chain. Media and content companies, for example, have started offering their content direct to consumers over the Internet. Sites such as MTV Overdrive, AOL In2TV and Movielink offer a broad range of content for download, with a variety of revenue models.

Customer electronics vendors have also been expanding across the value chain. Examples include Apple TV, which enables iTunes video content to be watched on the television, and TiVo's partnership with Amazon Unbox, which allows users to download paid content direct to their TiVo.

Meanwhile, Sony has launched the BRAVIA Internet Video Link, enabling consumers to browse and view selected online content for free

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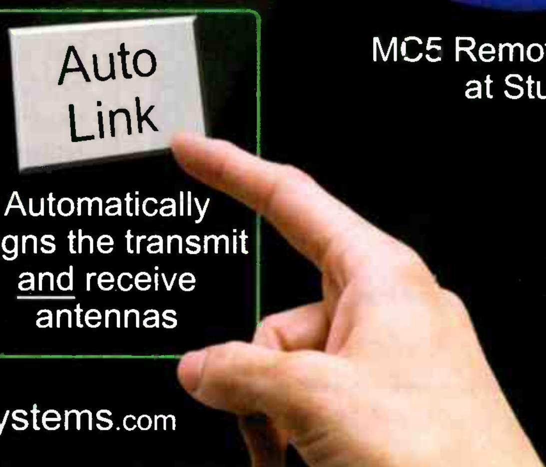

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on BRAVIA HDTV sets. This development is particularly interesting as online content is streamed direct to the TV rather than via the download-then-view model adopted by most online movie rental sites.

In the online space, Internet TV sites such as Joost and Babelgum are emerging with advertising-funded business models bringing free content to users for PC viewing. The risk to pay-TV providers is that this may set a wider expectation that on-demand content should always be available for free.

User-generated content also threatens the conventional IPTV business. Web sites such as YouTube, MySpace and Flickr have been highly successful in connecting creators of niche content with globally distributed audiences. Whether these major portals will move into TV-centric delivery remains to be seen; however, emerging services point to the potential for personalized, advertising-funded channels.

Telcos must make the best of a challenging situation, as they are faced with both abundant Internet-based competition and mature satellite and cable competition.

For telcos, online alternatives to IPTV both increase competition and threaten to relegate their role to that of bit-shifting utilities. It is a cruel irony that the telcos' broadband networks are enabling services that could undermine their own fledgling IPTV businesses.

However, the success of online video services may be their own undoing. Explosive demand is likely to cause a capacity crunch that will impair the quality of these online offers. In contrast, ownership and control of the access network enables telcos to assure the quality of experience of their IPTV service. They may also choose to make such capabilities available to their competitors — at a price — and the net neutrality debate continues to rumble on.

Strategic priorities for IPTV operators

Telcos must make the best of a challenging situation, as they are faced with both abundant Internet-based competition and mature satellite and cable competition. They must invest in services that will struggle to make a decent return in the short term. The temptation to over-invest in premium content should be resisted as a good return on investment is unlikely to be achieved. Instead, operators should look to differentiate themselves through the IPTV platform itself. (See Figure 2 on page 94.)

The EPG is at the heart of the user experience for IPTV. It has the potential to become IPTV's killer application.

Through the EPG, operators have a vehicle for defining a unique user experience on their platform.

A well-designed EPG guides users to relevant content with minimum effort. Additionally, the EPG can weave deeper into the fabric of consumer's digital lives. For example, operators could integrate IPTV with existing communications services, enabling functionality such as electronic messaging and social networking within the IPTV user interface. A second example would be to extend the reach of the EPG to index and access consumers' personal content, for example photo albums and digital music collections.

In parallel with the development of a compelling IPTV proposition, there is a clear need for operators to invest in customer education regarding the overall value of IPTV. With so much choice in online and digital media, too few customers understand what IPTV has to offer and why they would want it.

Telcos should also assess and understand what opportunities advertising-funded business models could offer to their own IPTV business. The interactive nature of IPTV enables richer, more engaging advertising formats and also enables ads to be targeted to consumers with far greater accuracy than broadcast media has been able to achieve. From both a technology and cultural perspective, operators have a potential lead in this area that they should seek to exploit aggressively.

Longer term, there is a real opportunity for the IPTV set-top box to emerge as the hub of the digital home, enabling a wide range of mass market and niche vertical applications, such as home security and management services, e-commerce applications, and training and education services.

The telco catch-22?

So what is the prognosis for IPTV in 2007? In the near term, IPTV really is a catch-22. Only by accepting this will operators be able to adopt a long-term view and develop services along a strategic roadmap. IPTV does have the potential to become a major player in the pay-TV landscape, but it will be hard to achieve this potential.

The immediate priority is to ensure that IPTV is not perceived as inferior to cable and satellite services. Moving forward, positive differentiation is required if subscriber targets are to be reached. Perhaps more importantly, additional revenue streams must be derived in order to achieve sustainable profitability.

In the long run, telcos' ability to run robust networks will play a critical role in delivering market-leading IPTV services. In the meantime, operators must build capabilities in less familiar areas to create the platform, propositions and user experience necessary to survive in this increasingly competitive market. BE

Michael Dargue is manager and Bob House and Ed Naef are vice presidents for CSMG Adventis, a TMNG Global Company.

Small Tree's Edge-Core

Do you have the right switch anymore?

BY STEVE MODICA

Whether you are into broadcasting, post-production, video capture or editing, you are probably making greater demands on your switching hardware than ever before.

Customers are demanding higher quality content, while at the same time forcing more of their data exchange (phones, video and audio) onto the network. Systems (even inexpensive embedded units like printers) are starting to come equipped with 1GigE. Wireless access points are getting faster as well. The results are often lackluster at best and disastrous at worst — phone calls and video with jitter, failed captures and lost data.

What can you do to assure that you're not headed for a train wreck with your current switch?

First of all, the old adage "you get what you pay for" applies here. The retail network switch market is extremely competitive, and almost all vendors price their hardware as low as possible. Paying less generally means getting less. You will either get less support, less performance, fewer internal resources or fewer features.

You could move to a name brand unit, but the costs are prohibitive. Is it really worth paying five times the cost of a retail unit for the extra peace of mind?

After a great deal of searching and negotiations with manufacturers, Small Tree now carries a line of switches called Edge-Core. They have the performance and reliability of the high-end units at a low cost.

Considering our assertion that less cost means less support, less performance, fewer resources and fewer features, let's go through those in detail.

Gauging support and performance

Support often speaks for itself. When something does melt down, who is going to get on the phone to help? Most switches end up installed in relatively simple configurations where debugging is generally no more complicated than moving cables and ports around to see what's broken. When additional hardware — such as multiple networks, IP telephones and wireless networks — is added to the mix, things get more complicated, and fast. If you run into a multicast loop, your network can come down very quickly, and without the help of experienced network personnel, most end users won't figure this one out. The switcher line supports high-end features like spanning-tree protocol to help work out issues like this without a lot of fuss. And the service team is well-equipped to assist users operating Apple systems.

The Small Tree Edge-Core switcher provides spanning-tree support, broadcast storm control, static and dynamic link aggregation, and link-level flow control.

If you run into a multicast loop, your network can come down very quickly, and without the help of experienced network personnel, most end users won't figure this one out.

Switch performance is a difficult concept to understand. A switch seems like a bunch of electronic plumbing, connecting a group of systems together. Everything is gigabit Ethernet, so one would assume all switches are the same. In fact, a quick online census of good vs. bad switches shows that just about all vendors claim their switches are nonblocking and will provide line rate performance. This means that, in theory, the user could have each port pushing data out, sucking data in, or both, all at 1Gb/s simultaneously.

This would be great provided that's what we all wanted to do. The problem is most networks aren't set up to work this way. Data isn't uniformly spread across a network on 23 machines. Data lives on the server. Phones connect to a private branch exchange (PBX). The server and PBX aggregate many connections into one place. Thus, the switch has to deal with the natural congestion that occurs when bursts from multiple locations try to go to one place. This same phenomenon occurs in the broadcast industry when a server is asked to

multicast content to many machines.

For example, a group of broadcast application engineers recently called to ask if our Ethernet driver had issues because their video was jittering when it was sent to 30 clients. After some quick investigation, it was discovered that their line rate switch was dropping packets almost immediately when they started their video feed. It could not deal with the congestion of a single gigabit stream getting replicated to 30 other ports. This would seem like an obvious thing for a high-performance switch claiming to handle line rate capabilities. Our switcher line is able to handle these bursts smoothly and let your network and server ride through these issues longer and with little or no disruption.

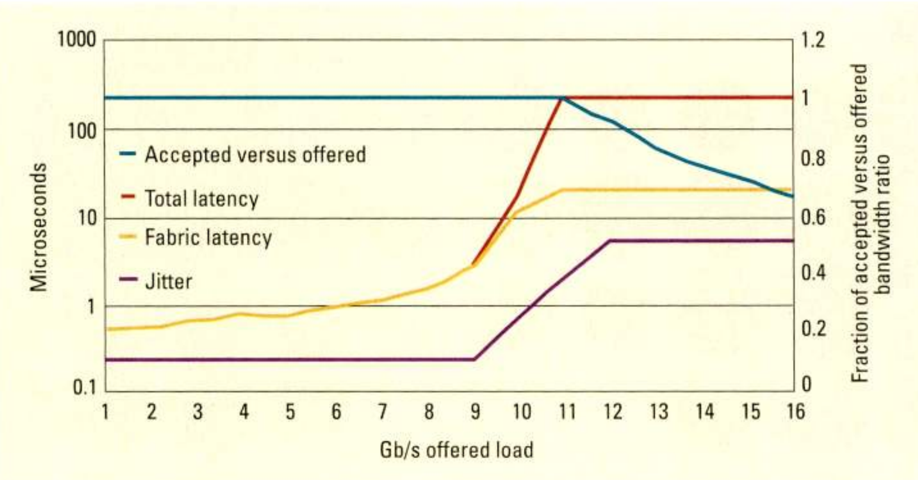


Figure 1. The test results for port-level performance with uniform destination distribution and nonbursty traffic pattern allows the designer to determine maximum stable load or throughput. Information courtesy CommsDesign.

Internal resources

Switches aren't just plumbing. They have to do a lot of work. Each packet coming in has to be checked for consistency and then forwarded to the correct place. Gigabit Ethernet can generate more than 80,000 packets per second. The longer it takes the switch to analyze each packet, the higher the latency (the time it takes for a packet to flow across the switch from one port to the next). As latency increases, the switch's sensitivity to overload conditions increases as well. (See Figure 1.)

A good switch needs to have the CPU power to efficiently handle its expected workload and sufficient buffer memory to handle bursty overloads. Provided it can ride through the occasional overload condition, the switch will provide smooth performance.

With insufficient resources, the switch will quickly begin dropping packets during even brief overload conditions, resulting in more traffic as systems attempt to recover the missing packets. This leads to additional (and sustained) degradation. Edge-Core provides high-end Broadcom Network processors that can quickly process each packet. Many low-end switches are basically running an internal operating system and doing all of their switching operations in software. This means higher latency and lower overall throughput.

Check the features

It's important to consider the vast number of features when looking at switches. It's not always easy to figure out which ones are necessary for your environment. Do you need spanning-tree support or broadcast storm control? Should you buy a switch that supports static or dynamic link aggregation (IEEE 802.3ad)?

The short answer: It depends. Features like spanning tree and broadcast storm control are important if you plan on adding multiple switches to your network. They help prevent infinite loops where packets are continually forwarded around the fabric.

Additional features like 802.3ad link aggregation and 802.3x link-level flow control are extremely important in server environments where a single source of data (server, PBX, etc) might exist and need extra bandwidth along with the ability to smoothly deal with congestion. Good switches will also have prioritization and QoS features, allowing an administrator to select which ports should have priority when congested conditions occur.

Small Tree's Edge-Core line provides all of these features and allows users to easily enable, disable and configure them using their Web browsers. It is also easy for users to save configurations, allowing them to try things without a commitment. It's as simple as a reboot to put things back as they were.

A good switch does more for business than acting as the plumbing between systems. It assures that data flows smoothly, phone calls are crisp, and applications function flawlessly. You regularly spend thousands of dollars to purchase a high-quality desktop to run your applications, so why connect 20 such systems with a sub-standard switch? **BE**

Steve Modica is CTO of Small Tree Communications.

The FS-4 recorder

Focus Enhancements' portable unit features playback.

BY RICHARD MONTALVO

I discovered Focus Enhancements' FS-4 Direct-to-Edit (DTE) recorder while facing near-impossible production deadlines as the production manager for isportsTV, an Internet-based sports broadcasting company. I was covering BMX race events across the country, shooting about 100 individual races at each event. Anyone covering live events knows they typically involve tight schedules and long nights — and this was no different. I'd finish shooting races Sunday night and have to get final products up on the Web site by Tuesday.

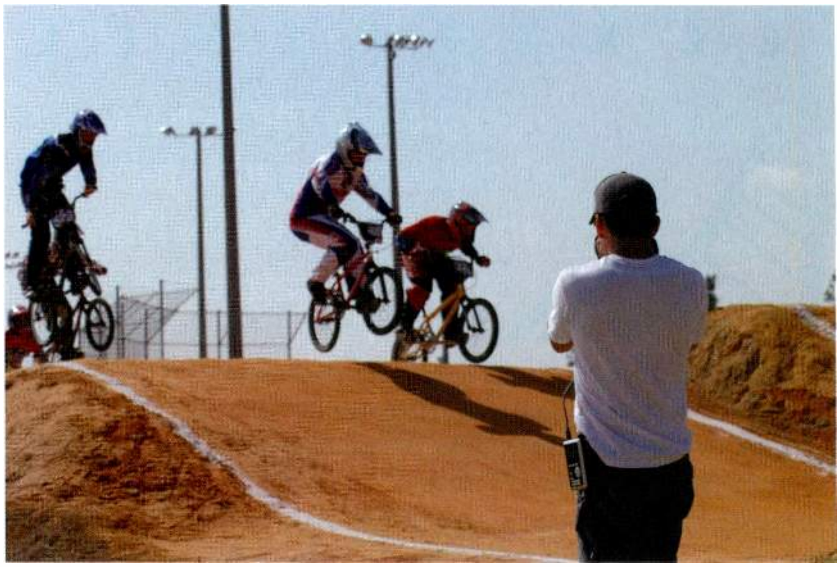
With a tape-based workflow, I simply couldn't meet this deadline. Capturing and labeling tape took forever. I'd typically end up finishing on Thursday, two days after the deadline. Faced with this grueling schedule and lack of sleep, I started looking for ways to cut down on production time.

Direct editing

The FS-4 is a portable 1lb, palm-sized DTE recorder that lets me record DV or HDV streams directly to disk via FireWire. The device can be mounted to the camcorder or clipped to my belt. Its 40GB capacity gives me three hours of uninterrupted recording time. An 80GB version is also available.

I typically capture a full day's worth of footage on Saturday, dump everything to an external hard drive Saturday night and am ready to go with a fresh unit Sunday morning.

The ability to record to hard disk and tape in parallel offers the best of both worlds. I use the disk as my editing source, while tape serves as an archive, giving me the added peace of mind of a back-up. Other useful features include the built-in six-second electronic shock cache, as well as the ability to extend the prerecord buffer to minutes, or even hours.



Focus Enhancements' FS-4 recorder is a portable 1lb, palm-sized Direct-to-Edit unit that allows users to review clips in the field. The FS-4 can record DV or HDV streams directly to disk via FireWire.

Playback

The unit lets me review clips in the field, and while shooting BMX races doesn't exactly allow for much leisure time to review footage in the field, from time to time I do check to see if I got a shot. This playback feature comes in handy when it's time to transfer clips, as I can quickly scan through each clip and delete the unnecessary ones before transferring everything to my hard drive.

The unit lets me review clips in the field, and from time to time I do check to see if I got a shot.

Flexibility

The recorder provides the flexibility to select my preferred file format — whether it's uncompressed MPEG files (720p/24, 25, 30) or edit-ready file formats for the major NLEs. Once shooting is complete, I simply connect the device to a Mac or PC editing system just like any FireWire hard disk drive. Clips can be dragged straight into the NLE's timeline, and the footage plus metadata are instantly available for editing. There's no more capturing, labeling or looking through tape. The recorder's transfer time is typically three to four times faster than real time. For example, a one-hour file takes about 15 minutes to transfer.

Most importantly, DTE technology allows me to finally meet my deadlines. Now I can post BMX race footage to my own Web site at *www.bmxvideo.net*. I'm able to get footage online faster than before.

Capturing tape is the biggest waste of time for any editor — not to

Richard Montalvo shoots BMX racing with the FS-4. The unit's transfer time is three to four times faster than real time, which enables him to get footage online faster than ever before.

mention your creativity can dwindle before you've even started editing. The FS-4 allows me to focus on the creative editing process, instead of logging and capturing footage.

Extreme contact

Initially, I did have reservations about whether the device could withstand the rigors of extreme sports BMX videography. Shooting extreme sports is not your typical "set-up a tripod and shoot" video job. On race day, I might be crouching on the side of a jump or perched on top of a mogul. Then, there are the BMX riders. I've been hit more than once. At one point, I was hit by a rider while on the back of a turn about 30ft off the ground. I went down, along with my equipment. As I saw the recorder bounce across the ground, I was pretty sure I'd be shooting with tape for the rest of the day, not to mention spending a long night in the editing room. But when I picked up the recorder, turned it back on and plugged it in, it started working right away. That's when I realized it's no average hard drive. **BE**

Richard Montalvo is a BMX videographer.

Grass Valley's C2IP

The remote camera control system puts WFAA where the action is.

BY MICHAEL GROTTICELLI

WFAA has turned the traditional concept of "on the scene" reporting on its ear in north Texas with a new, street-level studio set against the glitzy backdrop of Victory Park, an energized new section of downtown Dallas.

The station, owned by Belo, has constructed a glass-walled facility on the south side of the plaza outside American Airlines Center (home to the NBA's Dallas Mavericks, the NHL's Dallas Stars, and a series of concerts and events throughout the year), about a mile away from the station's main control room.

The new 4000sq-ft studio provides visitors to the Victory Park area with a storefront view of the station's live morning and evening newscasts — the highly rated local talk show "Good Morning Texas" — and other news and entertainment programs. It also gives home viewers the feeling of being part of the action when games or high-profile concerts are taking place.

The key enabling technology to facilitate this unique remote two-way production design is the Grass Valley C2IP TCP/IP-based Ethernet camera control system, which gives the station's technical staff the ability to shade and focus the cameras from their control room located about a mile away.

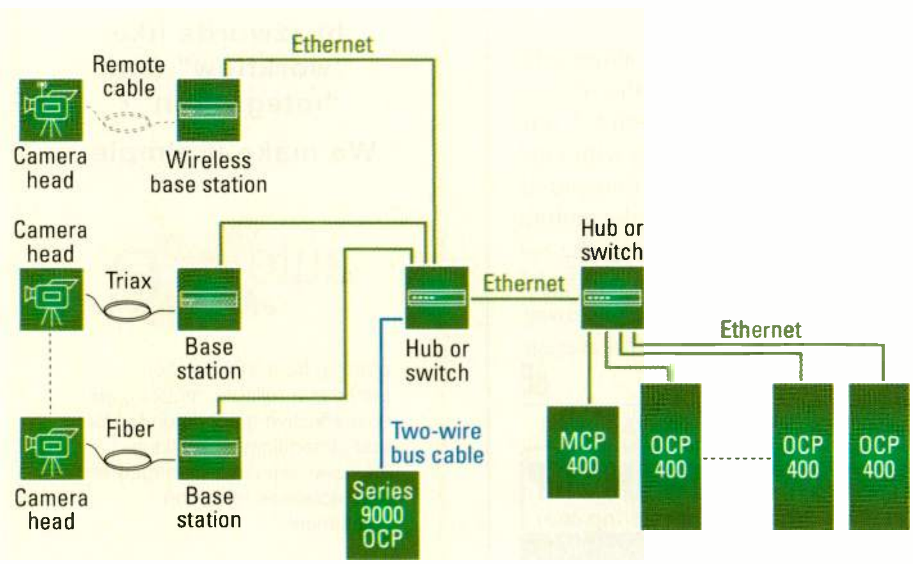


Figure 1. The C2IP offers Ethernet-based TCP/IP control of up to 99 digital Grass Valley LDK series cameras. The system consists of an operational control panel (OCP 400), a master control panel (MCP 400) and a base station data/network module (LDK 4500 SL).

The system consists of an operational control panel (OCP 400); a master control panel (MCP 400); and a base station data/network module (LDK 4500 SL). (See Figure 1.) It offers comprehensive remote operation for all Grass Valley LDK series cameras, including the LDK 4000 installed at the station. The system offers Ethernet-based control of up to 99 cameras using standard IP networking, as well as multiple control points per camera.

The compact (4RU) operational control panel includes variable matrix control, fine skin-detail adjustments and installation adjustments, which all directly control the camera's internal menu settings. The panel also features Ethernet connectivity, an intuitive interface for easy operation, and preilluminated buttons and text-screenings for dim-light environments.

Using the panel reduces the time and effort station technicians spend on camera setup and reconfiguration when changing shows. Instead of individually calling up each camera on a network to obtain its operational settings, the master control panel interprets and logs all network activity between cameras and control panels automatically.

The technicians also can use the data-gathering capabilities of the master control panel to adjust camera parameters on the fly. They can, for example, use the panel's spreadsheet-like interface to review the paint settings for all cameras in a particular production, and then adjust them across the board or on a camera-by-camera basis. This helps provide the station with a uniform look among the different camera outputs for all of its shows.

Camera and production settings also can be saved as digital files on standard USB storage media, which can even be e-mailed if necessary. When setting up a production, technicians simply load the settings into the OCP panel off the USB media.

The LDK 4500 SL base station data/network module allows the station to add new features and update the software easily, thereby future-proofing its investment. It also supports the Grass Valley NetConfig software, enabling fast device configuration and remote access via a Web browser interface.

The remote camera control system offers the station's engineering crew the freedom to manage the cameras from the station's main control room. It's as if they are positioned inside the studio in Victory Park, but they are not.

On the air in HD

The station's new facility was opened on Jan. 8, 2007, and began full HD broadcasting on Feb. 2, 2007. WFAA-DT is now on the air in HD with its local news (the first in its market to do so) and has become popular with viewers.

A variety of pre- and post-event broadcasts, along with its daily morning show, are produced in the new studio. Then the signal is transmitted via fiber-optic cable across town to the station's main control room located in the same building that the station has been broadcasting from since the late 1950s, and to the station's Grass Valley Kayak HD production switcher before going to air.

The C2IP gives the station's technical staff the ability to shade and focus the cameras from their control room located about a mile away.

There are even HD cameras located at various locations atop Victory Park and across the street on the second story of the new W Hotel to provide live reaction shots and to oversee the crowds coming to and from events. These overhead shots are often fed to large projection screens located outside the studio and incorporated into the station's coverage.

In order to maintain a consistent look for its locally produced programs, WFAA has installed four more LDK 4000 cameras in its existing production studio, which are fed into the Kayak HD switcher. These also are set up using the control panel of the C2IP system. BE

Michael Grotticelli regularly reports on professional video and broadcast technology industries.

Centralized operations

Integration leads to efficiency and maximized profits.

BY JOHN LUFF

All broadcasters are aware that the era of "ringing the cash register" several times an hour has largely ended. The fear, of course, is that changing economics means automation and centralization, with a loss of jobs on the local level. To be perfectly honest, that fear is entirely based on fact, or it's at least true in many markets. Cash flow is tighter these days, and management has a responsibility to the ownership to attempt to maximize profits in uncertain times.

The dynamics of what brought this on weigh heavily on how to change the trajectory of the station's finances. In any business when sales decline and costs increase, the results are the same. Competition that did not exist a few years ago is draining advertising dollars and going to program services distributed by cable, DBS and now IPTV. At the same time, labor costs per employee continue their inexorable increase, fueled in part by increases in health-care costs experienced by all segments of the economy.

What's a GM to do? It is tempting to find ways to reduce head count; cut investment in hardware; invest in lower cost programming such as reality television, DTV multicasting with more programming choices and potentially higher total revenue; and potentially centralize operations within a group.

But let's look carefully at the available options. Doing anything that makes the station's output less desired by the viewing public will send the trajectory in the wrong direction. That includes less desirable programming or poorly crafted program continuity. Less glitz may mean a smaller audience.

The goal needs to be to keep or increase revenue, maintain or reduce costs, and above all else not put the market share at risk. A centralized operations model is one way to reach this goal.

Lifetime Networks uses Harris' H-Class automation to centralize operations.

Partial centralization

Increased programming through multicasting means more, not less, effort in continuity and output stream assembly. By centralizing some portion of a stream that is used by a number of related stations in a group, the cost for each station is less, perhaps without affecting local employment at all.

Sinclair did this by first centralizing production of weather segments shown in all of its news operations and later by centralizing the national content provided to a common production facility. This worked only to a degree, however. In some markets the content was seen as less local and did not increase cash flow for the entire group, resulting in the company largely abandoning its NewsCentral operations.

NBC's WeatherPlus, however, has been more successful, with affiliates around the country using low bit rate multicast channels based partially on content distributed nationally.

There are many ways to reduce costs. For example, traffic can be operated in a fully centralized mode, with local sales personnel entering contracts and a corporate staff executing much as a local staff might. Or, with somewhat less savings, most of the local staff can operate on a system administered and managed at corporate headquarters, perhaps with thin client workstations at the local operation. This achieves some of the goals of consistency and centralized support without completely eliminating the local staff.

Centralizing master control

Centralized master control is another solution. However, it is a balancing act, with reduction in operating expense balanced against the increased cost for interconnection services. In major metropolitan markets, especially those with organized labor contracts that could make labor costs a major part of the operational costs, it is possible to experience significant savings in master control room operator costs. But even with decreasing costs for high-bandwidth interconnection circuit contracts, it is not possible to simply assume that labor savings will swamp connection costs. In each case, research must be done. The first step is selecting an operational model to use as a basis for the investigation.

Distributed operations

In a distributed operations model, only those portions of the content that make sense to offload to a centralized and combined operation are actually moved out of the local station. Syndicated content might be timed and prepped for air in a centralized operation for all group stations, but with the increased use of third-party services to deliver the content to the local station, it might make sense to only move the metadata from a centralized site to the local station.

That metadata, which might include editing decisions made regarding appropriate content, can be delivered in skinny pipes when compared with running the content over a WAN connection requiring perhaps 8Mb/s to 12Mb/s. This approach requires fully integrated automation software with the schedule assembled in the hub and executed at the spoke.

Remote monitoring is critical to make such an approach work well because it's likely that no one is monitoring at the local station. Modest bandwidth can accomplish this today. This includes both thumbnails and streaming media from the local station. The system can collect data and analyze audio and video levels, freeze frame detection, and the presence of signals in places where no operator is present. A logging system with browse access to the corporate WAN can allow remote users to verify that content is arriving and playing to air as expected.

The mechanics

A centralized operation can only work if the interconnection is essentially bulletproof. This might mean diversely routed circuits and a service level agreement that guarantees the availability of the end-to-end service. To achieve the goals, the provider may provision a full backup. It is often prudent, especially in the case of a distributed architecture, to provide a lower bandwidth backup to sustain monitoring and control during any outage in the main interconnection bandwidth (think back hoe fade).

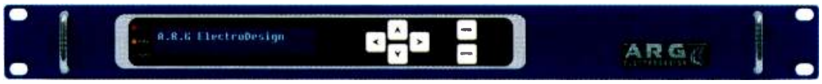
The mechanics of accomplishing centralized operations include little technical planning until the business case is developed and tested against objectives. For example, if the station is in a top-10 market, the cost of make goods may be so high that any potential savings in operations are lost. After the business plan is developed, an overlay technical plan must be drawn up and tested to determine if anticipated cost savings and projected capital cost can be achieved. Lastly, following a decision to move forward, the hard issues of dealing with staff confusion and uncertainty must be addressed.

One thing can be said for certain: Groups anticipating delivering multicast streams in the future need to think through the business model and determine if it can be accomplished more effectively via centralization of any part of the operation, traffic, promotions or master control. BE

John Luff is a broadcast technology consultant.

Send questions and comments to:
john.luff@penton.com

Inverse Multiplexer MKII — ARG ElectroDesign



Multiplexer transmits video over several low-cost telcos; maintains transmission quality by adding Reed-Solomon Error Correction and up to 64ms of differential line delay; features bidirectional transmission, T1 framing, SNMP, internal protection switching, 10/100BASE-T IP data port and plug-and-play functionality.

914-595-6993; www.arg.co.uk

CaptionBot — ULTECH

Automatic speech-to-text captioning system generates emergency broadcast captioning, and produces captions directly from the broadcast talent's speech audio, after being trained to recognize the talent's speech pattern; provides emergency closed-captioning during severe weather, natural disasters and other crisis situations; immediately available in the studio for activation when needed.

203-758-8667; www.ultech.com

Opera — Echolab

New features to the multiformat production switcher include floating frame synchronizers, floating frame stores, extended effects options, protocol options, a variety of multiformat output options and new remote aux panel; panel uses TCP/IP to communicate with the switcher to modify the sources assigned to a particular auxiliary output and allows simple cuts from source to source from any location with an Ethernet connection back to the switcher.

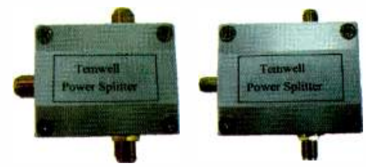
978-715-1020; www.echolab.com

FRC 94xyM — Micronas

Full HD frame rate converter IC eliminates motion blur and film judder on 1080p televisions; features truD FHD 120 technology that generates 120fps from 50/60Hz broadcast content and from 24fps film sources, and motion vector estimation and compensation frame interpolation technology for 1920 x 1080p 100/120Hz televisions; reduces cost, pinout and electrical noise with low voltage differential signaling interfaces on both inputs and outputs.

408-625-1200
www.micronasusa.com

UHF Power Splitter — Temwell



Two-way through four-way configurations come in 50Ω for WiLAN, WiMax, GPS and cell phone devices, and 75Ω for satellite broadcast distribution and Cat 5; feature center frequency from 300MHz to 2600MHz and bandwidth options of 100MHz, 150MHz, 200MHz and customized; offer excellent insertion loss and return loss, as well as RoHS compliancy.

+886 2 25652500
www.temwell.com.tw

Broad Scan — Analog Way

Computer-to-video and HDTV scan converter is fitted with digital DVI and analog RGB inputs; converts workstation, PC or Mac graphic images up to 1600 x 1200 at 60Hz (1920 x 1200 RB) into NTSC/PAL video or HDTV formats; features genlocks fitted with loop through outputs allowing for device chaining and real-time conversion with high-performance image processing; includes LCD screen and computer input format memory, which stores up to 16 user presets corresponding to 16 different input formats.

212-269-1902; www.analogway.com

Zoe ENG — 16x9

Updated version of the Zoe remote zoom control for full-size broadcast cameras offers a full range of innovative remote functions, including variable stepless zoom speed control, record start/stop button, return function and reversible zoom direction; uses electronic software to adapt to different optics; adjusts zoom function through the system's pressure sensitive rocker switch; available in eight- and 12-pin configurations.

661-295-3313; www.16x9inc.com

Multicam version 9 — EVS

Newest version of the software application offers major third-party integration, performance improvements for the XT[2] production server, including the ability to play clips on the XT[2] while transferring from NLE or archive systems, and a 50 percent expansion of the XT[2] disk bandwidth.

973-575-7811; www.evs.tv

Helix — Element Labs

Line of flexible LED video screens can bend and wrap to accommodate almost any design; offers a pixel pitch of 75mm; carries significant IP ratings; G75 model features an ultra-thin grid construction, linkable modules 4 pixels by 32 pixels in size and a weather-resistant design (IP rating 65); H75 model is daylight visible and fully submersible, can withstand high temperatures and prolonged sun exposure, and incorporates individually lensed RGB LEDs for high brightness.

512-491-9111
www.elementlabs.com

Zephyr iPort MPEG Gateway — Telos Systems

Codec transports up to eight channels of bidirectional stereo audio between locations; features a Livewire interface, two Ethernet ports and connection protocols, including MPEG-2, MPEG-3, AAC, aacPlus, AAC-LD, AAC-LD+HE and AAC-HE+PS; applications include anywhere MPEG encoding and/or decoding are needed for transmission over IP channels, such as STL links, Internet streaming, satellite uplinks, broadcasting to cell phones and other audio distribution systems.

216-241-7225; www.telos-systems.com

ACT 2 — Sachtler

Spring arm for camera stabilizing systems features three interchangeable stainless steel spring sets to handle payloads from 24lbs to 57lbs, pretensioning capability that allows the operator to adjust the tension to accommodate various loads with a single 4mm Allen wrench and a flip-over vest attachment that makes it easier to switch from right-handed to left-handed operation; offers adjustable friction with 5/8in gimbal mounting post; also available in 6in, 10in and 12in lengths.

845-268-0100; www.sachtler.us

Fusion — Chief

Confidence monitor carts feature 3ft to 4ft of toolless height adjustment, modular design for quick assembly/disassembly, 45 degrees of upward fingertip tilt, integrated cable management, a universal interface, lockable rear wheels and compact angled base; PFMU model fits 42in to 63in screens and up to 200lbs; MFMU model fits 30in to 50in screens and up to 125lbs.

952-894-6280; www.chiefmfg.com

6416Y2 A-Net Interface Card — Aviom

Card interfaces between Yamaha consoles and mix engines and Aviom's Pro64 digital audio network; supports up to 16 channels in/out simultaneously, variable sample rates of 44.1/48kHz or 88.2/96kHz and two interface paths to the Pro64 network's Virtual Data Cables; features a front-panel DB9 connector for either RS-232 or RS-422 data.

610-738-9005; www.aviom.com

PowerArc — PAG

Plug-in HMI unit designed for use with the 12V Paglight M uses a 24W lamp that has an output equivalent to 100W of halogen lighting with a daylight color temperature; produces a soft, even spectral distribution that is fully focusable from spot to flood; features a low power consumption with a high output.

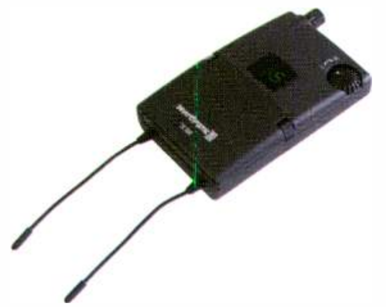
+44 20 8543 3131; www.paguk.com

RFX-CMT-II — RF Central

Camera-mounted transmitter offers a variable 6/7/8MHz modulator, 100mW power output, full MPEG menu control and HD upgradability; limits spectral regrowth at full power to less than -35dBc; offered in 2GHz frequency band, with other frequencies available upon request.

717-249-4900; www.rfcentral.com

IMS 900 — beyerdynamic



In-ear monitoring system features 16 preprogrammed UHF frequencies; consists of SE 900 stereo transmitter and TE 900 stereo pocket receiver; SE 900 accommodates up to eight channels per frequency range without interference; TE 900 is equipped with a mono-stereo switch, volume and balance control, allowing for instantaneous alterations to the mix as well as two RF signal antennas to prevent signal drop outs.

800-293-4463
www.beyerdynamic.com

SCDR — Neutrik

Soft plastic cover for the rear end of the company's D-size chassis connectors protects the gap between connector and cable; works with all common wires and cables by cutting off the cover end to the preferred diameter; protects against electric shock when using PowerCon; creates airtight assembly and powered speakers with the XLR; offers LC dust protection on the rear end of OpticalCon.

732-901-9488; www.neutrik.com

C100 HD v4.0 — Solid State Logic

New software offers up to 512 fader inputs and up to 256 additional short channel premix inputs with fader control, pan capabilities and access to mono, stereo and 5.1 submix busses; supports high-density processing engines and control surfaces with access to up to 256 fully featured input channels with full processing capabilities; features new processing libraries, a four-element channel format with full spill functionality and direct control of a DAW via HUI protocol.

212-315-1111
www.solid-state-logic.com

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DT12 — Wireworks

Audio cabling system consists of DT12 sports breakout box, trunks and tails; includes welded steel super-slim breakout boxes a quarter of the size of traditional stageboxes, male and female connectors with cover caps, recessed Neutrik XLR black/gold connectors and dual-sided channel identification; trunks manufactured with full-sized 22 AWG conductors provide lower signal loss; features100 percent shielded cables and fan outs available in 4ft or 8ft lengths.

908-686-7400; www.wireworks.com

MPEGID 2.2 — Manzanita Systems

Latest release of the stream identifier utility includes expanded format support for elementary streams, descriptor display and support for the company's USB hardware dongles; identifies and shows detailed information about files commonly used in DTV, streaming media and DVDs; includes a command line interface and GUI; supports H.264/AVC/MPEG-4 Part 10, DTS, Enhanced AC-3 and SMPTE 302M formats.

858-679-8990
www.manzanitasystems.com

HDMI-X — RapcoHorizon

HDMI fiber-optic extender meets HDCP standards and is DDC line compliant; includes an HDMI transmitter and receiver and an external 12V power supply adapter; contains of variety of HDMI equipment cables including four-strand 50/125 fiber cable, Cat 5e cable and HDMI cable; allows easy transmission of uncompressed digital video and audio up to 100m and ca be applied to the WUXGA format.

800-467-7276
www.rapcohorizon.com

WorldCast Eclipse — APT

IP audio codec offers IP, X.21/V.35 and ISDN interfaces and a selection of popular coding algorithms including Enhanced apt-X, MPEG-I/II Layer 2/3, MPEG-4 AAC, G.711 and G.722 on a single DSP-based codec platform; software allows user to control both audio and network settings such as packet size, jitter buffers, and QoS levels; deployable in wide range of applications such as OB, studio transmitter links over IP, leased line, fractional T1/E1, satellite, microwave or dial-up.

781-810-2260; www.aptx.com

dScope Series III v1.21 — Prism Sound

New version of audio analyzer software features enhancements including support for acoustic measurements of transducers and rooms, 192kHz sample rate support on AES3 and S/PDIF digital audio interfaces, generation and analysis using Windows sound devices including multichannel device support, support for measurement microphone sensitivity and frequency response calibration and analog I/O that can now sample at 48kHz, 96kHz and 192kHz to increase LF resolution of FFT analysis.

973-983-9577; www.prismsound.com

S4Production — S4M

Production planning system supports production processes from planning over production accompanying functions including progress monitoring to entry of actuals and accounting; ensures a complete overview at any stage of the production cycle with detailed transparency at any level; provides utilities such as templates and functions; supports the creation of series of appointments, automatic updates of the displayed data or automatic trans-sectional communication of changes.

+49 0221 28 5550; www.s4m.de

Tetra-VIO — Analog Way

A/V switcher/converter/interface with three universal inputs an done SD/HD-SDI input accepts formats from computer, video and HDTV in analog or digital, and provides connectors including BNC, HD15, DVI, mini DIN4, Cinch and RCA; inputs feature active loop through monitoring and accept NTSC/PAL/SECAM, S-video, RGB/YUV, HDTV in HD-YUV or HD-RGB analog formats, as well as RGB up to UXGA and 2K; features four analog audio stereo in and one out, as well as one digital S/PDIF audio in/out.

212-269-1902; www.analogway.com

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Smoke 7.08 - Octane MXE dual 600 Mhz 3.3 GB Ram IR36 4.5 hrs. uncompressed SD storage. Permanent License, Manuals.

Thomson Broadcast Systems 9200 Digital Component Mixer - 12 SDI inputs plus 4 aux buses. NTSC & PAL, 16x9, 4x3, Chroma keyer, RS-422 control, programmable GPI ports. Manual.

FOR-A DCC-700 Digital Color Corrector - SDI I/O color corrector. 10-bit 4:4:4. Manual.

Smoke v7.08 - Octane MXE, dual 600 Mhz processors, 3.3 GB Ram, IR36 Stone array - 4.5 hrs. uncompressed SD storage. Permanent License, Manuals.

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Help Wanted

CHIEF ENGINEER

WLNS-TV/DT has an immediate opening for a Broadcast Maintenance Engineer with 3-5 years experience. Successful candidate must possess a working knowledge of digital formats, both standard and high definition. Duties include equipment installation, work on Harris transmitters, support of ENPS newsroom system, server based news editing systems, broadcast automation, production and MCR switchers, audio consoles, microwave equipment, satellite receivers, routers, SX/SP/DVC Pro format tape machines, ENG trucks, non-linear editors, and all associated broadcast gear. SBE certification desirable. Individual must be capable of lifting 50 pounds and mobility is required. Send resumes to **jwing@wlns.com . www.wlns.com**

CHIEF ENGINEER

KWHE-TV, the LeSEA affiliate in Honolulu is seeking a Chief Engineer to oversee the Hawaii operations. Candidate should have 7 years of broadcast engineering experience. They should be familiar with microwave, up-link trucks, UHF transmitters and all aspects of studio and remote operations. Qualified candidates send cover letter, resume and references to **whylton@lesea.com.**

SENIOR TELEVISION ENGINEER

WSRE-TV, a PBS affiliate licensed to Pensacola Junior College seeks a full time Television Engineer. Prefer SBE CBTE or FCC General License. Familiarity with large complex television studio operations; experience in installation and repair of server-based ingest / playout, computer automation and broadcast related computer networking; knowledge of analog, SDI, HDSDI, ATSC, DTV, MPEG encoding and multiplexing; PC's and LAN's. Transmitters and Satellite operations. For full description / application go to **www.pjc.edu**. Job # 1755 OPEN TILL FILLED.

DIRECTOR OF TECHNOLOGY & BROADCASTING

South Dakota Public Broadcasting in Vermillion, SD seeks Director of Technology & Broadcasting. Position will oversee the architectural design & implementation of the operational transformation into digital technologies, automation, production and multi-channel broadcasting for a 9-station public television and radio network. Incumbent will be responsible for leading and managing the operations, engineering and IT departments.

Successful candidates should have experience in computer and network related systems or engineering field. Preference for candidates with prior leadership/management experience. Requires excellent organizational skills and strong verbal and written communications. Salary: $42,928.15 to $53,660.19. Closing Date: September 28, 2007. Submit a letter of interest and resume to: Kim Stahl, Bureau of Personnel, 500 East Capitol Avenue, Pierre, South Dakota 57501, Phone: (605) 773-6940, E-mail: **kim.stahl@state.sd.us**
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Help Wanted

MAINTENANCE TECHNICIAN

The successful candidate will have a strong background in the operation, maintenance and testing of UHF, VHF, microwave transmitters and related RF systems. Responsibilities will include operation and maintenance of: Analog transmitters, Digital transmitters, Analog, and digital microwave systems, Remote control systems, automation systems, studio robotic systems, microwave and satellite ENG trucks. I/T experience is essential. Knowledge of FCC Regulations is required. Must be able to work with minimal supervision and willing to work some nights, and weekends. Degree in Electronic Engineering or equivalent and FCC General Class License or SBE certification preferred. Send cover letter and resume to: Frank Bobro, Engineering Manager, WPXI-TV, 11 Television Hill, Pittsburgh, PA 15214 or email to JOB061117@wpxi.com.

SENIOR MULTI-MEDIA ENGINEER

Sinclair Broadcast Group is seeking a Senior Multi-Media Engineer for our corporate headquarters in Hunt Valley, MD. The individual must be well qualified to support a state-of-the-art broadcast news production facility that originates and distributes News and Sports programming. Candidates are required to have a minimum of 5 years in television broadcast maintenance and operations and be familiar and able to respond to news and sports driven customer requirements for computer and network support. Ideal candidates will be Avid ACSR and A+ certified with demonstrated proven ability with Avid News editing systems, Avid Unity, and Avid iNews newsroom computers systems. Prior Broadcast experience a must! EEO/Drug Free For a more detailed job description and to apply online see **www.sbgi.net**.

CHIEF ENGINEER

WRBL-TV 3 in Columbus, Georgia is seeking a Chief Engineer. Responsibilities to include supervising technical operations, insuring FCC compliance, purchasing technical items and equipment for other departments, researching capital needs, repairing and maintaining all station equipment, assisting engineers with maintenance, coordinating technical assistance with other departments, maintaining transmitter towers and microwave equipment, preparing reports and performing other administrative tasks. Qualifications include two years of college, at least 10 years experience including electrical, broadcast and mechanical engineering, a proven ability to manage, train, and motivate engineering staff, and the ability to make sound decisions on capital equipment as well as cooperate and coordinate with corporate management. Experience serving as chief or assistant chief with the ability to work on high towers, operate and repair all broadcast and non technical equipment a must. EOE M/F/D/V. Pre-employment drug and background screening required. Send resume and references to: Human Resources, WRBL 1350 13th Avenue Columbus, Ga. 31901, or email to hr@wrbl.com, or apply online at **www.mediageneral.com**.

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DTV diaspora

Broadcasters need to take charge.

BY ANTHONY R. GARGANO

What a mess! There are 17 months until the DTV transition. How many viewers will be surprised when their TV screens goes dark?

Microsoft will be happy to learn that there's been a color change. The Windows operating system's "blue screen of death" may soon be usurped by the analog TV's "black screen of death."

In this age of the enlightened consumer, the lack of awareness by the average viewer and, for the relatively few who are aware, the level of confusion surrounding the DTV transition remains unbounded.

The numbers speak for themselves

Recently, the "National Journal" reported that only 10 percent of viewers are aware of the analog cutoff scheduled for 2009. And, it is not just the analog-to-DTV transition that is in a muddle. Many viewers haven't a clue that HDTV is a subset of DTV.

In a study released in December 2006 by the Cable & Telecommunications Association for Marketing (CTAM), the researcher found that 48 percent of HDTV set owners weren't connected to an HDTV content source. In addition, 34 percent of those surveyed did not even know that they needed an HDTV content source to actually view HDTV; they simply assumed that it was all in the receiver.

And as of June 2007, little on this front had changed, according to the Consumer Electronics Association (CEA), which reported that 44 percent of current HDTV households are not connected to an HDTV content source.

It is a little distressing to see people spending hard earned money on an expensive new HDTV receiver and then not enjoying the benefits of the viewing experience because they don't fully understand what they need to do. At least, though, these viewers will not be subjected to the black screen of death in February 2009.

Jupiter Research projects that at the time of the analog shutoff, there will be 13 million television homes that still rely strictly on over-the-air signals. It is estimated that there are currently 300 million television sets in use. Some of those are second and third sets in use in homes that connect only one or two sets to cable, satellite or fiber. Any way you look at it, there is the potential for tens of millions of receivers to go dark when the analog switch is thrown to the off position.

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Know your role

Certainly, there are untold numbers of people and organizations trying to address the consumer education issue. Congress, various federal government agencies, a host of industry trade groups and numerous consumer groups have provided Web sites and magazine articles that attempt to inform consumers about the transition to digital television. The FCC has put together an informative Web site at *www.dtv.gov*. It's a resource that everyone would benefit from reviewing.

The fact that there is no coordination among all these well-intentioned efforts is a real problem. But, the overarching problem is that consumers don't know what they don't know, meaning they're unaware of the need to visit the sites or find the articles and read them.

That's where the broadcaster plays a critical role. No single resource can reach consumers as effectively as the broadcaster. The NAB has announced a DTV transition PSA campaign to begin this December. Clearly, this will help, but is it enough?

Broadcasters can and should be doing more, and it is in their best interest to do so. To the extent that it is a surprise when some of those tens of millions of screens go dark on that day in February, broadcasters will take the immediate brunt of it. The objective must be that Feb. 17, 2009, becomes essentially the same nonevent that Y2K was. If it doesn't and you are a local broadcaster, you better plan on bringing in additional help to man the phones. BE

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