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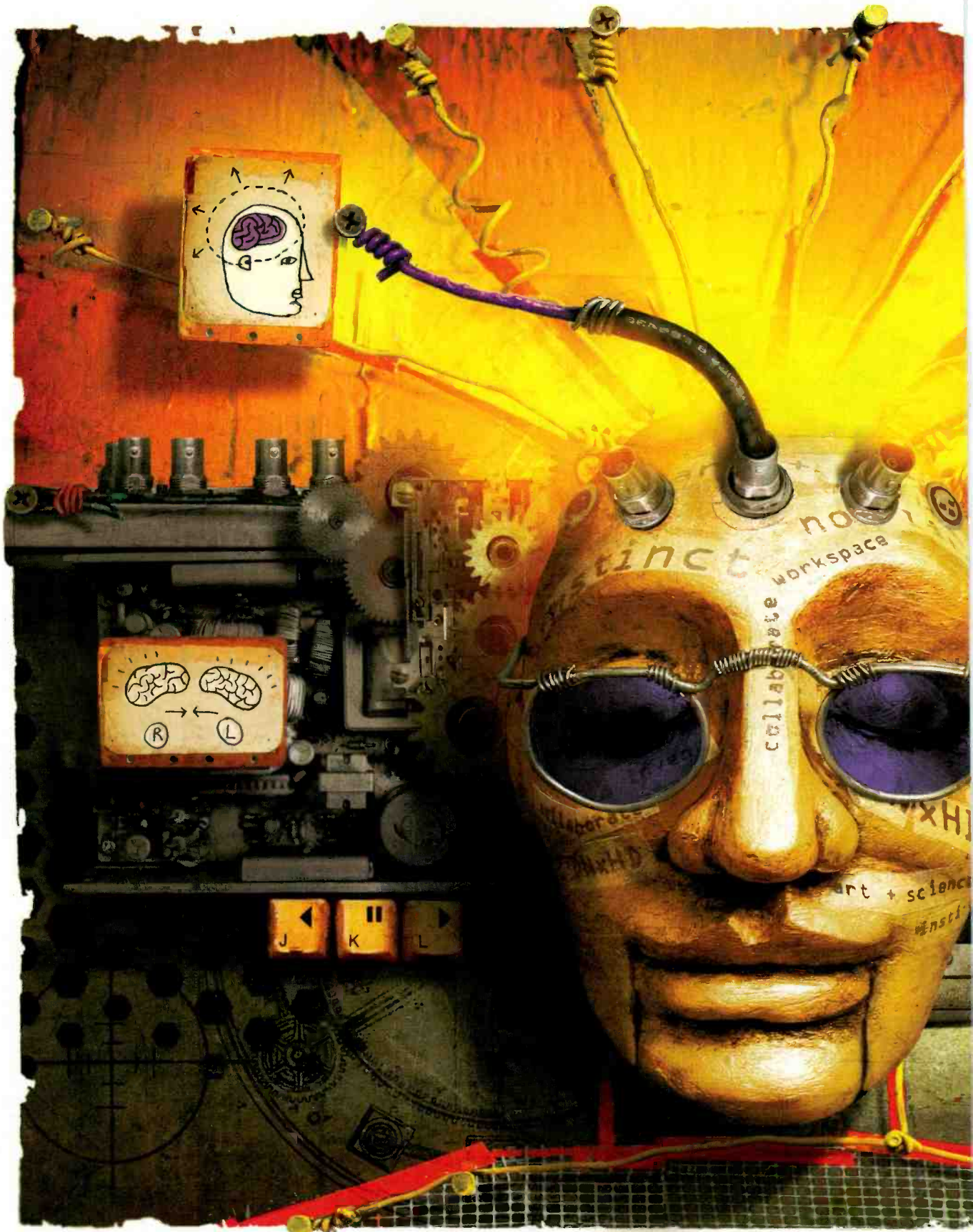


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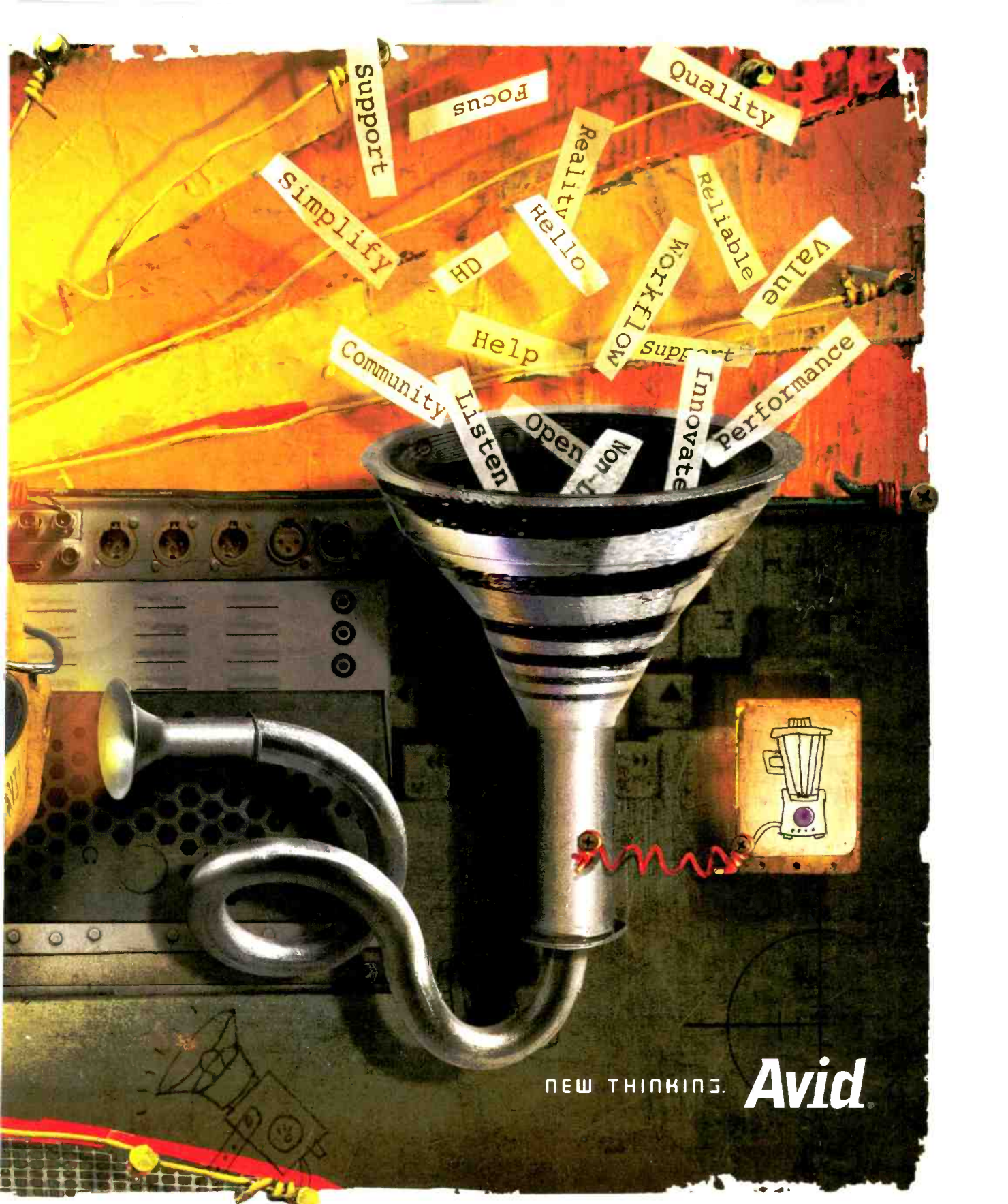
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details where you want them



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THE FREEZEFRAME QUESTION

Firewire is actually a trademarked name by _____ for an interface formally called IEEE _____.

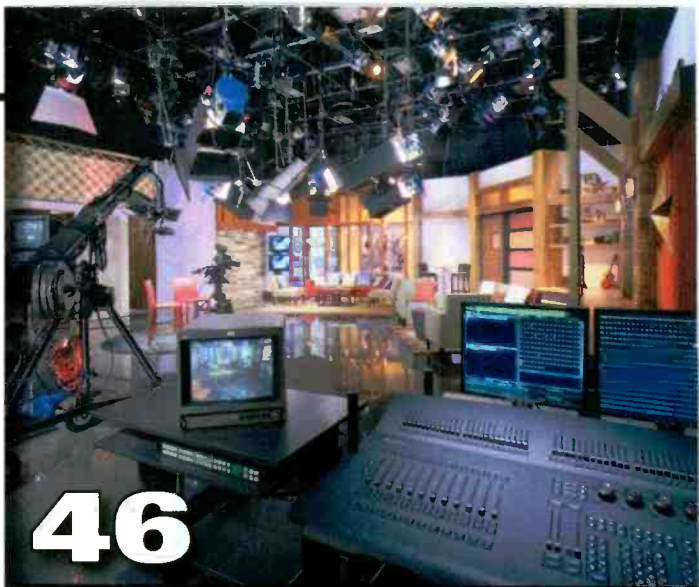
A firewire cable has _____ conductors, including two sets of twisted pairs for signaling/strobe and _____ for power.

This question was taken from the new book by author John Watkinson, "4th Edition, The Art of Digital Video" from Focal Press.

THE FREEZEFRAME ANSWER

Firewire is actually a trademarked name by **Apple Computer** for an interface formally called IEEE **1394-1995**.

A firewire cable has **six** conductors, including two sets of twisted pairs for signaling/strobe and **two** for power.



ON THE COVER:

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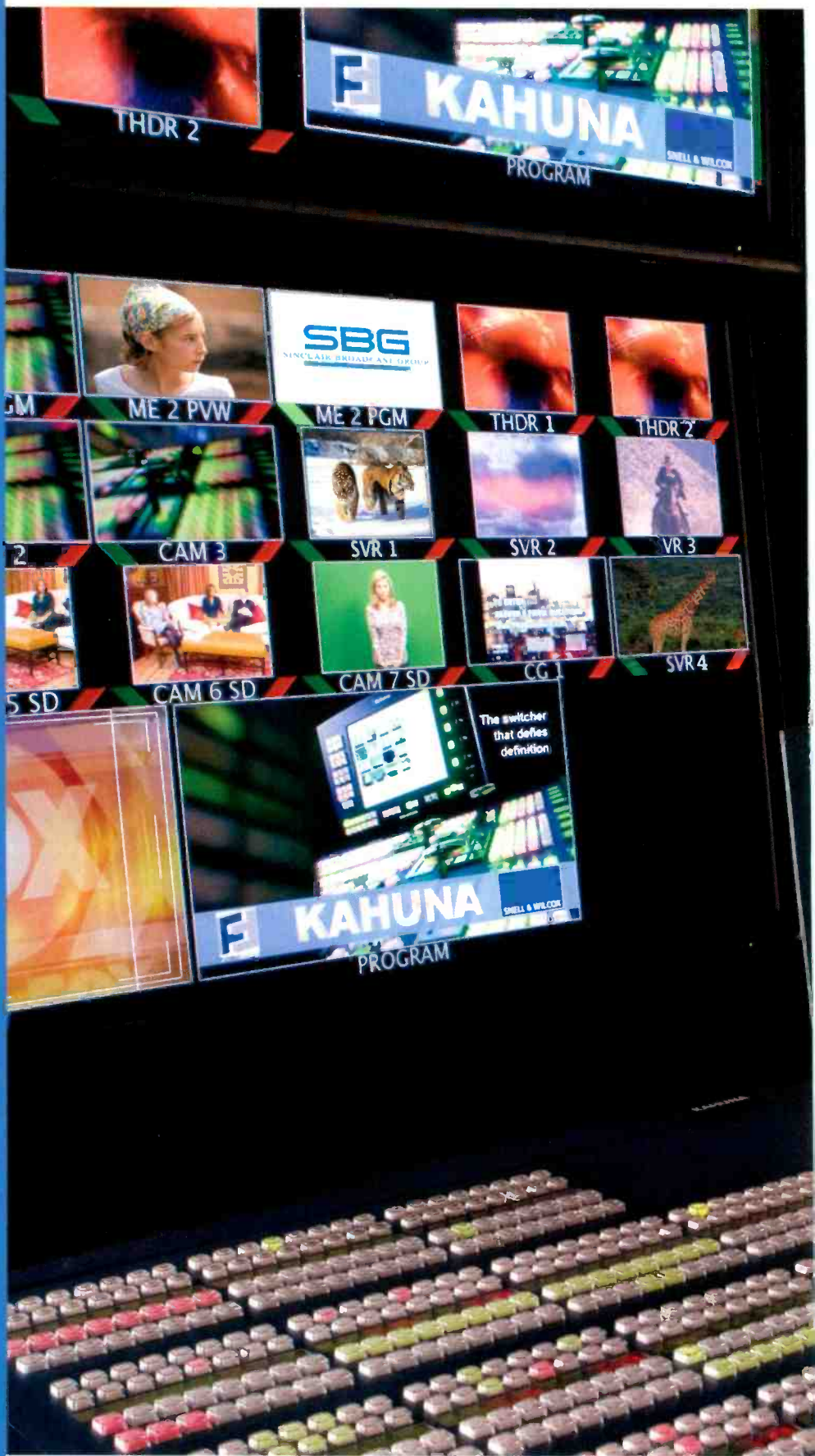
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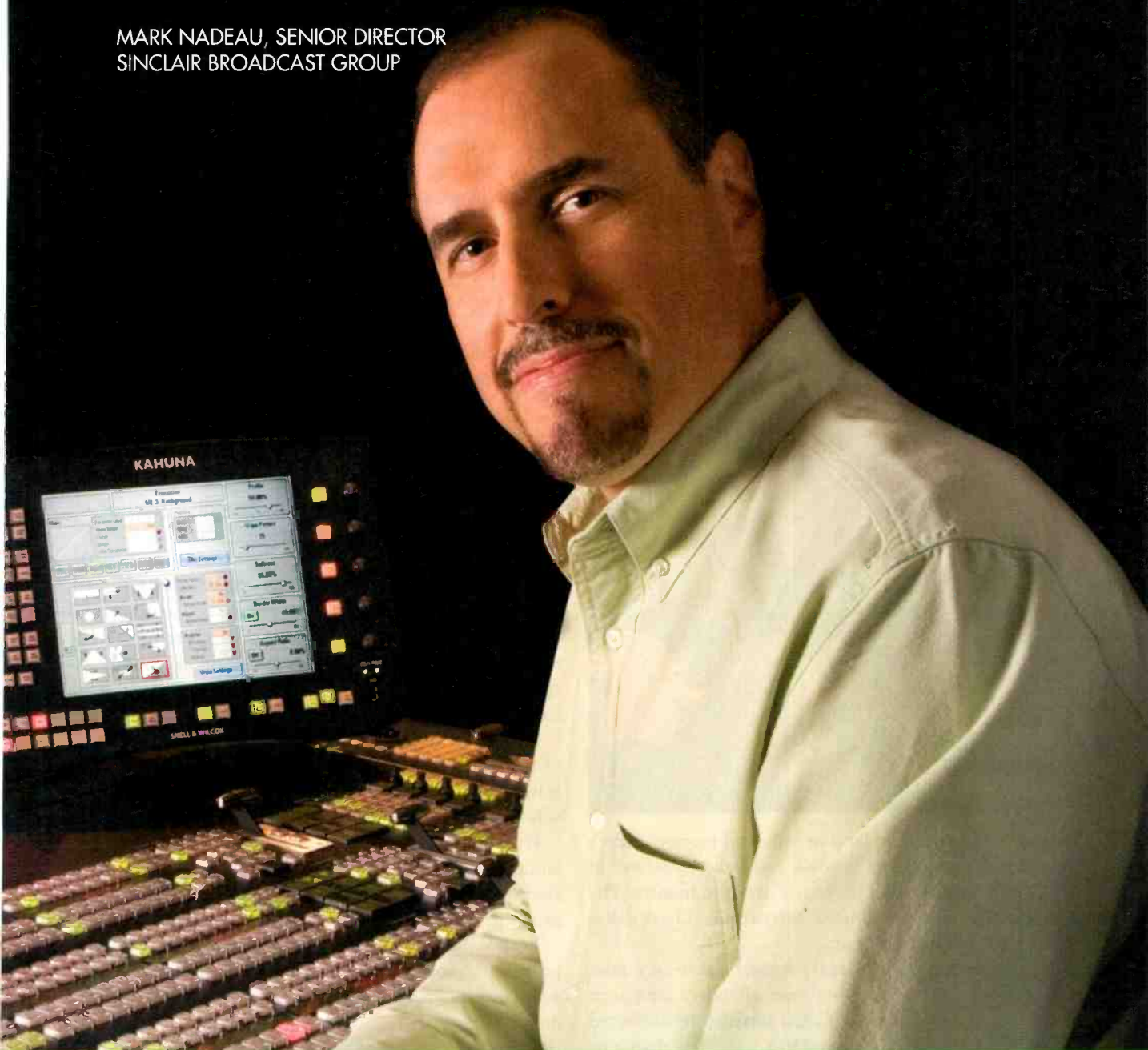
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MARK NADEAU, SENIOR DIRECTOR
SINCLAIR BROADCAST GROUP



SINCLAIR BROADCAST GROUP STANDARDIZES ON
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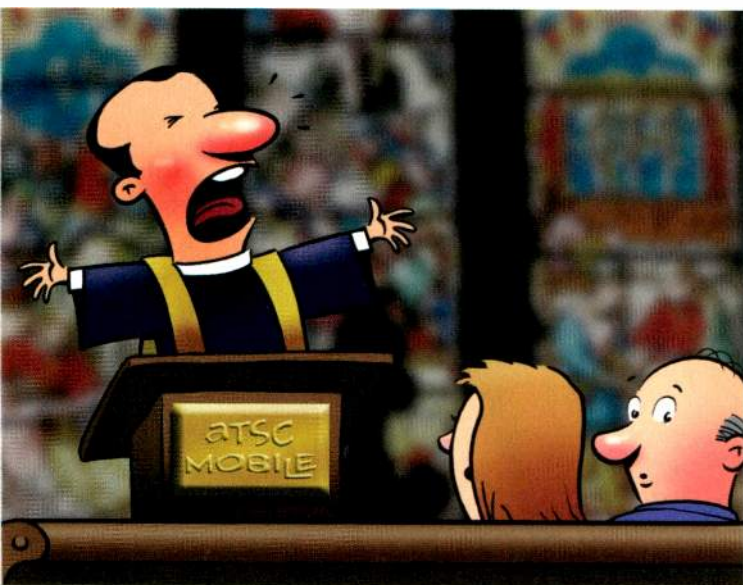
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Preaching to the ATSC choir

One could feel electricity in the air as the crowded room overflowed Monday morning at the mobile TV meeting at the NAB convention. Broadcasters, all desperate for new revenue opportunities, filled the meeting room breathlessly wanting for a Moses figure to lead them from the darkness of shrinking revenues. “Mobile TV! We must have mobile TV!” some chanted.

During the next hour, attendees were mesmerized as evangelical-sounding proponents dangled promises of broadcaster-delivered mobile TV before the throng. “Fol-



low me to the promised land of milk and money. There’s gold in those megahertz if you’ll just believe. Believe in ATSC, and paradise will be yours,” was the mantra. The fire-breathing preacher Elmer Gantry couldn’t have delivered a more powerful sermon.

The problem is Elmer Gantry turned out to be a fake. And this wouldn’t be the first time attendees have seen smoke and mirrors at NAB. Could broadcaster-delivered mobile TV be more self-serving to a select few than a financial future to many?

The hoopla for mobile TV at the NAB convention was no accident; it was arranged. The goal was to boost moods and minds that this industry will deliver video to handhelds and stand to make millions. The team’s revival message was powerful. But is it real?

In early April, in these same Las Vegas halls, the CTIA held its convention and also looked at video for mobile. Guess what? Broadcasters weren’t mentioned.

While broadcasters anxiously talk about mobile TV, no one is actually doing it. The proponents — ATSC, OMVC, NAB and XYZ — are all delivering stump speeches at rallies about broadcasters’ future in mobile TV. Unfortunately, only the cell phone companies are actually delivering video to handhelds.

None of the new phones introduced at CTIA shows mention having OTA mobile TV capability. All of the phones introduced were focused on data services provided by cell phone companies. To these guys, data includes everything — voice, text, video and live television. Nowhere at CTIA did the cell phone companies open their arms to the broadcaster’s version of video delivery.

And, why would they? If you own the phone, its technology, its operating system, the customer and the delivery infrastructure, why would you willingly give up any portion of that control or profit?

So what’s missing from the CTIA’s mobile picture? Of course, it’s local news, weather and traffic.

But is a local TV station needed to provide local weather, traffic or news? We’ve already got the Weather Channel, AccuWeather and others that produce zoned forecasts and updates. There’s Traffic.com and SigAlert, producing up-to-the-minute traffic conditions based on cell phone usage and traffic counting technology. And even local news can be obtained without a requirement for OTA delivery.

Get the picture? Broadcasters don’t have a part in any of this delivery or sales infrastructure. What we do have is local content. While that’s valuable, it’s but a portion of what viewers want to see on their handhelds.

Here’s a comparison to the challenge we face: Sony, Nintendo and Microsoft own the game station market. What chance do broadcasters have to begin delivering video games to the PlayStation, Wii or Xbox? None!

Broadcasters are late to this competition, with unproven technology, having to compete against powerful worldwide interests, on a U.S.-only technology — all in an unfamiliar space.

I’m not saying we can’t yet win a place at the mobile video table. However, Verizon’s marketing phrase, “Can you hear me now?” could easily become “Can you see me now?” And that could happen without one second of OTA participation.

BE

Broad Dick

EDITORIAL DIRECTOR

Send comments to: editor@broadcastengineering.com



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24/7 IT support

Dear editor:

In your "Buying a new server?" article in the April 2008 issue of *Broadcast Engineering*, you posit the question: What happens if the technology expert is on vacation, sick or otherwise unavailable?

If you manage your TV station the way we do here (name withheld to protect the guilty), you hire a dedicated IT professional. First, pay him or her a salary so you don't have to worry about that pesky overtime cost impacting the bottom line.

You then make sure that you call or page him with some "mission-critical" problem just as soon as he leaves the building. Any problem will do: the PC needs a reboot, the printer needs toner, the phone got unplugged, the talent can't get into her MySpace page ...

Off-duty hours? What are those? Call him at home during his sleep hours, again with petty little IT problems. If nothing else, call to tell him how office politics are preventing him from getting technical training, certified or looks at new technology. Calling while you are at NAB in Vegas is good too.

Making sure your configuration has "issues" can keep a good tech on his toes. For instance, keeping a 6TB server online to run one looping 15-second logo, while your two 1TB servers are running out of room on a daily basis, works well here. Racking the storage server but not using it because "we just aren't comfortable with it just yet" helps too.

Sick or vacation? Call early, and call often. Call his personal cell phone, especially if he is a couple time zones away so you are calling before dawn. Again, office politics discussions are good, personality conflicts are good and griping about suppliers is good — anything to keep your tech in the loop.

Eventually, your tech will give up and just sleep on a cot on the loading dock so you can have 24/7 support with just one person. Or, your tech will leave for an hourly tech support job in cube world, where he arrives at 8 a.m., goes home at 4:30 p.m. and never hears from the office in between.

Any other IT questions I can help you with?

909 smart antennas

Dear Also Cugini:

Any idea who is making a CECB with 909 antenna interface, preferably the common coax interface electronically steerable indoor or outdoor antenna compatible with same?

I recently tried out the Insignia brand converter (LG), and it works well in a rural-fringe setting with an amplified rabbit ears/UHF loop (RCA brand), but it clearly wants a 909 smart antenna to work well.

I've looked, but I can't find any-

thing. I thought you might be able to help, as it appears you are on top of things in this area.

FYI, I am an RF engineer, working mostly in Wi-Fi, TCP/IP networking and so on, so I am fluent in tronspeak.

**Stuckey McIntosh
Recon Aero**

Aldo Cugini responds:

To find the CECBs that support CEA-909, go to www.wikipedia.org. I don't believe there are any CECBs that use the single-wire (CEA-909A)

interface. To my knowledge, there are three companies that have some kind of antenna development program:

- *Funai/DX*. I consult for this company. It has not announced product availability.
- *GE/Jasco*. It has said that an antenna will be available, probably in the coming months.
- *Antennas Direct*. This company showed a prototype smart antenna at NAB, built for an NAB project. The antenna will be ready for NAB (small quantity) by October 2008. There are no current plans for mass production.

Best network type

Dear John Luff:

I wanted to know what network type is the best for television networking? Gigabit? Fiber? Ethernet? We are networking a couple of video servers, playout systems and editing systems, and we'd like to know the best one.

**Carlos
NET2Television
Ghana**

John Luff responds:

There are important applications for all types of networks in broadcast facilities. What factors are most important will vary depending on the application. First, one must consider the bandwidth needed. If network traffic will never exceed a few megabits, then 10BASE-T will suffice. But if real-time transport of HD content is required, then GigE is necessary, although uncompressed HD will require much faster speeds. Security, latency, distance and cost are all factors that should be evaluated.

It sounds like you might be well served by a gigabit backbone, which today is quite affordable. However, I suggest you have an IT professional take a serious look at all issues.

Test Your Knowledge!

See the FreezeFrame question of the month on page 8.





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Piracy or innovation?

Here's why Hollywood is losing the DRM wars.

BY CRAIG BIRKMAIER

As I prepared to travel to Las Vegas for my 30th consecutive NAB, it occurred to me that this might be a good time to test the waters and download a few movies to watch during the long flights from Florida to Vegas and back. After all, I have a MacBook Pro and an iPhone, so why not give the new iTunes movie rental service a spin? The MacBook Pro has a near-HD resolution screen. I figured, with a little bit of luck, I might actually be able to open it up on the plane. If, however, the passenger in the seat in front of me rendered it useless, the iPhone provided a fallback solution.

When I went to the iTunes store online, I decided to rent a movie and buy one so I could compare the experience. I was a bit apprehensive about the short viewing window for rentals. You have 30 days to begin watching the movie, but once you start watching,

you have 24 hours, then — poof — it's gone. This may be the least friendly digital rights management (DRM) scheme that Apple has adopted in its efforts to get and keep the iTunes store stocked with movies, TV shows and music from the media conglomerates.

It took about four hours to download two movies (each about 1.2GB) using the relatively slow 1.5Mb/s DSL connection at my home. While in Las Vegas, I downloaded another rented movie via a much faster cable modem. That took less than an hour.

Thanks to the use of H.264 compression, the image quality was as good as any SD DVD I have purchased, at about one-quarter the file size — not good news for the folks who make shiny discs. Even worse for DVD makers — but better for me — the movies still look great when I hook the MacBook Pro up to my 50in HDTV via a DVI cable. It may not be Blu-ray, but I'm not complaining.

Overall, it was a very satisfying experience, and there were no seat back problems. I did put one movie on the iPhone. It's like watching an old 19in TV vs. my big screen HDTV.

I was satisfied, except for one thing. Each time I would launch a rented movie, a window would pop up warning me that my 24-hour viewing window was ticking away and would soon expire. Thanks, Hollywood. This, together with some of the bizarre story content in the movies I rented, served as a reminder of why I don't spend much time or money watching the content produced by the media conglomerates.

Boom town or ghost town?

Apparently, I'm not alone. The TV broadcast industry just experienced the worst season in recent memory, in part because of the writers' strike and in part because there's a world of new alternatives out there vying for eyeballs.

At times the NAB show floor looked like an Old West ghost town, despite the fact that business on The Strip was booming. New hotels and condos are popping up everywhere, and let's just say that a trip to Vegas is not cheap — nothing like it was a few decades ago when I started to attend NAB.

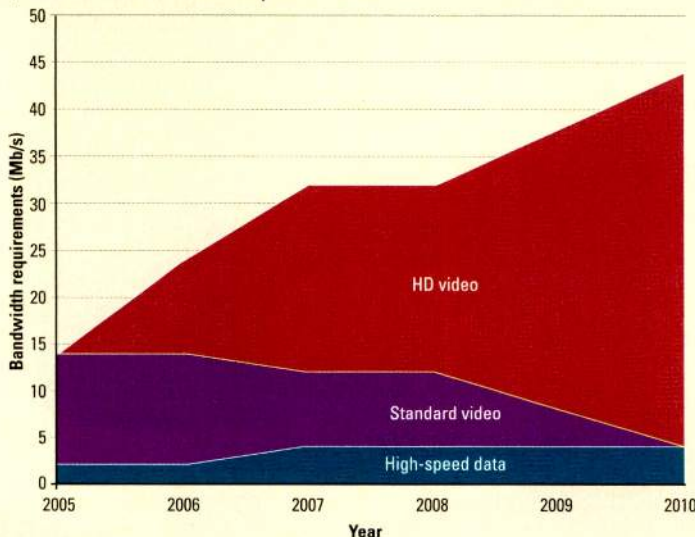
Based on what I heard at several NAB keynotes and other sessions, I can only conclude that the wheels are starting to come off the NAB bandwagon. It was hard to find a broadcaster among the 100,000-plus people that the NAB told us were preregistered for the show. Avid and Apple were nowhere to be found. It would have been downright embarrassing were it not for increased international attendance, thanks to the value of the dollar, which is plunging as if to emulate TV ratings.

It makes one wonder why the

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

Requirements for Internet and TV services to the home

By 2010, each TVHH will require 45Mb/s of bandwidth.



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- Loudness correction for digital program insertion (DPI)

media conglomerates treat consumers like common thieves, as they attempt to stay one step ahead of the pirates with ever more complex and onerous DRM schemes.

Didn't Apple prove that people will buy music if it is priced fairly and is easy to use on new generations of media players and smart phones? Maybe they should put up some golden arches at the entrance to the Apple campus in Cupertino that say, "Over Four Billion Sold."

Last year, Steve Jobs wrote a missive titled "Thoughts on Music," asking the record labels to drop DRM for online music downloads. (See "Web links.") Jobs noted that the industry sells unprotected audio CDs, which account for the vast majority of music stored on iPods; so why put DRM on downloads? Apple did convince one label to drop DRM, but the rest decided that Apple has too much power over distribution. So they offered DRM-free music to Apple's competitors.

The pirate's dilemma

Matt Mason began his career as a pirate radio and club DJ in London. Recently he published a book, "The Pirate's Dilemma: How Youth Culture is Reinventing Capitalism." (For more, see "Web links.") Mason contends that American cinema and cable television were founded as outlaw institutions. (There's a reason that Hollywood flourished as far away from D.C. and New York as it could get.) In his book, he notes, "During the nineteenth century Industrial Revolution, the Founding Fathers pursued a policy of counterfeiting European inventions, ignoring global patents, and stealing intellectual property wholesale." He

Web links

- "Thoughts on Music," Steve Jobs www.apple.com/hotnews/thoughtsonmusic
- "The Pirate's Dilemma: How Youth Culture is Reinventing Capitalism" <http://thepiratesdilemma.com>

goes on to say that Americans were so known for piracy that they were eventually branded Yankees, from the Dutch "Janke," slang for a pirate.

The heart of Mason's argument goes like this: "Piracy transforms the markets it operates in, changing the way distribution works and forcing companies to be more competitive and innovative. Pirates don't just defend the public domain from corporate control; they also force big business and government to deliver what we want, when we want it."

I'll go a step further and suggest that sharing (not piracy) is the most powerful promotional tool available to the media conglomerates. Where would the music industry be today were it not for radio? Radio became the promotional engine for the industry — payola and all. Now the music industry wants radio stations to pay license fees for every song they play, in addition to the annual ASCAP/BMI licenses they have paid for years.

The cable industry bypassed the stranglehold the TV networks had on viewers. Now we pay monthly subscriber fees for free broadcast TV that is carried on cable and DBS systems. Is this not another form of DRM, imposed by the cozy relationship of broadcasters and the government that regulates them?

The U.S. Constitution directed Congress to create patents and copyrights — not as a way to protect intellectual property, but rather to encourage its rapid proliferation into the public commons. For more than a century, the length of copyright protection for authors was 14 years. After that period, the author (if still living) could request a 14-year extension. In the 20th century, the length of protection for copyrights was extended seven times. It is now 70 years after the death of the author.

The tight coupling between the media moguls and the politicians has created an environment where piracy is the most effective tool for consumers to fight back. Mason concludes, "For the last sixty years, capitalism has run a pretty tight ship in the West.

But in increasing numbers, pirates are hacking into the hull, and holes are starting to appear. Privately owned property, ideas, and privileges are leaking out into the public domain beyond anyone's control."

I can't find much to disagree with, except that capitalism is not the culprit. It is the subversion of free markets through political gerrymandering that has caused this mess.

A Blu-ray of hope?

Clearly the big news from NAB is that HDTV is a reality for video producers at all levels, from wedding videographers to the networks.

There was much speculation heading into the 2008 NAB Show that Blu-ray was going to be a newsmaker. With the demise of HD DVD, the Blu-ray faithful expected major announcements about new authoring tools and an elevated level of excitement about using shiny discs to distribute HDTV. However, Blu-ray did not generate much excitement. There are two reasons why:

- The highly complex DRM schemes for the format are a barrier to adoption. And the licensing fees to use the DRM systems make Blu-ray distribution a non-starter for independent producers.
- The HD disc wars were a holding action that kept the market confused long enough for Internet downloads to become a viable option to shiny discs.

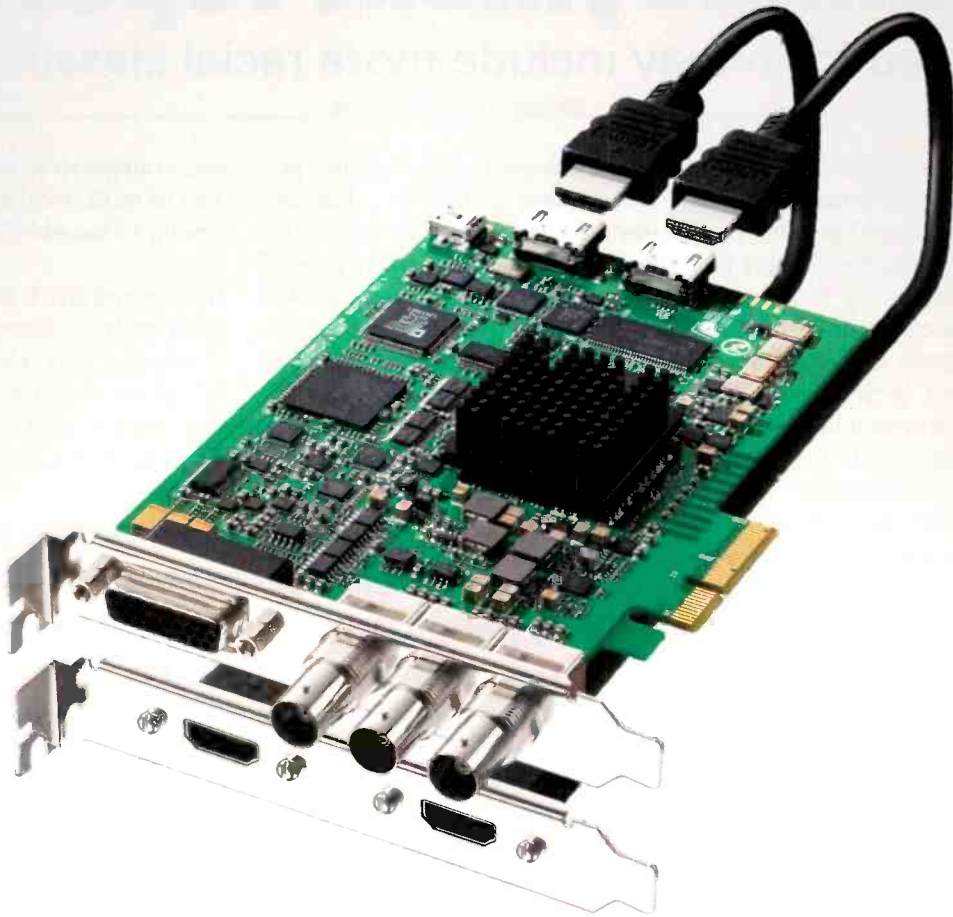
The movies I downloaded from iTunes were affordable and convenient. For a dollar more, I could have rented a 4GB HD version that could easily fit on an existing 4.7GB red laser disc. Considering the price of gas, going to Blockbuster to rent or Wal-Mart to buy content is growing less compelling by the day.

Now if Apple could just convince Hollywood to get rid of that ridiculous 24-hour DRM clock. **BE**

Craig Birkmaier is a technology consultant at Pcube Labs.

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

Blackmagicdesign



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Employment report

A revised form may include more racial classifications.

BY HARRY C. MARTIN

In April, the commission issued a notice seeking comment on possible revisions to Form 395-B, an annual employment report that must be filled out by broadcasters. The revisions would make the form match the racial and employment categories used in the Form EEO-1 Employer Information Report, which is used by the Equal Employment Opportunity Commission (EEOC). The EEOC form was last revised in January 2006, and the FCC wants to know whether the revised standards should be incorporated into Form 395-B. The commission also asks whether the proposed changes would be consistent with the Communications Act.

Major revision: Officials and managers category

The EEO annual reporting requirement was suspended in 2001. Then, Form 395-B called for the provision of the racial and gender composition of each broadcast employment unit, according to job category. The EEOC revisions do not appear to create any

major changes to the categories previously used by the FCC. The only obvious change is the EEOC's refinement of the "Officials and Managers" category, which it has now broken down into to gradations of officials and managers, including "Executive/Senior Level" and "First/Mid Level."

According to the EEOC's instructions, "Executive/Senior Level"

previous categories by providing for persons of mixed races and differentiates among Asians and Pacific Islanders.

In accordance with the Communications Act

Whether any changes to Form 395-B — even the apparently benign changes that would be needed to conform it to the EEOC form —

Whether any changes to Form 395-B — even the apparently benign changes — would be permitted by the Communications Act is a more troublesome question.

personnel "resid[e] in the highest levels of organizations" where they "plan, direct and formulate policies, set strategy and provide the overall direction." By contrast, "First/Mid Level" managers take directions from "Executive/Senior Level" managers. Examples of "First/Mid Level" positions are vice presidents, treasurers and operations managers.

EEOC form includes more racial classifications

As to the racial classifications, the EEOC form provides more classifications than the FCC previously did. Under the EEOC system, the reportable categories are:

- White (not Hispanic or Latino);
- Black or African American (not Hispanic or Latino);
- Hispanic or Latino;
- Native Hawaiian or other Pacific Islander (not Hispanic or Latino);
- Asian (not Hispanic or Latino);
- American Indian or Alaska Native (not Hispanic or Latino); and
- Two or more races (not Hispanic or Latino).

This list varies from the FCC's pre-

would be permitted by the Communications Act is a more troublesome question. Section 334 of the Communications Act expressly prohibits the commission from revising any EEO reporting forms. A subsection of Section 334 does provide the commission with latitude to revise its EEO regulations, but that exception says nothing about forms. A strict reading of Congress' language could lead to the conclusion that the FCC is stuck with the form it suspended in 2001.

The commission's notice of its intention to consider adoption of the EEOC's reporting standards and categories does not mean that a new Form 395-B will be adopted. But the notice is a strong indication that a new reporting requirement will be imposed.

BE

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

Dateline

- August 1 is the deadline for TV stations in California to file their biennial ownership reports.
- In the following states, August 1 also is the deadline for TV, Class A and LPTV stations that originate programming to place their annual EEO reports in their public files and place them on their Web sites: California, Illinois, North Carolina, South Carolina and Wisconsin.
- On August 1, TV stations with more than 10 full-time employees in North Carolina must electronically file their broadcast EEO midterm reports (Form 397) with the FCC.

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Video for mobiles

The industry needs to act fast to take advantage of this opportunity.

BY ALDO CUGNINI

According to a study released earlier this year by the NAB, broadcast television could reap an additional \$2 billion in revenue by 2012 by delivering content to mobile and handheld devices — but only if an industry standard is adopted and technology is deployed quickly. In fact, the growing interest in mobile video demonstrates that it is at the point where technology is not the limiting factor; business issues are. This month, we'll explore the various delivery methods that now present practical solutions for delivering content to mobile consumers.

Local vs. regional vs. national

The Open Mobile Video Coalition (OMVC) is an alliance of U.S. commercial and public broadcasters that supports the development of mo-

bile DTV. The OMVC is focusing on four categories of devices to carry mobile video: cellular telephones, in-vehicle devices, laptop computers and portable video players. While all of these can receive video programming, the form factor and usage will define what kind of content is best suited to each — long-form vs. short-form programs, streamed vs. cached, pushed vs. interactive, and so forth.

Mobile video transmission can be broken down into two categories: pedestrian and high speed. Both conditions require a wireless connection to the receiver. For this, three delivery paths are possible: satellite, Wi-Fi and terrestrial broadcast. Until recently, satellite delivery has offered the most viable means for mobile reception, though at an economic cost to the receiver. With a relatively short range, Wi-Fi continues to be limited to pedestrian or fixed receiver applications.

Terrestrial broadcast has also been limited because of the constraints of the various modulation systems. However, all three of these technologies are advancing to the point where the differentiator may become the business model — but more on that later.

As with any transmission system, satellite delivery of video requires appropriate bandwidth and signal robustness. The problem is that high-bandwidth services are constrained to a portion of the spectrum that requires a relatively large antenna and electronics that are relatively expensive for a handheld. Satellite mobile services have so far depended on antennas and tuners that are practical for vehicular use, and have supplemented transmission with terrestrial gap fillers. With mass consumption, the technologies may soon be at the point where the form factor and cost issues are no longer prohibitive.

Also, the FCC has allocated only enough spectrum for mobile services to permit 4Mb/s of downstream bandwidth. This means that MPEG-4/AVC compression is most likely, with video resolutions supporting a handheld device.

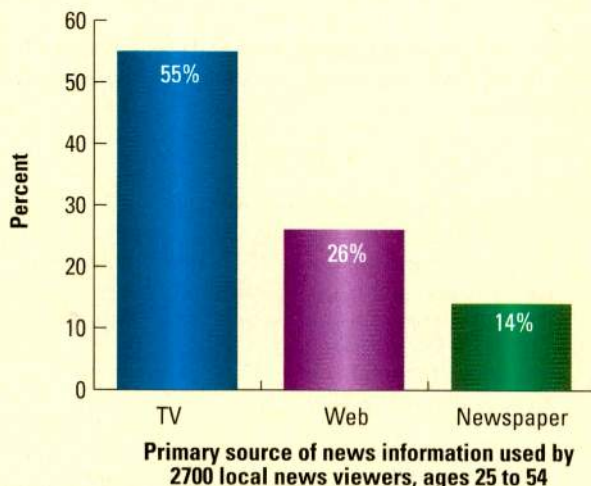
Because Wi-Fi is bidirectional, this medium provides for an inherently more robust connection — as long as the user is within range of the access point. Not only can one communicate in both directions, which is a must for Internet traffic, but the wireless LAN operates much like a wired LAN, with handshaking a key element. The channels are constantly being negotiated so that if there is interference that disrupts the communications, the communicating parties are instructed to retransmit the faulty data. Thus, when the channel goes bad, the data does not get corrupted; the data rate just goes

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down. This results in reliable, multirate data communications — provided the channels are there. While a single access point can run on one of 11 or more channels, these channels overlap, so that in practice sometimes only three Wi-Fi networks can coex-

ist on nonoverlapping channels. Each access point, however, can serve up to 128 (or more) users.

Interference with nonintentional radiators (e.g. microwave ovens) and intentional radiators (such as Bluetooth devices) can compromise reliability. In

addition, the connection range of the earlier Wi-Fi technologies is typically no more than 100ft. More recently, a new Wi-Fi system, WiMAX, has been developed, enabling a connection range of at least a few miles from an access point. Still, the size and power consumption of the WiMAX receiver are not yet practical for the handheld device market.

Terrestrially, ATSC-M/H (United States), DVB-H (Europe and Asia) and ISDB-T (Japan) are emerging as viable solutions for video delivery to handheld and mobile devices. These systems all borrow data bandwidth from a parent television transmission. Therefore, the addition of enhanced services will subtract from the total data rate by an amount that includes additional overhead, and that amount is dependent on the modulation system and the amount of robustness needed. (See Figure 1.)

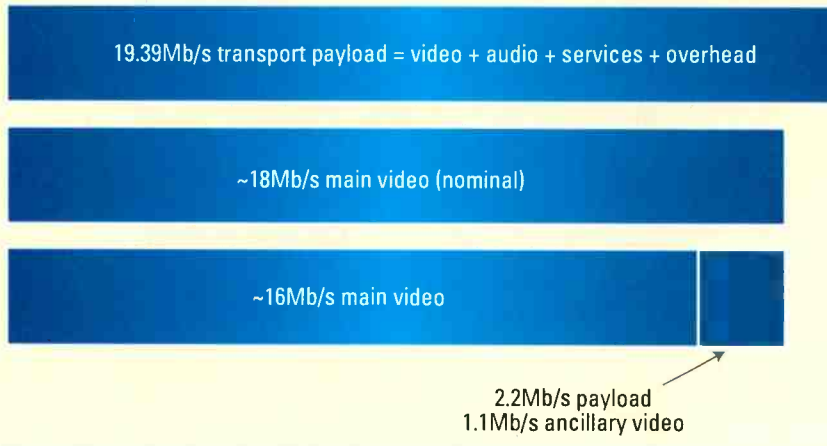
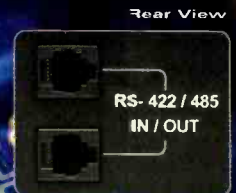
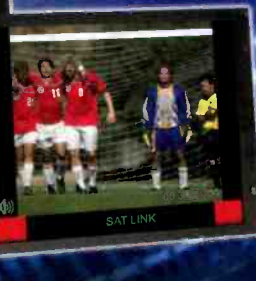


Figure 1. Ancillary video can be added to a terrestrial video transport, as shown here for ATSC.

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Various other formats are being deployed as well, in which the transmissions are dedicated to the mobile data stream. These include different versions of DMB in China and Korea and QUALCOMM's MediaFLO. The cellular telephone networks provide an additional means of delivery to handheld devices, using CDMA and GSM.

A key consideration for handhelds is power consumption. ISDB-T and DVB-H accomplish this by means of one-segment and time-slicing operations, respectively. These are means for receiver power cycling, synchronized in such a way that the receiver ignores the unnecessary other data (and modulation) in the stream. (See

Figure 2.) The various systems under consideration for ATSC-M/H also include some form of time slicing.

The OMVC endorses a single-system approach to mobile video in the United States, and for that reason, it supports the development of the ATSC-M/H standard. The Mobile DTV Alliance is another group that is promoting mobile video, with more emphasis (and membership) coming from product manufacturers. With a potentially worldwide product base, the group supports both ATSC-M/H and DVB-H.

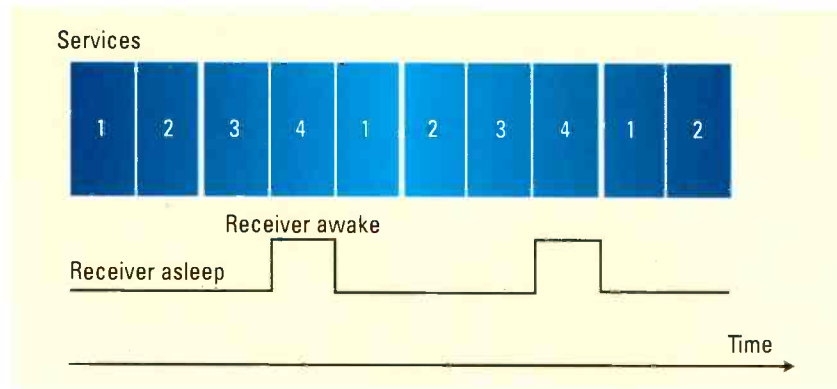


Figure 2. Time slicing saves power by switching the receiver off between bursts of data.

Compression, content distribution and carousels

The choice of a compression system will be a critical element in system deployment, especially for the smaller handheld devices. Affecting the design decision are compression quality and efficiency, product support at

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the user's side and possible licensing terms for the codecs. While downloadable software updates can provide for maximum flexibility, a stable and efficient platform is mandatory, and this may require that the compression decoder be unchanged after deployment. For streaming applications, the most popular codecs are Flash, Windows Media, QuickTime and RealVideo. For non-real-time playback, these codecs,

The choice of distribution mode will be closely tied to the physical infrastructure.

as well as H.264 (MPEG-4 AVC) and H.263/3GPP, are already seeing widespread use.

Several distribution modes are being considered for mobile video. One is unicast, or one-to-one transmission. This method essentially treats communications with each device as a unique channel, allowing video-on-demand and similar services, even if the program is not viewed in real time. This type of subscriber granularity places the highest demand on system bandwidth, with a large audience of inter-

acting subscribers requiring an enormous amount of data throughput.

Another option, multicast transmission, alleviates this issue somewhat. With it, communications to a smaller group of devices can be pooled. An à la carte subscription to different packages reduces the number of options for individual programs, but serves a network of users more efficiently.

Finally, a broadcast mode services viewers in the familiar broadcast television format, requiring little or no interactivity, but carrying the least flexibility for user choice.

The choice of distribution mode will be closely tied to the physical infrastructure as well as the content agreements by the service providers. Broadcast mode services, by definition, do not require a back channel to the service provider and may be entirely advertiser supported. The most interactive services, however, will require a return path, so a reliable cellular or Wi-Fi connection would be needed. In between these two scenarios could be a system where users place orders from an interconnected site, such as the home or office, and then receive the content at other times.

Users can also get a highly interactive experience by means of carousels, whereby content is repeatedly cycled

on various channels, much the way that program guides are distributed on existing DTV systems. By allowing a customer to preorder content, a near-VOD experience can be provided. The content distribution can be dynamically scheduled, depending on user pull.

System architectures and their geographical distribution will dictate how portable a service can be. From this respect, some business models will parallel the existing wireless television transmission methods, with the proportion of local vs. national content being driven by ad sales.

Which way to go?

Open standards, widespread availability of devices and experience with video services should point the way to a viable business. While it's risky to make predictions about this growing opportunity, the sheer number of interested heavyweights makes it all but certain that services will continue to expand from the limited trials now underway. Sitting on the sidelines is no longer an option. **BE**

Aldo Cugnini is a consultant in the digital television industry.

Send questions and comments to: aldo.cugnini@penton.com

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Milestones in Broadcasting

Rohde & Schwarz: 75 Years of Driving Innovation

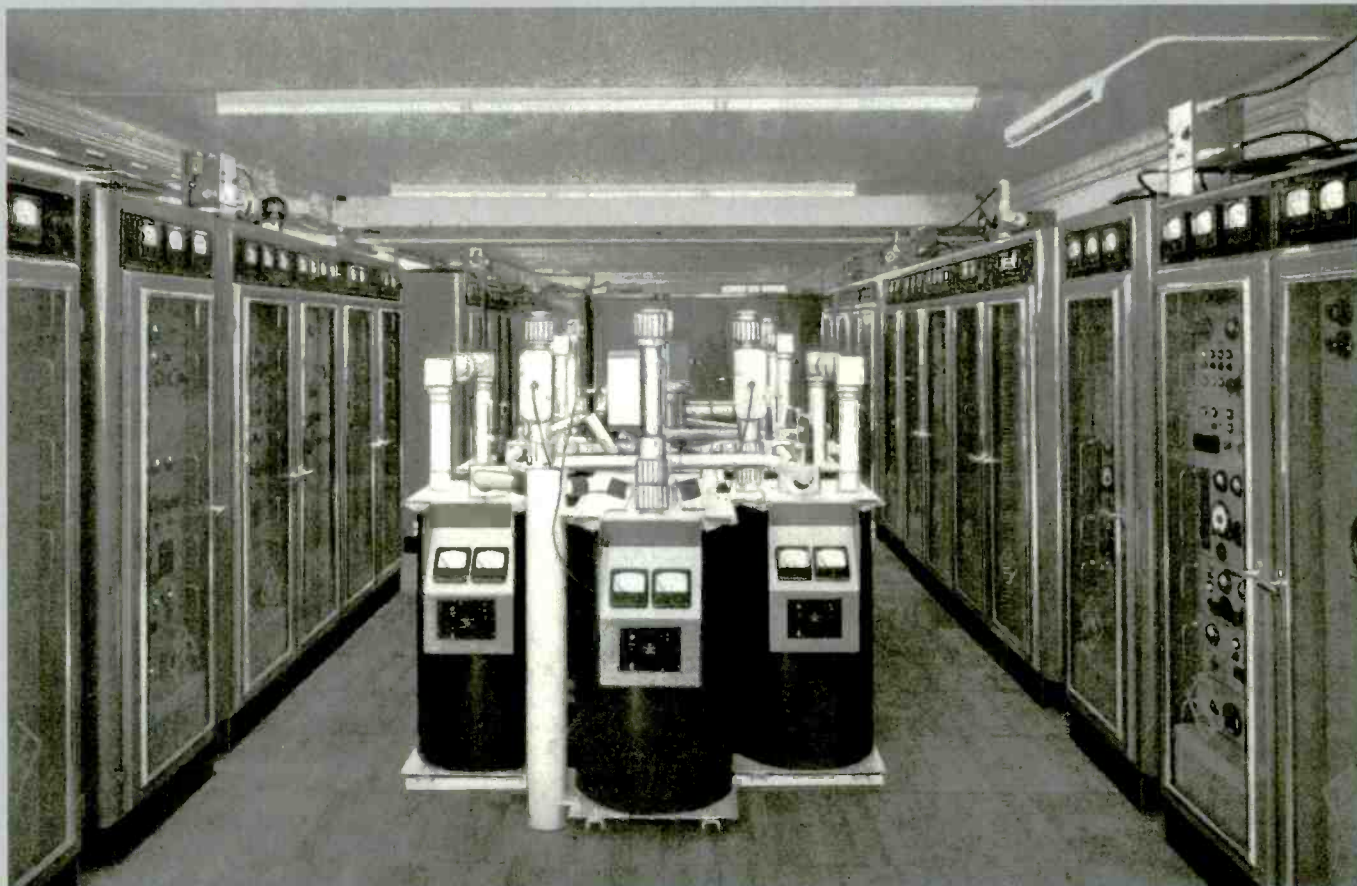
TV and radio have brought the world closer together. People, events, and regions far away now appear right in front of us – with a face, a voice. For almost six decades, Rohde & Schwarz has been a fixture in broadcasting and related T&M equipment. Standards bodies – user equipment testing – TV network setup: These are all areas where the world market leader in terrestrial TV transmitters plays an active role. A historical snapshot.

The present – 2008: Rohde & Schwarz is driving the transition from analog to digital and mobile TV. The Munich-based electronics group outfits entire countries with complete TV networks in a minimum of time: from the USA to Great Britain, Germany, Scandinavia or Spain, and all the way to Taiwan. Broadcasting equipment manufacturers turn to Rohde & Schwarz for a complete T&M portfolio in R&D and production. More than 70 company sites around the world provide direct customer care. But how did this start?

When the company first entered broadcasting, no one thought that it would one day supply nearly the entire world with TV. The initial goal was small, manageable: to bring radio to the people of Bavaria, Germany. That was

the 1940s: Broadcasting was synonymous with radio – and radio programs in Europe were broadcast primarily in the medium-wave range. After the war, an international conference in Copenhagen reallocated the medium-wave frequencies. Germany was assigned very unfavorable frequencies. An alternative was needed – and one was found: very high frequency (VHF). On January 18, 1949, Rohde & Schwarz received an order from the Bavarian Broadcasting Corporation to build a VHF FM transmitter. Only six weeks later – after a race against time and the competition – broadcasting went live. Rohde & Schwarz had put Europe's first VHF FM transmitter into service.

The company's broadcasting division was soon providing a full-fledged portfolio of VHF FM sound broadcasting products. Sound transmission in stereo, the radio data system (RDS) and the replacement of vacuum-tube transmitters followed in quick succession. And Rohde & Schwarz played a major role in driving the development of all of them. In 1979, the broadcasting specialist launched a socket-type transmitter featuring one kilowatt of power. This international bestseller featured the slogan "set up, connect, forget". In 1995, the world's largest DAB network at the time – produced jointly by Rohde & Schwarz and the Bavarian Broadcasting Corporation – went on the air.



Rohde&Schwarz installed this VHF FM transmitter system with a power of 6 x 10 kW in South Africa in 1963.

In the TV market, the company was clearly pursuing another course. It initially focused not on transmitters, but on T&M instruments. Highlights such as the AMF Nyquist test demodulator in 1955 defined the T&M industry for decades to come. The AMF made changes in the transmission paths of a TV signal visible, and broadcasters long considered it to be standard equipment. In the early 1960s, Rohde&Schwarz began developing special TV test transmitters. The 1970s ushered in test line T&M equipment, which enabled operators to monitor signal quality during live programming.

The first TV transmitter, which Rohde&Schwarz produced in 1955, was truly small: It supplied 20 mW of power to the network. Its big brother hit the market in 1956, only to continuously grow into a broader portfolio of products over the following decades. Today, transmitters designed in Munich are known above all for their low energy consumption. The latest models match the transmit power of competitor equipment while delivering power savings of up to 25 %.

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Broadcast security

Firewalls and passwords top broadcasters' concerns.

BY BRAD GILMER

I spoke with several broadcasters about security for this month's column. Two topics came up repeatedly — firewall technology and password security.

Firewalls give broadcast engineers heartburn for several reasons. First, in a perfect world, engineers would prefer that there not be any connections from their core broadcast networks to the Internet. Second, in many stations, broadcast engineers do not install or administer the firewalls in their installation, yet they depend on these devices to keep their core operations safe.

Fortunately, or unfortunately, it seems that Internet connectivity is here to stay. For a host of reasons, users of systems we design and implement need to connect to the Internet. Given this fact, what is the best way to design broadcast networks so that they are secure but meet end users' needs?

When you connect a network to the Internet through any sort of security device, there is a chance that the device will be compromised. One solution to this problem is to segment your networks. If you have a critical set of computers (e.g. on-air automation systems), put these computers on a separate physical network (your core broadcast network), and keep this network separate from the Internet. In fact, you probably want to keep this network detached from internal networks too. Do you really want a defective network card in an audio workstation in production to trash your on-air network? This is a real-world scenario.

Figure 1 shows how a network can be segmented. In most stations, it is not practical to completely separate the core broadcast network from the rest of the facility. Automation logs, as-run logs and commercial inventory are examples of information that need to be exchanged between

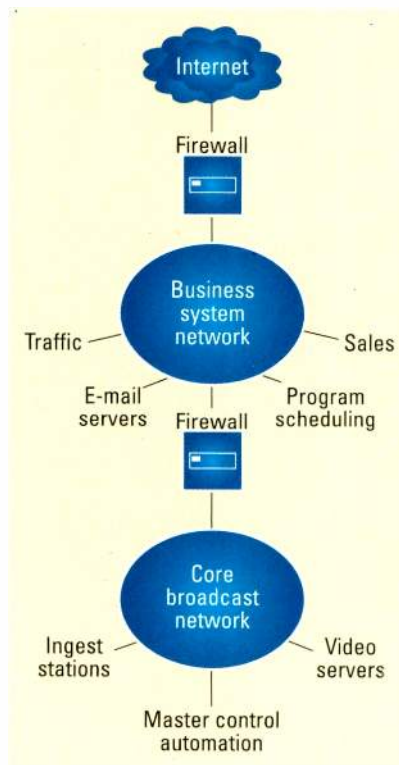


Figure 1. Separate the core broadcast network from the internal business network. Communications between the two networks should be moderated by a firewall.

the core broadcast network and the business system network. If you must connect the core broadcast network to the business system network, the best practice is to allow connectivity through a single, well-controlled point, usually a firewall.

Firewalls

When talking about firewalls, it is useful to understand what they can do. A firewall can:

- inspect packets to see if it makes sense to allow them into the network (stateful packet inspection);
- block probes of your network in advance of an attack;
- allow an administrator to admit only the traffic types he or she decides are acceptable across the firewall;

- conceal a local computer IP address from an observer on the business system network or the Internet;
- expose a particular port on a specific server behind the firewall through a demilitarized zone (DMZ), without exposing all computers behind the firewall; and
- provide logging so security threats from the Internet can be analyzed.

When specifying a firewall, you may want to get one that uses stateful packet inspection (SPI). SPI firewalls monitor conversations between computers on either side of the firewall. If a packet arrives that is destined for a computer on the other side of the firewall, the firewall checks to see if the packet makes sense in the context of what it knows about previous communications between the two computers.

For example, if the packet contains a request to provide status about a connection with the target computer but there is no history of communications between the source and target, the firewall discards that packet. The status packet makes no sense, but there is no conversation already in progress. This keeps an attacker from launching attacks based on weaknesses in some protocols.

Early firewalls without SPI would filter packet-by-packet, without any awareness of the state of communication between the source and target. As such, the firewall had no way to know whether the incoming packet was part of a legitimate conversation already in progress or not, so it would let malicious packets through.

When configuring a firewall, you should be aware that many default configurations allow common ports used for office applications to cross the firewall unimpeded. This is not a good starting point for a firewall that is going to be used in broadcast applications. Start by closing all ports



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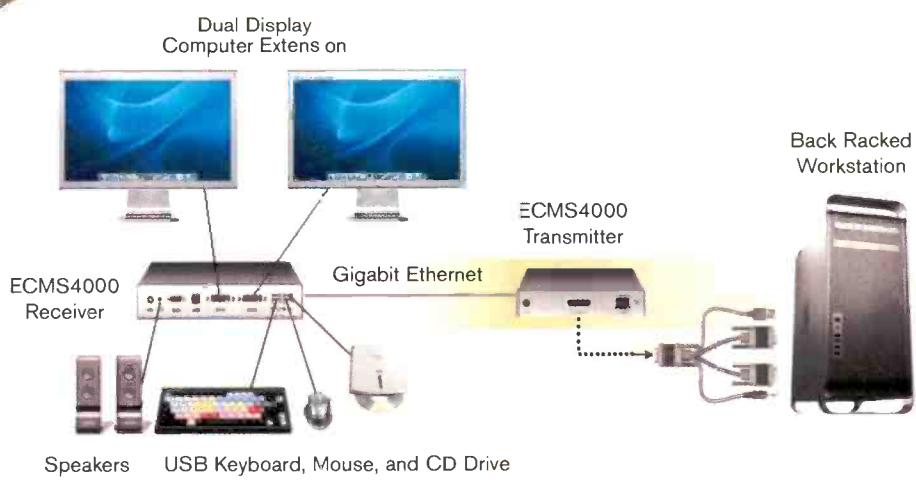
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and applications, and then open them on a case-by-case basis. This may mean more work in the initial configuration, but the firewall will not be passing traffic types that you do not know about. When you close the ports, be sure the system discards the packets without sending an error message back to the source. This is important because some attackers can gain information from the target system by analyzing the error

messages that are returned. (You can go to www.grc.com and run Shields Up!, a port scanning program that will report the status of all ports visible from the Internet on your computer.)

A firewall can conceal a workstation on your core broadcast network from prying eyes on the business Internet. This is called network address translation (NAT). In the example shown in Figure 2, the public Internet

address of the firewall is 67.243.7.12. Workstations on the core broadcast network all use the 10.0.0 private address space. Someone on the WAN (Internet) side of the firewall would never see a workstation on the core network. The only device visible from the outside Internet is the firewall.

Web clients connect to servers using port 80. In Figure 2, all inbound traffic from the Internet 67.243.7.12 port 80 is permitted to traverse the firewall and is directed to the Web server located inside a DMZ at 192.168.0.1. The firewall can be configured so that only HTTP traffic is permitted into and out of the DMZ. In other words, Web traffic can be permitted to go to the Web server but be prohibited from all other computers on the core broadcast network. In another example, the firewall may allow FTP across a DMZ to an FTP server, but it might not allow any workstations to use FTP.

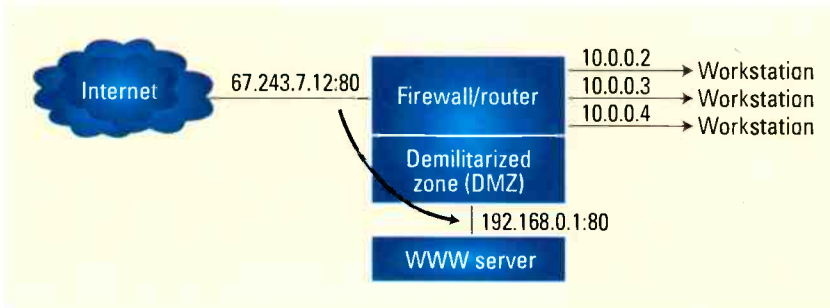



Figure 2. Firewalls use network address translation (NAT) and PAT to conceal the existence of computers on local networks.



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A word on passwords

For many years, it has been a challenge to ensure that the person accessing a system or network is authorized to do so. One solution is to assign each person a username and password combination. If the person knows the password for a given username, then it is assumed he or she is an authorized user.

This sounds like a great solution, and it is simple to implement, but of course, it has some problems. First, anyone who knows the username and password combination can use it, whether that person is authorized to do so or not. Second, humans often pick passwords that are easy to remember. Thus, many passwords are incredibly easy to guess. Furthermore, passwords that have meaning to humans are almost always contained in dictionaries, and it is a relatively simple thing for an attacker to try every

word in a dictionary as a password when attacking a system.

Security experts agree that a better solution is to base security on something you have and something you know. An example of this is pilots who carry an electronic ID card and also know a door access code. Some computer security systems require that the user carry a small electronic device about the size of a USB drive. The device creates a new password every few minutes.

A key solution to the password problem

One solution to the weaknesses of username and password technology is to not use it at all. Many e-mail, secure FTP and file server applications support enhanced authentication, which uses public/private key exchange. A small utility you can run on a computer creates key pairs. When you run the

utility, it generates two files — a public key and a private key. You send the public key file to the administrator of the system you wish to log in on. Keep the private key on your local computer, and point the authentication program to that file. When it's time to log-in to the remote system, start the application, and in many cases, it automatically logs you into the system by exchanging information based on the key files. Common authentication systems include RSA and DES.

You can find more information on both of these systems by searching for these terms on your favorite Internet search engine. **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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DRIVING THE FUTURE

Weather systems

Understand weather systems' data paths.

BY EMIL VLADKOV

Weather conditions constantly change, making weather monitoring important. Today's weather monitoring systems are a bundle of high-tech instruments, including smart sensors with the capability to speak directly to digital systems (data loggers and computer stations). However, their usefulness would be limited if the systems could not be placed anywhere outside and in large numbers to collect more data. Here, the new wired and wireless technologies come into play, and the neighborhood weather stations can become a wired, wireless (802.11) or mobile network.

Meteorology

The generalized set of parameters collected or measured by a weather system are ambient temperature, wind direction, wind speed (anemometers), humidity (hygrometer), barometric pressure, dew point, precipitation (rain gauges) and global radiation (solar energy). There is nothing unique in the way the computerized weather station is built. The most advanced piece of the equipment is the smart sensor, which outputs not an analog voltage as in the good old days, but digital values corresponding to the value of the parameter being measured. So, for the temperature, a digital thermometer is used. The wind direction is detected by a vane with an attached magnetic rotor, which passes over magnetically activated switches to give the eight or 16 compass points.

For the wind speed, the solution is to use wind cups with a rotor featuring mounted magnets incrementing a counter (again, a digital solution). The more advanced solution without moving parts is a Doppler anemometer, which measures the speed and frequency of the sound. The smart sensors speak to a weather station inte-

grated microcontroller through a one-, two- or three-wire interface. (Other implementations are possible.)

The timing of the procedure for collecting the data is given by a real-time clock chip, which is also responsible for attaching the respective timestamps to the measurement results. As a conventional microcomputer or microcontroller system, the weather station board also includes a memory — nonvolatile electrically erasable programmable read-only memory (EEPROM) or flash — to

store the data for when a communication channel to the network becomes congested or unavailable. The heart of this story involves how the information is transmitted to the place where it's analyzed and a conclusion for the weather is made.

The wired way

Most of today's commercially available weather stations have built-in RS-232 or Ethernet LAN interfaces. So, it is obvious that they can be easily connected in a point-to-point

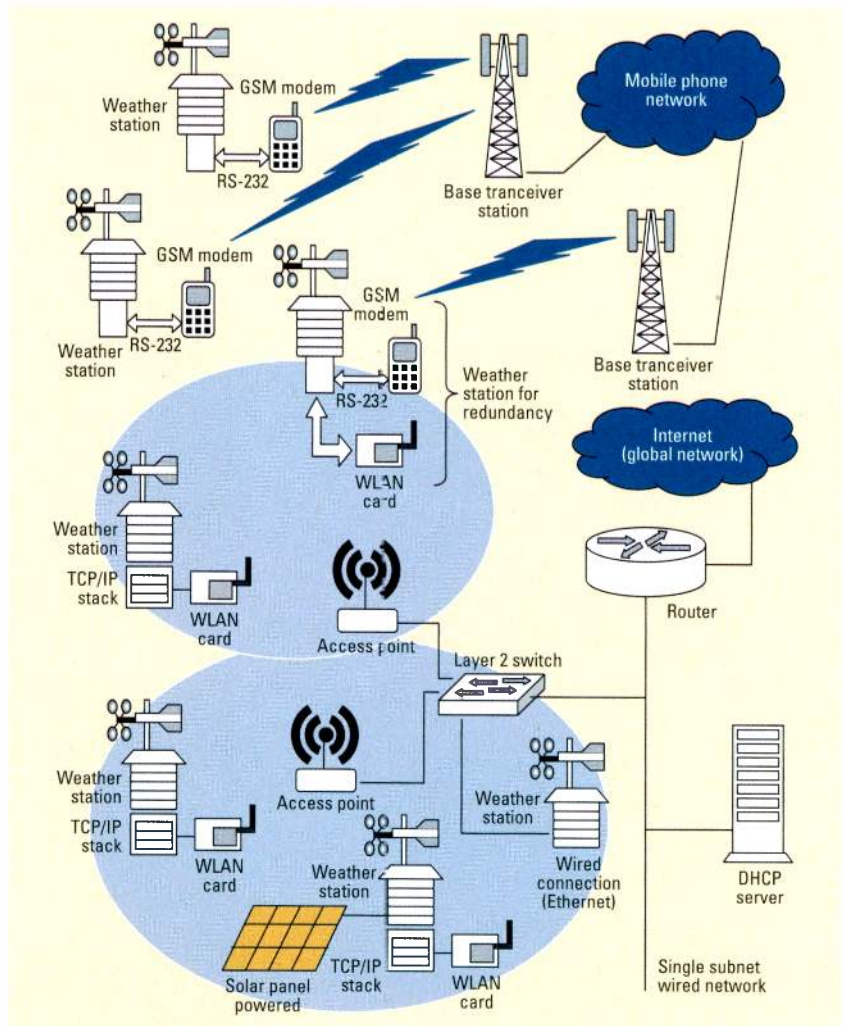


Figure 1. The different ways — both wireless and wired — for building weather station networks



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topology (RS-232) or to a LAN infrastructure. The good news is that in this case, the power supply to the weather station can be arranged as Power over Ethernet (the IEEE 802.3af standard). The drawbacks are the necessity to run cables to the equipment and, as a result, the constraints in placement and distances covered.

The wireless way

The most convenient solution today is to equip every weather station with a V.90/GSM modem with RS-232 or similar interface to the sensors, and polling the stations for weather data via SMS. (See the mobile phone network arrangement in Figure 1 on page 38.) Another option is to use a general packet radio service (GPRS) network to send the data from the weather station loggers.

Some weather stations transmit their data through a dedicated spread

spectrum radio modem and directional yagi-beam antenna, reaching a range of more than 30mi in the line-of-sight and above the tree line arrangement. The most sophisticated weather stations employ satellite telemetry technology, so they can be placed anywhere on the globe.

The smart weather stations (or even autonomous sensors) can be organized as an infrastructure 802.11 network. Such systems typically have short ranges of up to 400m for the 802.11b/g technology.

The limited range of the 802.11 solution can be resolved by the inclusion of a TCP/IP client in every weather station controller. This allows the unit to obtain an IP address (through Dynamic Host Configuration Protocol, or DHCP) and act as a network node visible from the whole world. In this case, the access point of the local wireless network should be layer 3 (network

layer) connected through a router to another area network with Internet connectivity. (See the WLAN globally connected arrangement in Figure 1.) The sensor data can be monitored on a standard Web browser interface or can be linked to database applications. The calibration and control of the station is performed using a Java-based interface in this case.

As the information gathered by the unmanned weather stations is extremely important, often a redundant link reservation is accomplished. For example, one of the stations in Figure 1 has both GSM modem and WLAN interface. This way if one of them (or the respective network) fails, the connectivity to the station data is not broken.

The mesh networking implementation

The more advanced mesh network can also be used for wireless weather

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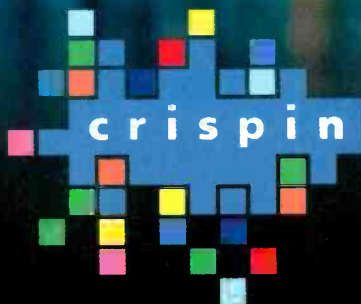
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stations, and the topology exhibits some analogies to the well-known ad-hoc networking. (See Figure 2.) The advantage of such a solution is the ability to expand the sensor network with new weather stations without the need to reconfigure the network infrastructure. The only requirement is that a weather station must be in the RF range of another station so it remains visible to the network.

The mesh network exhibits two features that are important for the reliable transfer of weather data: It is self-configuring and self-healing. It is the perfect solution for areas without network connectivity at all — mountains or uninhabited regions — the domicile of the typical weather station. The traffic model for a mesh weather station network differs from the conventional wireless network model. As the weather stations get closer to the data collecting node

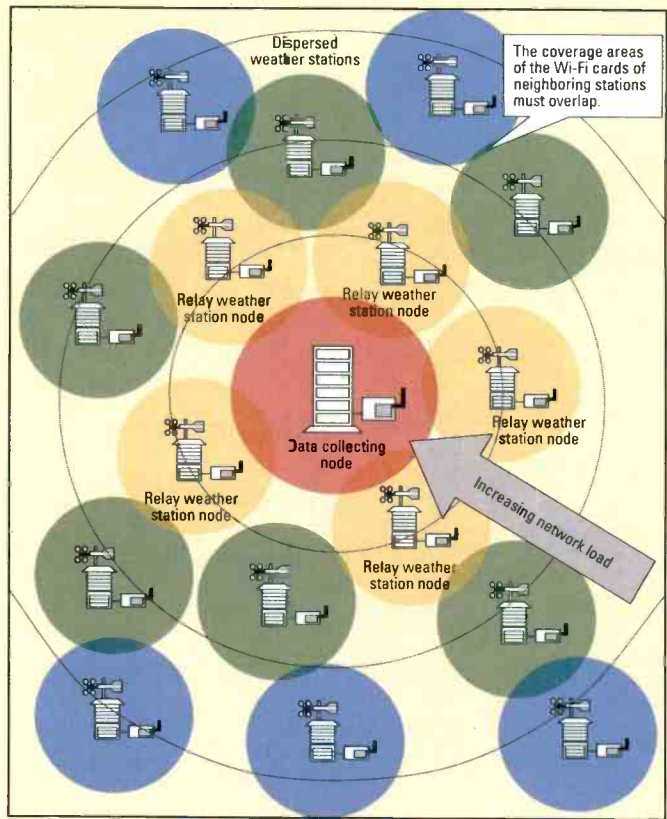


Figure 2. Weather stations mesh network with data collecting nodes.



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(base station), the more the many-to-one traffic approximation applies. Many packets from different nodes arrive to the base station closer node to be relayed. This means that the stations closer to the collecting node are congested with traffic and their controllers and wireless cards shall be able to process the packet flow. It is

even possible for the collecting node to be a moving object — an airplane flying over the area and collecting the data from the relay nodes.

Managing the weather network

The packets traveling the different types of networks are not only

weather data, but also management information. Many of the sensors need to be set up, calibrated or firmware updated with commands for measurement tasks and schedule (polling of the stations) that need to be exchanged. All this is part of the management functions, which can be centralized or distributed among manager agents (located in the more powerful weather station nodes). The management information burden

All wireless solutions suffer the same limitation — power application to the stations.

can be lowered by the use of the conception of the event-driven network. In simpler terms, traffic is exchanged only after a measurement by the weather station is made. From the security point of view, the management messages data need to be authenticated and encrypted.

Power supply limitations and solutions

All wireless solutions suffer the same main limitation — power application to the stations. There is no problem if a mains power supply is available at the location of the station. If no mains is present, one solution is to design and use power efficient protocols with battery supply. Another option is to power the weather station by solar energy panel, which makes its life unlimited (compared with a battery-powered limited lifetime instrument). The combination of reduced power sleep modes and efficient medium access protocols (MAC) improves the energy efficiency of the weather stations at the small price of somewhat increased delay in the response of the system.

BE

Emil Vladkov is an associate professor at the University of Sofia, focusing on communication technology and digital signal processing.



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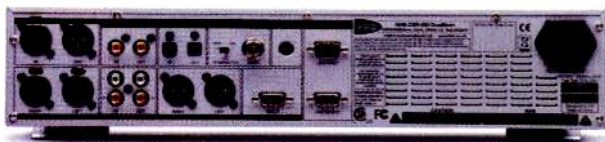
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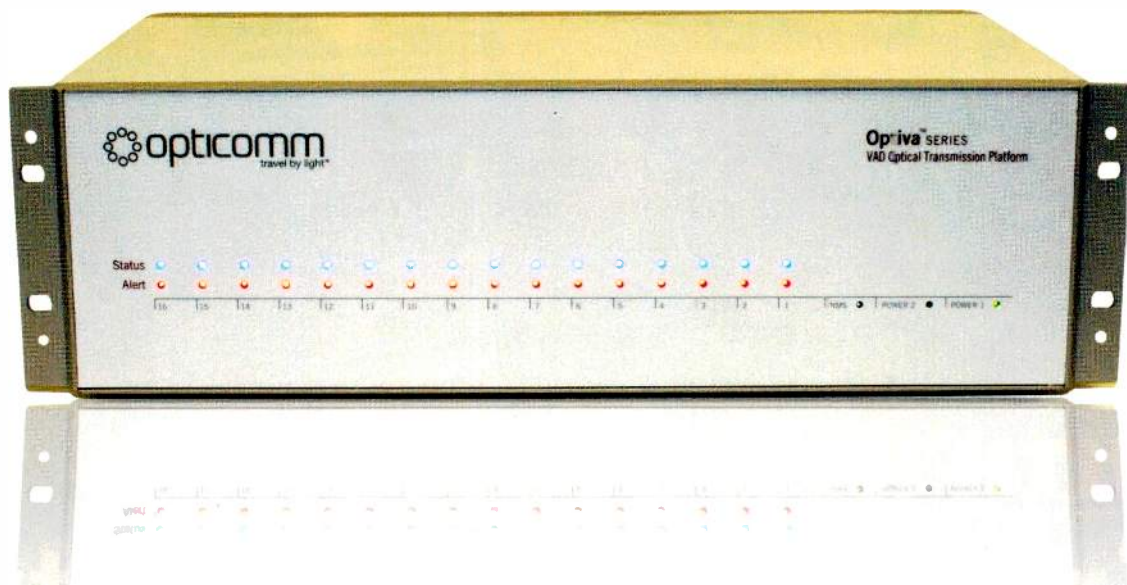


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WITH NEW STUDIOS, Great American Country LOOKS AND SOUNDS GOOD

BY MICHAEL GROTTICELLI

Scripps Networks' Great American Country (GAC) is one of the top-rated country music channels, and its new file-based, HD-compatible facility is receiving quite a few raves.

The country music network started in the 1980s, with most of its programs taped in Colorado and elsewhere across the country, and has grown considerably ever since.

After years of taping its programs in a variety of studios and production companies, the GAC network is now

settled into a new two-story production studio in downtown Nashville. The 8000sq-ft facility was completed

by Kevin Kritch, the network's vice president of production operations.

The sleek new studios were built

The GAC network is now settled into a new two-story production studio in downtown Nashville.

earlier this year, under the guidance of system integrator Broadcast Integration Group of Atlanta. It used a design developed internally by a Scripps Networks and GAC project team led

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walls, yet they can be adjusted, and parts of the walls and panels can be moved or replaced to accommodate different scenic designs and art direc-

tion for other shows and live music performances. Philadelphia broadcast scenic veterans Artists at Work designed and constructed the colorful

and flexible sets.

The main video control room features a Thomson Grass Valley Kayak 2.5 M/E switcher, Miranda Kaleido-X multi-image display system, Chyron HyperX2 SD/HD two-channel CG system and XClyps SD/HD two-channel clip player, and RTS/Telex Cronus intercom. An adjoining audio recording room includes a Solid State Logic (SSL) C132 digital audio console with Digidesign Pro Tools HD. There's also an NVISION router that moves both AES/stereo audio and video signals around the facility, all supported by dozens of Miranda signal conversion cards.

The smaller studio "B" is outfitted with three JVC GY-HD250U cameras with Fujinon lenses on robotic pedestals with Telemetrics custom heads. There is a small control room, complete with a Wheatstone E-6 audio console and a Broadcast Pix Slate



The main video control room has a Thomson Grass Valley Kayak 2.5 M/E switcher, Miranda Kaleido-X multi-image display, Chyron HyperX2 CG and RTS/Telex Cronus intercom.

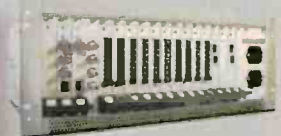
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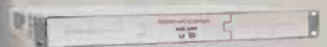
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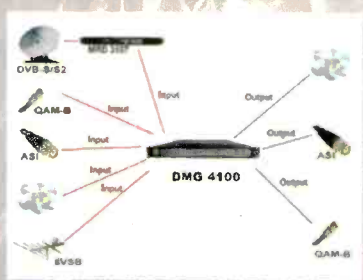
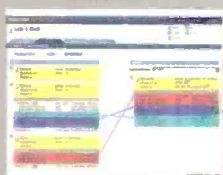
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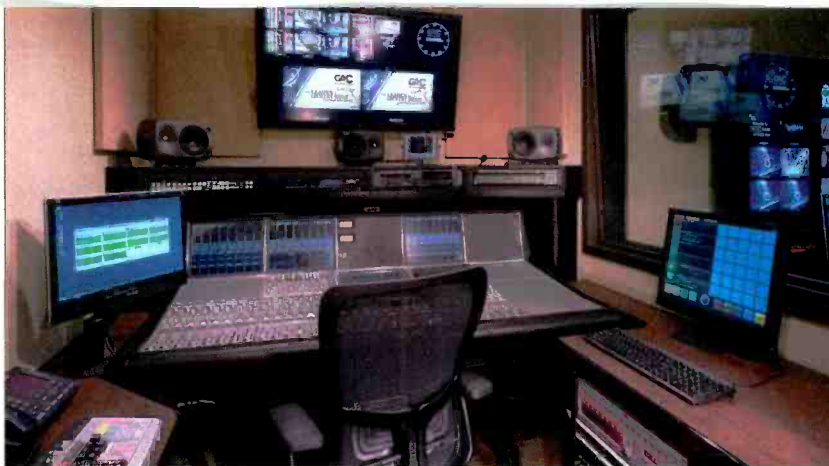
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integrated production system that serves up two playout channels of un-compressed video.

The studio cameras record to HDV tape or output an HD-SDI feed directly to an onboard hard drive or external server. The cameras can be easily moved to the larger studio, plugged into the facility's fiber and



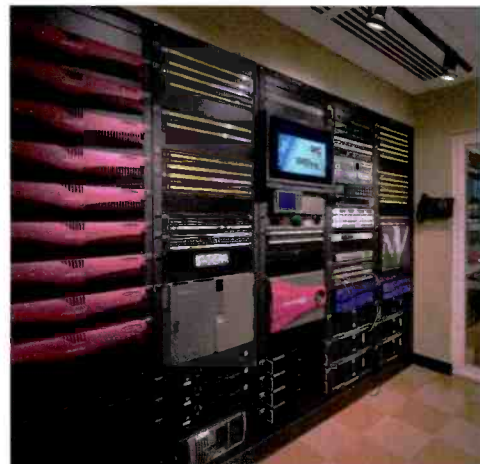
The facility employs an audio recording studio and audio post room managed by an SSL C132 digital audio console with Digidesign Pro Tools HD software.

be immediately available to the main control room production switcher.

Tapeless workflow

Field material is ingested into a 10TB Avid ISIS SAN managed by the company's Interplay asset management system. Studio material is directly ingested into an Avid AirSpeed.

The post facilities on the second floor boast a tapeless workflow, enabling editors to begin working on a clip within 15 seconds of ingest. The post department relies on three Avid Media Composer Adrenaline NLE systems and a clip-based StorageTek SL500 archive library, with 48 data tapes that hold about 800GB each. The interface between the ISIS and the SL500 is an SGL FlashNet. All of the edit systems can share clips coming from the storage system, which streamlines post-production sessions



The machine room houses networked Miranda signal conversion cards and an NVISION 128 x 64 video router.



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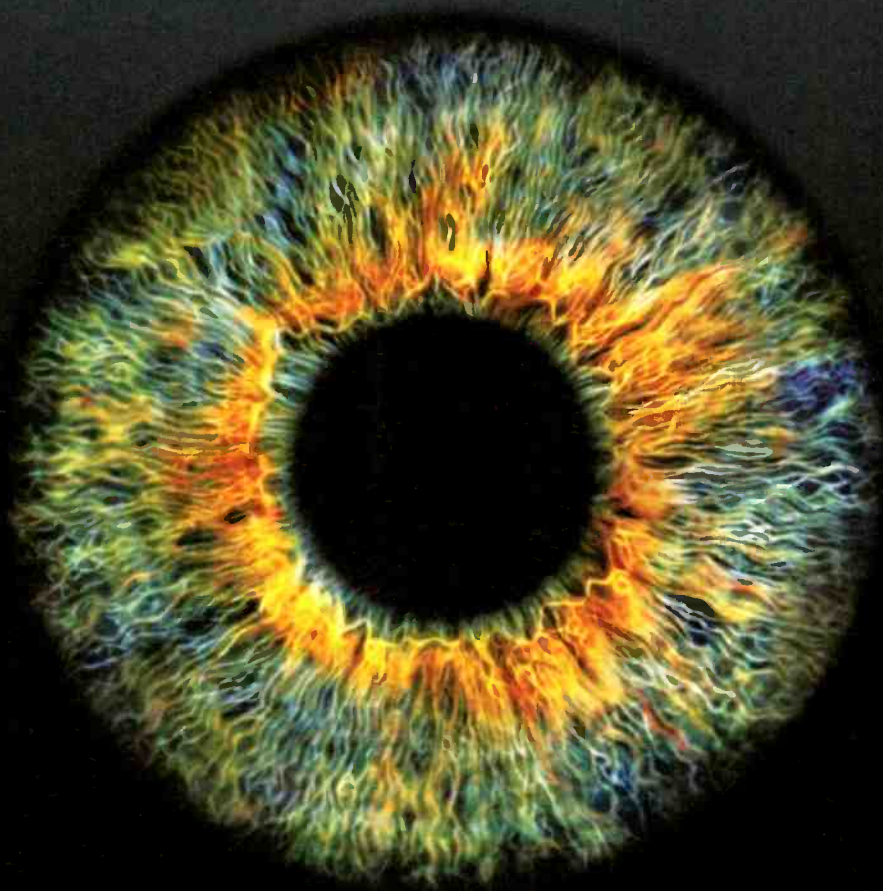
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and makes editors significantly more productive. Completed programs and production footage is all archived. This enables the creative team to easily repurpose material, which it does on a continuous basis.

File distribution

Completed shows are sent by overnight courier on an IMX or Digital

Betacam videotape to Scripps' Technology Center in Knoxville, TN. Commercials and promos are inserted before they are played to air with an Omneon Spectrum server. Once aired, the shows are kept in a massive archive for permanent storage in Knoxville.

The network will soon be able to send programs as digital files via a fi-

ber connection. Previously, a network fiber link was used for a few time-critical shows airing the same day. Soon, files will be played out directly from one of the Avid systems or a VTR in real time and sent to Knoxville. The program will then be recorded, QC'd, closed captioned and ingested into the server for payout to air.

The network's file-based workflow keeps content digital from ingest to finished output. This allows shows to maintain the highest quality images while enabling the production crew to have access to associated clips and elements throughout the process. The new system is so streamlined that the crew can now turn around its "Top 20 Country Countdown" show, a weekly, two-and-a-half hour, viewer-selected program, in three working days. **BE**

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

Design team

Broadcast Integration Group

Tom Larrison, vice president, customer liaison/contracts

Matthew Hathaway, design engineer

Brian Kincheloe, on-site team leader

Scripps

Peter Crowley, senior vice president, property development

Mike Donovan, senior vice president, engineering/satellite distribution

Kevin Kritch, vice president of production operations, GAC

Mike Nichols, broadcast engineer, GAC

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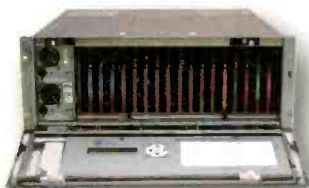
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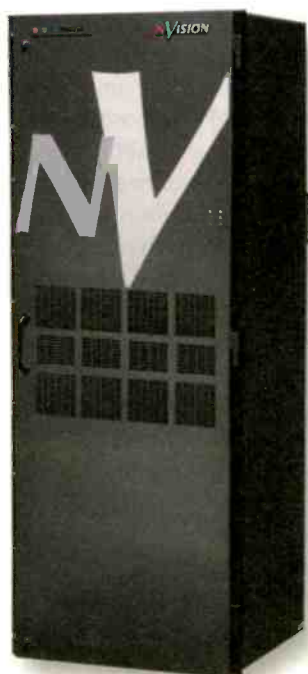


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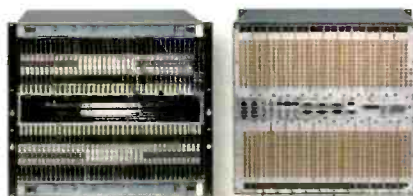
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The FOX News Electionlink ENG van features IT technology that enables reporters to file news from any location.

FOX News rolls out Electionlink IP broadband ENG

BY MICHAEL GROTTICELLI

During this year's presidential primary season, FOX News debuted the next generation in electronic newsgathering vans. The network now has two Electionlink vehicles on the road, and the vans will travel around the country long after the voting is over.

The new concept Electionlink (a retrofitted Ford Expedition) leverages IP signal transmission via satellite and broadband, transponder autodetection technology and solid-state recording cameras with wireless transmitters. (See Figure 1 on page 58.) When combined, these technologies offer additional swiftness and

freedom to ENG crews. There's no external power requirements and no cables to set up. Perhaps best of all, this vehicle, which uses mostly off-the-shelf networking components and computer gear, can be put together for less than half of what a traditional microwave ENG van costs.

Patrick Muskopf, remote operations engineer for FOX News, designed and installed the equipment in the vehicles with the goal of overcoming the limitations of traditional microwave-equipped vans by taking advantage of the latest IT technology. Both vans feature a RaySat Antenna Systems rooftop circular antenna that

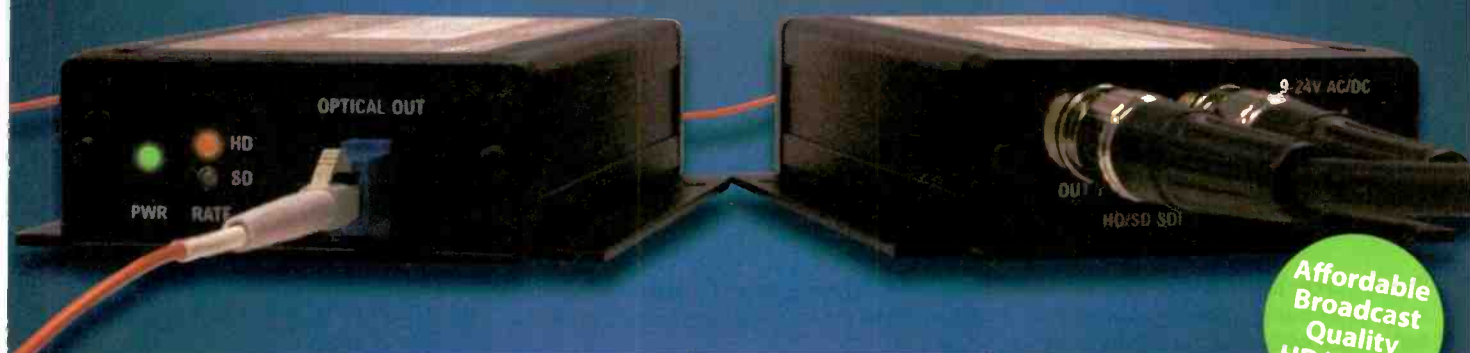
rotates to find the satellite and never needs to be raised for positioning. With its autotracking capability, each Electionlink can lock onto the satellite while in transit, enabling reporters to provide coverage live from the front passenger seat via a dashboard-mounted box camera. It can also use a ubiquitous broadband connection, either wireless or wired. In fact, the only transmission limitation is the modem technology used onboard, which provides up to 850Kb/s throughput.

For most live remotes, IP signals are uplinked to a dedicated satellite transponder (AMC-5), downlinked to FOX's Washington, D.C., teleport

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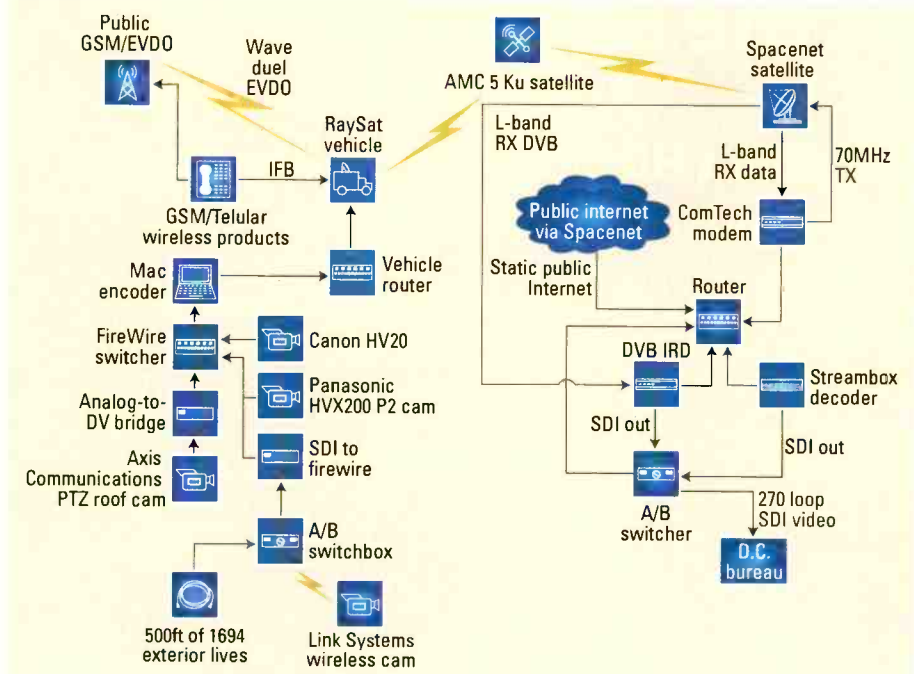


Figure 1. FOX has developed an end-to-end IP data delivery system that allows reporters to go live from the front seat of a moving van, or to set up at a breaking news site much faster than with traditional ENG microwave systems.

facility and then sent via fiber-optic line to the network's New York City headquarters at 270Mb/s. The only limitation is that both vans can't transmit simultaneously because they use the same coordinates.

Multicamera production goes anywhere

The Electionlink SUVs get their inspiration from military communications vehicles. Along with the rotating flat-panel array antenna, the van's rooftop also features a digital camera inside a weatherproof turret, which can rotate 360 degrees.

The van also has a small four-input Laird FieldFire video switcher (connected via FireWire) and Ashley audio mixer. This enables the crew to shoot a reporter inside the truck and immediately follow the reporter as he or she steps outside (via the turret camera as well) with a handheld Panasonic

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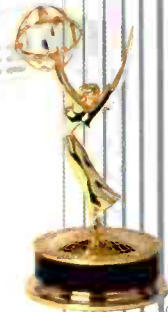
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AJ-HPX2000 P2 camera. The hand-held camera includes a Link Systems wireless transmitter, so a continuous POV is preserved. There's also a Miranda DV-Bridge to convert signals and Canopus SDI-to-DV converter to convert SD or HD footage to IP for transmission. The entire setup allows the viewers to see exactly what the reporter on the ground is seeing, at the same time. This first-person perspective was another conscious design goal of the new Electionlink vans.

IP in action

For transmission, there's a Streambox encoder and related software linked to an Apple MacBook Pro laptop. A second MacBook Pro is used for onboard editing and decoding. Once the van reaches a desired location (in addition to transmitting in transit), a signal can be sent by means of the antenna via the satellite in the sky or using a local 3G or Wi-Fi hot spot connection. (Starbucks coffee shops are a favorite stop of the crew.) A ComTech modem routes the signal internally, where data is streamed at

up to 850Kb/s, or about three times as fast as traditional microwave connections. The back channel is returned at 128Kb/s. A Streambox decoder is also used to establish a point-to-point path via the public Internet if needed. Video quality can be adjusted with a few turns of a knob on the encoder, in real time.

The two-man crews report that the video quality is great, and they can move around with unlimited freedom and little latency (about three seconds) between talkback. That's about one-and-a-half seconds longer than a standard satellite-delivered videophone connection for live broadcast. Muskopf is most proud of the fact that the two crews, who began as camera operators and audio mixers, were able to operate all of the equipment in the van and file footage with little training.

A limitation of satellite antennas is inclement weather. As any broadcast engineer knows, satellite transmitters need line-of-sight to the transponder. Muskopf said the during snow storms or in heavy rain, the vans actually perform better in motion than standing still. He's working on adding heating elements to counteract icing problems, but in general he's pleased with the reliability of the satellite links that are available virtually anywhere in the country.

Design team

FOX News

Patrick Muskopf, remote operations engineer

Technology at work

Apple MacBook Pro laptops
 Ashley audio mixer
 Axis Communications PTZ roof camera
 Canon HV20 dash camera
 Canopus SDI-to-DV converter
 ComTech modem
 Laird FieldFire video switcher
 Link Systems wireless transmitter
 Miranda DV-Bridge converter
 Panasonic
 AJ-HPX2000 P2 camera
 HVX200 P2 cam
 RaySat rotating flat-panel array antenna
 SES Americom AMC-5 satellite
 Spacenet satellite
 Streambox encoder and decoder
 Telular wireless products

Transmission on the go

The vehicle's ability to get the news as it happens was put to the test during the early Democrat party primary in New Hampshire. As the van was sitting outside a polling location in the state's capitol of Concord, news broke of a hostage situation an hour away at a Hillary Clinton campaign office in Rochester, NH. A news crew raced across the state, with a reporter staying live



FOX News reporters have access to a Streambox encoder and related software linked to an Apple MacBook Pro laptop. A second MacBook Pro laptop is used for onboard editing and decoding.

from the front seat. They arrived on the scene in plenty of time to witness the perpetrator as he gave himself up. It was all captured live and transmitted with an IP transmission via satellite. Everyone involved agrees that a stan-

dard microwave vehicle would have taken much longer to set up and capture the story as comprehensively.

Live at all times

Four months after their debut, the

new IP broadband vans have gotten the attention of many in the industry, especially among the FOX station group, which, budgets permitting, is considering building a few more by the end of the year. The dedicated transponder space that FOX News has at its disposal is perhaps the one major hurdle for local stations to add to their budgets.

Yet there's no denying that the future direction of ENG transmission is IP streaming, in one form or another, enabling reporters to file from any location, no matter how remote or congested. As Muskopf likes to say, the goal is "everywhere we go, we're live, at all times." At FOX News, that concept has been successfully achieved with the Electionlink vehicles. **BE**

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

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IP-based centralcasting

Learn how to reduce operating costs and invest in the future of your station.

BY MARK WARNER

As the media landscape expands with entertainment options, broadcasters are competing for a smaller slice of the advertising pie. This has motivated some station groups to look within to see if there are operating costs that can be streamlined or eliminated.

By reducing operating costs, many stations improve the bottom line, and those savings can be reinvested into converting the facility to HD. By upgrading local news and programming to HD, stations can improve their on-air product, attract new viewers and, in turn, increase advertising revenue to their stations.

A centralcasting solution can significantly streamline operations and save money, which can be redirected into capital improvements that advance a station's standing in the market.

What is centralcasting?

Centralcasting promotes greater operational efficiency because it centralizes the master controls of multiple

stations at a single, centralized network operations center (NOC). It essentially makes local stations the spokes of the wheel, and the NOC serves as the hub that feeds programming to them and controls their operations remotely.

As a result, stations controlled by centralcasting can reduce their master control personnel, reduce costly errors, and employ an economical alternative to broadcast automation and program distribution.

Rather than being based on costly fiber or satellite networks, some centralcasting solutions provide IP-based program distribution over less costly networking technologies, such as high-speed DS3 telco circuits or digital microwave.

By the time a station has invested in all the gear needed for its satellite site, including encoders, dishes and control systems, the bill could reach \$750,000, not including the \$65,000 a month needed for satellite time. In contrast, comparable IP signal transport over DS3 can be obtained for roughly \$200,000 to \$350,000.

Unlike satellite distribution, which is limited to blasting the same programming to multiple stations, IP-based centralcasting allows the NOC to simultaneously send customized program transport streams out to all of the stations in its Internet cloud.

Centralized master control

When centralcasting is deployed, master control operators can manage, control and oversee the master control operations for the central hub, as well as any remote, sister stations. This includes the capture, preparation and distribution of all syndicated programming, network feeds and even programming streamed to their Web sites.

Rather than stations having to obtain and prepare the same syndicated show for air, this process is done just once at the NOC and then delivered to the stations for immediate broadcast, saving the group considerable man hours of work over the course of a year.

A centralcasting network can use bidirectional DS3 telco circuits, each of which offers a maximum of 45Mb/s, which is more than sufficient for carrying the 19.4Mb/s ATSC transport stream. It also offers a 5Mb/s backhaul of the live video and audio signal to the NOC for confidence monitoring that the station is on the air without technical glitches. This leaves the remaining bandwidth open for station-to-station Internet traffic and control signals for remote automation.

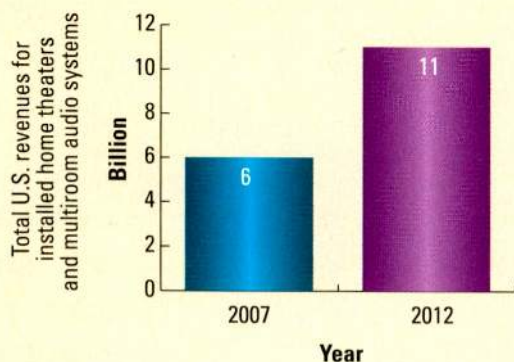
At the NOC, raw video and audio are encoded and compressed into an ASI transport stream and then encapsulated into an IP-based stream and transmitted over the IP network. At the receiving stations, the IP stream

FRAME GRAB

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Space-saving measures

While the NOC manages the house routers, master control switchers and other broadcast gear on behalf of multiple stations, sometimes a broadcaster's central master control room is not enormous.

One way to save space in a small master control room is to use multi-view monitors that allow multiple video signals for each station to be displayed on large-screen monitors. This

stations for HDTV broadcast. For example, stations may currently receive signals via centralcasting in SD and upconvert them to HD. Network feeds are sent in native HD and can be accessed via satellite at the individual stations. However, in the future, those HD network feeds may be captured at the NOC, encoded into MPEG-4, transmitted over the IP network and then downconverted at the stations wherever necessary.

While the individual remote stations are being fed programming by the NOC, centralcasting stations still

server and air that content from the server, as well as any evergreen programming they keep stored there.

Also, because most stations still have satellite downlink equipment on hand, in an emergency, a centralcasting NOC could resort to sending a program or two to the remote stations using satellite transmission. If for any reason network feeds can't be relayed to the stations, each station can still directly access feeds from the network with the flip of a switch.

In the event that a DS3 circuit should fail, the network can be set up to switchover to another telco service, or to squeeze an additional transport stream into the spare bandwidth of another DS3 circuit. The individual stations can use several circuits, which further improves reliability.

Return on investment

All of these redundant measures can be activated and controlled from a central hub, so the remote stations do not have to hire as many master control operators, which reduces operating costs.

By centralizing several of its stations' operations at its hub — including master control, syndicated programming ingest and preparation, traffic, and other engineering and production positions — a broadcast group can save money, cut staff or reassign personnel to other critical tasks. Installing an integrated production control room full of operators to just a technical director and producer to handle local newscasts.

As centralcasting stations realize these operational cost-savings, they are freeing up money that can be spent to expand the plant and improve the on-air product, such as offering their local newscasts in HD. This move enables them to gain a distinct market advantage by attracting high-profile HDTV viewers, which in turn can drive additional ad revenue to the station. **BE**



Using multiview monitors in a master control room enables multiple video signals for each station to be displayed on large-screen monitors.

greatly reduces the footprint required by dozens of individual monitors.

Another piece of equipment that central NOC and remote stations might want to install is a 3Gb/s router capable of passing SDI, HD and ASI streams.

By using space-saving techniques, a broadcaster can fit all of the equipment needed for the centralcasting network into a rack and a half of space. A centralcasting solution can be scalable and customizable to meet the needs of any station group.

Flexibility and redundancy

Centralcasting can also position

have a high degree of autonomy. They can break away from the network if they need to, for example, to produce a local newscast, and then rejoin centralcasting when they're finished.

Centralcasting can be designed with many levels of redundancy to ensure failsafe operations. While live programming is sent from the NOC to stations for broadcast, program content can also be sent in advance of airtime to individual stations on a lower bit rate, store/forward basis and placed on a station's server. In the event of a technical problem, station personnel can switch to the local

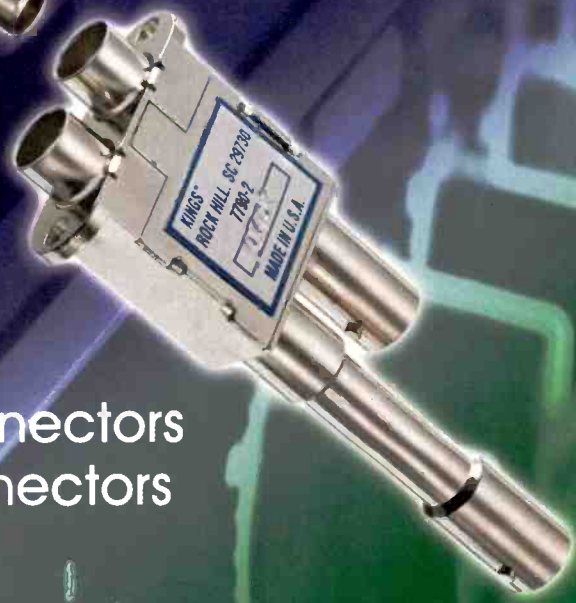
Mark Warner is vice president of Advanced Broadcast Solutions (ABS).

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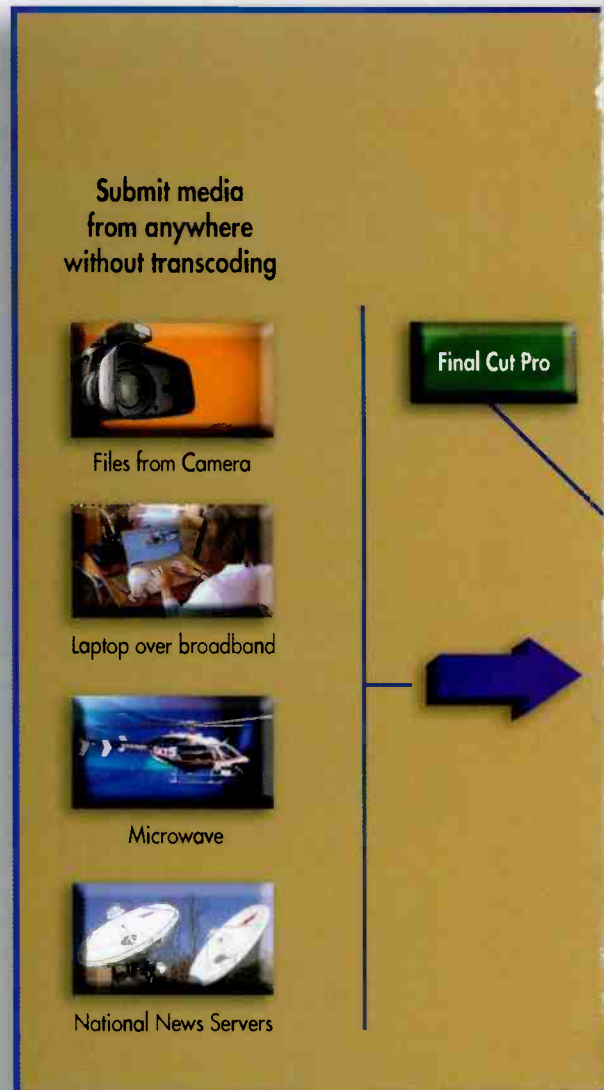
Bitcentral's Precis open news production system and the Oasis news sharing and archiving system allows you to handle your multi-format media assets from ingest-to-air effortlessly, without transcoding. Both systems support common formats from cameras, national news servers, .MOV files from creative services as well as formats sent in by viewers. Precis allows you to choose the editing software best suited for your workflow and supports direct editing from common high-speed NAS storage. Our 4-channel HD or SD playout servers support native playout of all the common broadcast formats. Mix and match any format HD or SD in the rundown, and they can play out back to back. The Precis playout also includes an off-rundown clip store for HD and SD video and graphics.

No Barriers NAS vs. Closed SAN

Precis uses the fastest NAS for the money—Sledgehammer® from Maximum Throughput. Compared with a similar priced SAN, Sledgehammer is four times faster. More importantly, all users in the station can enjoy fast access to any media without expensive fibre channel connectivity or gateways. So with Precis, you can edit the same media from common storage with Mac or PC over Gigabit Ethernet faster than a dedicated SAN.

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Stories and camera files submitted electronically or physically are all managed as MOS objects and tied into the ENPS or iNews assignment function. Rundowns are integrated into popular edit software so editors can save their work directly to the story. The user-intuitive, browser-based news management application has extremely fast search, categorization and retrieval of archived media. Because it can utilize any network storage device (such as spinning disk) to archive video digitally, the Bitcentral Oasis asset management system is about *half the cost of* dubbing back to tape.



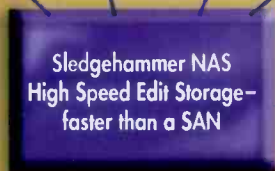
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Oasis



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The Precis and Oasis products are built on open architecture and standards-based technology which dramatically simplifies the news production process, reducing cost, complexity and time. Bitcentral utilizes HP hardware to ensure a highly reliable and supportable platform. What's more, Bitcentral installs the complete system, trains users and fully supports 24x7 all components of our system.

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by Fred Fourcher, President & CEO, Bitcentral Inc.

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www.bitcentral.com

Video servers

Video servers are evolving into a media platform that improves workflow efficiency.

BY TODD ROTH

The introduction of information technology (IT) into the traditional broadcast facility allowed television's associated workflows to become even more integrated — and thus, more efficient. With this IT-fueled growth in networkability and processing power, the video server emerged as the preeminent component within the broadcast television facility.

We are now on the cusp of the latest evolutionary leap — a platform that combines the file-based workflow functionality of the video server with the ability to host previously discrete media applications in a single, compact chassis. Along with reducing the hardware cost and complexity of the broadcast facility, this platform provides the infrastructure to add new media applications, processes and services with the ease of installing software-enabled functionality. Integrated applications also

reduce the costs of installation, operation and maintenance.

The rise of server-centric workflows

Until the introduction of the video server, most broadcast facilities built their workflows around the capabilities of their routers. In VTR/router-based infrastructures, a large router managed the flow of content throughout the facility, and components were discrete and connected via baseband. Moving content from one part of the facility to another often meant that tapes had to be physically copied, or dubbed. In a fully implemented video server model, in which a storage area network (SAN) becomes the facility nucleus, all users gain simultaneous access to the same material, so the whole concept of dubbing tape evaporates.

The ability to share media over a SAN reduced baseband routing re-

quirements and enabled new server-centric workflow models. Furthermore, network access to media as files allowed the efficient implementation of new services with minimal incremental staffing requirements. The "IT-ization" of the broadcast facility was now fully under way.

As technology advanced and products evolved, external applications and processes that were once discrete were incorporated into the core server and master control platforms. Simpler applications and processes, such as play-to-air sequencers and proc amps, were the first candidates for integration. This assimilation was usually accomplished by adding special-purpose hardware and software to the platforms. With fewer independent components, routing requirements were greatly reduced. Generally, every function built into the server reduced the load on a routing switcher by three ports.

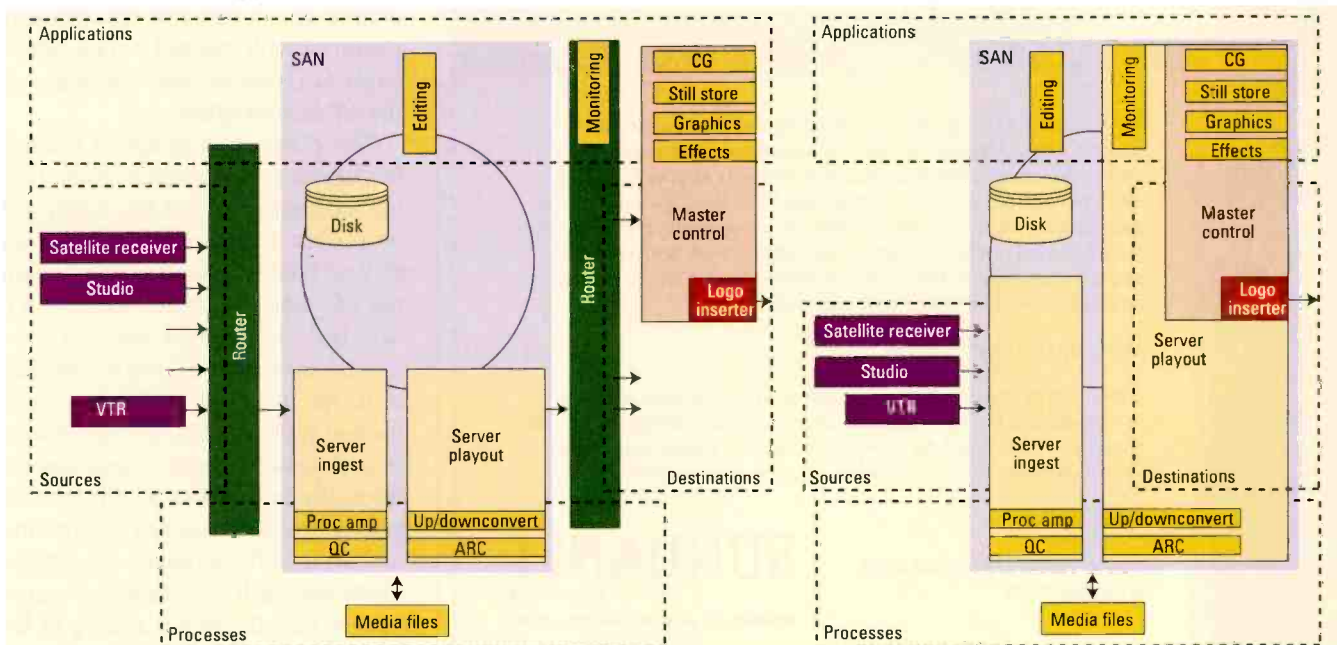


Figure 1. The evolution of the video server into a media platform brings more functionality into a single, integrated environment, including ingest and playout automation, channel branding, multiviewer I/O monitoring and audio-track manipulation.

Just as production processes became more streamlined, the storage infrastructure improved in bandwidth and capacity. New capabilities emerged, such as SAN-based editing, which offered specialized environments such as television newsrooms the ability to get stories to air faster than ever before.

CPU-based processing capabilities of the platforms continued to increase, and more complex components became integrated as software features. Enhanced processing capability added multiviewer monitoring to routers, and allowed the integration of master control applications. It also brought the ability to integrate

up/down format conversion and aspect ratio conversion to servers.

Benefiting most from Moore's Law are CPU and storage-based components, and the video server is no exception. Dual-core processors multiplied software-processing capabilities exponentially. The newfound processing power allowed codecs to move from hardware ASICS on add-in cards to CPU-hosted real-time processes. Compression format flexibility was now possible, and new compression standards, such as XDCAM and DV100, could be retrofitted as software upgrades.

What's more, as multi-core CPUs and graphics processors (GPUs) are added, the server platform becomes powerful enough to host many more applications in the broadcast chain, and a new platform is born. (See Figure 1 on page 71.) The addition of previously discrete processes such as channel branding delivers the ability to dramatically improve workflow. These user applications essentially become thin "clients," and the need for routing is eroded further.

The evolution of the video server into this new platform not only revolutionizes the approach to facility design, but also streamlines operations. Smaller facilities can be built around one or two (for redundancy) platforms with internal storage, while larger facilities can take advantage of the SAN architecture.

The platform is designed around the latest computer architecture, taking advantage of 64-bit multicore processors, high-performance GPUs, 8GB of 800MHz memory, and using the PCI Express (PCIe) bus for I/O. Attached via the PCIe bus is a two-input/four-output HD-SDI interface card. All media operations are performed via host CPU/GPU combination. Because all media operations are internally hosted, careful attention is paid to processing capacity and memory bandwidth resources. An appropriate approach is to create a resource budget and allocated it among all facility operations.

The shift to IT-centric infrastruc-

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tures has gone further than just accelerating product integration through processing power increases.

The actual architecture of applications is also shifting more towards the IT client/server model. Recognizing that workflow benefits of device “virtualization,” application development is shifting to the application server/thin client model. The platform architecture accommodates this change by dividing core processes into four sections:

- *The media engine.* The media engine performs all real-time media operations from ingest to playout. Typically, it can consume up to 90 percent of the platform resources.
- *Drivers and services.* This section handles the real-time control of the media engine, allowing for both externally (i.e. Ethernet, RS-422) and internally hosted control. Also at this level is the external media file interface that supports file and data wrapping and

unwrapping operations.

- *Media application servers.* Application servers are implemented as real-time components designed to decouple the human operator interface from the media platform. This not only allows for secure, remote operation, but also it improves reliability because most software bugs typically reside in user interface code. To further improve reliability, application servers such as automation are designed to continue to run against an internal schedule even in the event of communication loss to the automation client.
- *Client applications.* They can either run locally or as Ethernet clients. This is particularly beneficial to media platform development where the real-time heavy lifting requirements of media handling can be separated from the user interface (UI). By moving the UI from the real-time application platform to attached clients, additional

focus can be placed on reliability and security.

For redundancy sake, client applications are able to log-on and concurrently control primary and back-up media platforms.

Conclusion

The integration of graphics into server playout or the addition of a built-in multiviewer are notable accomplishments. Combined, the hosting of multiple applications onto a single platform truly represents the next milestone in equipment design — and will ultimately change the way broadcasters build their facilities. Put simply, the platform improves workflow efficiency throughout the entire broadcast chain, allowing new broadcast channels to be easily added with almost no additional operating costs.

BE

Todd Roth is vice president of technology for NEXIO server systems at Harris.

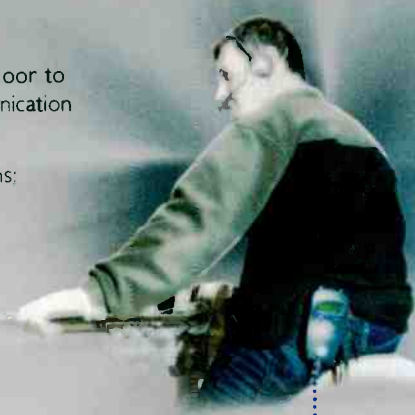
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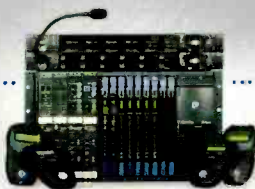
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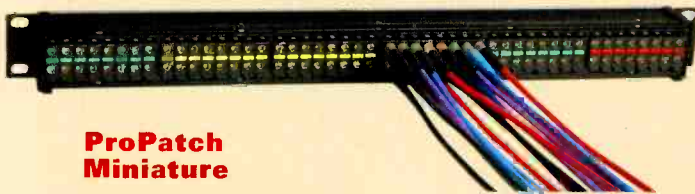
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Welcome to *Broadcast Engineering's* Pick Hit awards, the industry's longest-running product technology awards for broadcast and production. With a 24-year history, Pick Hits are the most prestigious technical awards given at NAB.

At the 2008 NAB Show, a panel of independent judges toured the exhibition floor for three days, looking for innovative technology. They then met to make their selections based on multiple criteria, including the technical and financial improvements the products can bring to a facility's operation. Our editors and publishers have no vote in the selection process.

Congratulations to the following 40 manufacturers for their creative technology solutions!

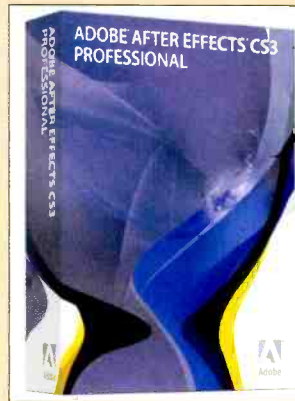


ProPatch Miniature

ADC
952-938-8080
www.adc.com/broadcast

Super high-density coax patching system is designed for HD, SDI, AES audio, 5.1 and 7.1 audio applications where coax medium is preferred but space is at a premium; available in

1RU and 1.5RU configurations; the 1RU panel features a patent-pending pullout designation strip that dramatically increases space for text, as well as a high-density 2 x 48 circuit configuration of ports; the 1.5RU unit panel features 4 x 48 ports.

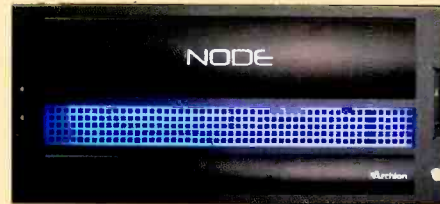


After Effects CS3 Professional

Adobe
714-280-1345
www.adobe.com

Digital motion graphics and compositing software lets users animate freely using new Shape layers and the Puppet tool, as well as combine moving imagery with still images, text and sound; users can manipulate their creations with hundreds of effects combinations; offers hundreds of customizable animation presets and templates; new Brainstorm feature enables users to select key elements of a layer and experiment with a variety of alternative modifications and effects to it.

SAN network for content creation comes in two chassis sizes; NODE 800 offers eight drives with independent SAS channels supporting up to 8TB of storage, with 4-Gig ports; the drive supports multiple RAID sets, multiple hosts, LUN masking and storage provisioning of all Vdiscs on both ports for switchless file sharing; NODE 2400 is configured with up to 24 drives through four ports, supporting capacities of up to 24TB of RAID storage; upgradable to 8Gb/s Fibre Channel; provides multiple streams up to 1200MB/s.



NODE
Archion
818-840-0777
www.archion.com

Extender delivers uncompromised digital workstation extension across unlimited distances; provides users with a full desktop computer experience from anywhere on a Gigabit TCP/IP network; can operate on a point-to-point Cat 5 e cable or on a switched GigE network; consists of a transmitter that connects externally to each remote computer with dual DVI-D video connectors and a

user station with dual DVI-I connectors, USB connectors and audio ports.

Emerge ECMS4000
Avocent
954-746-9000
www.connectivity.avocent.com





HD reference monitor features a grade-1 LCD display, ensuring a high level of color stability and accuracy for video reference tasks; grade 1 is a standard defined by the EBU that sets requirements for contrast, black lev-

els and brightness; ideal for monitoring fast-moving video; thanks to its high-speed 120Hz panel and scrolling LED backlight technology, it avoids motion blur and judder; offers excellent motion handling and lifelike motion scenes reminiscent of how CRT reference monitors used to show moving video.

RHDM-2301
Barco
678-475-8000
www.barco.com

Teleprompter features a wider hood and mirror for wide-angle shots and lenses; available in either an LCD or Pocket PC version; designed to be safe and solid for handheld, jib or steadicam shots; setup is less than three minutes; comes equipped with the camera-mounted mirror system, PocketPC PDA and prompting software, and a keyboard and mouse; packs away in a custom military-grade storm case; works on any internal focus camera lens with a



ProPrompter HD
Bodelin Technologies
818-767-929
www.bodelin.com

diameter of 100mm down to 52mm.

HD weather platform combines outlook analysis, worldwide 3-D terrain and high-resolution data; called the HD Elite package, Omni's HD data products include precipitation, wind, winds measured relative to

a moving storm, wind shear, hail, hail cores, precipitation rate, and rain and snow accumulations in one-, three-, 12- and 24-hour increments; stations can layer multiple data products and integrate live Baron radar with a true 3-D tower and sweep line.

Omni
Baron Services
256-881-8811
www.baronservices.com

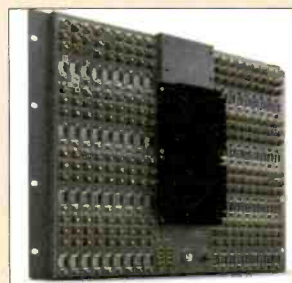


ers and video servers; includes and integrates the functionality of an entire live production control room — switcher, CG, clips store, still store, multi-view monitoring, as-

Live production system allows a single operator to run all aspects of a sophisticated 2 M/E live HDTV production, including complex graphics, animations, clips and effects, as well as control robotic cameras, audio mix-

pect ratio and format conversion, and video routing.

Slate 5000
Broadcast Pix
978-600-1100
www.broadcastpix.com



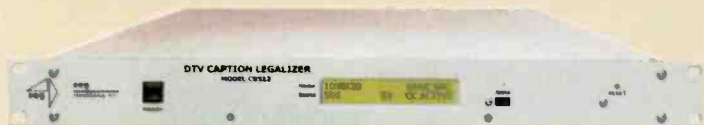
Broadcast Videohub
Blackmagic Design
408-954-0500
www.blackmagic-design.com

Routing switcher supports 3Gb/s SDI; includes 72 SDI inputs, 144 SDI outputs, 72 deck control ports, twin redundant power connections, SDI reclocking and 3Gb/s SDI technology in an 8RU chassis; all connections are grouped together to include an SDI input, SDI output, deck control port and SDI monitor output for each user; has twice as many SDI outputs as inputs, allowing users to control their monitoring without affecting the input of their editing workstation.



Flash XDR
Convergent Design
720-221-3861
www.convergent-design.com

Compact Flash-based portable HD recorder/player uses Sony MPEG-2 CODEC technology; records HD-SDI 1080i/p and 720p video into a high-quality MPEG-2 stream at bit rates up to 100Mb/s 4:2:2 and 160Mb/s 4:2:2 in full raster (1920 x 1080); uncompressed four-channel embedded or two-channel analog audio accompany the video into an MXF file stored on the CompactFlash cards; features an all solid-state package.



CB512
EEG Enterprises
 516-293-7472
www.eegent.com

HD caption legalizer and relocating bridge seamlessly bridges caption data from one video source to another, as well as relocates caption displays on the screen in response to GPI triggers; ensures compliance of caption

data with all DTV captioning standards; fixes common errors introduced in closed captioning flows by SD-to-HDI upconverters or incomplete 608 to 708 translation; regenerates all input caption data into a standardized, fully-compliant data stream, compatible with all MPEG encoder specs; accepts a wide range of input caption data.



CP-2200E
Evertz
 905-335-3700
www.evertz.com

Remote control panel features two high-resolution color LCD displays that intelligently interact with the panel's buttons and rotary controls, updating automatically as different operation facilities are selected; each of the 12 LCD buttons is capable of displaying a multicharacter text string or a graphical image; they also can be configured with a menu structure that allows quick navigation through the systems.



IntelliGain
Evertz
 905-335-3700
www.evertz.com

Automatic audio level system offers consistent audio loudness within a channel and/or program, automatic detection and level adjust for loud commercials,

gain control within a program interval to preserve audio dynamic range, artifact-free transitions between programs and commercials, and the elimination of drastic volume changes during commercials and interstitials; incorporates an onboard compressor, peak limiter and expander for dynamic range processing; VistaLINK enables control and configuration capabilities via SNMP; is ideal for aggregator applications and multichannel play-out facilities.

FanChat
Floral Systems
 352-372-8326
www.floral.com

Instant messaging-styled chat agent ties into Floral's AirBoss system; allows users to subscribe to chat rooms based on programming provided by the local station; prior to the start of the show, the agent will prompt users to connect; once connected, they will enter

an exclusive room with other local users that are connected through the local station; features Web banners above the chat room that provide revenue to the local station when users click the ads.

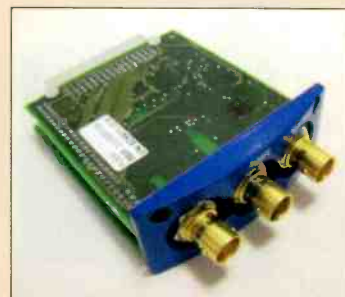


Sonarae
Graham-Patten Systems
 530-477-2984
www.gpsys.com

Audio monitoring system offers an input mode selector for up to eight AES/EBU data streams or 16 individual audio channels; a setup, learn and clear function — along with 5.1, 6.1 and 7.1 surround-sound stereo mix-down selectors — allow users to store custom stereo mix-down formats that are available for recall at any time; operator-selectable delay is built into the unit to allow for picture monitor latency compensation.

FlexiScope
Option 3 Module
Hamlet
 949-597-1053
www.hamlet.co.uk

Allows the display of HD-SDI and SD-SDI video and audio signals on the 9000 series range of Hamlet instruments; generator functions independently of the video and audio monitor with 16 available test signals, allowing closed-loop testing; the HD/SD serial input connection is made to the center gold-plated BNC socket, which is internally terminated at 75Ω; a second BNC provides for a video and audio SDI generator, while a third allows an external timing reference or AES audio signal to be input.



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NEXIO AMP

Harris
513-459-3400
www.broadcast.harris.com

3 Gb/s-ready broadcast server builds on the NEXIO and offers an HD/SD architecture; designed to integrate signal quality control,

channel branding, multiviewer I/O monitoring and play-out automation capabilities in a 3RU chassis; at the heart of the NEXIO AMP platform is a storage architecture built around the AMP MediaCore engine; features a real-time, 64-bit software engine and task-specific multicore CPU/GPU/FPGA processing; includes support for the patent-pending Harris Intrinsic Mirroring technology, the latest advance in Harris storage protection for SAN-based NEXIO systems.



X85

Harris
513-459-3400
www.broadcast.harris.com

All-in-one processor features a linear frame rate conversion option that converts 59.94Hz- and 50Hz-based signals, dual-channel

processing for maximum efficiency, and a 3Gb/s upgrade capability designed to allow for an easy, economical move anytime a broadcaster is ready to make the transition to 1080p; offers eight AES inputs and outputs with 32 channels of internal audio processing in a 1RU frame.



PortaMic 5.1

Holophone
416-362-7790
www.holophone.com

Surround microphone offers professional-grade discrete 5.1 audio quality; measures only 1in; its encoder is equipped with Dolby Pro Logic II encoding technology; this allows the mic's six audio channels to be encoded down to two channels, so it can be recorded to any broadcast camera or stereo recording device; the surround encoded audio is output to both a stereo mini plug and six-pin balanced mini XLR.

VxV-4HD

Image Video
416-750-8872
www.imagevideo.com



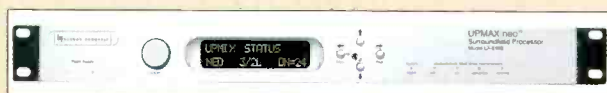
HD quad-split video processor features four auto-sensing SD/HD-SDI inputs; supports selectable 16:9/4:3 aspect ratios; is powered by Gennum VXP video processors; optional DVI cascade input allows up to four united to form a 16-input display system.

Adaptive real-time noise reduction unit identifies and suppresses broadband environmental noise, phone line artifacts and similar artifacts in audio content; detects noise in real time and automatically adapts to changing noise over time, significantly improving the sound quality of live audio in situations like location production and live call-in shows; residual noise switch lets users quickly preview the noise being removed.



ANR-B

iZotope
617-577-7799
www.izotope.com/broadcast



UPMAX:neo

Linear Acoustic
717-735-3611
www.linearacoustic.com

Two-channel to 5.1-channel surround upmixer creates an infinitely adjustable multichannel signal that is completely downmix-compatible; based on the upMAX2251, the UPMAX:neo shrinks the footprint to a

compact, roadworthy 1RU chassis; metadata input is standard, along with GPI inputs to control upmixing; additional upmixing choices are added to the original upMAX algorithm for increased flexibility in post-production applications; options include an eight-channel monitoring-grade balanced analog output with remote volume, mute and return to reference inputs.

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Portable I/O package for the Mac provides broadcast-quality up/down-

crossconversion; designed to streamline editing workflow with Apple Final Cut Studio and Adobe Production Premium on MacBook Pros and Mac Pros; enables users to benefit from file-based workflows with native support for XDCAM, XDCAM HD, XDCAM EX and P2; is lightweight, fits in a laptop bag and runs for hours on a field battery.



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 & VariCam 3700**
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www.panasonic.com/broadcast

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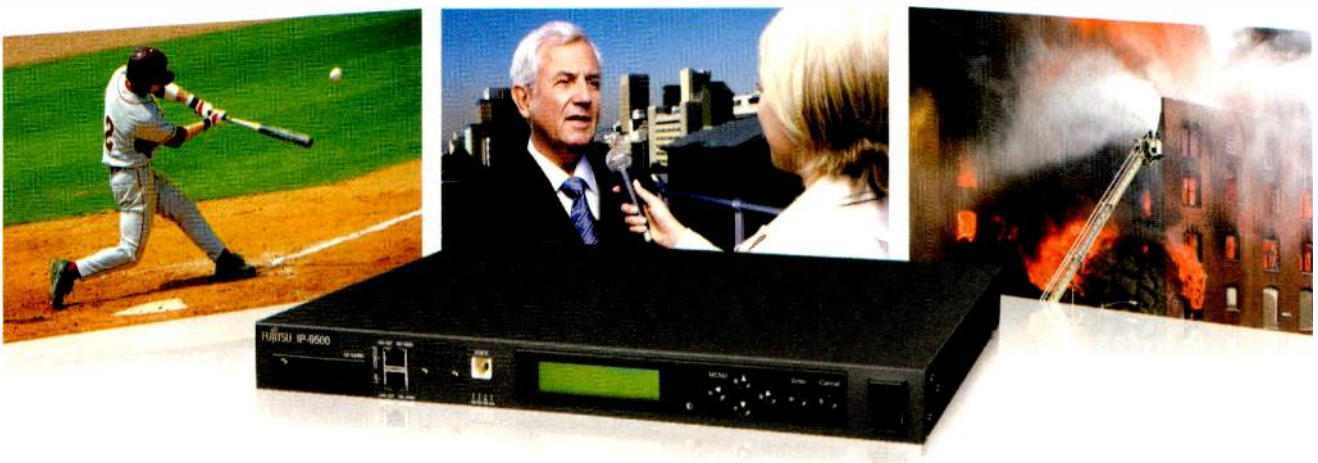
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transcode bottleneck; features at least 1TB of internal RAID storage, as well as connection to external network attached storage; this internal capacity equates to at least 100 hours of DV25, devoted to caching media for playout; includes a fully featured mixer; offers support for four external video inputs for live sources as well as fades, mixes and wipes from internal sources; can manage audio voiceovers using either embedded audio or the 16 discrete AES/EBU audio inputs.



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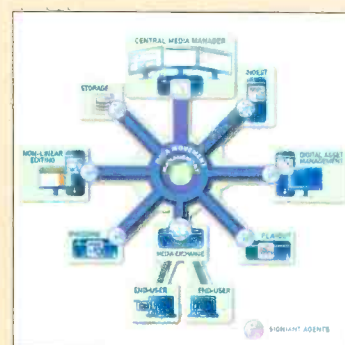
in four keyer multidefinition, two keyer multidefinition or four key standard-definition configurations.

Video archive system combines a 20-slot LTO 4 cartridge robotic tape library with a high-performance server containing 2TB of built-in hard disk storage that is configurable as JBOD or RAID levels 0, 1 or 5; archives more than 1440 hours of 25Mb/s MPEG-2 content for automated retrieval in 7RU; can easily be expanded to 44 slots, more than doubling capacity to 3168 hours; a second tape drive can be added for concurrent reading and writing; all tapes are controlled by a barcode, designed to make retrieval from the shelf fast and easy.



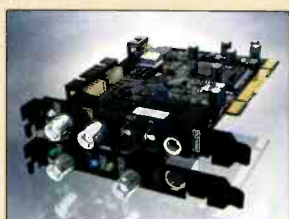
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and single-wire technology (96k frame) for 96kHz; all 64 inputs and 64 playback channels can be routed and mixed to 64 physical outputs freely, which translates to a 8192-channel mixer; features an analog 24-bit 96kHz line/headphone output with 110dB dynamic range for direct control of all input and output signals; uses Steady-Clock to extract the reference clock at lowest jitter directly from the MADI signal, making long-distance connections more convenient.

Camcorder offers similar functionality to the PMW-EX1 in a semi-shoulder design; features an interchangeable lens system, genlock, timecode and remote-control capability; the 1080i/720p switchable unit has an HDMI digital connection for use with an external monitor; has HD-SDI in/out, making it well suited for recording live HD content as well as dubbing other formats; the deck can also be used as an SxS PRO card reader/writer and for feeding content to existing HD and/or SD nonlinear editing systems.



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Ignite integrated production system; helps manage content throughout the production chain; enables stations to add more commercial spot avail time to existing content, while allowing them to create more content and cut down on technical errors.

Camera control unit for Sony robotic PTZ cameras features three CMOS mega-pixel sensors and a 20X optical zoom lens; lets users adjust color, gain and iris functions on the camera; these controls allow the camera to deliver a more accurate representation of the image that is being captured; other benefits include the ability to color match multiple cameras and eliminate the need to use automatic exposure and color settings; two scene store buttons enable users to save specific color matched images, such as day and night, lighting changes or multi locations.



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Fully self-contained receive site includes a six-channel diversity receiver, steerable high-gain directional antenna, five reconfigurable slotted dipole antennas with overlapping coverage totalling more than 360 degrees, and a remote-control package that provides power and communications; designed to be easy to install and operate; once the receive channel has been set, the A600 manages the link between the RF source and receiver; when one of the sector antennas detects a signal, the steerable high-gain antenna is automatically peaked and moved to improve signal strength, continuously optimizing its point to position during transmission.

Offers a 1056 x 1056 matrix in a single equipment rack; developed to provide a single platform for all digital router applications requiring extremely large matrix configurations; uses industry-standard 75Ω BNC connectors for I/O; offers redundant power supplies, low power consumption for cooler and more reliable operation, and signal format flexibility — including the ability to handle 3Gb/s progressive-scan HD signal formats.

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Multichannel video monitor and controller provides real-time monitoring and routing of up to 16 channels of multirate HD/SD-SDI video in 3RU; offers an LCD on the left with touch-screen capabilities that can display from four to 16 thumbnail images, which automatically scale to fill the screen; when an image

is touched, the corresponding video source appears on the right LCD monitor at full size, and its HD/SD-SDI source signal is sent to BNC outputs; the multiview touch screen is also duplicated on a VGA output for monitoring on a larger external display; well suited for multiviewer applications where space is limited.

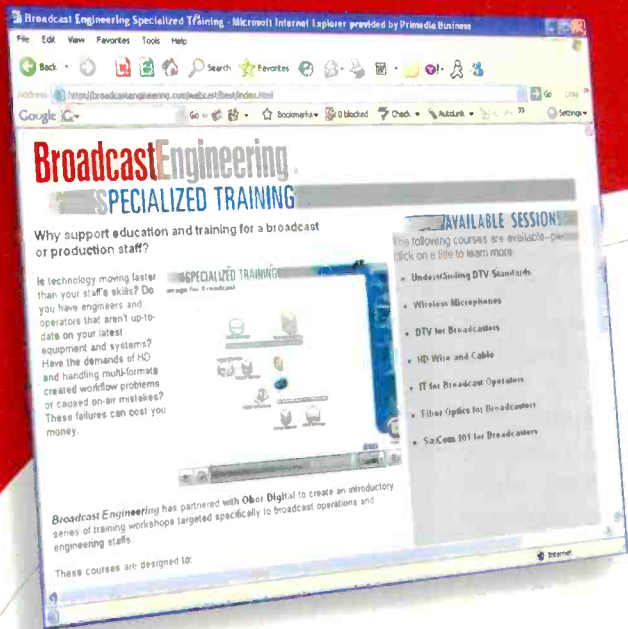


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High-resolution audio mixer/recorder for reality television, surround recording and ENG has no moving parts, making it ideal for use over the shoulder, in a sound bag or on a cart; features multitrack capabilities and eight output busses; records to two CompactFlash cards simultaneously, ensuring 100 percent solid-state

recording that provides redundancy; four balanced AES inputs with sample rate conversion allow eight channels of audio to come from four different devices with varying sample rates or unlocked sample rate clocks; can mix together 16 inputs to eight output busses for recording up to eight tracks.

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Audio

Surround sound dominates NAB audio.

BY JACK KONTNEY

To paraphrase an old industry adage, "Great sound makes your pictures look better." Never has this concept been more critical than today. The mandated leap to digital enables HDTV, and a truly immersive HD experience requires surround sound. With this being the last NAB before the DTV conversion, the solutions for multichannel capture, mixdown and monitoring were both expected and delivered.

Broadcast surround and loudness control

With the coming onslaught of channel-hungry 5.1 broadcasting, control of audio streams will become increasingly critical to broadcast operations. Linear Acoustic showed multiple solutions, highlighted by the new UPMAX:neo, a dedicated stereo-to-5.1 upmixer and *Broadcast Engineering* Pick Hits winner. Other significant announcements included



Linear Acoustic AEROMAX 5.1-XL

the AEROMAX:one for local loudness control with Dolby Digital AC-3 encoding, and the AEROMAX 5.1-XL, with loudness control, upmixing and metadata management.

Dolby Labs showed the Dolby Media Meter, a software-based plugin for the Media Producer Suite that allows ingest of multiple programs, logs against preferred loudness ratings and tags any areas that are out of specification. In addition, the LM100 loudness meter has been upgraded to include the ITU-R BS.1770 loudness algorithm.

Aimed at program aggregators and

playout facilities, Evertz's Pick Hit-winning IntelliGain loudness control system addresses both commercial and channel-to-channel loudness variations by detecting and adjusting the audio variations without adding audible artifacts.

Another Pick Hits product, the Graham-Patten Sonarae monitor, uses push-button simplicity, which enables NLE operators to hear one or two channels from a mix, or accumulate multiple channels into a stereo or mono mix while maintaining a constant level. A built-in delay function allows compensation for up to nine-and-a-half video frames of latency.

Mixing consoles

Most notable in this category was the debut of the compact Lawo mc²56. Large TFT touch screens provide full functionality, while primary mix-



Lawo mc²56

ing activities remain on the control surface. A new architecture allows 16 automated faders per bay, while the central control section boasts Lawo's powerful hyperpanning surround control. Snapshots are easily moved among any mc² Series desk via USB thumb drive.

German manufacturer Salzbrenner StageteC brought its new AURATUS console for OB trucks, a full-featured but streamlined version of the company's flagship AURUS desk. Offered

with 16 to 40 faders handling up to 64 busses and 140 inputs, it features a mic input section that handles up to +24dBu, 153dBA above the input



Salzbrenner StageteC AURATUS

noise floor, eliminating analog-domain gain trimming and guaranteeing that the console can't clip.

Solid State Logic leverages its SuperAnalogue technology with the introduction of the new Matrix console, a hybrid design with superb sound and full digital control that also functions as a master control surface for DAWs. In essence, the



Solid State Logic Matrix

Matrix is a summing line mixer, with 32 fader inputs, four stereo return and dedicated channel output to the DAW record path.

In the field

The channel-hungry prevalence of reality television has inspired the need for an ever-increasing number of audio channels to be captured and transported. Sound Devices celebrated its 10th anniversary with the introduction of the 788T field recorder. This rugged, feature-packed unit offers eight-track recording with time code iXML metadata, with the



Sound Devices 788T eight-channel portable recorder

ability to capture to three simultaneous destinations: its 160GB internal hard drive, high-speed CompactFlash (CF) card and an outboard device via firewire or USB.

A Pick Hits award winner, Zaxcom's Fusion is a digital mixer/recorder designed for multisource capture situations like reality TV and surround sound. Two CF card slots enable redundant recording of four audio tracks without moving parts. The internal 16 x 16 mixer's exten-



Zaxcom Fusion

sive capabilities are realized through a TFT touch screen, and four additional record tracks and a full digital effects package are options.

Nagra showed two significant new models: the Nagra VI, a six-input, 120GB hard disc recorder, and the Nagra LB, a two-channel flash recorder. The Nagra VI offers broadcast wave recording at sampling rates up to 96kHz and is iXML compatible. The Nagra LB is designed for high-resolution (up to 192kHz) field record-



Nagra VI



Nagra LB

ing, with full onboard editing and the ability to send files via Bluetooth connection to a cellular phone.

Celebrating its 60th anniversary, Studer announced its OnAir 2500 console. Designed for both remote and studio applications, this self-contained broadcast system houses control surface, I/O breakout, DSP core and power supply all within a sturdy, compact chassis.

Other notable field-ready hardware included the MAYAH Communications Flashman II, a portable



MAYAH Communications Flashman II

audio recorder/codec that can feed live audio to the studio while simultaneously recording for editing in the field.

JK Audio introduced BluePack, a handy beltback for field reporters that offers Bluetooth connectivity for filing reports via mobile phone.

Microphones and wireless

Lectrosonics showed a new RF concept in prototype form. The D4 is a four-channel digital wireless mic that holds four interleaved channels on a digital carrier, with both transmitter and receiver measuring roughly 5in wide x 5in deep x 5in high, making it perfect for camera-top applications.

Holophone won a Pick Hits designation with the introduction of the PortaMic 5.1, a budget-priced camera-top surround mic with integral Dolby Pro Logic II encoding to stereo outputs, allowing direct recording of surround in ENG/EFP applications. Sony showed two interesting camera-top products: the DWT-B01 and DWR-S01D portable digital wireless system, and ECM-680S, a switchable stereo/mono shotgun microphone.

The big news from Shure was its

UR1M, a micro-sized transmitter for the UHF-R system. The UR1M measures less than 2in tall, is specially treated for sweat resistance and offers 10/50mW selectable RF power.

Sennheiser introduced two twin products. The EM 3732 twin wireless receiver boasts a 90MHz tuning bandwidth, onboard frequency search



Shure UR1M micro-bodyback for UHF-R wireless

and integrated antenna splitter. The company's MKH 800 Twin microphone is a dual-capsule design with discrete outputs, allowing

post-production manipulation of the two signals.

Tools of the trade

Also new and notable was Wohler's WohlerPlus audio processors, configurable to meet precise functionality needs, including DSP, monitoring and metering. Users of Aviom's A-Net digital networking system were treated to the 6416a microphone preamp



Aviom A-net 6416a microphone preamp module

module, a 16-channel unit with high-quality preamps and MCS handheld remote interface. Finally, those waiting for a surefire way to archive their vinyl record collections should note the Audio-Technica AT-LP2D-USB turntable, which converts the audio to WAV, WMA or MP3 files. **BE**

Jack Kontney writes Broadcast Engineering's Audio Technology Update e-newsletter and is president of Kontney Communications, a communications and content creation firm.

Cameras

The shooter's belief system is under siege.

BY BARRY BRAVERMAN

NAB was particularly unnerving this year, and I'm not just talking about the hour-long wait for overpriced coffee in the convention center Starbucks. As the pace of innovation and products introduction continued unabashed, it seemed no one was subjected to more befuddlement than we shooters who had to make sense of the ongoing madness and then somehow convey a coherent message to our bosses and colleagues back home.

Well, good luck with all that. With respect to shooters, a major trend that emerged from the 2008 NAB Show was the lack of a clear theme from



Sony PMW-EX3

the major manufacturers. At Sony, the introduction of the PMW-EX3 (a Pick Hit winner) and PDW-700 camcorders reinforced the company's commitment to capturing images on both Express/34 flash memory cards and spinning optical disc. Gone were the loud pronouncements of past years touting optical discs' inherent superiority over flash memory as an image capture medium or assured archival master. The acceptance and relative



Sony PDW-700

merit of recording to flash memory à la Panasonic's P2 appears now to be an industry fait accompli.

Panasonic for its part communicated a similar juxtaposed message. After having disparaged the evils of HDV and long-GOP recording at past NABs, the company abruptly reversed course this year and embraced long-GOP AVCHD as the ultimate replacement format for all things DV and HDV.

So out of this chaos, what is the poor shooter to think? The merit of Sony/Panasonic triangulations aside, sometimes I feel like the beleaguered baseball fan with allegiance to my favorite guys only to find my guys abruptly traded away for the other team's guys — for whom I'm then supposed to feel just as much conviction and abject loyalty. It could be just me, but I usually don't like my belief system threatened that much, that often — whether in baseball, in life or in professional HD camcorders.

O come, all ye faithful

Luckily, if you're still enamored with the concept of recording on a spinning disc, you'll find great solace with the introduction of Sony's new PDW-700 XDCAM HD camcorder. The much-anticipated 2/3in 50Mb/s upgrade reflects a maturing of sorts of the XDCAM HD format, using 4:2:2 color sampling and dual layer media.

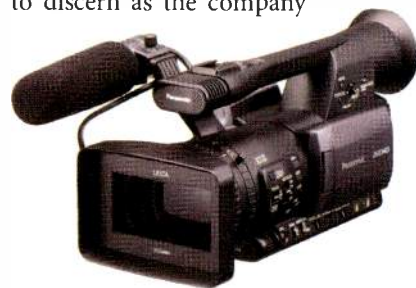
Just as luckily, if you're one of the growing number of folks who recognize the efficiency and economy of shooting on flash memory, you'll feel much more fulfilled now that Sony has expanded its compact XDCAM EX line to include the new PMW-EX3, a Pick Hit winner.

Accepting the latest 32GB SxS PRO solid-state memory cards, the EX3 incorporates most of the EX1

features, plus interchangeable lens capability, genlock and time code I/O for multicamera operation.

So many new cameras, so little time

At Panasonic, a coherent message for shooters was just as tough to discern as the company



Panasonic AG-HMC150

expanded its lineup of professional AVCHD cameras dubbed AVCCAM. The AG-HMC150 sports many of the same features found in the pricier P2 camcorders, such as the upgraded HVX200A. The HMC150 offers cine-like gamma settings and a full array of recording modes and options, including 1080p24, 720p24pN and 720p60, among others.

One big difference in the realm of AVCCAM: The HMC150 records on SD and SDHC flash memory, obviating the need to invest in a cache of costly P2 cards. The performance of the HMC150 is not likely, of course, to match that of the P2 ProHD line, but with a concomitant bump in bit rate at 21Mb/s to 24Mb/s in PH mode, the image quality can be quite startling nevertheless and more than sufficient for many smaller market and event shooters.

Despite any inherent keying limitations and increased risk of motion artifacts, the long-GOP AVCHD compression scheme certainly has its advantages, allowing up to three hours of 1920 x 1080 recording on a

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single 32GB SDHC card. For some shooters, this is a key advantage that underlies the economy of the format.

In the area of low-cost camcorders and overall industry trend, Panasonic's AG-HPX170 camcorder represented perhaps the show's most significant offering. Weighing in at 1.3lbs less than the HVX200A, the new, more-compact model dispenses with the vestigial MiniDV tape drive, forever severing this legacy medium from our collective pasts.

The slimmed down camera addresses many of the concerns of shooters employing this type of camcorder: the reduced mass and size, helping to ensure its unobtrusiveness in almost every situation; its ruggedized six-pin firewire connector, eliminating the four-pin menace that has bedeviled shooters for years; and the long-demanded HD-SDI output providing easy integration into common baseband workflows.

Most notable of all, the HPX170 features a built-in vectorscope and waveform — the first implementation of this vital feature in a camcorder at any price.

For broadcasters at the high end of the spectrum, Panasonic also introduced its P2 Varicam lineup, offering two new models (both Pick Hit winners): the



Panasonic AG-HPX170

AJ-HPX2700 at 720p and the AJ-HPX3700 at 1080p native resolutions. The HPX2700 features variable frame rates from 1fps to 60fps with 10-bit 4:2:2 full sampling recording using AVC-Intra.

This is a major development for more advanced shooters because 10-bit recordings at virtual D5 quality significantly improves performance across the board, reducing the risk of contour and motion artifacts on the one hand, while dramatically expanding post-production's color correction capability on the other.

Both new Varicam models feature chromatic aberration compensation to defend against objectionable fringing along an image's high contrast edges. This artifact, which will never be confused with art, has grown increasingly apparent and objectionable with the introduction of cameras with high native resolution imagers. Of course we would all prefer high-resolution images to see greater picture detail. The problem is that at the same time, increasingly, we're seeing a lot more lens defects.

Both new Varicam models feature chromatic aberration compensation to defend against objectionable fringing along an image's high contrast edges. This artifact, which will never be confused with art, has grown increasingly apparent and objectionable with the introduction of cameras with high native resolution imagers. Of course we would all prefer high-resolution images to see greater picture detail. The problem is that at the same time, increasingly, we're seeing a lot more lens defects.

Sticking to their roots

Canon seemed to stay on track this year with the introduction of its revised XL H1S and XL H1A models. These updated offerings represent more of a tweaking than radical change of thinking. The H1S is geared mostly for multicamera applications. The H1A lacks HD-SDI and genlock and is intended primarily for simpler more



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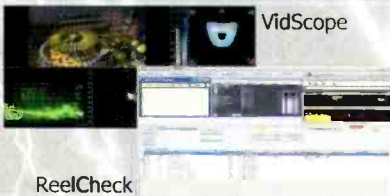
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The H1S and lower priced H1A feature an updated 20X lens with much needed mechanical enhance-



Canon XL H1S



Canon XL H1A

ments, most notably the addition of a manual iris ring. Shooters also now have the capability to focus while zooming, a feature long taken for granted by most ENG folks. In addition, color adjustment is more tweakable in the new models as is the various buttons' touch sensitivity. One significant and critical improvement: Embedded audio is now standard in the HD-SDI signal output. Hurray for that!

In the realm of new camcorders or revised camcorders, JVC seemed to run a relatively quiet show, introducing the GY-HD200B, which can capture and record 720p at multiple frame rates. Significantly the new model can also stream 1080i at 50/60Hz via firewire, a capability that has so far eluded Sony's XDCAM HD models as well as JVC's own HD250. For some shooters who require live capture of video via firewire for DVD dailies for example, this new capability in the HD200B could be significant because previously such functionality in long-GOP MPEG-2 cameras was limited to 25Mb/s SD.

Some goodies of note

Fujinon has been impressive lately, offering high performance lenses at modest price points. This appears to be especially true in the area of general-purpose optics for field acquisition, where even the company's package lenses that ship with various cameras, like the Panasonic HPX500, exhibit low chromatic aberration and flare, producing compelling images more typical of lenses costing twice or three times the price.

It is in this vein that we are seeing a high level of optical performance in the company's new ZA Select HD series of lenses. Three different models comprise this



Fujinon ZA 17X7.6BE

Fujinon ZA 22X7.6BE

new lineup: the ZA 12X4.5BE wide-angle, ZA 17x7.6BE general-purpose and ZA 22x7.6BE extended range zooms.

In the support area, Manfrotto introduced a rugged and simple new set of carbon fiber tripod legs — the MPRO. The model 536 with a 100mm ball can support a load up to 44lb at a height of 6.5ft with absolute stability. This relatively inexpensive tripod is suitable for use with full-size ENG camcorders.

The Sachtler SOOM is lighter weight and much pricier, but its functionality, versatility and speed of setup is a tour de force of efficient design. The system consists of four components that serve multiple functions: as a rugged pair of baby legs, monopod, standard tripod and center-column elevated tripod. The maximum weight supported in the current model is only 13.2lb, so the SOOM with its diminutive 75mm bowl is certainly not for full-size camcorders like Sony's new PDW-700 or Panasonic's HPX2700. For shooters using lightweight cameras,

TECHNOLOGY SEMINAR

such as the EX3 or HVX200A, the SOOM is a fantastic all-purpose support platform.



Sachtler SOOM

Shooters wishing to exercise greater image control may want to check out Schneider's new line of HD Classic Soft Filters. Most diffusion filters, including Schneider's own Frost and Classic lines, have seen little practical application in small-format HD because of the risk of the filter's image pattern appearing on-screen, especially when shooting at full wide-angle and at tiny f-stops.

The Schneider HD Classic Soft

mitigates the risk by employing a clever offset pattern along the inner surfaces of the filter's bonded elements, a strategy permitting for the first time use of such filters on 1/3in camcorders exhibiting a typical enormous depth of field.

Conclusion

Needless to say, this year's NAB was a challenging time for us shooters' besieged belief systems. Manufacturers seem to be raiding with apparent abandon each other's technology bins. Hitachi is manufacturing its own dockable P2 camera — the SK-HD1000. And Fujifilm is manufacturing its own P2 memory cards up to 64GB.

And then there is the RED juggernaut with its loyal band of followers and a belief system fervor like no other. Whether broadcasters will ever embrace the Scarlet 3K cam-

era with its less-than-streamlined RAW workflow is doubtful. But one thing is sure: It will rattle the belief systems of industrial giants' executives ensconced at the highest levels in Japan.

And that, in the long run, has to be a very good thing for shooters — whatever the camera manufacturer du jour we happen to believe in. **BE**

Barry Braverman is a veteran cinematographer. His latest book, "Video Shooter," is available from Focal Press/Elsevier.

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Edit systems

Technology shines despite absentee companies.

BY LT MARTIN

The South Hall of the Las Vegas Convention Center has traditionally been the arena for post-production exhibits at the NAB Show, and this year, despite the absence of both Avid and Apple, the crowds filling the aisles were treated to an abundance of editing innovations.

Adobe Systems announced that its Adobe Premiere Pro CS3 editing software now supports Sony's XDCAM EX format in addition to Panasonic's P2 solid state recordings. It also had the new Adobe Flash Media Encoder 2.5 software that allows users to capture and stream live content in H.264 with Adobe Flash Media Server and Adobe Flash Player. Adobe also revealed details of its industry-wide open file format initiative for digital cinema files to be called CinemaDNG.

Calling them previews of 2009 versions, Autodesk demonstrated new software for all its post-production systems, including the

Flame, Inferno and Flint visual effects systems and also for Autodesk Smoke, its Windows-based finishing NLE. Smoke's procedural timeline compositing workflow, Batch FX, now has a multi-input process tree, can directly input Panasonic's P2 and has new tabs to quickly access the waveform monitor and vectorscope displays.

Bringing 4K post to the desktop, CineForm's new Prospect 4K and Neo 4K can enable a 4K post-production workflow at up to 4096 x 4096 spatial resolution without resorting to proxies. CineForm also showed off beta support for the 4K Dalsa Origin and Vision Research Phantom 65 cameras.

New version 3.6 software for Film Master by Digital Vision features a revised control surface with faster response times, enhanced support for the ASC CDL, extended support for QuickTime, MXF and AAF and the ability to natively grade DNxHD, IMX50, P2 and XDCAM media.

Digital Video Systems (DVS), the first to provide real-time 4K editing, had a new version of its flagship CLIPSTER conforming system as the core of a DI workflow. In addition to being able to insert multiple EDLs into its timeline, CLIPSTER now supports all stages of DCI mastering, ranging from the Digital Source Master (DSM) to the Digital Cinema Package (DCP), all adhering to the specifications of the Digital Cinema Initiative.

The new version 4.6 software for Thomson Grass Valley's EDIUS Broadcast NLE gets enhanced functionality based on the same JPEG2000 codec used in the Infinity Digital Media Camcorder. Version 4.6 also enables multilayer editing of high-definition content even on a laptop computer, and its workflow for XDCAM has been enhanced to support Sony's new EX range of camcorders. Even better, version 4.6 is a free update for all current EDIUS Broadcast 4.x owners.



The FCC mandates that all broadcasts must switch over to digital on

FEB 17, 2009

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Harris brought out its new NewsForce family of edit systems optimized for deadlines in the newsroom. These include the NewsForce ES high-performance package editor, NewsForce Desktop for proxy editing on a PC, NewsForce XNG for laptops, and at the top of the line, the Velocity NX, a full-featured craft editor.

Maximum Throughput garnered a lot of interest with its MAXedit Web Edition, a subscription-based hosted online editing service that video professionals can access on demand from any location via the Web. Using editing software that resides on the home server itself, with MAXedit Web Edition editors can interact with producers or clients during the progress of a project over the Internet.

Bringing out its fifth major software release since 2005, Media 100 presented new version 12.5 of its venerable editing software. Media 100's

user-friendly interface is now empowered with more 2-D/3-D compositing features, support for HDV long-GOP formats through firewire conversion into Apple's ProRes 422 codec, multi-channel audio input, and integration with Abaltat Muse software for creating royalty-free soundtracks.

Quantel brought something new to the show, with stereoscopic 3-D capabilities added to all its major systems thanks to a new Quattro software offering for its eQ and iQ editors, Pablo color grading system, and Genetic Engineering DI powerhouse. Genetic Engineering's Sam data server can now virtualize media in the GenePool into TIFF as well as DPX files. The company also previewed its new Dino (which stands for distance is no object) intersite workflow technology, and the ability to ingest EDLs from Final Cut Pro directly into its systems.

New features in the Sony Vegas Pro 8.0 NLE from Sony Creative Software include new multicam capabilities, support for tapeless workflows, including AVCHD and AVC-Intra, enhanced scripting tools and a new ProType titler. Sony Creative Software also presented a technology demonstration of its upcoming Vegas Pro 8.1, completely rewritten into 64-bit code. This 64-bit code version will be a free upgrade, is backwardly compatible with 32-bit projects and will enable greater access to system memory and more efficient use of multicore processors. **BE**

L.T. Martin is a freelance writer and post-production consultant.

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IPTV

The NAB Show offered solutions to operators' problems.

BY PHIL KURZ

The presence of IPTV at NAB grew significantly in 2008 compared with last year with the addition of a new conference track, keynotes, the IPTV Pavilion (sponsored by *Broadcast Engineering and Telephony*) and multiple new products and services from a series of vendors serving one slice or another of the market.

Content aggregation and distribution

EchoStar entered the IPTV content aggregation and distribution arena at the show with the launch of its ViP-TV content transport service. Offering more than 300 channels of MPEG-4 H.264 TV and radio delivered via satellite, ViP-TV allows operators to insert the programs into their own IPTV distribution network. As part of the package, EchoStar provides two satellite antennas and one-and-a-half racks of receive equipment. One antenna points to EchoStar XVI to download national

and international programming. The other, a small DBS antenna, receives local broadcast channels for the DMA in which the operator offers service.

SES-Americom touted the addition of 12 new IP-PRIME HD-4 customers. Launched in the last quarter of 2007, HD-4 lets IPTV operators overlay MPEG-4 encoded HD programming on their existing MPEG-2 network without upgrading their entire infrastructure. Deployment can be done without service interruption. The HD-4 service provides a 32-channel lineup of news, entertainment and sports programming.

Intelsat also used the NAB Show as an opportunity to announce the addition of a new customer for its IPTV service. On the eve of the convention, Wave Entertainment Network contracted with Intelsat to provide the service to cruise ships around the world. The first ship to deploy Wave's multichannel interactive platform is the Oceania Cruises Insignia.

Comtech EF Data introduced the CMR-8500 DVB IP encapsulator. In the IPTV market, the new product offers program aggregators, system integrators and service providers targeting smaller IPTV markets a means to encapsulate IP data into multiprotocol encapsulation format for distribution via an ASI interface.

Metrics and monitoring

Delivering the quality of service (QoS) and quality of experience (QoE) viewers expect is critical for IPTV operators looking to reduce truck rolls and customer churn. At the show, Pixelmetrix showed visitors how three of its tools could be used together in an IP video delivery lab environment to test simulated network performance prior to deployment.

The tools included the VISUAL-mpeg Qualify, a new member of its analyzer family to assess audiovisual streams; the DVStorIP-Gen, which simulates a fully operational IP video delivery headend; and the DVStation-



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IP3, a monitoring engine for IP and transport stream analysis. The integrated solution can be used to identify and correct problems that otherwise would degrade QoS and QoE before an IPTV deployment goes live.

At the Tektronix booth, the MTM400A MPEG transport stream monitor was on display with the addition of a new FlexVuPlus interface. The MTM400A is designed to let network operators quickly detect the cause of signal degradation and diagnose errors so corrective action can be taken before viewers lose a signal. The FlexVuPlus interface simplifies monitoring, making it possible to monitor up to 500 IP sessions via new polling capability.

Digital Fountain presented its forward error correction technology to assist IPTV operators in solving delivery issues and ensuring high-end video delivery across its networks.

Protection, access and management

Verimatrix was on a twofold mission at NAB: unveil the latest release of its VCAS (which stands for video content authority system) and highlight technology and distribution partnerships with third parties. The company's new VCAS for IPTV version 2.3 offers incremental improvements to the product, such as enhanced system status and performance monitoring, and fully enabled wholesale-retail distribution of video-on-demand content. Technology partners on-hand included Falcon IP/Complete with its one-stop IPTV offering, Guest-Tek with its OneView Media IPTV solution for the hospitality market, and I-Systems, an IPTV reseller based in Chile.

At the Irdeto booth, the company highlighted its recent purchases of three companies as part of a strategy

to extend its offerings. The acquisitions include business support systems specialist IBS Interpret, set-top box provider IDway and software and data center security firm Cloakware. They will extend the company's offering to its more than 400 conditional access and digital rights management customers worldwide.

Widevine showed its Cypher for Digital Media solution in the Microsoft booth. Key to its use with Microsoft's Silverlight is the DRM solution's cross-platform support, assuring secure delivery of content to Mac OS and Windows operating systems. **BE**

Phil Kurz writes several Broadcast Engineering e-newsletters, including IPTV Technology Update.

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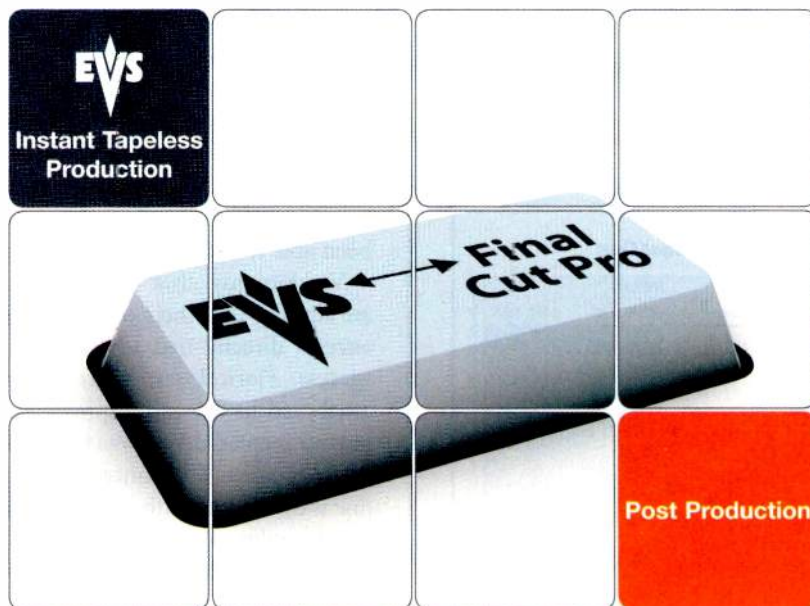
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Input/Output Chart

		OUTPUT FORMAT						
		SDI/HDSDI	HDV/20p	DV	COMPONENT	DVI	HD-SDI	SD-SDI
INPUT FORMAT	HDV/1080i	0	0	0	0	0	0	0
	HDV/720p	0	0	0	0	0	0	0
	DV	0	0	0	0	0	0	0
	COMPONENT	0	0	0	0	0	0	0
	DVI	0	0	0	0	0	0	0
	HD-SDI	0	0	0	0	0	0	0

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Automation

The technology keeps advancing.

BY JIM BOSTON

There was no letup this year in the rate of change occurring in the broadcast industry. In automation, nontraditional technological and business trends are shaping the products and services. In the end, automation, as one prominent vendor put it, has to enhance performance, not just command it. Until recently, automation vendors were heavily involved with the implementation of high-end broadcasts such as HD, but now it's about content management and repurposing media from HD down to cell phones.

The usual concerns confront broadcasters as they continue to fight for revenue and find ways to operate as efficiently as possible. This means removing as many hands from the process as possible. VCI Solutions says this means no more "manual" automation as stations over the next 24 months begin to adopt the Broadcast Exchange Format (BXF) enabling technology. The company claims that this will allow customers to reexamine their operations and push traffic and automation systems to do more than they have previously been able to accomplish.

Vendors say that many stations are finding that their online appearance is directly tied to their on-air success. Floralca says Gray Stations attributed its Q1 earning increase in part to increased Web site traffic and Internet sales. The concept that online is competing with on-air is giving way to online and on-air being partners. Floralca thinks automation will start expanding to not only help on-air, but to also help move product to the online process.

Other themes that have continued to flourish in this area of the business are more activity in the channel-in-

a-box segment and more emphasis on automation tools such as rules engines. Some claim this approach improves on the functionality of a traditional broadcast automation and playout chain and brings added efficiency through feature consolidation in a single set of hardware. Other vendors believe that there is an ongoing and future need for distributed control systems that enable customers to choose best-of-breed servers, graphics and other transmission chain devices. Some go as far as to say the industry must be able to separate the latest fad from the requirements desired by the industry.

Harris points out that another trend in the industry is to consolidate more types of content distribution (i.e., traditional linear, mobile, Web, VOD) under a single system with single operator control. Alan DeVaney of Crispin sees the integration of production NLEs used for creation of promotional material that air into the automation system. He stated that using automatic promo recognition — the movement to the play-to-air server — followed by removal from the play-to-air server can be accomplished without the need for human intervention.

Other challenges include standards-based interoperability, expanded archiving opportunities, even larger channel counts and a growing need for MPEG-4/H.264 to MPEG-2 transcoding. Some worry about the increased complexity and manageability of continual software upgrades. The looming FCC mandate for the dynamic EPG had the automation and EPG industry scrambling to offer a solution before the end of May deadline. Stations with existing automation weren't as hard hit as those running without automation.

Some were looking for ways to gracefully expand existing content for live mobile TV. Then there's the challenge from the outside. As one vendor put it, "lots of worry about Google and others eating our lunch."

So what's new this year?

Floral Systems demonstrated six new products at NAB this year. FanChat, a Pick Hit winner, is a social-networking, revenue-generating chat agent that ties online banner ads to on-air spots, while reminding viewers to tune-in. AirGuide is a dynamic PSIP interface for EPGs. The LiveLog BXF traffic interface with two-way communication is automatically notified if a spot is missed and can make an adjustment to the on-air schedule immediately rather than waiting for the next day's as-run log.

For three new applications in its S.M.A.R.T. Central suite of products,

Floral changed the workflow related to TV stations in two ways. First, reports and notices are automatically e-mailed to appropriate personnel. Second, the S.M.A.R.T. Client applications are securely accessible from any PC that uses a VPN to connect the stations' system. The new applications include Remote AirBoss, which monitors or controls the on-air schedule. The Web Editor edits on-air and future schedules. Remote Supervisory Monitor allows users to view and control multiple channels from one monitor.

Harris introduced several enhancements and interoperability advances across its automation portfolio. One example is the use of SMPTE 201 BXF to integrate live logs across the company's traffic and automation systems using OSi-Traffic to ADC-1000 automation and Vision Program Management to D-Series DSX

automation.

ADC-1000 and D-Series DSX automation use common content management and media movement workflow tools integrated with Harris automation systems, allowing both automation and digital asset management tools to share ingest and the resulting content. D-Series DSX automation uses a modular device architecture to support the addition of devices and new distribution channels without downtime and minimal operational disruption. The company also introduced a new interface for ADC-1000 automation to enhance ease of use and to support staff training.

Pro-Bel introduced its Pick Hit-winning station in a box, Morpheus ICE, an integrated content engine, which combines automation, master control and media storage in one 3RU box. It can be used standalone or in various



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configurations for playout, backup or regional opt-out channels.

VCI Solutions' latest automation release, autoXe MC, can manage one, 15, 50, or more channels on one workstation in one screen. It has a number of different views available through its GUI, such as icon view and timeline view. In icon view, you can quickly glance at the system and know what is running smooth and what needs your attention instantly.

Sundance Digital introduced Fast-Break NXT Entry Level Edition, the Digital Delivery Management Engine, a 13TB expanded Sundance Archive Engine, and Publish to Sundance.

Pebble Beach continues to add features into its Neptune. The company has also launched a new small automation package called DeckChair. This year Pebble Beach opened a support office in the United States.

Crispin launched its latest product, media management software, called MediaNav. The software is a standalone package that provides professional control to manage a client's Omneon video server. MediaNav allows broadcasters to browse the contents of the server for clips, as well as view key server statistics, such as free space, used space and number of clips. Users can search, sort, re-

name, delete and copy clips from one folder to another or even to another Omneon server. MediaNav features an intuitive graphical user interface, as well as easy click, drag-and-drop functions and simple configuration.

Aveco introduced Astra Orbiter architecture for large or distributed (even geographically) automation systems. Astra SHS feature for dynamic assignment of playlists, broadcast chains, automation systems and control workplaces to TV channels. It allows one operator to control all TV channels during the graveyard shift, and during prime time each channel can have its own operator.

OmniBus is offering iTX Business Continuity Planning (BCP), a cost-effective disaster recovery solution to ensure business continuity based on the iTX transmission system, along with iTX On Demand, a iTX-based production system for VOD file delivery. The company also showed its SmartClient, which is a platform-independent Web 2.0-based browse and content selection tool.

Digital Broadcast introduced MediaFire Dub HD, which provides the ability to dub both HD and SD syndicated programming off the Pathfire DMG server. Designed in collaboration with Pathfire, the Me-

diaFire Dub HD is integrated into Pathfire's dub service architecture. The MediaFire Dub HD expands to the fully automated MediaFire HD, which quickly transfers HD syndicated programming from the Pathfire server ready for playout without requiring format flipping and without degradation of the HD material.

Fission continued to add new features to its open architecture HDCore system, which uses off-the-shelf hardware.

Conclusion

The general consensus among the automation vendors this year is that although attendance was definitely down, the quality of the attendees as it relates to potential business was up. Most said business was not down and in some cases record setting, suggesting that broadcasters must still be trying to set the proper business course for survival. **BE**

Jim Boston is a West Coast consultant.

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949-206-7900; www.red.com

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Fujitsu

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Using Ethernet in the HD studio

Part 2: A look at genlock, real-time switching and studio network management

BY GAËL MACÉ AND MICHAEL JOHAS TEENER

In last month's article, we examined some advantages of moving to a common network infrastructure based on new-generation Ethernet protocols. In addition, we discussed some of the underlying protocols being developed to support an IP-based production environment. Now it's time to describe in more detail the next-generation HD studio with genlock, real-time switching and studio network management.

Studio genlock over Ethernet

The video genlock signal exactly synchronizes the frame rate of video equipment with a reference signal also called genlock. Each piece of equipment has to be in perfect sync so there are clean takes and transitions in live

switching, editing and post production. Without genlock, switching between sources results in a momentary loss of image stability while the monitor or device tries to lock itself to the

a standard composite video signal. When properly combined, the result is a correctly displayed image. A standardized signal, which includes all of the attributes but without any actual

The video genlock signal exactly synchronizes the frame rate of video equipment with a reference signal also called genlock.

new signal. Without synchronization between all sources, the images may roll either vertically or horizontally, or break up completely.

Genlock synchronizes four key video signal attributes: vertical, horizontal, frame and color synchronization. These are all normal parts of

video image, is known as black burst. In the absence of black burst, many genlockable devices will instead accept a standard composite video signal for synchronization.

In order to genlock two video sources, at least one must have a genlock input. The other signal source

may be used as the master, from which the sync signal must be derived. Alternatively, a variety of sync generators are available, which either produce black burst from an incoming video signal, or generate their own internal black burst references for all connected genlockable cameras in the system.

The problem

The first production goal is to synchronize any camera signals so that video coming from different cameras can be cut and mixed without roll, jump or chroma shift.

The constraints of how precise synchronization must be are strong, down to the pixel level. This requires a timing precision in the range of several tens of nanoseconds. This precision level was originally required by legacy analog equipment, which was quite sensitive to frequency chroma shift and offered minimal buffering.

With the migration to a digital world, past constraints are not so severe. Digital color transmission does not depend on any frequency, and buff-

ering is no longer a problem. Even so, time constraints have not disappeared. For example, if two unsynchronized cameras are shooting the same action, the display of their two pictures on the same screen may exhibit a slight delay between the two images. There may also be some stutter as frames are either dropped or repeated.

The global latency caused by the overall production chain (from the camera's head to the output of master control) must be imperceptible to the human eye. Throughout the entire IP studio, there should be an appearance of exact synchronization among video equipment. In addition, the camera operators must see the video on their monitors without delay as the scenes are shot. An example system block diagram demonstrating genlock is shown in Figure 1.

A system's global, end-to-end delay, from capture to the output of the video switcher, should be constrained to one or two frames. For synchronization reasons, this delay is typically an entire multiple of a frame. Because a video switcher and its video effects circuits usually make

use of these one or two frames, the latency inherent to the network and its core equipment must be minimal — preferably, less than one frame.

Furthermore, as with every multimedia flow, jitter is a problem because it increases buffering. The input buffers of a current video switcher are typically proportioned to manage no more than two or three video lines of jitter (a few tens of microseconds). Because packet buffering increases latency, the network itself must have low jitter.

Finally, in a production environment, the boot time needs to be short and accurate. When video equipment is connected to the infrastructure, especially for a live event, it needs to be able to start operation in less than one minute. Also, the synchronization systems and related servo mechanisms must have short convergence times.

A layered approach

The main difficulty in synchronizing equipment over an Ethernet/IP network is that packet transmission time over the network is not constant. The consequence is that there is always a time difference between the instant at which a packet is received and the instant at which it was intended to be received. This difference corresponds to the transmission jitter. While its average value may be zero, for each packet, its value is not zero.

A key component of IEEE 802.1AS is the ability to provide an accurate network timing service. This feature will ensure the transmission of a clock with limited jitter, typically in the submicrosecond scale. Further filtering of the 801.1AS clock has been shown to meet the requirements of uncompressed HD video.

On top of this network layer, a video application could transmit counter values at which synchronization signals (genlock) should occur. This layered synchronization is shown in Figure 2 on page 104.

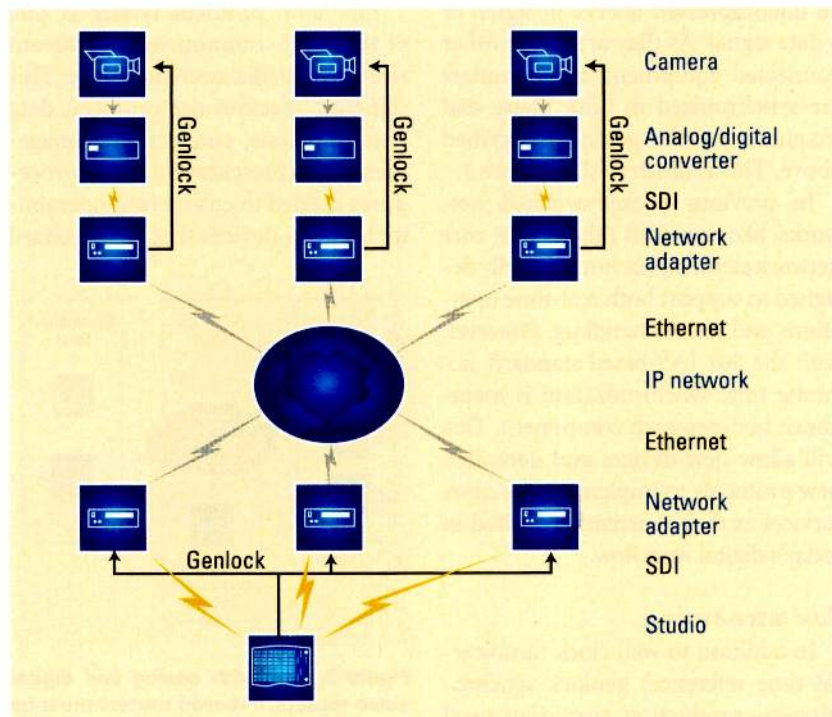


Figure 1. As with standard video chains, AV sync must be maintained throughout the entire system. End-to-end delay should be limited to no more than two frames.

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ETHERNET IN THE HD STUDIO

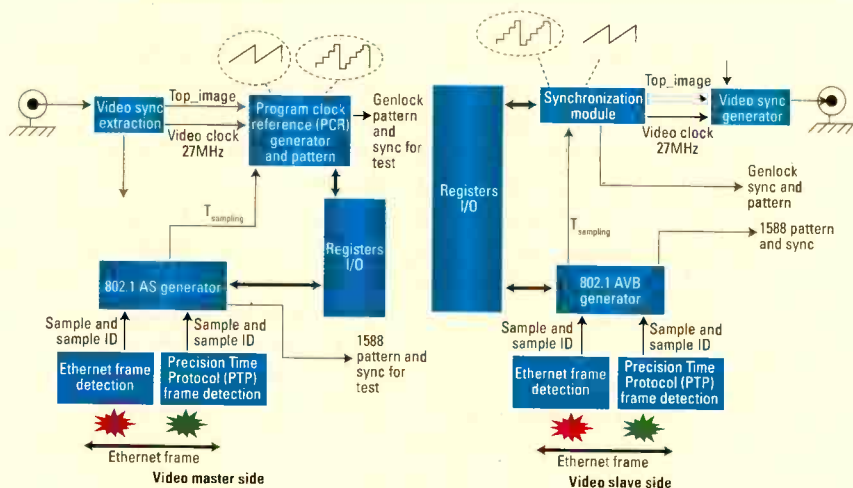


Figure 2. Synchronizing IP-based AV networks is more complex than with analog or digital video networks. The solution requires layered synchronization. The IEEE 802.1 AS system will provide the network timing signal, but the video equipment needs to add counter values, which can be used to develop genlock.

are dedicated point-to-point infrastructures, allowing both multimedia source transport and real-time operations on those streams.

Today's SD/HD video routers are compliant with SMPTE practice RP168. This practice defines a switching point where the effects of any signal discontinuity within the chain are minimized. This is the case regardless of whether the interface is carrying an uncompressed television signal or a data signal. As they are to the other connected equipment, video routers are synchronized in both phase and frequency by the genlock described above. This is illustrated in Figure 3.

In previous packet-switched networks, like non-AVB Ethernet/IP, core network elements are not primarily designed to support both real-time operations and stream handling. However, with the 802.1AS-based standard, accurate time synchronization is maintained between each component. This will allow new devices and dedicated new protocols to implement the same services as those currently required in today's digital workflow.

AV streaming

In addition to wall clock (a universal time reference) genlock synchronization, production operations need end-to-end delivery services that allow receivers (monitor wall, video switch-

er, etc.) to reconstruct the senders' packet timing and to manipulate them accordingly to their time reference derived from the wall clock.

Without the current SDI time information, but based on the time synchronization provided by 802.1AS services, the multimedia streams must integrate accurate timestamp mechanisms to minimize buffering and facilitate interoperability between devices.

The RTP protocol family is one of the most common ways to stream real-time media over networks. This standard specifies the protocol, data encapsulations, connection management and presentation time procedures needed to ensure interoperability between devices that use standard

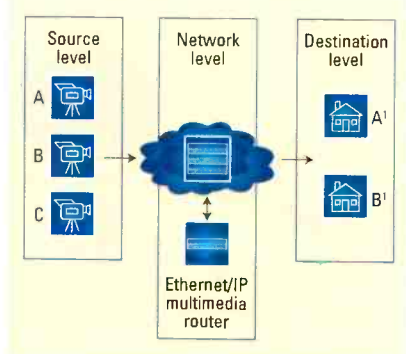


Figure 3. Like with analog and digital video routers, IP-based routers must be phase and frequency synchronized to minimize any signal discontinuities all the way from source to destination.

V	P	X	CC	M	PT	Sequence number
Timestamp						
Synchronization source (SSRC) identifier						
Contributing source (CSRC_1) identifier						
-						
Contributing source (CSRC_n) identifier						
Payload						

Table 1. RTP packet format

networking services provided by all IEEE 802 networks.

Based on the 802.1 AVB and the new IEEE 1722 AVBTP L3 technologies, it is possible to enhance RTP and remove its deficiencies in some of the QoS features required by a production environment. Table 1 illustrates the basic format of an RTP packet.

The solution provided by these protocols will define the packet format and stream setup, control, and teardown protocols. These improvements will allow RTP solutions to be more effectively used in production environments.

Studio network management

Fundamental performance requirements have to be considered and met in order to achieve the needed QoS level in an A/V studio. This includes:

- the ability to strictly reserve band-

width for flows up to 1.5Gb/s or even 3Gb/s;

- a low latency of less than a few video lines ($n \times 64 \mu\text{s}$) over the entire network so as to provide equivalent real-time performance and consistency with the existing infrastructure;
- low jitter for A/V streaming, meaning minimal latency from buffering; and
- no packet loss of A/V data.

In order to provide a high QoS for these demanding applications, the network must satisfy two necessary conditions. First, sufficient bandwidth must be guaranteed for an application under various circumstances, including congestion and failures. This condition also will help avoid A/V data packet loss. Second, as an application traverses the network, it must receive the appropriate class-based treatment, including scheduling and packet discarding.

Flow management

Whatever the network, real-time services with high bit rates, such as video, must be guaranteed. At the same time, non-real-time traditional data services should be transparently provided. In the past, the first step taken when designing such a network was to specify the bandwidth according to the global needs of the network. Unfortunately, this solution results in over-provisioning the network, creating additional costs that strip Ethernet/IP studio solutions of part of their cost advantage.

Moreover, bandwidth is not the only QoS concern for the IP studio. Latency and jitter limits are also important. These QoS variables cannot be calculated nor ensured based only on network topology. A mechanism is needed to limit and control the network resources used by the different flows over a constrained network infrastructure.

Flow management allows or forbids some hosts to emit flows and streams with particular characteristics. This decision has to be made according to the state of the network and previous reservations. As QoS needs are constantly changing, flow management has to be dynamic and, thus, automated. Then, whatever the implementation of the flow manage-

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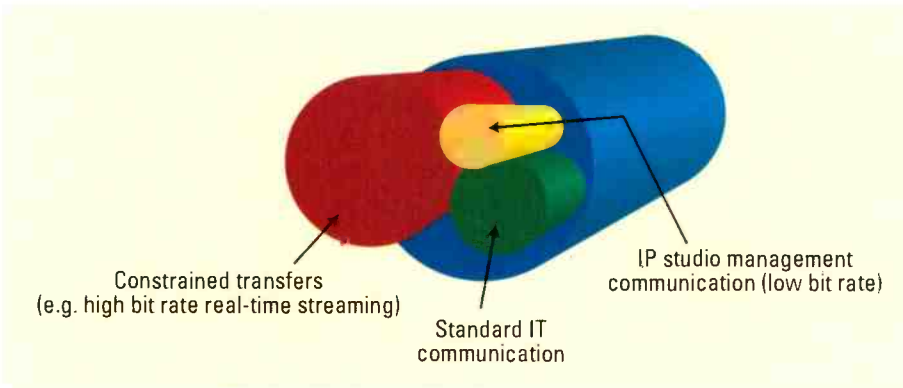


Figure 4. There can be many types of traffic over any given network. This graph illustrates the relative bandwidth required for some types of signals. A signal's required bandwidth alone may not determine its priority for transmission in times of congestion.

ment system, requests, orders and information will be exchanged over the network. For an AVB network, this function is handled by the 802.1Qat Stream Reservation Protocol.

When the flow management system decides to allow a reserved stream, it must ensure that this stream is flawlessly transmitted to the addressed host. For an AVB network, this function is

handled by the 802.1Qav Forwarding and Queuing Enhancements for Time-Sensitive Streams protocol. This protocol implements and guarantees the QoS specifications set previously by the Stream Reservation Protocol.

An Ethernet/IP studio requires several types of signals so system parameters must be monitored and ensured for high QoS services:

- Multimedia streams have severe real-time constraints. The stream must never be degraded and must have the lowest latency and jitter possible. For an AVB network, this is called Class A service.
- Management flows include all exchanges required to direct the IP studio. This includes intercom and tally. These controls must be exchanged quickly to ensure proper reaction times for studio crews. This communication requires guaranteed network latency and availability. Even so, this data still must not interfere with any multimedia streams. For an AVB network, this is called Class B service.
- All remaining information consists of traditional IT data, i.e., that without a real-time constraint.

Figure 4 illustrates the types and relative proportion of the different kinds of flow used in an IP studio. Figure 5 shows the interaction and

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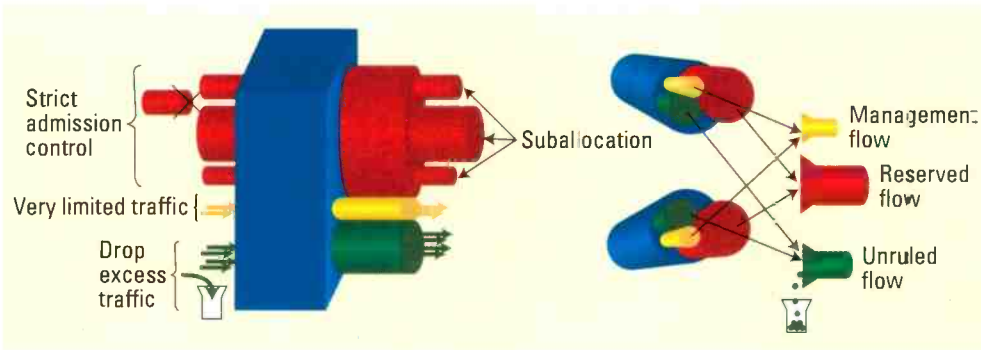


Figure 5. Because an AV network's bandwidth is fixed, decisions on what streams get forwarded when constraints are reached must be set by a network management policy. This policy can make decisions on what AV to pass based on many factors including QoS, legal or even type (like E911) of message.

management of these flows as they pass through the network.

As Figure 5 suggests, the total amount of flow must not exceed the network's available bandwidth. This means that management is required so that bandwidth and other QoS requirements are respected over the entire path followed by each stream, and unmanaged flows (traditional IP data) may be dropped in the presence of network congestion. The AVB protocols described above will manage all this.

However, there are still more global constraints. Any one link in the network has limits, as do the bridges. The AVB protocols only provide a reservation service and a guarantee that any successful reservation will be

respected. Therefore, a more global flow management system must also implement a global policy.

The flow management policy ensures that network flows are conveyed within the limits of the network capacity or resources, and that the priorities of studio management are respected. This means that if a particular network resource is unavailable, the flow management policy is used to decide which (if any) flows or streams need to be shut down so a more important (according to policy) stream can get through. A simple example of this is the E911 service available in many communities. Local emergency services must be able to override any existing service at critical times.

The future

As the video production studio has evolved from analog to digital and now to HD, the number of formats and types of processing required continues to increase. In the past, this has meant a continuing increase in the number and cost of interconnects and switching equipment,

and a growing complexity as all the formats needed to be converted and merged into a common format.

Initially, the flexibility and low cost of IT-based networking technology was attractive. Unfortunately, the real-time performance, link capacity and QoS management was inadequate for most video tasks.

This is now changing with the introduction of high-speed Ethernet links in excess of 10Gb/s. Combined with QoS and timing guarantees for AVB networks, engineers now have sufficient tools to operate high-quality video studios in an IT environment. **BE**

Gaël Macé is a corporate researcher for Thomson, and Michael Johas Teener is a plumbing architect for Broadcom.

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Video IP resilience

Challenges and solutions

BY ADI BONEN, PH.D.
AND GAL GARNIEK

Nearly every bit error creates a noticeable disturbance in picture and sound. These disturbances typically span several video frames, and can sometimes last several seconds. In IP networks, the key to minimizing these disturbances is implementing effective schemes for IP resilience.

The basis of IP networks

IP networks were developed based on two main transmission protocols: Transmission Control Protocol (TCP) and User Datagram Protocol (UDP). TCP can adapt to the available channel throughput and ensure the delivery of every bit of information by retransmitting packets that did not arrive at the destination. However, TCP is limited to point-to-point transmission and is unsuited for streaming applica-

tions where timing properties, such as jitter and latency, must be tightly confined.

UDP better serves point-to-multipoint applications while enabling more predictable delivery timing and, therefore, is much more suited to the delivery of video over IP on infrastructure networks. Unfortunately, over the years, IP networks developed a large dependency on the resiliency of TCP, and then video arrived.

In some equipment implementations, UDP's failure to support retransmission automatically labeled any UDP traffic as low priority. Furthermore, the conventional approach

in deploying IP switches and routers was to use small queues and deal with temporary congestion by dropping packets. Thus, during early video-over-IP trials and deployments, much of the work involved changing the approach from "drop packets upon any slight problem" to "pass the video packets at all costs."

To handle video, IP switches typically require a much larger buffer capacity, as well as QoS implementation. Although video packets may no longer be dropped because of switching

decisions, some are still lost through simple bit errors occurring in physical links between devices.

Traditionally, optical links were designed to have bit error rates of $10e^{-12}$, which was considered acceptable for time-division multiplexing (TDM) systems where a single bit error remains just one bit error. On Ethernet links, however, a single bit error causes the loss of a complete Ethernet frame. This may be acceptable when the TCP layer corrects the problem by retransmitting the information, but for video-over-IP implementation, this error rate yields a loss of seven MPEG transport stream (TS) packets, meaning a packet loss rate of $10e^{-8}$. A video-over-IP infrastructure may have multiple links between the source and destination devices, lowering packet drop rates of even a well-designed system to $10e^{-7}$.

Typical bit error rates on DSL links are several orders of magnitude worse, and packet loss rates are worse than on optical links. While in general IPTV is implemented using multicast, the DSL link connecting subscribers to the system is a point-to-point link that enables implementation of unique resiliency techniques.

Forward error correction

Resilience issues have not gone unnoticed by the international community. Efforts to standardize forward error correction (FEC) for transmission of MPEG over IP recently ended with SMPTE's adoption of the Pro-MPEG COP #3 spec as SMPTE 2022-2007. This standard enables re-creation of lost MPEG packets while tuning the trade-off among rate overhead, latency and level of protection.

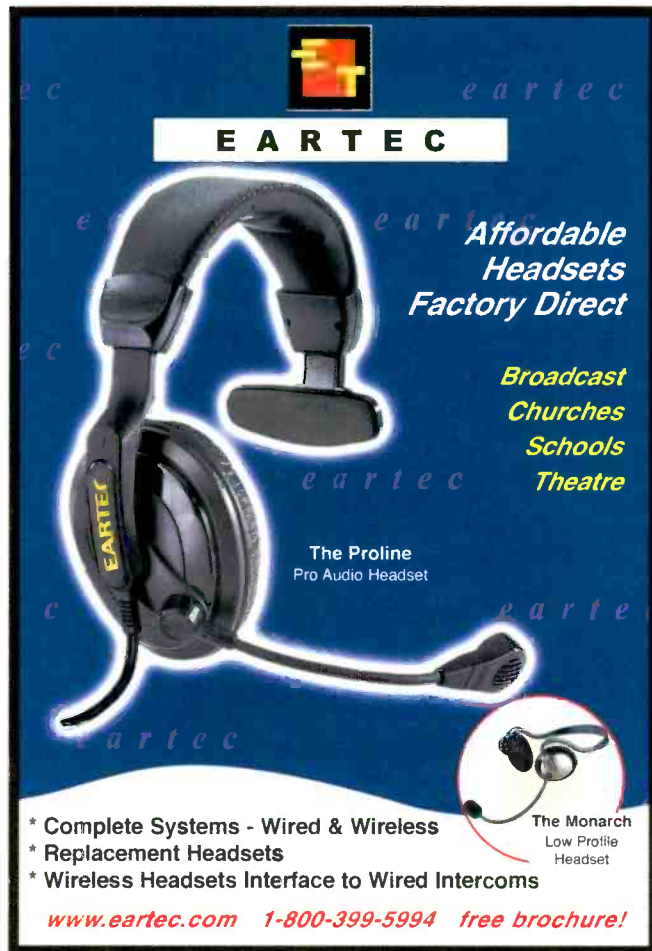
Because implementation of SMPTE 2022 FEC is rather expensive in terms of hardware resources, it is first emerging in applications requiring high quality and reliability in video-over-IP links, such as in point-to-point broadcast contribution. While nothing prevents implementation of FEC on the massive video infrastructure of telco and cable companies, FEC is limited in that it only addresses random and burst errors, not equipment failure or configuration problems.

Stream redundancy

In the one-way streaming world, recovery is usually based on redundant streaming and reception.

Figure 1 on page 110 illustrates redundant transmission, or "hot-hot" transmission, in which the same video channel is encapsulated over IP several times. In cable, for example, each headend may stream each video channel twice, using two parallel routes to protect against network failure. To protect against complete headend failure, two headends will stream in parallel, sending two identical streams per video channel to the edge, as indicated in Figure 2 on page 110.

At the edge, in the case of redundant transmission, video processing devices must be aware, performing automatic detection and transitions among video-over-IP streams.



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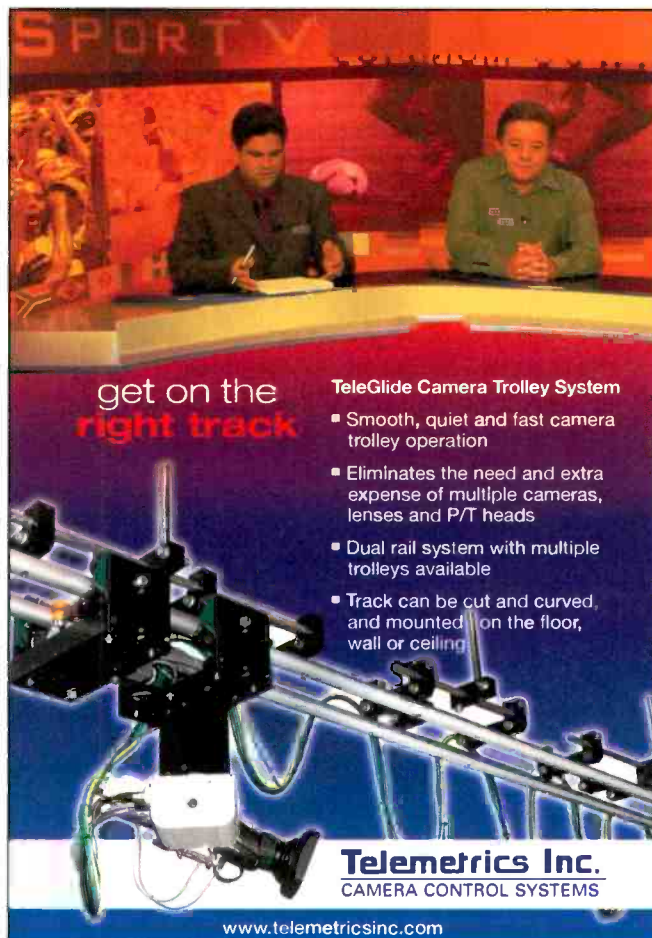
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VIDEO IP RESILIENCE

The most common implementation is called socket redundancy, through which the edge device detects the lost connection and immediately moves to a redundant stream. Although this mechanism supports automatic re-

covery from upstream network problems, it still creates visual and audible artifacts of one to a few seconds.

The packet switching solution enables a seamless transition from the failed video (network) socket to a vi-

able socket. Today, most edge devices receive and buffer only the active socket. Once a socket fails, the device tunes to the backup, requests it (in case of multicast), buffers it and plays it. For a seamless transition, the transmitter device must encapsulate identical video packets and stream them on two separate sockets. Thus, a given video TS packet and its continuity number are transmitted twice, with both versions arriving at the edge device at about the same time.

The edge device continuously stores the two socket inputs. When it detects a failure, it identifies the TS packet location in the buffer, which is ahead in time of the failure, and continues playout seamlessly. Note whether the system can allow the use of Real-time Transport Protocol (RTP). The addition of an RTP sequence number enables increased robustness (jitter, latency and burst losses).

Figure 3 illustrates a packet switching scenario in which encoder "A" streams two copies of the same service on two separate sockets. Those sockets are sent over IP to the receiver, which stores them at their respective FIFO buffers. Due to the nature of the IP network and other parameters, the two sockets contain the same video TS packets shifted by time-variable delays in the IP network. The receiver tracks the primary socket for failures and seamlessly switches to the second socket when it detects errors. This method provides a seamless user experience in the one-way streaming environment, even in the case of network failure.

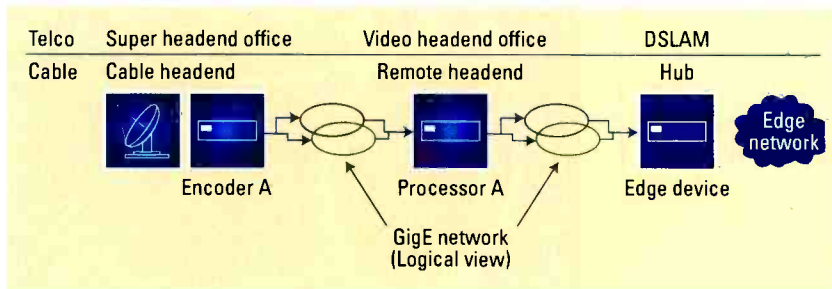


Figure 1. An example of redundant transmission

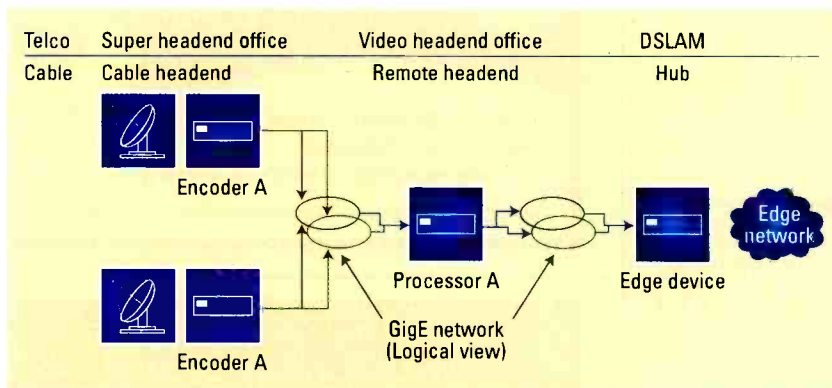


Figure 2. An example of redundant transmission with multiple backup

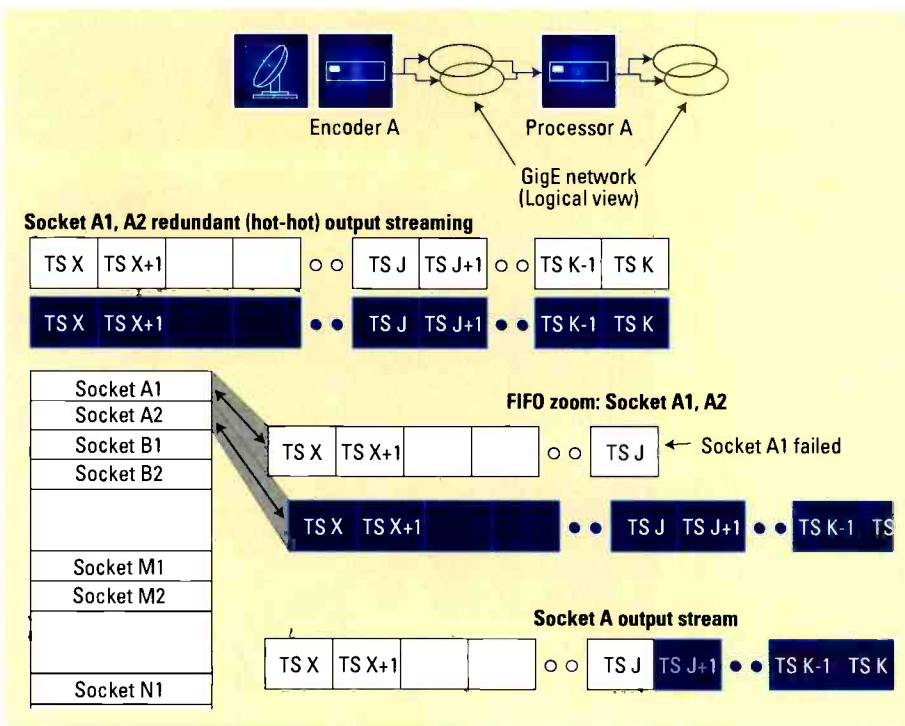


Figure 3. Packet-based switching

Video retransmission

When the network is inherently flawed in terms of relatively high bit error ratio (BER), as in DSL, operators can deploy retransmission protocols to ensure resilience. Retransmission is performed with protocols over TCP/IP and works well for end user devices (such as STBs) that have a large enough buffer and are less sensitive to latency, as in linear services and live TV. Retransmission allows for

end-to-end peace of mind. The transmitter maintains a per-STB TCP or TCP-like connection and retransmits lost packets per the STB's requests. The STB buffer size must accommodate the round-trip delay — from detection of missing packets to delivery of the retransmitted packet. Such implementation exists today in IPTV as standalone servers or as part of edge routers.

Bringing it all together

Generally, FEC is the best approach for long-reach point-to-point links (broadcast contribution) that require low latency and can withstand some additional equipment cost. In point-to-point applications, where a relatively high packet drop rate can occur and higher latency be tolerated, a retransmission approach is preferred.

Point-to-multipoint video infrastructure networks require the resiliency afforded by equipment and link redundancies. Many of these networks already support port-level redundancy, and a select few implement socket-level redundancy. In the near future, packet-based redundancy will be implemented in such networks, finally overcoming the remaining problem of random bit errors.

BE

Adi Bonen is chief technology officer and Gal Garniek is associate vice president, marketing, for Scopus Video Networks.

Challenges in video-over-IP resilience

- *Unprotected, one-way traffic has become the standard.* Most video-over-IP traffic erroneously assumes that the network and devices are lossless. Once packet losses do occur, recovery is difficult, as few video-over-IP systems feature built-in recovery mechanisms.
- *The burden of recovery rests on the network perimeter.* Network components are not built to identify video-over-IP packet drop. Switches and routers are passive devices in that they multiplex/demultiplex IP packets, but they can and do drop packets. Even when a video flow is defined as the router's highest priority, a packet dropped due to temporary congestion may be recorded but not actively recovered.
- *Large packet bursts drive packet loss and jitter artifacts.* Due to the nature of IP streaming, which combines large packets and high rates, large queues form in an arbitrary fashion, resulting in potential buffer overflow in IP switches unfit for video-over-IP streaming. Overflow of the switch's internal FIFO can cause packet loss.
- *The nature of encapsulation results in visual/audio artifacts in the case of packet drop.* In all video-over-IP encapsulation schemes, the IP packet size enables encapsulation of multiple MPEG packets, so the dropping of a single IP packet necessarily creates an artifact.

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Prompting & captioning

Early innovators of the technology would be jealous of today's capabilities.

BY JOHN LUFF

Few things in our industry have changed as much as prompting. Until the 1970s, prompting was a mechanical, not electronic, process. Sometimes text was laid up on menu boards — which some readers have likely never seen — by hand, one letter at a time.

When technology arrived, it was in the form of a continuous script typed on a large mechanical typewriter. The concept was allegedly developed to help Lucille Ball read commercials on television, a claim backed up by a patent issued to the producer of the program in 1959. To quote the patent, “The present invention relates to a novel apparatus for visual presentation of program or speed material to speakers, actors, and in general to individuals who appear in public or before television and movie cameras.” (See Figure 1.)

This invention was novel indeed, and innovation continued, with the paper rolls replaced by CRT display from the output of a camera shooting down at text rolling by on a flatbed track. Though not very portable, it was a major improvement over rolls of paper. Eventually, the progress led to the arrival in 1982 of the first computer-based system from Compu=Prompt. The system ran on an Atari 800 PC. Its innovation was to use the graphics output from a computer, allowing word processing software to write prompting text instead of manual typewriters.

Many variations on the general theme exist. Systems vary in complexity and size to suit field and permanent studio usage. Small, portable and battery-powered systems with lightweight LCD monitors suitable for HDV or similar sized cameras are sometimes used for wraparounds for documentary units. Larger systems suitable for cameras sitting a considerable distance

away from presenters are equally important in the market. Though early systems suffered from internal reflections and flare caused by the mechanics of lenses and mirrors available at that time, modern systems present much less of a problem for implementation in normal environments.

The connection between captioning and prompting

Today, prompting has developed into a fixture in all broadcast newsrooms, as well as in almost all venues where public speaking is done. The half silvered mirror of the first patent is still the dominant display method, though CRT monitors have been replaced by LCD monitors that can run off batteries in the field, fed by laptop software packages.

At least one company has put the software in the display, essentially using an integrated PC and display, allowing the text to be delivered by USB thumb drives or even Wi-Fi access. Controls have evolved as well, including wireless handheld units. For example, picture a PDA displaying the text with a simple scroll function controlled from a touch screen. The original innovators would be jealous of the flexibility and capability that has evolved.

More importantly, a symbiotic relationship has developed between prompting and closed-captioning software. The reason is simple: Why type the same text twice, once for captioning and once for prompting? The script, usually written for news programming in a newsroom automation system and fed to the prompting system as a file, can be delivered at the same time to a closed-captioning encoder. This replaces a manual step with an automated and more accurate electronic workflow. Otherwise,

a captioning operator would have to listen to the presenter and type the text again, live into a captioning system.

It takes unbelievable concentration to transcribe someone's words accurately and without break. It is no wonder that people trained as court reporters often do this work. The keyboards used for captioning are essentially the same as the transcription keyboards used in courts of law. Companies specializing in the stenographic market also supply software that can output the live stream needed to feed a closed-captioning encoder.

Two standards

Modern captioning requires straddling two worlds, one of which will become less important after Feb. 17, 2009, when analog TV broadcasting stops. Of course, I am referring to the two standards CEA-608-B and CEA-708-B captions. (Other standards defining creation, carrying and delivery of closed captions include, in part, SMPTE 333, SMPTE 334, SMPTE EG 43, ATSC A/65 and A/53, SCTE 43 and SCTE 54.)

Although both CEA standards carry the same kind of data, the systems operate differently. The 608 captions cannot be controlled to any great extent beyond simply on/off capability. The history of the FCC's regulatory statements on closed captioning almost doesn't matter at this point. Suffice it to say, essentially all programming must be delivered with captions, and all set-top boxes and televisions must support 708 captions. The 708 captions, in a fully implemented receiver, allow the viewer to select how the captions will be presented, including, for example, transparency on-screen and color. The broadcaster can choose how the text is presented, including animation

options such as rollup, scroll-on and pop-on. This aids with captions that are done live, allowing options that do not delay the delivery to the screen until a full sentence is complete.

Caption complications

Captions can vastly complicate the business of delivering alternate ver-

closed captions, hidden or displayed as a user's choice, closing credits, underwriting messages, popup ads, voice-over content and many other program variables — require the same structured data storage and synchronization to effect usage in multiple markets. The data is usually carried in VANC data space in SMPTE 259 and SMPTE

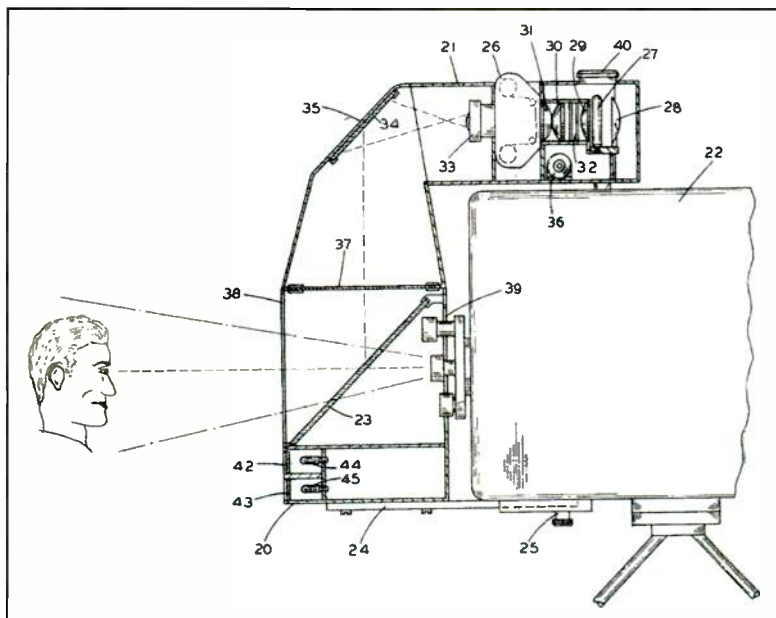


Figure 1. This figure was included in the patent for the prompting apparatus, filed on Oct. 14, 1954, by Jess Oppenheimer.

sions of content. For example, content that originates in the United States in English is almost always resold overseas or into Spanish language stations in the United States. Caption data must be added to programs in perhaps many languages on DVDs and other package media. Keeping all of this in sync is not a trivial matter. Synchronizing the insertion of caption data to time code can largely eliminate the need to caption content live. Using time code as a reference, a closed-caption system can pull the data and synchronize it automatically. Of course, this means that a significant amount of metadata must be carried with the essence (content).

As all broadcast systems become more “metadata aware,” there will likely be many instances of precisely this problem. Open titles — such as those “burned in” on-screen, as well as

292 Serial Digital Video, and bridged to other transport methods when encoded for compressed transmission.

One last comment

Although created by Congress to enhance the viewing experience for the hearing impaired, one of the most important uses for closed captions is for people whose first language is not the spoken language in a program. Closed captions make content accessible to immigrants as well as those with hearing loss. In emergency situations, this could mean the difference between loss of life and the safety of viewers with limited language skills. **BE**

John Luff is a broadcast technology consultant.

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

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Internet television

Finally, broadcast over broadband that works!

BY ANTHONY R. GARAGANO

My name is Tony Gargano, and I am a junkie. Yes, I confess: I am hopelessly addicted. It all started many years ago when I read my first issue of "Newsweek." Then things got worse. I found myself hanging around the newsstand late on Sunday nights waiting for the latest issues of "Time" and "U.S. News & World Report." I fought the valiant fight. And, just when I thought I had my news dependency under control, I was introduced to the hard stuff. You guessed it: "The National Review," "The Nation" and "The Economist." I have been hooked ever since. Yes, I admit it. I am an unabashed, inveterate news junkie.

Introducing Livestation

For the past several months, I have been participating in the technical trials and now the open beta test of a service being provided by Livestation (www.livestation.com). The London-based company is a part of Skinkers, a privately held company with its roots as a Cambridge, UK, technology startup. Livestation delivers live TV and radio news to your PC via a free applet that resides on your desktop. Mac users, don't despair. A Mac version of the applet should be available for beta test by about the time you are reading this.

Currently offered TV channels include Al Jazeera (English), BBC World News, Bloomberg Television, EuroNews (English, French and Italian), France 24 (English and French), i>Télé (French) and Russia Today (English). There are also radio channels, including the BBC World Service. The available channels depend on the country you are in when you connect. For the current beta test, Al Jazeera, Russia Today, the two France 24 channels and the BBC World Ser-

vice are available to U.S. participants.

Traditionally, video has been streamed over the Internet using a unicast model where each viewer requires a separate server connection, consequently making scalability a very expensive proposition. The other problem with unicast is that it does a really poor job in meeting the isochronous needs of live video. To overcome these difficulties, Livestation uses a hybrid peer-to-peer model where servers only have to provide the source signal to some of the audience who in turn share it with others.

The photo in this article is a screen shot of the 4in window I have open, watching Al Jazeera, as I am typing this month's article. The video quality is excellent. Opting for full screen on my 24in widescreen monitor, the video quality drops to something a bit better than VHS.

Livestation encodes its streams using SMPTE 421M (VC-1) based encoders, and this codec seems to produce an excellent balance of quality versus hardware demands on the viewing platform. I have installed it on both my laptop and my desktop. The service, which I use virtually anytime I am on the computer, only chews up 20 percent of CPU cycles, on average. Obviously, this will vary as a function of window size. Other Internet-delivered television services have various fatal flaws, such as poor video quality, complicated interfaces, excessive CPU or graphics card demands, or inappropriate content for the viewing medium.

Recipe for success

Livestation is the first Internet-delivered television service that I have found that has come up with a unique recipe for success. It offers a simple but effective interface, excellent video quality, minimal infrastructure demands and the critical ingredient — content

that is most appropriate to the viewing medium. As I have said in the past, the PC is not conducive to a long-form entertainment experience. I have often described a PC session as "lean in, doing something," while television is "sit back, entertain me." With its focus on



This screenshot shows an Al Jazeera newscast streamed over the Internet via Livestation.

news, Livestation has matched that perfectly appropriate short form of television news content with the "lean-in" style of the typical PC sitting.

During a recent conversation with Livestation CEO Matteo Berlucchi, he indicated that the current timetable is to transition from beta test to full rollout during the fourth quarter of this year. Berlucchi, who loves to talk expansively about his new service and the technology behind it, likens the company's application of peer-to-peer technology as the yeast in its recipe for success. Helping him bake that bread is Microsoft, who now has a small equity stake in the company.

For a news junkie, it is manna from heaven.

BE

Anthony R. Gargano is a consultant and former industry executive.



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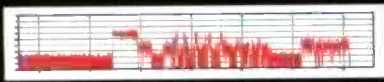
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