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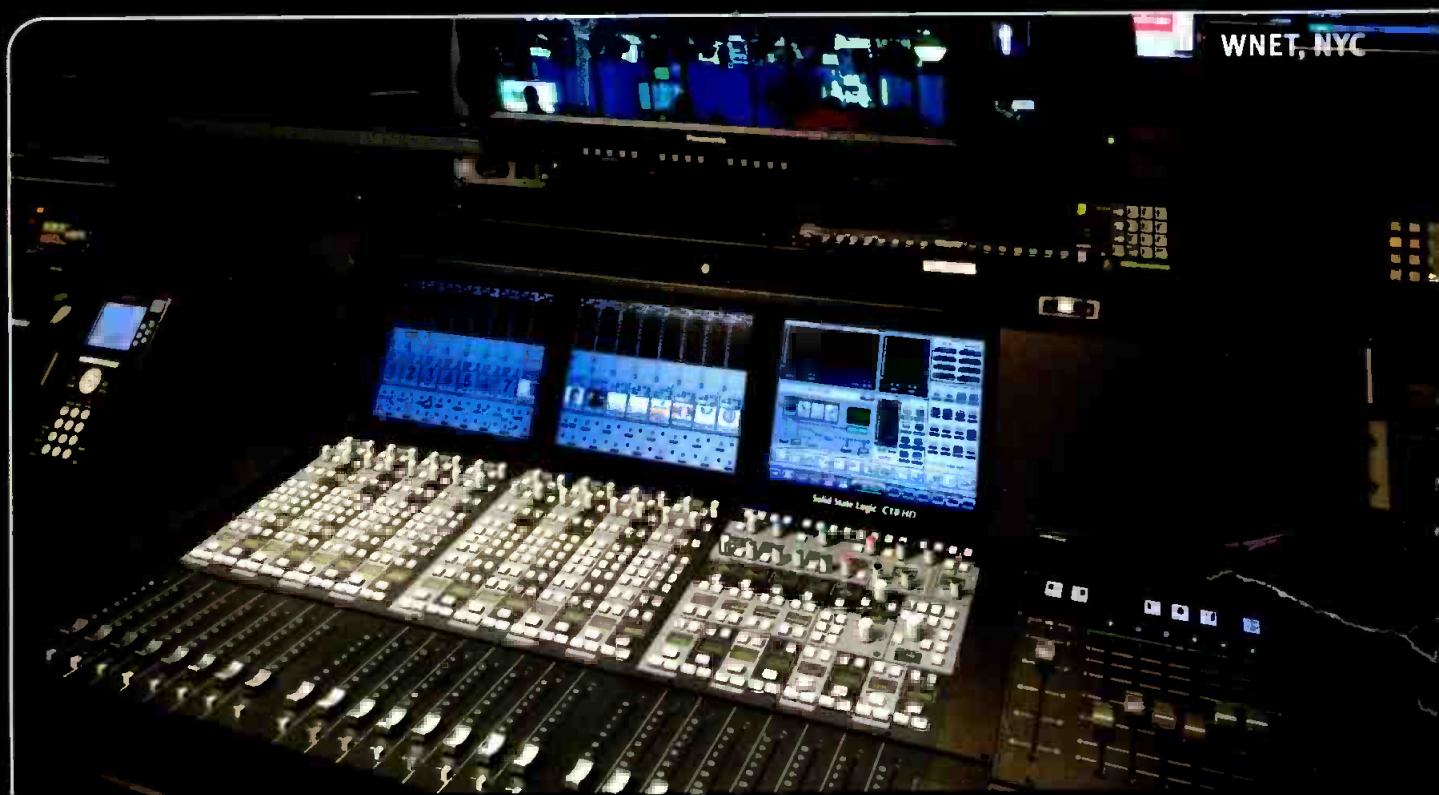

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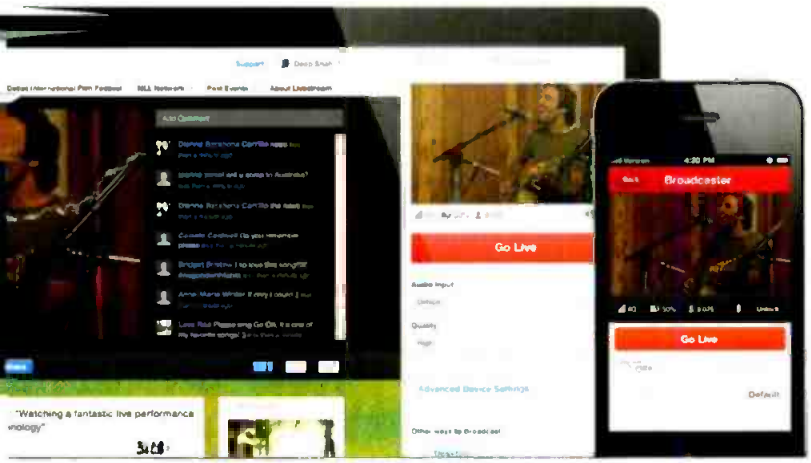

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BEYOND THE HEADLINES

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JUST THE FACTS!

Eugene Polley, inventor of the TV remote control, died May 20. Polley worked for Zenith for 47 years and acquired 18 patents. His "Flash-matic" remote was introduced in 1955.

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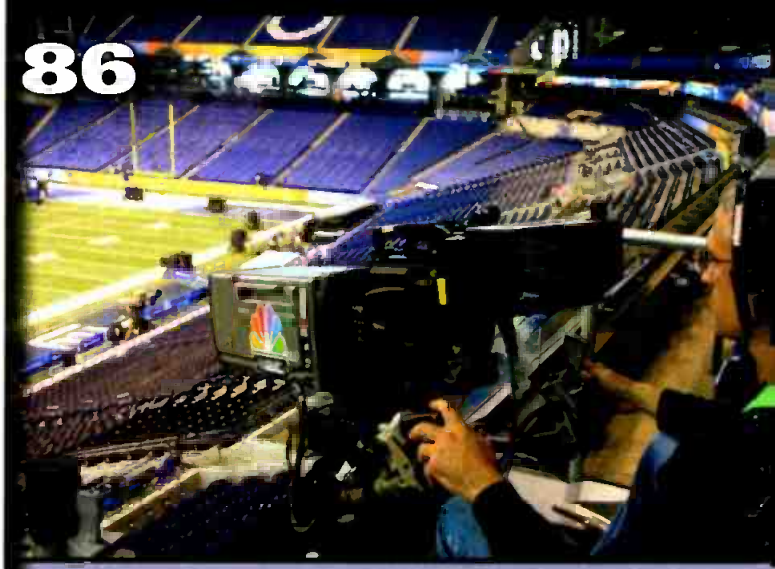

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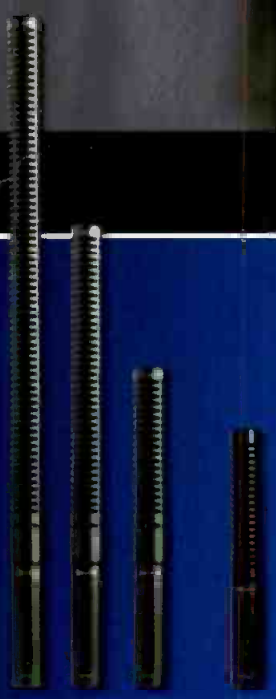

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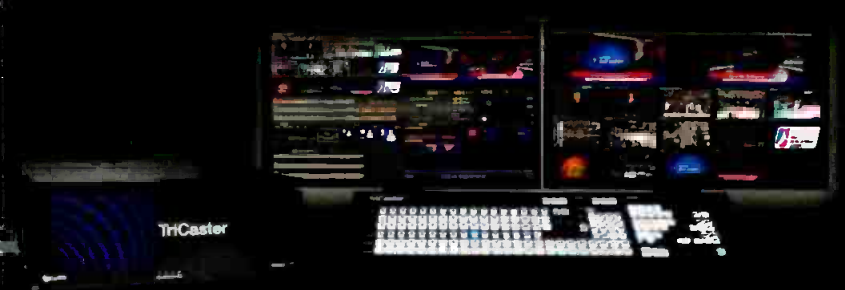

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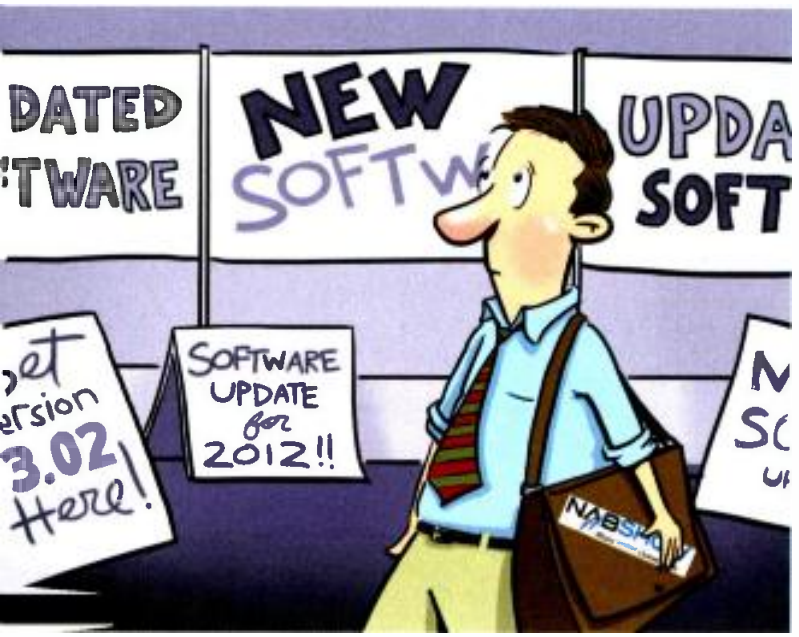
It's just software

As I toured the NAB exhibition floor, multiple top-flight exhibitors showed what they termed 4K/2K workflow solutions. The products included cameras, storage and other products, all claiming to offer a 2K and up to 4K workflow. As a result, I soon began thinking 4K/2K was the significant theme of this year's exhibition.

This remained my viewpoint going into the *Broadcast Engineering* Pick Hits meeting, as I assumed the judges would be excited about these new, higher-resolution products.



However, while three new 4K/2K cameras were nominated, only one other 4K product was mentioned. When I asked why more 4K solutions weren't a part of the conversation, the only response was a set of blank stares.

Upon reflection, perhaps I should not have been surprised at the response. After all, TV stations can't transmit the images. And, telling broadcasters it's time to support even higher high-res video is like telling the person who just endured a root canal that he needs a few cavities filled. No, thank you; once is enough.

That's not in any way to denigrate the fine 4K/2K products that were demonstrated. Certainly, there was plenty of excitement about them. But, in large part, could that have been because of attractive price points? These new tools make it possible to capture and process really high-resolution images for something less than the national debt.

Think back to all the excitement over 3-D at the 2010 NAB convention. The technology seemed hotter than a Las Vegas strip show. Even so, by the time the next NAB show rolled around, stereoscopic 3-D was scarcer than ice in the middle of a Nevada desert. How many stereoscopic 3-D products were released at this show? Could 4K/2K workflow solutions see a similar life span?

I remain convinced that 4K/2K solutions are here to stay. So, for you early adopters, go for it. Your investments will likely pay off.

Another interesting issue was evident by its absence on the exhibition floor. After four days of booth tours, it was clear that, overall, fewer new products were introduced at this show than in recent years. I even asked one company about the low number of new products being introduced and was curtly told, by its PR staff, "We issued our press releases prior to the show."

Well, yes you did, and you know what? I didn't see a single "new" product in the entire batch. The vice president of technology then quickly chimed in saying that while it was true no new hardware was announced, the company had "... produced several new versions of software."

Perhaps that statement exemplifies the future direction of NAB. While new solutions have traditionally been implemented as hardware, could software become tomorrow's crowd pleasers — fewer pieces of iron and a few more bits of code?

The CEO of a chip company told me, "With 25 GFLOPS on a single chip, requiring low power, providing high performance through massively parallel processors, solutions primarily become software."

He continued, "This kind of solution can reduce power consumption by a factor of 10 and development time by a factor of five." From a vendor perspective, what's not to like?

I enjoy attending NAB because of all the new bells and whistles and seeing innovative solutions tucked inside custom panels and boxes. And, some things can never be replaced by software. An announcement about "New version 3.07 software" just doesn't have the same wow factor as does "New 4K camera."

What do you think? BE

Brad Dick

EDITORIAL DIRECTOR

Send comments to: editor@broadcastengineering.com

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LET'S GO THERE.

Large-sensor cameras

New camcorders combine the best of HDSLRs and traditional broadcast cameras.

BY DAVID AUSTERBERRY

Over the last couple of years, there has been a revolution going on. The camcorder is being ousted by the DSLR in some sectors of content creation. NAB2012 was full of owners and all manner of booths supplying aftermarket accessories.

Many budding directors of photography (DPs) have left film school to find the only camera they could afford to build up a portfolio was a prosumer camcorder. These cameras have three 1/4in or 1/3in sensors with an integral zoom lens. Designed for the wedding videographer and corporate communications market, they provide good pictures for the price, typically around $3000.

In film school, they may well have used Super 16 or more expensive digital cameras. They have soon discovered that although the low-end cameras do what they are designed to do, they lack many features necessary for the more creative DP.

For the film "The Avengers," cinematographer Seamus McGarvey and his crew captured the intensity of many action scenes, visual effects and POV shots using five Canon EOS 5D Mark II and two EOS 7D DSLR cameras.

Camcorders had followed a progression; the more you spent, the bigger the sensor, from low-cost 1/4in up to 2/3in for the full broadcast specification camera. Similarly, if you spent more, then the camera had an interchangeable lens mount. Simply put, larger sensors cost more, as do lenses to cover the larger format.

Some years ago, consumer manufacturers started to add basic video capture to compact digital cameras. In 2009, Nikon released the D90 with video capability. The real catalyst for the change came when Canon was approached by a news agency to add a video facility to a DSLR. This would allow photojournalists to shoot brief video clips using the same camera and lenses that they were using for stills coverage.

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

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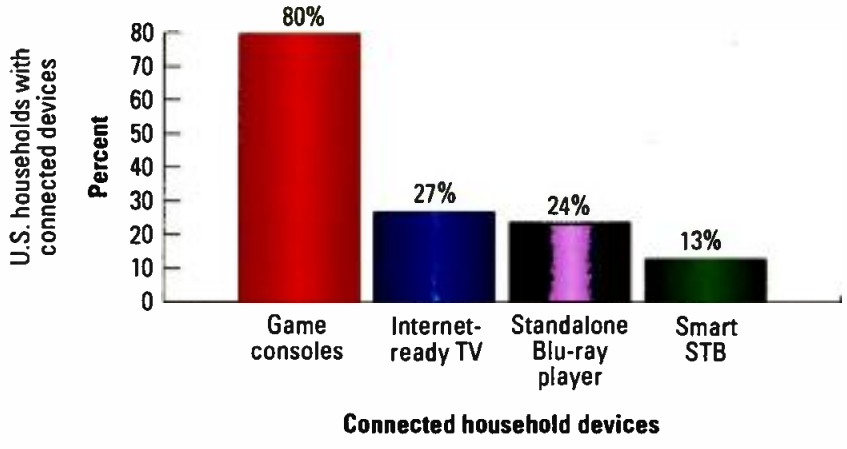

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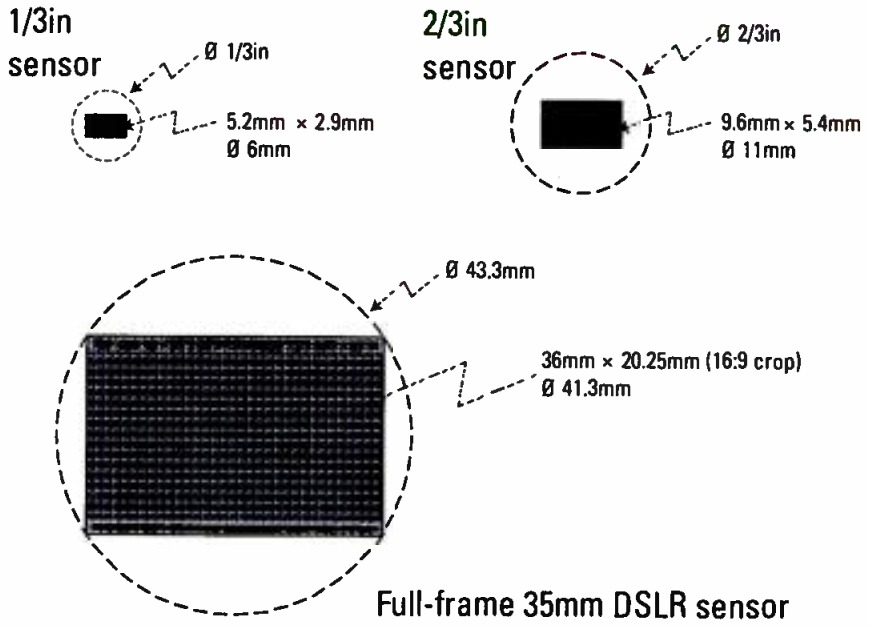


Figure 1. Shown here are dimensions of various sensors, to scale.

This was the eureka moment for indie filmmakers. If you couldn't aspire to the RED, a movie camera could be had for around $5000 after adding a few accessories. Many owners already had a good collection of still lenses that could be pressed into service as primes.

The DSLR offers two advantages over a similarly priced camcorder: an interchangeable lens mount with a large selection of lenses available, and a large sensor, (41.3mm diagonal for a Canon 5D versus 6mm for a 1/3in sensor) which gives a small depth of field at large apertures. (See Figure 1.) The latter is important for "filmic" shooting, where a small depth of field is used to give depth to the two-dimensional scene and to focus the viewer on the subject.

A small aperture will create a larger depth of field than a wide open lens, to the limit of a pin-hole camera where all is in focus.

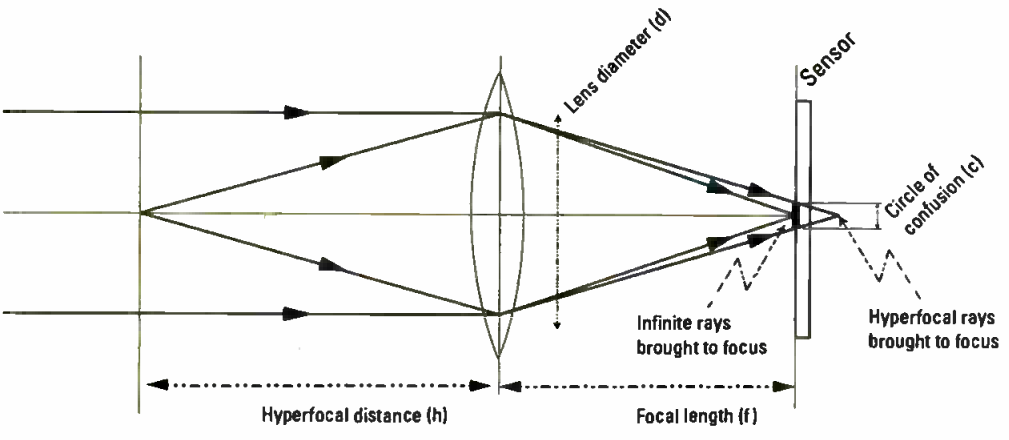
Depth of field

Depth of field is the region of the object that has adequately sharp focus. The boundary is where a point in the image becomes sufficiently blurred to be perceived by the viewer of the final image as a circle of confusion rather than a point. Depth of field is not an absolute measure, but subjective. It is inversely related to the aperture of the lens, and to the focal length. A small aperture will create a larger depth of field than a wide open lens, to the limit of a pin-hole camera where all is in focus. A long focus lens will have a smaller depth of field than a wide angle (short focal length). Note that depth of focus refers to the image plane at the sensor.

The focal length of a lens is selected to give the desired angle of view. The angle of view is a function of focal length and sensor (image) size. The smaller the sensor, the smaller the focal length for a given angle of view. This means that a small sensor will have a shorter focal length for a given angle, with attendant larger depth of field. As large sensors will use longer focal lengths, then inherently the depth of field is smaller.

The resolution of the eye is around 0° 1' (1 minute of arc). For a 42in screen, at a viewing distance of 5.6ft (to give a 30° viewing angle), the eye can resolve 0.5mm. The screen height is about 520mm, 1080 lines, so the eye can resolve about one pixel, hence the recommended viewing distance.

Depth of field can be derived from the hyperfocal distance. This is the closest point that appears in focus when the lens is focused on infinity.



Hyperfocal distance (h) = $\frac{d \times f}{c}$ The f-number (N) = f ÷ d

Hyperfocal distance can be expressed as: $h \approx \frac{f^2}{cN}$

Figure 2. Shown here are equations for calculating hyperfocal distance.

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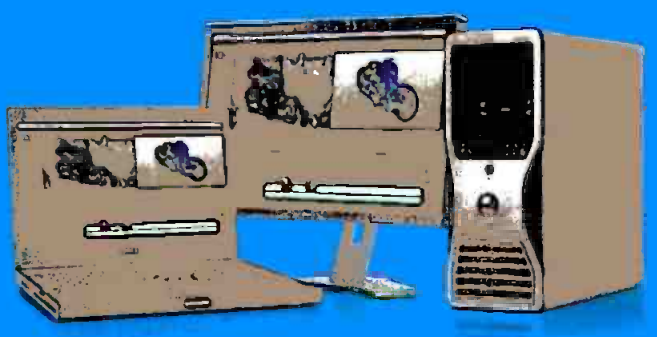

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Sensor	Focal length for normal perspective	Circle of confusion (1080-line picture)	Aperture	Hyperfocal distance
Full-frame 35	50mm	0.019mm	f2 f8	215.8ft 54ft
Super 35	33mm	0.017mm	f2 f8	105ft 26.3ft
MFT	24.3mm	0.012mm	f2 f8	80.7ft 20.2ft
2/3in	13.3mm	0.005mm	f2 f8	58ft 14.5ft
1/3in	7.3mm	0.003mm	f2 f8	29.1ft 7.3ft

Table 1. Hyperfocal distance increases and depth of field decreases as the sensor gets larger. Note that the distances are approximate, and some numbers have been rounded.

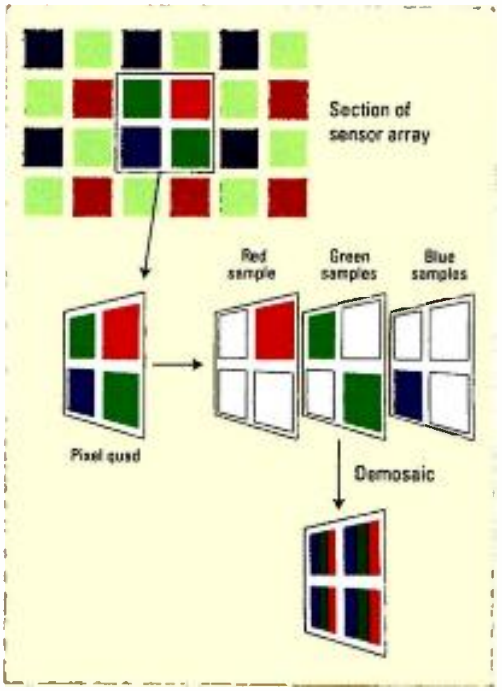


Figure 3. Samples from a Bayer color filter array must be processed to derive RGB values for each pixel site.

(See Figure 2 on page 16.) Table 1 gives hyperfocal distances for various sensors at the same angle of view.

Note that for the full-frame sensor, at f2, objects are in focus 215ft from the camera and beyond, whereas for the 1/3in sensor, everything is in focus from 29ft and beyond. This indicates the problem with small sensors: Nearly everything is in focus.

Single-chip cameras

Television cameras have traditionally used a beam-splitting prism with three sensors: red, green and blue. This system was developed back in the days of tube cameras, and the principle carried on when CCD and later CMOS sensors replaced tubes.

Single-sensor cameras use a color filter array referred to as a Bayer filter, after Bryce Bayer, who patented the concept in 1976 on behalf of Eastman Kodak. Green filters, serving to represent luminance, occur every other pixel, with blue and red alternating, giving a quad of two green pixels, one red and one blue. (See Figure 3.) The mosaic of color sites are demosaiced to give red, green and blue values for each site using interpolation algorithms. The value for each color is derived from weighted values of the nearest neighbors.

The resolution of the array will be less than the absolute pixel count as a consequence of the interpolation process. Contrast this with the three-sensor array where the full resolution of the sensor is delivered.

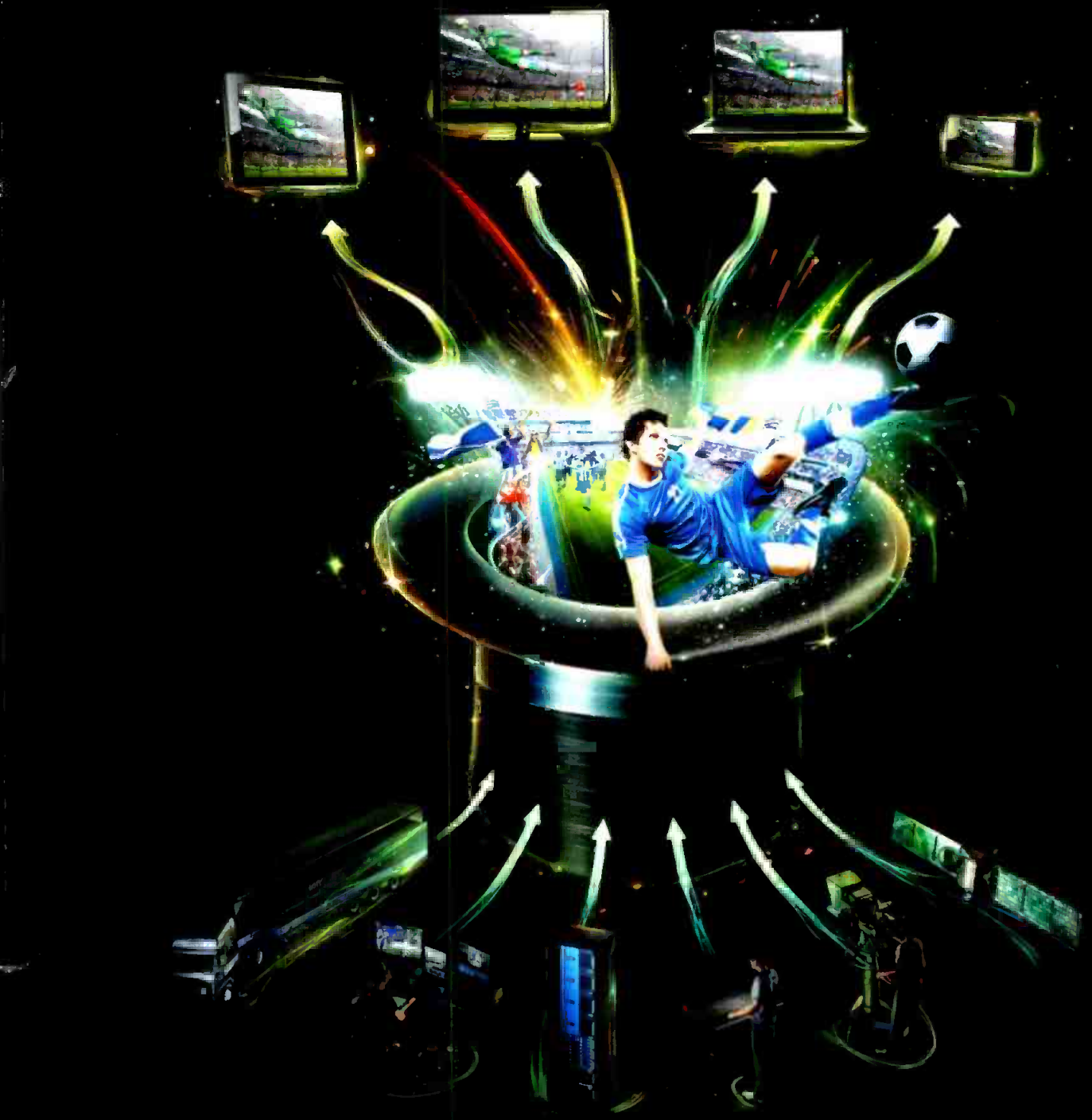
Avoiding the optical complexities of the prism meant that cinematographers adopted the single-chip Bayer filter sensor for digital cameras with 35mm film-sized sensors.

The beam-splitter was not practical for consumer cameras, especially the DSLR, where the large sensor size would have resulted in a bulky body. The long back focus would also have ruled out backwards compatibility with existing film lenses. The first commercially available cameras appeared in the early '90s.

The same need to avoid the optical complexities of the prism meant that cinematographers adopted the single-chip Bayer filter sensor for digital cameras with 35mm film-sized sensors. The Panavision Genesis was one such early development, and proved popular. More recently, the Sony F35, the RED One, and the ARRI D-21 and Alexa have provided the digital cinematographer with a choice of cameras that can now rival film as a capture medium. However, these cameras are beyond the budgets of the indie filmmaker, and it was this pent up demand for a large sensor and interchangeable lenses that led to the ready acceptance of the DSLR as a lower-cost alternative.

Viewfinders

The small depth of field has a related consequence: Greater precision is needed in focusing on the key subject. A telephoto DSLR lens for a full-frame camera can have such a small depth of field that if the subject's eyes



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are in focus, the end of the nose can be soft. Using the reflex optical viewfinder, the stills shooter can check focus before pressing the shutter release. However, when the mirror is up for video shooting, the optical viewfinder is of no use. The cameras provide a live view on the LCD display, but this is not full resolution, and it is difficult to see in full sunlight.

DSLR shooters can address the viewfinder issue in two ways. A simple solution is to shield the LCD display from light with some form of hood. Another is to use an external viewfinder driven from the HDMI output of the camera.

Follow focus

Cinematographers long ago developed ways around the problems of achieving sharp focus. Film actors are trained to hit the mark, a taped spot on the studio floor a measured distance from the camera. Unlike the television camera operator, who adjusts both zoom and focus, the film camera operator has a second person, the focus puller, to operate the focusing. The large focus wheel can be marked with key points of focus during a shot. The accurately calibrated lenses can be relied on to focus at the set distance. Contrast the DSLR lens, where the focus scale is more of a guide, and for most users autofocus provides a sharp image.

A film lens has a large travel from the closest focus to infinity, around 330 degrees of rotation. For a DSLR or video lens, it may only be 90 degrees. Film lens focus is always in one direction; with still cameras, it varies from manufacturer to manufacturer.

Various aftermarket accessories can be used to add film-style geared follow focus to the DSLR lens and even to reverse direction of rotation to the conventional.

If budget allows, rather than trying to adapt DSLR lenses, proper film lenses can now be purchased designed with the necessary image circle for the full-frame sensor, and with N and EF mounts. The film lens has long focus travel with an accurately calibrated focus scale, with gearing for the follow focus attachments. Film lenses are highly corrected, with low breathing and low flare.

The DSLR shooter now has the choice to add focus control for the cameraman or to use a focus puller. The DSLR has applications for the wedding videographer who wants pleasing out of focus backgrounds and to shoot with the same gear as the still pictures, all the way up to production companies shooting episodic television.

The JVC GY-HMQ10 combines a 1/2in CMOS imager with 8.3 million active pixels and a Falconbrid LSI processor to record, and play 4K video in real time at 24p, 50p or 60p.

Audio

The audio facilities of most DSLRs are limited. For most shooting, the audio must be recorded with a separate device, film-style. Without time code for sync, traditional methods of the slate or clapperboard must be used. Sound, however, can be synced in post using special software that aligns the camera sound on the timeline with the separate high-quality sound recording.

Single-chip camcorders

Camera manufacturers responded quickly to the demand for large-sensor cameras that could accept interchangeable lens.

Panasonic released the AG-AF100 with a Micro Four Thirds (MFT) sensor. This format was developed by Olympus as a smaller configuration than the full-frame DSLR, which would permit smaller, lighter cameras and lenses, yet include a larger sensor than a compact camera. The image circle is about twice that of a 2/3in sensor, but smaller than the APS-C used for most consumer DSLRs. The AF100 camera uses the Four Thirds mount, but a wide range of adaptors are available for other mounts including to PL. Video is encoded as AVCHD at rates up to 24Mb/s. HD-SDI and HDMI outputs at 4:2:2 8-bit sampling allow external recorders to be used for other codecs and with less compression.

Sony has the PMW-F3, which uses a Super 35-sized sensor and accepts PL-mount lenses. Forming part of the XDCAM EX family, it uses MPEG-2 long-GOP encoding at 35Mb/s recording to SxS memory cards. The camera has options for HD-SDI output as S-log and 4:4:4 sampling, which lends itself to compositing applications.

The F3 is now joined by the lower cost NEX-FS100, which uses the same Exmor sensor as the F3, but carries Sony E-mount lenses. The E-mount was developed for mirrorless stills cameras and the NEX camcorders. The flange to focal plane is about half that of DSLRs (as is the MFT), as no allowance is made for a reflex mirror. This allows for more compact cameras. The FS100 uses AVCHD or AVC coding at rates up to 28Mb/s. An HDMI output provides 4:2:2 uncompressed video with SMPTE time code for external recorders.

In 2011, Ikegami showed a prototype of a camera with a Four Thirds-size sensor, provisionally named the HDS-F90. This camera uses the PL mount. Video is encoded as MPEG-2 compression at 50Mb/s long GOP or 100Mb/s I-frame, and stored on the GFPAK SSD. Interestingly, the sensor is 4K and downconverted to 1080. This is claimed to give a better MTF characteristic for the sensor.

These cameras start at prices not much more than a high-end DSLR, but they record proper audio, have proper viewfinders and all the other facilities

you expect from a video camera, plus they can record longer than 10 minutes (the limit of many DSLRs).

The future for DSLRs

Will these cameras replace the hybrid DSLR? In some applications, yes, but the video capability of the DSLR was originally developed for the cross-media journalist, and that requirement still stands. Newspapers and consumer magazines are now expected to carry video on their websites and tablet apps, so the shooter has to bring back video and stills. Single-chip camcorders only provide low-resolution still images. The RED EPIC introduces the concept of the Digital Still & Motion Camera (DSMC) and can capture 5K still images while shooting video, but that carries a higher price tag and is not going to replace the humble DSLR.

For the video shooter, these large-sensor camcorders overcome many of the drawbacks of the DSLR. Compelling features for videographers include an optical low-pass filter matched to video resolutions, to properly control spatial aliasing. Moire and aliasing on moving edges proves a problem for DSLRs. Another feature is the uncompressed video outputs for external recorders. This allows the videographer to choose the codec for the desired picture quality and to match their workflow. The codecs in DSLRs are a compromise in devices optimized for still image capture and low power consumption.

For the video shooter, large-sensor camcorders overcome many of the drawbacks of the DSLR.

There has never been a wider choice of camera for the DP to choose from. The three-chip camera may remain as the mainstay for many broadcast applications from ENG to studio and sports production, but for episodic television, drama and commercials, the filmic look of the large sensors offers advantages to the DP, along with the ability to use high-quality film prime lenses. BE

David Austerberry is editor of Broadcast Engineering's world edition.

Online disclosure

The FCC is requiring Internet posting of public files from every TV and Class A TV station.

BY HARRY C. MARTIN

The FCC has decided that the public files of every TV and Class A TV station, whether commercial or noncommercial, will be hosted on a cloud-based system that the Commission promises to develop and manage. Uploading of public file materials is likely to be required this year.

Materials covered

The vast majority of existing public files for TV stations will have to be uploaded to the FCC-managed website. Each TV licensee will be responsible for posting the following materials:

- Political advertising materials (more on that below);
- Quarterly issues/programs lists;
- Annual EEO public file reports;
- LMAs and JSAs;
- Must-carry or retransmission consent elections;
- Children's TV commercial limits records;
- Citizen agreements;
- Renewal local notice announcements;
- Eligibility documentation for Class A stations;
- Materials related to FCC investigations; and
- Donor lists for specific programs (for noncommercial stations only).

Scope and exceptions

These documents must be uploaded on more than a "going forward" basis. Stations will be required, for instance, to upload all quarterly issues/programs lists going back to their last renewals. Anything in a station's public file as of the effective date of the new rules, with the exceptions mentioned below, will have to be included in the online version. However, the following are exceptions:

- Documents available on the FCC's websites (e.g., applications and reports filed through CDBS) do not need to be uploaded.
- Letters and e-mails from the public need not be uploaded. However, such materials must be kept in a file at the main studio. Comments left on social media sites do not have to be maintained anywhere.
- Shared services agreements and written sponsorship identifications will not have to be made available in any public file.
- While political broadcasting materials will have to be maintained online, this requirement will apply only to materials created after the effective date of the new rules. Paper files going back two years from the effective date also must be maintained.

Political files

Other requirements relating to electronic political files include:

- Stations affiliated with ABC, CBS, Fox or NBC in the top-50 markets must comply with the electronic political disclosure rule as soon as it is effective or as soon as the FCC data system can receive the materials, whichever is later. Other stations will not have to comply until July 1, 2014.
- Stations will have to immediately post orders from candidates for specific ad schedules, but will not be required to post general requests by candidates regarding availabilities and/or rates.
- The posting of records concerning disposition of requests may be delayed until bills are rendered in the normal course of business.
- Licensees will have to maintain their own local back-up copies of their political files, but not of the remainder of their online public files.

Timing

Stations will have six months after the effective date of the new rules to upload existing public file materials, subject to the exceptions noted above. Newly created materials must be uploaded as soon the rules become effective and the FCC's website is ready to receive them. BE

Harry C. Martin is a member of Fletcher, Heald and Hildreth, PLC.

Dateline

- On or before Aug. 1, 2012, noncommercial TV and Class A stations in California, North Carolina and South Carolina must file their biennial ownership reports.
- On or before Aug. 1, 2012, television stations, Class A TV, LPTV stations and TV translators in North Carolina and South Carolina must file their license renewal applications.
- On Aug. 1, 2012, TV and Class A TV stations in Florida, Puerto Rico and the Virgin Islands must begin their pre-filing renewal announcements in anticipation of an Oct. 1, 2012, renewal application filing date.
- On Aug. 1, 2012, television and Class A TV stations in the following states must place their 2012 EEO reports in their public files and post them on their websites: California, Illinois, North Carolina, South Carolina and Wisconsin.

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Wireless video

There are multiple ways to deliver content to mobile devices.

BY ALDO CUGNINI

With wireless technologies moving more content to viewers, live television broadcast must adapt to consumers' lifestyles, and while an OTA connection to a fixed display device appears to have a somewhat steady audience, mobile devices are driving alternate wireless transmission schemes. The increasing demand for Internet content is making wireless networks a hot commodity for connecting devices, and some methods have already become viable for supporting wireless video. This month, we look at the details of various existing and emerging wireless video delivery methods.

One-way broadcast is evolving towards networked connections

Historically, television broadcasting has been accomplished by means of non-networked broadcasting from one source to multiple receivers. Such a scheme makes best use of the transmission spectrum when it is expected that the highest number of receivers simultaneously connect to the one broadcast. The other end of the scale, unicast, describes the situation where each receiver is ultimately connected to a unique transmitter, such as is used with cellular telephone connections or with an IP connection to a unique content source. The proliferation of content, together with an increasing demand for user personalization, is now driving a mix of the two modes towards a more networked solution. Such a network will likely combine different media and modes; hybrid broadcasting, for example, can combine broadcast from a single high-powered transmitter with unicast by means of wired and wireless LANs.

Underlying most networked systems is the concept of Media Access Control (MAC), wherein multiple terminals have access to a shared medium. These terminals can communicate with one or more servers that operate in a unicast, multicast or broadcast mode. Sharing is accomplished by time- and/or frequency-based multiplexing of information packets, with collision avoidance mechanisms. Both Ethernet and Wi-Fi operate using MAC.

The proliferation of content, and an increasing demand for personalization, is driving a mix of broadcast and unicast.

Wireless networks have different characteristics that depend on the geographic coverage and can be grouped into technologies that serve customers on a physically hierarchical basis. From largest to smallest, these topologies are: WANs, wireless regional area networks (WRANs), then WLANs and wireless personal area networks (WPANs). With the increasing efficiencies of video compression, e.g., AVC/H.264 and High-Efficiency Video Coding (HEVC), it is now practical to move increasing amounts of video content over all of these networks.

Video and Internet are now key aspects of wide area and regional networks

WANs, originally designed to support cellular telephone voice traffic,

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A look at tomorrow's technology

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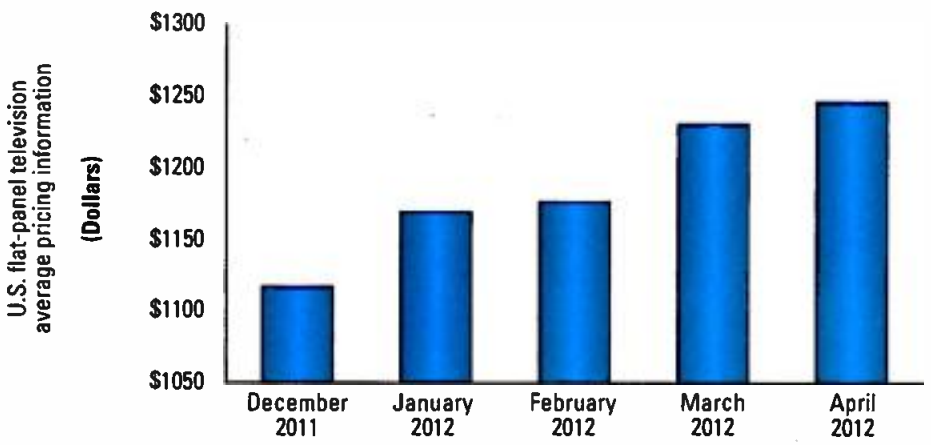
High-end television features, including Internet connectivity and the use of LED backlight technology, have pushed up U.S. flat-panel TV pricing by 11.4 percent since December 2011.



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use various modulation schemes based on OFDM, and include CDMA, GSM, GPRS, EDGE, EV-DO and LTE as defined by 3GPP and 3GPP2, which are collaborations between groups of telecommunications associations. (Note that the use of the well-known "3G/4G" nomenclature, while based on certain standards, is subject to some debate, resulting in imprecise definitions.) The evolutionary path of these schemes has seen increases in both QoS and data bandwidth. The basic differences between them generally concern the use of single-carrier, multicarrier or spread-spectrum modulation.

One of the newest WAN technologies is WiMAX, which is defined in the IEEE-802.16 standard. Intended for "last-mile" broadband access in the 2GHz to 66GHz spectrum, WiMAX can typically deliver 30Mb/s to 40Mb/s, with 72Mb/s (or more) possible for fixed receivers. Using a line-of-site (LOS) receive dish, WiMAX can cover an area up to about 2800sq mi (30mi radius), and thus competes readily with cable, DSL and T1 broadband services. (See Figure 1.) Non-line-of-site (NLOS) operation to mobile devices is also supported, but performance drops in both QoS and coverage area, with an expected service radius of 3mi to 10mi (314sq mi). In practice, a system can be built that combines both LOS and NLOS service, carrying LOS signals to a local base station that supports NLOS or Wi-Fi devices. WiMAX operates in both licensed and unlicensed bands, and offers multilevel encryption, making the protected distribution of paid content viable.

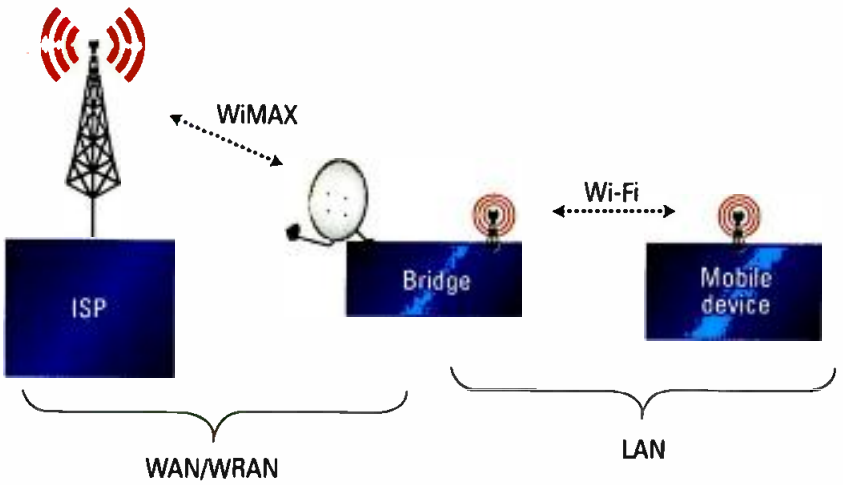

Figure 1. WiMAX can be used to bridge WANs and LANs.

WRANs will soon provide broadband services in the TV bands using the new white spaces regulations of the FCC. One standard for WRANs is IEEE-802.22, which defines point-to-multipoint cognitive radio networks using fixed base stations with GPS receivers and local spectrum sensing. Centralized servers are used to maintain an active database that establishes free TV channels and guard bands to protect them. Although developed to provide for alternate uses of the TV spectrum, it's not hard to conceive of video content forming an integral part of a new broadband service.

One of the drawbacks of 802.11 is the significant overhead needed for synchronization and data framing, resulting in the fact that the real throughput rarely comes close to the raw physical rate.

Local networks now move considerable amounts of compressed video

WLANs are now mostly made up of Wi-Fi devices using the IEEE-802.11 family of standards. Wi-Fi devices operate in either infrastructure or ad hoc mode, at a maximum power of 100mW. In infrastructure mode, devices communicate with a central access point that, in turn, connects to a WAN or LAN. In ad hoc mode, devices connect to each other directly in a peer-to-peer arrangement. WLANs can also use bridge devices that extend the Wi-Fi coverage, which is usually limited to about 100ft. While there have been attempts to deploy citywide WLAN networks, sponsors to date have been unable to establish a viable business model using 802.11 because of the number of local nodes needed.

One of the drawbacks of 802.11 is the significant overhead needed for synchronization and data framing, resulting in the fact that the real throughput rarely comes close to the raw physical rate. For instance, 802.11g operates at a maximum physical layer bit rate of 54Mb/s but yields only about 22Mb/s average data throughput. Updates to 802.11, however, have improved both security and QoS. A newer variant, 802.11n, adds multiple-input multiple output (MIMO) operation, which uses multiple antennas and channels to increase data throughput.

At the smallest end of the scale are WPANs, which use Bluetooth, wireless USB and ZigBee technologies, typically in the 2.4GHz band. Starting with Bluetooth, which was developed as a low-cost, low-power peer-to-peer interconnect that replaces a wired connection, future WPANs are

envisioned as supporting dynamic connections that a person establishes while roaming about.

Bluetooth devices come in different classes, with the most common one providing a 33ft range, using 2.5mW of power. There also exists the capability to turn on the radio only when needed for data transfer, lowering power consumption as well as aiding in security. Bluetooth low-energy technology, optimized for devices requiring maximum battery life instead of a high data transfer rate, consumes between 1/2 and 1/100 the power of classic Bluetooth technology.

ZigBee is a new WPAN technology designed for machine-to-machine applications such as smart grids, connected homes, building automation, mobile health, security and automatic control. ZigBee is a low-cost, low-power wireless mesh networking standard based on IEEE 802.15 and allows a range of over 245ft. ZigBee is designed to run for six months to two years on two AA batteries by using "time slicing," wherein the unit operates during a transmission time slot and sleeps in between.

ZigBee is designed to run for six months to two years on two AA batteries by using "time slicing," wherein the unit operates during a transmission time slot and sleeps in between.

Multiple content pathways will become the norm

Wireless broadband has the potential to bring new services to both fixed and mobile consumers, including HD video streaming, gaming, wireless docking and displays. As these architectures are deployed, it's inevitable that video will be carried over combinations of existing and new wired and wireless distribution systems. BE

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Metadata and MXF, part 1

Metadata plays a key part in media facilities.

BY BRAD GILMER

This month, we will begin a two-part series on metadata and MXF. First, we will look at the importance of metadata to the professional media facility. Then, we will look at some of the specifics of metadata as applied to file interchange via MXF.

Most video professionals are now quite familiar with metadata. But, just to be sure everyone is on the same page, when I use the term metadata in this tutorial, I am referring to information (data) that typically refers to a program, commercial or other video/audio content. Examples of metadata include: the name of a program, the length of a segment or an ISCII code associated with a commercial.

Collectively, video, audio, subtitles, AFD and other things people consume as part of a program are known as essence. Just remember that essence refers to the stuff we are watching when we view a program. Importantly, essence includes data (subtitles, teletext, AFD and so on). If we want to talk about data that is part of the program, we talk about data essence. Data essence is not metadata; data essence is part of the program that is intended for "viewing" by the end consumer.

Technical vs. descriptive

Metadata tends to be treated as a single topic. But, in my mind, there are several different ways to classify metadata. One way to look at metadata is whether it is technical or descriptive. Technical metadata is metadata that is required to identify and play back essence properly. Examples include: a Unique Media Identifier (UMID), information about compression used and raster size. Descriptive metadata is typically the sort of information operators in professional media organizations care about — program title, show number, kill date, ISCII code and so on. Descriptive metadata might also include things like shot notes, scripts and music scores.

Metadata is the information or data that typically refers to a program, commercial or other video/audio content. A program's name, a segment's length or an ISCII code are examples.

Some metadata falls into a grey area. How would you classify GPS location, zoom and focus setting, crank rate, or robotic camera position? Is this technical metadata or descriptive metadata? Generally speaking, technical metadata is directly related to the essence or essence coding and does not include these data types.

Another way to classify metadata is to think about how frequently the metadata is expected to change. We would expect some metadata to remain constant for the duration of the content being viewed. For example, we would not expect the title to change halfway through a program. In the United States, we might expect that the technical metadata regarding frame rate would remain at 59.97Hz for the duration of the program. As you can see from these examples, the frequency of metadata change is an orthogonal classification (meaning it is completely unrelated) to the metadata type (technical or descriptive). Not surprisingly, metadata that remains constant is called static metadata.

Other metadata, such as timecode, would be expected to increase monotonically (increase by a count of one, only) on every frame. Timecode and other metadata may, therefore, be placed on a timeline that increases predictably, and should never decrease (run backwards) or unexpectedly jump ahead. This type of metadata might be called timeline-related metadata.

Finally, metadata associated with shot logging, describing actors in scenes or associating a music score to a section of a program may appear fixed for a period of time, may be duplicated in several locations during a program or may even overlap with other similar types of metadata. This metadata can be referred to as event metadata.

There is one other important family of metadata, and that is perpetual metadata. As you can guess, this is metadata that should never change. Systems rely on the fact that these metadata items are immutable. If something is immutable, it means that it cannot be changed after it is created. Examples of this include a unique ID and the location where a program was filmed. Remember, systems will count on the immutability of certain metadata. If you violate the rules, all bets are off.

Why does all this matter? Because, in the end, media professionals build and operate systems, and these systems need to be properly designed to handle all of these different types of metadata.

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Metadata and essence

How do you tie timecode or program title to a specific copy of a movie? In the tape world, the question was irrelevant. The timecode was either stored in the VBI or in the ANC data, and the program title was printed on a label on the box or the tape itself.

But, things have changed in the file-based world. Associating metadata, especially technical metadata, to a particular program can be critical. Professional file formats must contain not only video and audio, but also the technical metadata necessary to play back the content. When it comes to descriptive metadata, the door was left open as to exactly what types of descriptive metadata were to be included in the file. This is both good and bad. One of the most critical linking mechanisms between metadata and essence is the UMID. The UMID is a unique identifier that is used to identify a particular piece of content.

UMIDs and the contract

It is important to understand that there is an implicit contract between systems that create content labeled with a UMID and systems that later manipulate the content or rely on the UMID to retrieve the content. Here is the contract: A system will never break the connection between a particular piece of content and the UMID that was originally associated with that content.

A system will never break the connection between a piece of content and the UMID originally associated with that content.

If you create a new piece of content, give it a new UMID. Simple, right? But, here is a twist: What if you create a bit-for-bit exact copy of the file? The rule is that you duplicate everything, including the UMID. But, now you have two copies of the content with the same UMID. Is this right? The answer is yes. And, if you ask a media asset management system to retrieve a piece of content using a UMID, you cannot say for certain which copy you will get. The particular instance of a copy of content is not uniquely identified by a UMID. For other reasons, a MAM system may uniquely identify each copy of the same content, but the UMID should not be used to do this.

In a file-based world, metadata becomes key. Understanding how unique identifiers work and treating them correctly is vitally important. Fortunately, manufacturers hide most of this from end users, so you may not even be aware that UMIDs exist.

Coming up

Next month, we will focus on why metadata is a critical part of file-based workflows. Also, we will explore issues with metadata rekeying in these workflows, and we will talk about how metadata contained in MXF files can reduce rekeying and errors. We will also discuss issues and solutions related to metadata interoperability in MXF files. BE

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

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Consoles

The future is bright, literally.

BY ROEY IZHAKI

It has been an exciting 10 years in the world of consoles. Technology advances opened doors for new, innovative and cost-effective designs. Manufacturers sent their R&D personnel back to the drawing board to brainstorm the best way to mix and match a multitude of new technological possibilities. Consequently, a wealth of new designs flooded in, with each manufacturer presenting its own take on what a modern console should be.

In what could be described as a "war of designs," users experienced and contributed feedback, patterns started to emerge, and we can now identify a few design concepts considered ideal by many. In other words, one can now easily speculate on what the future console will look like. Actually, a few manufacturers can already claim a product remarkably similar.

But, with common design concepts, expandability being standard, stability a must, and cheap digital technology of matching quality for all, where does the competition lie? The answer is in the way these consoles interface with users, which is destined to become an even bigger player in future consoles and a pivotal part in the way these are built.

The superior phenotype

Some of us have enjoyed them all — the analog console; the layers introduced with early digital consoles; a tiny monochrome screen; a color touchscreen; rear panel I/O card slots; soft patching of I/Os; firmware upgrades; software upgrades; cascading control surfaces; and Vegas mode.

For all the evolution they have been through, modern consoles seem to have found a superior phenotype. It is the digital 3-block design, sensibly combining all the best from past designs. The blocks are not contained within one physical enclosure; instead, they are separate and connected using cables. Such a design removes the physical constraints of a single-box console and means every part of the console is customizable, upgradable and expandable with relative ease. (See Figure 1.)

Figure 1. Modern consoles have found a superior phenotype in a digital, three-block design. The design removes the physical constraints of a single-box console and means every part of the console is customizable, upgradable and expandable.

In this design, the three blocks are categorized as follows:

- *I/O rack (or racks)* — These provide a variety of input and outputs, often in the form of rack-mounted units. These can be located either next to the operator or on stage.
- *Core* — Another box that contains a computer, a collection of DSP cards, connections to the control surface, and interface cards connecting to the I/O boxes.
- *Control Surface* — A surface that hosts various controls (faders, pots, buttons) along with meters.

Of these, the I/O block is perhaps the least likely to evolve much further. If anything, we might see thinner, higher-bandwidth connections to the core unit. But, current protocols (MADI, for instance) seem to do the job.

The core is worth discussion. Most consoles make use of a purpose-built computer, with expandable, specialized DSP cards. The big question is whether personal computers (together with professional consumer products) can replace these purpose-built machines. In order to do so, there are three main hurdles designers will have to overcome:

- *Processing power* — The processing power of most PCs is limited when compared to a machine with dedicated DSP cards. The added monitoring latency of any DSP expansion on modern PCs render these unfit for live applications.
- *Latency* — The audio buffers, which are processed by the CPU, have to be kept small to reduce monitoring latency. Add to this the varying processing demands of user input handling and graphical display tasks, and the audio engine can become unstable. Zero-latency monitoring and on-board DSP that some audio interfaces offer can only be used if third-party access to control these interfaces is allowed (not common, but possible).
- *Multitude of I/Os* — As most consumers hardly have any need for more than the standard stereo input and output, few audio interfaces allow more than 24 I/Os or the cascading of such boxes.

That said, there is some indication that PCs could become the heart of certain consoles (if not all in the far future). To begin with, such consoles already exist, although they are small and provide limited inputs. Then, 12-core machines already provide a respectable amount of processing power, which can be increased using distributed processing (already a working technology on Apple machines). For latency problems, programmers can reserve 11 of the 12 cores for audio only, ensuring stability.

Lastly, certain consumer products already allow 192 I/Os; little should

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The touchface

The last block of the superior phenotype — the control surface — is, by far, where the competition lies. The technical specifications of both the I/O and core blocks are equally achievable by all manufacturers, but how users interact with the underlying technology is essentially to become the big selling point.

Cost and physical considerations mean that on analog consoles, controls are not always where or how users would like them to be. Needless to say, once designed and manufactured, one can hardly modify or improve the product. Digital consoles with their hardware control surfaces are largely the same.

Then there's the iPad. A few weeks ago, I witnessed my two-year-old nephew using an iPad as if he already had one in the womb. The iPad has redefined the term "child's play," and, more importantly, how we interface with technology. A particular application available for the iPad facilitates the control over an audio-sequencer's mixer and its various plug-ins in a way that is more intuitive and productive than a mouse. It is also far more flexible than hardware control surfaces that are twice the price of the iPad itself.

There is nothing visionary here. iPad applications allowing the remote control of consoles and other audio products are now popping up in the Apple Store almost weekly, and some consoles already include a docking station that makes the iPad an integral part of the product. However, beyond these implementations, iPads are unlikely to end up replacing the face of our consoles; touchscreens certainly are.

I dare to argue we are heading toward an omni-console — a customizable software-based beast.

In the context of a control surface, I will call one based on touchscreens a "touchface." Again, there is nothing visionary here; touchscreens are already part of many consoles, but the benefits in having them have to be stressed. Touchfaces are completely customizable. They can be tailored to many applications, even per client or per session. Touchfaces can also be easily updated; any improvements suggested by clients can be implemented, tested and installed within days, and manufacturers are free to add features should the core unit allow. This is heaven for both manufacturers and users.

While hardware buttons and meters are easily replaceable by touchscreen controls, the interaction with on-screen faders and pots can understandably be considered cumbersome. So, it is almost certain that future consoles will still have at least two rows of hardware controls — one for faders and one for pots; the function of these will be determined by a quick tap on the touchface.

Software-based beast

I dare to argue we are fast heading toward an omni-console — a highly customizable, expandable and updatable software-based beast. With a reboot, such a product can become tailored for use in broadcast (television or radio), live concerts, recording studios, post production or any other settings. In order to become such, it will need to be mostly bright, as bright as an iPad display. BE

Roey Izhaki is the author of "Mixing Audio."

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Weather graphics

A properly configured system can reduce costs while maintaining high-quality on-air imagery.

BY PETTER OLE JAKOBSEN

For decades, the process of creating and presenting weather graphics has been insulated from the rest of the broadcast news production workflow. At most U.S. television stations, the weather department developed as an island unto itself.

In this traditional, dedicated model, the local TV station hires a meteorologist or weather team and invests in an end-to-end weather graphics solution that combines an exclusive weather data service with green screen-based presentation tools. Once the weather report is prepared, the meteorologist presents it as a stand-up, on-camera report during the live local newscast. The graphics are triggered by the presenter, not the director or the CG operator as occurs with the rest of the newscast.

To tell the weather story quickly and clearly, The Weather Channel employs Vizrt's Viz Weather. The 3D real-time weather system integrates with a broad range of weather-data providers and can trigger graphics and animations automatically.

Rethinking weather

Broadcast groups, networks and station managers are now starting to turn a critical eye to their weather workflows. While delivering weather updates and forecasts is a critical service, it also has traditionally been one of the biggest expenditures broadcasters make. Oftentimes, it consists of large, upfront capital investment in a proprietary solution accompanied with a high monthly fee for the companion weather data service. Typically, only the top-rated news stations in the market can justify this expense.

Although we operate in a global marketplace, it's important to note that not all markets are the same. Turning on the local television station to watch the weather is generally more important to viewers in the U.S. than those abroad. The station meteorologist often becomes a local TV personality, and stations promote their channel's exclusive branded weather service.

MOS environment

Many weather graphics solutions are proprietary and exist within the closed environment of the weather department. Another approach is to rely on a MOS-driven newsroom and broadcast graphics workflow. Such an approach doesn't require a meteorologist with design skills or lock the station into any particular weather data service, or even pay a monthly service fees.

One drawback to this solution is that if customers want and need a weather data service — and they generally do to provide them with forecast models, radar imagery or other weather metrics — they must locate a weather data provider on their own. While the station can then own the weather product outright, it must negotiate separate deals to arrange for the weather data service. Broadcast weather graphics vendors are often reluctant to sell just the data service portion of their end-to-end weather graphics solution.

This is an important distinction that broadcasters should understand when investing in weather graphics solutions. The dedicated technology approach offers weather data services tied to presentation technology, while an open weather data-agnostic approach supports any and all weather data sets, including those provided by leading weather graphics competitors.

This includes "point data," such as temperature; wind speed and direction; humidity; current conditions and forecasts; and "model data" that include isobars, isotherms, precipitation, storm fronts, cloud-scans and hurricane tracking displays. Another type of weather data is "imagery," which includes image sequences from satellite and radar that are used to create animations. And with an open system, data from various weather data sources can be implemented to

create hurricane formation graphics and weather alerts.

Consistent branding

Rather than building a weather graphics island, an open approach treats weather as one of the software-based components of a broadcast graphics workflow. Stations can design their own weather graphics from scratch and incorporate their signature branding and look, instead of relying solely on a prepackaged design from the weather graphics service provider. This gives the station complete ownership of its weather presentation.

The weather assets can be managed, repurposed and transcoded for delivery to other platforms, such as their secondary DTV channels and online platforms. They can even be optimized for display on mobile phones and tablets right along with all the other content. Weathercasts can be anchorless, automated sequences, or the weather graphics can be delivered by news anchors along with other stories in the rundown.

Versatile display control

Besides visually rich graphics, a major part of the weather report is the presentation. Rather than being limited to the conventional delivery — where a weather presenter stands in front of a green screen and clicks through prepared visuals — an open platform can leverage multi-touch screen technology. This allows presenters to easily control graphics during a live newscast by touching the screen.

One drawback is that when touching the screen, the presenter turns his or her back briefly to the viewer. That can be countered today by programming third-party control using tablet devices.

Migrating to stereoscopic 3-D

While stereoscopic 3-D may not take the weather industry by storm any time soon, there will be a unique set of customers who are looking for advantages in weather story telling. Although many proprietary weather systems offer stunning visual HDTV quality and sophisticated 3-D animation, not all platforms lend themselves easily to stereoscopic 3DTV. Such is not the case with a software-based solution that was designed from inception for stereo 3-D, and an environment oriented to an X-Y and Z-axis for depth.

The ultimate concern and objective in weather graphics is telling the weather story quickly and clearly. This involves combining weather data, animated weather icons, 3-D animations, text, weather tickers and live video into a single presentation or display. Showing the impact of weather to viewers requires sophisticated maps and satellite imagery. Customers can use these tools to focus on local areas, even neighborhoods; customize the visual style; and layer on text, real-time data, and live video reports from the field.

A critical service

Advancements in weather graphics creation and display are vital to ensuring that live weather reports stay on par with sports, news and elections coverage. Weather graphics must convey the weather to viewers while satisfying broadcasters' operational objectives.

A properly configured weather graphics system may incorporate well into an MOS-based automated workflow. This type of solution can reduce costs while improving productivity across multiple output platforms and maintain high-quality on-air imagery. BE

Petter Ole Jakobsen is Chief Technical Officer of Vizrt.

NAB REPLAY

PICK HIT

BroadcastEngineering 2012

***Broadcast Engineering*'s Pick Hit Awards are the industry's longest-running product technology awards for broadcast and production. With a 28-year history, Pick Hits are the most prestigious technical awards given at NAB. Here are the top products selected from the show by our panel of independent judges.**

Ki Pro Rack

AJA Video Systems
www.aja.com

Provides ready-to-edit recording in a 1RU format; ideal for broadcasters transitioning from tape to file-based workflows for recording and playback; designed to get material from source to editorial as quickly as possible; records 10-bit Apple ProRes and Avid DNxHD files direct to removable hard disk or SSD storage modules; files can be used in most editing systems without the need for additional transcoding or importing processes; enables users to perform broadcast-quality up/down/crossconversion during recording or playback without the need for additional conversion hardware; twin media drive bays allow for fast media changes.

Ninja 2

Atomos
www.atomos.com

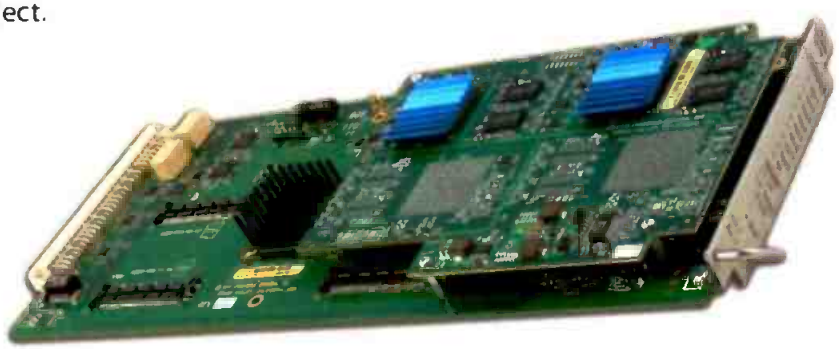
Field recorder allows the recording, monitoring and playback of pristine, 10-bit uncompressed images straight from a DSLR or camcorder directly to Apple ProRes or Avid DNxHD; boasts HDMI input and output, meaning it can be used to record directly from the new Nikon DSLR sensor (D4/D800) and the retina-display Apple iPad; upgraded touchscreen incorporates an 800 x 400 pixel display, with a viewing angle of 170 degrees — both horizontally and vertically; supports the latest version (3.0) of the AtomOS operating system; key feature of AtomOS 3.0 is SmartLog, the ability to mark in and out points and tag clips using XML metadata so that users can effectively make a pre-edit on their Ninja before getting to the edit suite.

New Keying and Layering Technology

Introducing the new, award winning Avenue Layering Engine – multi layer keying that's just right for branding, small master control, flypacks and trucks. There's a frame sync on every input so go ahead and use sources that aren't genlocked. And the extraordinarily intuitive iPad™ control gives you new freedom in switching a show or event.

PICK HIT Broadcast Engineering 2012

Two, independent linear keyers, program/preset background transitions, audio mixing, voice over and breakaway, make it an agile and flexible solution for combining audio and video content. Inputs can be driven by SD, HD or 3G SDI signals from cameras, remote feeds, character generators, graphic and stillstore systems, and video servers. Realtime processing, low latency and serial control make it easy to integrate into your next project.



infoComm C4820

ENSEMBLE DESIGNS

+1 (530) 478-1830

www.ensembledesigns.com

LUMO
Miranda
www.miranda.com

High-density fiber converter series packs 36 I/Os into a 1RU frame; modular design enables each converter to be serviced while the unit remains in operation; includes dual redundant power supplies and fr[illegible] controller with dual redundant IP-connections that can be used for comprehensive system monitoring and alarming; uses the same SMPTE-compliant fiber health SFP modules that are found on all 3Gb/s products in the Miranda line-up; fiber connectivity is provided on one side of the unit while coax is on the other, providing for easy separation of the heavier copper cable from the lighter fiber.

mxfSPEEDRAIL
MOG Technologies
www.mog-technologies.com

File-based system for post-production, playback and archiving; integrates the essential components of the creation process into a single and unified platform, saving costs and reducing production creation time; ideal for multichannel workflows as it allows multiple simultaneous ttansfers with generation of hi-res and proxy versions; its multiformat capabilities enable users to encode media contents in all professional broadcast formats; features a modular architecture; models include the S1000 multiformat SDI recording system, F1000 multiformat ingest system, O1000 for digital delivery and P1000 real-time playback system.

BT-LH2170
Panasonic
www.panasonic.com/broadcast

Ultra-rugged 21.5in LCD production monitor offers a 3D look-up table producing faithful color hues and smooth gradation; a production-tough aluminum die-cast chassis and 12V DC operation make it ideal for field use; features an eco-friendly panel with mercury-free LED backlight; provides critical viewing with 1920 x 1080 full HD resolution; the monitor's high brightness, high contrast, horizontally-aligned IPS panel has 178-degree vertical and horizontal viewing angles; exhibits minimal changes in brightness and color due to the viewing angle; incorporates diverse video inputs and remote terminals, including 3G-SDI and HD/SD-SDI HDMI, digital and analog DVI-I, composite and GPI inputs, and RS-232C and RS-485.

PRG TruColor HS
PRG
www.prg.com

With more than twice the output of a 2kW incandescent soft light, digital light fixture delivers an extended Color Rendering Index over 95, generates a 16-degree beam spread and uses only 400W of AC power; employs a lighting method called Remote Phosphor Technology, which eliminates the color-accuracy limitations inherent in LED fixtures; instead of relying on LEDs as the source of illumination, TruColor HS' independent phosphor panels emit high-quality light when excited by the high-frequency wavelengths from blue LEDs.

V-800HD
Roland Systems Group
www.rolandsystemsgroup.com

Multiformat video switcher is ideal for any live event or installation that requires the freedom to connect any type of source, whether it be digital or analog, computer or video format; each input has its own broadcast-quality scaler that can individually scale, stretch, crop and zoom each source as required to fit any output resolution chosen; is HDCP-compatible; features a built-in multiviewer output that provides a convenient monitoring solutions when connected to an HDMI monitor; eight mixing channels provide connectivity to 3G/HD/SD-SDI, DVI-A/DVI-D/HDMI, RGB, component and composite formats, as well as an additional two channels for still images assignable via USB memory stick or frame grab.

Vega
Snell
www.snellgroup.com

Routing platform allows users to configure any signal port independently for fiber or coax connectivity, and to configure any signal port as either an input or output; provides a flexible asymmetric routing solution within a space-saving 2RU 96-port or 4RU 192-port router; leverages proprietary algorithms to monitor every subassembly continuously; to ensure maximum redundancy, the system offers a full range of options — dual crosspoints, dual controllers, dual power supplies and dual fans — all of which are hot-pluggable or replaceable; the units ports can be configured simply and quickly, enabling broadcasters to choose the appropriate connection medium on the fly.

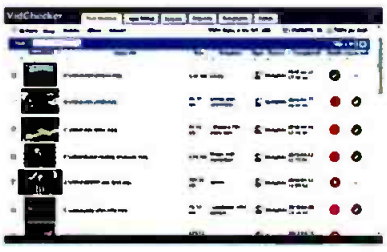
PICK HIT
BroadcastEngineering
2012

Bond
Teradek
www.teradek.com

Camera-top cellular bonding system for mobile content transmission and live reporting from the field; enables freelance and professional broadcasters to transmit live content over up to five 3G or 4G cellular modems simultaneously from multiple carriers worldwide; designed to seamlessly integrate with Teradek's Cube video encoder; incorporates technologies such as low-power hardware H.264 HD video compression, advanced streaming options such as RTMP and MPEG-TS, and Teradek's Adaptive Internet Streaming technology, which adjusts bit rate and buffering in real time to handle volatile network conditions.

UTAH-100/UDS
Utah Scientific
www.utahscientific.com

Universal Distribution System (UDS) is a new approach to signal distribution that combines the flexibility of a multirate digital routing switcher with the economy of simple distribution amplifiers; modular system is based on I/O modules with 16 ports, interconnected by a crosspoint fabric that allows any input signal to feed any number of output ports; is controlled and monitored through a built-in Web interface that allows the output ports to be assigned to blocks that are fed by a common input signal, making it simple to feed a large number of signal destinations with a new input source at the press of a button; external hardware control panels and virtual control via Ethernet can extend the functionality of the system to local and remote users as required.



VidChecker
VidCheck
www.vidcheck.com

Auto QC software for file-based media conducts a thorough check of the video and audio parameters, as well as the video and audio quality, legality, and correctness; automatically checks and corrects video and audio to ensure video is good to distribute and transmit; this includes meeting CALM and ATSC/EBU recommendations; can automatically write out corrected files; is simple to install on PCs/servers; is scalable from a single license that processes four files at the same time to eight or 12 files simultaneously on a single server, or spread across many servers working together in a VidChecker Grid for enterprise installations requiring high throughput.

NAB REPLAY
PRODUCT JACKPOT

The NAB Show is the place to see product launches. If you didn't make the show, here is a roundup of some of the new products that were on demonstration. And for even more NAB product coverage, check out our *NAB Special Report*, which is polybagged with this issue.

COMPLIANCE MONITOR
Cobalt Digital Spotcheck

Loudness measurement and data logging system monitors IP, ASI or MPEG streams at the transmit encode point; pinpoints segments outside of CALM/EBU R128 compliance and provides documentary proof of compliance should erroneous complaints appear; Ethernet control enables integration facility IT, providing long-term logging/thumbnail storage.

www.cobaltdigital.com

MEDIA EXTENSION OVER IP
Adder ADDERLink INFINITY dual

Encoding system is spatially lossless, with 1:1 pixel mapping; uses optimal lossless compression techniques to minimize network bandwidth usage; can be rack-, desktop-, wall- or monitor-mounted; features full DVI connectivity; uses USB 2.0 connectivity to interface with keyboards, mice and any other peripheral tool.

www.adder.com

THUNDERBOLT CONNECTIVITY
AJA T-TAP

Bus-powered device uses Thunderbolt connectivity to provide high-quality 10-bit SD, HD and 2K output through SDI and HDMI connections; adapter enables a simple, unobtrusive means of moving professional video and audio out of any Thunderbolt-enabled Mac system; supports SD, HD, 2K and 3-D 10-bit video over HDMI and 8-channel embedded audio.

www.aja.com

WEATHER PRESENTATION SYSTEM
AccuWeather CinemaLive HD 3.2

Adds CityVision 3D, which creates photo-realistic 3D renderings of landmarks that can be combined with realistic weather animations in settings that viewers recognize; adds radar sweep presentation feature; implements user interface enhancements based on user feedback; optional 2.5mi high-spatial-resolution computer model data in 30-minute steps.

www.accuweather.com

GPS MASTER CLOCK
ESE ES-185U/NTP

Twelve-channel GPS receiver provides master clock and TC generator signals; receiver tracks up to 12 satellites simultaneously, although reception of only one is required for accurate time data to be output; accuracy better than 10ns, and is entirely self-setting; automatic DST correction; provides one PPS output and a nine-digit LED display.

www.ese-web.com

FRAME-RATE CONVERTER
FOR-A FRC-30

Can be switched between motion compensation and linear conversions to deliver optimal results for various source material; built-in up/down/crossconverters deliver SD to HD, HD to SD, and 1080i to 720p conversions; supports 1080i59.94, 1080i50, 1080PsF23.98, 720p59.94, 720p50, 525/60 and 625/50; includes HD/SD-SDI and analog composite I/O; 1RU high and 1/2RU wide.

www.for-a.com

SIGNAL EXTENDERS
Avitech International Seneca-X HUT/R and VUT/R

Extends HDMI video, USB or KVM switch signal up to 6560ft using fiber-optic cable; multimode optical fiber ensures uninterrupted high-speed, high-quality transmission; VUT/R model is a VGA-over-UTP extender that transmits VGA video, USB or KVM switch signals up to 1312ft away.

www.avitechvideo.com

ATSC ENCODER
Evertz 3480ENC

Supports multiple combinations of HD-SDI and SD-SDI inputs; uses high-quality MPEG-2 distribution profile video encoder and Dolby AC-3 for audio encoding packaged in a 1RU form factor; includes built-in stat mux for outputting MPTS over IP; provides input frame syncing, loudness control, automatic input failover, and internal audio and video monitoring.

www.evertz.com.

GOLD MOUNT MOUNTING PLATE
Anton/Bauer MATRIX Cheese Plate

Mounts directly on 15mm or 19mm rod systems; is designed for use with the company's Gold Mount systems for the following cameras: Sony PMW-F3 camera and NEX-FX-100, Canon EOS 5D Mark II, EOS 7D, EOS 60D digital SLR camera and EOS C300, Panasonic AG-AF100 series professional HD camera, and the RED EPIC digital cinema camera.

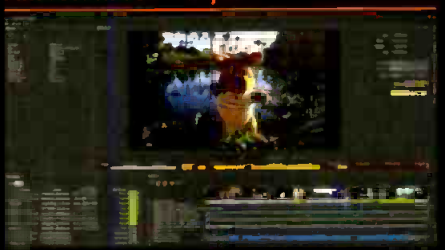
www.antonbauer.com

DIGITAL SWITCHES
Ensemble Designs Avenue 7435/9455

The modules switch cleanly between asynchronous sources, like broadcast and satellite feeds, to a backup feed without video glitches or audio pops; includes built-in video frame synchronizer, which ensures perfect alignment of mistimed and non-synchronous SDI sources; 9455 switch handles SD-SDI, 1.5Gb/s HD-SDI and 3Gb/s HD-SDI signals, while the 7435 handles SD and HD signals.

www.ensembledesigns.com

MEDIA PLAYER
AmberFin iCR Player



Fully featured, cost-effective, professional media player easily integrated within existing broadcast-IT workflows; users can customize XML files; enables the building of seamless MAM workflows via Web services without having to program AmberFin's iCR system; powerful feature set allows users to construct simple workflows using configuration buttons to create workflow tasks.

www.amberfin.com

DVI-OVER-FIBER EXTENDER
Apantac MAZAMA fiber series

Series of fiber-optic modules; DVI fiber-optic extender passes true EDID over a single SC fiber; supports 1080p signals out to 1500ft; a dual-link DVI FO extender supports resolutions up to 3840 x 2400 and extends signals up to 1000ft; an HDMI FO extender using an SC fiber supports 1080p signals out to 1500ft.

www.apantac.com

REFERENCE MONITOR
Dolby Professional Reference

Monitor now supports 48 fps; already supports 60fps; new support for the AMPAS ACES workflow; Image Systems Nucoda 3D LUT support to help with the color-managed workflow.

www.dolby.com

SET DESIGN
FX Design Group

Offers broadcast set design, fabrication, installation, facilities planning and lighting design; provides complete scenic design services for news, weather, sports, talk show and entertainment sets that are ready for HD television, 16:9 and digital broadcasting.

www.fxgroup.tv

LENS SERVO
Thales Angenieux Optimo Servo Unit

Compatible with Optimo lightweight film digital cinema lenses and Optimo DP lenses; provides camera operators with motorized control of zoom and iris; focus control available with specific versions.

www.angenieux.com

WORKFLOW PLATFORM
Digital Rapids Kayak

Based on the concept of technologies as components — from media-specific functions like encoding, packaging and processing to business-oriented functionality such as analytics, automated intelligence and reporting; component-based approach provides granular control over technology costs and provisioning, as users deploy only precisely the technologies they actually need for their specific workflows; Kayak Workflow Designer lets users graphically combine components into workflows with intelligent automation; designs can be tested instantly before moving them directly into production.

www.digital-rapids.com

PREAMP/PROCESSOR
Aphex Channel

Updated version of the Aphex model 230; incorporates seven devices within a compact, single RU design; includes the Aphex Reflected Plate Amplifier (RPA) Tube Preamp, EasyRider Class A compressor, Aural Exciter and Big Bottom.

www.aphex.com

CONTENT SHARING SOFTWARE
Aspera Shares

Web application provides simple and intuitive way to share content in the form of any size files and directories within an organization or with external customers and partners; enables secure access across diverse infrastructures; uses Aspera fasp transport; users can move content to different location without changing user workflow.

www.asperasoft.com

TV EVERYWHERE SYSTEM
Akamai TV Everywhere system

Enables broadcasters to rapidly bring TV Everywhere services to market by providing a common framework for implementing proprietary operator-programmer relationships; scalable to handle broadcast-size audiences; provides secure authentication and authorization identity services based on open standards; can be paired with the Akamai HD Network for scalable, high-quality and secure streaming with audience analytics.

www.akamai.com

VIDEO SERVER
Autocue/QTV Video Server

New firmware provides additional support for Avid and Apple editing workflows, with new OP-Atom and ProRes formats and improved handling of QuickTime, DNxHd and XDCAM content; provides scheduled playout of clips sequences with both local and remote access to playlists; supports 608 and 708 closed captions; transcoding can be triggered on demand from a predefined list of encode profiles.

www.autocue.com

PROMPTER DISPLAY AND ON-AIR TALENT MONITOR
Autoscript Enhanced Prompting Imaging Centre (EPIC)

Allows a single piece of equipment to do the work of two, with an on-air talent screen built into the prompter display that simply flips down to offer the perfect viewing angle; simplified camera set-up makes installation easier and more practical, particularly when on-air talent monitors are required on location; requires just one power cable for the prompter and on-air monitor.

www.autoscript.tv

MULTIVIEWER
Grass Valley Trinix NXT

Can be added as an option to all Trinix frames; enhancements include on-screen mouse and cursor functionality to expand individual tiles to full screen, powerful signal monitoring, status, alarming functions and the ability to easily import presets.

www.grassvalley.com

AUTOMATION APPLIANCE
Cache-A Library24/48

Library comes in two sizes, 24 or 48 tape slots; provides either 36TB or 72TB of storage; Library24 accommodates one or two LTO drives, and the Library48 option handles up to four drives; Under Pro-Cache, LTO drive is available for accessing content on shelf stored cartridges while simultaneously archiving to the library.

www.cache-a.com

TRANSCODER
Harmonic ProStream 1000 with ACE

Capable of transcoding up to 20 HD streams and 80 adaptive streaming profiles in a single, power-efficient 1RU appliance; supports any-to-any and any-to-many video/audio transcoding with automatic audio level adjustment; statistical multiplexing and scrambling and descrambling; simultaneously transcodes video content for both broadcast and OTT, mobile and Web applications.

www.harmonicinc.com

VIDEO SERVER
Avid ISIS 2000

A cost-effective 64-bit self-balancing, distributed near-line file system that works with Avid Interplay to provide enterprisewide search, browse, access and management of media; enables quick access to nearline files from any workstation; incorporates 84 hard disk drive (HDD) slots populated with 82 3TB SAS drives.

www.avid.com

ENCODER
Avitech International Seneca-E.264

High-performance, real-time MPEG-4 AVC SD and HD video encoder; supports 3G-SDI HD video, HD/SD-SDI SD video; for audio, supports two embedded SDI, two unbalanced analog or AC3 pass through; encodes dual-channel HD in MPEG-4 AVC high-profile level 4.2 or 4.0; supports CBR and VBR with rates from 2Mb/s to 30Mb/s depending on profile; 15W maximum power consumption.

www.avitechvideo.com

HA19x7.4

NEW

- 2.2x Extender
- New Lens Design
- 16 Bit Digital Encoders
- Superb Corner Resolution

XA19x7.4

NEW

- Latest EBC Coating
- Anti Backlash Gearing
- New Advanced Diagnostics
- Focus Breathing Compensation

• New Lens Design	• 2.2x Extender	• 16 Bit Encoders	• New Ergonomic Grip
• 3 Floating Zoom Groups	• Latest EBC Coating	• Anti-Backlash Gearing	• RS-232 Control
• Superb Corner Resolution	• Digital Servos	• New Advanced Diagnostics	• Premier Series Digital Features

Technology That Inspires...

FUJIFILM
expect INNOVATION™

FUJINON
fujinon.com

UP/CROSS/DOWNCOVERTER
BHV Broadcast Syntax

Based on advanced Super-Resolution Bandlet Technology; designed to bring the performance advantages of motion-compensated processing without the associated disadvantages of high cost and occasionally severe artifacts; features include analog video inputs, as well as audio facilities with noise reduction and ARC facilities.

www.bhvbroadcast.com

SSD RECORDER
Blackmagic Design HyperDeck Studio Pro

Solid-state recorder with four channels of 3Gb/s SDI I/O, Thunderbolt I/O, and full HDMI and analog I/O with XLR connectors for audio and time code; supports full 4K playback using Apple ProRes; user-friendly VTR-style design with function buttons and jog wheel; external RS-422 control; high-resolution LCD screen displays time code and transport information plus full color thumbnail of the current clip.

www.blackmagic-design.com

HD LENS
Canon HJ17ex6.2B

HD lens delivers a broad focal length range from 6.2mm to 106mm (212mm with built-in 2X extender) and a M.O.D. of 1.3ft (shortened by approximately 30 percent compared to previous models) for close shooting in news situations.

www.canonbroadcast.com

VIDED WALL PROCESSDR
Christie Digital Systems Vista Spyder

Supports up to 32 independent windows, 16 mixers or any combination in between; adapts to widescreen (edge-blended), single- and multiscreen discrete applications; permits unrestricted window and picture-in-picture (PIP) placement; allows any input to operate as a native high-resolution channel, scaled PIP, scaled background or Key Channel; switches inputs from any mode during normal operation, making all inputs fully capable (not dedicated purpose).

www.christiedigital.com

MOBILE CAMERA
Cineflex ELITE

HD Super 35 camera combines proven five-axis stability with Canon Premier lenses and the ARRI Alexa camera; easily integrates onto cable and rail systems, aircraft, automobiles, boats and other mobile platforms; features dual REC OUT BNC connectors for uncompressed ARRIRAW or uncompressed HD-SDI video, both with embedded timecode and metadata.

www.cineflexelite.net

SOLID-STATE PORTABLE VIDEO RECORDER
AJA Ki Pro Quad

Stores high-quality edit-ready files in formats including 4K (4096 x 2160), Quad HD (3840 x 2160), 2K (2048 x 1080), and HD (1920 x 1080) in 10-bit 4:4:4 or 10-bit 4:2:2 color; performs de-Bayer processing of the RAW data that can be used to produce on-board Apple ProRes recordings to SSD media; a scaled or cropped output is also simultaneously available for 2K or HD monitoring via dedicated SDI and HDMI connections.

www.aja.com

WIRELESS COMMUNICATION
Clear-Com Tempest 2400

Digital wireless intercom now features new Seamless Roaming capability; most applicable in large mixed facilities separated by sizable distances, such as campus buildings, multistudio environments and outdoor venues; uses narrowband signal that changes frequencies to burn through RF noise and interference; does not compete with signals from other 2.4GHz wireless devices.

www.clearcom.com

CONTENT DELIVERY PLATFORM
Dell Deliver

Allows network providers to sell CDN services to an enterprise as well as manage the on-demand delivery of any video to any screen; built on Dell PowerEdge servers, software from EdgeCast Networks and video processing software from Elemental Technologies; designed to reduce the amount of hardware and space required while using less power.

www.dell.com

TRANSCODING SOFTWARE
Digital Rapids Transcode Manager 2.0

Features new dynamic workflow capabilities and extends scalability within facilities and beyond; provides efficient management, automation and performance for media transformation between acquisition, production, archive and distribution formats; supports multiscreen distribution opportunities with output format support for viewing platforms from mobile phones and tablets to game consoles and connected TVs; new features in v2.0 include adaptive, logic-driven process automation with rich metadata support to reduce effort, errors and processing time; additional features include intuitive, visual workflow design tools and elastic scalability with dynamic, on-demand deployment.

www.digital-rapids.com

FOR-A
INNOVATIONS IN VIDEO and AUDIO TECHNOLOGY

HD/SD 2 M/E - 3 M/E Digital Video Switcher
HVS-4000HS
"HANABI"

HD/SD Frame Rate Converter
FRC-8000

HD/SD/Analog/PC Mixed High Resolution Multi Viewer
MV-3200

FOR-A ALL STARS

LTO-5 Video Archiving Recorder
LTR-100HS/120HS

Powered by BRAINSTORM

Sensorless Virtual Studio System
VRCAM2

3G/HD/SD Multi Purpose Signal Processor
FA-9500

HD Variable Frame Rate Camera
VFC-7000
"Flash EYE"

HD Variable Frame Rate Camera

VFC-7000
"Flash EYE"

TVTechnology 21

Government SALUTE 2010

VFC-7000 Operation Unit

High-speed HD Recording

Compact, lightweight and configured as an all-in-one self-contained unit, the VFC-7000 is an easy to operate variable frame rate camera that is capable of High-speed 700 fps HD full frame recording. Frame rate can be varied from 24 to 700 fps. F mount (Option: PL mount) is available. Also DC drive is supported, making it optimal for recording outdoors and in other environments with no power source.

3 Types of Mounting are Available

F Mount (Accessories) | PL Mount (with Option) | B4 Mount (with PL/B4 Adapter)

www.for-a.com

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- USA Eastern & Midwest (NJ) Tel: +1 201-944-1120
- USA Southern (FL) Tel: +1 305-931-1700
- Latin America & Caribbean (FL) Tel: +1 305-931-1700
- Canada (Toronto) Tel: +1 416-977-0343
- UK (London) Tel: +44 (0)20-8391-7979
- Italy (Milan) Tel: +39 02-254-3635/6
- Middle East-Africa (Dubai) Tel: +971 4-887-6712
- Korea (Seoul) Tel: +82 (0)2-2637-0761
- China (Beijing) Tel: +86 (0)10-5170-9870

Continuous Innovation

MAM PLATFORM
Dalet Digital Media Systems Dalet Galaxy

Most advanced version of the company's Media Asset Management platform; includes a high-value, BPMN 2.0-compliant workflow engine designed to dramatically boost productivity and agility while also improving operational and business visibility across the media enterprise; features include a new modern-looking GUI, more customizable data models, Dalet One Cut video editing framework, advanced tools for searching and indexing, increased interoperability with NLEs, and support for upcoming industry standards such as AS-02 and FIMS.

www.dalet.com

SIMPLIFIED FILE STORAGE
DataDirect Networks Chroma Enterprise

DDN ExaScaler now comes with Whamcloud's Chroma Enterprise; system simplifies Lustre file system management and accelerates ExaScaler adoption for enterprise Big Data environments; eliminates the complexity of support and management of sophisticated parallel file storage with simple, easy-to-use systems management that is tightly integrated with the Lustre file system and DDN's Storage Fusion Architecture.

www.ddn.com

TECHNICAL FURNITURE
TBC Consoles TracWall

Displays from 15in to 65in can be bolted directly to the grid with fixed, tilt/swivel and articulating mounts; cables are channeled directly into base cabinets, which also provide storage space for additional rack equipment and power supplies.

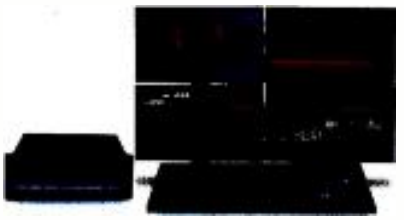
www.tbcconsoles.com

VIDEO TESTER
Rohde & Schwarz R&S VTE

Universal platform for testing video and audio interfaces on consumer electronics equipment during development and quality assurance; modular platform accommodates up to three test modules and can be equipped with additional software options to optimally suit the requirements of specific applications; features source, sink and dongle testing on MHL 1.2 interfaces; real-time difference picture analysis for testing video transmissions over LTE; localized touchscreen user interface; integrated test automation and report generation.

www.rohde-schwarz.com

PRODUCTION SYSTEMS
Newtek TriCaster series



Three new systems utilize a completely re-engineered platform and introduce new capabilities; TriCaster 8000 is designed for large, complex events; provides full integration of social media production tools, virtually limitless scalability with third-party router support, recordable macros, extensive effects and graphics capabilities with eight M/E rows; other models include the TriCaster 855 with 24-channel switching and the TriCaster 455, which is targeted to mobile producers and supports 14-channel switching.

www.newtek.com

STANDARDS CONVERTER
Blackmagic Design Teranex

Provides high-quality de-interlacing, upconversion, downconversion, SD and HD crossconversion, automatic cadence detection and removal; noise reduction, adjustable scaling and aspect ratio conversion; all with full timecode and multichannel audio conversion; includes 3-D dual-channel conversion, 3-D simulation and 3-D camera rig alignment.

www.blackmagic-design.com

SUBTITLE AND CAPTIONING
Softel Swift TX

Flexible and cost-effective subtitle/caption management and transmission platform; reduces workflow complexity and increases reliability and productivity; features real-time transcoding and a class-leading range of automation interfaces, along with the widest support of file formats available.

www.softelgroup.com

SOFTWARE UPDATE
Solid State Logic C100 HDS V5

Implements dual operator mode, which provides two operators the ability to have independent physical controls and access to shared audio assets through a single console processing engine, routing and I/O configuration; allows for an unlimited number of consecutive eight-channel fader bays to be assigned to a second operator; bays can be located at either end of a C100 console, or separated and installed in a remote location such as a production gallery.

www.solidstatelogic.com

AUDIO LOUDNESS PLATFORM
Linear Acoustic AERO.1000

Metadata-based transmission audio loudness controller; 1RU unit can house eight AEROMAX audio processing engines; supports up to 64 channels of encoded or baseband audio via AES, SDI, analog or optional DVB-ASI; each processing core includes UPMAX upmixing algorithm and compensating video delay; options include Dolby decoders/encoders and Nielsen watermark encoders.

www.linearacoustic.com

GRAPHICS PLATFORM
Harris Inscriber G8

Provides high-end, real-time graphics production support through uncompressed imagery, and graphics and animation capabilities; handles complex 3D graphics and animations; uses an Intel Xeon E5 processor and NVIDIA Quadro 4000 GPU to significantly reduce channel hardware density for a greatly reduced footprint (2RU), lower power consumption, and improved performance and clip playback scalability.

www.broadcast.harris.com

RAI Amsterdam

Conference 6-11 September : Exhibition 7-11 September

2012

Conference

Leading the electronic media and entertainment agenda through innovation and debate, the IBC Conference is attended by the most influential thinkers from the leading companies in the world.

It is split into four carefully selected streams – Advances in Technology, Content Creation and Innovation, The Business of Broadcasting, and Added Value – ensuring that all the fields contributing to the future of the industry are represented.

The conference consists of:

- 6 day, 4 stream conference programme
- 300+ world class high profile speakers
- over 60 conference sessions

Hot topics being discussed this year include:

- Broadcast Delivery
- Cinema
- Cloud
- Connected TV
- Social Media
- Sport
- Transmedia
- Workflow

For more information please visit: www.ibc.org/conference

Exhibition

IBC welcomes over 50,000 attendees from over 160 countries & 1,300+ key international technology suppliers each year. In addition, attendees can take advantage of a variety of extra special features including:

Future Zone
showcasing the latest developments in broadcast technology

IBC Connected World
including demonstration area in Hall 14

IBC Big Screen
providing the perfect platform for manufacturer demonstrations and the Saturday Night Movie

IBC Production Village
presenting the latest camera technology in a purpose built environment

IBC Awards Ceremony
acknowledges those who have made a real contribution to the industry hosted on Sunday 9 September

For more information please visit: www.ibc.org/exhibition

www.ibc.org

IBC Fifth Floor International Press Centre 76 Shoe Lane London EC4A 3JB UK
T + 44 (0) 20 7832 4100 F +44 (0) 20 7832 4130 E info@ibc.org

500W TRANSMITTER
Linear Industries AT71-500-11

4RU x 19in x 26in drawer size reduces installation footprint; nine temperature-controlled cooling fans provide optimal performance and longer life for critical components; features include scheduler software to run corrections/measurements at scheduled times, internal GPS receiver, selectable timebase reference and proprietary bandwidth reduction technology; operates in VHF and UHF.

www.linear-tv.com

LOUDNESS METER
DK-Technologies DK3

The size of a smartphone; upgraded device delivers conventional metering as well as ITU, EBU R128, ARIB and ATSC-compliant loudness metering; features a 3G HD/SDI video input; can be powered from a USB port; ideal for ensuring CALM compliance; product line also includes DK1 for stereo and DK2 for surround sound.

www.dk-technolgies.com

FULL DUPLEX WIRELESS COMMUNICATION SYSTEM
Eartec COMSTAR

Designed for production teams that need instantaneous, hands-free voice communications; not voice-activated and no delay when transmitting; allows up to eight users to talk simultaneously; provides full duplex communication up to 1200ft in any direction from the Com-Center centralized base transceiver; no FCC license is required.

www.eartec.com

MEDIA STORAGE
EditShare XStream and Energy series

Fully integrated with EditShare Flow, Lightworks, Geevs and Ark; shared storage solutions are scaled to petabytes; new features include advanced project sharing with Adobe Premiere Pro and support for FCP X; networking configurations have been enhanced to increase throughput across the EditShare tiered-storage platform.

www.editshare.com

VIDEO PROCESSING PLATFORM
Elemental Live 150 series

High-performance video processing and throughput in rack or desktop form factor; outputs several streams for multi-camera angle viewing; encodes video streams in MPEG-DASH with support for both ISO FF and MPEG-2 profiles; DECE Ultraviolet asset creation for secure and ubiquitous digital content distribution; audio loudness control; supports J2K, ProRes and AVC-I; expanded support for CC, subtitles including Teletext, DVB subtitles and TTML.

www.elementaltechnologies.com

AUTOMATED CONTENT PUBLISHING
Miranda Enterprise Suite On Demand

Automated content publishing system; simplifies creation of multiple content versions, with appropriate branding, for delivery to VOD platforms; automates version mastering, deliverables encoding and metadata packaging; content can be automatically sourced from network storage, video servers, archive systems or videotape; automates the entire production/delivery process through tight integration with traffic systems.

www.miranda.com

LIGHT
Litepanels SOLA 4

DMX-controllable LED Fresnel fixture features a 4in Fresnel lens; uses a small fraction of the power consumed by conventional fixtures; employs Litepanels' proprietary LEDs to produce a soft light quality in 5600°K daylight color balance; based on the same Fresnel technology as the company's Sola 6, but in a smaller, more lightweight form factor; focuses from 70 degrees to 10 degrees; can be dimmed from 100 percent to zero with no noticeable shift in color temperature.

www.litepanels.com

TELEPHOTO LENS
Fujinon XA20xs8.5BERM

Features a 2X range extender, an ergonomic digital servo, Quick Zoom and inner focus, as well as improved corner resolution; designed for applications from newsgathering to in-studio use; can be used with rear controls for zoom and focus; suitable for tripod use.

www.fujinonbroadcast.com

CLOUD PRODUCTION ENVIRONMENT
Avid Interplay Sphere

Real-time system enables broadcast news crews to acquire, access, edit and finish stories from any location; leverages a cloud-based architecture supporting a distributed environment that spans multiple locations and time zones; automatically manages the transcode, upload and check-in to any connected Avid Interplay system; pre-defined output processes provide one-button simplicity.

www.avid.com

FIBER-OPTIC CABLES
Gepco TactiFlex

Designed for portable applications in harsh environments; feature a polyurethane outer jacket that is 30 percent more flexible while remaining abrasion-, chemical- and cut-resistant; 125mm single-mode fiber elements are coated with a 900mm, hard elastomeric, tight buffer for further damage protection and mechanical isolation; available in either single-mode or multimode fiber.

www.gepco.com

TSL Universal Equipment-Control for Frontline Operators

bexel

prosales@bexel.com

TallyMan is the Tally system of choice for broadcasters worldwide

Now available in the USA

through TSL's local partner, BEXEL

TallyMan

Seamless cross-equipment communication

Ideal for:

- Studios
- Production Vehicles
- Remote Headends

- Provides a seamless communication path between equipment
- Configures hardware components to user-defined preferences
- Easy mapping of Tallies, mnemonics and router paths
- Simple drag & drop editing
- Interfaces with all known mixers, multi-viewers and routers

http://www.tsl.co.uk/download/TSL-TallyBrochure.pdf

NEW TallyMan Virtual Panel

TallyMan Virtual Panel with touchscreen is designed to simplify control of multiple router I/Os. The intuitive user interface is engineered to be more in-tune with the needs of creative operators such as Directors, Producers, EVS Operators and Graphics positions.

- Removes the need to install individual hardware panels each time a router is added or upgraded
- Interfaces with ANY third-party router, vision mixer or multiviewer
- Heightened security available for positions with limited functionality
- Remote switch-off available

http://www.tsl.co.uk/download/TSL_Tallyman_VP_Datasheet_PRINT.PDF

Audio Monitoring, Tally Systems and Power Management solutions

All products available from stock in the USA. Email: prosales@bexel.co.uk

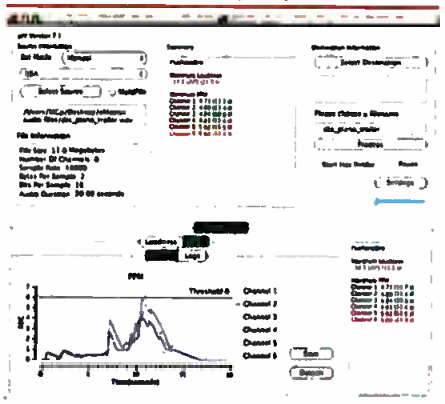
Please contact our partner BEXEL for more information. Tel: 800-842-5111 or 818-565-4339

To speak to TSL direct, please contact us:. Tel: +44 (0)1628 676 221 Email: products@tsl.co.uk

DOLBY E

AUDIO NORMALIZING AND LOUDNESS COMPLIANCE TOOL

Emotion Systems
Emotion File Finish (eFF)



Software application automatically analyzes and fixes audio loudness violations in file-based media; efficiently analyzes file-based media by using accurate modeling of VU and PPM meters, as well as loudness detection parameters (ATSC A/85, EBU R128 and ITU-R BS.1770); operates in faster than real time; provides operators with a graphical display that enables them to quickly assess any audio issues.

www.emotion-systems.com

ATSC ENCODER/MUX COMBO

Linear Industries LEX2000

Generates an ASI or SMPTE-310 output from multiple audio, video and metadata sources; MPEG-2 encoder uses intelligent scene analysis, adaptive decision logic and nonlinear quantization to achieve excellent quality video, even with multiple video programs and bandwidth constraints; its statistical multiplexer applies multilayer control algorithms to optimize encoding rates of multiple MPEG-2 streams.

www.linear-tv.com

XDCAM CODEC

EVS Sony XDCAM support

XT3 and XS servers provide native support for the Sony XDCAM 422 50Mb/s HD format in the suite of live and near-live broadcast production servers; easily integrates onto existing XT3 and XS server architecture with a simple upgrade; servers also provide native support for other codecs, including Avid DNxHD, ProRes422, AVC-Intra and DVCPRO.

www.evs.tv

STORAGE SYSTEM

FOR-A LTS-50

Storage appliance uses a linear tape file system (LTFS), which records video on tape as files and enables the reading and writing of files from a PC via FTP; can create original and duplicate copies with the installation of an external LTO drive; can be controlled through the company's LTR Browser software, and another optional proxy generator can be configured to automatically create low-res proxy files and thumbnails when archiving MXF files.

www.for-a.com

PLAYOUT MANAGER

PlayBox Technology
Multi Playout Manager

Fully assignable monitoring and control system with rights management for multiple AirBox playout channels from one or more Internet-connected PCs locally or from anywhere in the world via IP; allows multichannel playout centers to monitor and control all channels locally and assign full or restricted rights for any of the TV channels to one or more people to remotely monitor and/or control the TV channels from a remote PC, iPad, mobile phone, etc.

www.playbox.tv

ROUTER

Riedel Communications
MediorNet Compact

Provides a network bandwidth of 50Gb/s — enough capacity for bidirectional transport of 12 HD-SDI signals, dozens of MADI streams or GigE signals, and hundreds of audio channels or intercom ports; provides connectivity for four analog audio I/Os with mic preamps and a dynamic range of 117dB; also features an interface for Riedel RockNet digital audio networks, two DisplayPort outputs, three GigE ports, and connections for serial data and GPIs.

www.riedel.net

PRODUCTION SUITE

Primestream XDCAM support

Now integrates with the Sony XCDAM Station family of professional media recorders; XDCAM Station users can now easily import content into FORK's media asset management software using the FORK Ingest module; in addition, users can now use FORK to control the XDCAM Station in both recording and playout modes, in effect adding master control playout and production automation capabilities to the XDCAM Station.

www.primestream.com

LED LIGHT

Frezzi HyLight

Compact, travel friendly all-weather studio-quality portable LED light for news, field production and studios; powered by AC mains or standard broadcast snap-on or V-mount camera batteries; output is fully dimmable without color shift; features interchangeable LED power modules to change beam angle and color temperature in seconds.

www.frezzi.com

CONTENT MANAGEMENT AND AUTOMATION

Evertz Mediator

New features include automatic join-in-progress with content dead roll, live break insertion without altering the automation list for breaks in live events, a new graphics workflow with integrated template tools, and new configuration tools to customize workflows, tasks and playtime templates; cost-effectively scales services across multiple linear and nonlinear channels.

www.evertz.com.

Great Things. Small Packages.

The UTAH-100 family of routing and distribution products from Utah Scientific has a well-earned reputation for value, performance, and reliability. Two new members of the family are adding ***flexibility*** to the list.

The **UTAH-100/XFD** Fiber Distribution Frame packs up to 16 channels of coax-to-fiber and fiber-to-coax conversion into a compact 1RU frame.

Fiber-per-channel, WDM, and CWDM solutions, including Gigabit Ethernet over fiber, make this unit the logical choice for all of your fiber applications.

The **UTAH-100/XHDA** is a 3G-capable High Definition Distribution Amplifier with a big difference. It has 8 amplifier blocks, each of which can be programmed by the internal web interface to serve 2, 4, 6 or 8 outputs.

This unmatched flexibility makes it perfect for mobile systems, allowing a single unit to replace racks of DAs.

The UTAH-100 family offers a wide selection of routers in all signal formats in sizes from 8x8 to 32x32 with standard built-in web control and options for built-in or remote control panels, third-party control interfaces, redundant power supplies.

The family also includes Distribution Amplifier packages and modular DA solutions for all applications.

Contact your Utah Scientific representative today or visit us at: www.utahscientific.com for more information on this ever-expanding product family.

10 Year WARRANTY The Best in the Business

Utah Scientific

www.utahscientific.com

3G FIBER-TO-TRIAX CONVERTER
Grass Valley LDK 4427

Performs a 1-to-1 conversion of a 3G fiber camera signal to a 3G Triax signal; ancillary data — such as return video, control and intercom — are also converted on a 1-to-1 basis; delivers all HD video formats: 720p, 1080i and 1080p, from the base station; compatible with the LDK 8000 Elite and LDK 4000 Elite HD camera heads.

www.grassvalley.com

CHANNEL PLAYOUT DEVICE
Harmonic Spectrum channelPort

Integrated channel playout device for Spectrum media server; combines channel branding and master control switching with clip playout; supports four SD/HD channels per RU with up/down/crossconversion; includes EAS support; fits seamlessly into existing production and playout infrastructures, reducing complexity and the time it takes to launch new services.

www.harmonicinc.com

MEDIA CONVERGENCE PLATFORM
Harris Selenio

Features an MDX2 multiplexer module to reduce video headend infrastructure for DTV broadcasters; built-in DVB-T2 gateway can combine up to eight physical layer pipes within a single output stream enabling delivery of multiple tiers of digital services; MDX2 also features a built-in SFN adaptation for signal distribution across large over-the-air DTV networks — ideal for DVB-T/T2 and ISDB-Tb standards.

www.broadcast.harris.com

PRODUCTION CONTROL SYSTEM
Hi Tech Systems AViTA

Production system for the control of video servers over a network; provides the operator with a familiar hardware control panel, although the system can be operated as a software-only package; panels can have two or three control modules that can be mixed or matched to suit individual needs; every button on each panel is easily configurable to suit operational requirements; has a MOS interface to a Newsroom Computer System.

www.hitechsys.com

ANTENNA
Jampro Antennas JAT-U

Broadband batwing IV/V 470MHz to 860MHz antenna; radome-enclosed unit can be either top- or side-mounted on a tower; minimum windloading while providing broadband response makes it ideal for applications where either one channel is defined or multiple channels are combined.

www.jampro.com

4K CAMCORDER
JVC GY-HMQ10

Powered by JVC's Falconbrid LSI chip, provides high-speed signal processing; a 1/2in CMOS imager with 8.3 million active pixels; captures, records and plays video in real time at 4X resolution of HDTV (3840 x 2160) at 24p, 50p or 60p; also captures and records 1080i or 1080p60 full HD; built-in F2.8 10X zoom lens with optical image stabilizer.

pro.jvc.com

LOUDNESS CONTROLLER
Linear Acoustic AERO.lite

Two-channel loudness controller in 1RU package; offers HD/SD-SDI, AES, and analog inputs and outputs; audio is extracted from any HD/SD-SDI path for processing; audio can be re-embedded into any or all SDI pairs; GPI/O alarms and controls; options include integrated ITU-R BS.1770 loudness meter, SNMP and external redundant power supply.

www.linearacoustic.com

VIDEO SERVER
EVS XT3

Flexible 8-channel SD/HD and 6-channel 3D/1080p configurations; new generation of XT servers combines EVS' speed and reliability with ultimate capability and performance; supports unique loop recording and powerful networking capabilities; offers complete media control from ingest to playout, including live editing, slow-motion replays, and multichannel playback and transfer to third-party systems such as craft editors, automation, archiving or storage.

www.evs.tv

CONTENT AND WORKFLOW MANAGEMENT PLATFORM
Prime Focus Technologies CLEAR

Innovative hybrid-cloud content operations platform offers client-friendly dashboards and automation; features new automated fulfillment system for syndication and delivery; adaptive streaming feature seamlessly throttles content quality based on available network bandwidth, compensating for latency in transmission; has an integrated HTML5 video player.

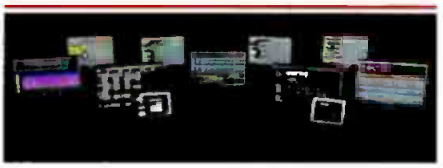
www.primefocustechnologies.com

GRAPHICS SYSTEM
PlayBox Technology TitleBox Dashboard

Provides remote control of TitleBox objects arranged in a playlist with hierarchical structure; ideal for known events; features full flexibility to add and change events needed in live programs.

www.playbox.tv

PRODUCTION SUITE
Primestream FORK 3.0



Manages and automates Adobe Premiere Pro, Sony XDCAM and Harmonic ChannelPort broadcast workflows; enables larger installations to quickly and more efficiently build workflows for multiscreen delivery; system includes FORK Xchange Suite, a new application Web portal into the FORK environment, giving broadcasters and media enterprises instant access to content from any Web browser.

www.primestream.com

FLUID HEAD
OConnor Ultimate 1030D

Features 30lb capacity (1030Ds holds 41lb); include stepless, ultrasmooth pan-and-tilt fluid drag that provides control and stability for digital cinematography shooting; features Sinusoidal Counterbalance system for true, accurate balance at any point in the tilt range; provides a tilt range of ±90 degrees; ideal for use with full-format sensor lighter weight cameras, such as the RED EPIC and SCARLET, Sony F3, and Canon C300.

www.ocon.com

P2 HD HANDHELD CAMERA
Panasonic AG-HPX255

P2 HD handheld camcorder with 10-bit, 4:2:2 independent-frame, full 1920 x 1080 resolution AVC-Intra recording; weighs 5.5lbs; has high-sensitivity 1/3in, full-HD 2.2-megapixel 3-MOS imager and a 20-bit DSP; features a wide 28mm to 616mm (35mm equivalent) 22X HD lens with three independent adjustable rings (zoom/focus/iris); lens includes optical stabilizer (O.I.S.).

www.panasonic.com

ON-CAMERA LIGHT
Litepanels Croma

LED light is a compact, portable fixture that's designed for users who move rapidly from one light environment to the next without time to change equipment; camera-mounted unit provides infinite control of both color temperature and lighting intensity via two ergonomic on-fixture dials; one offers the ability to dim from 100 percent to zero percent with no noticeable color shift, while the other lets users dial-in the fill light to any point between daylight (5600K) and tungsten (3200K) to precisely match the ambient light; draws 9W; provides the equivalent luminance output of 40W to 90W traditional fixtures.

www.litepanels.com

TECHNICAL FURNITURE
TBC Consoles SmartTrac V2

Features the ability to gang individual workstation components together to form complete master control and production control consoles; other features include optional electric height adjustment, multitiered monitor beam systems, a newly designed cable core with front access, power management, extended monitor Trac, and all new legs and feet.

www.tbcconsoles.com

VIDEO AND AUDIO MONITORING
Mediaproxy LogServer

Version 8 includes real-time loudness monitoring that is seamlessly integrated into the Web-based user interface; can export to DVD, H.264, Flash, iPhone and iPad; creates and displays user activity reports for security auditing and statistics; features live closed captions keyword monitoring; has full support for Internet Explorer, Firefox and Safari, on both PC and Mac.

www.mediaproxy.com

MASTER CONTROL SYSTEM
Miranda iTX MC

Integrates Miranda's iTX integrated playout platform with its master control system; combines playout automation with live event functionality; includes an automation system with roll-under and join-in-progress features; integrated HD/SD video server; input signal switching and processing; able to seamlessly switch between multiple HD or SD sources with a mix of stereo or 5.1, PCM or Dolby E audio; supports rich branding of logos, in-show promos, junctions and live data tickers.

www.miranda.com

SLOW-MOTION SYSTEM
Newtek 3Play 425

Four-input, two-output slow-motion system supports the simultaneous display, recording and instant replay of all channels; designed to give users an affordable option to deliver instant replay and slow motion for broadcast, webcast, arena scoreboard displays and more, without sacrificing quality; existing customers of the NewTek TriCaster can incorporate 3Play 425 into their programming over Ethernet, freeing up the live video inputs for cameras.

www.newtek.com

SSD SERVER
Ross Video BlackStorm

New two-channel BlackStorm playout server uses DVCPro HD codec; provides four hours of internal HD storage; perfect for playing content in a live mobile video production applications providing faster data access and higher reliability; supports evergreen content such as stills, animations, wipes and transitions.

www.rossvideo.com

KVM LINE EXTENDER
Matrox Avio F120

Extends two single-link DVI video, KVM, audio and USB devices from the host system out to 6562ft over a single duplex LC-LC fiber-optic cable; uncompressed FO transmission maintains graphics performance and full frame-rate HD video with no latency; system-agnostic design and wide OS compatibility facilitate plug-and-play deployment.

www.matrox.com

LOUDNESS MONITORING
RTW TM3

Latest addition to the TouchMonitor range for pro-level loudness, true-peak and PPM metering for analog and digital stereo and 5.1 signals; includes features of the larger TM7 TM9 versions; controlled using a touch-sensitive display; basic version handles analog and digital stereo audio, while the 5.1 option adds support of six-channel digital input.

www.rtw.de

MANUAL CAMERA SUPPORT
Shotoku TP200

Two-stage pneumatic pedestal has a maximum payload range of more than 175lbs; supports a wide range of camera configurations; column and base are designed to offer maximum stability and operational flexibility; one-step foot brake and single-action cable guard enable precise movements and control at all times for fast and easy positioning.

www.shotoku.tv

SINGLE/MULTICHANNEL AUTOMATION SYSTEM

Rushworks A-LIST

Provides intuitive, single- or multichannel SD/HD output for broadcast, PEG channels and Internet TV; features include DTMF and GPIO triggers, drag-and-drop scheduling, Auto-Loop, Auto-Fill, Auto-Bug, File Segmenting, multiformat playback, real-time upconvert from SD to HD, router control, dedicated EAS crawl, traffic import and the ability to record live events; supports streaming directly from the system.

www.rushworks.tv

TRIPOD

Sachtler Ace

Features an ergonomic design and payload range of 8.8lbs; designed for lightweight HDV camcorders and video-enabled DSLR cameras; Synchronized Actuated Drag system enables exact and reproducible pans; camera setup can be quickly balanced with five-step counterbalance.

www.sachtler.com

WIRELESS MICROPHONE

Shure FP Wireless

Supported with intuitive, flexible components; includes portable receivers and XLR plug-on transmitters; quick setup with just two presses of a button — the first to find a clear frequency and the second to sync with the transmitter; compatible with up to 20 systems simultaneously; XLR and 3.5mm cable receiver output options, single transmitter and dual transmitter system options.

www.shure.com/americas/

AUDIO MONITOR
Qualis Audio Sentinel

Latest firmware v.124 now available for Sentinel Surround Sound audio monitor; new version provides dialog balance measurement; can simultaneously measure and display loudness of surround sound programs; measures loudness according to BS.1770-1 or BS.17702 standards; offers enhanced version of loudness report automation.

www.qualisaudio.com

COLOR CORRECTION AND FINISHING SYSTEM
Quantel Pablo

New features include a stereo 3-D multilayer timeline and 48fps timeline, as well as support for new digital capture formats such as the latest RED HDRx, RED color 3 and RED gamma 3; additional new tools include a tracker that includes both point- and area-based operation, Render on Export for saving time on deliverables production, and tight integration with stereo 3-D timelines from Avid Media Composer 6.

www.quantel.com

INTERCOM INTERFACE
Riedel Communications AVB series

Series of products includes the AVB-108 G2 Client, the Connect AVB and Connect AVBx8 panel interfaces; allow professional intercom users to connect intercom panels in IP-based LAN environments in real time; offers intercom applications over LAN infrastructures such as matrix-to-control panel connections, audio distribution, matrix-to-matrix trunking connections or distribution of digital partylines.

www.riedel.net

IP TRANSPORT STREAM MONITOR
Rohde & Schwarz R&S DVMS-B40 IP option

New option for the R&S DVMS family of compact monitoring systems is designed to help network operators achieve maximum operational reliability when feeding transport streams over IP networks; depending on the model, up to four signals can be measured simultaneously; monitors all relevant quality parameters in the IP transmission; if one of the transmitted transport streams is faulty, the new option can extract this stream and transmit it to the central monitoring station, also over IP.

www.rohde-schwarz.com

PORTABLE TRIAX CAMERA
Sony HDC-2550 HD

Uses newly developed 16-bit A/D, DSP and new image-sensors; provides 64dB S/N with noise suppression; supports Triax cabling; 1080i/720p standard, PsF format will be optionally available; enhanced creative features include multi-matrix, adaptive matrix, skin-tone detail, hyper gamma, view finder focus assist and automatic lens aberration compensation.

pro.sony.com

AUDIO INTERFACE
Stagetec XDIP

Interface board connects NEXUS to networks running Audinate's Dante, which enables powerful audio and media networks to be created on existing standard Ethernet TCP/IP infrastructure; module supports up to 64 bidirectional audio channels with different sampling rates; fully compatible with Dante's unique plug-and-play network integration with automatic device discovery and system configuration.

www.usa.stagetec.com

VIDEO COMPRESSION
Streambox Avenir 2

Dedicated ACT-L3 HD/SD mobile broadcasting device supports up to 24 3G/4G cellular aircards, dual Ethernet ports, BGAN and Wi-Fi; full duplex enables receiving and playback HD-SDI video in the field; has optional 3-D capability; new chassis design extends battery life and improves Wi-Fi reception; works directly with Streambox decoders, Enterprise server and Streambox Live.

www.streambox.com

SUBTITLE AND CAPTION PREPARATION
Screen Subtitling Systems WinCAPS Qu4ntum

Features a new user interface designed to enable caption and subtitle timing to be assessed easily against the media timeline; features text-to-speech alignment in multiple languages, extraction of dialogue payload from scripts, and integration with speech recognition so that dialogue can be respoken directly into the file to save time typing.

www.screensystems.tv

MULTIFORMAT VIDEO SERVERS
Skylark Technology SL NEO Media Servers

Feature a high level of reliability that allows broadcasters to record and play back simultaneously without error; can operate multichannel record lists and playlists with multilayer graphics formatting; bridge traditional broadcast technology with new channel-in-a-box technology by supporting the most popular third-party device brands such as routers and switchers.

www.skylark.tv

MEDIA ASSET MANAGEMENT
Snell Momentum

Employs thin-client SOA to control a suite of proprietary and third-party applications running on various hardware platforms, providing maximum control and flexibility to media and broadcast operators; reduces operational costs by allocating resources more efficiently and making content more accessible; simplifies the migration of tapeless processes to nonlinear workflows.

www.snellgroup.com

LENS
Thales Angenieux Optimo 28-340

PL-mount 28mm to 340mm T3.2 zoom lens has been designed for image coverage of up to 31.4mm diagonal for S35 film and large-format digital cameras; focus ring has a 327° focus rotation with more than 70 precise focus witness marks and minimal breathing; 24.4lbs; close focus of 4'5".

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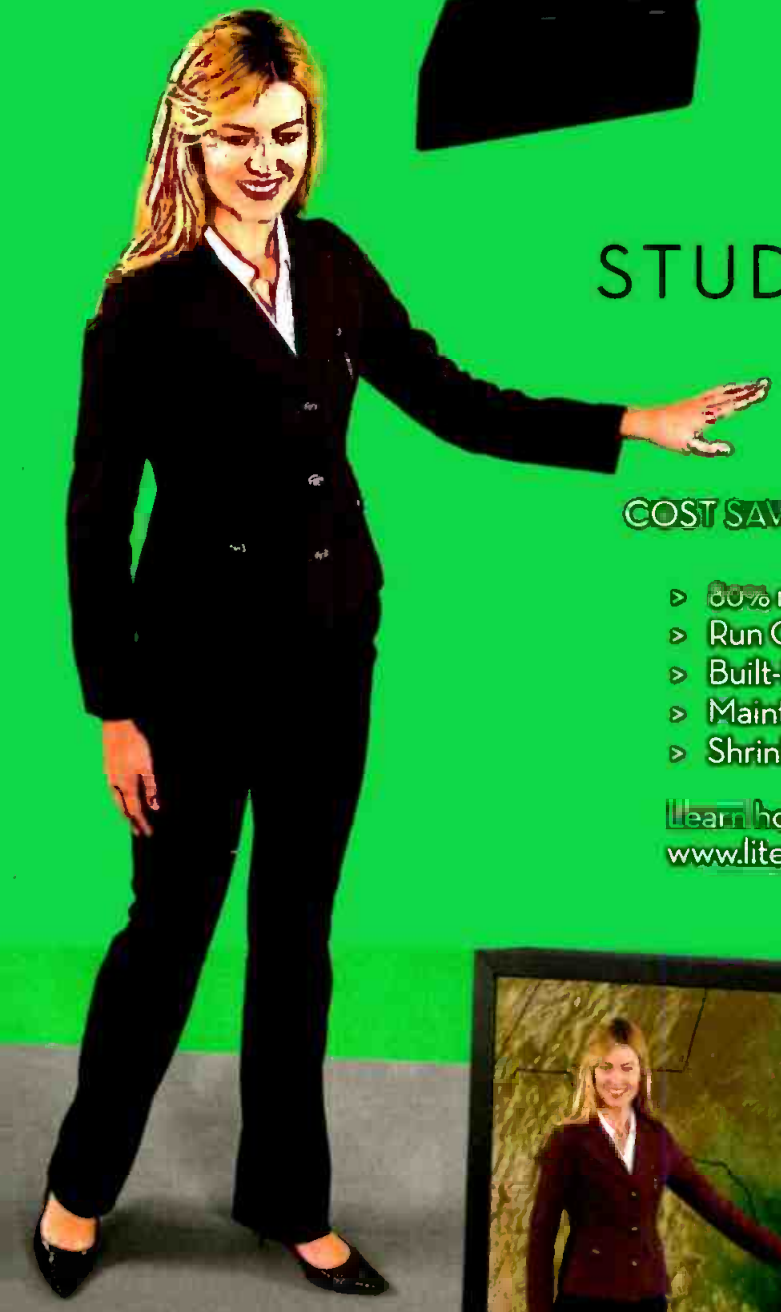

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TSL PAM2 3G16 MK2

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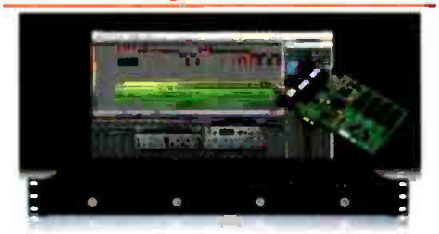
www.tsl.co.uk

AUDIO CONSOLE
Wheatstone Dimension One

Uses the company's Gibraltar DSP engine; control surface features motorized faders and is layered so that each fader controls two sources, each of which can be mono, stereo or full 5.1; faders can be "paged" together or separately; each fader also has a "spill" function, which allows its individual channels to spill out onto separate faders (two for stereo or six for 5.1 sources); LED displays always indicate a fader's current source to eliminate operator confusion; features automatic mic mixing to optimizes the levels of several microphones during dialogue, and Audio-Follow-Video (AFV), which allows the console to automatically control input channels based on the video source currently being taken.

www.wheatstone-tv.com

BROADCAST RECORDING SYSTEM
Solid State Logic Live-Record



System connects via standard optical MADI, so it can connect directly to MADI-equipped digital mixing consoles, venue audio distribution infrastructure or broadcast routers; presents cost saving opportunities when compared to hard disk recorders or other DAW recorder systems; can record up to 128 channels at 24-bit/48kHz or 64 channels at 24-bit/96kHz.

www.solidstatelogic.com

PAN-AND-TILT HEAD AND TRIPOD SYSTEM
Vinten Vision blue5

Lightweight system has a carrying capacity range of 12.1lb to 26.5lb @ 100mm CofG; infinitely adjustable Perfect Balance and LF drag technology provide smooth control and consistent movement quality; ideal for supporting the latest generation of professional camcorders and accessories.

www.vinten.com

VIDEO ENCODER
Telairity SES3200

Encoder is able to generate up to 32 channels of video and 128 channels of audio in a single, completely modular chassis; based on Telairity's proprietary Telairity-1 scalable architecture; input modules support eight connections each and handle SDI, ASI or IP input; transcoding option is available, which allows MPTS as inputs over ASI or GigE connections.

www.telairity.com

REAL-TIME MONITORING
Video Clarity RTM

The OTT feature offers automatic IP feed decoding with source video scaling to match downstream delivered formats; provides accurate assessment of picture quality; measures audio-video offset (lip sync); measures VANC data lines integrity; activates alarms and records the A/V sequences if any of the above have fallen below the degradation threshold.

www.videoclarity.com.

HD OVER ENG LINK
TVU Networks BD1000

Live HD ENG transmission system delivers HD broadcast quality over SD microwave and satellite links or 3G/4G/LTE wireless connections; uses TVU's Real-time Packet Replication (RPR) technology; packaged in a compact 1RU format; DVB-ASI interface connects to any digital SD resolution dedicated microwave or satellite link to provide live HD video transmission.

www.tvupack.com

REAL-TIME STEREO 3-D ANALYZER
Fraunhofer Institute STAN

Captures and analyzes stereo 3-D in real time; using actuators, interaxial distance rig can be adjusted automatically so that specified disparity range is not exceeded and stereo images are rectified; corrects residual distortions in color and stereo geometry; helps avoid eyestrain, headache and visual fatigue.

www.fraunhofer.de

ANTENNA MOUNT
K-Tek Shark

Designed to attach periodic antennas as well as wireless receivers, IFB and video receiver antennas, and microphones; T Shark and L Shark models provide multiple 3/8 x 16 threaded studs that are movable; bracket for each model has a cold shoe with a 5/8 x 27 removable threaded stud; ideal for most IFB antennas.

www.ktekbooms.com

WORKSTATION
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Offers up to 16 physical CPU cores and 32 logical CPU cores with Intel Xeon processor E5 2600 series Romley CPUs; up to 768GB of RAM and PCI Express 3.0 architecture; features NVIDIA Quadro 6000 professional graphics with Scalable Geometry Engine technology delivering 1.3 billion triangles per second; supports up to four double-wide graphics cards and/or GPUs.

www.lightbeamsystems.com

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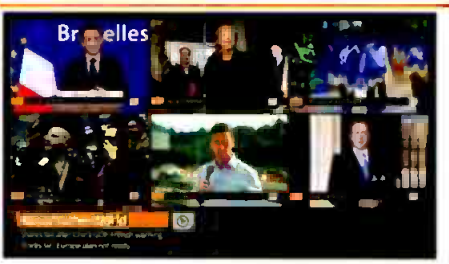
www.lowel.com

ON-CAMERA MONITOR
ViewZ VZ056F-3G

Features 5.6in LED screen with 1280 x 800 resolution; 3G-SDI input; 1:1 pixel mode; includes waveform, vectorscope, UMD, jog dial; HDMI to SDI active loop through; 0.5W power consumption.

www.viewzusa.com

STUDIO CONTROL SYSTEM
Orad TD Control



Allows users to select different video box compositions with a click of a button on their video switchers; technical director control is based on a touch-screen user interface that resides in the switcher; allows technical directors to select the different video box compositions and assign different video sources to each of the video boxes; this enables tasks that could not have been achieved before, such as switching on-air from six video sources to completely different video sources with one click of a button.

www.orad.tv

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ASSET MANAGEMENT

Square Box CatDV 9.0

Upgraded solution now features support for reading Adobe XMP and IPTC metadata and SRT subtitle files; has simplified import and export of screen layouts and other settings; employs powerful API for third-party application development; integrates with Avid via the new MME widget; has user interface improvements, such as the use of star ratings for favorite clips.

www.squarebox.com

NLE

Sony Creative Software Vegas Pro 11

Features GPU-accelerated video processing using OpenCL-compatible hardware, improving timeline playback performance and render times; adds New Titles & Text plug-in; "per-parameter" keyframing for many video plug-ins; adds Floating Windows masking tool in the Stereoscopic 3D Adjust plug-in, to compensate for screen-edge violations; supports NVIDIA 3D Vision on single-display systems; adds support for RED EPIC clips.

www.sonycreative.com

VIDEO RECORDER

Sound Devices PIX 260

Rack-mounted, file-based recorder records and plays files up to 220Mb/s in 10-bit 4:2:2 video as well as 32 tracks of 48kHz audio; has simultaneous recording on up to four eSATA-connected drives; features 5in, 800 x 480 pixel video display; can record and play up to 16 channels of embedded SDI audio; has embedded Web server for machine transport over Ethernet-based networks.

www.sounddevices.com

AUDIO PLATFORM

SRS Labs Multi-Dimension Audio (MDA)

Designed to deliver 3D surround sound to consumers in a wide variety of playback environments and devices; allows content creators to create, maintain and deliver 3D positional data with soundtrack elements in a multidimensional audio space that includes height, depth and width, rather than standard planar speaker configurations such a 5.1 and 7.1; not channel-based, so there is no restriction on the number of speakers that can be used to represent the resolution of a multidimensional audio soundscape.

www.srslabs.com

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www.visualunity.com

MOBILE INTERFACE

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Allows access to content anywhere, anytime through an iPad or iPhone; designed to provide greater flexibility, portability and the added convenience of accessing live Observer streaming along with back-navigation of previously recorded content from both local and remote locations; offers the ability to play, pause, search and create logged content on demand using smart devices; provides broadcasters with instant access to the final broadcast product to ensure quality and compliance.

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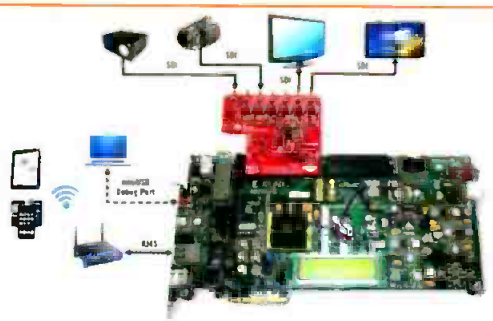
REAL-TIME VIDEO ENGINE FPGA

Xilinx RTVE



With a Web-based GUI, engineers can quickly design routers, switchers and multiviewers that adapt and integrate with new consumer standards; supports improved interaction with consumer SDI interfaces such as DisplayPort, HDMI and Thunderbolt; enables the aggregation and transmission of video over IT-based networks; allows for a dual processing pipeline, 10-bit/4:4:4 processing.

www.xilinx.com

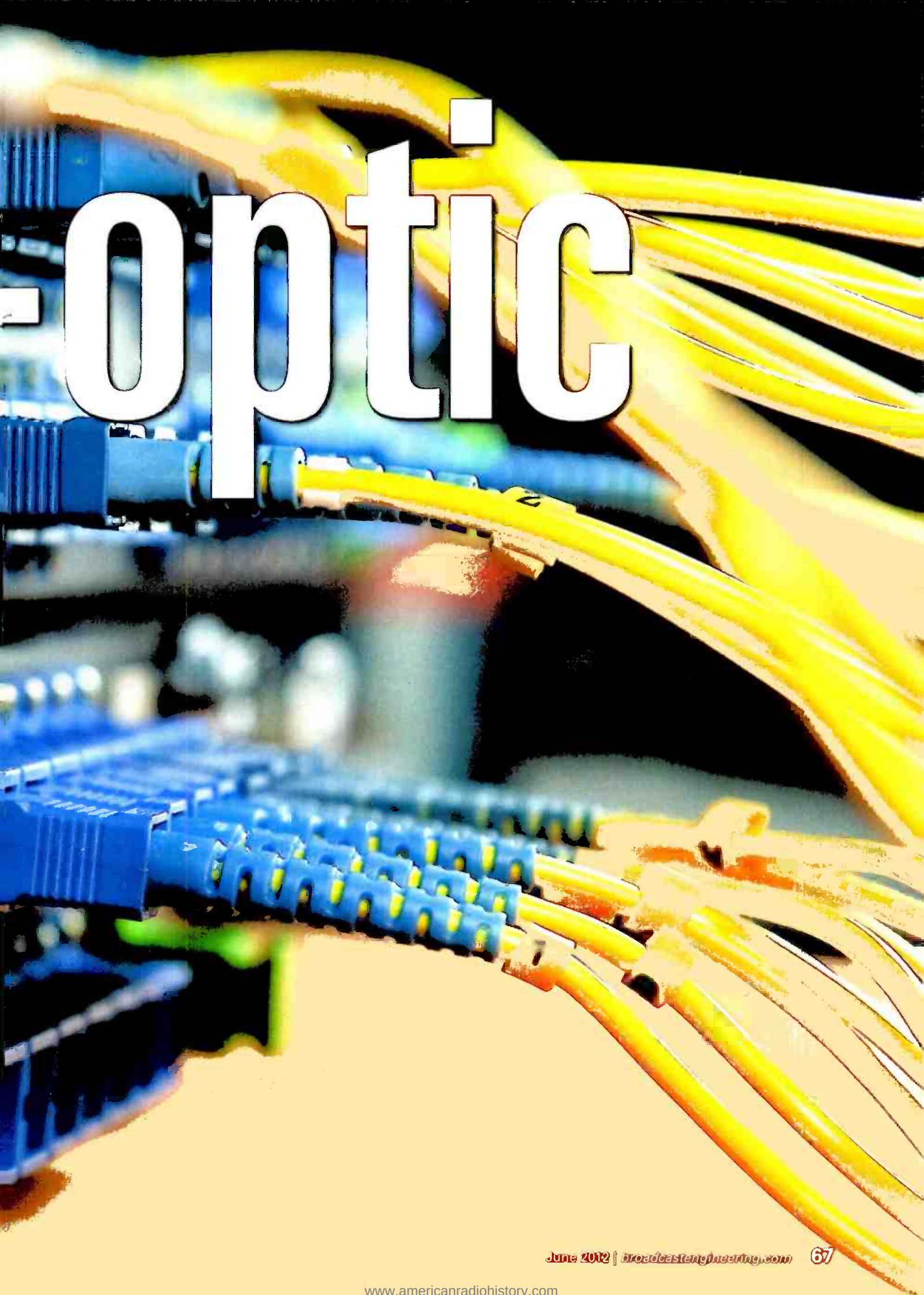
A fiber tutorial, part 1

Understand the basic components of optical fiber and different fiber types.

BY RENAUD LAVOIE

In a previous *Broadcast Engineering* article ("Understanding blocking capacitor effects," August 2011), I mentioned that one of the first tasks in my broadcast engineer career was to work on optical-to-electrical (O2E) and electrical-to-optical (E2O) converters. I explained that I tried different SFPs with video pathological signals without any success at that time. Before joining this broadcast business, I used to work in the telecommunication world, where I learned the basic fundamentals of optical communication. With this article, I hope end users and designers will understand a little bit more the concept and theory behind fiber transport.

The quantity of information on fiber optics is huge. There are multiple books and websites dedicated to it, as well as multiple papers from IEEE research. The question for me was: What should I explain, and in how much detail? You will find the answers inside this series of articles, and the hope is that they will be specific enough to spark your interest for fiber. This first part will describe the physics and types of fibers. Then, the second part will describe



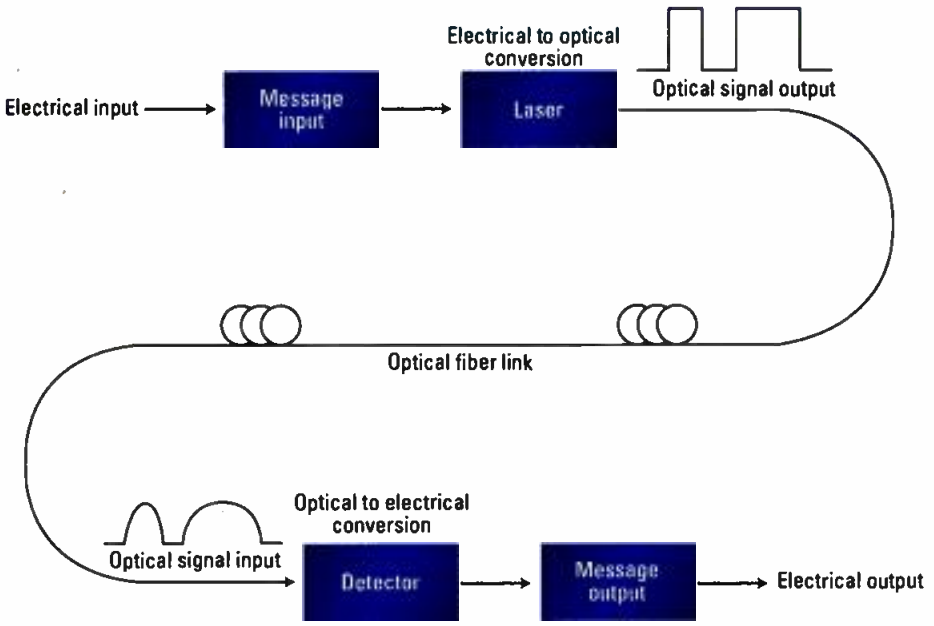


Figure 1. This shows the typical components found in a point-to-point optical communication system.

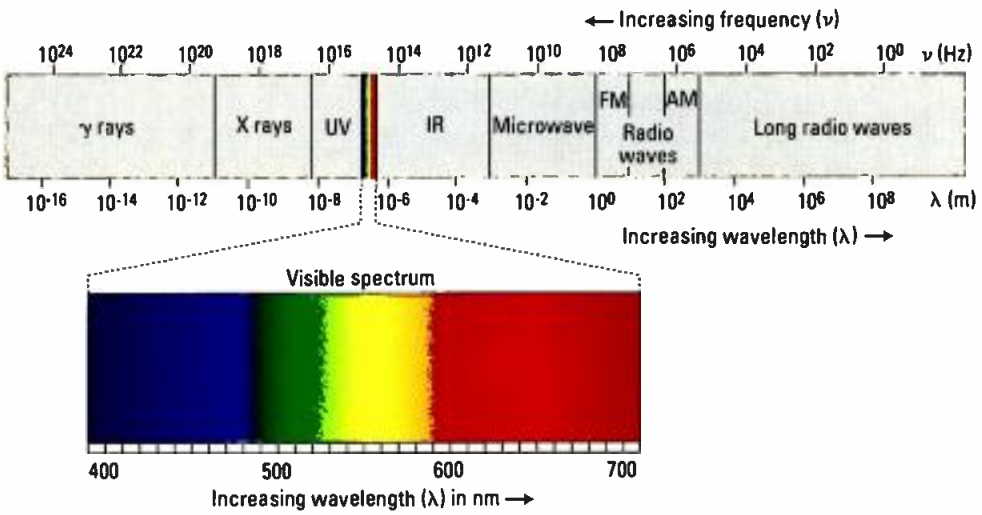


Figure 2. This shows the light spectrum, which is electromagnetic radiation that is visible or invisible to the human eye. Without visible light, the human sense of sight is not possible.

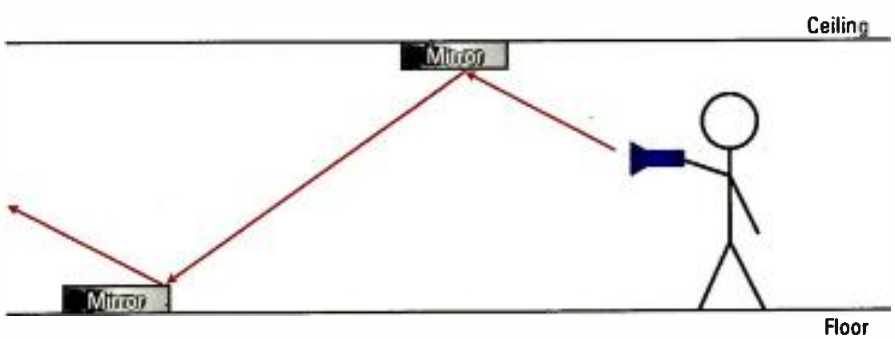


Figure 3. By shining a light and reflecting it off mirrors on the ceiling and floor, it is possible to model how light travels in fiber.

the conversion between electrical signals and light at the source and destination, as well as the effect of the fiber on the optical signal.

Optical beginning

Optical communication motivation began with the invention of the laser in the early 1960s. Since then, the technology has evolved at the speed of light. Optical technology has advanced so fast that it has become the information conduit of the world. The transmission of data, voice and media is distributed at the speed of light over a mesh of glass fibers that span thousands of kilometers throughout the world. In this article, I will explain the elements included in Figure 1, the physics of light, and the basics of the fiber optic medium.

Light and basic formulas

The general definition of light says it is electromagnetic radiation that is visible or invisible to the human eye, and is responsible for the sense of sight when visible. (See Figure 2.) Primary properties of light are: intensity, propagation direction, frequency or wavelength spectrum, and polarization. In a vacuum, the velocity of light is 299,792,458m/s and is one of the constants of nature. It is represented by "c" in the equation shown below. (This constant could change based on recent experimental results of Neutrinos, however, so stay tuned.)

Light is a wave that propagates through space. This space can be a vacuum, or air, or certain materials such as glass or plastic, both of which can be used for fiber production. Quickly, one question becomes: What is the speed of light inside the fiber? The speed of light inside the glass or plastic fiber can be obtained from the following equation:

$$s = \frac{c}{n}$$

This equation is almost identical to that for an electrical signal in a piece of coaxial cable, or a radio signal transmitted through a waveguide. In fact, fiber-optic cables are often called

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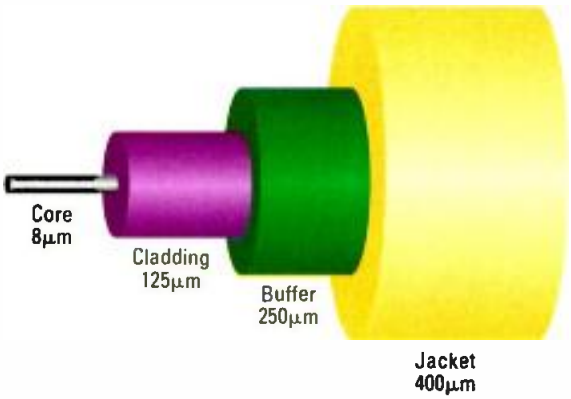

Figure 4. The optical fiber is made up of two concentric, cylindrical strands of silica surrounded by a plastic coating.

waveguides, and the glass or plastic is referred to as the dielectric. In our example, "s" is the speed of light in a material and "n" is the refractive index for that material. In silica glass, the refractive index is 1.45, so the light will travel at 225,407.863m/s.

Let's look at some other properties of light:

- *Intensity* — Intensity is measured in Lumens. But, fiber-optic system design is easiest if we know the power generated by the light source. This parameter will be expressed in dBm.

$$dBm = 10 \times \log_{10} (Power\ in\ mW)$$

- *Propagation direction* — To understand propagation, take a flashlight and put it over a mirror. If the light was directional (straight propagation), no light would bounce (reflect) off the mirror, right? The source is sending light in various directions, like a cone. Also, you see the mirror reflect the light. Next, place mirrors on the floor and ceiling. Your light will travel in air exactly like light in fiber. (See Figure 3 on page 68.)
- *Wavelength* — Light wavelength depends on its source. Every source has a wavelength or spectrum of wavelengths. (We will explore this more with laser and photodiode light sources in the next article, part 2.)
- *Polarization* — Light is electromagnetic radiation (E-M radiation) composed of two components — electrical and magnetic. These components oscillate in phase with each other. When light travels in free space, these fields are normally perpendicular. But sometimes, the oscillation may rotate

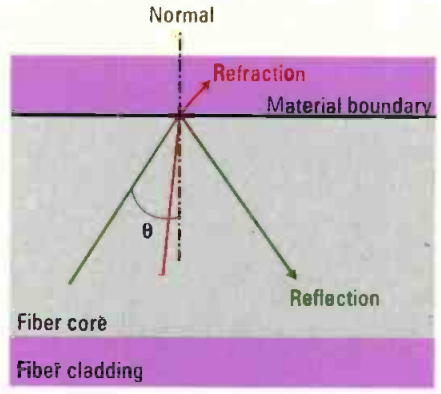

Figure 5. Light is confined within the optical fiber core through reflection.

right or left. This effect is called polarization, and can be more complicated.

Optical fiber as a medium

Broadcast engineers are well familiar with coaxial cable as it has been around for years. Coax is still employed at many places and in different infrastructures. The semiconductors used to receive and transmit the SDI signals are always improving, and now businesses can reach distances of more than 180m. Even with these advancements, fiber is used for longer runs.

In the 1960s, Charles Kao pursued the idea of using clad glass fiber for an optical waveguide (making the light bounce on the fiber boundary, like the mirror example). Kao targeted losses of less than 20dB/km and reached his goal in the early 1970s. Today, single-mode fiber loss is 0.1db/km to 0.5db/km.

Optical fiber structure

The optical fiber is made up of two concentric, cylindrical strands of silica surrounded by a plastic coating. (See Figure 4.) The center-most silica strand is the fiber core with a refractive index of approximately 1.48. The core of the fiber physically transports most of the optical power.

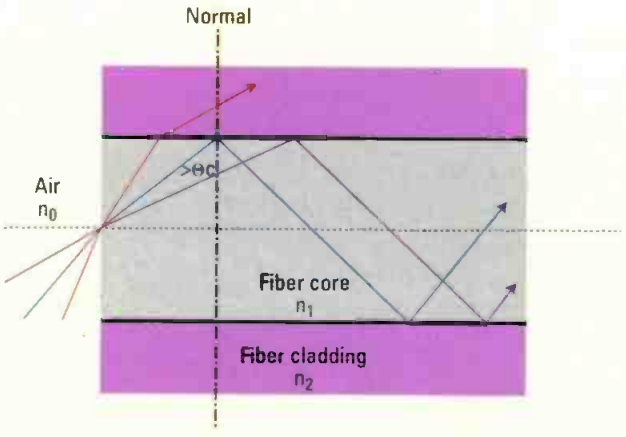

Figure 6. Multimode fiber allows multiple rays to propagate simultaneously down the fiber.

The core is surrounded by another strand of silica called cladding. The cladding has a slightly lower refractive index, 1.46, and acts like my mirrors. The goal of the cladding is to keep the energy inside the core by reflecting all of the light back into the core.

Let's also consider, for now, the fiber is perfect. Attenuation and dispersion losses will be discussed later.

Theory of reflection

Like my mirror example, the light in the fiber should reflect on the boundary of the core and the cladding. From the previous equation, we learned the concept of the refractive indexes "n." Because the core and cladding don't have the same refractive indices, it should be possible to keep all energy inside the core. This is called Total Internal Reflection. However, it is not possible under all conditions.

Multimode fiber is sensitive to dispersion, which tends to limit the distance and bandwidth of an optical system.

But, because the cladding is glass, sometimes light will escape in specific conditions, and signal energy is lost.

The outermost layer of the optical fiber is the buffer coating. This thin, plastic covering protects the glass from mechanical and environmental damage. Finally, the buffer is covered by the jacket. You might observe two colors of external jackets, orange and yellow. Orange is used for multimode fiber and yellow for single-mode fiber (mono) mode.

The relationship describing refraction at the interface between two different light-transmitting materials is known as Snell's law, and it is represented as:

$$n_1 \sin\phi_1 = n_2 \sign\phi_2$$

or

$$n_1 \cos\theta_1 = n_2 \cos\theta_2$$

Consider a ray of light passing between two media of different refractive indices n1 and n2, as Snell's equation shows. Reflection occurs when ncore > ncladding, and the incident ray of light makes an angle, Θ_c, such that it doesn't enter the adjacent medium but travels along the interface. At angles greater than Θ_c, it is reflected into medium A.

Light is confined within the core of the optical fiber through reflection. To understand reflection and how it's responsible for light confinement in an optical fiber, consider a ray of light incident on the fiber core. (See Figure 5 on page 71.)

Light enters the fiber core and strikes the core/cladding interface at an angle Θ. If this angle is greater than the critical angle (i.e. $\Theta \geq \Theta_c$ where Θ_c = arcsin(n2/n1)), the ray will reflect back into the core, thus experiencing total internal reflection. This ray will continue to experience total internal reflection as it comes upon core/cladding interfaces while propagating down the fiber.

Multimode fiber

The name multimode fiber comes from the number of waves (light paths) guided in the core. The most popular size is 65µm, but for some systems, 50µm is a better choice.

Multimode fiber allows multiple rays/modes to couple and propagate down the fiber at the same time. (See Figure 6 on page 71.) Large core fiber is attractive due to the ease in which light can be coupled into the fiber, greatly reducing transmitter design and packaging costs. Multimode fiber is sensitive to dispersion, which tends to limit an optical system's distance and bandwidth. Multimode fiber can be stepped-refractive-index-profile, or graded-index-profile. (See Figures 7 and 8.)

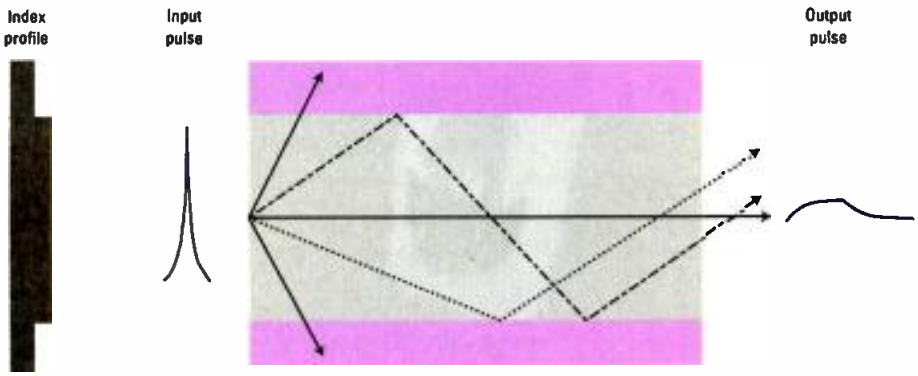

Figure 7. This shows a multimode fiber that is stepped-refractive-index-profile.

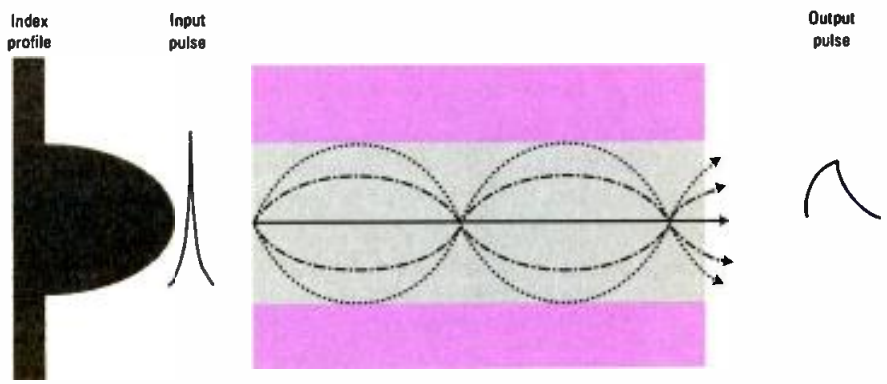

Figure 8. This shows a multimode fiber that is graded-index-profile.

Both figures show an input pulse is made up of multiple modes/rays. Each of the three rays takes different paths propagating through the core of the multimode fiber stepped refractive index and graded index profile. As a result, the three light rays arrive at different times, which causes broadening of the input pulse. This is dispersion and can lead to inter-symbol interference.

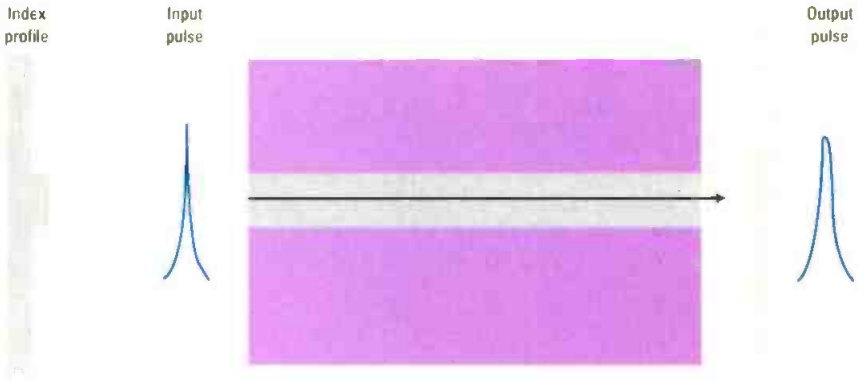

Figure 9. A single-mode fiber (mono mode) only allows one ray/mode to propagate through the fiber. This is done by shrinking the fiber core to comparable dimensions of the transmitted wavelength.

Single-mode fiber

As the name implies, a single-mode fiber only allows one ray/mode to propagate through the fiber core. (See Figure 9.) This is accomplished by shrinking the core of the fiber to dimensions comparable to that of the wavelength being transmitted. Single-mode fiber has a core dimension of ~9µm, making transmitter coupling much more difficult. Consequentially, single-mode fiber systems employ higher-costing lasers. However, single-mode fiber has an advantage of higher capacity/bandwidth and is also much less sensitive to the effects of dispersion than multimode fiber. It is also possible to incorporate wavelength division multiplexing techniques to further increase the transmission capacity of a single-mode fiber.

Looking forward

My next article will describe the different sources, different types of receivers and various loss-generating effects such as attenuation, dispersion and return loss in the fiber optic cable itself. BE

Renaud Lavoie is president and CEO of Embrionix Design.

IP contribution networks for live broadcast

There is an alternative to satellite and microwave feeds.

BY HELGE STEPHANSEN

Traditionally, live remote broadcasts have used microwave and satellite feeds to deliver signals from the event location to the broadcast studio. These are still highly viable methods, and they remain in the broadcaster's toolkit for managing live events. However, with the growth and maturity of IP networks, there is a third reliable option for delivering high-quality contribution content: video over IP.

Some of the keys to broadcast-quality reliability over IP include extensive FEC, diversity, low latency, error correction, redundancy and robust encoding/decoding. With the improved speed and reliability of IP networks, careful planning can result in high-quality contribution feeds that are reasonably priced and can be established quickly.

With recent advances, video over IP contribution is now a reality for live remote broadcasts. Some of the key developments to broadcast-quality reliability over IP include extensive FEC, diversity, low latency, error correction, redundancy and robust encoding/decoding.

Cost is always a consideration. Fortunately, because most commercial buildings now have Ethernet cabling, IP links are easier than ever to use. Even if cabling has to be added, the components and skills needed to create the links are low-cost and readily available. A suitable Internet connection can be provided by the local telco, cable company or other commercial IP bandwidth provider. In addition, because these links are more or less standard commercial IP networks and not a dedicated video-only network, no special installation skills are required, which helps keep installation costs low.

Whenever a commercial network is contracted for this IP service, it's critical that the provider is aware of the QoS necessary for contribution-quality television links. Depending on the location and the type of service available, it may be necessary to use two high-speed links to provide the main feed, and then another path to provide redundancy.

Let's consider some of the inherent advantages IP links may have over more traditional satellite and microwave remote feeds. These include simple return paths for control and intercom, as well as computer networking for Web access and e-mail. If ENG crews tend to work at certain locations (city hall, sports arenas, police stations, auditoriums, etc.), these locations can be wired for IP connectivity with much higher capacity and control capability. The system can even be extended to backhaul the cameras, using, for example, 10 JPEG 2000 links over a GigE pipe for remote production, eliminating the need for a complete OB truck.

FEC

Improvements in FEC play a big role in the ability of IP networks to deliver reliable high-quality video. SMPTE 2022-1 addresses FEC in IP networks and can be implemented with QoS-aware routers. The FEC data is put in its own packet and sent on a different path to the receiving end. There, it is combined with the primary signal to eliminate any loss of packets or jitter in the primary signal. The specification requires interleaving of FEC packets for still more reliability, but this introduces latency.

The jitter and latency specifications for MPEG-2 transport streams are generally tighter than IP standards.

Improvements in FEC play a big role in the ability of IP networks to deliver reliable high-quality video.

The SMPTE FEC specification identifies a matrix of 10 x 10 IP packets as a typical packet array. This is sufficient to compensate for burst losses of up to 5ms. Advanced encoders and decoders can widen the protection range to up to 50ms, which is similar to the time needed to automatically reroute a signal in the event of link failure.

In addition to error correction, it's also possible to conceal the effects of packet loss or other link anomalies. If the loss is severe enough to cause breakup, the receiver can repeat the last good frame. JPEG 2000 codecs often use this technique, as they compress each frame and, therefore, always have a last good frame available.

The jitter and latency specifications for MPEG-2 transport streams are generally tighter than the standards in IP networks. Identified in the ITU Y.1541 standard, IP packets can have an arrival time that varies by up to 50ms as a result of network traffic and IP buffer status. This can be compensated for by adding latency and managing the buffer output rate. A receiver with a configurable IP buffer lets the operator set the delay to cover any late-arriving FEC packets.

Redundancy and robustness

A big part of a successful IP contribution network is redundancy — how the system can be protected against single points of failure. There are several possible approaches to ensuring efficient redundancy. One option is to choose a configuration where the IP network itself automatically selects and forwards one stream at a time from the transmitter. Another option is to send two streams from the source to the destination, but on different network paths. A third is to combine the first two options to increase the robustness even more.

The first approach uses interaction with IP routing protocols. Two independent transmitters are set up to send exactly the same multicast with the same "virtual" source unicast address. The rules of multicast forwarding in an IP network mean that a router will only forward multicasts that arrive on the "shortest" path to the source of the signal. By manipulating link costs using routing protocols like Routing Information Protocol (RIPv2) and Open Shortest Path First (OSPF), it is possible to achieve redundancy switchovers. OSPF is the newest of these and provides the fastest switching times.

With OSPF, an exchange of link status advertisement messages (LSAs) is used to build the routing tree and calculate the shortest path to any destination. A transmitting device will send LSA messages based on the alarm status of the transmitted signal. When a router receives two redundant multicasts, it will only forward the "best" multicast — e.g. the signal that arrives on the port that is on the shortest path to the source.

Changeover in an OSPF system

is fast, with switching times of one second or less. Such a system will automatically sense a failure and immediately switch to the backup route. OSPF is relatively simple and easy to implement, but a drawback is that it may cause a short break in the program when changeover occurs.

The second approach uses two parallel signals all the way from the source to the destination. With a single transmitter and receiver connected with two high-quality IP links, IP packets can be synchronized at the receiver end. The receiver rebuilds the video stream using IP RTP sequence numbers. This approach will work perfectly as long as the two network connections do not lose the same segment of program data. This can be referred to as "IP diversity" mode

The last approach may be combined with the first to increase the robustness even more, i.e. combining IP diversity with OSPF. IP diversity provides a glitch-free service in the event of the loss of one of the links, while the OSPF mechanism makes sure that automatic redundancy switching will be performed in case of transmit equipment or source signal failure.

Contribution quality

Maintaining the quality necessary for contribution feeds can be done with MPEG-2, MPEG-4 and H.264/AVC encoding. However, while these technologies work well for the distribution side of broadcasting (e.g., from the broadcaster to the home), they are not ideal for contribution feeds. MPEG's GOP structure makes it vulnerable to coding impairments and transmission loss. Neither MPEG nor AVC works well in an environment where signals are repeatedly encoded and decoded. These systems use DCT compression, which is inherently lossy; they throw away pixel data and re-create the image based on predicting movement in the frames.

JPEG 2000 encoding uses wavelet compression and is inherently lossless, although it cannot be compressed as deeply as MPEG and AVC. With JPEG 2000 encoding, each frame is discretely encoded and there are no predicted frames. This is ideal for the contribution side of broadcasting, as it works well with editing systems and can endure multiple encode/decode stages without loss. Using redundant high-quality IP links, appropriate FEC, modern routers with OSPF capability and JPEG 2000 encoding, IP feeds can be confidently used for even the most critical HD and 3-D outside broadcast events.

For contribution via satellite and/or lower bandwidth telco links, MPEG-4 encoding provides another solid alternative. For those looking to deploy hybrid systems including existing satellite infrastructure and fiber-based IP networks, a high-end MPEG-4 10-bit system is a cost-effective and high-quality choice for live event contribution. With satellite links, operators must maximize limited bandwidth, which means delivering the highest video quality at the lowest bit rate. MPEG-4 is often a good choice.

For contribution via satellite and/or lower bandwidth telco links, MPEG-4 encoding provides another solid alternative.

Azzurro HD uses JPEG 2000 encoders and decoders to facilitate HD-SDI video contribution over an IP network.

Live contribution

Here are three real-world examples of successful implementations of live contribution of high-resolution, time-critical video over IP. Azzurro HD, a New York-based provider of broadcast-quality video transmission services, uses JPEG 2000 encoders and decoders to facilitate real-time HD-SDI video contribution over an IP network between Marist College in Poughkeepsie, NY, and its facility in New York City. The encoder/decoders enable live HD-SDI contribution video over IP from Marist College to be sent to any television network.

MTI Film, a provider of post-production and film restoration services, uses JPEG 2000 encoders and decoders to facilitate remote dailies and color correction collaboration of the revamped "Dallas" television series. With roughly 50Mb/s dedicated in each direction for color correction, the required post-production tasks can be handled over low-bandwidth links.

A1 Telekom Austria, Austria's telecommunications company, has equipped its newest fleet of OB vans with JPEG 2000 encoders and decoders, enabling a centralized news production model for Austrian national broadcaster ORF. The mobile news trucks are linked via an IP network to ORF's central editing studios. With the OB vans acting as roving fixed mobile units, ORF can now deliver high-quality video from 150 points of presence across Austria.

Satellite feeds and microwave trucks will remain necessary for many live news and event feeds. This is especially the case in situations where it is not possible to set up IP connections on short notice. However, in those instances where programming originates on a regular basis, redundant IP-based video networks combined with JPEG 2000 and MPEG-4 codecs can provide a simple and affordable path for high-quality contribution signals. BE

Helge Stephansen is chief technology officer, T-VIPS.

IT acronyms explained

You should know XML, SOA and REST, and what they do.

BY PAUL TURNER

As broadcast facilities and post-production houses implement new workflow and media management systems, they deal with an array of new IT-based technologies and are inundated with acronyms associated with those technologies, as well as the best practices concerning their use. Adoption of IT-based technologies continues apace with continued convergence across the media industry. Despite this rapid shift of operations into the IT realm, however, the industry as a whole has not been as fast in providing engineering staff with an education on the meaning of terms such as XML, WSDL, SOAP, SOA and REST, the technologies underpinning them, and the role they play in present and future media-focused operations. This article will review the most relevant acronyms, their fundamental principles and their typical applications.

XML and XML schema

Complex control systems depend on a reliable interchange of information in order to make the myriad business decisions that guide material through workflow. This is made simpler if individual systems can swap information in the form of structured data — that is, documents that contain both content and an indication of the content's role in the document. The concept of structured data is not new; humans have been dealing with information formatted this way for centuries. Examples include published (human-readable) books and magazines, as well as web pages displayed by a browser. In both cases, these systems indicate to the consumer the relevance and importance of any particular item on the page through the use of typographical hints — such as underlining text that hyperlinks to other documents. HTML achieves this by including "tags" in the document, and the browser uses those tags to determine how to emphasize the relative value of the associated data.

```
<author>William Shakespeare</author>
```

Figure 1. Unlike HTML, XML allows users to define their own tags. It provides a facility for defining tags and using them within a document.

As a markup language, HTML represents a fairly limited set of standardized tags intended for the presentation of web content, so its utility beyond that scope likewise is limited.

XML, however, offers flexibility that makes it more suitable for commercial use. This is true because, unlike HTML, XML allows users to define their own tags. Rather than defining the tags themselves (or the semantics of the tags), XML provides a facility for defining tags and using them within a document. As with HTML, data is then bracketed within opening and closing tags, which the receiving device can read and act on as appropriate. Figure 1 shows an example of the use of a tag "author" to identify a book's author in a library document.

Because XML tags are user-definable, an XML schema is used to define which tags are valid in a particular document. Such definitions describe, for example, elements that can appear in a document (along with their attributes), whether an element is empty or can include text, and the data types for elements and attributes. Thus, a document can be compared to an XML schema — acting much like a blueprint, style guide or template — to ensure the document is valid and contains all relevant information.

```
<?xml version ="1.0"?>
<xs:schema xmlns:xs="http://www.somenamespacelocation.com/MemoSchema">

<xs:element name="note">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="to" type="xs:string"/>
            <xs:element name="from" type="xs:string"/>
            <xs:element name="heading" type="xs:string"/>
            <xs:element name="body" type="xs:string"/>
        </xs:sequence>
    <xs:complexType>
</xs:element>

</xs:schema>
```

Figure 2. This shows an example of an XML schema for a memo. XML schema acts to ensure the document is valid and contains all relevant information.

Again, this idea is not a new concept solely used by XML. Most databases have some sort of schema. Also, textbooks have used schemas for years, generally referring to them as "style guides." Figure 2 shows an example of an XML schema for a memo.

SOAP and SOA

Simple Object Access Protocol (SOAP) is a lightweight protocol for the exchange of information. It describes three main elements: an envelope, the encoding rules, and a convention for the representation of remote procedure calls and responses. SOAP is no longer used; however, the technology remains very much in use.

Though it isn't used, the SOAP acronym is sometimes confused with Service-Oriented Architecture (SOA). Though SOAP standards may be part of an SOA application, the acronyms are not related.

SOA is a design philosophy that separates the core functions of a business into independent modules. These modules are referred to as services — essentially software functions — that are called by one or more other services in the overall workflow. (Media transcoding is an example of a service that could be invoked as part of an overall workflow management system.)

Operating on the principle of loosely coupled systems, SOA abstracts the functions of a service from the low-level substructures of that service, leaving the calling service to use much higher-level language to drive the process. In doing so, SOA can make it easier to choreograph multiple business activities and processes among multiple complex software systems, all working under the control of a central process to achieve the required goal.

Consider the operation of a typical media enterprise: Material comes into a facility on tape, via satellite or as a file transfer, and content from each of these sources must be processed before it can be used. Tapes must be ingested, satellite feeds must be fed through some sort of IRD, and files must be received and error-corrected. Some form of transcoding may then be applied in order to provide the material in the house format. A QC stage may then be applied to ensure technical compliance. In the software

world, each of these would be software modules in a SOA-based system.

Without SOA, setting up such systems is a time-consuming process that likely will demand customization so that one vendor's automation/asset management system can talk to another vendor's software module or hardware processor. Any operational or technical changes may require replacement of a module or augmentation with another vendor's module.

For example, in a traditional workflow, the automation system must have deep knowledge of the proprietary API calls required to tell a transcoder to transcode a particular piece of material to another format. Every time a new format is added to the transcoder by its manufacturer, that interface must be modified (or in the worst case, completely rewritten). The custom integration software capable of addressing systems from different vendors thus presents a high-potential investment in time and money.

In a more agile SOA-based architecture, the automation system would simply send an XML message that says, "Transcode file X to format Y, and store the result as Z." This message remains consistent, even if a new transcoder or format is added. Regardless of the vendor, equally equipped systems will perform the same basic transcode when given the same command. Knowing this, engineers can take a more flexible approach to workflow design. This model depends on the fact that each service describes itself and its capabilities to the rest of the system. Web Services Descriptive Language (WSDL) facilitates this exchange of information.

WSDL is an XML-based language used for describing features and capabilities of a particular service. Provided to the central controlling system, this information ensures all other services and applications are aware of a particular service's capabilities. Four critical pieces are supplied:

- Interface information describing all publicly available functions;
- Data type information for all message requests and message responses;
- Binding information about the transport protocol to be used in calling the service; and
- Address information for locating the specified service.

When several similar services exist in one environment, information delivered via WSDL allows an application to decide which of those is most appropriate for the current task and to engage that service as required.

A basic overview of key acronyms can go a long way in helping engineers.

REST

Representational State Transfer (REST), an architecture for distributed systems such as the World Wide Web, is targeted at HTML rather than XML. It addresses the scalability of component interaction, generality of interfaces and deployment of components to reduce latency and enforce security of transactions. Unlike SOA, which often is considered peer-to-peer architecture, REST is oriented toward client/server interaction where clients initiate requests to servers, and servers process requests and return appropriate responses.

In a RESTful transaction, requests and responses are built around the transfer of representations of resources, which themselves are specific information sources. A representation of a resource is typically a document that captures a resource's current or intended state. Each resource is referenced with a global identifier. To manipulate these resources, components of the network — typically user agents and origin servers — communicate via a standardized interface like HTTP and exchange representations.

In the case of web page information, the raw data on which the page is built is the resource, but the representation of that data could be different for different users. What is representation of a resource? Consider a human using a browser to view a web page in order to retrieve information, and a computer doing the same as part of some larger activity. Both navigate to the same page, but the computer has no interest in the page's layout and styling; it just wants the data. The human does care about layout and styling (which, after all, exists to make the page easier for humans to digest). The two clients (human and computer) want different representations of the resource, both derived from the same raw data source.

While SOA is object-oriented, with the object the service with which other services interact, REST is point-to-point and relies on "GET" commands to a specific URL. It enables code delivery in "applets" as needed, and this capability can reduce basic complexity of any client application. Specialized code (like JavaScript) can be delivered along with data and used to customize how data is presented or obtained.

Conclusion

A basic overview of key acronyms can go a long way in helping engineers to understand and implement IT-based technologies and solutions successfully within their own facilities. The topics discussed here are complex and the subject of much discussion and documentation. Engineers can be certain these technologies will become an increased part of the media ecosystem, and they should strive to continue their education in IT-based technologies. A wealth of additional reading material exists, readily available on the Internet.

To paraphrase a leading engineering manager: "Those engineers who adapt to new technology will do well. Those who do not will do less well."

I hope you do well. BE

Paul Turner is vice president, broadcast market development, Harmonic.

Blackmagic Design's ATEM 1 M/E

The switcher enabled two workflows in one OB truck.

BY BRIAN SCHEFFLER

Being a small sports production company based in central Illinois, we were faced with several challenges when we were asked to televise and produce DVDs of an all-day high school marching band competition. We mainly produce live multicamera sports broadcasts but often get booked to televise special events such as corporate productions and community parades.

ScheffTech Productions used the aux bus of a Blackmagic Design ATEM 1 M/E switcher to produce the DVD version of a marching band compteition while the televised production used the main bus.

The production involved more than 25 high schools, and we were asked to televise the competition for a cable network and produce DVDs to be delivered on-site to family and friends. Our challenge became: How do we produce two separate productions in our production truck with limited equipment and crew?

Independent productions

The televised version of the marching band competition was exclusively for cable subscribers. The DVDs of the event that we were to sell had to be a completely different production with separate cameras. Our solution was to position a separate director at the back bench of our production truck where our replay operator would normally sit. This gave him access to equipment that would be used for the DVD sales and also gave him an isolated area to focus on his own production while a larger-scale broadcast production was taking place in the front of the truck. He had access to an isolated intercom channel with his camera operators and several extra monitors normally used for building replay highlight package for sports.

Like any other TV production truck, we only have one video switcher onboard. Both of the side-by-side productions were being switched from the same Blackmagic Design ATEM 1 M/E Production Switcher. The main television broadcast crew was switching their show on the main program bus of the ATEM 1 M/E Broadcast Panel.

The director in charge of the DVD production was using the included software control panel to control his show with a keyboard and mouse. He was switching between his dedicated cameras on an auxiliary bus on the ATEM switcher. The televised production that was being produced in the front of the production truck took priority with graphics, dissolves, more cameras and additional effects. Because a switcher aux bus was being used, the DVD production had a scaled-back show using cut-only transitions. We used the aux bus because the switcher syncs all of the camera inputs, allowing for smooth cuts between cameras.

In front of the DVD sales director were several rack-mounted Blackmagic Design SmartView DUO monitors, which can be found all over our production truck. All of those monitors are directly routable via a Blackmagic Design Compact Videohub router and Smart Control button press. Normally these monitors are used by our replay operator to iso, preview and cue up crucial in-game replays and highlight packages. During this marching band production, we routed several cameras and the aux output into those monitors for the DVD director. He was able to preview his cameras and monitor his program output on the monitors in front of him while also using the router and monitors to ensure his DVDs were recording and finalizing. Using the control panel software from the switcher and all of the equipment in the back of our production truck, he was able to switch the cameras on the aux bus without affecting the switcher or crew doing the main broadcast in the front of the production truck.

As the 16-hour day progressed, and as we watched band after band perform and rotated crews, the equipment, crew and planning withstood the test of time.

Intuitive workflow

As the 16-hour day progressed, and as we watched band after band perform, the equipment, crew and planning withstood the test of time. Since

the day was so long, our crew rotated throughout the day. As we rotated directors, the workflow was intuitive enough that no one had a problem jumping into the DVD production director seat. Using the software to switch the show on the aux bus of the switcher seemed easy enough for the directors.

Throughout the day, we did change up the routing on the monitors at the request of the director. For example, some preferred to see their program output on one monitor. Others preferred it on a completely different monitor. This was an easy task since all of our monitors in the production truck are routable with the push of a button on the button press.

Our TV broadcast crew put on a great production, and our smaller DVD production crew was able to deliver DVDs to customers on-site about 20 minutes after each band performed.

The flexibility of our switcher, monitoring and routing was the key to success.

The flexibility of our switcher, monitoring and routing was key in allowing us to repurpose the back bench of our production truck as a separate control room — all while being easily reset the next day for live football.

In the future

We are in the process of lining up several other marching band competitions next year and plan to do the same split production for TV and DVD sales. One thing that will be different next time is the addition of the ATEM 2 M/E Production Switcher and 2 M/E Broadcast Panel.

This will still allow us to use one video switcher for two productions but will give us access to a second mix effect bus. This will increase the production quality of the DVDs by giving us access to dissolves and graphics without interfering with the main TV broadcast being switched on the program bus of the ATEM 2 M/E.

While marching band competitions are not our typical production, we look forward to multipurposing our production truck next year for more events. BE

Brian Scheffler is owner of SchеffTech Productions.

Harris HView SX Pro

The multiviewer fits a quickly-evolving live environment.

BY KEVIN JACKSON

The typical broadcast control room architecture, just a few years ago, had every single image coming from its own CRT monitor — hardwired and hard mounted in a fixed, hefty matrix.

Today, broadcasters take advantage of brilliant and readily available flat-panel and projection displays, populating multiple images onto each physical screen. The move at once minimizes real estate and energy requirements, while giving operators a sleeker viewpoint.

The multiviewer is a relatively recent concept, but it is hard to imagine one that has had a bigger impact on the day-to-day working lives of broadcast engineers. The product has evolved rapidly as we enter its third generation.

The standalone device represented the first generation, which took a number of inputs and created one output. The second generation integrated the multiviewer with the router. This had clear advantages as signals were already being managed inside the router. It seemed logical to add the multiviewer hardware within the frame.

This laid the ground for the third generation, which offers complete freedom to set and instantly change the layout in any combination of sources and geometry.

How far we have come

Today's control room signals come in different formats and resolutions, and users should have the ability to set their monitoring preferences to work comfortably.

The HView SX Pro has been introduced as this third generation of multiviewers comes to fruition. Specifically, this multiviewer brings highly flexible monitoring and control into the live production environment. Live production has changed dramatically over the last decade, with 10 cameras now considered a small production. Many productions today call for more than 20 cameras plus recorded sources. This is a challenge for monitoring in the studio gallery and (even more so) within the confines of a mobile production truck.

Though compact, the HView SX Pro installation can support 512 x 512 routing plus 192 monitor outputs.

Live production is a highly pressurized environment, and the director and TD must be comfortable with the monitoring layout. Looking across a monitor stack throughout a long production is tiring and frustrating. And, not being able to find a key shot can be the difference between a great show and a disaster.

There are three points to consider in live production environments:

- Hardware needs to be as compact as possible with space at a premium;
- Images must be precise, whatever the resolution, to minimize operator fatigue and eyestrain; and
- Screen layouts require quick setup, with instant recall to minimize downtime.

This is why the HView SX Pro takes care to highlight three workflow-minded design aspects: smaller, sharper and smarter.

Smaller

The Harris Platinum router typically hosts the HView SX Pro on boards within the frame (though standalone installations are supported). This saves space and energy consumption by sharing the router's existing power supplies. The boards are doubled in density for greater space efficiency. Audio embedding and de-embedding, as well as frame synchronization, are also internally supported — reducing external connections and I/O requirements.

The multiviewer modules provide both HDMI and HD-SDI outputs (three of each). The HDMI outputs are ideal for local screens, and the HD-SDI outputs can be guided back through the router and sent anywhere in the facility.

Though compact, the multiviewer retains the ability to work with very large numbers of sources. The integrated router and multiviewer installation can support 512 x 512 routing plus 192 monitor outputs.

Sharper

When it comes to multiviewer installations, picture quality is quite often cited as a concern. By nature, translating multiple sources onto a single screen requires a scaling down of the resolution. In order to maximize image quality, the simple solution has been to limit screen layouts to factors of two in each direction: four per screen, 16 per screen and so on.

Certain devices allow the grouping of some tiles. One example of this is surrounding two quarter-screen images with eight smaller images. Some engineers put relatively few sources on each display, which negates putting many sources close to the operator — a multiviewer benefit.

The third-generation solution uses processing power available inside the router architecture to drive a more sophisticated scaling algorithm. This allows the operator to define any image size for any source and precisely build the layout required, while ensuring that identical quality is achieved no matter the resolution. Compounding this design challenge is that scaling must not add to latency through the system. Live production operators make decisions that require immediate display and must show instantly if the director calls for the cut.

The Harris-developed MicroFine scaling solution uses a combination of polyphase interpolation with sophisticated filtering techniques. This is combined with adaptive deinterlacing in a fast processing path, achieving the required uniform-perceived quality while maintaining end-to-end latency of less than one frame through the system.

Smarter

Studio and mobile production companies aim to achieve high utilization. A large truck might, within the space of a week, cover a rugby match, an "X-Factor" type entertainment show and a ballet. Each will have different directors, different requirements for ancillary equipment (multiple replays and motion graphics are more common in sport than ballet) and a different crew.

Each operator will have dedicated monitor layout preferences. The ability to set these preferences quickly and easily, without significant engineering effort, is a great productivity boost. The proper solution hosts various configurations inside the multiviewer alongside a web server, which enables design layout capabilities over any browser.

The design tool allows the user to work on individual screens or treat a multi-screen arrangement as a single display. As previously noted, the SX Pro allows sources to be displayed at any resolution. The variations of screen layouts are, therefore, infinite in theory. Templates are included in order to expedite the speeds to which layouts can be populated and modified.

The multiviewer stores configurations in non-volatile memory. This means studios with regular bookings can instantly recall layouts. Also, the configuration file can be exported to a USB stick or other external system, allowing the transport of personalized settings. The monitor stack appears identical from studio to studio, or truck to truck.

These core attributes represent the third-generation multiviewer for the live production environment. With the continued growth of live sports and event production — from various award shows to the Super Bowl — the live production segment continues to impress as a true growth area of the broadcast industry. Compact, energy efficient, easy to use and offering excellent image quality, the SX Pro is positioned to help broadcasters, mobile production truck operators and production companies working within this field. BE

The SX Pro allows sources to be displayed at any resolution. The variations of screen layouts are, therefore, infinite.

Kevin Jackson is product manager, multiviewers, Harris Broadcast Communications.

Ikegami/NAC's Hi-Motion II

NBC used the camera system for its coverage of Super Bowl XLVI.

BY MICHAEL GROTTICELLI

Perhaps the most pivotal play during this year's Super Bowl XLVI — Mario Manningham making the big catch along the sidelines — was captured with a reverse angle ultra slow-motion camera system recording the action at 300fps. Without it, viewers might not have seen that the receiver skillfully got both of his feet down in bounds and thus was awarded the catch. It kept the drive alive and allowed the New York Giants to go on to win Super Bowl XLVI in Indianapolis on Feb 5.

One Ikegami/NAC camera system and Canon lens captured a pivotal play located atop the 20-yard line, across the field from where the play physically took place.

The "X-MO"

That camera was a new Hi-Motion II ultra-motion system, which NBC refers to as an "X-MO" camera. It's made by Ikegami in partnership with a Japanese company called NAC Image Technology (with U.S. offices in Simi Valley, CA) that was being tried for the first time in an NFL Super Bowl game (and the first U.S.-based production). Sold and supported by Ikegami, the unit is a dual-format 1080i/720p HD camera system that provides simultaneous output of live normal-speed video and ultra-slow-motion replay video.

The camera portion uses three 1in monochrome CMOS sensors with built-in memory to deliver more than 10X-speed recording capability and stunning ultra-slow-motion HD playback by capturing up to 120fps during record. At the Super Bowl, a crew from NEP Broadcasting — this year's main provider of technical facilities for the big game — used four Ikegami/NAC units with Canon box-style telephoto lenses, in addition to another three Sony HDC3300 3X Super SloMo cameras with similar Canon 75X HD lenses.

One of the Ikegami/NAC cameras was used on a roving cart located down low, and the other three were used in the reverse positions of the typical camera positions in the stands. Signals were sent back to the truck via fiber, using a Telecast Fiber Systems SHED/HDX box attached to the camera system's output to convert the baseband (HD-SDI) signals to light.

The Hi-Motion II works with the Ikegami fiber interface, allowing the camera to send signals more than 6000ft using SMPTE fiber as well as single-mode fiber with local power. The camera can be used with a variety of solid-state storage options, as well as HD video servers. Last year, NAC Image Technology was using Panasonic as its exclusive camera partner for the first-generation camera, but the company has since partnered with Ikegami.

Operated by NBC cameraman Nick Utley, the camera that got the pivotal play shot was located atop the 20-yard line, across the field from where the play physically took place. It was cut in with images from a Sony 3300 "3X" Super SloMo camera system, shooting at 90fps, and fed into a Grass Valley Kalypso production switcher before going to air. NBC's Mark Griffard used another of the X-MO cameras to provide the reverse 50 angle. Both angles were shown on-air.

A perfect match

The challenge for David Birdy, a freelance video engineer who regularly manages slow-motion cameras used on NBC's "Sunday Night Football" telecasts and also served the same function at the Super Bowl, was to match the images coming from the Sony 1500 and 3300 systems and from the Ikegami X-MO systems, even though their frame rates were significantly different.

"I wasn't sure we could make the two cameras match perfectly for the viewers at home, but, due to those CMOS sensors in the NAC camera, I was able to make adjustments and match the cameras 100 percent," he said. "Having the three (red, blue and green) sensors to work with made all the difference in the world."

To match the cameras, Birdy set up a matrix using a MacBeth Color Chart (commonly used to calibrate and match digital cameras) and set both camera systems using similar color parameters. He used an analog vectorscope with an HD-SDI converter to set up a Sony HDC1500 camera in front of the MacBeth chart. He then put a clear piece of acetate and marked all of the spots on the vectorscope that the 1500 camera represented. Then he set up the Ikegami/NAC camera system and adjusted the Matrix color knobs accordingly, using a dedicated menu within the Ikegami camera.

Fletcher Camera & Lenses in Chicago supplied the Ikegami/NAC camera systems to NBC and provided training a few days before the Super Bowl telecast. Fletcher recently purchased 12 such systems (at a cost of $3.5 million) for its rental inventory.

The camera system itself was five years in the making. While current state-of-the-art systems capture slow-motion at about 90fps, this Ikegami/NAC camera can actually capture up to 1200fps at 720p HD resolution and 1000 fps at 1080p.

"Everyone was seeing these cameras for the first time ever, so there was a bit of a learning curve we had to overcome," Birdy said, "but we did and the images looked stunning. We really felt like we were pushing the limits, although we stayed at 300fps because we wanted to ensure that all of the various cameras we were using would match up. You can't have the replay display too slowly, or viewers will get annoyed."

A video technician and broadcast engineer by trade, Birdy was in charge of shading and matching the X-MO cameras with the telecasts' regular Sony HDC1500 cameras — from inside NEP's ND-3 HD production truck, which is used by NBC's "SNF" telecasts during the season as well.

With CMOS technology, the Vision Research-based camera system can acquire images in incredibly high frame rates and can be accurately matched to standard HD cameras.

During the NFL football season, he used the Vision Research Phantom 640 ultra slow-motion camera system (at 210fps to 300fps) in a special housing made by I-Movix. The Vision Research Phantom camera, which was originally designed for highly accurate monitoring of manufacturing processes, uses a single CMOS chip.

"Trying to match this CMOS-based camera with the Sony 1500s (three CCD chips) was a real challenge, especially when producing the show in the 1080i HD format," Birdy said.

During the season, a team of video engineers, led by Harvey Szajt, senior video control for NBC, carried one spare in case of failure, but the I-Movix package worked reliably every time. Whereas Szajt's job is to manage the video engineers and oversee the regular HD cameras (at the Super Bowl he was responsible for 46 cameras), Birdy focused solely on the X-MO camera systems.

"Magic" signal processing

Birdy said that the camera is unique in that all of the "magic" signal processing is performed in the camera head, so it can be used as a standalone or handheld unit if necessary. The base station is used strictly for power, intercom and data communications.

"The [Ikegami/NAC] cameras worked very well, right out of the box," Birdy said. "We had a few software issues, but anything I needed for the game was resolved quickly."

He said the system's control panel can be used with any Ikegami camera. The camera can be used as both a traditional HD portable/field camera and an ultra-motion HD camera that can work side-by-side with other HD cameras. Birdy said the camera is slightly lighter than a typical shoulder-mount ENG camera and that the camera's menu structure is very similar to a standard Ikegami camera.

"With CMOS technology, we can get to incredibly high frame rates, and we can match the pictures to the standard HD cameras in ways we never could before," Birdy said. "One can get very creative with these cameras. We're talking about a live camera system with three separate RGB controls."

He continued, "At the end of the day, the proof is in the Super Bowl and that amazing catch. The three CMOS chips make a big difference. I can say that the Sony 1500 is one of the best-looking cameras on the market and for me to be able to match it with this NAC/Ikegami X-MO camera is, in my opinion, a milestone for live slow-motion camera systems." **BE**

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

Christie's Spyder X20

The video processor controls an array of video walls, LEDs and flat-panel displays for CCTV.

BY CAROLINE ALDRIDGE

When China's state broadcaster CCTV (China Central Television) launched its new U.S. hub in Washington, D.C., it wanted a clean, elegant on-air look for its first American content targeted to viewers back home.

The U.S. operation delivers English-language programming to China; the Washington hub is the latest in the broadcaster's worldwide expansion of bureaus and studios. CCTV operates 16 national channels in China and claims a global TV audience of one billion.

The design brief for Washington called for maximum flexibility to accommodate a large number of shows produced from just two studios located in an office building. As the designers and builders of the studio sets, we looked for a system that would enable CCTV to manipulate its PAL video and graphics seamlessly across the studios despite the different pixel counts for high-resolution and low-resolution display devices.

Installation

We selected three Christie Vista Spyder X20 0808 processors to control an array of video walls, LEDs and flat-panel displays designed into the sets. These displays showcase HD-SDI-driven titles, logos, graphic elements, breaking news and interviews. Everything in the sets can change: The lighting, video and graphics can give them a completely different look.

One Spyder is dedicated to Studio A's CCTV News Center set (left), while another is dedicated to the "Biz Asia America" show and other financial news programming originating from the other side of Studio A (right).

The Spyder X20 can be used in many different environments with any combination of display devices.

The X20 has established a good reputation in the broadcast world as a high-end, hardware-based video processor whose unique architecture allows for a resolution- and video format-independent environment. It can be used in many different environments with any combination of display devices. The system's 20 megapixel bandwidth enables it to blend, window, mix and scale any source format and route the signal to any destination device quickly and easily.

One Spyder is dedicated to Studio A's CCTV News Center set, where it feeds video and logo graphics to a curved Suncoast 4mm LED screen in the middle of the anchor desk; a curved 3 x 7 Orion flat-panel video wall across the back of the set; a Color Kinetics LED vertical panel with LED bottom ribbon to the left of the video wall; and a 10in Panasonic flat panel to the right of the video wall.

A second system is dedicated to the "Biz Asia America" show and other financial news programming originating from the other side of Studio A. It feeds content to the LED screen on another anchor desk; an L-shaped video wall in a 4 x 5 configuration flanked by a pair of Suncoast 8mm LEDs; and an 85in Panasonic flat panel to the left.

Studio B features a third Spyder, which feeds all the monitors and LED screens on its news set. The most elaborate of the three sets, the news set has a curved Orion 2 x 5 flat-panel video wall, which comprises the backdrop. Suncoast 8mm LEDS on either side show graphic displays, and a 103in Panasonic flat panel to the right side plays breaking news. A 42in Panasonic flat panel hangs vertically and serves as the anchor's over-the-shoulder monitor with the ability to display remote guest appearances. The front of the anchor desk has a built-in Suncoast 4mm LED.

A fourth system is on hand in a separate control room for use in future Chinese-language shows.

User-friendliness was a consideration when selecting equipment for CCTV's U.S. hub in Washington, D.C. Although the Spyder processors are sophisticated, the CCTV staff was quickly able to flow images to different display formats and orientation with ease.

Philadelphia-based systems integrator Video Visions installed the video control systems and X20s for CCTV's Washington studios.

Ease of use

User-friendliness of the equipment was a consideration throughout the project. Although Spyder is sophisticated, it's relatively simple for an operator to run and has an intuitive user interface. After just a few days of training, the CCTV staff was able to flow images to different display formats and orientations with ease. It's impressive to watch people with no experience of the product adopt it and use it to its full potential. The staff is already exploring new possibilities with the X20s.

Spyder's ability to manipulate a wide range of graphic and video content seamlessly and easily helped us deliver the clean, elegant on-air look the broadcaster sought and made CCTV's Washington, D.C., debut smooth and flawless. BE

Caroline Aldridge is COO and Project Manager for Broadcast Design International (BDI).

Brevity's V3

The system combines multipoint transport and transcoding.

BY JACOB BRONSTEIN AND TIMOTHY O'BRIEN

When it comes to video, more data translates to better quality. However, the large size of a typical video file in today's HD world also translates into transcode and transfer bottlenecks for broadcasters and production houses. It often becomes a trade-off between preserving quality and resolution versus limiting file sizes or bit rates to meet workflow deadlines.

For example, a master file for just one and a half hours of 1080p video could be as large as 540GB. This large file would require many hours to transcode into various formats for editing, broadcasting and archiving purposes. And at 540GB, this digital file would take longer to transfer from one facility to another over the Internet than it would take to ship a physical hard drive across the country overnight. With every project, the workflow comes to a halt as the team waits for files to be transcoded into different formats and then transferred between systems.

Brevity, a start-up based in New York City with offices in Los Angeles and Vancouver, WA, is taking a new approach to video transport and transcoding that streamlines the workflow and eliminates the bottlenecks, yet preserves or even improves on quality by avoiding cumulative loss in production and distribution workflows. The Brevity system relies on a combination of licensed software per location and Brevity or third-party certified hardware that has the necessary teraflops of graphical processing power.

The service relies on unique algorithms that model and compress information, breaking down a video file into a much smaller "blueprint," or set of instructions, for rebuilding the file into any format. This computationally intensive GPU-based approach is integrated into Brevity's enterprise video management tool, V3, which provides automated workflows with simultaneous transcode and transfer over a network.

How it works

To use the service, specialized rack-mounted hardware is installed at targeted destination points — for example, at New York and Los Angeles facilities. When a transfer is initiated, the algorithm uses specialized video router hardware to apply teraflops of compute power to break down the video into a blueprint-like set of instructions for transmitting and rebuilding the video while in process over the network. This approach of modeling the file into a set of instructions allows the system to reduce the amount of data that is sent over the network to as little as 1/30th the size of the original file.

Using the system, that one-and-a-half-hour 1080p video at 540GB can now be transferred over a 40Mb/s Internet line in as little as two hours (as opposed to 33 hours through WAN optimization alone).

Aside from reducing the transfer time, this approach also eliminates the need to transcode files after transferring them. Once the blueprint instructions have been transferred, the receiving client's unit will rebuild the file into any supported video format. In one step, the system compresses the source file, transfers it to one or multiple recipients, and rebuilds the file in the desired format. Essentially, the system offers simultaneous multipoint transcode and multipoint transfer.

The Brevity system relies on a combination of licensed software per location and Brevity or third-party certified hardware that has the necessary teraflops of graphical processing power.

Using the system, that one-and-a-half-hour 1080p video at 540GB can now be transferred over a 40Mb/s Internet line in as little as two hours.

For example, a user is finishing up a project in Avid, working in a DNxHD 220 format. The user now needs to hand off the video to another department. Using Brevity, it is

possible to specify the recipients, select the DNxHD 200 file to send and then start the transfer. The recipient specifies the format he or she would like to receive the video in, so it could arrive in H.264, ProRes, MPEG-2 or many other formats. The system supports an extensive list of industry-standard and vendor-specific formats. New formats are added for all clients under license at no additional cost.

Maintaining high quality

While the system supports leading industry formats at ingest and output, it uses its own unique transfer mezzanine format called Image Warp to gain its simultaneous accelerated transport and transcode capabilities. Image Warp, a patent-pending algorithm tuned to the human visual and perceptual systems, has been tested in HD and cinema applications to be visually lossless. It is designed to support all content types, including those used in most high-end production and post-production workflows. In direct-to-edit workflows, Image Warp exceeds editing codecs in both objective and subjective tests at a fraction of the size, while also being able to encode in submillisecond-per-frame speeds. For example, in peak signal-to-noise tests, the system performs consistently at about 60dB.

The system's other algorithm, Data Warp, moves files in a bit-for-bit lossless manner, ensuring that the file quality is mathematically identical to the original source. Just like with Image Warp, users choosing Data Warp for lossless quality can simultaneously transfer and transcode while transmitting over the network.

A permission-based workflow grants access to files and other rules to protect access and use.

In addition to transfer and transcode, the system also provides transformations such as frame rate conversion, aspect ratio conversion, letterboxing and others, simultaneously during transmission.

Interface

Brevity has built its service with simplicity in mind. The hardware, which includes GPUs, CPUs and SSD arrays, plugs into a network like a standard blade. If more processing capacity is needed, it is possible to simply add more blades. The additional capacity will dynamically cluster, providing scalable multiteraflop processing power. This additional processing capacity could be used to handle large files like 2K or 4K cinema files, or multiple, concurrent send and receive activities.

The system also includes a project paradigm to accommodate multiple workflow and collaboration features used across organizations and partners. A permission-based workflow grants access to files and other rules to protect access and how files are used. For example, it is possible to specify that high-resolution files never leave the internal network. An enterprise asset management structure organizes files into a single view, even when they reside on different servers located in different offices. Finally, Brevity offers a full set of Web services APIs to integrate into existing tools and applications.

The hardware acts like a video router, remaining invisible to the user. Clients access and manage files virtually through storage, clouds or SANs via an enterprise Web interface. A user signs in and then sets up a profile, specifying preferences such as formats to support for key tasks (DNxHD, ProRes, YUV, etc.). The V3 software then handles the rest. As a user selects the files needed from a virtual media asset management file approach, the system ensures that the requested files arrive at their proper destination in the required format.

Through its technology, Brevity is offering the broadcast industry a way to address bottlenecks and workflow workarounds with an integrated system that combines accelerated transfer with transcoding in a single, simultaneous process. BE

Jacob Bronstein is CEO of Brevity, and Timothy O'Brien is president of Brevity.

Violin Memory 6000

The flash-based storage system erases slow data access.

BY JONATHAN GOLDICK

The media and entertainment industry is under constant pressure to deliver quality results at high speeds. Video post-production and rendering require data-intensive environments commonly plagued by the slow data access of traditional hard disk drives (HDD). Fast data access and rapid processing time are essential to ensure a high-quality final product. These issues can be solved with a flash memory storage system that has the reliability, performance and economics necessary to be deployed as mission-critical primary storage in the most data-intensive video environments.

Each rack in the Violin Memory 6000 series has the potential to deliver 12 million IOPS and 48GB/s of bandwidth.

The Violin Memory 6000 is a fully-integrated, flash-based system for primary enterprise storage. With a "rack in a box" approach, the system paves the way for media and entertainment companies to leverage flash as the foundation for virtualized data centers. A single rack of 10 arrays can deliver 12 million IOPS and 48GB/s of bandwidth from 160TB of storage capacity.

The system optimally balances performance, reliability and cost to provide a high-performing solution for primary storage rather than traditional disk-based storage. This is achieved by taking a systems approach specifically designed to optimize flash performance and aggregation from the chip up. Compared to disk-based systems, Violin Memory arrays deliver low cost per bandwidth (for rendering) and latency (for post-production and streaming), and significantly lower both CAPEX and OPEX. Compared to other solid-state storage alternatives, the arrays deliver on all key enterprise requirements where alternatives are lacking. These requirements include:

- *Shared network storage* — Arrays attach to the network, providing a strategic resource that can be shared across thousands of servers and multiple applications. Network options are also flexible enough to allow for arrays to be directly connected to servers.
- *Sustained performance* — Unique vRAID technology, with its patent-pending erase-and-write hiding feature, ensures sustained performance without the read-and-write latency spikes experienced by other solid-state approaches.
- *Mixed workload performance* — The arrays deliver excellent performance over a wide range of read/write I/O profiles with predictable low latency.
- *Enterprise high availability* — There is no single point of failure. Two or more of every component exist, all of which are hot-swappable in order to ensure no downtime or loss of data in the event of failure. Flash chips are packaged into Violin Intelligent Memory Modules (VIMMs) that are organized into RAID groups (of five VIMMs) to ensure no loss of data or performance in the event of VIMM failure. Spare VIMMs are configured in the system, allowing for fail-in-place with no disruption of operation and hot-swap when convenient.
- *Performance under failure* — Performance must be maintained in the event of component failures, even if a RAID rebuild is required. Gone are the days when a failed hard disk took dozens of hours to rebuild, impacting application performance the entire time.

Violin arrays deliver on all key requirements where alternatives are lacking, including: shared network storage, performance, enterprise high availability and performance under failure.

Other deployments

There are other approaches to deploying flash memory, all of which fall short on one or more dimensions:

- *PCIe cards* are essentially a form of Direct Attached Storage (DAS) as they are configured within a single server providing a memory extension or caching capability. This approach is poorly suited to sharing over the network across multiple applications and servers. Additionally, component failure prevents data access, cannot be hot-swapped and usually causes

server failure. PCIe cards are also susceptible to potentially significant performance degradation from the flash "write cliff."

• *SSD-based arrays* use off-the-shelf solid-state disks in place of Hard Disk Drives (HDD). These arrays lack the enterprise reliability capabilities required for primary enterprise storage. The use of commodity SSD components, in conjunction with standard disk interfaces and controllers, limits the ability to optimize for flash. Even though latency performance is faster, the controller becomes the bottleneck, limiting IOPS with only a few SSDs.

Violin arrays deliver high performance density. In addition to the 16TB Single Level Cell array described earlier, Multi Level Cell (MLC) systems are also available. These arrays can provide a higher density of up to 32TB per 3U system, while still delivering 500K IOPS with read/write latency under 200ms.

MLC systems are also available, providing higher density of up to 32TB per 3U system, with 500K IOPS and read/write latency under 200ms.

Summary

Violin Memory takes an integrated systems approach to deliver flash memory arrays for mission-critical shared network storage. The arrays are engineered from the chip up for optimal use of flash, sustained performance and high availability that cannot be achieved by using SSDs or PCIe cards for primary enterprise storage.

With video post-production, where a relatively small number of users are employing heavy-duty software in order to view and alter movies one scene at a time, it is absolutely critical to guarantee reliable, zero-jitter performance in order to provide a suitable product. HDD-based systems have an extremely difficult time guaranteeing isochronous delivery of video frames. Flash-based storage platforms eradicate these concerns where low latency is a given under all conditions. BE

Jonathan Goldick is CTO software, Violin Memory.

Monitoring in a flat world

Flat-panels and scaling engines changed monitoring.

BY JOHN LUFF

Fundamental to any control room is a method of monitoring the audio and video that is being assembled in production or air operations. Though the requirements of those environments are not identical, we sometimes attempt to shoehorn both into a single system. In the recent past, monitor walls were built up using metal racks and discrete monochrome and color monitors, with speakers, clocks and the odd computer display added where applicable. In some complex facilities managing large numbers of incoming and outgoing feeds, like a network news or sports operation, the number of discrete devices can grow quite large.

Such systems have worked well, however. There was great flexibility to design cost-effective monitoring by applying cost/benefit analysis to the selection of each monitoring device. Feeds for which only signal presence was important did not need the expense of a color monitor or speaker, and monochrome 9in monitors were popular. When audio levels or critical video performance evaluation are required, a switched system, close to the operator, allows for detailed analysis or quality checking. This is particularly effective from the operator's perspective.

One might ask why this has changed, as it has, in fundamental ways. The factors are quite obvious, not the least of which is the rather rapid disappearance of discrete, low-cost, small monitors. CRT monitors are vanishing rapidly, reducing available options. Secondly, the power consumption of multiple monitors is at least additive, and considering the conversion loss in each power supply, it is likely a drain on power and air conditioning systems.

When KOMO-TV in Seattle upgraded its production facility to HD, the station added multiple flat-panel displays for monitoring. The station uses the upgraded facility to produce HD newscasts. Photo courtesy Rob Purdy.

Monitor walls

Looking at a mechanical model, a "conventional" monitor wall is constrained by the metal that supports it. It is space-inefficient, heavy and not easily adapted to special use cases that require monitors that don't fit in a rigid 19in rack structure. I built a "nonconventional" monitor wall in a mobile unit that was used for HD delivery of NFL games that broke ground as the first entirely flat-panel-based monitor wall. Had we been constrained by the 19in limit, the monitor wall would have contained fewer monitors. The system mounted the monitors inches from the outside wall with no lost space between displays. It also allowed us to use large monitors for program and preset, and still group the 17in 16:9 flat-panel displays efficiently around the outside of the large monitors.

Though the ability to pick individual monitors was once appealing, overall, the constraints placed on monitor wall construction have become a burden on both the design and operation of television facilities.

Happily, two developments came along in the last decade that together have fundamentally changed how monitoring is done. Individually, neither would have solved the problems older approaches could not. Flat-panel widescreen monitors came from consumer electronics initiatives, not from purpose-built HD displays for broadcasters. Initially, plasma, and later LCD and other technologies, allowed relatively low power consumption compared to similarly sized CRT monitors. But they didn't fit well in the 19in structure we were constrained by, and they were too large to allow single-source monitoring of a large number of sources.

The other development that changed our collective lives was not what you might assume. It was the development of scaling engines, in silicon, that were created to allow flat-panel monitors to accept multiple

scanning standards and spurred the ability of new composite devices to combine many signals into one output. These scaling engines became monitor wall processors. Over time, the capabilities of monitor wall systems grew to embrace all of the devices we put in monitor walls in discrete form, including clocks, audio metering, closed caption decoders, etc.

The idea of monitor wall processors preceded practical HD/SD systems by most of a decade. However, they were initially limited to a fixed layout of usually 16 inputs. Since they were based on complex technology, not silicon solutions, they were also expensive. Thus, though they were ground-breaking in many ways, they had no impact. It took the additional development of silicon scaling engines to facilitate a practical multi-image monitor processor.

It is worth noting that even tablet computers now have higher than HD resolution, and higher resolution (and frame rate) acquisition and processing is now commercially possible.

Consumer electronics

This is no longer a surprising confluence of factors, for it arises out of consumer electronics momentum. Flat panels and the technology of monitor walls have evolved from systems outside the professional domain. Other professional products have come from similar synergy, like DV-based recorders that came from the development of consumer VCRs, which by the way were largely a market flop. Once the research has been paid for, our professional electronics manufacturers are happy to co-opt new technology into creative systems for professional system problems. Personally, I hope we never stop doing this.

There are, however, problems that arise from using this approach. Perhaps the most obvious is that using consumer display technology that has the same resolution as studio signals seems like the perfect marriage of convenience and necessity, but it binds us to multiple windows of lower resolution displayed on a single display. The filtering used in multi-image processors is good these days, but of necessity the pictures are degraded.

We can hope that processing systems will adopt higher resolution outputs soon, because consumer 4K displays are beginning to show up. For those concerned about preserving quality, it would be nice to get back to full resolution, or close at least. This would not be inexpensive, but the display cards in computers already have the ability to feed higher resolution displays that have been available from a number of manufacturers for years. It is worth noting that even tablet computers now have higher than HD resolution, and higher resolution (and frame rate) acquisition and processing is now commercially possible. It won't be long before HD is the new SD. Remember, at one time the British 405-line standard was considered HD.

Finally, a word of caution: When building a wall of displays of one type, one has to hope that for a reasonable number of years all of the displays age similarly and that should replacement of one become necessary, a replacement of similar dimensions and performance will be available. With our reliance on CE manufacturers for these critical pieces of our facilities, it is a fervent hope, but one without guarantees. **BE**

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Mobile DTV

It was a different year and the same promises at NAB.

BY ANTHONY R. GARGANO

For a while, it appeared the Mobile DTV Pavilion at this year's NAB show was, in reality, a geocache. In order to find it, it seemed one needed to sign up for the NAB version of a GPS treasure hunt. However, if one perservered and looked long enough, the Mobile DTV Pavillion actually did exist. That's not to say that you would have felt rewarded by all that effort.

No, what was found was what appeared to be an uncoordinated collection of seven or eight loosely-related companies and organizations, all tucked into an obscure area of one of the lesser-visited exhibit halls.

Empty

For a technology that has been so hyped previously at both NAB and CES shows, this once promising new broadcast application appears now to be orphaned and struggling. To say the lack of prominence was hugely disappointing would be a gross understatement. Of the several times I stopped by the pavilion, on one occasion there was not a single other visiting soul there, and half of the stands at the pavilion weren't even staffed. During a second visit, still not all of the stands were staffed, but at least there was one other person walking around. Actually, the stands really didn't need staffing. A recording with the same promises and commitments from last year would have sufficed.

The erstwhile mobile DTV iPad dongle, promised last year, was once again promised to be available later this year. Prototypes of standalone, pocket-sized portable receivers and receiver cell phone combo units from shows past were all there, once again, in protoype form. Productization of these devices continues to be a moving target as discussions with vendors resulted in statements of availability by June, September or the end of 2012. Basically, it was a replay of 2011.

Six years since S9

It's hard to believe six years have passed since the ATSC's S9 working group meetings from which a specification emerged that ultimately embraced mobile DTV. In attendance for a consulting client at the time, it was interesting for me to observe the advocates of two different proposed technical approaches — A-VSB and MPH — as each side pitched its respective technologies for adoption.

Mobile DTV, in this era of "Business @ the Speed of Thought," has taken too long to get to market.

As occurs with most standardization processes, ultimately, a compromise was achieved, and the ATSC-M/H standard was adopted. In between the compromise and acceptance of the final standard, a rather lengthy period of testing was designated. It was during this period that I raised concerns over the length of the process.

Believing strongly there was a finite window of market opportunity for mobile video, the danger would be it would close before the broadcast industry got out of the starting gate. As productization and commercialization (in themselves processes of some length) could only proceed after a standard was adopted, the danger was a lengthy period of testing and evaluation, combined with the typical glacial speed of committee workings, would result in missing the market. Surprisingly, it turns out the long pole in the water has been the commercialization and not the standardization process. Mea culpa, ATSC.

It's been more than two years since the Mobile Content Venture (MCV), a joint activity comprised of a number of station groups, FOX and NBC among others, has been announced. Over two years, and it is still not possible to dial into Dyle. (Dyle is the name designated by MCV for its mobile content service.) Meanwhile, the Mobile500 Alliance, another group of broadcasters promising mobile content services, has proudly announced its second-generation mobile service. Second-generation? I guess we all somehow missed the first.

I have always been a great believer in the appeal of mobile entertainment to consumers. I was a strong advocate of it during many years at Sony. Broadcasters today should participate in that opportunity, but Mobile DTV in this era of "Business @ the Speed of Thought" has taken too long to get to market. Frustratingly, it still isn't there, shown by yet another NAB promising that "it is coming."

While broadcasters may have some exclusivity rights for various content, the value of those rights continues to drop dramatically. Consumers today are purchasing and downloading viewing apps, investing dollars in available portable media platforms and services, and investing themselves in their personal viewing behavior development.

So, while not declaring Mobile DTV dead, it is gasping on life support. And, if the industry doesn't deliver its Mobile DTV promise this year, it won't take a CSI team to make a death determination. BE

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

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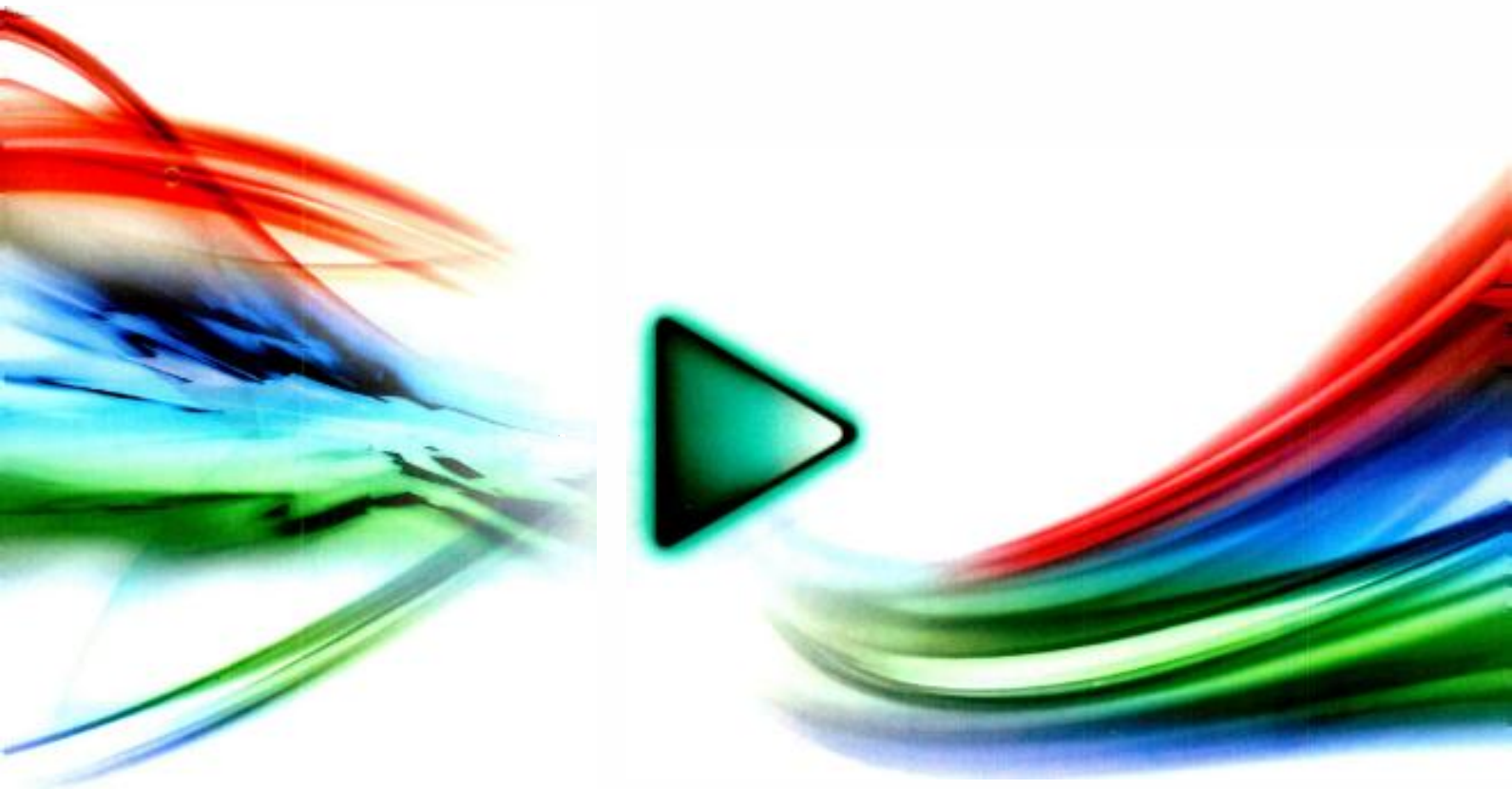

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